STATE OF NEW YORK
SUPREME COURT COUNTY OF RENSSELAER

JAY BURDICK, CONNIE PLOUFFE, EDWARD PLOUFFE, FRANK SEYMOUR, EMILY MARPE, as parent and natural guardian of E.B., an infant, and, G.Y., an infant, JACQUELINE MONETTE, WILLIAM SHARPE, EDWARD PERROTTI-SOUSIS, MARK DENUE and MEGAN DUNN, individually, and on behalf of all similarly situated,

Plaintiffs,

v.

TONOGA INC., (d/b/a TACONIC),

Defendant.

AFFIDAVIT OF NICHOLAS P. CHEREMISINOFF, Ph.D.

Index No. 253835

STATE OF WEST VIRGINIA)

COUNTY OF JEFFERSON) ss:

NICHOLAS P. CHEREMISINOFF, Ph.D., being duly sworn, deposes and says:

1. I am the Principal of No Pollution Enterprises (aka N&P Limited), an environmental consulting firm located in Charles Town, West Virginia. I am also a member of the Board of Directors of ThermoChem Recovery International, a developer of steam reforming gasification systems located in Baltimore, Maryland. I am also senior technical advisor on environmental projects to Princeton Energy Resources, International, in Rockville, Maryland. Princeton Energy Resources, International (PERI) is an environmental consulting firm providing engineering, technical, economic, policy, and regulatory services to various government agencies, bilateral and multilateral financial institutions, and private sector clients worldwide.

2. I am a chemical engineer specializing in the safe handling and management of chemicals and hazardous materials. I have 40 years of industry, business, and applied research experience. I hold three degrees in chemical engineering from the same academic institution, Clarkson University, formerly known as Clarkson College of Technology. My Bachelor of Science in chemical engineering was conferred May 18, 1974. My Master of Science in chemical engineering was conferred May 25, 1975. My Doctor of Philosophy in chemical engineering was conferred May 21, 1978.

3. In 1977, I accepted employment with Union Camp Corp. as a research scientist and environmental engineer. I then worked for Exxon Chemical Co. and Exxon Research and Engineering Co. between 1979 and 1992 as a senior technical staff member and section/division manager for product and process design assignments for synthetic elastomers, chemicals, and refining operations. During those years, I worked on commercialization of new products and processes, assisted in refinery and chemical plant expansions and turnarounds, mergers and acquisitions of chemical manufacturing facilities, and addressing air and water emission issues.

4. In 1992, I co-founded N&P Limited. From 1992 to 1995, I performed environmental site assessments, prepared environmental impact statements, and managed site remediation assignments for various private sector clients, land developers and commercial lending institutions. During this period, I worked with the New Jersey Department of Environmental Protection on implementing industry training programs on conducting safe work practices at contaminated properties, environmental site assessments, site remediation and removal of underground storage tanks, and soil remediation projects. During this same period, I assisted the New Jersey Institute of Technology to develop continuing education programs on OSHA safe work practices for transporters and site remediation personnel working at contaminated properties.

5. From 1995 to 1998, I was U.S. resident technical advisor to the Ministry of Environment and Nuclear Safety under a technical support program to the Government of Ukraine funded by the United States Agency for International Development and the World Bank Organization. In this program, I led a team of Ukrainian national engineers to perform environmental audits and prepare mass balances of air, solid waste and water releases from multiple industrial complexes, including coke chemical plants, steel mills, pharmaceutical plants, rendering plants, machine building plants, armament plants, petrochemical manufacturing operations, power plants, and mining operations. The purpose of these site investigations and highly technical evaluations was two-fold: first, to assist the Ukrainian Ministry of Environment and Nuclear Safety in its enforcement practices by developing model emissions inventories for the Donetsk Oblast region that would be rolled out to other regions of the country; and second, to assist industry stakeholders to improve environmental performance by the adoption and implementation of pollution prevention practices.

6. Between 1998 and 1999, I served as the Program Manager on a technical assistance program for the restructuring of the National Inspectorate of the Ministry of Environment and Nuclear Safety located in Kiev. This was a technical assistance program to the Government of Ukraine funded by the European Commission in which I assisted the inspectorate in restructuring its program on enforcement by facilitating in-country assignments of European Commission environmental enforcement experts to train inspectors on verifying emissions inventories and reporting requirements by industry.

7. In 2000, I worked for the World Bank Organization and was assigned to the offices in Kiev to prepare draft regulations on Integrated Pollution Prevention legislation in conformance with the European Directives.

8. Following this assignment through approximately 2006, I worked for various organizations including the World Bank Organization, USAID, USTDA, the IFC, and the European Bank of Reconstruction & Development (EBRD) performing due diligence on environmental impacts from privatization and restructuring of various industrial investment and loan projects involving sovereign guaranteed loans. These assignments involved performing technical assessments and recommending environmental management and pollution mitigation strategies for various industrial complexes, including steel mills, coal fired power plants, pharmaceutical plants, coal mining operations, gas pipelines, on and offshore gas and oil extraction operations, and oil refineries. I was also engaged during this period by KBR-Halliburton to perform a detailed review of environmental impact statements prepared for a plastic manufacturing plant in Turkmenistan, which was required to meet the environmental standards of the World Bank Organization for a loan. I also had assignments during this period working for GE and an Israeli engineering firm for a major natural gas pipeline in Uzbekistan.

9. From 2006 to 2009, I worked with CDM Consultants and PERI on assignments in Jordan, implementing several projects dealing with air and water pollution. I managed a team of Jordanian engineers that performed material and energy balances in order to quantify water and air discharges from the Hashemite Kingdom's Royal Refinery and various industrial complexes. I also led a design team on two wastewater treatment plant operations, worked with environmental regulators to draft revised environmental regulations, and was responsible for the air pollution assessment portion of an environmental impact statement prepared by CDM for a wastewater treatment plant.

10. In approximately 2010, I was placed on assignment through PERI under a contract from USTDA to develop worker safety standards for the power industry in Nigeria. I inspected all

of the power plants and assembled national estimates of waste quantities, surveyed worker practices, and authored national safe work practices, which later became codified.

11. I have held academic positions, including adjunct professor in the Department of Civil and Environmental Engineering at the New Jersey Institute of Technology between 1979 and 1992; ran continuing education programs on environmental auditing practices for Farleigh Dickinson University, and have been an invited Lecturer at the Ukrainian Academy of Sciences, the Jordan University of Science and Technology, Texas A&M University, University of Missouri-Rolla, Cooper Union University, and the University of Leuven. I have conducted joint training programs on waste management, pollution prevention and site remediation practices with the New Jersey Department of Environmental Protection and U.S. EPA Region IV in their international programs. These programs have required knowledge and understanding of responsible waste and pollution management, safe chemical handling practices, environmental auditing and inspection practices, facility permitting and closure rules/practices, pollution prevention practices, and assembling air emissions inventories. I have led and/or participated in numerous continuing education programs that have trained several thousand industry personnel on waste management, pollution prevention, the application of environmental and safety management systems, on air pollution control technologies, and industry best practices.

12. I have authored, co-authored or edited more than 100 technical books and several hundred state-of-the-art review articles and research papers on chemical engineering processes, pollution prevention, refinery and petrochemical manufacturing practices, waste and pollution management, air pollution control technologies, and worker safety, all embodying best practices as a theme.

13. I have spent decades working with industry stakeholders, communities, lending institutions, and governmental officials on responsible waste and pollution management, the application of best management practices, and technologies that prevent worker and community exposures from the mishandling of toxic and dangerous waste and chemical products resulting from industrial activities. I have been proffered and served as an environmental standard of care expert in over 60 federal and state courts. A list of cases in which I have served as an expert witness is set forth in my CV, which is attached as **Exhibit A**. I make this Affidavit in opposition to the motion of Defendant to exclude my testimony.

Methodology and Basis of Standard of Care Analysis

14. The standard of care assessment is a benchmarking assessment based on comparing the practices of the facility in question against standards and norms of practice. Best practices are embodied in:

- Best industry practices aimed at controlling and eliminating pollution;
- Environmental management; and
- Environmental due diligence.

15. The term *standards* means best practices (or best management practices or good industry practices—all of these terms I consider to be synonymous). The standards considered in this analysis are voluntary industry best practices that have been prepared by well-recognized and authoritative bodies. It is universally understood by industry that following standards constitutes good industry practice. When companies apply good practices of pollution prevention, applying and maintaining reliable pollution controls, preparing emissions inventories and tracking performance, and applying good environmental management practices, not only are statutory obligations met, but communities are protected from harm.

16. Good industry practices are embodied in both voluntary practices and statutory obligations. These are combinations of control technologies and operational procedures that are intended to reduce air and/or water discharges and reduce harmful wastes, or to manage the wastes in a manner that insulates communities from harm. Best Practices do not require the most advanced or costly control technologies; rather, the term "Best" refers to the most appropriate or best way to control an emission. The action or technology is not the most costly or even one which eliminates or controls an emission to the highest level.

17. Although good practices are embodied in both voluntary practices and statutory obligations, not all good practices are incorporated in statutory obligations. Statutory obligations constitute minimum good practices—*i.e.*, they make voluntary practices mandatory because not all companies adopt reasonable practices and statutes historically have been adopted or promulgated because of the poor practices generally recognized as being harmful that were followed by some companies. As I have learned over my career, it is possible for a company to strictly follow its statutory requirements but still cause harm to others.

18. The Best Practices methodology involves first performing a forensic reconstruction of events and activities and then comparing what was done against good industry practices. The forensic reconstruction involves assembling all relevant documents and records according to subject categories. Documents are then arranged chronologically from earliest to latest. Each document is examined for its relevance to the work assignments and pollution management practices of the defendant. A timeline of the events, practices employed, and the information obtained from each of the relevant documents is summarized and documented. All documents are identified either by a Bates Stamp or description in terms of date, subject matter and other identifying markers in those instances when Bates Stamps are not included on a document. **Exhibit**

B sets forth the relevant documents that I reviewed to perform my forensic reconstruction in this case.

19. No attempts are made to interpret information gathered from documents. The information obtained from each document is either directly quoted or paraphrased as close as reasonably possible to the original statements found. No relevant facts obtained from a document are excluded, including contradictory statements and information.

20. In situations where contradictions of fact are identified among documents, effort is made to identify and consider other records and/or testimony to corroborate and distinguish between more likely than not or most probable facts and suspect information.

21. In the case of testimonies, all statements made by fact witnesses are considered to be truthful and factual. Testimonies given by designated corporate representatives are considered to be formal statements made on behalf of a defendant and are taken to be factual. Testimonies given by fact witnesses that are not corporate representatives are considered factual to within the best recollection of the person. In situations where testimony is found to contradict documented information or events, period documents and other evidence such as photographs and engineering drawings are considered to be more reliable. Discrepancies between oral testimony and written documents and other physical evidence are identified and highlighted in the analysis. The forensic reconstruction provides a timeline of activities concerning relevant material handling and air pollution management practices.

22. As I have done in other assessments performed over the years, I do not assume that the absence of records constitutes that certain actions or practices were not followed. Rather, I rely on indicators and cross-references to determine whether certain practices were likely relied on or not.

23. By examining the records, including the contemporaneous statements of relevant stakeholders and participants, it is reasonable to conclude what a company knew or should have known. As an example, the Defendant is not illiterate and presumably reads Material Safety Data Sheets which informs it how toxic or dangerous the chemicals it is using are. As another example, when the Defendant is informed by a regulator that it has excessive air discharges, it is reasonable for me to conclude that it understands that its pollution controls are inadequate. As another example, it is reasonable for me to conclude that the Defendant has common sense enough to understand that if it releases chemicals on its property and to the subsurface, that those chemicals are subject to off-site transport by natural hydrogeological forces. In short, it is reasonable for me to conclude that the Defendant has sufficient common sense to comprehend that its property and operations are not hermetically sealed and that when it is not attentive to controlling and managing pollution and waste, toxic chemicals can be released offsite and can expose neighbors when no actions are taken to prevent this from happening. When there is sufficient evidence, as in this case, I can draw conclusions about what a company knew or understood at the time, or what the company should have known or should have understood based on the information that was available to it.

24. My analysis is supplemented by considering authoritative references from the regulatory, scientific, and industrial communities. My methodology is intended to provide an unbiased critical assessment of the air pollution and waste stream pollution management practices of the Defendant. My role as a scientist offering expert testimony is to provide a critical assessment which leads to opinions to within a reasonable degree of scientific certainty, as supported by the overall weight of the evidence, allowing me to opine on more likely than not conclusions in this matter.

General Overview of Coating Operations

25. The Defendant in this case is Tonoga, Inc., a successor to Taconic Plastics (referred to throughout as "Taconic") that has been operating in Petersburgh, New York since the early 1960s. The facility coats polytetrafluoroethylene (PTFE) and fluorinated ethylene propylene (FEP) dispersion (referred to collectively as "PTFE dispersions") onto fiberglass cloth and other materials. Through the late 2000s, these dispersions contained ammonium perfluorooctanoate (APFO) as a surfactant and processing agent in amounts that ranged from 0.1% to 1%; according to the Barr Report produced by the Society of Plastics in 2005, aqueous PTFE dispersions contained on average 0.28% APFO. Other formulations it used show that it applied APFO in almost pure chemical form in its manufacturing process.

26. Taconic purchased PTFE dispersions from various manufacturers, including DuPont, Daikin, ICI and others. [redacted] This increased the percentage of APFO contained in the dispersions.

27. [redacted]

[redacted] The documents indicate that there were vents in the lower zones of the ovens that exhausted out water vapor, formic acid and logically other chemical vapors.

28. Below I set forth some of the key records, documents, and testimonies that I found to be integral in my forensic reconstruction.

Material Safety Data Sheets

29. I have examined approximately 178 Material Safety Data Sheets (MSDS) that were produced by Taconic in this matter. These date back as far as 1989. The MSDS disclose that PTFE dispersion products used by Taconic were toxic. As an example, a 1996 MSDS states for Ammonium Perfluorooctanoate:

> Ingestion caused weight loss, gastrointestinal irritation and enlarged liver. Repeated exposures produced liver, kidney, pancreas and testes changes, anemia and cyanosis. Tests in male rats demonstrated weak tumorgenic activity based on an increased incidence of benign testicular, pancreatic, and liver tumors . . . . Evidence suggests that skin permeation can occur in amounts capable of producing the effects of systemic toxicity . . . . Ingestion may cause gastrointestinal tract irritation; abnormal liver function . . . or abnormal blood forming system function with anemia. Individuals with preexisting diseases of the liver or bone marrow may have increased susceptibility to the toxicity of excessive exposures. This compound is absorbed by the body and may be detected in the blood stream following ingestion, inhalation or skin contact. Animal and human experience indicate that this compound has a long half-life in the blood, and may be detected years after exposure. **[See Exhibit 10 to the Affidavit of James Bilsborrow in Opposition to Summary Judgment]**

30. The same MSDS also states, "High temperatures such as sintering operations may release ammonium perfluorooctanoate vapors. These vapors may condense as a solid or as a liquid solution in the oven, exhaust duct or stack, or on other cool surfaces."

