

Evaluating the Potential for Vapor Intrusion Impacts to Indoor Air: New York State DEC Issues New Draft Policy

This article examines New York state's draft policy focusing on vapor intrusion issues that was issued in November 2004. Although the authors commend the state for its efforts in issuing the draft policy, they believe the policy fails to address some key issues that must be considered if the policy is to be successful. Furthermore, the authors particularly are concerned about the potential chilling effect the policy might have on the redevelopment of brownfields properties in New York if the state agencies fail to address the issues identified in this article.

231.1555 Introduction *

On Nov. 22, 2004, the New York State Department of Environmental Conservation (DEC) introduced a draft program policy to evaluate vapor intrusion (VI) pathways at sites impacted by volatile contaminants, specifically chlorinated volatile organic compounds (CVOCs). VI describes the process in which contaminants in soils and/or ground water evaporate into the air, migrate through the soil column, and are dispersed to the outdoors or through cracks and crevices of basements or floor slabs where they impact indoor air. According to the department's draft policy, DEC initially will concentrate on legacy sites previously closed by DEC and known to have been impacted by CVOCs. As garnered from the title of the document, *Evaluating the Potential for Vapor Intrusion at Past, Current, and Future Sites*, the draft policy may significantly affect all contaminated sites, including previously remediated and closed sites, and sites for which investigatory and/or remedial work plans are being developed or implemented. In addition, the draft policy broadens the investigation obligations for future sites because, according to DEC, "the vapor intrusion pathway will be evaluated as a component of the investigation like any other media (e.g. ground water and soil)".¹

The draft policy comes approximately two years after the U.S. Environmental Protection Agency drafted federal guidelines on the evaluation of indoor air at contaminated sites.² Neither the draft DEC

policy nor the draft EPA guidelines seem to be driven by new revelations about adverse health effects of volatile organic compounds (VOCs) because there still is no consensus about what is a safe level in indoor air (how clean is clean enough). Instead, the guidelines appear to be motivated by evidence from a few high-profile sites that low-level VOCs have a greater than expected ability to migrate into structures from soil or ground water. Other factors that have heightened agency focus on the issues are the increased redevelopment of contaminated sites under voluntary cleanup programs, the increasing trend to use risk-based cleanups that rely on institutional controls to address soil and ground water contamination, and the large-scale remedial efforts being undertaken at a former IBM facility in Endicott, N.Y., to address elevated VOC levels in surrounding residences.³

(a) Scope of the Draft Policy

DEC intends to apply the draft policy to an extensive collection of sites. The VI site evaluation will include "all completed, current, and future contaminated sites in New York State... to determine whether these sites have the potential for exposures related to soil vapor intrusion. These include all Resource Conservation and Recovery Act (RCRA) Corrective Action sites, inactive hazardous waste disposal sites (state superfund), Voluntary Cleanup Program sites, Brownfield Cleanup Program sites,

currently is reviewing numerous comments on the guidance. It also is considering the output of discussions at technical working sessions held in San Diego, Calif., and Amherst, Mass. Following a third technical working session to be held in San Diego in March 2005, EPA "will determine how best and over what time period to finalize the guidance." Testimony of Matthew Hale, director, EPA Office of Solid Waste, before the Committee on Environmental Conservation, New York State Assembly, Endicott, N.Y., Nov. 15, 2004.

³ IBM Corporation first reported leaking chemicals at its Endicott, N.Y., facility in 1979 (a 4,100-gallon methyl chloroform spill). Since that time, approximately 300 acres are known to have been impacted and roughly 80,000 gallons of VOC-contaminated ground water have been extracted. In addition, IBM has installed ventilation systems in hundreds of homes in the plume area as remediation activities continue under NYS DEC oversight.

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¹ *Evaluating the Potential for Vapor Intrusion at Past, Current, and Future Sites* (Draft Policy), p. 3 (<http://www.dec.state.ny.us/website/der/vaporstrat.pdf>) The policy was announced in the New York State Environmental Notice Bulletin (11/24/04) available at <http://www.dec.state.ny.us/website/enb2004/20041124/not0.html>.

² *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (Subsurface Vapor Intrusion Guidance) (67 FR 71169, 11/29/02); <http://www.epa.gov/correctiveaction/eis/vapor.htm>. EPA has received and

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Environmental Restoration Program sites, and petroleum spill sites.”⁴ While DEC’s expansive scope appears unworkable considering the current influx of work to an already burdened department, DEC has created a weighting system based on various factors to systematically categorize and address the several hundred sites impacted by CVOCs.

