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EPA'S 2015 vapor intrusion guides — What do they mean for your facility?

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The United States Environmental Protection Agency (“EPA”) released two new Guides on June 11, 2015, regarding vapor intrusion, which is the now well-documented potential for the migration of volatile organic compounds from any subsurface contaminant source, such as contaminated soil or groundwater, through soil and into an overlying building. Vapor intrusion has received considerable regulatory attention from EPA and state environmental regulatory agencies in recent years because of the possibility that hazardous vapors intruding into a building from the subsurface may accumulate at levels posing unacceptable risks to human health for building occupants.

EPA issued a first draft of its vapor intrusion guide in November 2002. During the intervening time period, the understanding of vapor intrusion conditions and of the material health risks caused by them has progressed rapidly based on many engineering and field studies. These two recently issued EPA Guides represent EPA’s current research and regulatory approaches to the evaluation and mitigation of vapor intrusion conditions and risks, notwithstanding some consternation in the technical community about the basis of some of the risk studies, which is likely to lead to anticipated challenges to the Guides by some industrial groups. Nevertheless, the Guides are expected to be used by some states as a foundation for state-specific regulatory programs, and the Guides will be used by property owners, sellers and purchasers, their lenders and others, to evaluate potential risks and liabilities associated with vapor intrusion on (or near) sites.

The two new EPA Guides, both issued on June 11, 2015, are:

- OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (the “Technical VI Guide”).
- Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites (the “Petroleum VI Guide”).

The Technical VI Guide describes EPA’s recommended methods for evaluating and mitigating vapor intrusion risks with respect to volatile chemicals in the subsurface from whatever source(s). The Petroleum VI Guide is a companion document to the Technical VI Guide and provides similar

guidance with respect to vapor intrusion risks specifically posed by petroleum contamination caused by leaking underground storage tanks.

Variables and complexities in evaluating vapor intrusion

Vapor intrusion is a complex phenomenon and is different in some important ways from contamination in soil and groundwater. The following are among the key features of vapor intrusion:

- Indoor air contaminated as a result of vapor intrusion can be present inside buildings at levels hazardous to human health without being detected by sight or smell.
- If volatile chemicals exist in the subsurface as sources of vapor intrusion, the potential for vapor intrusion through, among other things, cracks in floors and foundation walls, crawl spaces, sumps, utility connections and other openings will need to be evaluated.
- Vapor intrusion can be influenced by a myriad of site-specific features, including subsurface soil type, groundwater conditions, building and foundation design and configuration, building pressurization, building heating, cooling and ventilation systems, wind and other weather conditions and location and configuration of subsurface utility lines and conduits. Some buildings are under pressurized relative to outdoor air pressure, with the result that the pressure differential may draw toward the building subsurface volatile contaminants (in vapor form) from outside the building footprint. This is referred to as “advection” because vapors can be drawn into (“turned toward”) the building.
- While the potential for direct human exposures to contamination in soil or groundwater can be reduced or eliminated in many cases by deed restrictions or institutional controls (without the need to implement active remediation of the contamination), deed restrictions or institutional controls cannot prevent building occupants from breathing indoor air. If possible human health risks associated with vapor intrusion exist, they can be reduced or eliminated through engineered solutions, i.e., active remediation of the source of volatile chemicals in the subsurface, or implementation of building engineering techniques to prevent hazardous vapors from entering the building or to prevent the accumulation of hazardous vapors inside the building.
- Volatile chemicals that are used inside buildings, such as cleaning supplies, consumer products and chemicals used in industrial operations, may themselves be sources of contamination of indoor air of the same type that may be caused by vapor intrusion. One of the key aspects of the two new EPA Guides is the articulation of indoor air assessment methodologies that will enable analysts to distinguish indoor air contamination caused by vapor intrusion from so-called “background contamination,” i.e., indoor air contamination caused by the presence of volatile chemicals in the building or caused by ambient air outside the building. The EPA Guides address background contamination only for the purpose of enabling it to be distinguished from indoor air contamination caused by vapor intrusion. As such, evaluation and mitigation of background contamination is beyond the scope of these two Guides, although it may be addressed through OSHA permissible exposure levels (“PELs”) in certain non-residential settings, or other indoor air regulations. The Guide still leaves unresolved the substantial dichotomy between “protective levels” for OSHA purposes and risk-based target levels as calculated by EPA’s vapor intrusion screening level calculator.

