

July 20, 2007



SDMS DocID

285149

FOR PLACEMENT IN THE ADMINISTRATIVE RECORD

Eve Stolov Vaudo, Esq.
U.S. EPA, Region 1
1 Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

Re: Centredale Manor Restoration Project Site – Response to Exponent
Memorandum Submitted by NECC Customer Group

Dear Eve:

We are writing on behalf of Emhart Industries, Inc. (“Emhart”) in response to the memorandum of April 4, 2007, prepared by Exponent and Limno-Tech (“Exponent Memo”), submitted by the NECC Customer Group to U.S. EPA. According to the authors, the objective of the Exponent Memo is to assess the validity of the arguments contained in the October 19, 2006 report of J. Ronald Hass, entitled “Evaluation and Opinions on the Conceptual Site Model Contained in U.S. EPA’s Interim-Final Remedial Investigation Report and Human Health and Ecological Risk Assessment Reports” (“Hass Report”). The purpose of the Hass Report, which was submitted to U.S. EPA under cover of our correspondence dated October 19, 2006, was to analyze and test the conceptual site model (“CSM”) for the Centredale Manor Restoration Project (“CMRP”) Site presented by U.S. EPA in its Interim-Final Remedial Investigation Report (“RI Report”), dated June 30, 2005.

Enclosed for Agency consideration please find the responses to the Exponent Memo prepared on Emhart’s behalf by Dr. Hass and AMEC Earth & Environmental, Inc. (“AMEC”). In his response, Dr. Hass addresses the chemistry issues raised by the Exponent Memo. Dr. Hass explains that Exponent has failed to show that the hexachlorophene (“HCP”) production process reportedly utilized by Metro-Atlantic, Inc. could be the source of the dioxins and furans found in samples taken at the Site. In fact, as demonstrated in Dr. Hass’s response, Exponent’s assertions have no factual basis and are unsupported by the testimonial evidence. Moreover, Dr. Hass explains how Exponent has failed to demonstrate that the drum reconditioning activities conducted by New England Container Company (“NECC”) at the Site or the handling of materials from the NECC customers that were taken to the Site should not be considered a plausible source of these and other contaminants detected at the Site. Therefore, it is requested that EPA reconsider the validity of its CSM, acknowledge that the evidence is controverted regarding whether the HCP process is a possible source of the dioxins and furans found in samples from the Site, and evaluate other potential sources of these chemicals, including NECC’s operations.

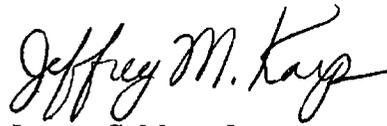
In its response, AMEC addresses the risk assessment issues raised by the Exponent Memo. In particular, AMEC reiterates EPA’s risk assessment findings regarding compounds

Eve Stolov Vaudo, Esq.
July 20, 2007
Page 2

other than dioxin, including polychlorinated biphenyls ("PCBs"), that exceed EPA's acceptable risk range at the Site. In fact, AMEC concludes that if Aroclor 1254, a PCB mixture that EPA solely has attributed to NECC's operations at the Site, were the only chemical of concern detected at the Site, EPA still would consider requiring remediation of the Allendale and Lyman Mill Pond sediments.

Please place this letter and the enclosed documents in the Administrative Record for the CMRP Site. If you have any questions or comments, or would like to schedule a meeting to discuss the matters addressed in the enclosed responses to the Exponent Memo, please do not hesitate to contact us.

Sincerely,



Jerome C. Muys, Jr.
Jeffrey M. Karp

Direct line: 202 370 3921
jkarp@sandw.com

Enclosures

cc: Ms. Anna Krasko (U.S. EPA)
Ms. Deidre Dahlen (Battelle)
Mr. Louis Maccarone (RIDEM)
David Graham, Esq.
Howard Grubb, Esq.
Gregory Benik, Esq.
Laura Ford Brust, Esq.

FOR INCLUSION IN THE ADMINISTRATIVE RECORD

Centredale Manor Restoration Project Superfund Site
North Providence, Rhode Island

**Response to the April 4, 2007 Exponent/Limno-Tech External Memorandum
Regarding EPA's Conceptual Site Model**

J. Ronald Hass, Ph.D.
July 19, 2007

On April 4, 2007, Exponent, with assistance from Limno-Tech, Inc., submitted an external memorandum ("Exponent Memo") on behalf of a group of nine companies that are potentially responsible parties ("PRPs") at the Centredale Manor Restoration Project ("CMRP") Superfund Site for inclusion in the CMRP Administrative Record. The stated purpose of the Exponent Memo is to provide comments on the CMRP Conceptual Site Model review prepared by Dr. J. Ronald Hass dated October 19, 2006 ("Hass Report" or "Report"). The present document is in response to the Exponent Memo.

The purpose of the Hass Report was to analyze and test the conceptual site model ("CSM") for the CMRP Site presented by U.S. EPA in its Interim-Final Remedial Investigation Report ("RI Report"), dated June 30, 2005 and quoted in the Report. In summary, the Hass Report found as follows:

- The Metro-Atlantic hexachlorophene ("MA HCP") production process could not have created the polychlorodibenzo-*p*-dioxins ("PCDD") and polychlorodibenzofurans ("PCDF") ("PCDD/PCDF") found at the CMRP Site.
- Any aqueous waste from the MA HCP process would have contained insignificant 2,3,7,8-tetrachlorodibenzo-*p*-dioxin ("2,3,7,8-TCDD"), if any, and no other PCDD/PCDF.
- Any 2,3,7,8-TCDD originating in the 2,4,5-trichlorophenol ("2,4,5-TCP") feedstock used for the MA HCP process would have been removed during the initial 2,4,5-TCP purification and disposed as solid waste.
- Activated charcoal would be a marker for any solid waste from the MA HCP production process.
- Activated charcoal is not present in the CMRP samples analyzed for 2,3,7,8-TCDD or PCDD/PCDF.
- Therefore, the 2,3,7,8-TCDD and other PCDD/PCDF found in these samples could not have originated with HCP solid waste disposal by MA.
- Therefore, the CSM is in error.
- One of those errors is not considering all plausible sources of the 2,3,7,8-TCDD.
- The correct combination of materials and heating or combustion can be expected to lead to the observed compounds.
- New England Container Company ("NECC") engaged in combustion and other high temperature activities on a regular basis.

- NECC customers may have provided the appropriate materials.
- Therefore, NECC is a plausible source of the 2,3,7,8-TCDD and PCDD/PCDF.

In light of the foregoing, I respond to the critique of the Hass Report contained in the Exponent Memo, as follows:

1. At page 2, paragraph 2, Exponent states that 2,3,7,8-TCDD is the primary driver of the site remediation. The Hass Report did not address this issue. Rather, the Report was concerned with the source of the PCDD and PCDF, as was clearly stated in the first two paragraphs of page 1 of the Hass Report.

There is no chemically plausible mechanism for 2,4,5-TCP, the alleged source of the PCDD/PCDF at the CMRP Site, to form any octachlorodibenzo-p-dioxin ("OCDD") under the conditions employed in the MA HCP production process. The finding that average concentrations of OCDD are higher than those of 2,3,7,8-TCDD in the CMRP Site source area soil samples directly and irrefutably contradicts the assertion in the RI Report that the MA HCP process is the source of the alleged PCDD/PCDF contamination at the CMRP Site.