(b) *Prioritization Process*

The draft VI policy “primarily” applies to “sites where remedial decisions have already been made.”⁵ Specifically, the draft policy states that it will focus first on “pre-2003 sites with the greatest potential for vapor intrusion”⁶ and sets forth a detailed “procedure” for screening and prioritizing pre-2003 sites.

(1) *Establishment of Initial Target Lists*

Because the draft policy will affect hundreds of sites at which remedial decisions already have been made, and could require costly, disruptive additional testing and *ex post facto* remedial measures, it is noteworthy that DEC acknowledges the initial focus of the investigation program will be to ascertain whether its proposed screening and prioritization procedures have any basis in reality and whether indoor air impacts associated with VOC-contaminated soils and ground water “actually exist.”

This raises questions about who will pay for DEC’s fact-gathering and any after-the-fact remedial measures it may impose (see Section 231.1555(c)). It also suggests the initial group of presumed high-risk sites selected for review by DEC, and the bases for targeting these initial sites, will assume disproportionate significance because they largely will determine the procedures to be followed thereafter. DEC’s plan to justify the implementation of the policy through trial and error underscores the need to make the creation of the initial target list transparent.⁷

Specifically, the draft policy notes that “a *manageable number* of past sites will be targeted initially for further study” as part of what only can be called a research effort “to determine whether [indoor air] impacts associated with vapor intrusion [actually] exist” and are causally related to site contamination, and to “provide additional site-specific information to help identify which sites, both old and new, have the

greatest potential to have vapor intrusion impacts” [emphasis added].⁸

Target sites will be selected based on a weighted scale with points assigned based on:

- depth to contaminated ground water,
- depth to contaminated soil,
- proximity to high-risk receptors, and
- site use.

These and other screening criteria are outlined further in the discussion that follows.

Only after carrying out these initial studies and making any necessary refinements to the procedures will the department “begin to investigate the remaining sites identified as having potential vapor intrusion impacts.” As information is gathered and experience is gained, DEC plans to “use the new information to assess whether the assigned weighting factors serve as a useful tool for predicting whether vapor intrusion is likely to be a significant exposure pathway.”⁹

After the DEC Division of Environmental Remediation (DER) staff has reviewed “the initial list” of sites “as a check on the validity of the screening process and to find out about other potential sites which for one reason or another did not rank highly,” a “manageable number of pre-2003 sites will be targeted initially for further study to determine whether indoor air impacts associated with site contaminants actually exist.”¹⁰ Each year, it is “expected” that “*several* previously-investigated sites *will be selected from each Region* at which to conduct further vapor intrusion investigations until all sites requiring further study have been completed” [emphasis added].¹¹

How does DEC propose to come up with its target list? The policy states “[b]ased on a review of the [DER] Tracking System as well as information from the Division of Solid and Hazardous Materials (DSHM), it is estimated that solvents or other volatile chemicals have been disposed at over 750 sites, resulting in contaminated soil or groundwater.”¹² Deciding to concentrate on more hazardous chlorinated solvents, DEC then pruned this list based on “the DER Tracking System” to generate “a list of more than 400 sites” plus “all RCRA corrective action

⁴ Draft Policy, p. 1.

⁵ Draft Policy, p. 1.

⁶ Draft Policy, p. 2.

⁷ The investigation process also includes a significant research and field verification component for which site owners and developers should not be asked to pay.

⁸ Draft Policy, pp. 2, 4-5.

⁹ Draft Policy, p. 4.

¹⁰ Draft Policy, pp. 4-5.

¹¹ Draft Policy, p. 2.

¹² Draft Policy, p. 2.

[§231.1555(b)(1)]

sites” where CVOCs “were disposed of or detected in soil or groundwater.”¹³

Despite the great importance placed on DER’s tracking system from which the initial target list will be gleaned, this database does not appear to be accessible to interested stakeholders. While very limited spill and inactive hazardous waste site databases can be accessed by identification number or location from the DEC/DER Web site, the public lacks access to the data DEC will rely on to develop its target list. There is no easy way for the public to extract from public databases comparative information on VOC or CVOC data that would allow a property owner or developer to determine whether a site is likely to be targeted by DEC as a high priority VI site. In addition, the public databases only contain limited, summary information of scant value in applying the draft screening criteria and weighting factors. Those potentially impacted by the tracking system should have the ability to review the data it contains for accuracy and completeness. For the sake of accuracy, fairness, and transparency, the tracking system data and priority list should be accessible to interested and affected stakeholders.

(2) Exposure Pathway Determination

DEC will target sites for VI if they exhibit a complete VI pathway. The department defines a complete exposure pathway as a contaminant pathway that leads to human exposure to vapors originating from site contamination. DEC is developing the investigation protocol it will use to determine whether an exposure pathway exists. If DEC determines a complete exposure pathway is present based on site and contaminant characteristics, additional evaluation and investigation will be conducted to determine the human health risk and the requisite level of mitigation. However, even if DEC determines a complete vapor pathway is not present, future redevelopment plans or other scenarios that may impact site conditions could change DEC’s analysis, subjecting a previously low priority site to potentially significant investigation and mitigation requirements.

