Protecting Children Attending School Through Effective Regulations of Harmful Volatile Organic Compounds

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Part I. INTRODUCTION

The United States Environmental Protection Agency (EPA) has a regulation known as the Federal Clean Air Act.¹ Currently, the Federal Clean Air Act only sets the framework for air pollution control as it affects industrial settings.² Although industrial facilities are not major sources of ozone depletion per se; they are sources of high emissions of volatile organic compounds (VOCs), which are the precursors of ozone depletion.³ The EPA has not established standards for indoor VOCs and nonindustrial settings. As a result, public health is compromised as states and communities are left to determine policies relating to land development and indoor safety standards.

The Environmental Protection Agency has set National Ambient Air Quality Standards for six pollutants including ozone, carbon monoxide, particulate matter, sulfur dioxide, nitrogen oxide, and lead. These standards limit the concentration of pollutants in the air to protect public health and welfare.

¹ 42 U.S.C. § 7401 (1990); see also [http://www.epw.senate.gov/envlaws/cleanair.pdf](http://www.epw.senate.gov/envlaws/cleanair.pdf). Specifically section 103 states that “Air Pollutant Monitoring, Analysis, Modeling, and Inventory Research – in carrying out subsection (a), the Administrator shall conduct a program of research, testing and development of methods for sampling, measurement, monitoring, analysis, and modeling of air pollutants. Such program shall include the following elements:…..(3) Development of improved methods and technologies for sampling, measurement, monitoring, analysis, and modeling to increase understanding of the sources of ozone precursors, ozone formation, ozone transport, regional influences on urban ozone, regional ozone trends, and interactions of ozone with other pollutants. Emphasis shall be placed on those techniques which…..(B) improve the understanding of the mechanism through which anthropogenic and biogenic volatile organic compounds react to form ozone and other oxidants…” Section 112 provides for “ambient monitoring for a broad range of hazardous pollutants (including but not limited to, volatile organic compounds…) in a representative number of urban locations…”

² Id.

dioxide, and lead. These standards are used as a foundation for the regulatory framework for industries. Of the six pollutants, only the National Ambient Air Quality Standards (NAAQS) for ozone depletion is likely to have a significant impact on the regulations of industrial companies. Although there is a NAAQS for ozone depletion precursors, the relevant emissions for monitoring purposes are VOCs. It also provides a list of the general definition and requirements for substances to be classified as VOCs. These regulations are done by placing restrictions on national primary and secondary ambient air quality in industrial settings, but not in nonindustrial settings.

Volatile organic compounds are carbon-based compounds that are emitted as gases from certain solids or liquids. Organic chemical compounds are those whose composition makes it possible for them to evaporate under normal indoor atmospheric conditions of temperature and pressure. The ability of organic chemicals to cause health effects varies greatly from those that are highly toxic, to those with no known human health effect. When discussing indoor environments and air quality, all organic chemical compounds that can volatize under normal

4 Section A. Clean Air Act Requirements, supra note 3.
5 Id.
6 Id.
7 Id.
8 Id.
12 An Introduction to Indoor Air Quality, supra note 10.
indoor atmospheric conditions of temperature and pressure are VOCs.\textsuperscript{13} Other than volatility (or boiling point) no other criteria are used to define VOCs indoors.\textsuperscript{14}

Because Americans spend approximately twenty-two hours every day indoors, children, seniors and susceptible adults are at a much greater risk for adverse health effects from chronic low levels of exposure to indoor air pollutants.\textsuperscript{15} Healthy school environments are necessary for the vigorous growth and development of children. There are serious health consequences that may arise when schools are planned and built in highly industrial areas that produce high levels of pollution. Children are more susceptible than adults to air pollution and the hazardous substances they produce. The vulnerability of minors to this type of pollution arises from the fact that their lungs are still developing, causing them to have narrow airways.\textsuperscript{16} Respiratory and cardiovascular complications, headaches, eye and throat irritation, cancer and even premature death are just some of the wide array of the harmful impacts resulting from urban pollution. Pollutants have also been linked to negatively impacting development processes, nervous, reproductive, and immune and digestive systems in children. The irritation that is caused by air pollutants results in potentially significant obstruction in the airways of young children, whereas in healthy adults those same pollutants might produce only a minor response.\textsuperscript{17}

\textsuperscript{13} Volatile Organic Compounds Technical Overview, supra note 11.

\textsuperscript{14} Id.

\textsuperscript{15} Jonathan A. Bernstein et al., The Health Effects of Nonindustrial Indoor Air Pollution, American Academy of Allergy, Asthma & Immunology 114; 116-1123 (2004).


\textsuperscript{17} Id.
With so many potential hazardous dangers lurking around the facilities where children are sent to learn and grow, as well as where they live with their parents, why are there no EPA regulations in place to make sure future generations strive in a healthy and flourishing environment? Why are there not more environmental justice concerns with respect to neighborhood and school location contaminations? There should be a greater concern for the growing awareness of dangers posed by the locations of schools and neighborhoods. Because children spend much of their time in schools, schools are an integral component for addressing the overall environment for children. Building a school or low-income neighborhood on top of land that was previously a landfill or is located near an industrial facility, poses a high danger of both short term and long term health effects and potential industrial catastrophes. These oblige a closer look at the current policies by the Environmental Protection Agency to provide minimal regulations for industrial sites but not requiring any such regulations for nonindustrial areas. Due to the non-existence of regulations for nonindustrial sites, there should be at a minimum, suggestion for local governments to consider in relation to pollutants and VOCs when placing schools and neighborhoods on contaminated land.