This observation should have led EPA to examine alternative CSMs capable of explaining the scientific evidence. One of those alternatives should have been the drum recycling activity conducted by NECC at the Site. The Hass Report does not offer the opinion that NECC is the only alternative that should be examined. Rather, the Report suggests that NECC, as well as any other plausible alternatives, should be investigated by EPA.

2. At page 4, paragraph 1, Exponent discusses the TCP purification procedure undertaken in the MA HCP process. As shown in Figure 1, in an aqueous solution, 2,4,5-TCP exists in two forms. At low pH (< ~ 6), the form on the left side of Figure 1 predominates. At higher pHs (> ~ 7), the form on the right predominates. The form on the left has limited water solubility while the form on the right is highly soluble in water. The addition of caustic and cooling the solution will result in the sodium 2,4,5-trichlorophenate ("2,4,5-NaTCPenate") precipitating.

EPA's accepted solubility limit of 2,3,7,8-TCDD in pure water is 19.3 ng/L at 22 °C.¹ The solubility would be lower at the temperature used by MA to recrystallize the 2,4,5-TCP.² In addition, the ratio of cold, solid 2,4,5-NaTCPenate precipitate:2,3,7,8-TCDD would be on the order of 50,000:1, providing a substantial surface area for the 2,3,7,8-TCDD to adsorb. Thus, we can expect the aqueous 2,3,7,8-TCDD concentration to be reduced by > 10⁷ to 10⁹ based upon simple Kow and Koc considerations.

Even if the allegation that MA discharged the waste stream from the purification process directly into the Woonasquatucket River were true, the highest conceivable levels of 2,3,7,8-TCDD would still be orders of magnitude too low to

¹ EPA Dioxin Risk Assessment, Part 1, Volume 3, Chapter 2, Section 2.4.1, 2000.

² I was unable to find reports of the TCDD aqueous solubility of TCDD at temperatures below room temperature. However, some insight can be gained by considering the case of 1,3,7,8-TCDD whose aqueous solubility at 7 °C and 21 °C have been reported as 7.56 x 10⁻¹⁰ mol/L and 14.9 x 10⁻¹⁰ mol/L, respectively. Friesen, K. J., and Webster, G. R. B., *Environ. Sci. Tech.*, 1990, 24, 97-101. Other congeners showed a similar factor of ~ 2 change in solubility between these two temperatures.

raise any environmental concern, much less account for the 2,3,7,8-TCDD found in the Allendale Pond sediments and at points further downstream, as alleged in the referenced CSM. No other PCDD/PCDF congener could be released since none were present.

Nonetheless, Exponent does raise an interesting question in considering the validity of the CSM. If MA discharged the aqueous waste from the HCP process, what happened to all the 2,4,5-TCP? Mr. Cleary has stated that it is likely that less than 25,000 kg of 2,4,5-TCP was supplied to MA.³ If, as Exponent contends, 12% to 21% of the 2,4,5-TCP was lost during the purification procedure, then 3,000 to 5,250 kg (3.3 to 5.8 tons) of 2,4,5-TCP would have been discharged directly into a low flow river⁴ in a 9 to 12 month period had that been the disposal route used by MA. While the NaTCPenate would have been in solution initially, the lower pH of the river would have led to precipitation of the free phenol (See Figure 1) as the solution was diluted and the pH fell. Accordingly, the question becomes what happened to the 3.3 to 5.8 tons of 2,4,5-TCP?

3. On page 5, Exponent develops a speculative argument that MA brought 124,171 to 165,561 kg of TCP on site. Their arguments require that between 16.4 and 38.3 tons of TCP were dumped over a 9 to 12 month period into a slow moving river with little or no adverse environmental effects noted at the time.

On page 7, as part of the basis for this argument, Exponent refers to a telephone conversation in which Mr. Cleary is alleged to have given details of the daily production practices at MA. This was a private conversation that allegedly occurred between Exponent and Mr. Cleary. Emhart's representatives were not privy to this conversation nor was Mr. Cleary under oath. In fact, Mr. Cleary has given sworn testimony⁵ in which he testifies that he lacked the detailed knowledge of the day-to-day production practices at MA that Exponent implies he had. Accordingly, any claims based on this alleged telephone conversation with Mr. Cleary should be ignored.

The document cited by Exponent for the Diamond Alkali ("DA") data also states that "Virtually all the Na 2,4,5-TCP produced was further processed to produce 2,4,5-T acid."⁶ Table 6 from the same document lists the 1966 production of 2,4,5-TCP to be 688,541 lbs. The 1965 number is highly likely to be similar. The calculation in the Exponent Memo requires that between 39% and 53% of DA's total 2,4,5-TCP production would have been sold to MA, even though DA was under government pressure to use their 2,4,5-TCP for Agent Orange production.³ Therefore, Mr. Cleary's estimate of no more than 25,000 kg (55,000 lbs, or 8% of DA's total TCP production in 1966) seems overly optimistic and likely too high.

³ Cleary, T., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Feb. 10, 2003, Ex. 15.

⁴ Figure 3-7 of the RI Report shows 1964 to be a below average year for river flow and 1965 to be the lowest flow period recorded for the Woonasquatucket River between 1942 and 2003. Both years are also below average for peak stream flow as shown in Figure 3-8.

⁵ Cleary, T., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Feb. 10, 2003, Page 36, Line 17-Page 37, Line 6; Page 38, Line 17-Page 39, Line 25; Page 92, Lines 2-5.

⁶ Dioxin Registry Report. Report Prepared by Review Documents from Diamond Shamrock Corporation, Diamond Alkali Company, Newark, New Jersey, Report No. 117.16. Division of Surveillance, Hazard Evaluations and Field Studies, National Institute for Occupational Safety and Health, Centers for Disease Control, Cincinnati, Ohio, June 1986, page 13.

In summary, Exponent's estimate of the amount of 2,3,7,8-TCDD brought on site is without factual basis and directly refuted by testimonial evidence. Therefore, it should be given no credence.

4. On page 6 of the Exponent Memo, Exponent engages in selective use of information and invalid comparisons in an effort to obscure the simple fact that activated charcoal is highly effective for the removal of 2,3,7,8-TCDD from liquid materials. Their arguments do not alter the fact that the schematic diagram in the Hass Report, which they agree is accurate, shows that any TCDD not removed in the TCP purification process would have been subjected to activated charcoal a second time. Furthermore, any TCDD not removed by the second activated charcoal treatment was shipped to Kalo Labs.⁷ Therefore, arguments about the effectiveness of activated charcoal have no bearing on the issue of TCDD discharge. Any TCDD entering the MA HCP process either would have been bound to activated charcoal or shipped to Kalo Labs. No TCDD measurable by EPA Method 8280, as applied to the CMRP source area samples, could have been in the MA HCP waste streams.

Exponent makes an invalid comparison by using results from the DA process to predict the results that were obtained by MA's use of activated charcoal. Differences between the systems invalidate the comparison.

DA utilized an activated charcoal column. As noted in the Stalling patent⁸ cited in the Exponent Memo, activated charcoal columns normally present flow problems. Any steps taken to improve the flow likely would have resulted in a decrease in TCDD removal efficiency.