(3) Prioritization, Evaluation, Investigation

According to the draft policy, sites determined to have a complete exposure pathway will be prioritized based on several weighting factors. When prioritizing sites, DEC will focus its considerations on adjacent

land uses, depth to contamination,¹⁴ the level of contamination, and soil characteristics. Sites evidencing higher levels of CVOCs, less dense soil characteristics, and shallower contamination, and those that contain occupied buildings, will be given higher priority and ultimately will be slated for investigation and mitigation in advance of sites with deeper contamination, dense soil characteristics, lower levels of CVOCs, and those situated on vacant lots.

At first glance, the weighting factors appear logically structured to evaluate potential impacts to human health. However, although the weighting factors acknowledge impacts of occupancy at a site and DEC instructs, in a footnote, that additional emphasis should be given to sites with sensitive receptors such as day care centers, elder care facilities and hospitals, the weighting criteria do not account for differences in residential versus nonresidential site uses. Because the distinction between residential and nonresidential uses has been a hallmark of risk evaluation from soil and ground water impacts, the absence of such a distinction in the VI context is perplexing. Ignoring the nature of a site’s land use has the potential to subject commercial and industrial sites to costly and disruptive remedial requirements out of all proportion to public health and environmental benefits.

Once DEC evaluates the tracking system using the weighting factors, a group of high priority sites will be investigated to further narrow the scope of sites potentially requiring mitigation measures. The draft policy anticipates that, at a minimum, investigation of these sites will consist of gas sampling. If gas sampling indicates impacts to indoor air or if CVOC contaminated ground water is discovered within 100 feet (horizontally or vertically) of an occupied building, DEC may require more invasive ground water and/or soil vapor sampling. The draft policy provides that sampling objectives will be determined on a site-specific basis, but the procedures for investigation are still under development. Therefore, the need for mitigation measures and/or environmental cleanup will be determined based on applying yet-to-be-determined cleanup objectives to yet-to-be-established sampling requirements.

¹⁴ At least one experienced environmental consultant in New York state questions the value of a “depth to contamination” scaling factor because “in most areas of the state, ground water is found within 15-feet of the surface.” Their feeling is that in most cases VOC concentrations will control. Vincent B. Dick, vice president, Haley & Aldrich, Rochester, N.Y. (personal communication).

[§231.1555(b)(3)]

¹³ Draft Policy, p. 3.

(c) Concerns

While a screening procedure to prioritize sites and allocate resources makes good sense, the draft policy as currently structured will yield results that will mean something only to DEC. Although applying the policy will enable a site owner or developer to calculate a “score” for its own site, in the absence of definitive guidance on what constitutes a failing grade, stakeholders will have no idea whether a score is good or bad relative to the other sites being graded unless DEC posts statewide screening results online or provides another procedure for making the results available.

Other issues of concern include the draft policy's post-cleanup impacts on volunteers at brownfield sites, the presumption that structures can be impacted by VOCs within a set 100-foot radius, the downplayed significance of basements and crawl spaces, and the failure to recognize a distinction between residential and nonresidential structures.

(1) Reopening of Agreed-Upon Cleanups at Brownfield Sites

The draft policy states that “all completed, current, and future contaminated sites in New York state will be evaluated to determine whether these sites have the potential for exposures related to soil vapor intrusion.”¹⁵ This includes all sites, including brownfield sites, under the Voluntary Cleanup Program (VCP), Brownfield Cleanup Program (BCP), and Environmental Restoration Program (ERP).

The sketchy and complex nature of the VI issue and its uncertain link to health effects at the levels prevailing in environmental exposure settings create a special dilemma for volunteers at brownfield sites. It seems unfair and counterproductive to treat cleanup volunteers who did not cause or contribute to the VOC contamination giving rise to potential VI as harshly as “responsible parties.”

DEC itself acknowledges “vapor intrusion is a rapidly evolving issue” with many scientific uncertainties and policy complexities. In fact, in the draft policy, DEC states that near-term safety hazards or acute health effects are unlikely¹⁶ and there is a need to confirm “whether indoor air impacts associated with site contaminants actually exist.”¹⁷ How, then, can

¹⁵ Draft Policy, p. 1.

¹⁶ Draft Policy, p. 2.

¹⁷ Draft Policy, pp. 4-5. It should be noted that the draft policy as currently outlined simply will gather more data that may add to DEC's knowledge of VOC migration patterns at different sites.