31. The same MSDS provides detailed information on requirements for safe handling, including the use of neoprene gloves, chemical protective clothing, chemical resistant boots, and recommended respiratory protection such as respirators.

32. For waste disposal, the same MSDS states the Preferred options for disposal are:

> (1) Separate solids from liquid by precipitation and decanting or filtering. Dispose of dry solids in a landfill that is permitted, licensed or registered by a state to manage industrial solid waste. Discharge liquid filtrate to a wastewater treatment system. (2) Incinerate only if incinerator is capable of scrubbing out hydrogen fluoride and other acidic combustion products. Treatment, storage, transportation, and disposal must be in accordance with applicable federal, state/provincial, and local regulations.

33. All of the MSDS dated later than 1996 provide similar, and in a number of instances more detailed warnings. Taconic employees testified that they were aware of the information contained in the MSDS for PTFE dispersions.

34. The MSDS provide sufficient warnings that the PTFE dispersion products used in Taconic's manufacturing processes are or may be harmful to humans. The warnings on the MSDS sufficiently convey that the products and wastes require use of protective clothing, respirators, and good industry handling practices. There is sufficient warning to the user that air emissions and wastes containing these products should not be released into the environment where the general public may be exposed. The warnings are sufficient for a sophisticated industrial user to understand that wastes containing these products should not be released to groundwater sources, especially those which may be drinking water sources. In addition, because of the high water solubility of components of these dispersions, including specifically APFO, a sophisticated industrial user would also understand that air releases of chemicals used in this product could eventually make their way into surface and groundwater. The toxic and hazardous nature and special handling requirements are explained in great detail in the MSDS. [redacted]

[redacted] They learned this from the MSDS, which also provides physical properties data. MSDS in Taconic's possession state that the surfactants containing APFO are "**apprec(iably)**" soluble in water; that their solubility in water is "**complete**"; that the solubility of the surfactant product is "**Dispersible**" in water; that the solubility of the products are "**completely miscible**" in water; the product is a "**completely miscible organic solvent**"; that the products used are "**miscible**" in water. Defendant accuses me of placing myself in its mind by drawing conclusions from the obvious – it is a sophisticated user of the chemicals that it contaminated the groundwater and public drinking water supplies with. It is inconceivable that the Defendant did not understand from its reading of product MSDS at the time that when it allowed these chemicals to enter into the subsurface that they would contaminate the entire water body with chemicals they clearly understood to be toxic. Indeed, even a layperson understands that the terms 'miscible,' 'appreciably soluble,' 'completely miscible,' and 'dispersible' all have the same meaning and implications – that the chemicals completely mix and disperse in a water body; they don't form layers and only contaminate a portion of the water table but contaminate the entire water source. As a sophisticated industry user, it should have and I believe more likely than not understood this at the time of use.

35. The Society of the Plastics Industry (SPI), a leading trade industry group, published a bulletin which is referenced in the MSDS for PTFE dispersion.[1] The following are relevant statements made in this publication:

- "Fluoropolymer dispersions are an aqueous form of fluoropolymer typically used for coating metal and glass cloth . . . . The purpose of this guide is to provide safe handling information to dispersion processors, since these products utilize a fluoropolymer polymerization aid (FPA) during their manufacture. Recent studies have revealed the FPAs are

[1] Fluoropolymers Division, The Society of the Plastics Industry, Inc. BP-101, Guide to the Safe Handling of Fluoropolymer Resins, 4th Edition examined; Copyright 1992, 1995, 1998, 2005.

persistent in the environment and have exhibited toxicological effects in animals.

- "FPAs are members of a class of commercially available perfluoroalkyl carboxylate surfactants (e.g., ammonium and sodium perfluoro-octanoate). FPAs are used to suspend and emulsify some fluoropolymers during manufacture or industrial use and are typically used in concentrations less than 0.5%."

- "An eight-carbon member of this family, ammonium perfluorooctanoate (APFO) is the FPA most commonly used in the production of many fluoropolymers and fluoroelastomers. APFO has several synonyms including C-8 acid, PFOA, FC 143, and perfluoro ammonium octanoate. Similar emulsifiers include sodium perfluorooctanoate, and the salts of other perfluorocarboxylic acids, such as perfluorononanoic acid. Because APFO is the best understood FPA in terms of toxicology and health effects, it is the main focus of this guide."

- "Since APFO is a perfluorinated chemical, **it is extremely stable, degrades slowly, and therefore persists in the environment**. APFO also appears to be persistent in humans and has been found in trace amounts in the blood of workers exposed during manufacturing operations involving its use."

Taconic works in the plastics industry. If it did not read this document, then it should have. It has an obligation to handle the chemicals it uses so that it does not harm its workers and the public from mishandling dangerous chemicals. It knew or clearly should have known from MSDS alone that APFO and the products as a whole are toxic and completely miscible in water. The SPI further documents that the chemicals persist in the environment.

36. The scientific literature on C8/PFOA surfactants stretches back to the 1940s. It is reported in the early literature that perfluorinated surfactants are highly stable. Most of the early literature was published by 3M researchers. Although not the identical surfactants used by Taconic, these materials are of the same C8 chemistry. 3M was capable of producing a variety of perfluorinated products at its Cottage Grove facility (PFOS, PFOA, and PFBA, in addition to the salts of PFOS, PFOA, and PFBA). All of these surfactants were understood by 3M to readily

dissolve in water. In 1962, testing of PFOS-based surfactants indicated that these compounds were very soluble (Guenthner, et al.[2]). Numerous perfluorinated compounds (PFCs) manufactured by 3M, including fluorocarbon carboxylic acids and fluorocarbon sulfonic acids such as PFOA and PFOS, readily dissolve when mixed with water (Bryce[3], (1964)). 3M published works in 1964 indicating that when dissolved, fluorocarbon carboxylic acids and fluorocarbon sulfonic acids dissociated to form highly stable perfluorocarboxylate and perfluorosulfonate ions (Bryce (1964)). Essentially these same findings are reported in MSDS which Taconic acknowledges it relied on.

37. 3M published in patents that these surfactants had extremely limited reactivity and that the high thermal stability of the perfluorinated carbon chain inhibited degradation in the environment (Bryce[4], 1950). The breaking of a carbon-to-fluorine bond requires the input of large amounts of energy to overcome the chemical bond between carbon and fluorine. Chemical and physical processes occurring in nature lack sufficient energy to break carbon-to-fluorine bonds and without this input of energy, the carbon-to-fluorine bonds remain intact. Bryce wrote, "This chemical stability also extends itself to all types of biological processes; there are no known biological organisms that are able to attack the carbon-fluorine bond in a fluorocarbon" (Bryce, 1964). In natural environments, the surfactants do not undergo degradation of the carbon-to-fluorine bonds of the perfluorinated carbon chain. The non-fluorinated, functional group of the chemical will partially degrade, yielding recalcitrant products such as PFOS, PFOA, and PFBA, which then resist further degradation. Basic weathering and degradation reactions, such as hydrolysis, occur at the non-fluorinated, functional group end of the molecule, producing the

[2] Guenthner, R. A., et al., 1962. Surface Active Materials From Perfluorocarboxylic and Perfluorosulfonic Acids, 1(3): 165-168.
[3] Bryce, H.G. (1964) - Chapter 4 - Industrial and Utilitarian Aspects of Fluorine Chemistry, in J.H. Simons - Fluorine Chemistry - Volume V
[4] Bryce, T. J., 1950. Fluorocarbons - Their Properties and Wartime Development. Fluorine Chemistry, 1(13): 423-462.

original fluorocarbon compound (Pearlson[5]). Depending on the surfactant these reduce to PFOS, PFOA, or PFBA.

38. When Taconic used PTFE dispersions containing APFO, it knew or should have known that once this ingredient is released to the environment it does not biodegrade. The ingredient is extremely stable because it is a member of the C8 family of surfactants. Bryce wrote in 1964, "This chemical stability also extends itself to all types of biological processes; there are no known biological organisms that are able to attack the carbon-fluorine bond in a fluorocarbon." In 1962 Gunther wrote about these surfactants that the compounds were very soluble, which means that it disperses readily in water. The chemical suppliers' MSDS at least as early as 1989 report that the products they sold were toxic and required special handling. The body of literature provides reasonable warnings that care should be exercised to prevent or minimize releases to groundwater sources that may be relied on for drinking water purposes.

Pollution Sources

39. The coating process at Taconic generated air, water, and solid waste emissions. Various pollution controls and practices were relied on at different points in time.

Air Emissions

40. The ovens are a source of air emissions. The first pollution control device used at Taconic was named the "Smog-Hog," which was installed in 1991.[6] Oven exhaust was channeled through this control device, which was an electrostatic precipitator. It is not clear whether the exhaust from the vents in the lower part of the ovens went through this device.

41. There has been no useful information reported by the defendant on the control efficiency of the Smog Hog. The record it provides states: "It removes waste heat from the Coating

[5] Pearlson, W. H., 1950. Fluorocarbon Derivatives. Fluorine Chemistry, 1(14): 463-522.
[6] Prior to 1991, Taconic employed no pollution control devices on its stack.

department oven exhaust . . . . It removes contaminants from the exhaust stream. The smoke particles are removed electronically, *effectively cleaning the air stream* which leaves the stack. Only a trace of water vapor is allowed to pass through. The contaminants are collected in a tank and then placed in drums for disposal." **[See Ex. K to Affidavit of Hyeong-Moo Shin]** The control efficiency of any pollution control is never defined in such vague terms as "effectively cleaning the air stream" released from a stack. Pollution control literature as far back as the 1950s and even earlier explain control efficiency in quantitative terminology, typically as the percent removal of a pollutant – see for example Manufacturing Chemists' Association 1951, Air Pollution Abatement Manual, Washington, DC, as well as U.S.EPA 1973 – Air Pollution Engineering Manual, 2nd Edition, May 1973. Control efficiencies are established through vendor warrantees and verified though stack testing by the operator. There is no evidence to support that the defendant had any quantitative data on its air emissions allowing it to even apply such vague terms as 'effectively cleaning.'

42. In 1996 a device called a Fume Eliminator was installed and replaced the Smog Hog. The Smog Hog was retained as a backup control device, but Taconic personnel testified it was not used after the Fume Eliminator was installed. The Fume Eliminator passed exhaust from the ovens through a water vapor and then through two sets of fiberglass type filters before exiting the stacks. When Building 6 was built, a second Fume Eliminator was installed for the ovens there. The approximately 1500 gallons of water contained in a closed loop within each fume eliminator had to be changed periodically. The filters were also periodically changed out.

43. The Fume Eliminator was a scrubber with a pre-filter section. This type of control device is an impingement device, meaning it captures particulates, in contrast to a thermal destructive device like a Regenerative Thermal Oxidizer (RTO). The control is listed as a fabric

filter/gas scrubber in the facility's 2014 permit. Page 53 as emission source/control FE005 (NY State Dept. of Environmental Conservation – Permit ID: 4-3834-00004/00028).

44. The performance warrantee of the control states, "When the CVM Fume Eliminator is operated at the specified conditions, it will eliminate essentially all of the visible oil fume particulate and meet the APC requirements now in effect in your area. The maximum opacity as it relates to fume particulate will not exceed five (5) percent. Any opacity due to water vapor in the exhaust or design not provided by CVM will not be guaranteed." On the surface this appears to be a high efficiency control device; however, it is an impingement type air pollution control. Like all scrubbers it has a cut size. All collection devices such as electrostatic precipitators, baghouses, cyclones, multiclones, and scrubbers have a cut size and a fractional efficiency curve. The cut size and the fractional efficiency curve are unique to the machine design and the density of the dust particles handled. The term 'cut size' is defined as "the diameter of those particles collected with 50% efficiency." "Collection efficiency for particles larger than the cut size will be greater than 50% while that for smaller size particles will be less" (U.S. EPA (1973)[7]). A more efficient pollution control that could have been employed was a venturi scrubber and an even better control would have been an RTO or combination of both. Venturi scrubbers are capable of achieving control efficiencies of 99% in the submicron range.[8] U.S.EPA 1973 explains this in great detail along with stack test methods and computational procedures for sizing this air pollution control device. I have found no evidence that the defendant took the time and effort to properly size its air pollution control. It appears to have simply purchased and placed a control device into service without giving reasonable consideration to the droplet/particle sizes of its stack emissions and did

[7] U.S.EPA (1973b), Air Pollution Engineering Manual, 2nd Edition, Air Pollution Control District, County of Los Angeles, May 1973, p. 95.
[8] Midwest Research Institute, Particulate Pollutant System Study, Vol. II, Fine Particle Emissions, Aug. 1971 (Fig. 17, p. 59).

not consider whether the control efficiency was reasonable; especially in light of what it understood from the toxic nature of the chemicals it used (see numerous MSDS).

45. APFO when heated vaporizes and only coagulates into particulate matter that would be capable of being captured by the fume eliminator type of control device once it was cooled sufficiently. There has been no data presented indicating the extent to which APFO vapors cooled and formed particulate matter prior to entering either the Smog Hog or the Fume Eliminator. The levels of PFOA detected in the fume eliminator system water indicates that some of the APFO was captured by this device, but again, no data exists that enable an assessment of the percentage captured because Taconic failed to conduct any relevant testing (e.g., a stack test) that would provide such information.

46. In its motion for summary judgment, Taconic claims that it tested the stack emissions from the Fume Eliminator in 1997 and those emissions came back non-detect for PFOA. **[Mtn for Summary Judgment, p. 15]** 'Non-detect' does not mean there was zero PFOA in the stack emissions; only that the analytical measurement method used was insensitive. Stephen Washburn, Taconic's proposed expert, explains when discussing this testing, "It is acknowledged that at the time the tests of the Fume Eliminator were conducted in 1997, standard, federally-approved analytical methods for PFOA were not available and thus there is increased uncertainty in the quantitative results of the testing." **[Washburn ¶ 22]** Taconic personnel also understood that the stack testing performed in 1997 was uncertain. Taconic's engineering manager, Malcolm Green, reported internally in April 1997 "that there is no accepted method to test for ammonium perfluorooctanate." Adirondack Environmental Services Inc., the company Taconic retained to perform the stack testing, reported in April 1997 that "there is no acceptable stack test method for the parameter ammonium perfluorooctanoate." **[Bilsborrow Aff., Ex. 16]** Mr. Green testified that

he did not know whether Adirondack's testing methods were capable of detecting APFO, stating that the results "would indicate that the—the—the testing did not detect any or couldn't—that's the level—the lowest level it would detect it." **[Bilsborrow Aff., Ex. 7 at 224-25**] Taconic could have attempted to perform mass balances about the control in order to develop estimates of the PFOA air emissions. U.S.EPA reports that the mass balance method[9] is an acceptable method to estimate air emissions from stacks; but rather than be proactive, Taconic appears to have ignored these air emissions.