MA, in contrast, intimately mixed their activated charcoal with the 2,4,5-TCP solutions prior to filtering. Also, they had an indicator that enabled them to monitor the effectiveness of their purification procedure. Specifically, MA added the activated charcoal to remove colored materials. Any substance more strongly adsorbed would be removed before these colored impurities. Thus, it is highly probable that the conditions removing the targeted colored material would also have removed essentially all the 2,3,7,8-TCDD. Based upon Mr. Cleary's testimony,⁹ we can be highly confident that the MA process would remove all visible colored materials.

Accordingly, the original point in the Hass Report stands: Essentially all the 2,3,7,8-TCDD would have been removed by the activated charcoal, and Exponent's comments are without merit.

5. When DA added an activated charcoal column to their process, they achieved a substantial reduction in the 2,3,7,8-TCDD levels in their 2,4,5-TCP. Exponent's assertion that the improvement was from 16 ppm to 1.1 ppm does not stand up to scrutiny. This assessment is apparently based upon the Dioxin Registry Report⁶ for DA, since no other reference is given.

According to Table 10 in the Dioxin Registry Report, 19 of 22 samples purified with the activated carbon column contained no detectable TCDD with stated

⁷ Cleary, T., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Feb. 10, 2003, Page 42, Line 22-Page 43, Line 5.

⁸ Stalling, D. L., Huckins, J. N., and Smith, W. A., "Adsorbent for Polynuclear Aromatic Compounds," U. S. Patent 4,102,816, July 25, 1978.

⁹ Cleary, T., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Feb. 10, 2003, Page 22, Lines 7-22.

detection limits of 0.5 to 1.0 ppm. The concentration range for the three samples with "detected" TCDD was 0.9 to 1.1 ppm. Of the 19 samples, 15 were non-detectable with reported detection limits of 1.0 ppm. The remaining 4 samples had a detection limit of 0.5 ppm. Thus, the highest reported detected concentration (1.1 ppm) was likely no more than 10% greater than the detection limit (1.0 ppm detection limit) and certainly no more than a factor of 2.2 greater (0.5 ppm detection limit). This very small difference between detection limit and quantification limit is below any current criteria for reporting TCDD concentration.

The analytical procedure used by DA for these analyses was a simple benzene extraction of a caustic solution of 2,4,5-TCP, concentration of the benzene extract, dilution to a known volume, and then injection of an aliquot into a GC injection port at 245 °C. The described procedure would not have removed any 2,4,5-TCP that was co-extracted into the benzene.¹⁰ The injection port temperature was high enough to convert at least some of any residual 2,4,5-TCP present into 2,3,7,8-TCDD, creating a positive interference.

The GC column chosen (SE-30) is incapable of separating 2,3,7,8-TCDD from many other isomers. The GC conditions seem to be designed to give a sharp peak (for improved sensitivity), rather than optimal separation as evidenced by the TCDD peak eluting under the solvent tail. Thus, there is no way of knowing how many components that are not TCDDs might have co-eluted with the observed peak.

None of the current identification criteria were met for 2,3,7,8-TCDD. The probability of artifacts is high. There is no basis in the available data to assume that any 2,3,7,8-TCDD was found in the DA purified 2,4,5-TCP. The method applied, at best, tells us the maximum possible concentration of 2,3,7,8-TCDD in the sample analyzed. There is no way of knowing if any 2,3,7,8-TCDD was actually present.

In summary, Exponent's assertion that the MA process would not remove essentially all the 2,3,7,8-TCDD is unsupported by the data they cite and is contrary to well-established chemistry. Thus, the assertion is without merit.

6. Near the bottom of page 5, Exponent raises the issues of "wastage, spillage, and discharge of bad batches." It is interesting that Exponent would have us believe that the same management who they say would tolerate wastage of 2,4,5-TCP, an expensive, difficult to obtain feedstock, would recycle Nuchar, a cheap, readily available material.

The same considerations apply to spillage. In addition, the concrete floor would have adsorbed any TCDD spilled inside the building. None of the cleaning methods described in the deposition testimony would have removed that TCDD. Therefore, the only possibility for spills to have contributed to the TCDD contamination would have been prior to the 2,4,5-TCP entering the building. Any

¹⁰

It is important to remember that we are dealing with rapidly reversible reactions (See Figure 1). Even at high pH, there will always be some neutral 2,4,5-TCP present in the caustic solution. This neutral 2,4,5-TCP is much more soluble in benzene than the caustic solution. As it is removed, the components in the caustic (aqueous) phase will attempt to adjust by replacing the extracted 2,4,5-TCP. Thus, the amount of 2,4,5-TCP extracted into the benzene will depend upon the details of the solution (pH, temperature, ionic strength, etc.) and the contact time between the caustic solution and the benzene. The amount of 2,4,5-TCP thus extracted is likely to be highly variable and could easily account for all the 2,3,7,8-TCDD reported by reaction in the GC injection port.

TCDD spilled outdoors would have been adsorbed by the soil and would have remained within a few inches of the surface, unless disturbed. However, there is no evidence that suggests such spills of 2,4,5-TCP occurred.

7. Exponent implies that Mr. Cleary's HCP process was unreliable, perhaps leading to bad batches that were disposed. They cite a partial quotation from his deposition to support their assertion.¹¹ A review of the full quotation¹² reveals that the basis of Mr. Cleary's patent is that he replaced the existing so-called "tricky" one step process with a more easily controlled two step process for the condensation of 2,4,5-TCP with formaldehyde, thus mitigating the potential bad batch problem. There is no evidence suggesting that Mr. Cleary was less than completely successful in eliminating bad batches.

The argument that bad batches were disposed is contrary to the testimony. Mr. Cleary testified that the low quality residual materials were sold to Kalo Labs.⁷ Joseph Buonanno, Jr. testified that it was customary practice at MA to dilute off-spec batches into normal production.¹³ Exponent overlooks the testimony of the former MA production manager that any solid material with any commercial value was sold and solid waste was taken away from the Site, whereas off-specification liquids were diluted into production batches and sold.¹⁴ Any material that could not be handled in that manner was sold to companies that reclaimed chemicals.¹³ Thus, there was no "bad batch" disposal.

8. On page 6, paragraph 2, Exponent misrepresents the Hass Report. The Report is not claiming a 630,000,000-fold reduction in TCDD; rather, it concluded that is the minimum reduction predicted, based on the best scientific models available that have been in widespread use for more than 100 years. Exponent simply attacks the conclusion without providing a supporting rationale. The fact remains that TCDD adsorption by activated charcoal is highly effective.
9. In the final paragraph of page 6, Exponent disputes the difficulty of removing 2,3,7,8-TCDD from activated charcoal on the basis of a single sentence in a patent⁸ that is contradicted by other references in the Hass Report and by other reports that are incorporated by reference therein. Exponent does not comment on the publications that contradict the chosen sentence.

The cited patent does not deal with activated charcoal. It deals with a mixture in which activated charcoal is a 14% component. The entire basis of the patent is that this mixture is different than activated charcoal alone.

The patent presents no control data. That is, there are no data presented to show that the same results would not have been obtained in the absence of any charcoal. The ease of recovery is compelling evidence that the 2,3,7,8-TCDD was effectively blocked from contact with the activated charcoal by the polyurethane ("PUF").

¹¹ Exponent Memo, Footnote 4.