DEC subject a volunteer to additional cleanup or mitigation at sites where cleanup has been completed, especially when the link among site contaminants, indoor air quality, and adverse human health impacts remains so tenuous?

This imposition seems particularly onerous because brownfield cleanup volunteers are less culpable than those typically involved in other site cleanups and brownfield sites tend to be lower-risk sites due to less severe contamination than RCRA and superfund sites. This risk is lessened even more considering the stringent “unrestricted-use” cleanups required at brownfields with a planned residential end-use. It also is worth noting that cleanup volunteers usually get involved in brownfield cleanups because of an interest in redevelopment. Such sites that have gone through the remediation process thus are more likely to see rapid redevelopment and/or resale. To subject brownfield volunteers, as the draft policy appears to do, to the risk of having to go back and pay for additional cleanup or mitigation after an investment has been made in cleanup and redevelopment (and, possibly, after the developer already has resold the property) compounds the injury. It imposes a double penalty on the innocent would-be redeveloper: Not only has the developer gratuitously invested in a futile cleanup, but it may be prevented from recouping its further investment in redevelopment of the site. Indeed, the lack of finality and certainty created by the mere possibility of post-cleanup vapor intrusion requirements is sure to operate as a powerful disincentive against investing in brownfield sites.¹⁸

Far from providing added protection against VI, an approach that discourages voluntary cleanups and investment in brownfields redevelopment will only ensure more brownfield sites with VOC-contaminated soil and ground water will be left to fester and spread contamination.¹⁹ This is self-defeating and bad public policy.

It will not really answer the central questions “How clean is clean?” and how much VOC in indoor air is “too much,” or, to paraphrase the draft policy, “How much site contamination does it take to produce indoor air impacts?”

¹⁸ The reopener issue (based on VI concerns) is more of a problem at sites where cleanup has been completed and redevelopment has not yet occurred than at new sites entering the brownfields program. However, there is a separate problem at new sites where tighter restrictions on VOCs and closer scrutiny of VI concerns will raise site cleanup costs and inject greater uncertainty into the cleanup process.

¹⁹ Keeping brownfield sites from being redeveloped may be seen by some as the ultimate way to avoid vapor intrusion into structures. By discouraging developers from coming in and building on such sites, there will be no structures (or occupants) to be impacted by vapor intrusion. Such logic is perverse. Not all brownfield sites are vacant. Some merely are underutilized. Pre-

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Brownfield sites differ from other contaminated sites in another important respect. They are cleaned up by the volunteer pursuant to a legally-binding agreement with DEC that prescribes rights and responsibilities. Such agreements include a certificate of completion (COC) and liability release when the cleanup is completed that absolve the volunteer of additional cleanup responsibilities, subject to limited and precisely worded reopener or reservation clauses.

ERP cleanups come with complete indemnifications and cannot be reopened except at full state expense. VCP and BCP cleanups, although subject to somewhat different reopener provisions, generally can not be reopened absent a showing that the original remedy no longer is protective of public health or the environment.²⁰ Given the complexities and uncertainties regarding potential health effects of low levels of VOCs in soil or ground water intruding into buildings, it is unclear whether the VI issue at a site would be legally sufficient to reopen a brownfield COC.

This is especially true for VCP reopeners. Reopeners under the nonstatutory VCP program, established and periodically refined by administrative fiat, display more variability than under the new BCP, where a standard set of reopeners is prescribed by statute. The most common reopeners under the VCP included²¹ the following:

- offsite migration of petroleum contamination,
- the response action later is determined to be insufficiently protective of human health or the environment,
- failure to implement the cleanup agreement to DEC's satisfaction,
- changes to the site's use by the volunteer (or a successor) to the extent that protection of public health and the environment requires a reduced level of residual contamination,
- discovery of previously unknown site-related environmental conditions that indicate the site

venting or discouraging cleanups of such sites will only place occupants of existing structures at greater risk. More significantly, allowing VOCs and other contaminants in the soils and ground water at brownfield sites to continue to permeate the landscape is likely to spread the risk and increase the potential for eventual exposure of nearby workers and residents.

²⁰ A site also can be reopened if there is fraud and under other limited circumstances not pertinent to the present discussion.

