ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

217/524-3300

March 24, 2017

Veolia ES Technical Solutions, L.L.C.
Attn: Doug Harris
7 Mobile Avenue
Sauget, Illinois 62201-1069

Re: 1631210009- St. Claire County
        Veolia ES Tech
        Log No. B-29R
        RCRA Part B Permit File

Dear Mr. Harris:

This letter is in response to Veolia's human health risk assessment dated October 2016. The Illinois Environmental Protection Agency (Illinois EPA) had a conference call with U.S. EPA and Veolia on January 19, 2017. The comments provided below are a written summary of the initial review and may not be complete. U.S. EPA has asked for and has not received electronic project files for the risk model. Since Veolia's contractor will not provide the electronic risk assessment project files, U.S. EPA will need to reprocess the risk model on our behalf using the risk modeling system available. Due to the delay and not receiving useable risk assessment archive files, a more comprehensive review will be provided after air dispersion modeling files are converted and the risk model is reprocessed.

Section 1.1.   The objective of the risk assessment should be stated in this section. The purpose of the risk assessment is to evaluate predictive risk from the facility at maximum allowable maximum achievable control technology (MACT) emission limits to determine if these limits are protective of human health and the environment or if the facility's Resource Conservation and Recovery Act (RCRA) permit needs to impose additional conditions to ensure protection of human health and the environment. It should be noted in this section that Veolia is also subject to an Illinois IEPA RCRA permit.

Section 1.2   The risk assessment evaluated measured emission of mercury collected during the most recent Comprehensive Performance Test (CPT). Despite claims of "worst-case" conditions during the CPT, future CPTs could demonstrate compliance at

4302 N. Main St., Rockford, IL 61103 (815)987-7760
595 S. State, Elgin, IL 60123 (847)608-3131
2125 S. First St., Champaign, IL 61820 (217)278-5800
2009 Mall St., Collinsville, IL 62234 (618)346-5120

9511 Harrison St., Des Plaines, IL 60016 (847)294-4000
412 SW Washington St., Suite D, Peoria, IL 61602 (309)671-3022
2309 W. Main St., Suite 116, Marion, IL 62959 (618)993-7200
100 W. Randolph, Suite 10-300, Chicago, IL 60601

Appendix 5 1

even higher emission rates which are closer to the MACT stack standards. The facility could request higher feed- and emission-rates based on extrapolation to the MACT from a lower value. Lastly, increases in stack gas flowrates could increase emissions even further while still complying with the MACT standard. For example, the 2013 CPT for Stack 4 was conducted at 73% of the stack flowrate demonstrated in 2008. A return to the 2008 stack gas flowrate could boost emissions of target compounds by up to 37%.

During any future CPT Veolia may increase emissions higher than those tested in their most recent CPT while still complying with the MACT. Also, at any time Veolia may request an extrapolation increase of emission rates higher than their CPT emission rates. When either of these situations occur, Veolia's current risk assessment results would not be an accurate evaluation of this future Air permit's emissions.

Here and throughout the report, Veolia should address descriptions of conservative values or operations in the uncertainty section of the report. Furthermore, such conclusions should be based on the objective of evaluating predictive risk from the facility at the maximum allowable MACT emission limits.

Section 1.3   This section does not seem to have a logical point. Descriptions of conservative values or operations should be discussed in the uncertainty section of the report.

Section 1.4   It is not clear how this risk assessment evaluated acute effects from incinerator emissions if mercury was the only subject of the assessment. Emission components that typically contribute more of an acute effect, such as chlorine and hydrogen chloride, are not evaluated here, so broad statements about overall acute impacts are not appropriate.

Section 2.3   It is not clear why Veolia proposes to use "default values" for mercury speciation for units 2 and 3 when the September 2005 Human Health Risk Assessment Protocol (HHRAP) "recommend[s] basing the estimates on the concentration of mercury in various components of the Agency's multiple metals sampling train ...". Veolia has conducted several CPTs since the original Illinois EPA permit was issued, including sampling using U.S. EPA's Method 29. The HHRAP includes a methodology for using Method 29 data for site-specific mercury speciation and this information is more appropriate and site-specific than the default values. These derived values would be more appropriate than the default values and should be used in this risk assessment. Note that the estimates for mercury global loss are dependent upon the speciation. They should be different for any stacks that do not have the same speciation. Also, please provide references for the "recent studies" mentioned at the end of the third paragraph.

Section 3.2.1 Please note that U.S. EPA Region 5 has conducted a literature review of Henry's Law Constants (HLC) and Diffusivity in Air parameters for mercuric chloride

(used when modeling divalent mercury vapor). They recommend its use in the model. The recommended HLC for mercuric chloride in this review, 2.37E-05 Pa m^3/mol, differs from the one Veolia used as indicated in Table 3-1. The report generically describes where other parameters identified in Table 3-1 were sourced, however, it does not clearly identify the source of each parameter or present a complete rationale for choosing each parameter provided. Please clearly delineate the source for each parameter selected and justify its use in comparison to other available values in accordance with Section 5.8 of HHRAP. Also, the fraction of the contaminant in vapor phase (F_V) depends upon the speciation and loss estimates. The listed F_V of 0.85 is only appropriate for modeling when the HHRAP default scenario is used. Veolia should recalculate the F_V to match the speciation and global loss combinations corresponding to the site-specific stack-test based results for mercury species.

Section 3.2.2 The particle size distribution test of stack 4 should be described and referenced. Because Veolia has not tested particle size on stacks 2 and 3, the report needs to explain Veolia's determination that the lack of carbon injection in those stacks does not allow a larger percentage of smaller particles to emit from stacks 2 and 3. The uncertainty section should discuss using stack 4 particle size distribution on stack 2 and 3 modeling.

Section 3.3 U.S. EPA disagrees with delineations made in determining dispersion coefficients. In particular, the report incorrectly identifies the following areas as not urban land use: the south west neighborhoods of East St. Louis and a vast industrial tank farm directly south of the facility. It is not appropriate to selectively identify individual tanks as urban land-use while identifying the containment areas as not urban land-use. U.S. EPA previously estimated the land-use to be approximately 58% urban in the June 2006 U.S. EPA document on site-specific dispersion modeling. Since estimates of urban and rural land-use vary close to the 50% suggested decision point, U.S. EPA recommends the risk assessment use modeling with both urban and rural dispersion coefficients in order to understand the potential range of values.

Section 4.2.1 The percentage of contaminated home grown produce consumed should be 100% and not 25%. See HHRAP 6.2.2.3, "Therefore, by using consumption rates specific to home produced foods, we consider it reasonable to assume that 100% of those home produced foods are contaminated." The method in this risk assessment uses the percent of home grown produce consumed twice. The percent can only be applied once.

Section 4.2.2 The fish consumption rates used in this risk assessment are incorrect. These rates are based on an U.S. EPA report that has a different objective than the purpose of this risk assessment. That report states "the analysis presented provides U.S. EPA's recommended methodology for developing a national-level fish consumption rate (FCR) for use in developing ambient water quality criteria as

required under Section 304(a) of the Clean Water Act." That report provides the methodology and analysis of fish consumption across the entire U.S. population. That means that it includes all people in the United States. Some people eat very little or no fish, while others may eat a lot of fish. The fish that the United States population eats comes from many sources (i.e. restaurants, packaged, imported, etc.). The defined fisher scenario in this risk assessment encompasses not the average U.S. population but only the local residents who fish locally and eat some of the fish they catch. The fish consumption rates need to be derived from studies that sampled populations of fishers who eat some of the fish they catch. It would be incorrect to use sampled populations of people who do not eat fish in determining fish consumption rates for the defined fisher scenarios in this risk assessment. The risk assessment should be processed using the HHRAP default fish consumption rates unless there is a well-prepared, robust and peer-reviewed site-specific study of fish consumption rates of people who fish locally and consume some of the fish they catch (see Section 5.8 of HHRAP). Veolia's report also states that "Veolia understands that the usage at the Frank Holten State Park lakes to be that of recreational fishers only..." and makes this assertion without sufficient supporting information. Again, the percentage of contaminated home grown produce consumed should be 100%, not 25%.

Section 4.4   The report does not provide a description or delineation of the waterbodies and watersheds.

Section 5.2.2.2The report incorrectly states that the referenced U.S. EPA report is more comprehensive for the objective of this risk assessment than the default values in the HHRAP guidance. The HHRAP guidance should be used for the consumption rate for fishers. As noted above, the April 2014 U.S. EPA report served a different purpose. Also, the factor for adjusted fish cooking and preparation loss is 38%, not 41%. The 38% total loss is derived from the mass remaining after 30% mean net loss cooking multiplied by the percentage remaining after 11% mean net post cooking loss (70% x 89% = 62%, 1 − 0.62 = 0.38).

Section 5.2.2.3As discussed above, the percentage of locally caught contaminated fish that is consumed should be 100%. By definition, all locally-caught fish that is consumed comes from local waterbodies. The local waterbodies in this study area are the Frank Holten Lakes.

Section 6.2   The purpose of the risk assessment should be to evaluate predictive risk from the facility at maximum allowable MACT emission limits to determine if these limits are protective of human health and the environment or if the facility's RCRA permit needs to impose additional conditions to ensure protection of human health and the environment. This risk assessment does not determine these results.

Section 6.3   Veolia makes a number of errors in determining the appropriate mercury Bio-Accumulation Factor (BAF) value. The report does not follow Section 5.8 of HHRAP in determining the appropriateness of using site-specific parameter values versus default parameter values. It says: "The majority of fishing at Frank Holten State Park, as witnessed on numerous occasions by Veolia personnel, is accomplished by fishing with a cane pole from the banks and using live bait (worms)", and concludes 'these practices primarily yield bluegill, carp, buffalo, and catfish." Anecdotal observations made by Veolia employees do not meet the established criteria to disregard the well-established, peer-reviewed default parameter value. The report mentions fish-stocking information, but does not include this information or explain its relativeness. The report incorrectly states that catfish is not categorized as a Trophic Level 4 species; however, catfish greater than 450mm are categorized as Trophic Level 4. The report needs to include the studies it references. The report must provide a clear justification to use a value other than the default value.