¹² Cleary, T., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Feb. 10, 2003, Page 21, Line 13-Page 24, Line 25.

¹³ Buonanno, J., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Jan. 17, 2003, Page 34, Line 23-Page 35, Line 20.

¹⁴ Anon., Administrative Deposition Transcript, *In the Matter of Centredale Manor Superfund Site, North Providence, Rhode Island*, Aug. 31, 2000, Page 7, Line 16-Page 9, Line 5; Page 16, Line 16-Page 17, Line 6.

In addition to the papers cited in the Hass Report, two more informative studies subsequently were identified. Cutie¹⁵ reports "It was found that none of the solvents included in Table 1 would successfully remove TCDD from Amoco active carbon; therefore, another approach was taken."¹⁶ Benzene (similar, and perhaps, stronger solvent properties than the toluene used for some of the CMRP samples) and acetone/hexane (used for approximately 50% of the CMRP TCDD analyses and nearly all the source area samples) are specifically listed with 0% recovery. In order to get useful recovery, Cutie diluted the Amoco carbon with a 25-fold excess of silica gel and then eluted with a benzene/toluene mixture at 95 °C. This is far different than the conditions described by Stalling *et al.*,⁸ strongly suggesting the TCDD in their experiment was adsorbed to the PUF rather than the charcoal.

Cutie also reported on the removal of 2,3,7,8-TCDD from Pittsburgh active carbon, a coke-based activated carbon. He found no recovery with any of the solvents used for the Amoco PX-21 carbon. He reported it was necessary to Soxhlet extract the Pittsburgh active carbon with dichlorobenzene in order to obtain recovery. This finding requires that Stalling's reported recovery cannot be measuring 2,3,7,8-TCDD bound to activated charcoal.

Stanley and Sack¹⁷ report recoveries ranging from 4% to 7.3% for five fly ash samples examined in the single laboratory validation study for what became EPA Method 8290, used for the vast majority of soil/sediment samples not analyzed by EPA Method 8280.

Exponent has not shown that 2,3,7,8-TCDD could be removed from activated charcoal by rinsing with any known solvent and especially one of record at MA.

10. On Page 8, paragraph labeled B, Exponent confuses risk assessment with forensics. The issue of toxicity is irrelevant for the forensic question of establishing origin. While Exponent objects to the Report's conclusion that the dioxins might be associated with NECC, they make no comment about the basis for that objection.
11. On Page 8, paragraph labeled C, Exponent apparently fails to recognize that the Hass Report was written, in part, in response to a statement in the referenced CSM made without foundation, and contrary to the available evidence, attributing the high variability of the alleged HCX:TCDD ratios to variations in the MA HCP process.¹⁸ The analysis in the Hass Report demonstrates that HCX cannot be a by-product of the MA HCP process or used as a marker, as the referenced CSM assumes. Nor has EPA provided valid data to demonstrate its presence, much less an accurate quantification. The Report did not discuss alternative explanations for data already shown to be invalid and pointless.

¹⁵ Cutie, S. S., "Recovery Efficiency of 2,3,7,8-Tetrachlorodibenzo-*p*-dioxin from Active Carbon and Other Particulates," *Analytica Chimica Acta*, **123 (1981)**, 25-31.

¹⁶ Amoco PX-21 is a graphitized carbon that is less active than Nuchar.

¹⁷ Stanley, J. S. and Sack, T. M., "Protocol for the Analysis of 2,3,7,8-Tetrachloro-*p*-dioxin by High-Resolution Gas Chromatography/High Resolution Mass Spectrometry," Final Report, Contract SAS 1576X, Quality Assurance Division, Environmental Monitoring Systems Laboratory, Office of Research and Development, U. S. EPA.

¹⁸ The Hass Report also is misrepresented on page 7, paragraph 3, regarding the possible role of HCX in identifying the source of the TCDD on the CMRP Site.

12. On Pages 8 through 10, paragraph labeled D, a number of points are raised. The Report restates the CSM assumption under discussion in the title. It is unclear how Exponent felt they were misled by this quotation.
- In response to the first bullet point on page 9, the Report made no attempt to analyze the effects of any disturbances on spatial distributions.
- In the second bullet point on page 9, Exponent misstates the Report's intent in a discussion of the CSM. The referenced CSM claims that TCDD and HCX were dumped into a river. If that is true, then how does one explain that the highest alleged HCX sample is across the Site in a location that would require water to flow up hill? This remains a serious flaw in the referenced CSM.
- Exponent suggests that the HCX could have reached the tailrace as a consequence of floor drains in the MA manufacturing building. Exponent, however, confuses the original textile mill building, which had floor drains, with the HCP building, which did not have floor drains.¹⁹ There is no evidence that a drain line was dug across the property, negotiating the buildings in the way to connect the MA HCP building to the tailrace. Moreover, the existence of such a drain line would further contradict the referenced CSM, which claims waste was disposed directly into the river.
- Exponent also does not recognize the difference between the dumpsite "near the tip of the island,"²⁰ alleged to have been used by MA and NECC, and the "damaged drum disposal area,"^{21,22,23} located south of the NECC facility near the tailrace that was used only by NECC.
- In the third bullet point on page 9, Exponent seems to define sample locations 100 feet or more from the riverbank as being in the river. Exponent offers no rational explanation of how material dumped into the river, as required by the referenced CSM, finds its way to the sample locations cited. Their discussion does not address this fatal flaw in the referenced CSM.
- Regarding the fourth bullet on page 9, the Hass Report found that no sample reported by the date of the RI Report is above 1 ppb, the stated action level in the RI Report, until the location is down gradient from a cap area. The TCDD under the cap area cannot be explained by the referenced CSM, which states in clear, unambiguous language that the PCDD/PCDF were dumped directly into the river from the MA HCP operation. Under this CSM model, none of the TCDD in the source area originated with the MA HCP activities.
13. On Page 10, paragraph labeled E, Exponent fails to acknowledge that by the mid to late 1950s, NECC customers were delivering drums to the Site, that by the early 1960s, NECC had its own trucks making pick-ups and deliveries, and that

¹⁹ Anon., Administrative Deposition Transcript, *In the Matter of Centredale Manor Superfund Site, North Providence, Rhode Island*, Aug. 31, 2000, Page 18, Line 8-Page 19, Line 8.

²⁰ Nadeau, R., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 14-15, 2006, Page 59, Lines 21-24; Page 75, Lines 3-10.

²¹ Carbone, D., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Oct. 4, 2006, Page 6, Line 17-Page 9, Line 22; Page 10, Line 21-Page 13, Line 25.

²² Carbone, D., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Jan. 28, 2003, Page 9, Line 1-Page 12, Line 3.

²³ Neri, K., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Dec. 18, 2002, Page 49, Line 21-Page 51, Line 11; Page 52, Lines 10-11; Page 53, Lines 1-20.

by 1968, MA was no longer a customer of NECC, which recycled 50,000 drums/year in continuing operations at the CMRP Site until 1970 or 1971.

Mr. Vincent Buonanno, elsewhere in the same deposition cited by Exponent, unambiguously testifies that there were no drums associated with the MA HCP process.²⁴ Mr. Buonanno's testimony is supported by Mr. Cleary, who states unequivocally in his deposition that the 2,4,5-TCP arrived in tank trucks.²⁵ All of the evidence supports the theory that no 2,4,5-TCP associated with the MA HCP process ever found its way to NECC.