Evaluation of potential vapor intrusion conditions under the Technical VI Guide

Because the physical phenomena associated with vapor intrusion are complex, the Technical VI Guide offers detailed guidance on appropriate methodologies to evaluate vapor intrusion conditions and risks. The Technical VI Guide provides no “one-size-fits-all” approach. Instead, it emphasizes the need for flexibility and careful consideration of site-specific and building-specific features that may create vapor intrusion conditions and risks. The following are some of the key analytical features for the assessment of whether vapor intrusion conditions are present at any particular site or facility:

- **Emphasis on multiple lines of evidence.** EPA emphasizes the need for multiple lines of evidence to support an evaluation of whether vapor intrusion exists at any given site or facility, with concurrence among the different lines of evidence. In other words, EPA strongly discourages any approach relying on one or a small number of assessment techniques that may lead to either false positives or false negatives. For example, EPA strongly discourages any reliance on indoor air sampling data that is not complemented by detailed information about other site or facility characteristics or features. Multiple lines of evidence may be provided by information concerning, among other things:
 - Potential vapor intrusion sources in contaminated soil, groundwater, subsurface wastes, etc.
 - Subsurface geology at the site or facility that may affect the behavior of volatile vapors or their sources in the subsurface.
 - The rate of biodegradation of volatile contaminants in the subsurface that may mitigate, or increase, vapor intrusion risks at the site or facility.
 - Building design and construction features that may facilitate the intrusion of hazardous vapors from the subsurface into the building.
 - Subsurface utility lines and conduits that may facilitate the migration of contaminants that may be a source of vapor intrusion.
 - Background contamination, either from sources inside the building or from ambient air outside the building.
 - Analytical testing data concerning (i) soil and groundwater contamination that may be sources of vapor intrusion, (ii) soil gas outside the building, (iii) sub-slab soil gas (i.e., soil gas underneath the building footprint) and (iv) indoor air quality. Among other things, EPA emphasizes the need, when evaluating indoor air quality, to reduce the sources of background contamination and to compare the ratios of different volatile contaminants in the results of indoor air tests with the ratios of the same volatile contaminants in soil gas samples or ambient air samples. For example, disproportionate ratios between sub-slab soil gas samples and indoor air samples may indicate that the indoor air contamination is not caused by vapor intrusion but rather by background conditions.
 - Testing data from multiple testing events at different sampling times and seasons, based on the influence of seasonal weather conditions on the behavior of vapor intrusion phenomena.
- **Conceptual site model.** The EPA Guides emphasize the importance of the Conceptual Site Model as a working analytical tool to guide the evaluation of vapor intrusion conditions and risks that should be constantly updated and refined as multiple lines of evidence are developed.
- **Lateral inclusion zones.** The Technical VI Guide indicates that a 100-foot lateral inclusion zone (i.e., the potential source of the vapor intrusion is within 100 feet of the building in question) may be used in initial evaluation of potential vapor intrusion conditions and risks. However, the

lateral inclusion zone may need to be increased or decreased based on site-specific features including possible preferential pathways that may require that the lateral exclusion zone be increased for purposes of the evaluation.

- **Risk-based screening levels.** EPA has provided a Vapor Intrusion Screening Level (“VISL”) calculator with generic concentrations, for screening purposes, of groundwater contamination and contaminants in soil gas (outside and beneath buildings). These VISL screening levels are based on default risk levels and exposure scenarios. While these VISL screening levels may be useful to support preliminary evaluations, EPA cautions that the evaluation of actual vapor intrusion risks may need to take into account site-specific characteristics.

Evaluation of potential vapor intrusion conditions under the Petroleum VI Guide

The Petroleum VI Guide is intended to have limited application only to petroleum releases from leaking underground storage tanks and not to other sources of petroleum contamination. Other sources of petroleum contamination, such as petroleum refineries, petroleum bulk storage facilities, oil exploration and production sites, pipelines and transportation facilities, chemical manufacturing facilities, former manufactured gas plants and dry cleaners that use petroleum solvents are covered by the Technical VI Guide and not by the Petroleum VI Guide.