Section 7.0   This section needs to recognize the high certainty of the known location of the waterbodies in regard to the risk driver and the air model outputs. The report should include references to all mentioned studies. The report should discuss the certainty of harvesting fish from lakes that are intentionally stocked to promote fishing. The report should address the uncertainty associated with the value it used for Time Period of Deposition. This parameter is the estimated time period that the facility will burn hazardous waste. The HHRAP recommends considering time periods of deposition of 30, 60, and 100 years. The report should address the uncertainty caused by omitting the evaluation of other stack Compounds of Potential Concern (COPCs) and fugitive emissions. U.S. EPA has determined that the "Effect of Ditches Connecting the Mississippi River and the Frank Holten Lakes on Frank Holten Lakes water quality and fish" does not "cast significant doubt" on risk assessment conclusions. While it is appropriate to discuss the connection in the uncertainty section, the report fails to note that the type and size of fish living in Frank Holten Lakes that are taken for consumption are highly likely to have lived within a home-range that is much smaller than the entire size of either lake. This phenomenon, in accordance with U.S. EPA Guidance on BAFs (*Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) – Technical Support Document Volume 3: Development of Site-Specific Bioaccumulation Factors*, U.S. EPA, EPA-822-R-09-008, September 2009) greatly ameliorates the potential for migratory fish to influence the typical catch. Furthermore, the fact that other potential sources exist for mercury in Frank Holten Lakes does not alter the fact that the watersheds for these Lakes lie in close proximity to and downwind of Veolia's facility and that a portion of any mercury the facility emits will likely contribute to mercury concentrations in Frank Holten Lakes fish.

Datasheets   The report should specify all universal site-specific parameter values with appropriate references. The report should specify all non-default parameter values used with appropriate references.

If you have any questions in this matter please contact Mary Riegle of my staff at 217/524-3329.

Sincerely,

Joyce L. Munie, P.E., Manager
Permit Section
Division of Land Pollution Control
Bureau of Land

JLM:MER:1631210009-RCRA-B29R-Final

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December 21, 2017

VIA FEDERAL EXPRESS OVERNIGHT DELIVERY

Jane E. McBride, Esq.
Assistant Chief
Environmental Bureau, South
Illinois Attorney General's Office
500 S. Second St.
Springfield, IL 62706

Re: Veolia ES Technical Solutions, L.L.C.'s ("Veolia's") Response to IEPA's March 24, 2017
        Correspondence and Franklin Engineering Group, Inc.'s ("Franklin's") December 2017 Human
        Health Risk Assessment Report Prepared on Behalf of Veolia

Dear Jane:

Enclosed herewith please find Veolia's response to IEPA's March 24, 2017 correspondence regarding
Veolia's Human Health Risk Assessment ("HHRA") dated October 2016. In addition, I have also
enclosed a copy of a December 2017 HHRA prepared by Franklin on behalf of Veolia, which further
evaluates the potential for health risk and hazards from incinerator emissions of mercury compounds.
Veolia sent copies of the December 2017 HHRA via overnight delivery to Sunil Suther and Ted
Dragovich of IEPA earlier today.

The conclusions contained within the December 2017 HHRA are based on theoretical emissions of target
compounds consistent with HWC MACT emission limits. The conclusions set forth in the December
2017 HHRA show that the HWC MACT emission limits are protective of human health and the
environment.

Veolia and Franklin believe that the December 2017 HHRA is accurate and reasonable and will withstand
judicial scrutiny. The December 2017 HHRA addresses many of the directives and questions posed by
IEPA's contractors. Having said this, unreasonable or unrealistic assumptions suggested by IEPA's
contractors were rejected in favor of reasonable and realistic assumptions that are consistent with the site-
specific nature of the risk-assessment process.

I would be remiss if I did not point out a few, but obviously not all, of the reasonable and realistic
assumptions upon which the December 2017 HHRA is based. These assumptions are set forth
immediately below.

> **A reasonable, conservative consumption rate:** No one uses the golf course lake beyond a
> recreational fisher level, in part, because the fishers have other available food sources. Further,
> Illinois provides recommended consumption limitations due to PCB levels and the lake cannot

sustain a fish population that would support consumption levels beyond recreational fishers. Moreover, no credible evidence exists for a consumption level for the lake beyond a recreational fisher level.

Recognition that the lake(s) are an open system: The December 2017 HHRA acknowledges Dan Stephenson's opinion that the lake(s) are an open system "allowing a constant exchange of multiple species between lake and river." As you know, Mr. Stephenson is the current IDNR Chief of Fisheries and his statements are consistent with his expertise.
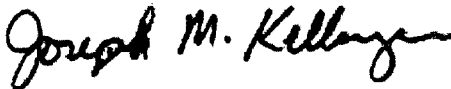
The lake(s) are subject to periodic restocking: The majority of the fish that are in the lake(s) were placed into the lake(s) as part of the restocking efforts and are not native to the lakes (hence the need for restocking twice a year) or, as Stephenson opines, originated from the Mississippi River.

To my knowledge, the risk assessment and addendum IEPA uses to support the Veolia RCRA permit under appeal are at least ten years old and fail to utilize current, more accurate, risk assessment methods. Further, IEPA's contractors failed to follow the methodology set forth in EPA's guidance for SSRAs by failing to include a complete uncertainty discussion and conclusion section. As you are aware, in the *Essroc* decision, the Court reviewed a risk assessment with similar flaws and found EPA had more work to do on the risk assessment. To this end, Veolia would like to know whether IEPA/EPA has updated its risk assessment to use up-to-date models and values. I have not seen such a document if one does exist.

In short, while Veolia is open to continued dialogue, Veolia believes the dialogue must begin with the reasonable assumptions contained in the December 2017 HHRA.

Very truly yours,

Thompson Coburn LLP

By
    Joseph M. Kellmeyer
    Partner

JMK/leb

Enclosures

cc: Ryan R. Kemper, Esq.

December 20, 2017

Sunil Suthar
Division of Land Pollution Control
Bureau of Land
Illinois Environmental Protection Agency
1021 North Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

Re: 1631210009 – St. Clair County
        Veolia ES Technical Solutions, L.L.C.
        Log No. B-29R
        RCRA Part B Permit File

Dear Mr. Suthar:

I am in receipt of Ms. Munie's March 24, 2017 correspondence ("Correspondence") which provided comments on Veolia's human health risk assessment dated October 2016. Veolia has substantially revised the risk assessment, in part due to the comments. For your convenience, I have therefore attached a copy of the revised risk assessment hereto. Set forth below, I have also specifically responded to the comments contained within the Correspondence: ·

Section 1.1.   The objective of the risk assessment should be stated in this section. The purpose of the risk assessment is to evaluate predictive risk from the facility at maximum allowable maximum achievable control technology (MACT) emission limits to determine if these limits are protective of human health and the environment or if the facility's Resource Conservation and Recovery Act (RCRA) permit needs to impose additional conditions to ensure protection of human health and the environment. It should be noted in this section that Veolia is also subject to an Illinois IEPA RCRA permit.

Veolia Response: Veolia prepared the attached human health risk assessment to evaluate the potential for health risk and hazards from incinerator emissions of mercury compounds. The conclusions contained within the risk assessment are made based on maximum allowable MACT emission limits for mercury compounds. Based on the conclusions, the MACT emission limits are protective of human health and the environment.

Section 1.2   The risk assessment evaluated measured emission of mercury collected during the most recent Comprehensive Performance Test (CPT). Despite claims of "worst-case" conditions during the CPT, future CPTs could demonstrate compliance at even higher emission rates which are closer to the MACT stack standards. The facility could request higher feed- and emission-rates based on extrapolation to the MACT from a lower value. Lastly, increases in stack gas flowrates could increase emissions even further while still complying with the MACT standard. For example, the 2013 CPT for Stack 4 was conducted at 73% of the stack flowrate demonstrated in 2008. A return to the 2008 stack gas flowrate could boost emissions of target compounds by up to 37%.

During any future CPT Veolia may increase emissions higher than those tested in their most recent CPT while still complying with the MACT. Also, at any time Veolia may request an extrapolation increase of emission rates higher than their CPT emission rates.

When either of these situations occur, Veolia's current risk assessment results would not be an accurate evaluation of this future Air permit's emissions.

Here and throughout the report, Veolia should address descriptions of conservative values or operations in the uncertainty section of the report. Furthermore, such conclusions should be based on the objective of evaluating predictive risk from the facility at the maximum allowable MACT emission limits.

Veolia Response: The conclusions contained within the risk assessment are made based on maximum allowable MACT emission limits for mercury compounds. Both the extrapolation issue and stack flow issue are irrelevant since the risk assessment is based upon the maximum allowable MACT emission limits.

Section 1.3   This section does not seem to have a logical point. Descriptions of conservative values or operations should be discussed in the uncertainty section of the report.

Veolia Response: This section in the attached human health risk assessment addresses the methodology of the quantitive estimation of non-cancer effects and the determination that incinerator emissions are unlikely to impose adverse effects related to non-carcinogenic hazards for any exposure scenario.

Section 1.4   It is not clear how this risk assessment evaluated acute effects from incinerator emissions if mercury was the only subject of the assessment. Emission components that typically contribute more of an acute effect, such as chlorine and hydrogen chloride, are not evaluated here, so broad statements about overall acute impacts are not appropriate.

Veolia Response: See discussion contained within Section 1.4 of the attached human health risk assessment. Pursuant to discussions with IEPA's contractors, the risk assessment was conducted for mercury only.

Section 2.3   It is not clear why Veolia proposes to use "default values" for mercury speciation for units 2 and 3 when the September 2005 Human Health Risk Assessment Protocol (HHRAP) "recommend[s] basing the estimates on the concentration of mercury in various components of the Agency's multiple metals sampling train ...". Veolia has conducted several CPTs since the original Illinois EPA permit was issued, including sampling using U.S. EPA's Method 29. The HHRAP includes a methodology for using Method 29 data for site-specific mercury speciation and this information is more appropriate and site-specific than the default values. These derived values would be more appropriate than the default values and should be used in this risk assessment. Note that the estimates for mercury global loss are dependent upon the speciation. They should be different for any stacks that do not have the same speciation. Also, please provide references for the "recent studies" mentioned at the end of the third paragraph.

Veolia Response: The emission rates contained within the attached risk assessment for elemental and divalent mercury reflect theoretical maximum emissions based on the HWC MACT emission concentration limits in conjunction with the speciated mercury emissions as demonstrated for Incinerator 4 and used at Incinerators 2 and 3. Also, no references can be provided for "recent studies" because there is no third paragraph in Section 2.3.

Section 3.2.1   Please note that U.S. EPA Region 5 has conducted a literature review of Henry's Law Constants (HLC) and Diffusivity in Air parameters for mercuric chloride (used when modeling divalent mercury vapor). They recommend its use in the model. The recommended HLC for mercuric chloride in this review, 2.37E-05 Pa m3/mol, differs from

the one Veolia used as indicated in Table 3-1. The report generically describes where other parameters identified in Table 3-1 were sourced, however, it does not clearly identify the source of each parameter or present a complete rationale for choosing each parameter provided. Please clearly delineate the source for each parameter selected and justify its use in comparison to other available values in accordance with Section 5.8 of HHRAP. Also, the fraction of the contaminant in vapor phase (Fv) depends upon the speciation and loss estimates. The listed Fv of 0.85 is only appropriate for modeling when the HHRAP default scenario is used. Veolia should recalculate the Fv to match the speciation and global loss combinations corresponding to the site-specific stack-test based results for mercury species.