Moreover, there is no evidence to suggest that MA used 2,4,5-TCP for any purpose, other than making HCP. There is no MA employee testimony that they ever saw a drum labeled as 2,4,5-TCP. Nor is there any report during the various construction and remediation activities that notes the presence of a drum labeled 2,4,5-TCP. Accordingly, any suggestion that 2,4,5-TCP came to NECC from MA is groundless speculation.

14. In the paragraph on page 11 beginning "With regard to the use of the dumpsite...", Exponent again confuses the shared disposal site at the southern tip of the island, which is the subject of Mr. Raymond Nadeau's cited testimony, with the drum disposal area located near the tailrace. The nature of the area about which Mr. Nadeau is testifying is further clarified by his testimony, cited on page 12 of the Exponent Memo, where he describes this dump as being located at the point on the south end of the property. This point is several hundred feet from the location of the highest-level alleged HCX sample, which is in the vicinity of NECC's unusable drum storage location, directly south of the NECC facility.

Mr. Raymond Nadeau's testimony, cited by Exponent, alleging that MA truck drivers dumped material and then brought the "empty" drums to NECC for recycling has no impact on the role of residual combustion in forming 2,3,7,8-TCDD. His testimony is best understood in the context of his on-site presence, and hence opportunity to observe practices, which greatly decreased around 1963 when Mr. Nadeau became a truck driver for NECC. There is no evidence that any drum supplied to NECC by MA would have had any residual TCDD or any chemical likely to form TCDD under the NECC recycling conditions.

Exponent then turns to the testimony of Mr. Joseph Nadeau, which is unrelated to MA's HCP production activities. He testifies that the floor drains were in the main building, which was not the building where the HCP production occurred.²⁶ Exponent fails to include in the quotation of Mr. Joseph Nadeau's testimony that, while he worked at MA during 1964 and 1965,²⁷ he was not involved with HCP production and never went into the building where HCP was manufactured.²⁸ Nor does Exponent highlight the additional relevant testimony of Mr. Joseph

²⁴ Buonanno, V., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Mar. 25, 2003, Page 26, Line 21-Page 27, Line 9.

²⁵ Cleary, T., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Feb. 10, 2003, Page 59, Lines 6-14.

²⁶ The products produced in the main building about which Mr. Nadeau testified in the quotation on page 12 of the Exponent Memo were "reserve salt" and "40S". There is no conceivable means by which the reserve salt could have contributed any 2,3,7,8-TCDD, nor is there evidence to suggest that 40S could have contributed any 2,3,7,8-TCDD to the tailrace.

²⁷ Nadeau, J., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 14-15, 2006, Page 4, Line 24-Page 5, Line 1; Page 13, Lines 13-20.

²⁸ Nadeau, J., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 14-15, 2006, Page 23, Line 21-Page 24, Line 13.

Nadeau that solid waste was disposed into containers that were hauled away by a commercial service, and that no land filling was performed by MA.^{29,30}

In the discussion of Mr. Joseph Nadeau's testimony, Exponent speculates that the dumpster described for solid waste was disposed in the dump area, based on Mr. Raymond Nadeau's testimony that barrels of sludge from MA were disposed in the dump area in the late 1950s. Exponent overlooks two important facts, in addition to the contradictory testimony that the dumpster's contents were hauled away. First, during the period that Mr. Joseph Nadeau was working at MA, Mr. Raymond Nadeau was driving a truck for NECC, and hence not in a position to observe solid waste management practices at the Site. Secondly, there is no testimony or other evidence that either MA or NECC had the necessary equipment to handle a dumpster. Therefore, this speculation is totally unsupported, contrary to testimony, and should be disregarded.

On pages 13 and 14, Exponent quotes Mr. John Turcone, a former MA employee. However, Mr. Turcone's referenced testimony is describing Treflan,³¹ not HCP production.³² In fact, he was unaware that HCP was even made at MA.³³ Treflan is not a source of the PCDD/PCDF contamination at the CMRP Site, and the CSM makes no such claim. Further, in his testimony concerning solid waste management, Mr. Turcone is describing practices in the main building. There is no testimony that the HCP building even had a floor drain.¹⁹ As did Mr. Joseph Nadeau, Mr. Turcone testified that, during the time period of MA's HCP production, solid waste was disposed in a dumpster.³⁴

15. On the top of page 14, Exponent makes reference to Mr. Turcone's testimony alleging acid disposal directly into the river. As noted above, Mr. Turcone was unaware that HCP was made at MA. He was describing the manufacture of Treflan. Nonetheless, even assuming that such acid had originated with the MA HCP process, it would contained *de minimus* quantities of 2,3,7,8-TCDD, if any, and no other PCDD/PCDF.
16. On page 16, Exponent again veers from the purpose of the Hass Report, which is to analyze whether EPA considered viable alternate hypotheses in their CSM for the 2,3,7,8-TCDD and PCDD/PCDF found in site sampling. The Report's discussion of NECC is intended to illustrate that other hypotheses exist that do not contradict basic science and the testimonial record, as does the referenced CSM in the RI Report. It was not the intent of the Hass Report to present irrefutable evidence that NECC is the only viable alternative or that it is the actual source of the TCDD at the Site.

Exponent overlooks a substantial body of literature that demonstrates the PCDD/PCDF combustion congener pattern is heavily influenced by the

²⁹ Nadeau, J., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Dec. 17, 2002, Page 43, Line 8-Page 44, Line 2.

³⁰ Nadeau, J., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 14-15, 2006, Page 35, Lines 11-20; Page 47, Line 21-Page 49, Line 10.

³¹ Treflan is an orange solid. HCP is a white solid.

³² Turcone, J., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 18, 2006, Page 14, Line 5-Page 15, Line 8.

³³ Turcone, J., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 18, 2006, Page 24, Lines 2-6.

³⁴ Turcone, J., Trial Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Sept. 18, 2006, Page 5, Line 19-Page 7, Line 11.

feedstock. The presence of relatively small quantities of 2,4,5-TCP and PCP in NECC's clients' incoming drums would explain the observed congener distribution. There is no rational explanation for the congener distribution based upon the MA HCP process being the source of the PCDD/PCDF observed, as is alleged in the CSM.

17. Exponent challenges whether 2,3,7,8-TCDD is formed during the combustion of 2,4,5-TCP. Exponent apparently overlooked the paper cited in the Hass Report showing that 0.5% of 2,4,5-TCP is converted to 2,3,7,8-TCDD at 600 °C, with much higher conversion ratio expected in open flame conditions, or that heating the sodium salt of 2,4,5-TCP leads to ~ 80% yield. There are numerous additional papers cited in the Hass Report, and earlier reports incorporated by reference therein, that document heating 2,4,5-TCP and/or its salts will produce 2,3,7,8-TCDD in substantial yield.

While the contents of drums and their sources collected by NECC may be open to some conjecture, the chemistry is not. If the choice comes down to MA or NECC as the source, the NECC choice does not require the violation of known principles of chemistry. The MA choice does.