²¹ No new projects are being allowed to enter the VCP, but there still are older projects being completed under the administrative program.

use is not sufficiently protective of public health and the environment,

- a new release or threat of release at the site of any hazardous substance or petroleum, or
- fraud or a misrepresentation by the applicant of a material fact.²²

Importantly, one of the statutory reopeners under the new BCP typically did not show up in cleanup agreements under the VCP. This reopener entails "a finding by the department that a change in an environmental standard, factor, or criteria [sic] upon which the remedial work plan. . . was based, . . . renders the brownfield site remedial program implemented at the site no longer protective of public health or the environment."²³ Clearly, the draft DEC policy on VI, if it has the effect of imposing new post-cleanup investigation or remedial obligations on a brownfield cleanup volunteer, would constitute a *de facto* change in "an environmental standard, factor, or criteri[on]" on which the cleanup was based. What is less clear is DEC's ability, especially through a broad-based policy pronouncement unencumbered by notice-and-comment rulemaking, to categorically conclude that revisiting a previously accepted remedy is essential to protect public health and the environment.

Because most VCP cleanups did not have a reopener based on "changed standards," to reopen such a cleanup to address new VI concerns would require DEC to demonstrate that "previously unknown" site-related conditions make the cleanup no longer protective, or the previously approved remedy no longer is protective of the contemplated site use. If the VOCs giving rise to the VI concerns previously were known to be present, it would seem hard to argue the new-found VI concern was associated with "previously unknown" site-related conditions. Similarly, if the contemplated site use has not changed; the site-related conditions have not changed; and the DEC-approved remedy comported with all applicable criteria, guidance, and standards at the time, it is not clear how DEC could justify requiring the cleanup volunteer to implement additional, after-the-fact measures without a reopener for "changed standards."²⁴

²² See, e.g., M. Chertok and D.A. Desnoyers, "The New York State Voluntary Cleanup Program," *The Evolving Perspective on Contaminated Properties—Tweaking the Environmental Management Framework*, New York State Bar Association, 2002, at A-10.

²³ N.Y. Env'tl. Conserv. Law Section 27-1421.2(a)(iv).

²⁴ As the Legislature made clear in the BCP Act, where it

[§231.1555(c)(1)]

Whether or not DEC has a valid legal or even health-protection basis for reopening an approved and completed brownfield cleanup based upon VI concerns, it is far from clear that this would be good public policy. Cleanup volunteers need to be encouraged and cultivated if brownfield sites are to be rehabilitated and returned to productive use. Making brownfield cleanups less certain and final, and adding to the costs and risks of cleanup and redevelopment, only will serve to deter volunteers from coming forward in most cities, towns, and villages throughout New York state (other than New York City and its environs), where land values and investment returns, even when supplemented with redevelopment tax credits, only can support a moderate level of environmental risk and cleanup expense.

(2) Effect on Neighboring Properties and Responsibility for Costs

As noted above, one of the weighting factors in the draft policy is the proximity of the contaminants to a building. DEC presumes indoor air quality in buildings within a 100 foot radius of CVOC contamination will be impacted by VI. Several questions arise regarding DEC's determination that 100 feet is the appropriate radius. For example, what investigatory or mitigation measures will be required where the 100 foot radius transcends property boundaries? And which parties are responsible for costs and must conduct the investigation and remedial measures?

Under the draft federal EPA VI guidance, EPA similarly suggests a 100 foot radius as the distance that triggers vapor intrusion scrutiny. Although the 100 foot radius serves as a weighting factor in the DEC draft policy, it is not determinative. DEC acknowledges factors such as the levels of contaminants, density of soils, and whether sites contain occupied or unoccupied buildings may impact the level of assessment.²⁵ These factors also will influence the determination of whether a neighboring site should be investigated.

intended DEC to apply a "changed standards" reopener, it knew how to say so.

²⁵ Similar to the draft DEC policy, the draft EPA guidance does not directly address ground water flow gradients or topography. However, as part of "Tier 3—Site Specific Pathway Assessment," Question 6, screeners are asked to "determine if the nature and extent of contamination has been adequately characterized to identify the buildings that are most likely to be impacted." (EPA guidance, p. 13). Thus, unlike the draft DEC policy, the resultant conceptual site models certainly could take relevant flow gradients into account.

The DEC draft policy confines itself to procedures for screening and prioritizing sites that may present VI issues. It does not identify the mitigation and/or remedial measures that may have to be taken to address any existing or prospective soil vapor pathway with a health effects potential. Applicable action levels and necessary response actions will, presumably, be specified in forthcoming "Soil Cleanup Objectives" being developed by the state Department of Health (DOH) and DEC, and in various guidance documents under development by the two agencies.^{26,27} Among other considerations that should be addressed, the final VI policy and technical guidance should articulate and promote the legislative intent under the Brownfield Cleanup Program Act to consider and encourage innovative technologies in addressing brownfield sites.²⁸ This means not discouraging technologies that suppress the volatilization or migration of volatile compounds to prevent or retard VI in favor of more traditional ventilation and extraction methods.