**Part II. THE FEDERAL CLEAN AIR ACT**

The Federal Clean Air Act establishes a system for regulating air pollution that all of the states must comply.\(^\text{18}\) It should be noted that the last amendments were added in 1995, almost over twenty years ago.\(^\text{19}\) Section 130 of the Federal Clean Air Act states that “Emission Factors… Within six months after enactment of the Clean Air Act Amendments of 1990, and at


least every three years thereafter, the Administrator shall review and, if necessary, revise the methods (“emission factors”) used for the purposes of this Act to estimate the quantity of emissions of carbon monoxide, volatile organic compounds, and oxides of nitrogen from sources of such air pollutants (including area sources and mobile sources). In addition, the Administrator shall establish emission factors for sources for which no such methods have previously been established by the Administrator.”

A major limitation of understanding the adverse health effects of these specific air pollutants stems from most individual’s inability to directly relate to these health concerns and the understanding that is needed to equate the measurable amounts of ambient air concentrations and their effects through personal exposure. The main complication that occurs with the procedures and regulations of the Federal Clean Air Act, pertaining to the non-occupational indoor settings, is that the environmental exposures that are present are often more subtle and not readily or easily recognized.

Currently, there is very limited information available with regards to the permissible exposure levels in a nonindustrial setting, such as the homes, schools, and workplace. Experts have maintained that it is recommended for indoor air pollutant levels to be maintained at 50%, or even less, than the registered levels under the National Ambient Air Quality Standards.

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21 Jonathan A. Bernstein et al., supra note 15.

22 Id.

23 Id.

24 Id.
These established standards for outdoor air pollutants have been set forth by the Environmental Protection Agency.25

The air quality control regions throughout the country are rated based on whether they meet the national air quality standards for each of these designated pollutants.26 “Nonattainment areas” are regions which do not meet the mandated levels for any of the criteria pollutants.27 Areas that test positive for the presence of pollutants must begin efforts to reduce emissions.28

The EPA’s National Ambient Air Quality Standard establishes levels of air quality that are to be applied uniformly throughout regions in the United States.29 However this standard applies only to a small number of the most common pollutants.30 The EPA has authorized Maximum Achievable Control Technology standards for source categories that emit at least one of the pollutants on the list.31

Currently, the Federal Clean Air Act only sets the framework for air pollution control as it affects the electronics industry.32 Companies in the electronic industry use chemicals that they have identified as being harmful in use when preparing the manufacture of semiconductors,

25 Id.

26 See 40 C.F.R. §§ 81.11 81.275 (1999) for a list of designated air quality control regions.

27 Id. at §§ 7407(d), 7501(2).

28 Id. at § 7502.


30 Id.

31 Id.

printed wiring board manufacturing, semiconductor packaging and displaying manufacturing industries. Individual facilities have their own chemical use patterns which ultimately mean that a particular facility may use chemicals that are not listed in the Federal Clean Air Act. They also may use some but not all of unregulated chemicals. As a result, each facility must identify the universe of rules that apply to it by examining the regulations themselves. The applicability of many federal regulations is determined in part by the chemicals being used at a facility. This ultimately means that electronic industry companies are left to decide which chemicals they use are potentially harmful to the environment and which are not. This can make it quite difficult for these companies to follow the limited regulations set forth in the Federal Clean Air Act.

The permit system is an approach that was established by the Amendments of the Federal Clean Air Act. This was designed to define each source’s requirements and to facilitate enforcement of the minimum standards and procedures that are required for the State operating permit programs. Under the current regulation system, any operating facility is required to

34 Id.
35 Id.
36 Id.
37 Id.
38 Id.
39 Federal Environmental Regulations Affecting the Electronics Industry, supra note 33.
40 40 C.F.R. § 70 (1990), supra note 32.
41 Id.
secure a permit by going through the required measures.\textsuperscript{42} The term “facility” is defined as a “major source” for pollutants and is thus required to secure a permit.\textsuperscript{43} Part 70.2 defines “source” as the single point from which emissions are released as entire industrial facility that is under control of the same person.\textsuperscript{44} The term “Major source” is defined as any source that emits or has the potential to emit certain amounts of VOCs.\textsuperscript{45} Federal and State Regulations are to be followed to allow for permit to be received.\textsuperscript{46} However, once a permit is submitted, the industrial operations may still be operated until permit is approved.\textsuperscript{47}

**Part III. CURRENT PROTOCOLS BY THE ENVIRONMENTAL PROTECTION AGENCY SPECIFICALLY IMPLEMENTED TO PROTECT CHILDREN**

Studies have shown that children have a unique vulnerability to air pollution.\textsuperscript{48} They are considered to be more vulnerable due to the disproportionately high levels of exposure and biomedical susceptibility.\textsuperscript{49} Children, mainly while at school or home, partake in more outdoor

\textsuperscript{42} Id.

\textsuperscript{43} Id.

\textsuperscript{44} 40 C.F.R. § 70 (1990), \textit{supra} note 32, at § 70.2.

\textsuperscript{45} 40 C.F.R. § 70 (1990), \textit{supra} note 32.

\textsuperscript{46} Id.

\textsuperscript{47} Id.


\textsuperscript{49} Id.
activities than adults. The air pollution that is caused by industrial facilities is the main cause for air pollution.

Poor and minority communities suffer the most from the effects of industrial air pollution. Historically, they are more likely to bear the burden of having to live near these industrial facilities, which in turn exposes them to environmental hazards at disproportional rates. Low-income communities are greatly impacted due to the lack of resources to cope with and recover from health problems that are associated with the air pollution. Hispanic residents are twice as likely to live in an affected region, with African Americans residents just as likely. Studies have found that hazardous industrial facilities are largely located near or around minority communities.