The Petroleum VI Guide is similar in many respects to the Technical VI Guide with respect to such key concepts as the recommendation for multiple lines of evidence, the careful preparation and updating of the Conceptual Site Model, the application of the VISLs and the mitigation of vapor intrusion risks. However, the Petroleum VI Guide is different in some respects because of the different behavior of petroleum contamination in the subsurface in comparison to many non-petroleum-related contaminants. For example, petroleum contaminants have a greater tendency than non-petroleum-related contaminants to biodegrade in the subsurface into harmless constituents and in some cases relatively quickly. By contrast, other volatile contaminants such as chlorinated hydrocarbons do not so easily biodegrade and, in some cases when they do, their daughter products can be more harmful than the original contaminant. Based on this and other key differences between petroleum contaminants and other volatile contaminants in the subsurface, EPA’s Petroleum VI Guide is different in some respects including the following:

- Because of the combustible and explosive nature of some types of petroleum contamination, EPA emphasizes in the Petroleum VI Guide that an early assessment should be made whether the petroleum contamination creates immediate threats to safety such as risks of fire or explosion and, if so, how those risks can be mitigated.
- Unlike the Technical VI Guide, the Petroleum VI Guide does not provide any “rule of thumb” guidance on the preliminary extent of the lateral inclusion zone for screening purposes. This is based in part on the highly mobile nature of some petroleum constituents in the subsurface and the ability of some to rapidly degrade. In this regard, EPA has previously developed a separate guidance document in 2013 to describe methodologies to determine lateral and vertical inclusion zones for sites affected by petroleum contamination from leaking underground storage tanks. This separate guidance is entitled “An Approach for Developing Site-Specific Lateral and Vertical Inclusion Zones within Which Structures Should be Evaluated for Petroleum Vapor Intrusion Due to Releases of Motor Fuel from Underground Storage Tanks.” In both the Petroleum VI Guide and this 2013 guidance document, EPA emphasizes the site-specific nature of the determination of the extent of the lateral inclusion zone, including such features as groundwater

flow direction, groundwater gradient, soil permeability, the existence of preferential pathways, distance between sampling points, *etc.*

- For buildings within the lateral exclusion zone, the “vertical separation distance” must be determined, i.e., the thickness of clean, biologically active soil between the lowest point of the building and the highest point of the petroleum contamination. If the concentrations of petroleum contamination are at concentrations defined as “lower” (meaning that the contamination is dissolved in groundwater), then no further vapor intrusion investigation is needed if the vertical separation distance is at least six feet. If the concentrations are “higher” (meaning that the contamination is “light non-aqueous phase liquid,” i.e., petroleum-free product), then the vertical separation distance required to avoid further vapor intrusion investigation must be at least 15 feet in order to support a decision not to continue the vapor intrusion investigation.
- If the petroleum contamination is in direct contact with the building slab, foundation, basement floor or crawlspace, then indoor air sampling must be conducted. If the petroleum contamination is not in direct contact with any of these building features, then the vapor intrusion investigation may proceed along either of two options, i.e., either (i) collect paired shallow and deep soil gas samples near the building slab or (ii) collect soil gas and air samples from inside the building. However, if the building is longer than 66 feet, then the investigation must proceed under the alternative (ii).

Mitigation of vapor intrusion risks

The Technical VI Guide also provides guidance on various methods to mitigate the risks of vapor intrusion, if they are determined to exist at any given site or facility at levels that are unacceptable to human health. The Petroleum VI Guide adopts these same mitigation strategy options for petroleum contamination from leaking underground storage tanks. Both Guides emphasize the need to eliminate quickly any immediate threats to human health and safety. EPA also encourages parties to aim to achieve a permanent remedy by eliminating or substantially reducing the levels of vapor-forming chemicals in the subsurface. In cases where the subsurface vapor sources cannot be remediated quickly, EPA recommends engineered exposure controls to reduce or eliminate vapor intrusion into buildings or to reduce indoor air exposure levels, such as the following:

- Implementation of de-pressurization and ventilation systems.
- Sealing major openings for soil gas entry.
- Implementing building over-pressurization.
- Installing, repairing or maintaining vapor traps.
- Notification of local fire department about potential explosion hazards.
- Notification and risk communication to building occupants and owners, including imposition of deed notices to give public record notice of such conditions.
- Increasing building ventilation.
- Treating indoor air.
- Temporary relocation of building occupants.