Finally, and perhaps most importantly, is the concern regarding who bears the additional cleanup and mitigation responsibilities resulting from the draft policy. Under all of DEC's programs, responsible

²⁶ In recent testimony (Nov. 15, 2004) before the New York State Assembly Environmental Conservation Committee, DEC Deputy Commissioner for Air and Waste Management Carl Johnson made the following distinction between interim mitigation measures and ultimate cleanup: "... [T]he Department recognizes that vapor intrusion cannot be resolved simply through ventilation at the buildings where hazardous or potentially hazardous levels of vapors are discovered. Elimination of the source is the Department's ultimate objective ... We view the use of vapor mitigation systems as a short-term solution ... By addressing the source ... and ensuring that steps are taken to remediate and monitor the soil and groundwater which provides a pathway for the migration of these chemicals, the Department can provide effective long-term protection of the public health from vapor migration. By going to the source ... and ensuring that steps are taken to remove contaminated soils, the Department can remediate and monitor the groundwater which provides a pathway for the migration of these chemicals. These steps protect public health from vapor migration effectively." Prepared Testimony, pp. 3-5.

²⁷ For example, DOH has developed an air guideline for tetrachloroethylene (also known as PERC or PCE) of 100 micrograms per cubic meter (ug/m³) and for trichloroethene (TCE) of 5 ug/m³. Soil vapor and indoor air matrices under development by DOH would require varying levels of monitoring and/or mitigation at varying combinations of sub-slab vapor and indoor air concentrations for each of these CVOCs. DOH also has developed ambient air guidelines/criteria for methylene chloride and eight other contaminants as well as for dioxin and polychlorinated biphenyls in indoor air. Testimony of Nancy K. Kim, director, DOH Division of Environmental Health Assessment, Nov. 15, 2004, before the Assembly Environmental Conservation Committee.

²⁸ N.Y. Env'tl. Conserv. Law Section 27-1415.9.

[§231.1555(c)(2)]

parties generally are required to delineate and remediate contamination. Cleanup volunteers under the BCP, however, although required to delineate the extent of the contaminant plume, are relieved of remediating offsite contamination. The draft policy does not address who has the responsibility to conduct any additional cleanups. In the case of onsite VI for new projects, it is appropriate for DEC, after the rules have been developed that clearly set forth VI requirements, to prospectively require volunteers to evaluate the VI pathway along with other exposure pathways and to implement appropriate mitigation or remedial measures. It also is appropriate to impose both prospective and retrospective obligations on responsible parties. However, in revisiting legacy sites, it should not be the responsibility of innocent brownfield volunteers to bear the cost of helping to refine DEC's VI screening procedures or to retrofit previously approved cleanups based on DEC's newfound awareness of the vapor intrusion pathway. In such cases, if further action is required, it should be carried out by DEC at public expense.

A further potential problem arising from the 100-foot guideline and the lack of responsibility of cleanup volunteers for offsite contaminant migration is the effect they may have on neighboring property owners. Because in the VI context the delineating activities of a volunteer could lead to costly and time-consuming requirements to remediate or implement mitigation measures to address any VI issues, this may discourage neighboring property owners from providing access to their sites. If the neighboring owner did not cause or contribute to the contamination giving rise to the VI problems, the solution, again, is for the state to assume responsibility for any necessary investigation and remediation work.

(3) Do Basements or Crawl Spaces Matter?

Although conventional wisdom used to be that VI primarily was of concern in structures with basements or crawl spaces, which would allow high concentrations to accumulate and spread in the occupied parts of buildings, the draft policy is virtually silent on this subject. A footnote to the flow chart on "Soil Screening for CVOC Vapor Intrusion"²⁹ contains the following parenthetical statement: "The weighting factor for the depth to soil can be adjusted upward or downward to account for . . . the building types that sit over it. (For example . . . soil contamination at foundation depths should be given a higher weighting

if buildings that sit over it have basements.)" No parallel footnote is provided for the "Groundwater Screening" flow chart, although CVOC contamination of shallow ground water would seem to pose a comparable risk to buildings with basements.

If the presence of a basement or a crawl space increases the VI risk, why does this factor not deserve inclusion in the screening matrices as a weighting factor in its own right, along with other considerations relative to the potentially impacted building type(s)?³⁰

(4) Distinction Between Residential and Non-residential Structures

The screening matrices for both soil and ground water give different weighting factors based on the type of land use above the contaminated soil or ground water. Those land uses are categorized as occupied structures, unoccupied structures, and vacant lots. Provision also is made in each matrix for adding "1 point each" for "Sensitive Receptors . . . above Contaminated Soil." According to the policy, "sensitive receptors" include such things as "day care centers, elder care facilities, [and] hospitals."