47. In 2003, Adirondack informed Taconic that the methodology it used for the 1997 testing "was developed in-house . . . and may not have been sensitive enough to detect small quantities of PFOA that may have been present in the samples." In an email, an Adirondack representative told Andy Kawczak, Taconic's environmental, health and safety manager, that the "in-house" test method used by Adirondack may not be sensitive enough to detect PFOA, especially as it undergoes chemical changes in the coating process. **[Shin Aff., Ex. X]** In July 2004, Tim Kosto, Taconic's Technical Manager at the time, explained that Adirondack's "test methods are too coarse for these evaluations. . . . If I recall correctly, the techniques used by Adirondack testing were simple GC and GC/MS testing, which at best will evaluate in the ppm levels." **[Bilsborrow Aff., Ex. 28]** Kosto explained that after 1997, the EPA and SPI developed testing capable of detecting APFO at the parts per million level. The record demonstrates that Taconic knew or should have known at the time it performed the stack tests in 1997, and certainly knew or should have known by 2003, that the 1997 stack testing on the Fume Eliminator was unreliable with regard to its PFOA results. There is no evidence that Taconic conducted stack testing for APFO after it learned of new test methods capable of detecting PFOA. Defendant did

[9] USEPA, Introduction to AP 42, Volume I, Fifth Edition, https://www3.epa.gov/ttn/chief/ap42/c00s00.pdf

not simply suspect but it knew that its initial stack tests were unreliable and insensitive, and that by 2003 more reliable analytical test methods were available for stack testing; yet it appears to not have bothered to measure its air emissions.

48. Although the 1997 stack test, referenced above, could not effectively detect APFO emissions, it is difficult for me not to conclude that Taconic gained understanding of the potential risks of its air emissions to neighbors from its coating operations, especially in light of the following. In March 1997, Bob Warland from the DEC visited the Taconic facility to inspect the stacks. DEC explained that "[t]hey are concerned with ammonia in the Teflon dispersion. . . . They want to test for this at the stack. They would like this done in 6-7 months if not sooner." **[Bilsborrow Aff., Ex. 13]**

49. Shortly after this meeting, the DEC sent a memo to Taconic expressing concern about the potential toxicity of its air emissions and specifically referencing APFO. **[Bilsborrow Aff., Ex. 14]** The memo calls to Taconic's attention that its air emissions containing APFO are exposing the neighboring community. Relevant statements from the memo are as follows:

- "In response to the neighborhood complaints around Taconic Plastics of a disagreeable stink, reports of nausea and headaches, and visible bluish smoke, we have examined permit data and the toxicity of compounds used by the facility."

- "Current permit data indicate that the facility is operating at 10% of the AGC for ammonium perfluorooctanoate."

- "There is no AGC or TLV for the thermal degradation products of PTFE. The American Council of Governmental Hygienists states that '***air concentrations should be controlled as low as possible***' (ACGIH, 1995-96)."

    - The DEC's statement and reference to the ACGIH's recommendation should have made clear to Taconic that it should be using the best available control technology to control its air emissions.

- "An evaluation of the toxicity of compounds emitted from this facility, ammonium perfluorooctanoate (CAS No. 3825-26-1) and thermal degradation products of PTFE (polytetrafluoroethylene) (CAS No. 9002-84-0) was performed." Toxicity profiles in the memo state:

    - Regional inspection revealed PTFE heating temperatures recorded at this facility of 725 to 730°F (385 to 388°C). DEC's review of the literature showed that at these temperatures, the possibility existed for production of thermal degradation products of PTFE of high toxicity. The DEC noted that thermal degradation products of high toxicity may be emitted at temperatures in excess of 300°C (571°F – citing 1992 DuPont product literature). DEC further noted that the toxicity of thermal degradation products of PTFE increased with increasing temperatures. DEC further noted the evaluation of workers engaged in PTFE fabrication at 350 to 380°C (662 to 716°F) found symptoms consistent with polymer fume fever (citing ACGIH from 1995 to 1996).

    - DEC reviewed the MSDS that Taconic should have already been familiar with, observing that the MSDS on ICI Fluoropolymers cites a range of toxic and corrosive products due to thermal decomposition at temperature ranges greater than 380°C (716°F), warning Taconic that exposure to these products must be avoided.

    - DEC went on further to highlight for Taconic toxicity effects reported from animal studies and again advised it of the importance of controlling operating temperatures. It further emphasized information reported in Taconic's MSDS of toxicity data from human studies pointing to liver damage resulting from skin absorption in rats. This information was already in MSDS in Taconic's possession. Taconic has acknowledged reading and understanding the information in MSDS in this litigation for this time period. I fail to understand why its knowledge and interaction with the DEC was not applied to examining the adequacy of its control technology, working with air pollution control vendors to select higher control efficiency equipment for its stack emissions, and most certainly eliminating its poor wastewater management practices.

    - DEC further reported that the resident complaints associated with emissions from the facility "may be related to the thermal decomposition products of PTFE." DEC instructed Taconic to "focus on working . . . **to reduce all point and fugitive**

emissions of these products in an attempt to resolve the neighborhood complaints."

- DEC further states that it could not "determine if an adequate margin of safety exists without more detailed emission information." From DEC's statement, it is clear that the community at large was at that point in time at an indeterminant level of risk from the air emissions from Taconic's facility. I fail to understand how Taconic would not have understood this since DEC's warning is clear. I have found no evidence to support that this raised concern on the part of Taconic and that it did not even take minimal steps to assess its APFO air emissions. Nothing prevented Taconic from:

    - Assigning an engineering team to assess its air pollution control and determine whether it was best available control technology that had a reasonable level of safety in controlling APFO air emissions. There were no lack of higher efficiency control technologies at the time such as RTOs, afterburners and combinations of these with venturi scrubbers as examples;

    - It could have performed a Pollution Prevention audit and determined points of releases of fugitive emissions and then eliminated these either through source reduction or replacing its processing aids with less toxic materials;

    - It could have reviewed the adequacy of its in-house training programs and strengthened these to ensure that its operators were adequately trained to control oven temperatures and to accurately monitor stack opacity;

    - It could have assigned one or more engineers the tasks of assessing whether it had adequate oven controls that could maintain precise operating temperatures over narrow operating ranges and whether its thermocouple sensors were accurate and reliable as well as placed these on a preventive maintenance program to ensure that they did not fail;

    - It could have performed a Pollution Prevention assessment focusing on waste minimization which not only more likely than not have helped to reduce fugitive air emissions, but improved wastewater management practices.

- The defendant could have and should have looked to the extensively published good industry practices of the day for approaches and practices to reduce both its air emissions and wastewater releases. These publications provide numerous well documented examples on waste minimization, pollution prevention and improved air emissions controls that were documented by both industry and the U.S.EPA. These published good industry practices were being widely practiced by U.S. corporations including corporations in the plastics industry sector at the time while Taconic sat idly by. See for examples: Air Force Research Laboratory (2001) - Special Advanced Studies for Pollution Prevention, AFRL-ML-WP-TP-2005-404; Battelle (2003) - Overview - Office of Pollution Prevention and Toxics Programs; Bringer, R. (1993) - The 3M Story, "Pollution Prevention Pays" & Extracting Principles (PowerPoint presentation); CDPHE (1996) - Colorado Pollution Prevention Case Studies Compendium NPPC (1995) - Pollution Prevention Concepts and Principles; Resources for the Future (1998) - Searching for the Profit in Pollution Prevention: Case Studies in the Corporate Evaluation of Environmental Opportunities; SAIC (1995) - Pollution Prevention - Environmental Impact Reduction Checklists for NEPA/309 Reviewers; USEPA (1983) - Wet Scrubber Inspection and Evaluation Manual, EPA-340/1-83-022; USEPA (1995) - Pollution Prevention Case Studies Compendium, 2nd Ed., EPA/600/R-95/036; USEPA (1995) - Profile of the Rubber and Plastics Industry, EPA 310-R-95-016; USEPA (1997) - Profile of the Plastic Resin and Man-made Fiber Industry, EPA 310-R-97-006. These illustrative publications abound with pollution prevention case studies and practices. Some of these publications provide good industry practices and methods for inspecting equipment like the defendant's scrubbers to ensure they perform at highest control efficiencies. See also The Pollution Prevention Services InfoHouse - The Pollution Prevention Services InfoHouse is a searchable online collection of more than 50,000 pollution prevention (P2) related publications, fact sheets, case studies and technical reports. https://p2infohouse.org/, many of which were published throughout the 1990s. See also Zero Waste Network, Center for Environmental Excellence – a site that documents 528 case studies of how a real facility saved

money, reduced waste, and/or lowered their regulatory burden through an innovative P2 practice. http://www.zerowastenetwork.org/success/index.cfm.

- The defendant could have and should have paid attention to the ACGIH advisories. It did not have to wait until the DEC brought these to its attention. Defendant handled toxic chemicals in its manufacturing process. It is obligated to be aware of any published health risk information in order for it to manage the chemicals safely in the work environment and in preventing releases that may expose the public. It does not appear to have done so.

50. The defendant could have and should have given priority to pollution prevention practices given what it did know and was advised about its APFO air emissions by the DEC. The Pollution Prevention Act of 1990[10] made pollution prevention a national policy. Congress declared that "pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner." The records the defendant produced in this litigation do not even provide a hint that pollution prevention practices were considered.

51. As explained above, under pressure from DEC, Taconic began to explore air emissions testing for APFO but was not successful in finding a company that knew of an effective test methodology. Although it performed a stack test in 1997 that was unable to detect PFOA, it knew this test methodology was not reliable. In subsequent years, Taconic would learn of reliable stack testing methodology, but it did not test its stacks again for APFO until 2016, after it had

[10] Pollution Prevention Act of 1990, Public Law 101-508, Title 6, 104 STAT. 1388 (1990).

ceased using PTFE dispersions that contained APFO. Beginning in 2002 and 2003, DuPont advised Taconic to test its stacks for APFO emissions and offered a testing company that could reliably perform the analysis, but Taconic did not pursue any such testing.

52. In late 1999, DEC performed an unannounced inspection of Taconic and determined that the company had failed to properly report the potential for volatile organic compound (VOC) emissions. **Exhibit C** is an internal memorandum that memorializes in part the findings of the inspection. The following are highlights from the record:

- The memorandum documents a meeting with DEC that took place in December 1999. "The underlying goal of our meeting was to approach the DEC to ask for an extension to our Consent Order requiring plant emission testing and submittal of results to the DEC by Feb. 04, 2000. Based on information from test results and advice from Matt Traister, testing would put us out of compliance."

- "A decision to install a thermal oxidizer, requiring an extension to the Order, was brought to the DEC in hopes of minimizing lawyer involvement, thus making this a technical issue only. In turn, Taconic would buy time to make appropriate business decisions and submit required permits whether it be Title V or lower. A Consent Order modification would be needed to proceed."

    - The thermal oxidizer (discussed below in Opinion No. 1) constitutes best available control technology that Taconic could have installed years earlier.

- The DEC "expressed dissatisfaction with events in the past concerning reporting of our emission levels. Two documents were mentioned. The first was Malcolm Green's statement that Taconic does not emit VOC's and a Source Owner letter sent by the DEC to all companies that emit or might emit VOC's. The letter asked each company to determine their proposed permit requirements based on their 'potential to emit' and to submit the appropriate application for a permit. [Rick] Leone [of DEC] mentioned the cases of hospitals in New York fined $60,000 for not properly reporting their status on this alone."

    - The DEC's criticism indicates that Taconic was sloppy with its management of air pollution. If the company was paying attention to its emissions, chemical supplier MSDS, and carefully monitoring and accounting for its air emissions, then it

would have been accurately reporting and controlling its air pollution.

- The DEC said to Taconic's representative "to clearly bring back the message that this is a serious issue. Leone said we would be in violation of Part 201. 201 requires a new source review, certificate to construct a new source, and operating permit. Part 228 deals with threshold limits requiring pollution control devices and requirements for capping out of Title V. Failure to comply with the Source Owner letter requirements mentioned earlier and Part 231 were mentioned also, which also relates to total emission limits. **All applicable if we were found out of compliance**."

    - DEC's admonishment shows that Taconic was seriously out of compliance and had grossly under-reported its VOC emissions. Pete Empie (DEC) stated that "he has felt Taconic has the potential to be a Title V facility . . . based . . . on information from past discussions and the type of products in use at the adhesive coater. **During the site visit a couple weeks ago, Empie requested a 280A adhesive MSDS and said calculations could be easily calculated based on a given line speed**. At the time we were running 10 ft/min. During his visit he suggested we do internal tests and modify the Consent Order before we ran tests. Leone and Empie expressed that fines could be significant. Empie said it was better to step up now to address the issue within the confines of a revised Consent Order rather than face the penalties if they find us out of compliance through their own means."

        - Defendant did not bother to "step up" and do the testing advised by the DEC. This is in keeping with other records I have noted above as well as below in which Taconic did not bother to quantify and control its emissions, take steps to reduce air and wastewater emissions, and to apply higher control technologies. The evidence supports that unless there was direct action by way of fines levied by the DEC, the defendant appears not to have been concerned with exposing its neighbors to APFO.

53. In September 2000, the DEC issued a public notice reporting a major fine levied on Taconic for non-compliance regarding VOC emissions and requiring Taconic to enter into a Consent Order. **Exhibit D.** The Consent Order appears at **Bilsborrow Aff., Ex. 17**. The

information documented in the order is relevant to the air emissions of APFO even though this ingredient is not specifically mentioned. The following are important disclosures along with my observations:

- The facility was issued a permit to operate 10 emission sources on May 1, 1990. The permit violations documented in the Consent Order show that the facility was out of compliance for close to a decade.

- "Department staff inspected the facility on November 24, 1999 and March 15, 2000 and found a coating line not included in the facility's permit ('new coating line')." The consequence was that Taconic had an unpermitted air emission source that released regulated hazardous air pollutants in addition to APFO emissions coming from its coating ovens.

- The Order reports that the "Respondent is still operating the old coating line ('old coating line') which is included in the facility's permit." As noted above, this coating line relied on inferior air pollution controls.

- "The new coating line . . . has no air pollution control equipment."

