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Vapor intrusion: Changing viewpoints and increasing development costs

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In recent years, the environmental and real estate sectors have expanded preliminary due diligence activities to include evaluation of vapor intrusion into existing or proposed structures. Vapor intrusion is a concern wherever there is a potential for volatile or semi-volatile organic compounds to migrate from a subsurface release in soil or groundwater into an overlying or proposed building. Potential vapor intrusion can significantly increase construction costs associated with installing and operating mitigation systems beneath buildings and can substantially impact construction schedules and property development.

Concern about vapor intrusion can be attributed to several factors including enhanced knowledge of the health risks associated with exposure to chemical vapors, the potential for creating significant liability for property owners and developers, and regulatory changes that require assessing and investigating volatilization pathways. Historically, vapor-intrusion regulations have focused on radon and methane caused by naturally occurring conditions or construction over landfills or marshes. Chemicals that can contribute to vapor intrusion may include industrial solvents, volatile and semi-volatile organic compounds associated with petroleum releases, and in some instances, inorganic compounds such as elemental mercury and hydrogen sulfide.

Given the significance of these risks, several states, including N.Y. and N.J., have been reevaluating vapor intrusion on properties that have been affected by constituents of concern, and properties that are close to or upgradient of affected properties. Reassessing subsurface volatilization pathways has led to modifications of previously approved remediation workplans or the re-opening of cases in which assessment of this pathway was not previously required. Reassessment of previously approved remedies can result in significant costs associated with additional investigation and sampling activities, installation of a retrofit remediation system beneath an existing structure or incorporation of vapor mitigation systems during new construction, and increased legal fees associated with tenant-landlord issues and coordinating with regulatory agencies. .

The environmental community previously considered vapor intrusion to be an issue when the contaminant source was proximate, shallow, and the magnitude of contamination was significant. These assumptions regarding the mechanisms of vapor intrusion and human exposure are now understood to be incomplete. Several states, including Conn., have increased the depth required for assessing volatilization remediation standards from shallow depths to up to 30 feet below ground surface. In addition, the American Society for Testing and Materials (ASTM) has approved a standard that identifies requirements for assessment of off-site sources, some at significant distances from the site of concern, as part of due diligence. ASTM-E 2600 provides guidance for screening properties for potential vapor intrusion during property transactions and may be used as a voluntary supplement to ASTM E-1527 for phase I.

Given the property-owner's liability and the increased costs and construction implications associated with vapor mitigation technologies, early understanding of the potential for vapor intrusion is imperative to minimize expense and owner accountability. Preventing vapor migration from the subsurface into existing or proposed structures is typically more cost-effective and practical than remediating the vapor source, especially on sites with existing structures. On sites where vapor intrusion is the primary exposure pathway for contamination, many state agencies will allow contamination to remain in place if this pathway is rendered incomplete by use of vapor-mitigation measures.

Several methods can be utilized to mitigate vapor intrusion including sealing the building envelope, treating indoor air, and installing passive barriers or venting systems, sub-slab depressurization systems, and soil vapor extraction systems. While many of these technologies can be used to retrofit an existing building most are more cost-effectively implemented during construction of a new building.

Whether required by regulatory agencies or due diligence protocol, a thorough assessment of the potential for vapor intrusion should be conducted on all sites where contamination is detected. The assessment should include a determination of the presence of contaminants in soil, groundwater or soil vapor; an evaluation of the mechanisms by which these contaminants migrate through the subsurface and into aboveground structures; and how changing conditions can affect the extent of migration. Armed with this knowledge, mitigation design can focus on specific pathways and impacted areas and allow for installing a mitigation system that will conform to a proposed building design and result in minimal impact on construction costs and schedules.

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