Children living in these low-income and minority communities suffer from industrial pollution at higher rates than children who do not live in these areas. Higher rates of respiratory

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50 Gilliland, supra note 48.


54 Pastor, supra note 52.

55 Id.

56 Id.
problems, mainly asthma, have been reported in poor minority children, specifically in African American children.\textsuperscript{57}

Congress enacted the Energy Independence and Security Act in December 2007.\textsuperscript{58} A provision of this act included a requirement of the United States Environmental Protection Agency to develop model guidelines for the siting of school facilities that take into account;

“(1) special vulnerabilities of children to hazardous substances or pollution exposures in any case in which the potential for contamination at a potential school site exists; (2) the modes of transportation available to students and staff; (3) The efficient use of energy; and (4) the potential use of a school at a site as an emergency shelter.”\textsuperscript{59}

These guidelines are strictly voluntary, but were implemented to encourage, inform and improve the consideration of environmental factors in local school siting decision making processes without infringing on the local decision making agency.\textsuperscript{60} The goal for these guidelines seems overreaching as it states “to serve children, staff and the broader community by supporting states, tribes, communities, local officials and the public in understanding and appropriately considering environmental and public health factors when making school siting decisions”.\textsuperscript{61} All of the factors that are used in these guidelines are for the purpose of “encouraging” or “demonstrating” the need for regulations throughout the process of choosing land for building a new school.\textsuperscript{62} The

\textsuperscript{57} Gillilland, supra note 48.


\textsuperscript{61} United States Environmental Protection Agency School Siting Guidelines, supra note 59.

\textsuperscript{62} Id.
Environmental Protection Agency believes that the “recommendations in these guidelines represent a set of best practices that inform and improve evaluation and selection decisions for a wide range of settings where children spend their time”. 63

The main purpose of a school is to provide a safe, healthy and supportive environment in which children can learn. Children spend nearly a third of their typical day in their school environment. 64 While in these buildings, they may be exposed to a range of contaminants both indoors and outdoors. 65 Each location for a school may have different underlying causes of potential exposure, which include contamination, neighborhood emission sources or indoor air quality problems. 66 Children are more vulnerable to environmental exposure because their responses to these toxic substances, both in severity and in the nature of the adverse effect, can differ markedly from those of adults. 67

**Part IV. VOLATILE ORGANIC COMPOUNDS**

Volatile organic compounds are any compound of carbon that precipitates in atmospheric photochemical reactions, except those that are designated by the Environmental Protection Agency as having negligible photochemical reactivity. 68 Carbon monoxide, carbon dioxide,

63 Id.
64 EPA School Siting Task Force, supra note 60.
65 United States Environmental Protection Agency School Siting Guidelines, supra note 59.
carbon acid, metallic carbides and carbonates are excluded from the carbon compounds.\textsuperscript{69} The composition of these organic chemical compounds makes it possible for them to be evaporated under normal indoor atmospheric conditions of temperature and pressure.\textsuperscript{70}

VOCs are categorized by their ease of ability to emit.\textsuperscript{71} Very volatile organic compounds are so unstable and unpredictable that they are very difficult to measure and are found almost entirely as gases in the air rather than in materials or on surfaces.\textsuperscript{72} All available measurement methods are selective in what they can measure and quantify accurately, and none are capable of measuring all VOCs that are present.\textsuperscript{73} The range of measurement methods and analytical instruments is large and will determine the sensitivity of the measurements as well as their selectivity and biases.\textsuperscript{74} Least volatile compounds that are found in the air constitute a far smaller fraction of the total amount present indoors.\textsuperscript{75} The majority of these compounds are found in solids or liquids that contain them or on surfaces including dust, furniture and building materials.\textsuperscript{76}

\textsuperscript{69} Id.
\textsuperscript{70} Id.
\textsuperscript{71} Id.
\textsuperscript{72} Id.
\textsuperscript{73} Id.
\textsuperscript{74} \textit{Volatile Organic Compound, supra} note 68.
\textsuperscript{75} Id.
\textsuperscript{76} Id.
Adverse health effects that have been attributed to indoor VOCs include, but are not limited to, systemic effects such as headaches and loss of concentration.\textsuperscript{77} The irritant effects of VOC exposure include eye, nose and throat irritation.\textsuperscript{78} Toxic effects are damage to the liver, kidney, and central nervous system, as well as cancer or sick building syndrome.\textsuperscript{79} Sick building syndrome occurs when one becomes suddenly ill while occupying a building, such as a home, office, or other buildings, that is contaminated with one or more chemicals and/or organic compounds.\textsuperscript{80} Symptoms of sick building syndrome include headache, nausea, fever, dizziness, eye or skin irritation, dry cough or fatigue.\textsuperscript{81} These symptoms may lessen or even disappear upon leaving the contaminated building and can be controlled by eliminating or removing the source.\textsuperscript{82} Frequent causes of sick building syndrome are poor ventilation, mold, dust mites, bacteria, pollen, and chemical contaminants like volatile organic compounds.\textsuperscript{83}

Examples or VOCs in common household goods include paints, lacquers, cleaning supplies, pesticides, hairspray, makeup, carpet, dishwashers, and dry-cleaned clothes.\textsuperscript{84} VOCs can also be found in office supplies and goods such as building materials, furnishings, copiers, copiers, copiers.