    - This is both a serious violation of the facility's air pollution control permit and highly irresponsible. Air emissions were released in an uncontrolled manner directly to the atmosphere. Since this is a coating line, VOCs were released directly to the atmosphere.

    - Taconic characterizes my description of its behavior as my "own personal opinion." **[Mtn to Exclude, p. 1]** Covertly installing a new coating line that uses toxic chemicals without any pollution controls is not a responsible action. Concealing the installation of that line from the DEC by not including it on its permit is not responsible action. These are facts which the DEC published and disclosed to the public. The DEC documented the violations and the details of the Consent Order so that the public could be advised of the irresponsible behavior of this defendant. It fined the company heavily because its actions were irresponsible and placed the public at risk. See the Consent Order documenting a fine of $421,750. When any company ignores the requirements of its air pollution permit – it is acting irresponsibly. When any company fails to properly quantify and control its air emissions it is acting irresponsibly and contrary to the norms of good industry practice. When a company installs equipment without any air pollution controls, it is violating the Clean Air Act and

placing the public in harm's way – that certainly is not responsible by any stretch of the imagination and is not a personal opinion. Following the requirements of one's permit is part of good industry practices that are universally recognized. Taconic was found to be in violation of its air permit for nearly a decade. It violated the Clean Air Act which it is obligated to follow. My opinion is best expressed by stating that I agree with the DEC when it found Taconic to be irresponsible by fining it and forcing it to enter into a Consent Agreement to control its air emissions.

- "The new coating line has the potential to emit 327,624 pounds per year or approximately 183 tons of volatile organic compounds ('VOC') per year."

    - DEC's disclosure shows that the facility did not properly account for its air discharges. Since it did not account for the VOC emissions, it made no estimates of the potential to release APFO from the coating line. This was in spite of the fact that Taconic knew that the DEC was concerned about APFO emissions, as evidenced by the dialogue regarding the 1997 stack testing in which the defendant was told in plain English language that the DEC was concerned about APFO releases from the facility back in 1997. It is not even an issue that the defendant 'should' have known – but rather it did know of the concern for APFO air emissions from its drying ovens.; and yet it charged forward installing a new line without any air pollution controls. I think my opinion of this company acting irresponsibly is not a personal opinion; rather its actions speak for themselves.

- "Respondent constructed the new coating line in November 1998 without a preconstruction permit."

    - This is a violation of the Clean Air Act (CAA) and sidesteps good engineering practice. Responsible companies do not simply build and begin operation of any new equipment or process line without performing careful assessments of the potential air emissions. Taconic side-stepped common sense good practices which require first assessing potential negative impacts and then devising proper mitigation plans to eliminate or mitigate these impacts. Taconic forged forward constructing a new coating line without giving consideration to the additional air emissions it created and gave no consideration to how it would control these emissions. It ignored the additional VOC emissions and it did so just a year after DEC had expressed concerns about stack emissions.

- The facility was fined heavily for operating without a Title V permit. Such a permit is required for large quantity emitters under the CAA. Taconic operated its facility for years misrepresenting its air emissions. A Title V permit is required for large sources ("major" sources) and a limited number of smaller sources (called "area" sources, "minor" sources, or "non-major" sources). Title V permits have rigorous requirements for pollution controls that stem from federal and state regulations that are applicable to sources. Following statutory obligations is recognized universally as part of good industry practice. Failure to do so is irresponsible.

    - Because it misrepresented its air emissions it was allowed to operate without a Title V permit for years which would have held it to a higher degree of accountability in reporting emissions, monitoring and reporting exceedances of permit levels, and maintaining with verification its pollution controls in good working order.

- The Consent Order highlighted that the DEC had inspected the facility's old coating line and obtained records of adhesive coating usage. It reported that based on the old operating records, Taconic violated Part 228.7 of its permit by operating at production volumes in excess of its permit for 114 separate runs during 59 days in 1999. Each of these runs was considered a violation. The DEC also determined similar violations for the new coating line.

- The Consent Order highlights that the operator (Taconic) violated its permit by constructing the new coating line without a Part 201 permit, the consequences of which is that it simply caused more pollution. The operator is required to demonstrate emission offset credits when it adds a new source, which it failed to do. The DEC highlighted that Taconic had not applied LAER (lowest achievable emissions rate) on its new coating line, which was a major source of VOCs.

- Taconic was fined $421,750 for its violations. This is not a small fine that is issued for innocent violations. It demonstrates irresponsible actions that stem from not following good industry practices which includes meeting statutory obligations.

Wastewater

54. Throughout the years that the facility operated, wastewater was generated through the process of cleaning PTFE dispersions off of the equipment and from the dip pans. Many

products that were manufactured required different PTFE dispersions coated on top of each other. Each time there was a change for a product run, the old dispersion would need to be cleaned out of the pan and off of the rollers in preparation for the next production run. These rinse waters which contained APFO were, at various times, discharged to septic, sent to a leach field, and sent offsite as discussed further on.

55. **Bilsborrow Aff., Ex. 56** is a package of documents that date back to 1988 and constitute the permit application of the septic system for Outfall 001, which released APFO to the subsurface. This package of documents discloses the following facts:

- **TACONIC_Paper-0039096** refers to Outfall 001. The record reports that the facility plans to discharge industrial waste to the subsurface from washing (75 gpd) and ammonia rinse (25 gpd).

- **TACONIC_Paper-0039098** is a form which states, "list any of the pollutants listed in Table 2c-3 . . . which you know or have reason to believe is discharged or may be discharged from any outfall. For every pollutant you list . . . describe the reasons you believe it to be present and report any analytical data in your possession." Taconic wrote "None" under the listing for Pollutant.

- **TACONIC_Paper-0039101** is the beginning of Form 2c-3. The respondent is required to check any of the chemicals listed which it knows to be present. On the second page of this form, Taconic checked the box corresponding to "Surfactants."

- **TACONIC_Paper-0039110** is a schematic of the wastewater flows to three outfalls. Outfall 001 shows 25 gpd from rinsing operations and another 75 gpd from washing operations. There is a notation referencing EPA-00010, which I conclude indicates that the DEC had reviewed and approved the plan.

- **TACONIC_Paper-0039113** is part of the 1998 DEC permit application in which the respondent is required to answer questions. Question 13 asks, "Is subsurface liquid waste disposal involved?" Taconic answered, "Yes," and identified the type of waste as "aqua ammonia – leach."

- **TACONIC_Paper-0039116** is part of the 1988 application which requires the respondent to list the "Chemicals of Concern" and annual

amounts used. Taconic lists multiple chemicals—the chemicals I noted were Triton X-100 Surfactant (32,000 – units believed to be lbs.) and Teflon (PTFE) Resin Dispersion (200,000 – units believed to be lbs.). To me this is significant because Taconic identified the surfactant and PTFE as Chemicals of Concern.

- **TACONIC_Paper-0039117** is an attachment titled "Engineer Report and Supporting Data" for "Plant Consolidation Project." The report discloses the following relevant information:

    - Taconic proposed a 1000-gal. concrete settling tank with a subsurface leach pit to control runoff from the floor drain, industrial sink drain and the ammonia rinse process in Building #4, which was ultimately tied in to Outfall 001. On **TACONIC_Paper-0039118**, the report states, "The proposed equipment and facility changes will not cause an increase in emissions from current levels, since essentially only an equipment location change is involved. Daily coating and treating operations will be conducted in Plant #4, while Plant #1 coating/drying equipment will be maintained for standby use." This raises a question as to how Taconic managed its wastewater streams prior to the septic system it installed prior to 1988. A 1982 USGS aerial photo reveals the presence of a waste pond or large leach field. Evidence supports that prior to the permitted Outfall 001, rinse and wash streams containing APFO and PTFE were discharged directly to land. This conclusion is further supported by **TACONIC_Paper-0039119**, which states, "TPL plans to transfer coating and treating operations to Plant #4 by EDY 1988. Plant #1 building will be used as warehouse for raw and finished goods." Taconic transferred its operations to a new building location—which means it transferred its waste disposal operations to Plant #4. It had the same wastewater generation at Plant #1. Hence, Taconic disposed of wastewater streams to the subsurface for much longer periods of time (dating back to the 1960s).

    - **TACONIC_Paper-0039120** states that the Rensselaer County Health Department approved a sanitary waste system connected to Plant #2 and #4 for Outfall 002; but this record sheds no light on how the industrial wastewater was managed before these outfalls were approved. This page does report that a "1,000 gallon concrete settling/holding tank, installed below grade, with concrete dry well, to provide subsurface drainage for floor/sink drains and **non-hazardous industrial discharge**" is approved for Outfall 001. The waste clarification of a non-hazardous discharge is based entirely on the information

Taconic chose to disclose at the time of its permit application. There is no evidence that it shared information from the MSDS on the toxic and hazardous nature of ingredients in the PTFE dispersions it used.

- The same page discloses that for each pound of glass fabric that was coated with 1.33 lbs. of resin, 0.16 lbs. of surfactant and 18.9 lbs. of water were used. The document reports that ½ of the surfactant (APFO) is evaporated and released to air. It further reports that 3,780,000 lbs. of water and 16,000 lbs. of surfactant were emitted annually, amounting to an hourly rate of 450 lbs. of contaminated water and 1.9 lbs. of surfactant being sent to the septic system hooked into Outfall 001. This is a large amount of surfactant that is completely miscible in water, known to be chemically stable in the environment, and which had health risk warnings disclosed by the supplier on MSDS that was to be released to the subsurface.

- **TACONIC_Paper-0039121** reports that the impregnated fiber made in the coating process undergoes a water rinse dip. The waste stream (the rinse) is referred to as the Aqua Ammonia stream which is sent to the subsurface holding tank and leach pit at a rate of 75 gpd. While this stream is not given a detailed composition, it appears to contain APFO based on the nature of the process. The page goes on to disclose that about 75 gpd of wash water containing a "trace of Triton X-100" surfactant, which Taconic states "**readily combines with water**" along with "a small amount of colloidal Teflon resin solids," which Taconic represents settles out before being released to the septic system, constitute the waste stream. The document states that these non-hazardous waste in trace quantities are "discharged to a subsurface leach pit."

    - Taconic's descriptions are deceptive and conceal the hazardous nature of the waste streams. This is borne out by gross contaminations found in groundwater decades later. Taconic's representations at the time it filed for permits were devoid of any composition measurements or reliable mass balance estimates of the hazardous materials it released to the subsurface.

56. In 1996, an Evaporator unit that was designed to evaporate a portion of the water in wastewater was installed in order to reduce the volume of waste the facility had to dispose of

after it stopped releasing wastewater into the septic system in the ground.[11] While this practice reduced the volume of aqueous waste, it generated an air emission source which introduced an additional air pollution emissions source. See **Bilsborrow Aff., Ex. 18**, which states:

> This memo is to detail a telephone conversation I had with Dennis Carroll at NY State DEC. The purpose of this phone call was to verify the need for an emission point permit for the evaporator. Secondly, was to make him aware of the evaporator due to the steam plume it gives off. Due to our recent complaints we decided it was best to notify him regarding these issues. Dennis' response to the evaporator was that he thought we did need an emission point permit for the evaporator. Until we resolve this issue Wayne will lock out the evaporator. . . . Dennis also commented that he was in the middle of drafting a letter to us to request that we submit emission point permits for the laminate's bake ovens as well as the etcher. When I asked if we could run the units he gave us no definitive answer. I take this to be a yes as long as we are working with him on these issues. He will also ask for clarification of the existing permit points, with purpose that some are out of service and can be discontinued. He also asked about the additional capacity that will be coming on line in the oven room. He wanted to know if the additional capacity will also cause other operations, specifically the adhesive coater, to have more emissions. I responded that the answer was no, with the disclaimer that I would need to see the permit for the existing adhesive line to verify what we put on the mass balances. I did discuss with him the potential for the second adhesive coater which will require us to use the incinerator and also require a permit.

57. Taconic has a history of starting up operations like the evaporator without applying for permits. The consequence of this poor practice is it introduces additional pollution which released APFO. This action led to a Consent Order several years later and close to a half million dollar fine.

58. **Bilsborrow Aff., Ex. 18** describes the evaporator system. The record states: "The evaporator unit will be used to evaporate and minimize our waste rinse water stream from the oven room. This stream is the water generated by rinsing our pans and process area in the aqueous

[11] [redacted]

Teflon coating area. We periodically empty our pans of the Teflon dispersion and need to clean them. The waste water is the stream that is generated from rinsing the pans clean. **Currently the water is going into our septic system** . . . ." These rinses contained APFO.

59. Prior to the time that Taconic installed the evaporator, all of the wastewater was released into the septic system and leach fields into the groundwater and outfalls. Even after this evaporator unit was installed, however, groundwater was able to seep into the underground storage tank (UST) holding the wastewater prior to its being pumped in the evaporator, meaning wastewater was also seeping out into the ground. By 2000, the evaporator was no longer being used and wastewater was being stored on site in aboveground storage tanks (ASTs) and then sent off site for disposal.

Opinions

60. My opinions are reiterated below. They are based on a methodical review of the defendant's records and testimony, supplemented by considering authoritative literature sources. As explained in my report, my methodology consists of a forensic reconstruction of the events and activities concerning air pollution and wastewater management practices as documented in Taconic's records, and then consulting authoritative sources of good industry practices which I compared against the Defendant's practices to assess reasonableness. The forensic reconstruction provides a timeline of activities concerning relevant material handling, and air and water pollution management practices.

61. The forensic reconstruction involves assembling documents and records produced by the Defendant chronologically and according to subject categories. Each document is then examined for its relevance to the Defendant's work assignments and pollution management practices. A timeline of the events, practices employed, and the information obtained from each of

the documents are summarized and documented. All documents are identified either by a Bates Stamp or description in terms of date, subject matter and other identifying markers in those instances when Bates stamps are not included on a document.

62. No attempts were made to interpret information gathered from documents. The information obtained from each document is either directly quoted or paraphrased as close as reasonably possible to the original statements found. No relevant facts obtained from documents are excluded, including contradictory statements and information.

63. In the case of testimonies, all statements made by fact witnesses are considered to be truthful and factual. Testimonies given by designated corporate representatives are considered to be formal statements made on behalf of the Defendants and are taken to be factual. Testimonies given by fact witnesses that are not corporate representatives are considered factual to within the best recollection of the person.

64. In situations where contradictions of facts are identified among documents or testimonies, effort is made to identify and consider other records and or testimony to corroborate and distinguish between more likely than not or most probable facts and suspect information.

65. The methodology I applied is identical to every single litigation matter I have been proffered and accepted as a standard of care expert in. It is the identical methodology I was taught to apply in engineering practice when I attended the university. It is the same methodology I have applied over the past 40 years in problem solving for my clients.