18. The discussion starting on page 14 of the Exponent Memo contains summary results of Limno-Tech's fingerprint analysis. Exponent bases their conclusions on the comparison of the observed PCDD/PCDF congener patterns with six source types from an EPA database. First, the database referenced in the Exponent Memo is specific to emissions to the air and not other media.³⁵ Second, the database referenced in the Exponent Memo does not contain air emissions data for "crude 2,4,5-TCP sources." Third, the Exponent Memo fails to explain what the six patterns are and how any of these six patterns are relevant to the alleged activities at the CMRP Site, or establish that the database contains congener patterns that are relevant to these same activities. The Exponent Memo does not explain how one would distinguish between crude 2,4,5-TCP versus 2,4,5-TCP combustion as the source,³⁶ makes no comment on the dearth of congener data from most of the source area,³⁷ especially the crucial areas of the dump sites and the MA HCP building, and offers no explanation for the most abundant PCDD/PCDF congener observed.

There is a very simple means to distinguish between crude 2,4,5-TCP and 2,4,5-TCP combustion as the 2,3,7,8-TCDD source at the CMRP Site. Each kg of 2,3,7,8-TCDD resulting from the disposal of crude 2,4,5-TCP originating from DA in the mid-1960s would be accompanied by 26,000 kg (28 tons) to 125,000 kg (138 tons) of 2,4,5-TCP. For this possibility to receive serious consideration, its proponents must demonstrate that MA even had access to sufficient quantities of 2,4,5-TCP to explain the 2,3,7,8-TCDD found in the source area, Allendale Pond, and downstream locations.

In contrast to the crude 2,4,5-TCP theory, the residual from burning \leq 200 kg of 2,4,5-TCP that is required to form a kg of 2,3,7,8-TCDD that would contain trace

³⁵ <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=20797>

³⁶ This distinction is the essential question in addressing whether the 2,3,7,8-TCDD originated from MA HCP waste disposal or NECC waste combustion.

³⁷ The "fingerprints" are congener profiles. Their absence precludes "fingerprinting" or any other statistical analysis based upon congener ratios.

to minor amounts of the 2,4,5-TCP. Had Limno-Tech analyzed the data more completely by including the 2,4,5-TCP data reported for the CMRP Site, they would have found that, based upon statistics, the observed pattern would preclude the possibility of crude 2,4,5-TCP and strongly support 2,4,5-TCP combustion as the source of the 2,3,7,8-TCDD at the CMRP Site, especially considering the other combustion signature patterns reported.

Limno-Tech raises the possibility of HCP being the source of the 2,3,7,8-TCDD. In the HCP case, 12,600 kg (13.9 tons) to 60,600 kg (66.7 tons) of HCP is required for each kg of 2,3,7,8-TCDD, assuming all 2,3,7,8-TCDD is carried through to the final product or otherwise disposed with it. Since there is no testimony indicating that any HCP product was disposed on site, only one sample reported even traces of the compound, and given the testimony that even the still bottoms were sold,⁷ the possibility of hexachlorophene product disposal being the culprit can safely be discarded.

19. On page 15, paragraph labeled 2, *Combustion of 2,4,5-TCP*, Exponent alleges that the Hass Report does not present any data to support the theory that 2,4,5-TCP and pentachlorophenol combustion better explain the site data than does the MA HCP process. To summarize, the site data includes PCDD/PCDF congeners that cannot chemically originate with the MA HCP process. These same congeners are well-known combustion and pyrolysis products of 2,4,5-TCP and PCP. NECC engaged in practices that are near ideal for the reactions to occur. NECC's customer base included companies engaged in commerce with these chemicals. Accordingly, there is no support for Exponent's allegation.
20. In the next to last paragraph on page 15, Exponent misrepresents the critique presented in the Hass Report. The RI Report cites the Newfields forensic report as the basis for EPA's CSM. The Hass Report objects to using the Newfields report to conclude that the observed PCDD/PCDF congener patterns demonstrate that MA HCP manufacture was the origin of the PCDD/PCDF contamination when, in fact, they show the opposite. The MA HCP process is incapable of producing the bulk of the reported PCDD/PCDF or the hexachloroxanthene ("HCX"), whether measured in number of isomers or absolute quantities, found at the CMRP Site.
21. In the last paragraph on page 15, Exponent criticizes the quotation of EPA's CSM in the Hass Report. The subject CSM was repeated verbatim on page 1 of the Report and referenced so that any who doubt the quotation's accuracy could conveniently compare it against the original document. The only MA HCP discharge path offered in the referenced CSM is directly into the river, as properly quoted.
22. The low 2,3,7,8-TCDD levels expected in the MA aqueous waste, no matter where it was discharged, are not dependent upon the water being charcoal filtered, as alleged by Exponent. As discussed above, EPA's accepted solubility limit for 2,3,7,8-TCDD in water is 19.3 ng/L.¹ A concentration this high can only be achieved if the 2,3,7,8-TCDD in solution is in equilibrium with solid 2,3,7,8-TCDD and at 22 °C or higher temperatures.

In the particular case of the MA HCP process, there was approximately 40,000 to 50,000 fold excess of cold, solid 2,4,5-TCP present. Given the use of a centrifuge to isolate the 2,4,5-TCP in each case water was disposed, essentially all the particulate matter remained with the solid material in the centrifuge. We

see that the aqueous 2,3,7,8-TCDD levels were many orders of magnitude too low to account for the TCDD found in the Allendale Pond and downstream locations.

The basic point is that if discharge of the MA HCP aqueous waste stream were the source of the PCDD/PCDF contamination, there would be no 2,3,7,8-TCDD to clean up. Therefore, the referenced CSM is flawed, as stated in the Report, and Exponent's criticism of the Report is without merit.

23. On page 16, paragraph labeled 3, Exponent agrees that it is possible that 2,4,5-TCP will form 2,3,7,8-TCDD under the conditions used in the NECC tight head drum cleaning tank. Nevertheless, they complain that the Hass Report provides no evidence that NECC drums did, in fact, contain any 2,4,5-TCP. Again, it was not the intention of the Report to prove any particular drum in fact contained 2,4,5-TCP. Concomitantly, Exponent cannot present convincing arguments that it is unlikely that at least 200 kg of 2,4,5-TCP entered the NECC process given: 1) the hundreds of thousands of drums from NECC customers other than MA that were processed;³⁸ 2) NECC's 104(e) response that some of their customers dealt specifically in the 2,4,5-TCP and PCP necessary to explain the observed congener pattern on the basis of NECC activities; and 3) that nearly one-third of their identified customers advertised products likely to contain 2,4,5-TCP and/or PCP.

Despite agreeing with the basic scientific point that 2,3,7,8-TCDD could have been formed in NECC's closed head process, Exponent attacks the Report as speculative. They continue with an unsupported assertion that the sampling data contradict any implication of NECC, despite their own statistical analysis identifying a combustion pattern. This assertion is totally without merit and contradicts Exponent's own findings.

24. At the bottom of page 16, Exponent disputes the observation that, according to the maps in the RI Report, sample CMS-451F is located near the location of the second NECC fire pit. They make an unsupported assertion that the sampling location is actually at the corner of the MA HCP building.