\textsuperscript{77} Jonathan A. Bernstein et al., \textit{supra} note 18.
\textsuperscript{78} Id.
\textsuperscript{79} Id.
\textsuperscript{80} Melissa Kaplan, Chronic Neuroimmune Diseases – Sick Building Syndrome Victims of mysterial illness suffers from public ignorance. SF Gate 2013; \url{http://www.anapsid.org/cnd/mcs/ei4.html}. (last visited on Feb. 1, 2014).
\textsuperscript{81} \textit{What is Sick Building Syndrome?}, About.com Home Green LivingAbout.com, \url{http://greenliving.about.com/od/architecture/design/g/sick_building Syndrome.html}. (last visited on Sep. 6, 2013).
\textsuperscript{82} Id.
\textsuperscript{83} Id.
\textsuperscript{84} An Introduction to Indoor Air Quality, \textit{supra} note 10.
printers, correction fluids, carbonless copy paper, glue, permanent markers, and many photographic solutions.\textsuperscript{85}

The impact of VOCs in industrial settings as well as outdoors is regulated by the Environmental Protection Agency.\textsuperscript{86} This is to prevent the formation of ozone photochemical smog.\textsuperscript{87} Ozone is considered a secondary pollutant because it is not emitted directly into the air, but rather it is created when VOCs react with nitrogen oxides in the presence of sunlight.\textsuperscript{88} Although photochemical smog is often invisible, it can be extremely harmful, leading to irritations of the respiratory tract and eyes.\textsuperscript{89} Photochemical smog is a serious problem in many cities and continues to be quite harmful for senior citizens, children, and people with heart and lung conditions such as emphysema, bronchitis and asthma.\textsuperscript{90} Elevated rates of death and respiratory illnesses have been observed in regions of the world with high concentrations of photochemical smog.\textsuperscript{91}

Many VOCs form ground-level ozone, but only some are considered reactive enough to be of concern.\textsuperscript{92} Those compounds that are non-reactive or of negligible reactivity to form ozone smog are not included in the definition of volatile organic compounds used by the Environmental

\textsuperscript{85} Id.
\textsuperscript{86} \textit{Volatile Organic Compound}, supra note 68.
\textsuperscript{87} Id.
\textsuperscript{90} Id.
\textsuperscript{91} Id.
\textsuperscript{92} \textit{Volatile Organic Compound}, supra note 68.
Protection Agency.\textsuperscript{93} Most states have their own individual VOC definition, including their own list of exceptions, but it is generally the same as the EPA’s definition.\textsuperscript{94}

For regulatory purposes by the Environmental Protection Agency, the specific definition of outdoor volatile organic compounds can change by what is excluded from the definition.\textsuperscript{95} Since first establishing the list of exempt compounds in 1997, the EPA has added several to the list, and frequently has several petitions for additional compounds undergoing review.\textsuperscript{96} The EPA formerly defined the regulated organic compounds in outdoor air as “Reactive Organic Gases”, which clarified its meaning as being limited to reactive chemicals.\textsuperscript{97} However, the EPA later changed that terminology to VOC and has ultimately created a misunderstanding when applied to indoor air quality.\textsuperscript{98} Many individuals and organizations, including manufacturers of building materials and products, and third party certification organizations, have come to think of VOCs as “only those regulated by EPA for outdoor air”, and apply the same definition for indoor air purposes.\textsuperscript{99} To the extent that some exempted compounds impact the health of exposed individuals indoors, the definition of VOCs regulated for outdoor air has the potential to create

\begin{itemize}
\item \textsuperscript{93} Id.
\item \textsuperscript{94} Id.
\item \textsuperscript{95} Id.
\item \textsuperscript{96} Id.
\item \textsuperscript{97} Id.
\item \textsuperscript{98} Volatile Organic Compound, supra note 68.
\item \textsuperscript{99} Id.
\end{itemize}
serious misconceptions for indoor air quality; therefore, such VOCs should not be excluded from consideration for indoor air.\textsuperscript{100}

To the extent that some compounds impact the health of exposed individuals indoors, the definition for volatile organic compounds in the use of industrial settings includes those that should not be excluded from consideration for indoor air or nonindustrial settings.\textsuperscript{101} The chemicals used in paint strippers and dry cleaning fluid are just a few examples of exempted compounds from the EPA’s definition for outdoor regulation.\textsuperscript{102} These could pose a serious health risk to individuals who are exposed in an indoor nonindustrial setting.\textsuperscript{103} Indoor volatile organic compounds react with indoor ozone even at concentrations that are below public health standards.\textsuperscript{104} The International Agency for Research on Cancer organizes nonindustrial volatile organic compounds into lists based on those that are potential human carcinogens and probable human carcinogens.\textsuperscript{105}

Americans spend more than 90\% of their time in indoor settings.\textsuperscript{106} VOCs are on average two to five times higher indoors than outdoors, regardless of whether the homes were located in rural or highly industrial settings.\textsuperscript{107} Common VOCs present in nonindustrial settings are emitted

\begin{thebibliography}{99}
\bibitem{100} Id.
\bibitem{101} Id.
\bibitem{102} Id.
\bibitem{103} Id.
\bibitem{104} Id.
\bibitem{105} Id.
\bibitem{106} Id.
\bibitem{107} Id.
\bibitem{68} Volatile Organic Compound, supra note 68.
\bibitem{10} An Introduction to Indoor Air Quality, supra note 10.
\end{thebibliography}
by a wide array of products numbering in the thousands. This list includes paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furniture, copiers, printers, copy paper, glues, permanent markers, cosmetics, carpet and so many more. VOCs persist in the air long after the product is used and the activity is completed while indoors.