However, no provision is made in the draft policy for any downward adjustment in weighting factors where the potentially affected structure is a nonresidential building. There seem to be good reasons, grounded in both science and law, to treat industrial and commercial buildings differently from residential structures. From a technical/scientific standpoint, commercial and industrial buildings are less likely than residential ones to result in critical exposures to CVOCs for the following reasons:

- Such structures are less likely to have basements that can collect harmful vapors.

³⁰ There is not unanimity among regulators regarding the significance of basements and crawl spaces. For example, the Colorado Department of Public Health and Environment contends the presence of a basement has not been observed to increase the vapor intrusion risk: "There has been no observed pattern of measured indoor air chemical concentration between styles of building foundations. For example, indoor air chemicals from the subsurface have been observed in homes with basements, homes with crawl spaces, and those with slab-on-grade construction." Colorado Department of Public Health and Environment, Hazardous Materials and Waste Management Division, *Indoor Air Guidance* (Draft), September 2004, p. 2. The Colorado position uses some waffling verbiage. It is not clear whether the data really support the conclusion. The mere fact that vapor intrusion can be a problem in houses without basements or crawl spaces does not demonstrate that basements and crawl spaces do not amplify the risks.

²⁹ Draft Policy, p. 7.

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- Soils on such sites are more likely to be largely covered with asphalt or concrete. Commercial and industrial buildings are more likely to have thicker foundation slabs.
- Especially sensitive or vulnerable people (young children and the elderly and those who are chronically ill) are less likely to be present at such sites.
- The most sustained exposures at these sites would be on the part of employees or workers, whose period of exposure will be far less than that of a long-term resident (i.e., eight-hours a day, five-days-a-week exposure during a several-year job tenure versus 24-hours a day, seven-days-a-week exposure over a 70-year lifetime).³¹

From a legal standpoint, the federal Occupational Safety and Health Act of 1970³² specifies it “shall apply” with respect to any employment within a workplace in a state. OSHA uses permissible exposure limits (PELs) to regulate chemical exposures in the workplace. PELs are based on an eight-hour day, 40-hour work week for the average, healthy worker and take into account economic feasibility as well as risk.

Most states defer to OSHA's PEL standards in workplace settings. Colorado explains its approach as follows:

The key to understanding the difference between the way the Department and OSHA regulate exposure to hazardous vapors is knowing whether the exposure is voluntary or not and whether the employees are informed and afforded the appropriate personal protection. The Department will generally defer to OSHA's numbers and forego corrective action in occupational settings where 1) the facility workers have voluntarily accepted the known risks associated with exposure to chemicals during their employment, 2) the exposure concentrations are within OSHA's standards, 3) reasonably safe controls (clothing, respiratory gear, periodic health monitoring, etc.) are in place to limit foreseen exposures to hazardous chemicals and 4) the workers are informed of the environmental contamination and have access to the results of OSHA-mandated monitoring which shows the increased contamination, if any, caused by the subsurface

source. The Department will employ its own risk-based numbers in all other instances where employees within buildings have not voluntarily accepted a risk associated with environmental contamination in connection with their employment.³³

Even EPA and OSHA in a 1990 memorandum of understanding³⁴ make clear that OSHA has the authority to promulgate and enforce “mandatory safety and health standards for private sector workplaces.”³⁵ DEC should not lightly attempt to brush aside OSHA's primacy in the workplace setting, either by applying a screening approach that fails to differentiate between residential and occupational exposures or by utilizing state DOH guidance that relies on “a standard exposure scenario” of “continuous exposure for 70 years, [a] 70-kg person, and [an] inhalation rate of 20 m³/day.”³⁶ If health risks depend on level and duration of exposure to a toxic chemical, it stands to reason a given indoor air concentration of a chemical will be far less harmful in an occupational exposure setting—where the duration of exposure will be more sporadic and far shorter—than in a residential exposure setting where exposure is more continuous and prolonged. An analogy might be the loud noise caused by a gunshot once an hour. It probably could be tolerated during an eight-hour workday, but would be unbearable if it occurred around-the-clock in a residential setting. The implications of applying an unnecessarily stringent residential standard in a workplace setting, in addition to undercutting a federal law meant to establish nationwide uniformity, are that by increasing environmental compliance costs on businesses (without commensurate incremental public health benefits) there will be less

³³ Colorado *Indoor Air Guidance*, p. 16.

³⁴ *Memorandum of Understanding Between the U.S. Department of Labor, Occupational Safety and Health Administration, and the U.S. Environmental Protection Agency Office of Enforcement* (MOU) (11/23/90). However, EPA points out in its draft vapor intrusion guidance (p. 3, n. 1) “the OSHA standards are not ARARs [Applicable or Appropriate and Relevant standards] under the CERCLA statute and regulations. Therefore, there may be instances (under CERCLA and other cleanup programs) where standards other than the OSHA standards are used to determine whether the exposure pathway presents a risk to human health.” EPA draft guidance, *supra*, n. 2.