66. The defendant accuses me of placing myself in the mind of the corporation (Taconic) and that my opinions amount to nothing more than personal opinions. To the contrary, my observations and opinions are based on careful consideration of the weight of the evidence. I have concluded that the defendant acted in a highly irresponsible manner and have carefully

documented and referenced specific reasons where it failed to apply reasonable practices that are embodied in what is recognized universally as good industry practices. The fact that the defendant's property is a Superfund site, which is considered to be the worst of the worst, speaks volumes to the irresponsible behavior of the corporation.

67. I understand reasonable practices to be Good Industry Practices that are documented in the literature, including but not limited to those practices that are required under air pollution control permits in the United States. Air pollution control permits document good industry practices which operators of industrial facilities have statutory obligations to comply with. Records show more that Taconic was not in compliance with its permits in the late 1990s. I fail to see why the defendant thinks I have expressed a personal opinion when I report that it was irresponsible by violating its permit.

68. The terms "Best" and 'Best Available Control Technology' should not be equated with cost. None of these terms require or imply that a practice or technology to control an air emission source should be based on achieving maximum control regardless of cost. Best Available Control Technology (BACT) means that an operator has carefully evaluated emission control alternatives (relative to energy, environmental and economic impacts) and selected controls or practices that meet the objective of reducing pollution to levels that are safe. In the U.S. a top-down BACT is performed when evaluating control options. This means that the lowest possible emission rate is first considered with the highest level of control (and often most costly), but then less effective and costly alternatives are justified if they achieve the goal of meeting safe air quality standards. The explanations and citations above show that the defendant used poor and ineffective air pollution controls and even no controls at times. Prior to 1999, there were also few to no

attempts on the part of the defendant to improve poor wastewater management practices which its records show persisted for years.

69. The defendant argues that I have placed myself into the mind of the corporation in formulating opinions. To the contrary, the defendant's own corporate representative has clearly explained the mentality and policy of the company with regard to pollution management and control. According to Mr. Kawczak, "Andy [Russell] was always of the opinion that unless it's a requirement, we're not going to volunteer and do it [test water off-site]." **Bilsborrow Aff., Ex. 9 at 109-10.** Andy Russell is the current CEO of Taconic and has been since the mid-1990s. Unless Taconic is told by a regulatory agency how to act responsibly, it does not feel it has to.

Opinion 1:

70. Taconic is a sophisticated user and processor of polymer products. It knew or should have known from its MSDS for dispersions containing APFO and safe handling practices recommended by the Society of Plastics, as well as guidance from ACGIH and the DEC, that APFO contained in the PTFE dispersions it used and the nature of this chemical was dangerous and could cause harm from air emissions. Despite this knowledge, Taconic relied on outdated air pollution control technology to manage the air emissions from its ovens. In addition to using inferior air pollution controls it did not maintain these and allowed them to operate at variable and low efficiencies. Further, its operators were untrained and ill equipped to even marginally improve control efficiencies or even monitor stack releases. Moreover, Taconic failed to test its emissions after 1997 to determine the efficiency and efficacy of the technologies it did employ even though it knew or should have known the emission test performed in 1997 did not provide useful emission data. Taconic relied on these poor practices for years, allowing harmful air emissions containing APFO to be released to the air. It was advised that it needed to use best available control technology

(BACT) but took no steps to identify higher control efficiency devices which it could have installed to reduce the emissions until faced with regulatory action by the DEC, and even then, employed these technologies in a limited way. It had an option early on to install a much higher control technology. By at least 2005, Taconic knew or should have known that a thermal oxidizer was the BACT to capture and destroy APFO exhausted from ovens during the PTFE coating process. Taconic could have installed a thermal oxidizer but chose not to, even after the Barr Report confirmed that APFO was being emitted from Taconic's stacks. It should have used both BACT for its air pollution control along with careful monitoring and control of its oven temperatures to reduce the air emissions to lowest achievable levels. This conduct fell below a reasonable standard of care for a sophisticated user and processor of polymer products.

71. Even if Taconic did not fully understand how potentially dangerous APFO was early on, it understood or should have understood that its air emissions on the whole were dangerous and should be controlled. And certainly by 2005 Taconic was aware of the Barr Engineering Report, which reported significant amounts of APFO being exhausted from ovens tested during the PTFE fabric coating process. It is unreasonable for the company not to have evaluated whether its air pollution controls were adequate and to have upgraded them to reduce air emissions even at this late stage. The Barr report references a thermal oxidizer as BACT. Taconic could have installed one but chose not to. In addition, it grossly under reported its air discharges and misrepresented its status to the NYDEC as an insignificant source. Its poor management practices and failure to pay attention to controlling its air discharges resulted in a Consent Order and more than a $400,000 fine years later for violations of the Clean Air Act.

72. I note that during most of the time it used APFO, APFO was not listed as a hazardous air pollutant; but that is not dispositive. Taconic knew or should have known at all times

that the air emissions from its oven operations on the whole were harmful and dangerous, plus it knew or should have known that the DEC believed there to be an undefined margin of safety in the air emissions for this chemical released into air from Taconic's stacks. Taconic always had an obligation to control its air emissions on the whole both from a statutory standpoint and as an industry stakeholder to prevent its neighbors from being exposed to harmful air pollutants. The history of the company from records that I reviewed shows this company had a poor track record in controlling its emissions and meeting its statutory obligations. Its Consent Order showed it to be a major source emitter of VOCs.

73. Taconic initially used an air pollution control device known as a Smog Hog beginning around 1991. No air pollution controls were used at the facility prior to 1991 despite RTO and thermal oxidizer technology being readily available. Later in the 1990s it replaced the Smog Hog with a device called a Fume Eliminator. Both of these were inferior air pollution controls.

74. The emissions from the ovens are degraded polymer products resulting from exposure to temperatures that were published by the chemical manufacturer and Society of the Plastics Industry as causing thermal degradation, which released noxious VOCs, acid aerosols and various products of thermal degradation. These pollutants are in the form of VOCs, organic and acid aerosols and ultrafine particulate matter. The nature of these gaseous streams are not unique compared to other industry sectors, which is the basis by which air pollution controls are selected and applied across a broad spectrum of industries. The oven emissions contained levels of APFO as part of the composition of pollutants. At no point in time did Taconic speciate its air emissions because there was no need to do so – the air emissions on the whole contain a toxic soup of air pollutants which included APFO. Therefore, one technology capable of achieving the lowest

possible emissions was required to manage the air emissions and not one that specifically removed a target chemical compound.

75. The fume eliminator control device used by Taconic is described in US EPA 1976.[12] On pp. 273-274 of EPA's authoritative publication it describes industry experience with this device:

- "The manufacturer claims 83 percent removal of hydrocarbons, and the opacity of the plume has been consistently less than 10 percent."
- "The CVM device will reduce emissions by 83 percent and occasionally perform in compliance (85 percent) . . . visible emission (20 to 5 percent opacity) is the only serious problem and appears to be attributable to inadequate cooling in the first stage of the unit."
- "The plant in which the CVM unit was installed has since terminated the unit's operation. . . . After extensive studies comparing its performance with other pollution control devices, it was decided that the CVM unit could not provide compliance with either the hydrocarbon or visible emissions regulations."

76. The NYSDEC sent a memo to Taconic expressing concern about the potential toxicity of its air emissions and specifically referenced APFO. The memo calls to Taconic's attention that its air emissions containing APFO are exposing the neighboring community **Bilsborrow Aff., Ex. 14.** DEC highlighted that "There is no AGC or TLV for the thermal degradation products of PTFE. The American Council of Governmental Hygienists states that "***air concentrations should be controlled as low as possible*** (ACGIH, 1995-96)." Taconic was advised "to **reduce all point and fugitive emissions of these products in an attempt to resolve the neighborhood complaints**." The NYDEC further states that it could not "determine if an adequate margin of safety exists without more detailed emission information." The same record warns

[12] U.S.EPA 1976. Environmental Aspects of Chemical Use in Printing Operations, EPA-560/1-75-005, Environmental Protection Agency, Jan. 1976

Taconic that it is operating its ovens at excessively high temperatures which are the cause of air emissions.

77. Taconic had sufficient guidance and warnings from NYDEC to reduce air emissions to lowest achievable levels. It should have:

- Reviewed its oven operating procedures, temperature controls and qualifications of its operators. It knew that operating temperature, residence time and careful monitoring were critical to minimizing air emissions. Based on a review of its operating practices it should have devised rigorous procedures and installed appropriate controls, along with operator training to ensure oven temperatures were maintained within safe limits in order to minimize air emissions.

- Trained its operators to monitor stack emissions. There was no shortage of stack monitoring methods which could have been adopted.[13]

- Carefully evaluated its pollution controls and replaced these with controls capable of achieving lowest achievable emissions. The obvious remedy was thermal oxidation or a regenerative thermal oxidizer.

78. EPA's Fact Sheet[14] describes the workings of a Thermal Incinerator. It states:

- "This type of incinerator is also referred to as a direct flame incinerator, thermal oxidizer, or afterburner. . . . [T]he term afterburner is generally appropriate only to describe a thermal oxidizer used to control gases coming from a process where combustion is incomplete."

- "Type of Technology: Destruction by thermal oxidation. Applicable Pollutants: Primarily volatile organic compounds (VOC). Some particulate matter (PM), commonly composed as soot (particles formed as a result of incomplete combustion of hydrocarbons (HC) . . . ."

- "VOC destruction efficiency depends upon design criteria (i.e., chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing). . . . Typical thermal incinerator design efficiencies range from 98 to 99.99% and above, depending on system requirements and characteristics of the contaminated stream. . . . The typical design conditions needed to meet 98% or greater control or a 20

[13] Cheremisinoff, P. N. Editor, Industrial Pollution Control Measurement & Instrumentation: Proceedings of A Special Conference Given at New Jersey Institute of Technology, Newark New Jersey, Ma. 22-23, 1976, Technomic Publishers, Conn.
[14] EPA Air Pollution Control Fact Sheet, EPA-452/F-03-022.

parts per million by volume (ppmv) compound exit concentration are: 870/C (1600/F) combustion temperature, 0.75 second residence time, and proper mixing. For halogenated VOC streams, 1100°C (2000°F) combustion temperature, 1.0 second residence time, and use of an acid gas scrubber on the outlet is recommended. . . ."

- "Thermal incinerators can be used to reduce emissions from almost all VOC sources, including . . . **operations performed in ovens** . . . ."

- "Most incinerators operate at higher temperatures than the ignition temperature, which is a minimum temperature. Thermal destruction of most organic compounds occurs between 590°C and 650°C (1100°F and 1200°F). Most hazardous waste incinerators are operated at 980°C to 1200°C (1800°F to 2200°F) to ensure nearly complete destruction of the organics in the waste. . . ." *These temperatures are adequate for the destruction of APFO.*

- "Thermal incinerators can be used over a fairly wide range of organic vapor concentrations. . . ."

- "Incinerators are one of the most positive and proven methods for destroying VOC, with efficiencies up to 99.9999% possible. Thermal incinerators are often the best choice when high efficiencies are needed . . ."

- Further, the Barr Engineering Report, which Taconic was in possession of, stated that a thermal oxidizer would destroy almost all APFO.

79. EPA's Fact Sheet[15] describes the workings of an RTO. It states:

- "This type of incinerator is also referred to as a regenerative thermal oxidizer (RTO), or a regenerative catalytic oxidizer (RCO) if a catalyst is used."

- "Applicable Pollutants: Volatile organic compounds (VOC) . . . ."

- "VOC destruction efficiency depends upon design criteria (i.e., chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing) . . . . Typical regenerative incinerator design efficiencies range from 95 to 99% for RTO systems and 90 to 99% for RCO systems, depending on system requirements and characteristics of the contaminated stream. . . ."

[15] EPA Air Pollution Control Fact Sheet, EPA-452/F-03-021.

- "Regenerative incinerators can be used to reduce emissions from a variety of stationary sources. . . . Particulate matter (PM) and condensables which can clog the incinerator's packed bed or poison the catalyst (for RCOs) would have to be removed by an internal filter or some pretreatment technology prior to entering the reactor chamber . . . ."

- "An RTO uses natural gas to heat the entering waste gas to typically from 760°C to 820°C (1400°F to 1500°F), however, it is capable of operating up to 1100°C (2000°F) for those cases where maximum destruction is necessary. An RCO uses a precious metal catalyst, which allows oxidation to occur at approximately 400°C (800°F). . . ."

80. As early as 1973, RTOs were recognized as an effective pollution control. EPA wrote, "Afterburners can be used for control of combustible particulates and odors."[16] In 1995, EPA wrote, "Another approach to odor/VOC control is thermal oxidation at approximately 750°C (1382°F) for 0.5 seconds, followed by some form of heat recovery."[17]

81. Taconic did not consider installing an RTO until about 1999 and delayed several years more before purchasing one When it did, this device was only used to control emissions from its adhesives line. An RTO was never used to control emissions from its coating ovens. This decision did not conform to industry Best Practices.

Opinion 2:

82. As stated above, Taconic operated its facility for years misrepresenting its air emissions. It was a major source according to the NYDEC. It ignored the potential to emit. Its air pollution controls were inadequate and it relied on poor practices of monitoring and controlling oven temperatures which led to harmful air emissions. It should have been operating under a Title V permit from the mid-1990s onward when the permit program began to be implemented.

[16] EPA-450/3-73-003a - EMISSIONS CONTROL IN THE GRAIN AND FEED INDUSTRY VOLUME I - ENGINEERING AND COST STUDY (1973).
[17] EPA's AP-42 Section 9.9.7 – Corn Wet Milling.

83. A Title V permit is required for large sources ("major" sources) and a limited number of smaller sources (called "area" sources, "minor" sources, or "non-major" sources). Title V permits have strict requirements for pollution controls that stem from federal and state regulations that are applicable to sources. As documented above, Taconic underestimated its air emissions. Because it operated without a Title V permit it did not operate its plant using BACT nor was it held accountable to strict requirements for monitoring its emissions, maintaining pollution controls in good working order, and operating its ovens at temperatures outside of recommended supplier ranges that are known to cause polymer degradation.

84. The Consent Order highlighted that the DEC had inspected the facility's old coating line and obtained records of adhesive coating usage. It reported that based on the operating records, Taconic violated Part 228.7 of its permit by operating at production volumes in excess of its permit. The DEC also determined similar violations for the new coating line.

85. The Consent Order highlights that the operator violated its permit by constructing the new coating line without a Part 201 permit, the consequence of which is that it simply caused more pollution. The operator is required to demonstrate emission offset credits when it adds a new source, which it failed to do. The DEC highlighted that Taconic had not applied lowest achievable emission reduction on its new coating line, which was a major source of VOCs. Taconic did not use BACT.