It is important to know that the EPA does not regulate nonindustrial setting produced volatile organic compounds because these are of concern in indoor and outdoor settings that do not impact the photochemical oxidation. There has been a significant growth in public awareness regarding the risks and concerns of nonindustrial VOCs. Individuals are beginning to better understand the effects of VOCs and have started to attempt to eliminate them on their own. All indoor organic chemical compounds whose compositions give them the potential to evaporate under normal atmospheric conditions are considered VOCs and should be considered in any assessment that is done of indoor air quality impact.

Part V. IMPACT OF VOCS ON OUR CHILDREN AND THOSE WHO ARE ATTENDING SCHOOL

As disturbing as it may be, there are several court cases and incidences that involve children and teachers becoming seriously ill from the exposure of VOCs while they simply

\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Id.}\]
\[\text{Volatile Organic Compound, supra note 68.} \]
\[\text{42 U.S.C. § 7401 (1990), supra note 1.}\]
\[\text{Jonathan A. Bernstein et al., supra note 18.}\]
\[\text{Id.}\]
\[\text{Volatile Organic Compound, supra note 68.}\]
attend school on a regular basis. Due to their greater respiratory rates, children breathe a proportionately greater volume of air than adults and inhale more pollutants per pound of body weight.\textsuperscript{115} Children spend most of their time engaged in vigorous activity.\textsuperscript{116} Young children’s height and play habits, such as crawling and rolling around, mean they are more likely to be exposed to pollutants or aerosols that are heavier than air and tend to concentrate in their breathing zone near ground level.\textsuperscript{117}

The common denominator among these cases is that these are minority children from low-income families.\textsuperscript{118} They often attend school at a facility that was erected on the grounds of a recent industrial building or landfill where waste from these industrial companies were dumped and never moved or just covered over during construction.\textsuperscript{119} It has been proven that chronic exposures to low levels of VOCs can trigger attacks in people who have asthma, cause learning disabilities, and decrease IQ.\textsuperscript{120} These school-aged children have higher rates of environmentally induced illness than other children nationwide.\textsuperscript{121} As of 2008, only three states, Florida, California, and Utah, have policies regarding the siting of schools based on the prior use of the

\textsuperscript{115} Lawrie Mott et al., supra note 16.

\textsuperscript{116} Id.

\textsuperscript{117} D. Bates, The Effects of Air Pollution in Children, Environmental Health Perspectives 103; 49-54 (Sep. 1995).

\textsuperscript{118} Michelle A. Westcoat, Symposium: Regulation of Private Funds: Note: Once a Landfill, now a Neighborhood School, and that’s OK: Hartford Park Tenants Association v. Rhode Island Department of Environmental Protection, Rutgers Law Journal 30; 739 (Spring 2008).

\textsuperscript{119} Id.


\textsuperscript{121} Id.
land to be used.\textsuperscript{122} These limited protections preclude the siting of schools on “hazardous waste disposal” sites, a “known contaminated” site, or a “repository for hazardous waste”.\textsuperscript{123} None of the prior-use requirements are definitive as all allow for waiver or a discretionary form or remediation.\textsuperscript{124} Due to the discretionary nature of such statutory guidelines, they are considerably less effective than direct prohibitions in ensuring the safety of the students whom attend the schools.\textsuperscript{125} While twenty-six states in total have policies requiring some type of environmental assessment at proposed school sites, only five; California, Florida, Illinois, Massachusetts, and New Jersey, actually have remediation policies that are specific to the school sites.\textsuperscript{126} Of these five, only Massachusetts and New Jersey maintain substantive remediation requirements specific to children, that is, enhanced exposure criteria that are based specifically on the unique vulnerability of the children.\textsuperscript{127} These requirements are especially necessary in a context where policy makers maintain that it is appropriate to site schools on a highly toxic piece of land.\textsuperscript{128} Massachusetts and New Jersey follow these requirements and implementations to guarantee the

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{122} Westcoat, \textit{supra} note 118.
\item \textsuperscript{123} Id.
\item \textsuperscript{124} Id.
\item \textsuperscript{125} Id.
\item \textsuperscript{127} Id. at 30; 55.
\item \textsuperscript{128} Westcoat, \textit{supra} note 118.
\end{itemize}
\end{footnotesize}
safety of their children.\textsuperscript{129} Unfortunately, legislation in forty-eight states is devoid of such consideration.\textsuperscript{130}

In \textit{Hartford Park Tenants Association v. Rhode Island Department of Environmental Management.}, tenants of Hartford Park in the city of Providence, Rhode Island were zoned for new schools that were built on pre-existing landfills.\textsuperscript{131} These students were predominantly non-white and of low economic means.\textsuperscript{132} The site for the school was originally an undeveloped wetland that was divided into over one hundred individual housing lots, but no houses were ever built and the lots were unfenced.\textsuperscript{133} In the 1950’s, due to the easy access of the lots, illegal dumping on the wetland began, to which the wetland gradually became an unauthorized municipal landfill.\textsuperscript{134} Dumping was ceased in the mid 1970’s as a response to the community’s complaint of noxious odors and rats.\textsuperscript{135} Shortly thereafter, the land became a wooded area as plants and trees sprouted on the soil that was then deposited over the dumped trash.\textsuperscript{136}

When the school began construction in 1999, it was not made known to the school board or the community that the approved site was previously a dump.\textsuperscript{137} Tests and soil samples were conducted on the land and revealed that there was a presence of lead, arsenic, and total petroleum

\textsuperscript{129} Rhode Island Legal Services, \textit{supra} note 126.

\textsuperscript{130} \textit{Westcoat}, \textit{supra} note 118.