Veolia Response: See discussion contained within Section 3.2.1 of the attached human health risk assessment.

Section 3.2.2   The particle size distribution test of stack 4 should be described and referenced. Because Veolia has not tested particle size on stacks 2 and 3, the report needs to explain Veolia's determination that the lack of carbon injection in those stacks does not allow a larger percentage of smaller particles to emit from stacks 2 and 3. The uncertainty section should discuss using stack 4 particle size distribution on stack 2 and 3 modeling.

Veolia Response: See discussion contained within Section 3.2.2 of the attached human health risk assessment. Further, Veolia has already submitted a construction permit to add carbon injection to Incinerators 2 and 3.

Section 3.3   U.S. EPA disagrees with delineations made in determining dispersion coefficients. In particular, the report incorrectly identifies the following areas as not urban land use: the south west neighborhoods of East St. Louis and a vast industrial tank farm directly south of the facility. It is not appropriate to selectively identify individual tanks as urban land-use while identifying the containment areas as not urban land-use. U.S. EPA previously estimated the land-use to be approximately 58% urban in the June 2006 U.S. EPA document on site-specific dispersion modeling. Since estimates of urban and rural land-use vary close to the 50% suggested decision point, U.S. EPA recommends the risk assessment use modeling with both urban and rural dispersion coefficients in order to understand the potential range of values.

Veolia Response: For determination of rural/urban dispersion coefficients, the Auer Land Use Analysis method, recommended in the HHRAP guidance, was employed using the EPA program AERSURFACE (version 13016). As detailed in the attached human health risk assessment at Section 3.3, the analysis using recent data found the area is 41.5% urban and 58.5% rural. AERSURFACE files are included on the CD attached to the report.

Section 4.2.1   The percentage of contaminated home grown produce consumed should be 100% and not 25%. See HHRAP 6.2.2.3, "Therefore, by using consumption rates specific to home produced foods, we consider it reasonable to assume that 100% of those home produced foods are contaminated." The method in this risk assessment uses the percent of home grown produce consumed twice. The percent can only be applied once.

Veolia Response: See discussion contained within Section 4.2.1 of the attached human health risk assessment. The risk assessment used 100% of contaminated home grown produce consumed.

Section 4.2.2   The fish consumption rates used in this risk assessment are incorrect. These rates are based on an U.S. EPA report that has a different objective than the purpose of this risk

assessment. That report states "the analysis presented provides U.S. EPA's recommended methodology for developing a national-level fish consumption rate (FCR) for use in developing ambient water quality criteria as required under Section 304(a) of the Clean Water Act." That report provides the methodology and analysis of fish consumption across the entire U.S. population. That means that it includes all people in the United States. Some people eat very little or no fish, while others may eat a lot of fish. The fish that the United States population eats comes from many sources (i.e. restaurants, packaged, imported, etc.). The defined fisher scenario in this risk assessment encompasses not the average U.S. population but only the local residents who fish locally and eat some of the fish they catch. The fish consumption rates need to be derived from studies that sampled populations of fishers who eat some of the fish they catch. It would be incorrect to use sampled populations of people who do not eat fish in determining fish consumption rates for the defined fisher scenarios in this risk assessment. The risk assessment should be processed using the HHRAP default fish consumption rates unless there is a well-prepared, robust and peer-reviewed site-specific study of fish consumption rates of people who fish locally and consume some of the fish they catch (see Section 5.8 of HHRAP). Veolia's report also states that "Veolia understands that the usage at the Frank Holten State Park lakes to be that of recreational fishers only..." and makes this assertion without sufficient supporting information. Again, the percentage of contaminated home grown produce consumed should be 100%, not 25%.

Veolia Response: See discussion contained within Section 4.2.2 of the attached human health risk assessment.

Section 4.4   The report does not provide a description or delineation of the waterbodies and watersheds.

Veolia Response: See discussion contained within Section 4.4 of the attached human health risk assessment.

Section 5.2.2.2 The report incorrectly states that the referenced U.S. EPA report is more comprehensive for the objective of this risk assessment than the default values in the HHRAP guidance. The HHRAP guidance should be used for the consumption rate for fishers. As noted above, the April 2014 U.S. EPA report served a different purpose. Also, the factor for adjusted fish cooking and preparation loss is 38%, not 41%. The 38% total loss is derived from the mass remaining after 30% mean net loss cooking multiplied by the percentage remaining after 11% mean net post cooking loss ($70\% \times 89\% = 62\%$, $1 - 0.62 = 0.38$).

Veolia Response: See discussion contained within Section 5.2.2.2 of the attached human health risk assessment. The risk assessment uses 41% adjusted fish cooking and preparation loss as defined in Table C-1-4 of the 2005 HHRAP guidance.

Section 5.2.2.3 As discussed above, the percentage of locally caught contaminated fish that is consumed should be 100%. By definition, all locally-caught fish that is consumed comes from local waterbodies. The local waterbodies in this study area are the Frank Holten Lakes.

Veolia Response: See discussion contained within Section 5.2.2.3 of the attached human health risk assessment.

Section 6.2   The purpose of the risk assessment should be to evaluate predictive risk from the facility at maximum allowable MACT emission limits to determine if these limits are protective of human health and the environment or if the facility's RCRA permit needs to impose

additional conditions to ensure protection of human health and the environment. This risk assessment does not determine these results.

Veolia Response: Veolia prepared the attached human health risk assessment to evaluate the potential for health risk and hazards from incinerator emissions of mercury compounds. The conclusions contained within the risk assessment are made based on maximum allowable MACT emission limits for mercury compounds. Based on the conclusions, the MACT emission limits are protective of human health and the environment.

Section 6.3   Veolia makes a number of errors in determining the appropriate mercury Bio-Accumulation Factor (BAF) value. The report does not follow Section 5.8 of HHRAP in determining the appropriateness of using site-specific parameter values versus default parameter values. It says: "The majority of fishing at Frank Holten State Park, as witnessed on numerous occasions by Veolia personnel, is accomplished by fishing with a cane pole from the banks and using live bait (worms)", and concludes 'these practices primarily yield bluegill, carp, buffalo, and catfish." Anecdotal observations made by Veolia employees do not meet the established criteria to disregard the well-established, peer-reviewed default parameter value. The report mentions fish-stocking information, but does not include this information or explain its relativeness. The report incorrectly states that catfish is not categorized as a Trophic Level 4 species; however, catfish greater than 450mm are categorized as Trophic Level 4. The report needs to include the studies it references. The report must provide a clear justification to use a value other than the default value.

Veolia Response: See discussion contained within Section 6.3 of the attached human health risk assessment.

Section 7.0   This section needs to recognize the high certainty of the known location of the waterbodies in regard to the risk driver and the air model outputs. The report should include references to all mentioned studies. The report should discuss the certainty of harvesting fish from lakes that are intentionally stocked to promote fishing. The report should address the uncertainty associated with the value it used for Time Period of Deposition. This parameter is the estimated time period that the facility will burn hazardous waste. The HHRAP recommends considering time periods of deposition of 30, 60, and 100 years. The report should address the uncertainty caused by omitting the evaluation of other stack Compounds of Potential Concern (COPCs) and fugitive emissions. U.S. EPA has determined that the "Effect of Ditches Connecting the Mississippi River and the Frank Holten Lakes on Frank Holten Lakes water quality and fish" does not "cast significant doubt" on risk assessment conclusions. While it is appropriate to discuss the connection in the uncertainty section, the report fails to note that the type and size of fish living in Frank Holten Lakes that are taken for consumption are highly likely to have lived within a home-range that is much smaller than the entire size of either lake. This phenomenon, in accordance with U.S. EPA Guidance on BAFs *(Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) — Technical Support Document Volume 3: Development of Site-Specific Bioaccumulation Factors,* U.S. EPA, EPA-822-R¬09-008, September 2009) greatly ameliorates the potential for migratory fish to influence the typical catch. Furthermore, the fact that other potential sources exist for mercury in Frank Holten Lakes does not alter the fact that the watersheds for these Lakes lie in close proximity to and downwind of Veolia's facility and that a portion of any mercury the facility emits will likely contribute to mercury concentrations in Frank Holten Lakes fish.
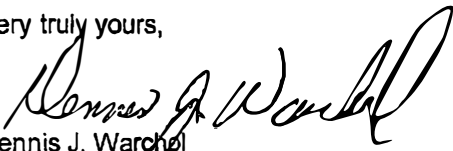
Veolia Response: See discussion contained within Section 7.0 of the attached human health risk assessment.

Datasheets   The report should specify all universal site-specific parameter values with appropriate references. The report should specify all non-default parameter values used with appropriate references.

Veolia Response: The attached human health risk assessment references all sources relied upon.

I anticipate that this correspondence and the attached risk assessment fully addresses the comments contained within the Correspondence. Nevertheless, if you have any additional questions, please feel free to contact me.

Very truly yours,

Dennis J. Warchol
Environmental, Health and Safety Manager

cc: Ted Dragovich, IEPA-DLPC
    Doug Harris ✓
    IEPA File

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397

BRUCE RAUNER, GOVERNOR   ALEC MESSINA, DIRECTOR

217/524-3301

April 18, 2018

Veolia ES Technical Solutions, L.L.C.
Attn: Doug Harris
7 Mobile Avenue
Sauget, Illinois 62201-1069

CERTIFIED MAIL
7014 2120 0002 3286 4813

Re: 1631210009 – St. Clair County
    Veolia ES Tech
    ILD098642424
    Log NO. B-29R
    RCRA Part B Permit File
    Permit Correspondence

Dear Mr. Harris:

The Illinois Environmental Protection Agency (Illinois EPA) has prepared the following list of parameters, model options, explanations, and references missing from the risk assessment Veolia ES Technical Solutions, L.L.C. submitted in 2017 (the 2017 Risk Assessment). We provide this list, which is not exhaustive, only to assist the exchange of information and facilitate a complete review of the 2017 Risk Assessment.

1. Air Modeling

    a. Please provide confirmation of meteorological tower location (Google Earth Pro shows the location used off by almost ½ mile).
    b. Please provide an explanation for using no adjustment to AERSURF ACE for continuous snow cover.
    c. Please provide an explanation for using no adjustment to AERSURF ACE for abnormally wet or dry years.
    d. Please provide an explanation for not considering the U adjustment to friction velocity.
    e. Please provide an explanation for using a reactivity of O for divalent mercury under Gas Deposition Control Parameters.
    f. Please provide an explanation for not using the updated Henry's Law Constant recommended in the Illinois Environmental Protection Agency's (IEPA's) March 24, 2017 response to a risk assessment Veolia submitted in October 2016.