³⁵ MOU, Section II.B.

³⁶ See, e.g., Oct. 31, 2003, letter from Nancy K. Kim, Ph.D., director, Division of Environmental Health Assessment, NYS DOH, to Dale Desnoyers, director, Division of Environmental Remediation, NYS DEC (explaining the derivation of DOH's air guideline for trichloroethene [TCE or trichloroethylene]), p. 5.

³¹ Even Colorado's conservative draft guidance recognizes “The commercial/industrial scenario exposure assumptions are generally less conservative than the residential exposure scenario.” Colorado *Indoor Air Guidance*, p. 13.

³² 29 USC 653; see also, 29 CFR 1910.5(a).

[§231.1555(c)(4)]

money to pay workers and accomplish other societal objectives.³⁷

(d) Conclusions

The DEC has made a commendable effort in developing the draft VI program policy. The draft policy provides the regulated community with a basis to understand the procedure for evaluating VI sites and lays the groundwork for additional VI policy and guidance.

Throughout this article, aspects of the draft VI program policy have been highlighted to identify areas requiring clarification or raising concerns. The following is a recap of those issues:

- The draft policy applies to all past, current, and future sites with VOC impacted soils or ground water. According to DEC, this community includes approximately 750 sites.
- DEC wisely recognizes it cannot revisit all of the 750 VOC sites in its tracking system and appropriately identifies a strategy to characterize and prioritize sites susceptible to impact by VI. However, DEC's focus on CVOC sites still presents a large pool of sites—up to 400 or more. Considering DEC's workload, the additional burden of VI may be difficult to accommodate.
- DEC should consider how the draft policy will impact DEC's various contaminated site programs, specifically its impact on "innocent" cleanup volunteers under the Brownfield Cleanup Program (or the predecessor Voluntary Cleanup Program).
- DEC should make the selection of the initial target lists of CVOC sites transparent. Tracking system data relied upon by DEC should be made available to the public to allow review for accuracy and completeness. Additionally, once evaluation methods are confirmed, DEC should allow peer review or public comment on the measured and validated DEC evaluation methods.
- DEC needs to specify the procedural steps for forestalling or mitigating future VI risks at

sites where there is not a completed VI exposure pathway but where a contemplated redevelopment may create one.

- DEC should clarify the applicability of traditional residential and nonresidential concepts and the extent to which the state will defer to federal OSHA permissible exposure limits in workplace settings. Similarly, DEC should clarify the application of the "sensitive receptor" weighting criteria and determine how it applies to residential, nonresidential, and differently engineered buildings (i.e., basement, crawl space, or slab).
- Particularly in situations where a building has been constructed after a DEC-approved cleanup, DEC should preserve the flexibility to strike an appropriate balance between potential public health impacts and the cost and disruptiveness of invasive sampling and mitigation when the draft policy is applied to an occupied building.
- Where a completed site is revisited, the DEC policy should make clear how much emphasis will be given to vapor intrusion source removal versus mitigation. The final policy (and forthcoming technical guidance) also should consider and encourage innovative technologies in addressing VI at brownfield sites. Technologies that inhibit the volatilization or migration of volatile compounds in soils or ground water to prevent or retard vapor intrusion into structures should not be disfavored in relation to more traditional ventilation and extraction methods.
- Reopening an investigation and/or remediation in the context of a voluntary cleanup to address newly identified VI concerns should be at DEC's expense, with cost recovery from responsible parties. In addition, where a DEC-approved remediation has been completed, DEC should clarify its emphasis on source removal versus mitigation.
- DEC should clarify the respective responsibilities of neighboring property owners when the presumptive 100-foot zone of influence crosses the property boundary and the presumed VOC source is one side of the line and the potentially affected structure is on the other side.

In closing, the aforementioned highlights of this article are meant to flesh out concerns raised by the draft VI policy. It is the hope of the authors that DEC

[§231.1555(d)]

³⁷ NYS DOH supports its approach of applying residential standards to workplace exposures primarily based on the situation in Endicott, where IBM workers are exposed to CVOCs both at home and at work. DOH felt it could not reasonably defend a higher exposure threshold in the workplace than in the home under this scenario. Personal communication from Erich Zimmerman, senior engineer, Arcadis G&M, West Falls, N.Y. It is not clear, however, that statewide policy should be driven by the exceptional circumstances prevailing in one or two highly publicized situations.

will take these considerations into account in issuing its final VI policy.

[\$231.1555(d)]