\textsuperscript{131} \textit{Hartford Park Tenants Ass’n}, \textit{supra} note 120, at *13.

\textsuperscript{132} Id.

\textsuperscript{133} Id. at 27.

\textsuperscript{134} Id.

\textsuperscript{135} Id.

\textsuperscript{136} Id. at 28.

\textsuperscript{137} \textit{Hartford Park Tenants Ass’n}, \textit{supra} note 120, at *31.
hydrocarbons in excess and above the average amount.\textsuperscript{138} The report also revealed significant high levels of VOCs and mercury at the site.\textsuperscript{139} The school board decided to simply eliminate the exposure through installing a cap or engineered cover over the toxic land before construction.\textsuperscript{140}

The current Rhode Island Department of Environmental Management lacks the established policy or procedure for considering environmental equity issues as there is no evidence of any published policy in effect at the time of the site remediation process.\textsuperscript{141} Under this regulation, testing for landfill gases or VOCs was unnecessary because the remedy included soil vapor extraction and monitoring systems to check and prevent harmful vapors from entering the school buildings.\textsuperscript{142} It was knowledge to all involved that the unauthorized excavation and disposal of hazardous material and solid waste at the construction site presented an imminent hazard to the public health, safety, and to the environment.\textsuperscript{143} The court held that the construction company and school district failed to develop and implement a process that would have ensured the community involvement throughout the investigation and remediation of the contaminated sites where the schools were built.\textsuperscript{144}

\textsuperscript{138} Id. at 32.
\textsuperscript{139} Id. at 33.
\textsuperscript{140} Id. at 32.
\textsuperscript{141} Id. at 66.
\textsuperscript{142} Id. at 91.
\textsuperscript{143} \textit{Hartford Park Tenants Ass’n, supra} note 120, at *41.
\textsuperscript{144} Id. at 1.
In *Lucero v. Detroit Public Schools*, a new Elementary school that was intended primarily for Hispanic and African-American children sits on 6.45 acres of land that is currently a contaminated site. The site was used previously for industrial manufacturing, storage, and maintenance operations from 1918 through 1964. Studies revealed that the land had a long history of industrial uses and indications that underground storage tanks might still be present. The levels of VOCs, arsenic, and other harmful compounds yielded two to fifty times higher than applicable residential criteria.

The Board was aware of the school being built on a previously used landfill but simply ignored the fact and continued construction. The court held that it is not the facility being built that may cause injury to the students and teachers, but the site where the school is being built, which has already been found to be highly contaminated. The court also ordered that vigilant monitoring and continued maintenance of the engineered cap at the new Beard School is critical in protection of the children who attend the school from the exposure to the contaminants present that are known to be hazardous to humans over an extended period of exposure time.

In *United States v. Hooker Chemicals & Plastic Corporation*, at least two large pits, one to the south and the other east of the eventual location of the school, were dug and filled with

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146 Id. at 772.
147 Id.
148 Id. at 773.
149 Id. at 772.
150 Id. at 805.
waste before the school was constructed.\textsuperscript{152} In the northern section, Hooker dumped mostly trash after 1950, but small quantities of chemicals were deposited in the bottom area of the construction site.\textsuperscript{153} Water puddles containing aliphatic acids were found on numerous locations of the school grounds, large quantities of chemical residues were found underneath the raised playground area and several buried drums, containing harsh chemicals such as thionyl chloride and other acids, were found in numerous locations on and around the school’s property.\textsuperscript{154} The land was tested and brought to the attention of the Superintendent of the School Board as being unsuitable for a location of a new school.\textsuperscript{155} After long exposure and absorption of VOCs in the skin of individuals, severe abnormalities began to occur in the surrounding residents and students.\textsuperscript{156} These abnormalities included severe anemia, easy bleeding, burning and blistering of the skin, severe rashes and burning of the eyes.\textsuperscript{157} Ultimately, the school was closed due to environmental hazards.\textsuperscript{158}

The Belmont Learning Center in Los Angeles California was proposed as a school to serve mostly Latino students that lived in the surrounding low-income neighborhoods, but was never actually opened.\textsuperscript{159} The site of the school was once a former oil field and industrial site.\textsuperscript{160}

\begin{flushright}
\textsuperscript{153} Id.\\
\textsuperscript{154} Id. at 1037-1038.\\
\textsuperscript{155} Id. at 1021.\\
\textsuperscript{156} Id. at 1014.\\
\textsuperscript{157} Id. at 1037-1038.\\
\textsuperscript{158} Hooker Chemicals & Plastic Corp., supra note 152, at 1024.\\
\end{flushright}
After construction was well underway, parents became aware that the school district knew VOCs existed where the school was being built.\textsuperscript{161} Explosive methane gas, poisonous hydrogen sulfide, VOCs such as acetone, the carcinogen benzene, and residual crude oil saturated the earth where the school was being built.\textsuperscript{162} These were all the result of the land once being a former oil field and industrial site.\textsuperscript{163} However, despite the parents’ efforts to stop construction at this particular site, construction of the school buildings continued, as of 1985.\textsuperscript{164} In 1991, the construction was halted after it was confirmed that the concern of soil contamination, specifically, methane and hydrogen sulfide, was in fact true and the area contained over 1,000 active oil wells.\textsuperscript{165} In December 2000, Superintendent Roy Romer saved the project and began reviewing private bids to address the additional issues at the site.\textsuperscript{166} The project was temporarily suspended in