4302 N. Main St., Rockford, IL 61103 (815)987-7760
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2125 S. First St., Champaign, IL 61820 (217)278-5800
2009 Mall St., Collinsville, IL 62234 (618)346-5120

9511 Harrison St., Des Plaines, IL 60016 (847)294-4000
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2309 W. Main St., Suite 116, Marion, IL 62959 (618)993-7200
100 W. Randolph, Suite 4-500, Chicago, IL 606   Appendix 5 - 15

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2. Mercury Speciation

   It is not clear whether the 2017 Risk Assessment calculated mercury speciation and global loss correctly. The narrative suggests the 2017 Risk Assessment adjusted the final global loss to be consistent with the MSRC default example, rather than basing it on the site-specific speciation results. The *Mercury Emissions and Speciation Data* table in the Appendix would appear correct except they do not carry forward the rates for elemental mercury. Other values appear in the *COPC Toxicity Data* table. Based on the narrative, there might be further adjustment not evident in the tables. A risk assessment should fully identify the emission rates of each mercury species (elemental mercury, divalent mercury vapor, and particle-bound divalent mercury) both before and after accounting for global loss for each stack. Moreover, the 2017 Risk Assessment does not explain why it used speciation data from the Rotary Kiln Incinerator instead of deriving mercury speciation for the Fixed Hearth Incinerators from site-specific Method 29 stack data Veolia collected from those units in 2013.

3. Emission Rates at the MACT

   It is not clear why the 2017 Risk Assessment used the Stack 4 emission rate calculated at the MACT for Stack 2 and Stack 3. The Stack 2 and Stack 3 operational flowrates significantly differ from the Stack 4 operational flowrate. Also, please show the calculation for the maximum emission rates at the MACT for each stack.

4. Source Parameters

   The 2017 Risk Assessment does not show the results for when the *Time Period over which Deposition Occurs (Tc)* is 60 years or 100 years. These results should be prepared and considered.

5. Waterbody Parameters

   The 2017 Risk Assessment does not provide references for *depth of water column (dw)*, *average volumetric flow rate through waterbody (vf)*, and *waterbody surface area (wa)*. Please explain how these values were determined.

6. Watershed Parameters

   a. Please provide watershed descriptions, locations, delineation, images, and the rationale for selection.

   b. References for *percent impervious to runoff, watershed area, USLE cover management factor*, and *USLE rainfall erosivity factor* were not provided. Please explain how the 2017 Risk Assessment determined these values.

7. COPC Database Values for methyl mercury (CAS No. 22967-92-6) and Mercuric Chloride (Cas No. 7487-94-7)

   Please explain how the 2017 Risk Assessment determined the values for *Henry's Law Constant and Fraction of Contaminant in Vapor Phase*. Provide calculations and/or

references and explain why they did not use the updated Henry's Law Constant IEPA recommended on March 24, 2017.
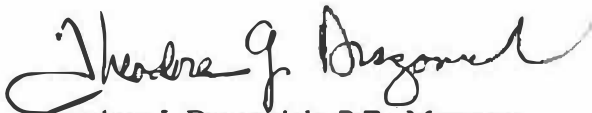
8. Non-Default Parameter Values

Clearly identify and describe any parameter where the 2017 Risk Assessment did not use default values from the 2005 *Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities* (the HHRAP), and provide the following information for each one (Section 5.8 of the HHRAP):

1. An explanation of why using a more site-specific parameter value is warranted;
2. The technical basis of the site-specific parameter value, including readable copies of any relevant technical literature or studies;
3. A comparison of the weight-of-evidence between the competing studies; and
4. A description of other risk assessments or projects that used the site-specific parameter value, and how such risk assessments or projects are similar to the current risk assessment.

We look forward to receiving the missing information. If you have any questions regarding this corrrespondence, please contact Sunil Suthar at 217-524-3293.

Sincerely,

Theodore J. Dragovich, P.E., Manager
Permit Section
Division of Land Pollution Control
Bureau of Land

TJD:SIS: 1631210009-Log B-29R-B29R-Corr

Attachment: Henry's Law Constant and Diffusivity Memo

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

Memorandum

From: Todd D. Ramaly, Environmental Scientist, U.S. EPA, Region 5, LCD
        Christopher A. Lambesis, Environmental Scientist, U.S. EPA, Region 5, LCD

To: File

Date: September 13, 2016

Re: Review of the Literature for Gas Deposition Parameters for Divalent Mercury Vapor for Use in Air-dispersion and Risk Assessment Modeling

Abstract: Henry's Law Constant and Diffusivity in Air are important parameters for estimating deposition in the EPA AerMod air-dispersion model for use in a human health risk assessment. Deposition of emitted contaminants often drive risk assessments that include indirect exposure pathways. An analysis by Bishop 2007 demonstrated that the deposition estimates in AerMod are sensitive to these parameters. The EPA recommended Henry's Law Constant and Diffusivity in Air values for divalent mercury vapor (modeled as mercuric chloride – $HgCl_2$) in AerMod differ from values cited in other sources, including other EPA publications. We reviewed the sources of these values in AerMod, EPA publications, and others. Very few values came from actual laboratory experiments. The majority of values were cited from prior works or were estimated based on other properties such as molecular weight, vapor pressure, and aqueous solubility. We propose to use a Henry's Law Constant value for $HgCl_2$ of 2.37×10^{-5} Pa m^3/mole, which was both modeled from thermodynamic descriptors and calculated separately by Abraham et al 2008. We propose a Diffusivity in Air value for $HgCl_2$ of 0.0453 cm^2/s based on equations published by EPA.

Introduction: The EPA AerMod air-dispersion model uses a methodology presented by Wesely et al 2002 to estimate wet and dry deposition of emitted gases and particulate matter for use in the EPA Industrial Source Complex (ISC) dispersion model. The same methodology is used in the AerMod dispersion model, which replaced the ISC model. These mechanisms are important for evaluating indirect exposure pathways wherein contaminants transfer to other media (i.e. soil, sediment, fish) before human or ecological exposure occurs. The Henry's Law Constant is the proportional amount of dissolved gas in solvent (water for environmental systems) to its partial pressure in the gas stage. Diffusivity in Air is a proportionality constant that describes the movement of a substance from a region of high concentration to a region of low concentration in air without bulk motion.

The dry deposition rate is estimated as a deposition velocity in a resistance scheme. The Henry's Law Constant (HLC) value adjusts the effects of solubility and aqueous dissociation on mesophyll, cuticular, and ground resistances in that resistance scheme. Diffusivity in Air (D_a) is an important parameter in evaluating the surface resistance of the quasilaminar sublayer of air in contact with surface elements

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and the resistance of the surface itself to uptake. Wesely proposes the following values of HLC and D_a for mercuric chloride ($HgCl_2$): HLC = 6×10^{-6} Pascal cubic meters per mole (Pa m^3/mol); and D_a = 0.06 square centimeters per second (cm^2/s).

Schreiber, Yonley and Associates (SYA), an environmental consulting firm, submitted a request in 2015 to the Indiana Department of Environmental Management (IDEM) to consider alternative values to these parameters (among others) because of better reference documentation of the sources of the parameters' values (SYA 2015). The parameters are to be used in a risk assessment evaluating the impact of a new hazardous waste combustion emission source in southern Indiana. IDEM asked EPA to assist in evaluating the proposal. Here, we are reviewing the available literature to evaluate the portion of the SYA request that pertains to $HgCl_2$. HLC values are presented here in units of Pa m^3/mol for all references to aid in comparison.

Review of Literature for $HgCl_2$ Henry's Law Constant (HLC)

Wesely et al 2002: This study's value is based on estimating HLC by calculating the ratio of vapor pressure to the aqueous solubility (V_P/S). This approach is based on a simplification of air/water partitioning equations for solute/solvent systems with water as the solvent. The approach assumes that activity coefficients (that express deviations from ideal gas behavior) are constant and that water is not appreciably soluble in $HgCl_2$.

Wesely cites a value of 5×10^{-5} Pa m^3/mol at 20 °C and pH = 0.3 measured by Sommar et al 2000 and concludes that HLC for ambient environmental conditions must be lower because HLC appears to be pH-dependent. Sommar also cites a value of 2.94×10^{-5} Pa m^3/mol at 20 °C and a pH =1.5. Sommar references Iverfeldt and Lindqvist 1980[1], for this value and describes it as measured in a "single experiment at each temperature."

Wesely goes on to estimate HLC at ambient environmental conditions by dividing the vapor pressure of $HgCL_2$ by its aqueous solubility. Wesely estimated the vapor pressure of $HgCl_2$ to be 0.15 Pa described as midway between reported values of 0.27 Pa for elemental Hg and 0.033 Pa for mercuric iodide (HgI_2), without further justification for choosing the midpoint. Wesely cites the CRC Handbook of Chemistry and Physics and The Merck Index—Encyclopedia of Chemicals, Drugs, and Biologicals for properties used to estimate parameters, however, EPA could not duplicate these values from the references (Merck 1976 and CRC 1984). The aqueous solubility reported by Wesely, 25,000 moles/m^3 (6.9 grams per cubic centimeter - g/cc) is reported in the CRC as 250 moles/m^3 (0.069 g/cc). We could not duplicate the calculated HLC of 6×10^{-6} Pa m^3/mol using the citations given.

In consideration of the rationale presented for adjusting HLC down for pH-dependence, Sommar states that ". . . by definition, the Henry's Law constant is not pH-dependent, at least not at the first level of approximation." The pairs of measured HLCs at different pHs were not from the same study and the overall range of pH presented was small relative to the difference between both measured pH and neutral conditions (0.3 and 1.5 versus 7.0). It is not clear that this information demonstrates a pH-dependence and a need to lower the HLCs reported by Sommar or Iverfeldt and Lindqvist.

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[1] This citation could not be obtained by EPA at the time of this writing.

Schreiber, Yonley, and Associates: SYA proposes a value of 7.2×10^{-5} Pa m^3/mol taken from the EPA Mercury Study Report to Congress (MSRC) (U.S. EPA 1997). SYA states that the sources cited in the MSRC are experimentally determined. Versions of the MSRC available to the authors of this paper did not reveal the sources of the cited values. The MSRC also contained a different value of 2.7×10^{-7} (no units given) that referred to an ISC Gas Deposition guidance document. We could not confirm the units or obtain the guidance document.

To evaluate values for HLC, we conducted a literature search for values of HLC. In doing so, we found the work of Rolf Sander of particular help. Sander included comprehensive discussions of types of HLCs and various units and unit-conversions. Sander's literature review cited 11 different HLC values for HgCl$_2$ and provided a degree of classification and rationale for assigning reliability to the values based on the type and quality of the studies cited (Sander 2015). We evaluated the HLC values cited by Sander as well as others.