86. Taconic was fined $421,750 for the violations. This is not a small fine that is issued for innocent violations. It demonstrates irresponsible actions that stem from not following good industry practices and paying attention to statutory obligations.

Opinion 3:

87. Taconic's practice prior to 1996 of disposing waste streams containing PTFE and APFO in a septic system was unreasonable because it understood its industrial waste had the potential to contaminate drinking water sources, including the water sources for its own facility, which it learned by 2004/2005 were contaminated. There was sufficient information to understand that even small releases over time could cause contamination of drinking water sources which required it to err on the side of conservatism and consider other practices.

88. Records produced in this matter are not clear on how Taconic managed its industrial wastewater prior to 1989, [redacted] Opinion 3 only addresses the septic system and relates specifically to the time period during which Taconic disposed its wastewater to the septic system.

89. In 1988, Taconic applied for a permit to dispose of its wastewater to a sanitary system which it designed. The purpose of the system was to intentionally release industrial wastes to a surface water outfall, Outfall 001 The septic system was concrete construction. Records documented above show that the waste streams were corrosive and as such the concrete septic basin which was installed below grade was subject to chemical attack resulting in the release of contaminated water directly to the subsurface and to an outfall. The sanitary system was sized to dispose of 100gpd of waste water that Taconic understood contained PTFE resin and APFO as well as other chemicals.

90. When Taconic designed, installed, and operated the industrial waste septic system it knew or should have known the following:

- It was contaminating drinking water. It relied on ground water as a potable water source for its workers and it understood it was releasing

industrial waste to a public water course which supplied drinking water to the neighboring community.

- That its process waste streams were acidic and as such subjected conveyance piping and the concrete septic basin to corrosion and chemical attack. The consequences of this was leakage and permeation of industrial waste to the groundwater. Evidence of this is documented above.

- That PTFE was toxic and that APFO had significant health risks as documented in the chemical suppliers' MSDS.

- That APFO was completely miscible in water; the consequence of which was to contaminate large volumes of ground and surface water bodies.

- That APFO was highly stable and that when released into the environment it would persist and not break down.

- That the chemical supplier of its polymer processing ingredients recommended specific waste disposal methods that required treatment of aqueous waste streams and that wastes containing APFO in particular as well as PTFE required segregation and containment, and that these wastes were recommended to be disposed of in a licensed landfill and/or destroyed by high temperature incineration.

- Given the nature of its waste streams managed in the sanitary system, it more likely than not understood or believed its waste streams to be dilute and of low concentration.

91. Taconic also faced some constraints or unknowns. There were no analytical techniques for monitoring APFO in wastewater at that time period. There were no definitive safe levels of exposure and there were no known water treatment technologies to effectively remove APFO from waste streams or from contaminated drinking water sources. Because of these limitations, simply interpreting its waste streams as dilute flows was an improper basis to dispose of its wash and rinse streams through a septic system given the factors set forth in the items above.

92. In its permit applications to the NYDEC and the County Health Department it characterized the wastewater as a non-hazardous industrial waste. Taconic did not disclose the toxic nature of the chemical ingredients in its waste streams.

93. When Taconic applied for its permits it had reasonable knowledge of the chemical nature of its waste streams. It knew or should have known from its MSDS that APFO and other ingredients were potentially harmful to humans. I have documented above the information Taconic had from its MSDS and other sources. Taconic did not have a reasonable basis to state in its permit applications that its wastewater was a non-hazardous waste; its MSDS reported that safe handling requirements included the use of neoprene gloves, chemical protective clothing, chemical resistant boots and respirators. The MSDS reports for Ammonium Perfluorooctanoate state, "… Ingestion causes weight loss, gastrointestinal irritation and enlarged liver. Repeated exposures produced liver, kidney, pancreas and testes changes, anemia and cyanosis. Tests in male rats demonstrated weak tumorigenic activity based on an increased incidence of benign testicular, pancreatic, and liver tumors. . . . Evidence suggests that skin permeation can occur in amounts capable of producing the effects of systemic toxicity. . . . Ingestion may cause gastrointestinal tract irritation; abnormal liver function . . . or abnormal blood forming system function with anemia. Individuals with preexisting diseases of the liver or bone marrow may have increased susceptibility to the toxicity of excessive exposures. This compound is absorbed by the body and may be detected in the blood stream following ingestion, inhalation or skin contact. Animal and human experience indicate that this compound has a long half-life in the blood, and may be detected years after exposure." Taconic knew in general that it was releasing a toxic chemical into drinking water sources. It had no basis to assume that it was releasing a toxic chemical at a safe level simply because it generally understood its waste streams were dilute.

94. Taconic understood or should have understood it was releasing harmful chemicals to the subsurface and surface water body. It did not carefully consider open pathways of exposure to drinking water sources; the consequence was to create a public health risk that has lasted for decades. Its MSDS state that the preferred options for disposal are to separate solids from liquid by precipitation and decanting or filtering and then dispose of dry solids in a landfill that is permitted, licensed or registered by a state to manage industrial solid waste and/or to discharge liquid filtrate to a wastewater treatment system, and/or to incinerate. Taconic did not treat the waste water from its facility. It dumped rinse and wash waters containing hazardous chemicals without any treatment to the septic system. While its permit application states that particulate matter like the resins settle out, there is no supporting data or records that show it performed any standard jar settling tests to establish how much settling took place. It had no engineered filtration operations to remove solids and it had no treatment operations at all to remove APFO which it knew or should have known to be miscible in water. Taconic's sanitary system was a direct conduit to contaminating the subsurface and the natural water course at the outfall.

95. As a sophisticated user of polymers and processing aids, including surfactants like APFO, Taconic was obligated to know the properties of the chemicals it used and to make a determination as to whether or not its waste disposal practices created open pathways to sensitive receptors like neighbors and even its own workers that used ground water as a drinking water source. To act responsibly, it should have erred on the side of conservatism in order to reduce the risk of harming the public. The mere fact that the permit application required Taconic to identify the presence of a surfactant as a contaminant in its wastewater is not reasonable disclosure on the part of the company because it had knowledge beyond that of the permit reviewer.

96. Taconic is required to know more about both the toxic nature and properties of the chemical ingredients it uses than a regulatory agency or a health department. Even if a chemical is not regulated or required to be disclosed on a permit application, a responsible company should act responsibly by disclosing what it knows or to seek guidance from a regulatory agency, a health department and especially the chemical supplier on whether disposal practices which release waste streams to the subsurface are prudent. Taconic took no precautionary measures or made any efforts to vet its proposed disposal to a sanitary septic system that was designed to release the waste directly to the subsurface and to an outfall where the public can gain access. It should have taken the time to review the literature on APFO – irrespective of whether or not it was a regulated chemical that is required to be disclosed on a permit application. It could have reviewed the literature that had been around for decades which reported that surfactants like APFO are chemically and thermally stable. The public literature documented above reported that when processing aids of the C8 family like APFO are released into the environment they do not break down. C8 chemicals are extremely stable. Bryce wrote in 1964, "This chemical stability also extends itself to all types of biological processes; there are no known biological organisms that are able to attack the carbon-fluorine bond in a fluorocarbon." In 1962 Gunther wrote about these surfactants that the compounds were very soluble, which means that it disperses readily in water. Taconic understood or should have understood that APFO was miscible in water because it stated so on its permit application. Its actions show that it disregarded public safety when it applied for its waste disposal permit – it gave insufficient consideration to how its neighbors or even its workers might be exposed to a potentially dangerous chemical. The widespread contamination it created with its actions were foreseeable even in the absence of health advisories that were published by U.S. EPA more than a decade later.

97. It is not unreasonable to expect a company to review the literature carefully when it uses a commercial chemical – after all it has a responsibility to use the products it incorporates into its manufacturing operations safely and it further has an obligation to ensure that any wastes that it generates are managed responsibly and do not expose the uninformed public. As set forth above, at the time that Taconic decided to install a septic, the literature made clear that fluoropolymer polymerization aids are members of a class of commercially available perfluoroalkyl carboxylate surfactants (e.g., ammonium and sodium perfluoro-octanoate). Further, the literature explained that an eight-carbon member of this family, like APFO, is **extremely stable, degrades slowly, and therefore persists in the environment**. Taconic not only could have obtained this information from readily available literature, it could have gone to DuPont or any of its chemical suppliers and asked them if their proposed waste disposal practice, which released industrial waste water to water bodies, was reasonable. There is no evidence that Taconic either reviewed the available literature or consulted with its chemical suppliers.

98. As a sophisticated user of polymer products, Taconic has the responsibility to ensure that its operations don't place its workers and neighbors at risk. Responsible actions include:

- Understanding the nature and properties of the chemicals being used.
- Evaluating potential exposure routes from waste handling practices.
- Considering all negative impacts or consequences from waste disposal and management practices and mitigating risks posed to sensitive receptors.
- Consulting knowledgeable sources such as the chemical manufacturer for recommended waste management practices and technologies.
- Carefully reviewing authoritative literature sources so that informed decisions can be made on waste handling and disposal methods that

incorporate margins of safety when there is uncertainty as to how toxic or hazardous materials are.

- Sharing knowledge and information with regulatory and public health officials in order to seek guidance on practices that eliminate the possibility of harm from exposure to chemicals.

- Adopting conservative approaches to waste management in order to compensate for potential risks.

Opinion 4:

99. The first records evidencing Taconic beginning to assess whether its practices exposed water users to harm date to about 2005, after Taconic learned that DuPont was getting sued for PFOA contamination around its site at Washington Works. This indicates that the company managed its environmental aspects in a reactionary way and was not proactive in waste and pollution management.

100. My conclusion is supported by the testimony of Taconic's employees. Andy Kawczak, Taconic's environmental, health and safety manager, testified that even after DuPont advised the company that it would need to account for APFO in its waste streams, there was never a discussion about whether its operations may be exposing the public to harm. Kawczak himself characterized Taconic's conduct as "reactionary," and explained several times during his deposition that Taconic would take no actions to protect public health that were not required by regulation or statute.

101. Since the 1990s such practice has been increasingly recognized by industry on the whole as being poor. Over the past 30 years companies have adopted Environmental Management Systems that are based on the principle of continually improving environmental performance. Taconic had a poor environmental management system and as such it has mismanaged C8 chemicals, the consequence of which is to create a public health crisis. Ground and surface

drinking water supplies have been severely impaired as a direct result of the company's mismanagement of its air pollution and waste streams. It is immaterial whether C8 chemicals were regulated or not when it comes to good practices. This company had a fair amount of information going all the way back to 1989 regarding C8 (APFO) environmental persistence, bioaccumulation and potential health effects such that it should have been acting in a prudent manner by taking proactive steps to prevent these chemicals from being released to air and sensitive groundwater sources. Taconic had a responsibility to act reasonably based upon what it knew or should have known and the lack of a regulatory agency mandate was not an excuse for failing to recognize that its practices could result in exposing uninformed populations to a potentially harmful material, like PFOA. Taconic should have been taking steps to continually improve its waste and pollution management practices notwithstanding applicable regulatory requirements.

102. Environmental Management Systems (EMS) are a part of Best Practices. All companies have some type of EMS. Ones that are recognized as being based on the very best practices are the U.S. Responsible Care Program and the ISO 14000 Environmental Management System (see Responsible Care 2018[18]). The ISO standards are implemented under a certificate program where a 3rd-party auditor assists the company in setting up the management system. Follow-up audits are conducted to ensure that the EMS is effective and follows the standard. The ISO 14000 certificate carries global recognition and is considered a green seal of approval.

103. The ISO 14000 environmental management standard was first introduced in the early to mid-1990s and is intended to provide practical tools for companies to manage their environmental responsibilities. ISO 14000 is a series of international, voluntary environmental management standards, guides, and technical reports. The standards specify requirements for

[18] Responsible Care 2018, http://www.nsf.org/services/by-type/management-systems/environmental-health-safety/responsible-care-management-system.

establishing environmental policy, determining environmental impacts of business and manufacturing operations, planning environmental objectives, implementing programs to meet objectives, and conducting corrective actions and management reviews (see ASQ[19], Cheremisinoff 2001[20], Cheremisinoff and Ben-David Val 2001[21], Cheremisinoff 2003[22], 2005[23], 2006a[24], 2006b[25], 2008[26]). An EMS begins with establishing a corporate Environmental Policy statement that defines the company's commitment to pollution prevention and continual improvement to environmental performance.

104. Companies that have an EMS track their:

- Performance in meeting statutory obligations in a timely manner;
- Performance in reducing pollution;
- Performance in reducing or eliminating causes for continued violations, exceedances, practices which lead to upsets, the consequence of which can be large episodic releases; and
- Incident reports and the root causes of episodic releases.

105. Metrics are used to track performance referenced to a base year. Common metrics that companies track are:

- Air emissions;
- Compliance;

[19] http://asq.org/learn-about-quality/iso-14000/
[20] Cheremisinoff 2001, Pollution Prevention Practice Handbook, Marcel Dekker Publishers, NY and Basel, 2001.
[21] Cheremisinoff and Ben-David Val 2001, Green Profits: A Manager's Handbook to ISO 14001 and Pollution Prevention, Butterworth-Heinemann Publishers, United Kingdom, 2001.
[22] Cheremisinoff 2003, Achieving Environmental Excellence: Integrating P2 and EMS for Improved Profitability, Government Institutes, Washington, D.C., 2003.
[23] Cheremisinoff 2005, Environmental Technologies Handbook, editor, Government Institutes, Oxford, UK, 2005.
[24] Cheremisinoff 2006a, Environmental Management Systems Handbook for Refineries: Pollution Prevention through ISO 14001, Gulf Publishing Co., Houston, TX, 2006.
[25] Cheremisinoff 2006b, Refinery Manager's Guide to ISO 14001 Implementation, Gulf Publishing Co., Houston, TX, 2006.
[26] Cheremisinoff 2008, Responsible Care: A New Strategy for Pollution Prevention and Waste Reduction through Environmental Management, Gulf Publishing Co., Houston, TX, 2008.

- Maintenance (as equipment and pollution controls must be properly serviced to ensure they operate efficiently). This extends to retiring and/or modernizing old unreliable equipment and controls;

- Source reduction, pollution prevention and pollution control projects – most notably documenting the emissions reduction achieved;

- Air quality;

- Spills events, leaks and ground water monitoring;
- Odor complaints;

- Other metrics which allow a company to monitor and devise methods to reduce impacts and improve overall performance.

106. Formalized tracking systems called Environmental Management Information Systems (EMIS) are applied to evaluate performance trends, assign and schedule corrective actions, and to communicate within the company. A well-structured and executed EMS has goals and targets that follow a corporate wide commitment to achieving improved environmental impacts.