\begin{footnotes}
\footnotetext[160]{Westcoat, supra note 118.}
\footnotetext[161]{Id.}
\footnotetext[162]{Id.}
\footnotetext[163]{Id.}
\footnotetext[164]{Note 157 at 21. A legislative summary was released before the cessation of construction, recounting the deficiencies of the Los Angeles District in the sitting process for schools: “While there are numerous laws designed to prevent such apparent bureaucratic failure, these laws were apparently insufficient to prevent the Nation’s second largest school district, the Los Angeles Unified School District,…. from engaging in not one but a series of at least eight school construction projects on hazardous land.” Assembly Member Scott Wildman, A Special Report of the Joint Legislative Audit Committee, The Environmental Quality Act and the Belmont Learning Complex: A Breakdown in Process 3, available at \url{http://www.fulldisclosure.net/ProgramDetails/Specialdocumentation/EQABelmont.pdf}.}
\footnotetext[165]{Id.}
\end{footnotes}
September 2002 when an earthquake fault was detected on the northeast portion of the plot.\(^{167}\) Despite the presence of harmful chemicals and VOCs, the school was eventually completed in June 2009, when the first graduating class walked the stage on the football field.\(^{168}\)

The Cesar Chavez High School in Houston Texas was opened in August of 2000.\(^{169}\) This school was home to mostly one thousand Latino students.\(^{170}\) The location of the school placed it about less than a quarter of a mile from three grandfathered refineries, which included Goodyear Tire and Rubber Co., ExxonMobil and Texas Petrochemical.\(^{171}\) Local residents and students at the school complained that the industrial air pollutions released by these neighboring industries were a hazard to the students.\(^{172}\) City officials denied that there were any dangers present, but were forced to revisit the issue when complaints and tests were run by the University of Texas.\(^{173}\) This study focused on the Houston Ship Channel, located within two miles of the University of


\(^{170}\) Id.

\(^{171}\) Id.

\(^{172}\) Id.

Texas and 2.90 miles of Chavez Cesar High School.\textsuperscript{174} The report found that those living within these radiiuses had a 56\% higher childhood lymphocytic leukemia rate than those living greater than 10 miles from the Houston Ship Channel.\textsuperscript{175} The results from this study forced the City to implement an “emissions reduction agreement” with Texas Petrochemicals, Co. that alleviated some of the risk from 1, 3-butadiene in the area that surrounded both schools.\textsuperscript{176}

In Florida in 1955, Duval County School Board obtained land and built the Mary McLeod Bethune Elementary School, in what was predominantly a minority population and low-income area.\textsuperscript{177} From 1949-1955, the City of Jacksonville dumped municipal solid waste and incinerator ash on a large land site, which was once Brown’s Dump.\textsuperscript{178} Local residents raised their concern to the city, however, the county school board assured the residents that they had run reports for their safety and refused to close the school down.\textsuperscript{179} The Environmental Protection Agency eventually came onto the land to run tests and closed the school pending their

\textsuperscript{174} Id.
\textsuperscript{175} Id.
\textsuperscript{176} Cindy Horswell, Susan Carroll & Rosanna Ruiz, \textit{Study Cites Possible Link Between Ship Channel Air, Cancer Risks: The Research Bolsters a Mother’s Suspicions About Young Son’s Illness}, Houston Chron. (Jan 19, 2007).
\textsuperscript{178} Id.
\textsuperscript{179} Id.
massive remedial action by the agency. Elevated levels of lead, arsenic, other inorganics, organics, pesticides, and dioxin/furans were found in the soil.

In Louisiana, Moton Elementary School was built atop a former agricultural landfill. After complaints of severe illnesses by children and teachers, the school first closed in 2000 for minimal clean up, re-opened in 2001, and closed for good in 2005. The reason it was finally closed was because the school received frequent complaints from children and staff of rashes, vomiting, respiratory problems, and headaches. The school did not voluntarily close the school for good, even after the several complaints of severe illness, but instead it was forced to shut down when Hurricane Katrina made that decision.

A post-Katrina report followed the history of the site and found that it was sometimes referred to as the “black Love Canal” because the community had 60-80% African Americans as residents. This old municipal landfill held ordinary garbage that was mixed together with

180 Id.
181 Id. “The EPA has concluded that surface soil, sediment, surface water, and groundwater have been impacted by the releases of these toxins at this site.” Press Release, U.S. EPA, Agreements Reached to Address Contamination at Two Hazardous Waste Sites in Jacksonville, Florida (Sept. 13, 1999), http://www.epa.gov/newsroom/newsreleases.htm (follow “By Date: 1999” hyperlink; then use “Earlier Releases” hyperlink to browse to September press releases). (last visited on Sep. 13, 2013).
183 Id.
184 Id.
186 Id.
liquid hazardous waste to a depth of between two and 32.5 feet.\textsuperscript{187} The City of New Orleans, in 1969, built a low-income housing project on top of the site, as well as the Moton Elementary School.\textsuperscript{188} It was only after community leaders began demanding the Environmental Protection Agency to conduct a full investigation of the site, that the Agency decided the contamination at the site was enough to warrant an emergency cleanup and placement on the United States National Priority List.\textsuperscript{189} It was revealed in a health assessment that was prepared for the site by the Agency for Toxic Substances and Disease Registry, a unit of the Center for Disease Control, that the undeveloped portions of the site posed a “public health hazard”.\textsuperscript{190} It was suggested that if the land was ever used for residential housing, the exposure to lead, arsenic, and volatile organic compounds in the soil could pose an “unacceptable health risk”.\textsuperscript{191}

\textbf{Part VI. CHANGES FOR THE PROTECTION OF OUR CHILDREN}

Significant changes need to be made by the Environmental Protection Agency to the Federal Clean Air Act to accommodate regulations and the safety of individuals to the exposure of volatile organic compounds. If it has been proven time and time again that individuals spend a vast majority of their time indoors and in schools, then why wouldn’t there be safety precautions and regulations for children and adults in nonindustrial settings? If it is true that indoor VOCs are two to five times higher than those in industrial settings, then a change needs to be made since

\begin{itemize}
  \item \textsuperscript{187} Id.
  \item \textsuperscript{188} Id.
  \item \textsuperscript{189} Id.
  \item \textsuperscript{190} Id.
  \item \textsuperscript{191} Center For Progressive Reform, \textit{supra} note 185.
\end{itemize}
individuals use items emitting VOCs on a daily basis and are unaware of their exposure to and hazards of such chemicals.