Experimentally measured values: Only one study, Severit 1997[2] (of those reviewed by Sander), was noted to report an experimentally-measured value. Sander reports this value as 1×10^{-3} Pa m^3/mol and notes it was measured at 60 °C. Unfortunately, we could not obtain a copy of the study for review. Since HLC is known to be temperature dependent, the reported value would not be appropriate for modeling ambient conditions, however it is similar to values reported for elevated temperatures in other studies reviewed below.

Iverfeldt and Lindqvist 1980 is described in a number of references here as a study including experimentally measured HLCs for HgCl$_2$. Despite contacting many EPA laboratories and libraries, the successor organization to the Swedish State Power Board, and the study's authors, we could not obtain a copy of the study to review.

Sommar et al 2000 and Yarwood and Niki 1990 both referenced Kobayashi and Watanabe 1984. We were able to obtain an untranslated copy of this study (in Japanese) and attempt a crude internet-translation. Apparently, HLC measurements were based on samples of natural rainwater with very low concentrations of mercury with other ions also present and with varying pH (HLCs reported at 25°C at pHs 1.0, 3.0, 4.1, 5.3, 6.4, and 8.0). The EPA air-dispersion model uses the HLC value determined for binary mixtures of the compound of concern with water. Since Kobayashi and Watanabe's tested rainwater include other ions, the reported HLC values might not be appropriate for the EPA models. Sommar et al 2000 expressed concern with the purported pH-dependence for HLC in Kobayashi and Watanabe based on analytical reliability for the low concentrations reported. For these reasons, we are not recommending the HLC values reported by Kobayashi and Watanabe at this time.

Estimated or modeled values: A study by Abraham et al 2008 modeled HLC as a gas/water partition coefficient using *linear free energy relationships (LFER)*, a technique that relates reaction- or equilibrium-constants for one series of reactions with another related series of reactions in order to generate coefficients which can be used to predict other reaction- or equilibrium-constants. In this way, Abraham predicts a HLC for HgCl$_2$ of 2.37×10^{-5} Pa m^3/mol.

The study continues by comparing the predicted value with two calculated from V$_P$/S as well as a third reported HLC value. Abraham's solubility is cited to Clever et al 1985 which itself is a literature review of

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[2] This citation could not be obtained by EPA at the time of this writing

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60 studies of HgCl$_2$ solubility going back to 1881. Clever reports an average solubility of 0.073 g/cc from 19 of 22 reported values of solubility at standard temperature. This value is very similar to other references for HgCl$_2$ solubility, 0.069 g/cc (CRC 1984) and 0.074 g/cc (Merck 1976).

Abraham cited vapor pressures from Landolt-Börnstein 1960 and Phillips et al 1959. Abraham converts the vapor pressures (or saturated vapor concentrations) into vapor concentrations of 6.76x10^{-6} moles/m^3 and 2.57x10^{-6} moles/m^3 (respectively). We were not able to review Landolt-Börnstein at this time, however, we did confirm that Phillips data experimentally measured saturated vapor concentration at 25 °C and either 35 °C or 45 °C. Philips then converted the saturated vapor concentrations into vapor pressures using the ideal gas law. When divided by the solubility from Clever, these vapor concentrations result in HLCs of 6.23x10^{-5} and 2.37x10^{-5} Pa m^3/mol (respectively). The value derived from measured saturated vapor concentrations from Philips and the Clever solubility exactly matches the value predicted by the LFER in Abraham et al 2008.

Studies which reference prior work: Kanefke 2008 is a doctoral dissertation that broadly addresses mercury emission chemistry, mercury abatement processes, and issues with mercury measuring devices. Within this large work, Kanefke fit three reported values of HLC for HgCl$_2$ at three different temperatures to an equation giving HLC values as a function of temperature. Lindqvist and Rodhe 1985 are cited for HLC values at 10 °C and 25 °C. Severit 1997 gives the HLC value at 60 °C. The values are not reported by Kanefke except in graphical form. He does provide the constant values (A and B) for the temperature-dependent HLC equation he fit from the data. Using the equation, a HLC value of 7.6x10^{-5} Pa m^3/mol can be calculated at 25 °C.

Shon et al 2005 appears to focus on seasonal and diurnal variations in atmospheric speciation of Hg. The HgCl$_2$ HLC value cited is from another source – Ryaboshapko et al 2001. The value of 4.22x10^{-6} Pa m^3/mol could not be duplicated from Ryaboshapko.

WHO 1990 is a health assessment for methylmercury. HLCs for HgCl$_2$ of 7.19x10^{-5} Pa m^3/mol at 25 °C and 2.97x10^{-5} Pa m^3/mol at 10 °C are cited to Lindqvist et al 1984.

Lindqvist and Rodhe 1985 is focused on emissions sources and atmospheric speciation. The values of 7.19x10^{-5} Pa m^3/mol at 25 °C and 2.97x10^{-5} Pa m^3/mol at 10 °C are taken from Iverfeldt and Lindqvist 1980. They are described as experimentally determined.

Schroeder and Munthe 1998 is a literature review. The HLC value cited, 3.69x10^{-5} Pa m^3/mol at 20 °C, is referenced to Schroeder et al 1991 and Wallschläger 1996 although we could not duplicate this value from either source.

Braun and Dransfeld 1989 reports values of HLC of 2x10^{-3} Pa m^3/mol at 60 °C and 1x10^{-1} Pa m^3/mol at 80 °C. The report does not appear to provide the citation for these values. These HLC values would not be appropriate for modeling ambient conditions.

Iverfeldt and Persson 1985 reported a HLC value of 1.59x10^{-3} Pa m^3/mol at 25 °C citing Cubicciotti et al 1966 and Abraham et al 1970. The quoted value was not found in either work. Cubicciotti reports a vapor pressure of 1.63x10^{-7} atmospheres (from other work not clearly cited). Abraham 1970 reports a measured solubility of HgCl$_2$ at 25 °C of 0.071 g/cc. If Iverfeldt and Persson calculated HLC as V_p/S, the resultant value would be 6.31x10^{-5} Pa m^3/mol, not 1.59x10^{-3}. The reported value by Iverfeldt and Persson could not be duplicated from Cubicciotti and Abraham.

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Ryaboshapko et al 2001 studies the modeling of Hg species. The HLC value is identical (with a small rounding variance) to that of Lindqvist and Rodhe 1985, 7.24x10^{-5} Pa m^3/mol at 25 °C. Ryaboshapko cites Lindqvist and Rodhe 1985, Seigneur et al 1994 and Sommar et al 1999.

Lindqvist et al 1984 summarizes the present knowledge of mercury in natural systems of Sweden. The values of 7.19x10^{-5} Pa m^3/mol at 25 °C and 2.97x10^{-5} Pa m^3/mol at 10 °C are taken from Iverfeldt and Lindqvist 1980. They are described as experimentally determined.

Schroeder et al 1991 is a literature search of various parameters. It describes HLC for elemental mercury and states that divalent forms have higher values, however, none were cited.

Wallschläger 1996 presents a mercury balance of a floodplain system in Germany. The discussion includes references to HLC from Yarwood and Niki 1990. The value given 1.07x10^{-3} at a pH of 6.4. No units were referenced.

Seigneur et al 1994 presents and discusses a kinetic model for atmospheric mechanisms for inorganic mercury. The study did not appear to determine or measure HLC for HgCl$_2$. The study cited Lindqvist and Rodhe 1985 for an HLC value of 7.24x10^{-5} Pa m^3/mol at 25 °C.

Yarwood and Niki 1990 is a broad literature search of primary scientific literature for chemical properties, forms, reactions and concentrations in air of mercury and mercury compounds. The value cited to Yarwood and Niki by Wallschläger is further cited here to Kobayashi and Watanabe 1984. This value converts to 2.65 Pa m^3/mol, much higher than others reported here. All HLC values reported in Yarwood and Niki are cited to other works. Table 10 in Yarwood and Niki cites three values from Iverfeldt and Lindqvist 1980 (10°C and 25°C at pH = 1.5 and 10°C at pH = 6) and six values from Kobayashi and Watanabe 1984 (25°C at pHs 1.0, 3.0, 4.1, 5.3, 6.4, and 8.0).

Review of Literature for HgCl$_2$ Diffusivity in Air (D$_a$)

Wesely et al 2002: Wesely proposes a value of 0.06 cm^2/s but does not provide a source or derivation for this value. An equation for estimating D$_a$ is presented earlier in Wesely and is described as derived from the work of Fuller et al 1966 and Fuller et al 1969. The approach proposed by Fuller is widely accepted for estimating diffusivity but requires special atomic diffusion volumes for the atoms, groups, and structural features of the diffusing species. Wesely applies this approach to organics exclusively and no diffusivities or atomic diffusion volumes were provided for HgCl$_2$. Wesely references a text book by Reid et al 1987 for additional values. We were unable to find atomic diffusion volumes or diffusivity values for HgCl$_2$ in an updated version of Reid (Poling et al 2004).

Schreiber, Yonley, and Associates: SYA propose a D$_a$ of 0.0453 cm^2/s as referenced in MSRC. SYA states this approach, based exclusively on molecular weight, comes from a 1980 report by O'Connor. MSRC references Schnoor et al 1987 for this equation. Schnoor, in turn, references a 1980 text book by O'Connor, Modeling of Toxic Substances in Natural Water Systems for this equation (O'Connor 1980). The equation is: $D_a = 1.9/(MW^{(2/3)})$ (cm^2/s)

O'Connor 1980 derives this equation from a linear fit of D$_a$ values calculated by other methods and combined into one dataset. The copy of O'Connor 1980 that we obtained does not provide citations for the D$_a$ values used or the methodology used in calculating them.

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Experimentally measured values: We are not aware of any studies purporting to measure the diffusivity of HgCl$_2$ in air.

Estimated or modeled values: In addition to the method cited above by SYA, The User's Guide for EPA's *Water 9* database system includes an approach for estimating D$_a$ based on density, molecular weight, and temperature (U.S. EPA 2001). The guide recommends using the approach for any compound for which the information is missing but later describes the equation as applicable for organic molecules. Using this equation for HgCl$_2$ at 25 °C results in D$_a$ = 0.045 cm^2/s. U.S. EPA 2001 did not further cite a source for this equation.

The Handbook of Chemical Mass Transport in the Environment describes various methodologies for estimating diffusion coefficients, including the one by Fuller discussed here above (CRC 2011). The Handbook goes on to present a molecular weight-based correlation for compounds for which atomic diffusion volumes are not available. The correlation was based on "measured values of environmentally relevant compounds in air plotted against molecular weight." Mercury is specifically identified on the graph and appears to significantly deviate from the correlation with a much higher diffusivity than predicted. However, HgCl$_2$ is not identified on the graph. The correlation relationship is:

$D_a = 1.304\ MW^{(-0.584)}$ and results in a predicted D$_a$ for HgCl$_2$ of 0.049 cm^2/s.