107. Trend charts and environmental performance tracking are also used to keep the public aware of emissions. Many companies publish their annual emissions on web sites for the public to gain better understanding of what they are breathing and the efforts being taken to reduce pollution. In the U.S. this is most often done by reporting annual air emissions for regulated Hazardous Air Pollutants to the EPA's Toxics Release Inventory (TRI), but many companies publish their findings on corporate web sites in order to keep communities informed – something which Taconic has not done.

108. In the United States the preparation of emissions inventories is and has been driven for decades by statutory requirements both at state and the federal levels under the federal Clean Air Act. Environmental regulatory agencies obligate industrial complexes to prepare detailed air

emissions inventories in order to demonstrate compliance with permits such as Title V permits, as a basis to levy fines for violations and for annual pollution fees that facilities are obligated to pay for polluting. If Taconic had been carefully monitoring and accurately evaluating its air emissions over the years it would not have had to enter into a Consent Order over violations of the CAA.

109. I do not know one way or the other whether Taconic has been registered under the ISO or Responsible Care program. In either case, its actions over the past 30 years reflect that it does not follow the good practices established under these programs and has not shown efforts to improve its management of C8 chemicals until forced by regulatory action or the threat of civil suit. Its records from the 1990s show me there were no serious efforts to reduce waste quantities to communicate with the subsurface without taking corrective actions. Its records further show it did not pay sufficient attention to its air emissions and under-reported these until it was caught by DEC. Its records show that at no time until about 2005 did it take the time to carefully examine PFOA contamination levels in groundwater sources that it knew or should have known were impaired from past practices and which it had to have known to be an obvious consequence of intentionally discharging industrial waste to a sanitary system beginning in at least 1989.

110. Taconic was handling PTFE and APFO for decades and yet there is evidence that it did not apply reasonable due diligence to assess whether the chemicals it required its workers to handle and the wastes it intentionally discharged to ground and surface waters were safe. The records address questions that Taconic should have been focusing on all the way back to 1989 when it decided to discharge industrial waste to the subsurface and a publicly accessible water body. Only in 2005/2006 does it begin to look at:

- The chemistry and toxicology of APFO. Why did this ignore or overlook its MSDS or reach out to chemical suppliers for advice in whether it was reasonable to inject waste containing APFO into the ground water or release it to a public water course?

- It should not have been a revelation to Taconic that EPA's material balance for a glass coating process showed 77% APFO destroyed, 19% to air, 3% to wastewater, 1% to solids. Its own personnel comment in the records that **Taconic's water portion was probably higher due to historical practices, septic, POTW disposal, etc**. If the company was being diligent in the management of its wastes and applied reasonable environmental management practices throughout the 1990s and up to the time it learned about PFOA becoming regulated, then it would have known not in a general way but precisely the distribution and delineation of its waste forms.

- The records report ACGIH limits, but in 1997 Taconic understood that the American Council on Governmental Hygienists reported that "***air concentrations should be controlled as low as possible***." **Bilsborrow Aff., Ex. 14.** With that early knowledge, as well as the DEC's expressed concern over APFO emissions, the company could have been putting in safeguards to limit employee exposure, eliminating fugitive emissions, replacing its inefficient air pollution controls, eliminating leaking storage tanks, and stopping its practice of discharging wastes containing APFO to the ground water. It took none of these actions until the mid-2000s and even then, only pursued some of these.

111. In the records cited, only in 2005/2006 does Taconic begin assembling information on who their suppliers are; how long the chemicals have been used at its facility; how the chemicals are used and stored; and how wastes are disposed. For the first time they begin to examine where their wastes are going by beginning to identify:

- Process streams containing the chemicals – such as dispersion processing and groundwater and well water;

- Air emissions (both indoor and outside);

- Their stack media; past practices with septic leach field, ASTs and USTs;

- Sludge and slurry off-site disposal to landfills;

- When they performed their last stack test;

- Floor washing practices which indicated where spills involving PTFE chemicals wound up;

- Concentrations of chemicals in wastewater streams (the records cited are 2006, but in **TACONIC_Paper-0077150** it states that the most recent sample was taken in 2004 with a reported value of 80-85 ppm APFO, which is an incredibly high concentration);

- Company handling/disposal practices for off-spec and aged products;

- Whether or not the company even bothered to sample groundwater and drinking water.

112. The waste surveys that Taconic began focusing on in 2005/2006 should have been done in the 1990s or even earlier with the knowledge it had. Taconic should have been focusing on continually reassessing its waste and pollution control practices and not waiting until it faced legal or regulatory action. It was not proactive in C8 chemical waste management and did not place good environmental performance at the same level of importance as financial performance.

Opinion 5:

113. By 2005 Taconic had firmly established that the aquifer beneath its facility and feeding the drinking water wells at the residences it owned were highly contaminated with PFOA. By 2006 it began reviewing its past waste management practices in great detail and had good understanding that its poor air pollution control practices, its failure to address leaking storage tanks, and its discharges to the subsurface through a septic system were the direct causes of contaminating the aquifer beneath its property. It should have been obvious to any reasonable person that the contamination of C8 was not confined to the property. Taconic most certainly understood that there was not a hermetical seal around the property line that extended both above and below grade. Indeed, they were in possession of material obtained through the Society of Plastics that indicated that much of the APFO that contaminated the Ohio River Valley was spread via air emissions that had traveled significant distances from DuPont's Washington Works plant.

114. There was no reasonable basis for Taconic to conclude that its actions had not likely caused the spreading of PFOA into the drinking water in the community around its facility. [redacted] Despite this, Taconic took no action to test for PFOA contamination beyond its own property line to determine both the geographic spread of PFOA pollution and its severity. This showed callous indifference towards the safety of the neighboring community. It elected not to assess the danger it created in the public sector. It had more than sufficient knowledge and the analytical means to perform groundwater testing off site in order to warn the community and to take actions to provide alternative water sources. It appears to have delayed any responsible actions, justifying such callous indifference towards the safety of the community because it was not mandated by the NYDEC or DOH to perform ground water testing beyond its property in 2005. In fact it took no actions to assess the spread of contamination beyond its site for 11 years [redacted]. Over the 11 years that Taconic decided to ignore off-site contamination and failed to warn its neighbors, it could have applied well established good industry practices to define and delineate the extent of contamination and it could have taken actions to prevent the community from being further exposed. It decided to ignore the problem and public health hazard it created and exacerbate the problem by needlessly exposing the public to drinking water contaminated with PFOA for more than a decade.

115. In 2006 Taconic had accumulated information to indicate that avoiding exposure to PFOA in drinking water was prudent. It told its employees that although there were unknowns

about the hazards related to exposure to PFOA, "when there are 'unknowns' it is extremely important to protect one's self" **Bilsborrow Aff., Ex. 46**.

116. Despite the precautions taken on behalf of employees, Taconic did nothing to alert residents near its plant of the potential that their drinking water was contaminated. As more information became available, Kawczak requested a meeting with his superiors to discuss PFOA as "it is again getting more attention" **Bilsborrow Aff., Ex. 50**. This meeting was held on February 3, 2009, during which it was discussed that EPA had issued a Health Advisory "that no one drink water when contaminated with levels greater than 0.4 ppb" **Bilsborrow Aff., Ex. 51**. The sampling results from 2004-2005 were then apparently discussed, which showed PFOA levels in the groundwater hundreds of times higher than 0.4 ppb, but it was decided that "any additional testing data would not be useful" and providing bottled water to employees "should be sufficient to protect employees health."

117. No further testing of either the groundwater near the plant or the drinking water of the residences owned by Taconic was performed until February of 2016, after PFOA was found to be contaminating the drinking water supply in nearby Hoosick Falls.

118. The only action Taconic took prior to 2016 to address the contamination it created was in August of 2005 when it sent out one-paragraph letters to NYSDEC, NYSDOH and the Rensselaer County DOH advising them that they had found PFOA in the groundwater beneath the plant and purportedly enclosing test results **Bilsborrow Aff., Ex. 44**. Although the plan had been to schedule a meeting with the three agencies "to brief them on the protective/investigative/remedial measures the company had taken," **Bilsborrow Aff., Ex. 43**, there is no evidence any such meetings were scheduled or took place.

119. Taconic also installed GAC systems on process wells 1, 2 & 3. Pre and post GAC samples were sent to Exygen in January of 2006 for wells 1 & 3. These tests revealed pre-GAC PFOA levels of 18.8 ppb in well # 1 and 1.48 ppb in well #3 and after GAC treatment levels of .725 ppb and .0738 ppb respectively. Bottled water was provided both to workers and to residents in the homes that Taconic owned where PFOA was detected in well water, although the timing of the latter is in dispute. No GAC systems were installed on the residences nor is there evidence that residents were told about the PFOA in the water or warned not to cook or bathe with it. Moreover, after the GAC systems were installed, they were never maintained by replacing the activated carbon beds **Bilsborrow Aff., Ex. 9 at 150, 265**.

120. There are good industry practices that are well documented for conducting groundwater quality investigations; but Taconic seemed either to be ignorant of them or simply ignored these. This company clearly understood or should have understood by 2005 that PFOA groundwater contamination was the result of legacy pollution stemming from its practices. Long before C8 groundwater contamination became a regulated issue there were a variety of sciences, strategies, technologies and actions applied to assessing human and ecological risks from the contamination. Very little of the well-established practices to assessing impacts from groundwater contamination appear to have been applied by Taconic. The following is a summary of the good industry practices it could have applied in order to delineate contamination, assess risks to the community, and begin addressing remediation.

121. *Environmental Site Assessment Practices* - The first step in assessing impacts requires a body of good practices that are recognized by industry on the whole and is referred to as the *environmental site assessment*. The site assessment that Taconic applied was superficial or at the very least has not been well documented and shared in the discovery records.

122. The goal of an environmental site assessment is to identify recognized environmental conditions. The term *recognized environmental conditions* means "the presence or likely presence of any *hazardous substances*… on a *property* under conditions that indicate an existing release, a past release, or a material threat of a release of any *hazardous substances*… into structures on the *property* or into the ground, groundwater, or surface water of the *property*."[27]

123. The control of hazardous substances and the prevention of the entry of these substances into the environment is the objective of several acts of U.S. Congress. Rules regulating various aspects of hazardous waste can be attributed to the Toxic Substances Control Act (TSCA); the Clean Water Act (CWA); the Clean Air Act (CAA); the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); the Safe Drinking Water Act (SDWA); the Resource Conservation and Recovery Act (RCRA); and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

124. Good practices for assessments are explained in Section 105 of CERCLA and part of the National Contingency Plan (NCP), developed under the Clean Water Act. Subpart F of the NCP, Hazardous Substance Response, establishes a seven phase approach for determining the appropriate extent of a response "when any hazardous substance is released or there is a substantial threat of such a release into the environment, or there is a release or substantial threat of a release of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare."[28] Each phase sets specific criteria to establish the need for further action. The Phases are:

- Phase I – Discovery and Notification
- Phase II – Preliminary Approval

[27] ASTM Designation: E 1527 – 97
[28] *Characterization of Hazardous Waste Sites: A Methods Manual, Volume I – Site Investigations*, EPA/600/4-84/075, April 1985.

- Phase III – Immediate Removal
- Phase IV – Evaluation and Determination of Appropriate Response – Planned Removal and Remedial Action
- Phase V – Planned Removal
- Phase VI – Remedial Action
- Phase VII – Documentation and Cost Recovery

125. This phased approach is the basis for implementation of all CERCLA-authorized Hazardous Substance Responses to which industry is obligated to comply. While Taconic may not have been subject to these practices from a statutory standpoint, nothing prevented it from following them or some version of them. I don't find these practices or anything approaching these practices in any of Taconic's records until about 11 years after it concluded that the groundwater beneath its property had been impacted by its operations.

126. In 1984 the U.S.EPA published a nationwide strategy for ground water protection.[29] U.S.EPA stated that "ground water contamination looms as a major environmental issue… The attention of agencies at all levels of government, as well as that of industry and environmentalists, is now focused on this vital resource. As contamination has appeared in well water and wells have been closed, the public has expressed growing concern about the health implications of inappropriate use and disposal of chemicals. As concern has increased, so have demands for expanded protection of the resource." This apparently was not of importance to Taconic in 2005 or at any other point in time before 2016 or, if it was of importance to Taconic, the company did not follow this strategy.

[29] U.S. Environmental Protection Agency, Office of Ground-Water Protection, Washington, DC, August 1984.

127. The American Society of Testing Materials (ASTM) developed the RBCA standards. RBCA stands for *Risk-Based Corrective Action* which is a generic term for corrective action strategies that categorizes a site according to risk and moves the site toward completion using appropriate levels of action and oversight. The most recent ASTM standard provides a framework for implementing a RBCA strategy. With this process, regulators and investigators can make sound, quick, consistent management decisions for a variety of sites using a three-tiered approach to data collection and site review contained in ASTM's E1739 standard guide. The RBCA helps to categorize sites according to risk; allocate resources for maximum protection of human health and the environment, and provide resources for appropriate levels of oversight. These actions are intended to assist sites to move forward quickly towards defining risks and mitigating them. I don't see these concepts or practices having been applied by Taconic at any point prior to 2016.

128. The ASTM RBCA standard, like the early standards established by the U.S.EPA in 1985, is intended to identify exposure pathways and receptors at a site; determine the level and urgency of response required at a site; determine the level of oversight appropriate for a site; incorporate risk analysis into all phases of the corrective action process; and enable selection of appropriate and cost-effective corrective action measures. RBCA is not a substitute for corrective action, but a tool for determining the amount and urgency of action necessary. Again I don't see this or anything like it as part of Taconic's efforts between 2005 and 2016.

129. The ASTM standard (E1739) is based on a "tiered" approach to risk and exposure assessment, where each tier refers to a different level of complexity. The goal of all of ASTM's tiers is to achieve similar levels of protection. The difference is that, in moving to higher tiers,

more efficient and cost-effective corrective action results because the conservative assumptions of earlier tiers are replaced with more realistic site-specific assumptions.

130. Beginning circa 1980, the U.S.EPA began to steadily develop best practices for conducting environmental site assessments. These best practices were widely published and accessible to industry. By 1985, well-defined best practices were established, constituting the foundation for further refinements over the next decade. From about 1995 onward, further refinements to both technologies that aid in site assessments as well as more refined best management practices were devised and published by the ASTM and later further refined by such organizations as the World Bank Organization (WBO), ANSI, ISO, and others. In 1985, U.S.EPA published a three-volume manual of best practices for industry to follow when conducting environmental site assessments. The first volume was titled: *Characterization of Hazardous Waste Sites: A Methods Manual, Volume I – Site Investigations*.[30] The following are excerpts from the publication, annotated in some instances with my comments. Overall the statements and recommended good industry practices are self-evident.