The future implications of cases involving children becoming ill from simply attending school makes it obvious that children, especially those in minority and low-income areas, are not, and will continue to not be, sufficiently protected from environmental harms. These pollutants, that are severely harming our children and their health, are caused by industrial companies contaminating the air, soil, and water with their hazardous waste. In the creation of judicial enforceable environmental equity regulations under the EPA, the government would ultimately be able to finally begin protecting the most vulnerable people in our society. This would allow for protection of minority and low-income individuals from the ill effects of the environmentally unstable locations that are harmed by the land standing, dumping on and harming of the land, air, and soil.

The School Siting Guidelines is a great start for the Environmental Protection Agency; however, its mere stated purpose is to just provide voluntary and suggested guidelines that are intended to assist local school districts. As of now, the federal government has no authority over where a new school can be built. No single set of national guidelines can reflect the widely divergent situations and institutional relationships that exist throughout the school system in the United States, but states have tried to develop their own location evaluation and selection procedures. The Environmental Protection Agency can push for these state laws is by having a better system for the states to follow, because these “guidelines” are nothing that are enforced and have clearly been established to try and begin moving in the direction of implementing new regulations for nonindustrial settings, primarily school and minority community locations. If there were more practical regulations, then the guidelines would be able to better support state,
tribal and community decision makers in evaluating their existing school processes and policies to address environmental factors in school siting and construction decisions. This would be especially beneficial in locations where the presence of contamination may pose a threat to a safe learning or living environment for children, especially low-income and minority individuals.

The process for picking a location for a school or community should be rigorous, thorough and well-documented. It should also include substantive and ongoing meaningful public involvement. Currently, the only means of determining if there are any onsite or offsite environmental hazards that may pose a health risk includes performing an environmental review of the candidate locations or selecting sites where environmental reviews have recently been conducted and documented. These environmental reviews should be no older than within the past six months. If potential hazards are found on these preferred locations, regulations would help guide those involved in the right direction for determining cleanup, mitigation and long term stewardship. These implementations would ensure the safety and health of those living on and around these locations. A thorough and transparent environmental review process with regulations would help reduce the likelihood of natural hazards or environmental hazards being discovered after the location has been developed. This would ultimately reduce potential adverse environmental and public health effects.

There are certainly other locations for schools and neighborhoods for minority and low-income individuals. There is no need to force them to live and learn in buildings where their lives are at risk. Schools can be located on a more suitable parcel of land that is not currently or has never been used for industrial uses. Minimizing costs should not overshadow the requirement for safe schools and communities for minority and low-income individuals. While school relocations
are costly, the health and safety of children has to be better prioritized. Therefore, the benefits and feasibility of relocation of these schools should be better evaluated.

We can ultimately protect children with the creation of regulations of VOCs in nonindustrial areas and schools. Through regulations it can be made nearly impossible for the cities, towns, and municipalities to intentionally or negligently build schools on land that threatens the safety and well-being of the children and local residents. Children will improve their physical and mental well-being if they are able to attend a school that is safe and healthy. By instilling regulations, children can attend school in an environment that contributes to the livability, sustainability, and public health of neighborhoods and communities. New regulations will not only protect our children, but protect the earth and the future of its well-being. With the enormous amount of startling information available, there must be a change and it must occur immediately.

**Part VII. CONCLUSION**

The EPA has not established minimal guidelines for nonindustrial settings. With few regulations in place, individuals are exposed daily to indoor VOCs. This allows states and local governments to ignore potential hazards when building schools. If the EPA is not going to regulate indoor air quality, then at a minimum, a comprehensive environmental review should be required. This would allow for the determination of whether or not there is a presence of hazardous materials or potential for a release of or exposures to hazardous materials or substance that is capable of posing a health threat to children, staff or the surrounding community. This review could also be used to assess the need for cleanup based on levels of contamination found and identify the cleanup standards that would be used.
Recognizing that individuals spend most of their days indoors, the question to be asked is why are there current standing regulations for VOCs in industrial settings, but not in nonindustrial settings? The presence of environmental contamination and threat of exposure to unsafe levels of contaminants on school property triggers the urgent need for state and possibly federal involvement. Not just for children, schools should be a hub for the whole community, providing the public spaces for recreation and learning, extended hours before and after school and during the weekends and summers, and space for academic and non-academic services such as social services and activities that engage parents and the entire community. We send our children to school to learn, grow, and flourish, not to become ill or harmed because industrial companies do not see a need to protect our younger generations.

The most effective way to protect our children's health is to reduce, if not eliminate, their exposure to environmental hazards such as lead, pesticides, air pollution, and VOCs. Emphasis needs to be on prevention rather than treatment of illnesses related to pollutants and contaminants and diseases in children. Prevention must be the ultimate overarching goal of all efforts by the EPA and industries to protect public health and safeguard the next generation.