CRC 2011 references D$_a$ values for this figure from Thibodeaux 1996 and Gustafson and Dickhut 1994. The title for Gustafson and Dickhut 1994 limits that reference to values of D$_a$ for polycyclic aromatic hydrocarbons and was not reviewed for HgCl$_2$ HLC values. Thibodeaux 1996 did not contain a measured diffusivity for HgCl$_2$.

Conclusions and Recommendations:
Given appropriate methods and quality control, EPA prefers experimentally measured values over those derived by other means. Unfortunately, two references that are reputed to include experimentally measured values, Severit 1997 and Iverfeldt and Lindqvist 1980 were not available to us at the time of this writing. Kobayashi and Watanabe 1984 was only available in Japanese and it is not clear that the values reported and measured in rainwater are appropriate for EPA models. We recommend using the HLC modeled by Abraham 2008 (2.37x10^{-5} Pa m^3/mol). The modeled value is similar to (and in one instance identical) to HLC values calculated from vapor pressure and aqueous solubility.

We are not aware of any measured values of D$_a$ for HgCl$_2$. We could not find the source for Wesely's recommended value of 0.06 cm^2/s. Three other methods recommended for estimating D$_a$ using molecular weight, temperature, and density predict similar values. We recommend using the value referenced in the MSRC, 0.0453 cm^2/s.

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[3] This citation could not be obtained by EPA at the time of this writing.

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[5] This citation could not be obtained by EPA at the time of this writing.

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**TECHNICAL RESPONSE TO APRIL 18, 2018 IEPA COMMENTS ON HHRA FOR
THE VEOLIA, SAUGET, IL HAZARDOUS WASTE COMBUSTION FACILITY**

Prepared for:
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Sauget, IL 62794

Prepared by:
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JULY 2018
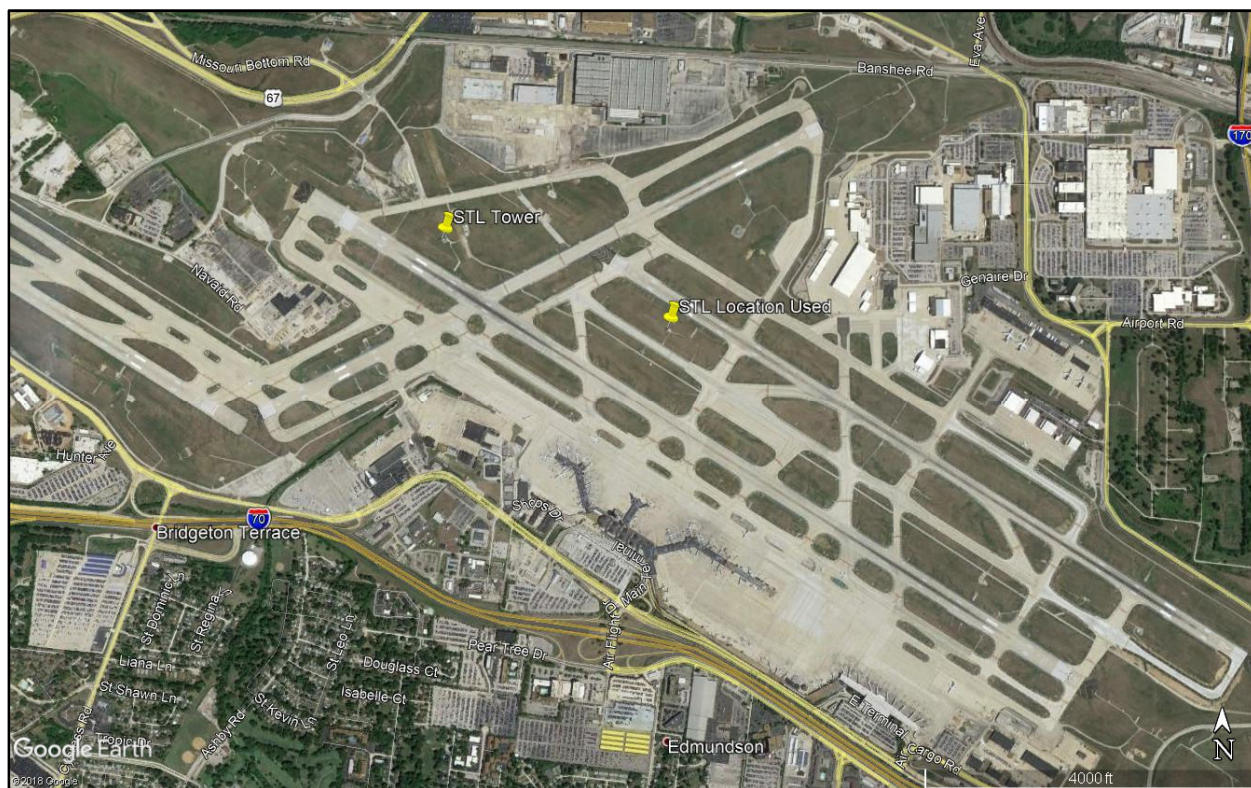
www.franklinengineering.com

Franklin Engineering Group, Inc. (Franklin Engineering) prepared a human health risk assessment (HHRA) based on estimated emissions of mercury compounds for the Veolia Environmental Services (Veolia) Sauget, IL facility in December 2017. IEPA has recently reviewed the submittal and provided comments on the methodology and results. This letter includes responses to outstanding issues presented by IEPA with clarification and additional information as applicable for each issue. Each issue identified by IEPA is listed in this transmittal and followed by the response. Some of this information may have been provided in previous submittals.

1) *Air Modeling*

   a. *Please provide confirmation of meteorological tower location (Google Earth Pro shows the location used off by 1/2 mile).*

   The best available information was used to locate the St. Louis Airport (STL) meteorological tower when the modeling analysis was performed in 2016. Current information (Google Earth Pro) provides a more accurate location for the tower. However, the location used is well within the grassy area of the airport, and any differences in air data collected due to the difference in location are expected to be negligible. The two locations are shown in Figure 1.

   Figure 1. St. Louis Airport (STL) meteorological tower

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b. *Please provide an explanation for using no adjustment to AERSURFACE for continuous snow cover.*

AERSURFACE seasonal definition may be entered by season or by month. For winter, the model provides an option to indicate either continuous snow cover, or winter with no snow cover. Seasonal outputs were selected for this analysis. AERSURFACE prompted the user: "Does the site experience continuous snow cover for most of the winter?" Veolia responded no to this query based on local knowledge and on the following supporting information. Table 1 shows days per month at STL (downloaded as monthly climate data from the U.S. National Climatic Data Center (NCDC)) with measured snow depth for 30 years prior to the modeling analysis. It is not typical for the area to have complete months with snow cover on the ground.

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Table 1. Number of Days with Greater Than 1 Inch Snow Depth – STL

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1986	1	3	0	0	0	0	0	0	0	0	0	0
1987	19	1	0	0	0	0	0	0	0	0	0	5
1988	3	8	2	0	0	0	0	0	0	0	2	4
1989	3	7	5	0	0	0	0	0	0	0	0	14
1990	0	2	3	0	0	0	0	0	0	0	0	8
1991	17	0	0	0	0	0	0	0	0	0	4	0
1992	4	2	1	0	0	0	0	0	0	0	0	0
1993	7	11	3	0	0	0	0	0	0	0	4	2
1994	9	1	0	0	0	0	0	0	0	0	0	0
1995	10	1	0	0	0	0	0	0	0	0	1	17
1996	16	2	1	0	0	0	0	0	0	0	0	1
1997	16	1	0	1	0	0	0	0	0	0	1	7
1998	6	1	5	0	0	0	0	0	0	0	0	1
1999	20	0	0	0	0	0	0	0	0	0	0	0
2000	2	3	2	0	0	0	0	0	0	0	0	19
2001	13	2	0	0	0	0	0	0	0	0	0	0
2002	5	3	4	0	0	0	0	0	0	0	0	8
2003	7	10	1	0	0	0	0	0	0	0	0	2
2004	6	10	0	0	0	0	0	0	0	0	1	0
2005	10	3	0	0	0	0	0	0	0	0	0	4
2006	0	2	2	0	0	0	0	0	0	0	0	10
2007	3	8	0	0	0	0	0	0	0	0	0	6
2008	0	7	5	0	0	0	0	0	0	0	1	2
2009	6	1	1	0	0	0	0	0	0	0	0	1
2010	7	9	0	0	0	0	0	0	0	0	0	8
2011	16	13	3	0	0	0	0	0	0	0	0	1
2012	4	2	0	0	0	0	0	0	0	0	0	1
2013	3	7	5	0	0	0	0	0	0	0	0	9
2014	9	11	1	0	0	0	0	0	0	0	3	0
2015	0	10	3	0	0	0	0	0	0	0	0	0
# of years > 50% days with snow cover	6	0	0	0	0	0	0	0	0	0	0	2
% of years:	20%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	7%

░░░░░ = more than ½ of the month had snow depth greater than 1 inch

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c. *Please provide an explanation for using no adjustment to AERSURFACE for abnormally wet or dry years.*

AERSURFACE prompts the user: "Characterize the surface moisture condition at the site relative to climatological normals, to be applied for all periods. Enter 'A' for Average, 'W' for Wet, or 'D' for Dry." The answer to this question will dictate the value of the Bowen ratio. The user answered average, and average Bowen ratio values were used since AERMOD is not sensitive to Bowen Ratio. A review of the STL annual precipitation for each year in the analysis (2011 – 2015) indicates that two years did not have average precipitation compared to the climatological normal. The other three years were average. Differences in model results due to changing the Bowen Ratio values for two years are expected to be negligible.

d. *Please provide an explanation for not considering the U adjustment to friction velocity.*

The ADJ_U* option was a BETA option, not a regulatory option, when the modeling analysis was performed (May 2016). At that time, ADJ_U* was only allowed for use by permission of the Agency for certain applications. ADJ_U* did not transition to the non-BETA option until AERMET version 16216.

e. *Please provide an explanation for using a reactivity of 0 for divalent mercury under Gas Deposition Control Parameters.*

Veolia used the default value from the 2005 HHRAP of 0 for reactivity for all mercury compounds in the assessment.

f. *Please provide an explanation for not using the updated Henry's Law Constant recommended in the IEPA's March 24, 2017 response to a risk assessment Veolia submitted in October 2016.*

The 2005 HHRAP specifies that Henry's Law constants for mercury compounds be based on values from the Mercury Report to Congress, Volume III: Fate and Transport of mercury in the Environment (EPA-452/R-97-005)1997. Those values are shown below in Table 2. Veolia followed this applicable guidance when conducting the risk assessment. The information in the Mercury Report to Congress, 1997 has been subjected to peer review by agency, academic, public, and industrial sources.