The Report's observation is based upon combining two maps from the RI Report.³⁹ The locations of the historic buildings are contained in Figure 1-3. The sampling locations were taken from Figure 4-1. Using Photoshop CS, the relevant sections from each map were copied, placed in different layers, scaled to match the common features, mainly parking lots, and then the relative positions of the NECC building, the MA HCP building and sample location CMS-451 were noted. In light of Exponent's comments, the work was re-examined. It was discovered that the parking lots between the two maps were misaligned. While it was observed that the CMS-451F sample is not at the NECC fire pit as originally reported, it also is not at the corner of the MA HCP building. Rather, the sampling location of CMS-451 is in the old driveway, assuming the RI Report

³⁸ And hence, hundreds of thousands of kg of waste, even if each drum contained a residual of only 1 kg.

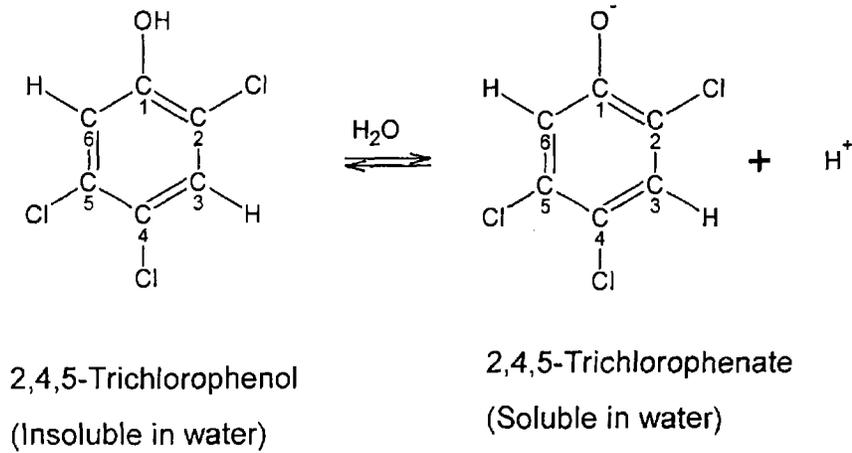
³⁹ The original purpose of the review was to assess the validity of conclusions of the CMRP RI Report. The assessment of map accuracy was not one of the purposes of the Report.

maps are accurate. This location is approximately the same area identified in deposition testimony as an incoming drum storage area for NECC.⁴⁰

25. In summary, both the scientific evidence and the testimonial record contradict the theory that the MA HCP production was the source of the 2,3,7,8-TCDD and PCDD/PCDF at the CMRP Site. Moreover, the scientific evidence and testimonial record support the theory that the 2,3,7,8-TCDD and PCDD/PCDF resulted from combustion of materials, some of which contained 2,4,5-TCP and/or PCP, provided to NECC by its customers.

⁴⁰ Neri, K., Deposition Transcript, *Emhart Industries, Inc. v. Home Insurance Co.*, No. 02-053 S (D.R.I.), Dec. 18, 2002, Page 29, Lines 1-9; Page 46, Line 15-Page 48, Line 18.

Figure 1



H⁺ (acid) added, reaction is driven to the left side

OH⁻ (base) is added, H⁺ consumed by OH⁻ to form H₂O, reaction is driven to the right side.

Figure 1: Solubility of 2,4,5-trichlorophenol. At an acidic pH, the TCP exists in the “free” form and is poorly soluble in water. At high pH, the TCP exists as an anion and is highly water-soluble.

FOR INCLUSION IN THE ADMINISTRATIVE RECORD

**RESPONSE TO THE APRIL 4, 2007 EXPONENT/LIMNO-TECH MEMORANDUM -
DISPOSITION OF PCBS AT THE CENTREDALE MANOR RESTORATION PROJECT
SUPERFUND SITE.**

July 12, 2007

**AMEC Earth and Environmental, Inc.
15 Franklin Street
Portland, ME 04101**



On April 4, 2007, Exponent, with assistance from Limno-Tech, Inc. submitted an external memorandum ("Exponent Memo") on behalf of a group of nine companies that are potentially responsible parties ("PRPs") at the Centredale Manor Restoration Project ("CMRP") Superfund Site for inclusion in the CMRP Administrative Record. The stated purpose of the Exponent Memo is to provide comments on the CMRP Conceptual Site Model review prepared by Dr. J. Ronald Hass dated October 19, 2006 ("Hass Report" or "Report"). This document is in response to the Exponent Memo.

In the Exponent Memo, Exponent states on several occasions that the US Environmental Protection Agency's (EPA's) interim final baseline human health risk assessment has shown that 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) is the primary risk driver at the CMRP Site. While it is true that the potential human health risks EPA computed for 2,3,7,8-TCDD are generally higher than the risks they computed for other compounds, the potential risks that EPA attributed to other compounds, specifically polychlorinated biphenyls (PCBs), exceed EPA's upper end of the acceptable risk range.¹

EPA guidance states, "Generally, where the baseline risk assessment indicates that a cumulative site risk to an individual using reasonable maximum exposure assumptions for either current or future land use exceeds the 10(-4) lifetime excess cancer risk end of the risk range, action under CERCLA is generally warranted at the site."²

Considering PCBs alone, both the EPA computed cancer risks and non-cancer hazards for the recreational angler and the residential receptor under conditions of "reasonable maximum exposure" (RME), exceed the EPA's risk threshold for remedial action.^{1,3} Moreover, the central tendency exposure (CTE) to PCBs from consumption of fish results in non-cancer hazards that are 40 times greater than EPA's threshold hazard index of 1.0 for the recreational angler and the residential receptor.

Figure 1 illustrates EPA's assessment of the potential human cancer health risks from the PCB mixture Aroclor 1254 to the RME receptors at three of the exposure areas evaluated by EPA -- Greystone Mill Pond, which is upstream of the CMRP Site, and Allendale and Lyman Mill Ponds. Figure 2 shows the non-cancer hazards from Aroclor 1254 to the RME receptors for the same exposure areas.

¹ Interim Final Baseline Human Health Risk Assessment. Centredale Manor Restoration Project Superfund Site, North Providence, Rhode Island. August, 2004.

² US EPA OSWER Directive 93555.0-30. Role of the Baseline Risk Assessment in the Superfund Remedy Selection Decision. April 22, 1991.

³ PCB risks are primarily due to the presence of the PCB mixture, Aroclor 1254, in sediment and fish tissue.