Practical implications

There are many potential practical implications from the new EPA Guides with respect to any given site or facility that is or may be affected by vapor intrusion, including the following:

- ***Environmental due diligence in corporate and real estate transactions.*** Environmental due diligence in many corporate and real estate transactions will most likely now include more intensive investigations and evaluation of vapor intrusion conditions and risks, and be more costly. Because of the iterative nature of vapor intrusion investigations, it is possible that environmental due diligence will take longer to complete and/or that the parties to the transaction will more explicitly allocate vapor intrusion risks among themselves in the transactional documents. However, because of the fact-intensive nature of vapor intrusion evaluations and risk assessments, contractual provisions addressing vapor intrusion may be challenging for parties to negotiate.
- ***Potential re-openers of previously closed regulatory matters.*** Many contaminated sites have previously been evaluated and/or remediated under the scrutiny of federal and state regulatory agencies, with determinations that the sites have achieved an acceptable level of protectiveness of human health. To the extent that any such sites may have received such regulatory determinations without consideration of vapor intrusion risks, it is possible that the regulatory agencies may “re-open” such cases and require further evaluations and/or remediation to address vapor intrusion conditions and risks. It is known that some states, including New York, have already embarked on a program for systematic evaluation of previously closed sites to determine whether they should be re-opened because of vapor intrusion conditions or risks that were not previously evaluated, and others will likely follow.
- ***Potential influence on state programs.*** Many states have developed their own vapor intrusion regulations and/or guidance documents before EPA issued these two new Guides. It is likely that some of the states with their own existing vapor intrusion programs will use the two new EPA Guides as the basis to revise and update their state programs. It is also possible that some of the states that do not presently have vapor intrusion regulations or guidance documents will use the new EPA Guides as the basis for implementation of new vapor intrusion regulations or guidance in those states.
- ***Potential implementation of preemptive mitigation methods.*** The vapor intrusion evaluation process described in the two new EPA Guides requires a comprehensive and time-consuming approach to the evaluation and mitigation of vapor intrusion conditions and risks. The need for multiple lines of evidence to support conclusions and risk management decisions, and the EPA emphasis on multiple sampling events over time and at different seasons, may make it infeasible and uneconomic in some cases to perform an extensive vapor intrusion evaluation consistent with the protocols in the two new EPA Guides. EPA has recognized this possibility in the Guides and has indicated that parties may simply elect to implement preemptive mitigation methods instead of spending considerable time and effort on a comprehensive evaluation of vapor intrusion conditions and risks. The preemptive mitigation alternative may be particularly appealing in cases of site development or redevelopment work where the preemptive vapor intrusion mitigation strategies can be implemented as part of building design and construction without significant incremental development and construction costs.
- ***Potential litigation consequences.*** It is possible that the standards and protocols in the two new EPA Guides may be relevant to the determination of the standard of care in the context of various types of common law tort claims. For example, if a building owner or manager acquires

and operates a building that, under the two new Guides, may be susceptible to vapor intrusion risks and the building owner or manager fails to perform a vapor intrusion evaluation or mitigation consistent with the EPA Guides, it is possible that an occupant of the building might claim that the building owner or manager breached a duty to the occupant by failing to evaluate and mitigate vapor intrusion risks consistent with the Guides.

- **Reduced use of modeling.** Historically, computer models (such as the Johnson & Ettinger model) were used in lieu of detailed data-gathering to determine whether a contaminant level posed a risk concern. However, the Guides de-emphasize the value of such models as the “sole rationale” for determining whether a building is threatened or impacted by vapor intrusion, while leaving open the question of exactly how much data is needed to make a risk determination. This leaves regulated parties, consultants and litigants with substantial uncertainty about where to draw the line on data collection, and potentially at the mercy of the ability and willingness of regulators, lenders, insurers and others to allow reasonable judgments to be made. For example, at what point will potential loan covenants be violated, or how will parties evaluate potential litigation risks or insurability of the risks?

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Our attorneys and environmental technical professionals provide transactional due diligence services for a broad spectrum of industrial sectors, lenders, developers and insurers. We also represent property owners and potential developers in evaluating, allocating, mediating and, where necessary, litigating matters relating to environmental site contamination and potential vapor intrusion risk, including frequently working with technical experts on risk assessment, forensic analysis of chemical and petroleum constituents, remediation, community outreach and communication of risk-related issues.