Table 2 – Default Henry's Constant Recommended by Guidance

Chemical	Default H Value (atm-m /mole)
Elemental Hg	7.1×10^{-3}
$HgCl_2$	7.1×10^{-10}
Methylmercury	4.7×10^{-7}

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2) *Mercury Speciation*

It is not clear whether the 2017 Risk Assessment calculated mercury speciation and global loss correctly. The narrative suggests the 2017 Risk Assessment adjusted the final global loss to be consistent with the MSRC default example, rather than basing it on the site-specific speciation results. The Mercury Emissions and Speciation Data table in the Appendix would appear correct except they do not carry forward the rates for elemental mercury. Other values appear in the COPC Toxicity Data table. Based on the narrative, there might be further adjustment not evident in the tables. A risk assessment should fully identify the emission rates of each mercury species (elemental mercury, divalent mercury vapor, and particle-bound divalent mercury) both before and after accounting for global loss for each stack. Moreover, the 2017 Risk Assessment does not explain why it used speciation data from the Rotary Kiln Incinerator instead of deriving mercury speciation for the Fixed Hearth Incinerators from site-specific Method 29 stack data Veolia collected from those units in 2013.

Mercury speciation is discussed in detail in the HHRAP. Section 2.3.5.3 of the HHRAP introduces the topic of speciation as follows:

"The methods for analyzing mercury speciation in emission plumes are being refined, and there is still controversy in this field. The speciation of mercury emissions is thought to depend on the fuel used, flue gas cleaning, and operating temperatures. True speciation of mercury emissions from the various source types is still uncertain and thought to vary not only among source types, but also between individual plants. Total mercury exiting the stack is assumed to consist entirely of elemental and divalent species, with no emissions of methyl mercury. The exit stream is thought to range from almost all elemental mercury to nearly all divalent mercury. Much of the divalent mercury is thought to be mercuric chloride ($HgCl_2$), particularly in the combustion of wastes containing chlorine. The divalent fraction is split between vapor and particle-bound phases (Lindqvist et al. 1991)."

In an effort to minimize the uncertainty of speciated Hg from the incinerator stack emissions, Veolia performed emissions testing on the Rotary Kiln Incinerator using the Ontario Hydro Method (ASTM D6784-02). The results of this testing were consistent with the language provided above from the HHRAP. In the previous draft of the HHRA, the results of speciated mercury analysis were utilized for the Rotary Kiln and HHRAP Guidance default values were used for the mercury speciation for the Fixed Hearth Incinerators.

However, US EPA Region 5 provided comments related to the use of speciation data. Since their opinion was that the site-specific speciation results were actually less conservative than the default values, they recommended that the speciated results be used for mercury emissions from all three stacks to ensure that worst-case emissions were addressed by the HHRA. Furthermore, Veolia agreed to install carbon injection on Units 2 and 3 so the speciation for these units should be similar to Unit 4 which has carbon

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injection.   Therefore, Veolia used the speciation results in the manner recommended by US EPA Region 5 for the HHRA. Global losses were considered per Figure 2-4 of the HHRAP guidance as a compound-specific emission rate.

The results were provided in Table 2-3 of the HHRA Report and shown below:

Table 2-3
Mercury Speciation Data for the Rotary Kiln (Unit No. 4) and applied to all incinerators

Parameter	Value
3-Run Average Emissions, µg/dscm	
Speciation of Total Mercury Emissions, (Mass Fraction)	
Fraction as Hg^0	0.01177
Fraction as Hg^{2+} Vapor	0.9867
Fraction as Particle-Bound Hg^{2+}	0.00149

Finally, although methyl mercury is not enumerated in the stack gas speciation in Table 2-3, technical literature supports that this form of the metal may develop once mercury is released into the environment. Therefore, methyl mercury is part of the risk assessment estimates of risk and hazard for the facility based on the calculations provided in the HHRAP. Each step of the calculations is shown in succession in the HHRA Appendix.

3) *Emission Rates at the MACT*

It is not clear why the 2017 Risk Assessment used the Stack 4 emission rate calculated at the MACT for Stack 2 and Stack 3. The Stack 2 and Stack 3 operational flowrates significantly differ from the Stack 4 operational flowrate. Also, please show the calculation for the maximum emission rates at the MACT for each stack.

The information included in existing Tables 2-2 and 2-4 of the December 2017 Risk Assessment Report was used in the risk model, but the tables did not present all the supporting calculations of total emission rates. Emission rates in g/s from each stack were calculated using the MACT concentration-based limit and totaled. The intent of the table was to show that emissions from each stack were totaled in the risk assessment as if each incinerator was operating at the maximum MACT emission limit simultaneously. Revised tables have been provided as Attachment 1 to clarify the original intent.

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4) *Source Parameters*

The 2017 Risk Assessment does not show the results for when the Time Period over which Deposition Occurs (Td) is 60 years or 100 years. These results should be prepared and considered.

The final HHRAP recommends the assumption that receptors are exposed to the long-term average COPC soil or water concentrations (and the subsequent COPC plant or animal concentrations) present in the environment or media following a period of time during which there were continuous hazardous waste combustor emissions. EPA has assumed that this period of time to be 30 years and has recommended a default duration of exposure (life of the combustion facility) of 30 years. The underlying assumptions include that the incinerator is currently in place and that it will continue to be used for the rest of its useful life (estimated to be 30 years).

Despite the possibility of longer term operability, exposure for this entire period is unlikely in the extreme. The HHRAP acknowledges that many Americans do not remain in the same area for a 70-year lifetime. An estimate of the number of years that a person is likely to spend in one area, such as the vicinity of a combustion facility, can be derived from information about mobility rate and median time in a residence. The 2016 mobility tables provided by the U.S. Census Bureau, specific to the U.S. Midwest (https://www.census.gov/data/tables/2016/demo/geographic-mobility/cps-2016.html) indicate that nearly 10% of the population relocates annually. That value more than doubles for households at poverty level income. In addition to the number of years at a particular location or residence, the amount of time spent at that location each day directly affects exposure. For example, children that attend day care or adults that work in a different location for part of the day are not exposed to contaminants in the assessment area during that time. In light of these factors, there is not a site-specific reason to increase the time period of exposure to a time period greater than that recommended by the HHRAP.

5) *Waterbody Parameters*

The 2017 Risk Assessment does not provide references for depth of water column (dw), average volumetric flow rate through waterbody (vf), and waterbody surface area (wa). Please explain how these values were determined.

The information provided regarding water bodies was included in previous versions of the Veolia HHRA, but Veolia understands that previous versions may not have been available for review by IEPA. US EPA did not previously comment on the rationale for determining water body parameters.

The Southern Illinois Fishing Map Guide indicates that the surface area of the Frank Holten Main Lake is 392,545 m^2 and the surface area of Frank Holten Lake #3 is 323,748 m^2. The combined water surface area is 716,293 m^2. This value was confirmed using 3-D TopoQuads and was used in this risk assessment.

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The waterbody surface area for the portion of the Mississippi River located in the assessment area was determined using the 3-D TopoQuads program. The surface area for the Mississippi River used in this assessment was 13,550,000 m^2.

An average water column depth for the lake at Frank Holton State Park of 9 feet (2.74 meters) was determined through correspondence with the Illinois Department of Natural Resources. This value was accepted by US EPA Region 5 in June 2005.

A value of 25 feet (7.62 meters) was used as the depth of the water column for the Mississippi River near St. Louis. This value was obtained from the Army Corps of Engineers. This value was accepted by US EPA Region 5 in June 2005.

The average annual volumetric flowrate of the Mississippi River and Frank Holton Lake were calculated using values already discussed (water column depth and surface area) in conjunction with average velocities. There is great variability for these values over time. Values provided in the 2017 submittal, 3.85E05 meters/sec for Frank Holton Lake and 1.54E11 meters/sec for the Mississippi River were accepted by US EPA Region 5 in June 2005.

6) *Watershed Parameters*

   a. *Please provide watershed descriptions, locations, delineation, images, and the rationale for selection.*

   The information provided in the following paragraphs was included in previous versions of the Veolia HHRA, but Veolia understands that previous versions may not have been available for review by IEPA. US EPA did not previously comment on the rationale for determining watershed parameters.

   The total watershed area for the Mississippi River was determined utilizing the water body and elevation data provided by the 3-D TopoQuads program. The value used in this risk assessment was 49,550,000 m^2.

   b. *References for percent impervious to runoff, watershed area, USLE cover management factor, and USLE rainfall erosivity factor were not provided. Please explain how the 2017 Risk Assessment determined these values.*

   To determine the percent of the watershed area that is impervious to runoff, the watershed area delineated using 3-D TopoQuads was overlaid on NCLD land use data. The resulting graphic was analyzed using MathCAD to quantify the land usage inside the watershed area. Each land use category was assigned an estimated percent impervious value. A weighted average was calculated to determine the overall percent impervious to runoff. For the Mississippi River watershed area, the percent

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impervious to runoff was determined to be 42%. Thus, the impervious watershed area receiving deposition was 20,811,000 m^2.

For the Frank Holton State Park watershed area, the percent impervious to runoff was determined to be 47%. Thus, the impervious watershed area receiving deposition was 3,106,700 m^2.

The USLE cover management factor used was 0.1, as recommended for watersheds in Table B-4-13 of the HHRAP.

The USLE rainfall erosivity factor was determined using the method recommended by the HHRAP, which cited a range of suitable values based on geographic region. A value of 210 was used for Rf using the graphic provided by the reference for this factor in Table B-4-13, of Wischmeier, W.H., and D.D. Smith's 1978 *Predicting Rainfall Erosion Losses—A Guide to Conservation Planning* from *Agricultural Handbook No. 537* published by U.S. Department of Agriculture provided here for your convenience: https://naldc.nal.usda.gov/download/CAT79706928/PDF

7) *COPC Database Values for methyl mercury (CAS No. 22967-92-6) and Mercuric Chloride (Cas No. 7487-94-7)*

Please explain how the 2017 Risk Assessment determined the values for Henry's Law Constant and Fraction of Contaminant in Vapor Phase. Provide calculations and/or references and explain why they did not use the updated Henry's Law Constant IEPA recommended on March 24, 2017.

Please see the response provided for Comment #1(f) and #2.