Figure 1. RME Cancer Risks from Exposure to Aroclor 1254

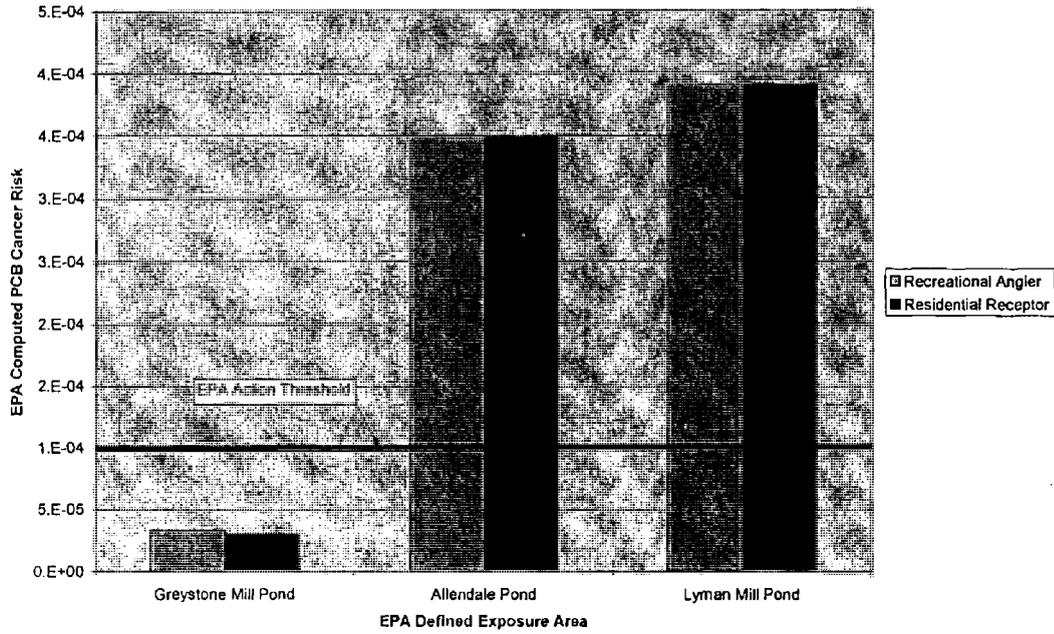
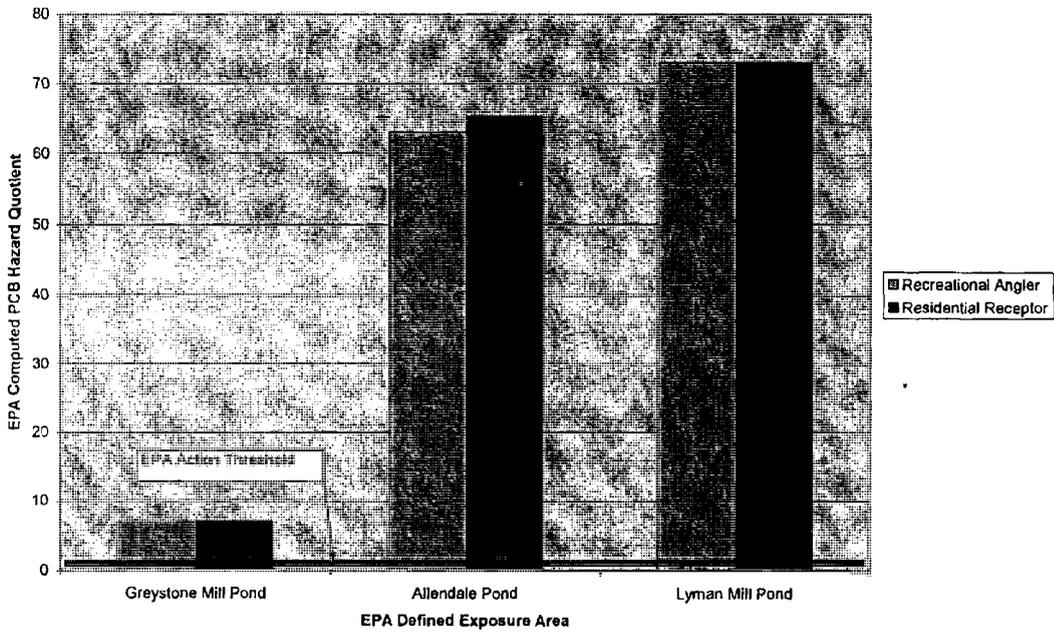


Figure 2. RME Non-Cancer Hazard Index from Exposure to Aroclor 1254





What is evident from Figures 1 and 2 is that the EPA computed health risks for residential receptors and recreational anglers from exposures to PCBs alone are high enough to warrant remedial action of the sediments in Allendale and Lyman Mill Ponds.

The Greystone Mill Pond risks are shown in Figures 1 and 2 for two reasons. First, Greystone Mill serves as an upstream background and it is evident that the risks for Allendale and Lyman Mill Ponds are significantly greater than background risks. Secondly, by plotting both background and CMRP-related areas, it easily can be visualized that the "incremental" risk posed by PCBs in the CMRP exposure areas are well above the EPA risk range of $1E-04$ and an HQ of 1.0.

According to EPA's Remedial Investigation Report (RI), PCBs, specifically Aroclor 1254, were detected in on-site soils at a frequency almost equivalent to that of 2,3,7,8-TCDD (70% for Aroclor 1254 vs 69% for 2,3,7,8-TCDD). Aroclor 1254 was detected in 297 samples collected from the source area, with concentrations ranging up to 1,300 mg/kg. Aroclor 1254 was detected in 131 sediment samples from Allendale Pond, with detected concentrations as high as 28 mg/kg. Again, the frequency of detection for Aroclor 1254 in Allendale Pond sediments is similar to that for 2,3,7,8-TCDD (90% for Aroclor 1254 vs 97% for 2,3,7,8-TCDD). Finally, Aroclor 1254 was detected at a frequency of 75% (49 of 65 samples) in Lyman Mill Pond, with concentrations as high as 2.6 mg/kg.

The RI Report states that the evidence suggests that the operations at NECC's former drum reconditioning facility at the Site resulted in waste disposal onto surface soil and beneath the ground surface. EPA also states that "the historical drum refurbishing operation likely washed pesticide and Aroclor residues into the Source Area soils" and that "surface soil erosion and sediment migration secondarily transported a fraction of the initial discharge in to the hydrologically down gradient locations."⁴ EPA's statements regarding NECC's likely contribution of PCBs to the environment by mishandling of PCB waste are corroborated by the statements on page 6 of the Exponent Memo, where Exponent affirms that, in a time before environmental regulation, it would be unreasonable to assume that spills of left over liquid and solid materials did not occur. Further, Exponent asserts that in a time prior to environmental regulations, it would be implausible to assume that a zero-emission operation took place. Given that the RI Report states that labels from drums recovered from the Site indicate that PCBs were potentially present, there is strong evidence implicating NECC as the source of PCBs to the site soils and the sediments in Allendale and Lyman Mill Ponds.

⁴ Interim Final Remedial Investigation Centredale Manor Restoration Project, North Providence Rhode Island. June 30, 2005. Appendix E, page 15.



Based on the information summarized above, the following statements and conclusions may be made:

- EPA's human health risk assessment for the resident receptor and recreational angler shows that both the incremental cancer risks and non-cancer hazards for PCBs alone exceed EPA risk management guidelines for implementing remedial action at Superfund sites.
- The human health risks computed by EPA for PCBs in Allendale and Lyman Mill Pond sediments are significantly higher than that computed for the upstream background area (Greystone Mill Pond).
- The "incremental" health risks posed by PCBs in Allendale and Lyman Mill Pond sediments are well above the thresholds for remedial action used by EPA.
- The PCB mixture, Aroclor 1254, was detected at frequencies consistent with 2,3,7,8-TCDD in source area soils as well as in pond sediment.
- EPA identifies NECC, the former drum reconditioning facility, as the most likely source of PCB residues to the source area soils.
- EPA identifies soil erosion as the secondary transport mechanism of PCBs from source area soils at the drum reconditioning facility to down gradient locations (Allendale and Lyman Mill Pond sediments).

Moreover, based on the foregoing information, it can be concluded that, if the PCB mixture, Aroclor 1254, was the only chemical of concern detected at the CMRP Site, for which NECC would be solely responsible, EPA would consider remedial action of the sediments in Allendale and Lyman Mill Pond.