- "At the first meeting of the Agency-Wide Steering Group for the Development of a Methods Manual for Characterization of Hazardous Waste Sites in August 1981, the scope of the planned Available Methods Manual was expanded from sampling and analysis to site characterization. The steering group agreed that *sampling and analysis of hazardous wastes must be closely tied to sampling and analysis strategy. Before methods can be useful, they must be related to the purposes and objectives of sampling and analysis. Such an association leads to the necessity of considering all aspects of hazardous waste site characterization*."

    - As early as 1981 the U.S.EPA recognized and recommended that proper site characterization requires that a strategy with clearly defined objectives be established in order to properly identify and characterize the environmental conditions of a property.

[30] *Characterization of Hazardous Waste Sites: A Methods Manual, Volume I – Site Investigations*, EPA/600/4-84/075, April 1985.

- "The objective of this manual is to provide field and laboratory managers, investigators, and technicians with a consolidated source of information on the subject of hazardous waste site characterization. The manual covers the range of endeavors necessary to characterize hazardous waste sites, from preliminary data gathering to sampling and analysis."

- "Because of the large number of subjects covered in this manual and the need to provide detailed methodology in the areas of sampling and sample analysis, this manual comprises three volumes: Volume I - Site Investigations; Volume II - Available Sampling Methods; Volume III - Available Laboratory Analytical Methods."

- U.S.EPA's 1985 multi-volume manual of practices provides guidance on information gathering activities in support of the requirements specified in the National Oil and Hazardous Substances Pollution Contingency Plan. "The National Contingency Plan contains a seven-phase approach to implementing the authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Each phase represents a level of response dependent upon the situation. Information must be obtained to determine the appropriate level of environmental response. Both *remedial and enforcement actions under CERCLA require reliable site information*. This volume describes approaches to obtaining this information and follows a semi-chronological order through subsequent phases of the National Contingency Plan. These steps range from *preliminary data gathering*, *to site inspections*, *to large field investigations*."

131. U.S.EPA's manual described policies and procedures common to all data gathering efforts, such as personal conduct, document control, and quality assurance. Sections included in the manual provided a framework for gathering the required information. U.S.EPA detailed what information is necessary, where that information can be found and how the information can be acquired in an environmental site assessment. Its manual presented topics such as investigative conduct, documentation and recordkeeping, quality assurance, site entry, etc., from the viewpoint of Agency policy. It stated that although its discussions were based on EPA policy, they were intended to "serve as a guideline for anyone conducting a hazardous waste site investigation." U.S.EPA stated that the following requirements constitute good practices: Persons conducting

hazardous waste site investigations must "develop and report the facts of an investigation completely, accurately, and objectively." I do not find that Taconic followed these practices or anything like them.

132. On p. 2-3 EPA's document control practices are discussed. "The purpose of document control is to assure that all project documents issued to or generated during hazardous waste site investigations will be accounted for when the project is completed. *The purpose is achieved through a program which makes all investigation documents accountable. This should include serialized document numbering, document inventory procedures, and an evidentiary filing system*. Accountable documents used or generated during investigations include: Project Work Plans, Project Logbooks, Field Logbooks, Sample Data Sheets, Sample Tags, Chain-of-Custody Records and Seals, Laboratory Logbooks, Laboratory Data, Calculation, Graphs, etc., Sample Checkout, Sample Inventory, Internal Memos, External Written Communication, Business Confidential Information, Photographs, Drawings, Maps, Quality Assurance Plan, Litigation or Enforcement Sensitive Documents, and Final Report." I find none of this among Taconic's records until beginning about 2016.

133. EPA recognized that site investigations have the potential to generate large volumes of information and reports and that document control is an essential element to controlling information, and in support of any analysis applied towards remediation. It recommended that each document be assigned a "serialized number" and be "listed, with the number, in a project document inventory assembled at the project's completion."

134. Beginning on p. 2-17 of Volume I, U.S.EPA recommended good practices to be applied in environmental site assessments to ensure high quality and reliability throughout the assessment and in developing remedial actions.

135. Section 4 (beginning p. 4-1) of EPA's 1985 good practices manual provides practices, protocols and stepwise procedures for data gathering in order to perform a proper environmental site assessment. EPA recommended that a task should be "initiated to collect and review available information about the known or suspected hazardous substance site or release." EPA's recommended practices constitute what is commonly referred to as a Phase I environmental audit.

136. In Section 5, beginning on p. 5-1, EPA provided detailed procedures, protocols and best practices for conducting site inspections. It defined these as being important components of Phase II, Preliminary Assessment and Phase IV, Evaluation and Determination of Appropriate Response - Planned Removal and Remedial Action. It stated that the "major objective of a site inspection is to determine if there is any immediate danger to persons living or working near the facility." It explained in great detail the recommended practices, protocols and procedures for conducting these activities and stated that the primary items addressed during the site inspection are:

- "A determination of the need for immediate removal action";
- "An assessment of the amounts, types and location of stored hazardous substances";
- "An assessment of the potential for substances to migrate"; and
- "Documentation of immediate threats to the public or environment."

Again, I find no such information considered by Taconic over the years.

137. On p.5-7 EPA recommended that "information regarding population size and distribution should be available from the preliminary assessment. In many instances this information, if obtained from state or regional agencies will be somewhat dated. It is important therefore to tour the area assessing the likelihood of significant demographic changes. Recently

constructed housing developments, apartments, schools and public buildings may indicate that changes have occurred since the information was published." Such practices were recommended in order for the environmental site assessment to define the potential risks of hazardous substances on site to neighboring off-site receptors. Again Taconic has not produced records demonstrating these factors were ever considered.

138. Beginning on p. 6-1 EPA addressed the need and best practices for data evaluation. It wrote that "a data assessment is performed to ultimately assist in formulating response management decisions affecting later stages of the investigation. The data evaluation may also indicate data gaps which need to be filled either by further background research or additional site inspections (or an initial inspection if one has not yet been conducted)… The evaluation should encompass the scope detailed below:

- the existence (or nonexistence) or a potential hazardous waste problem;
- probable seriousness of the problem and the priority for further investigation or action; and
- the type of action or investigation appropriate to the situation.

139. In 1996 the ASTM published its standard Designation: E 1528 – 96: *Standard Practice for Environmental Site Assessments: Transaction Screen Process*. It wrote "The purpose of this practice, as well as Practice E 1527, is to define good commercial and customary practice in the United States of America for conducting an *environmental site assessment* of a parcel of *commercial real estate* with respect to the range of contaminants within the scope of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and *petroleum products*…" It further defined the term *Recognized Environmental Conditions*, of which it wrote, "In defining a standard of good commercial and customary practice for conducting an *environmental site assessment* of a parcel of *property*, the goal of the processes established by this practice is to identify *recognized environmental conditions*. The term *recognized environmental*

conditions means the presence or likely presence of any *hazardous substances* or *petroleum products* on a *property* under conditions that indicate an existing release, a past release, or a material threat of a release of any *hazardous substances* or *petroleum products* into structures on the *property* or into the ground, groundwater, or surface water of the *property*. The term includes *hazardous substances* or *petroleum products* even under conditions in compliance with laws. The term is not intended to include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment."

140. It further wrote "Objectives guiding the development of this practice and Practice E 1527 are (1) to synthesize and put in writing good commercial and customary practice for *environmental site assessments* for *commercial real estate*, (2) to facilitate high quality, standardized *environmental site assessments*, (3) to ensure that the standard of *appropriate inquiry* is practical and reasonable…" Again, I do not see any actions on the part of Taconic which are consistent with these practices.

141. In 1997 the ASTM published its standard Designation: Designation: E 1903 – 97: *Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process*. It wrote "The primary objectives of conducting a Phase II ESA are to evaluate the recognized environmental conditions identified in the Phase I ESA or transaction screen process for the purpose of providing sufficient information regarding the nature and extent of contamination to assist in making informed business decisions about the property . . . ."

142. ASTM further stated in E 1903 – 97: "At the completion of a Phase II ESA, the environmental professional should be able to conclude, at a minimum, that either *(a)* the ESA has provided sufficient information to render a professional opinion that there is no reasonable basis to suspect the presence of hazardous substances or petroleum products at the property associated

with the recognized environmental conditions under assessment, or *(b)* the ESA has confirmed the presence of hazardous substances or petroleum products at the property under conditions that indicate disposal or release. If the information developed in the ESA is insufficient for the environmental professional to reach either of these conclusions, the environmental professional may recommend additional iterations of assessment if warranted to meet the objectives of the user. If the environmental professional reasonably suspects that unconfirmed hazardous substance releases remain but concludes that further reasonable assessment is not expected to provide additional information of significant value, he may recommend that further assessment is not warranted. In such circumstances, the recommendation for no further assessment should be accompanied by an explanation why a reasonable suspicion of releases remains and why further reasonable assessment is not warranted." Taconic made no such determinations.

143. *Establishing Cleanup Goals* – The basis of any groundwater remediation strategy needs to take into consideration the risks to receptors, current technology, regulatory requirements and trends, and cost considerations. State agencies publish risk-based cleanup criteria for industrial sites and recognize "mixing zone" concepts which allow stable contaminated plumes to attenuate in place so long as surface water and drinking water resources are protected. ASTM has also developed a risk-based corrective action (RBCA) standard for chlorinated solvents that is similar to the standard developed for fuel. I see no consideration of these criteria in any of the work Taconic did over the years to address ground water contamination.

144. *Conceptual Models* – The nature and extent of a site's groundwater contamination must be defined in part with a conceptual model. The investigator needs to develop a useful conceptual site model or update an existing one and determine what human or ecological receptors may be at risk and how to limit their exposure to the contamination.

145. An accurate conceptual site model is critical to evaluating the true risk of contamination, as well as the possibilities and limitations of site remediation strategies. A complete model should include a visual representation of contaminant source and release information, site geology and hydrology, contaminant distribution, fate and transport parameters, and risk assessment features such as current and future land use and potential exposure pathways and receptors.

146. The conceptual site model should be developed as a part of the site investigation or feasibility study phase of site remediation. Many interim remedial systems have been installed and are operating without a well-defined model; oftentimes leading to major cost overruns or inability to achieve cleanup goals within reasonable time periods. Some remedial systems were designed based on an initial model that requires updating based on recent operations and monitoring data.

147. The conceptual site model should include a description of the source of contamination and what is known about the timing and quantity of the release. Most site characterizations begin by locating areas where chemical contaminants were originally released to the subsurface. In many cases, the distinct source of contamination is known to be a former underground storage tank (UST), disposal pit, a leaking pipeline, a spill, etc.

148. A conceptual site model should include a summary of the chemical, physical, and biodegradation properties of key contaminants of concern and describe their distribution, movement, and fate in the subsurface environment. Descriptions should include:

- Chemical and physical properties of the chemical contaminants that impact subsurface transport (e.g., partitioning coefficients, solubility, vapor pressure, Henry's Constant, density, viscosity);

- Estimate of the phase distribution of each contaminant (free-phase DNAPL, sorbed, in soil vapor, or dissolved) in the saturated and unsaturated zone;

- Temporal trends in contaminant concentrations in each phase;

- Geochemical evidence of contaminant natural attenuation processes (destructive and nondestructive).

149. Taconic's records don't support that it undertook efforts to develop a conceptual model to assist it in addressing cleanup actions or reducing risks to community.

150. Risk Assessment – Elements that need to be included in assessments are:

- Analysis of potential receptors (current and future) which could be impacted by groundwater contamination.

- Analysis of potential exposure pathways that could allow chemical contaminants to impact receptors.

- Determination of the level of contaminant exposure that will not present an unacceptable risk to impacted receptors (i.e., risk-based cleanup goals).

- Measurement of contaminant concentrations at potential exposure points or estimation of exposure point concentrations using fate and transport models. Exposure concentrations should be compared against risk-based cleanup goals.

151. The goal of risk-based remediation is to find the most cost-effective method of reducing present and future risk by combining risk reduction strategies. Risk-reduction strategies include:

- Chemical Source Reduction – Achieved by natural attenuation processes over time or by engineered removals such as excavation and soil vapor extraction or other appropriate remedial technology.

- Chemical Pathway Elimination – Examples include the natural attenuation of a groundwater plume, semi-permeable barrier walls or pumping to stop the migration of contaminants toward downgradient receptors.

- Restrict/Protect Receptors – Land use and groundwater use controls such as site fencing, surface capping, digging restrictions, protective clothing, and groundwater well restrictions can eliminate chemical

exposure until natural attenuation or engineered remediation reduce the chemical source.

152. Taconic's records do not support that it undertook any risk-based assessments. EPA reports that important considerations for defining risk-based goals are:

- Determining the risk-based screening levels that are appropriate for a contaminated site;
- Developing site-specific cleanup goals based on realistic exposure scenarios at the site; and
- Estimating the average exposure concentration as opposed to the maximum concentration at the site.

153. Once a conceptual site model has been devised, defining the source of chemical contamination, potential pathways, and potential receptors, the task of defining risk-based cleanup objectives may begin. This can be approached as a two-step process involving the following actions:

- First, an initial comparison of potential exposure concentrations to conservative industrial screening levels for each contaminant of concern can be made. For sites with potential discharges to surface water bodies, a comparison to ecological screening levels may be deemed appropriate.
- Next, any contaminant exceeding conservative screening levels can be evaluated using more realistic, site-specific exposure assumptions to determine if an unacceptable human health or ecological risk could actually or potentially exist.

154. A two-step approach provides flexibility to replace potentially conservative, non-site-specific exposure assumptions with site-specific information, while still providing the same level of human health and environmental resource protection. The investigator is likely to encounter increasingly complex levels of data collection and risk along the process. The progressive evaluation will need to be performed in order to establish the type and magnitude of remediation required to reduce or eliminate unacceptable risks at a particular site. This may be

accomplished by replacing non site-specific (i.e., default) assumptions about how chemicals behave in the environment and how receptors may be exposed, with site-specific data and assumptions that are more representative of actual site conditions and realistic exposure pathways for human and ecological receptors.

155. A screening level evaluation provides a means of identifying whether a particular chemical warrants additional risk evaluation. Screening levels are conservative (health protective), generic cleanup criteria that define the residual amount of a contaminant that can remain onsite and not present an unacceptable risk to potential receptors. For sites with the potential for discharge to surface waters, ecological screening levels are appropriate.

156. Many of the above good practices set forth above were available from the mid-1980s and were refined with more precise guidance in the years that followed. By 2005, Taconic had no excuses not to have applied these tools to delineating off site contamination, assessing community risks, devising remedial actions, and most important of all – warning community members that the groundwater was unfit to drink.

Nicholas P. Cheremisinoff, Ph.D.

Sworn to this 30TH
day of April, 2019

Notary Public