8) *Non-Default Parameter Values*

Clearly identify and describe any parameter where the 2017 Risk Assessment did not use default values from the 2005 Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (the HHRAP), and provide the following information for each one (Section 5.8 of the HHRAP):

a. *An explanation of why using a more site-specific parameter value is warranted;*
b. *The technical basis of the site-specific parameter value, including readable copies of any relevant technical literature or studies;*
c. *A comparison of the weight-of-evidence between the competing studies; and*
d. *A description of other risk assessments or projects that used the site-specific parameter value, and how such risk assessments or projects are similar to the current risk assessment.*

As stated in Section 1.1 of the HHRA Report, the methodology presented is based on the September 2005, <u>Final Human Health Risk Assessment Protocol Guidance Document for</u>

Hazardous Waste Combustion Facilities (HHRAP). Where possible, site-specific information was used to perform the assessment. However, most assumptions made were based on default model options. Therefore, the list of any non-default parameters is brief, and a rationale for using those non-default parameters and any applicable references are typically discussed in the appropriate sections within the HHRA Report. Non-default parameters have been discussed in previous submittals and Veolia has compiled those discussions here for clarification since IEPA may not have access to those past records.

1. **Site-Specific PSD**: Although default particle size distribution (PSD) information is allowed, Veolia performed site-specific testing to determine the actual PSD at the source. Section 3.2.2 provides information about PSD testing at the facility and the results are provided in Table 3-2 of the HHRA Report. Since PSD is determined by many factors, the HHRAP recommends the use of site-specific PSD instead of default values. Veolia utilized the appropriate technology for sampling and results were evaluated for quality control parameters and reported as part of testing performed at the facility for compliance purposes.

2. **Percentage of Contaminated Fish**: The percentage of contaminated fish consumed by fishers in the assessment area modified from the default value of 100% as stated in Section 5.2.2.3 to 75% due to the site-specific conditions discussed in Sections 5.2.2.3 and 6.3 of the HHRA Report. It is assumed that 75 percent of the fish consumed by the fisher and fisher child are contaminated. Although the default consumption rate for fishers in the HHRAP is 100%, site-specific factors play a significant role in reducing the percentage of fish consumed from the Frank Holton Lake. First, fish harvested from the lake are largely fish that have been stocked into the lake for sport fishing. Regular stocking of farm-raised fish is well documented. Typically, the lakes are stocked twice yearly with thousands of pounds of trout and catfish.

   Interviews were conducted with residents of East St. Louis, a former resident of E. St. Louis, and regulatory personnel who have knowledge of fishing and consumption practices in the area. The majority of fishing at Frank Holton State Park, as witnessed on numerous occasions by Veolia personnel, is accomplished by fishing with a cane pole from the banks and using live bait (worms). These practices primarily yield bluegill, carp, buffalo, and catfish. Illinois Department of Natural Resources (IDNR) fishing reports state that the stocked game fish "...are culled out fairly quickly. They do not survive the summers in these lakes." "…75 to 80 percent are caught. You may have some mortality on some, but most of them are harvested." These statements from the IDNR personnel indicate that these game fish do not survive long enough in the lakes to be affected by long-term exposure of pollutants or to propagate.

   Also pertinent to the percentage of contaminated fish consumed by the fisher exposure scenario is the availability of fish for harvest. Veolia asserts that the Frank Holton Lake is an inappropriate selection for the water body designated for fishers in this risk assessment. The HHRAP guidance specifies, "for the Fisher scenario, an appropriate water body (and/or its associated watershed) would receive deposition from the emission source, and be able to sustain a fish population harvested by humans." Frank Holton

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Lake is unlikely to sustain a fish population without the annual fish stocking program at the park. The Lake Management Status Reports have stated "Maintaining a decent sport fishery in this lake is challenging. The physical habitat of the lake is quite poor. The lake is shallow and turbid with no aquatic plants and little structure." The use of this lake as the source for fish consumed by fishers in the assessment area introduces considerable conservatism due to the unlikelihood of harvesting fish to provide much supplement to the diet of residents.

Additionally, Dan Stephenson, the current Acting Chief of the Illinois Department of Natural Resources Division of Fisheries, found "the lakes at Frank Holton are connected via ditches to the Mississippi River allowing a constant exchange of multiple species between lake and river. This is not a static system. There could be a claim that the fish tested originally came from the river and pick up the methyl mercury elsewhere." The "open system problem" identified by Mr. Stephenson introduces several uncertainties into this risk assessment and casts significant doubt on any conclusions attempting to associate risks to any discreet facility including the Veolia facility. The open system allows all facilities and operations contributing constituents through air emissions or effluent to the Mississippi upstream of the ditches leading to the Frank Holton lakes to contribute in whole or in part to mercury, if any, in the Frank Holton lakes.

Similarly, risks, if any, to possible receptors from the consumption for fish from Frank Holton lakes will vary significantly depending upon the levels of mercury, if any, found in the consumed fish. Mercury levels, if any, in the fish are dramatically impacted by the open system since such levels are dependant, in large part, upon the fish being exposed to mercury in its life-cycle habitat. Lake Management Status Reports also document the transfer of fish species from connecting water bodies, "The lake also floods through ditches connected to the Mississippi River. This connection introduces many undesirable species including common carp, buffalo, grass carp, bighead carp, gizzard shad, yellow bass, and bullheads." As a result of the open system, little is known concerning the long-term habitat of the consumed fish, including the amount of time such fish were present in Frank Holton lakes or in the Mississippi River habitat. In summary, there is no way to determine the origin of constituents in the water in Frank Holton lakes or the origin of the fish and duration of the fish in the Frank Holton lakes or Mississippi River habitat. Therefore, the assumption that fish harvested from Frank Holton Lake were exposed to modeled mercury concentrations in the lake overestimates hazard for this facility.

3. **Fish Consumption Rate**: The consumption rate of fish for the fisher and fisher child exposure scenario was modified to more accurately reflect EPA's revised fish consumption rates. The previous consumption rate for fishers was developed decades ago and was not specific to the demographics of the site. EPA's Final Report on Fish Consumption Rates, April 2014 EPA-820-R-14-002, (https://www.epa.gov/fish-tech/estimated-fish-consumption-rates-reports) provides several levels of consumer. A high end consumer, shown as a 90th percentile user may be indicative of a subsistence fisher level. A mid-range consumer may be characterized as a 50th percentile user. A low-range consumer may be represented by lower percentile fishers. Veolia asserts that the usage at the Frank Holten State Park lakes to be that of recreational fishers only and

that the lakes are subject to fish consumption advisories for reasons unrelated to Veolia. Therefore, in order to ensure that the results from this risk assessment are representative of site-specific conditions, a consumption rate of the 50th percentile user has been assumed for this risk assessment. The fisher and fisher child scenarios are designed to evaluate the risks to an individual (adult or child) living in an urban or rural exposure setting where fish is a component of the receptor diet. A mid-range consumer is appropriate for this assessment.

EPA's Final Report on Fish Consumption Rates also provided more defined categories for fishers and where they are harvesting fish. Some of the categories included the type of water bodies, freshwater vs. saltwater, species of fish, and fisher age, race and economic profile. The consideration of these types of distinctions allowed a much more site-specific and appropriate consumption rate of fish for adults and children from Frank Holton Lakes. Even considering the revised consumption rates available from US EPA, other factors including the minimal size of the lake and limited accessibility reduce the likelihood of regular sport fishing from the lake. Additionally, harvesting fish for consumption from the lake is governed by state restrictions on size and number, and guided by notices at the lakes that further restrict the quantity of fish removed based on PCB levels in the lakes. PCBs have never been treated in the incineration units at the Veolia Sauget, Illinois facility.

4. The HHRAP recommends a specific Bioaccumulation Factor (BAF) for Hg in fish tissues that is based on the consumption of Trophic Level 4 fish, which would include large sport fish such a large-mouth bass. Based on communications with local wildlife resource personnel, referenced in Section 6.3 of the HHRA Report, a lower site-specific BAF based on Trophic Level 3.0 fish was more suitable. However, Veolia used a BAF value representative of Trophic Level 3.5 to maintain the conservative nature of the risk assessment.

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ATTACHMENT 1

REVISED TABLE 2-2 AND TABLE 2-4

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TABLE 2-2
MERCURY EMISSIONS FROM UNITS 2, 3 AND 4 INCINERATORS

Source	Concentration	2013 CPT Data			Concentration [1]	Emission Rate	
		O$_2$	Flow Rate				
	μg/dscm @ 7 %O$_2$	%	dscf/m	dscm/m	μg/dscm	μg/m	g/s
Unit 2	130	10.87	5,158	146.06	94.06	13,739	2.290E-04
Unit 3	130	11.8	5,294	149.91	85.43	12,807	2.134E-04
Unit 4	130	12.24	16,674	472.16	81.34	38,407	6.401E-04
Total							**1.083E-03**

Notes:
[1] Concentration at stack conditions.
   Concentration = 130 X ((21-O$_2$)/14)

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TABLE 2-2
MERCURY EMISSIONS FROM UNITS 2, 3 AND 4 INCINERATORS (Continued)

CAS No.	COPC Name	Calculated Emission Rate (g/s) [1]			
		Unit 2	Unit 3	Unit 4	Total
TOTAL MERCURY		2.290E-04	2.134E-04	6.401E-04	1.083E-03
7439976	Elemental Mercury	NA	NA	NA	1.28E-05
7487947	Mercuric Chloride [2]	NA	NA	NA	1.07E-03
22967926	Methyl Mercury [3]	NA	NA	NA	1.61E-06

Notes:

[1]   Hg mass emission rate of 1.083E-03 g/sec calculated using HWC MACT Hg concentration limit extrapolated and stack conditions from the 2013 CPT.

[2]   The emission rates of divalent vapor phase mercury and particle-bound mercury are evaluated in the risk assessment as mercuric chloride.

[3]   Although considered negligible in stack emissions, methyl mercury is evaluated as a COPC in this risk assessment to account for the methylation of divalent mercury within contaminated media.

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TABLE 2-4
EMISSION RATE DERIVATION FOR MERCURY SPECIES

Parameter	Unit 2	Unit 3	Unit 4	Total
Total Mercury Emission Rate, g/s	2.290E-04	2.134E-04	6.401E-04	1.083E-03
Fraction of Mercury as Hg^0 Vapor	0.01177	0.01177	0.01177	0.01177
Fraction of Mercury as Hg^{2+} Vapor	0.9867	0.9867	0.9867	0.9867
Fraction of Mercury as Particle Bound Hg^{2+}	0.00149	0.00149	0.00149	0.00149
Hg^0 Emission Rate, g/s	2.70E-06	2.51E-06	7.53E-06	1.28E-05
Hg^{2+} Vapor Emission Rate, g/s	2.26E-04	2.11E-04	6.32E-04	1.07E-03
Particle-Bound Hg^{2+} Emission Rate, g/s	3.41E-07	3.18E-07	9.54E-07	1.61E-06
Total Hg^{2+} Emission Rate, g/s (modeled as mercuric chloride)	2.26E-04	2.11E-04	6.33E-04	1.07E-03

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