Hazard Ranking System (HRS)
Subsurface Intrusion (SsI) Component

Frequently Asked Questions

1. Why did EPA add a subsurface intrusion component to the Hazard Ranking System?

The previous HRS (40 CFR 300, Appendix A), promulgated December 14, 1990, did not consider the threat posed by subsurface intrusion in its evaluation of the relative risk posed by a site. In 1990, the available science and sampling methods were not considered sufficient to evaluate subsurface intrusion threats for HRS scoring purposes. Therefore, the previous HRS did not provide a complete assessment of the relative risk that a site may pose to the public.

The subsurface intrusion component was added so sites previously not eligible for the Superfund National Priorities List (NPL) based on other exposure or migration pathways may now be eligible after evaluation of the threat posed by intrusion of contaminants into occupied structures from the subsurface.

The SsI component was added as a subsurface intrusion threat evaluation to the soil exposure pathway, which was renamed the soil exposure and subsurface intrusion pathway.

2. What is the difference between subsurface intrusion and vapor intrusion?

Subsurface intrusion is the comprehensive term used to define the migration of hazardous substances, pollutants, or contaminants from the subsurface environment—or more specifically, the unsaturated zone or shallow, unconfined groundwater—into overlying structures. Subsurface intrusion can occur either through vapor intrusion or by contaminated groundwater intrusion. Vapor intrusion is the most common form of subsurface intrusion. It generally occurs when there is a migration of volatile chemicals from contaminated groundwater or soil into overlying structures.

Subsurface intrusion can also occur through the migration of hazardous substances, pollutants, or contaminants in contaminated groundwater directly into overlying structures, such as when basements become flooded due to high groundwater elevations. Contaminants can then vaporize from the flood waters directly into indoor air, or when the water recedes or evaporates, contaminants may remain in the structure.

Groundwater intrusion is less common than vapor intrusion but has been documented to result in health risks. Groundwater intrusion is an emerging issue only now being comprehensively investigated.

3. Why is subsurface intrusion a concern?

Subsurface intrusion is a concern because it can result in human exposure to harmful levels of hazardous substances in the form of a gas (vapor intrusion from underlying contamination) or liquid/solid (groundwater infiltration) as these substances migrate from the subsurface into overlying structures. These exposures can cause negative health effects over a short- or long-term time period.

4. What types of substances are of concern at a subsurface intrusion site?

Typically, volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) are likely to be the most common substances of concern at SsI sites due to their ability to form vapors that can migrate from contaminated groundwater and soils into overlying structures.

In the instance of contaminated groundwater infiltrating into a structure, the contaminants could also consist of metals (e.g., hexavalent chromium, mercury) and radionuclides that may be left behind as the groundwater recedes.

5. Why can't EPA address subsurface intrusion using removal authority (e.g., by installing a vapor mitigation system)?

Using the Superfund removal program exclusively to address sites with subsurface intrusion contamination threats would not fully address the scope of the environmental problems that often accompany subsurface intrusion.

EPA presently uses the removal program authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to address the imminent public health threat associated with subsurface intrusion mainly by interrupting the migration of contaminant vapors, such as by installing vapor mitigation systems in the most contaminated structures. However, because there may be limitations on the extent and cost of an individual removal action, EPA is often not able to address the source of the subsurface contamination, which usually involves extensive areas of contaminated subsurface soil or groundwater.

Without addressing the source of contamination, a vapor mitigation system would typically serve as a temporary solution for most sites, not a permanent remedy.

6. How does the 2017 Subsurface Intrusion addition to the HRS relate to EPA's 2015 OSWER Vapor Intrusion Guide?

The June 2015 OSWER *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (Vapor Intrusion Guide) and the 2017 HRS SsI addition have different purposes, statutory authority, scope and applicability. Both, however, are based on the same scientific understanding of subsurface migration of volatile contaminants.

The Vapor Intrusion Guide advises the investigation and assessment of the vapor intrusion threat to structures from all sources, particularly actions taken under CERCLA and the Resource Conservation and Recovery Act (RCRA).

The HRS SsI addition amended the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), under CERCLA, to support placement of sites on the NPL based on a subsurface intrusion threat. The HRS SsI addition uses data collected from vapor intrusion investigations to rank the relative threat posed by sites.

7. Are all sites that score 28.50 or greater added to the NPL?

No. A site may be included on the NPL if it scores sufficiently high on the HRS, which EPA published as Appendix A of the NCP.

The HRS is a mathematical formula that serves as a screening device to evaluate a site's relative threat to human health or the environment. As a matter of EPA policy, those sites that score 28.50 or greater on the HRS are eligible for inclusion on the NPL. This scoring process is the most common way a site becomes eligible for the NPL, but that is not the only consideration.

EPA evaluates a number of options before determining the most effective approach for site cleanup. Alternatives to NPL listing may include: Superfund Alternative Approach, state cleanup, cleanup by

other federal agencies, EPA removal, or deferral to the RCRA program and various enforcement mechanisms.

8. Does NPL listing mean that cleanup is required?

Not necessarily. Placement on the NPL is not an assumption of a need for remedial action at a site; it indicates that further investigation of the site is warranted.

As noted in the original HRS, adopted by EPA in 1982, "the HRS is a means for applying uniform technical judgment regarding the potential hazards presented by a facility relative to other facilities. It does not address the feasibility, desirability, or degree of cleanup required."

Further, a site's listing neither imposes a financial obligation on EPA nor assigns liability to any party.

9. With the Subsurface Intrusion addition to the HRS, does EPA plan to re-score sites that previously had not met the 28.50 cutoff score?

EPA does not plan to systematically re-evaluate sites that had previously not met the HRS 28.50 cutoff. EPA will continue to follow its policy regarding legacy sites of typically re-scoring only those sites for which new information becomes available or additional sampling has been performed due to evidence of changing site circumstances (e.g., a municipal well downstream of a groundwater plume becomes contaminated). However, it is not EPA policy to routinely re-score sites below the HRS cutoff score.

10. How has EPA incorporated the HRS SsI component into its site assessment program?

The addition of the SsI component to the HRS has provided EPA with an additional mechanism to address sites that pose the greatest risk, but has not changed how EPA evaluates and prioritizes sites for the NPL. EPA will continue to review sites as part of the Superfund remedial site assessment program to determine whether sites are eligible for further remedial evaluation under CERCLA authorities and to prioritize sites posing the highest risk.

11. What are the main indicators that a site may be evaluated using the SsI component?

Typically, indications that a site may be evaluated using the SsI component are that contamination by VOCs or SVOCs has been identified in the subsurface beneath regularly occupied structures in soil, soil gas, or groundwater and is suspected of, or has intruded, into overlying regularly occupied structures.

12. What does it take for an SsI site to score 28.50?

The SsI component is structured in the same manner as other HRS pathways, which means that the same general level of relative risk is required to qualify for the NPL as other pathways. Furthermore, a similar number of target receptors is required to achieve a site score sufficient for placement on the NPL as the other pathways. For example, a site with approximately 23 people actually exposed to contamination with concentrations exceeding a health-based benchmark would likely be eligible for placement on the NPL. Additionally, sites where target receptors have actually been exposed to contamination, rather than potentially exposed, generally will lead to higher HRS scores.

13. How does EPA sample for subsurface intrusion?

Sampling for subsurface intrusion can be done in many ways. Soil, groundwater, and soil gas samples can be collected from outdoor areas to help determine the extent of the subsurface contamination that may be intruding into a regularly occupied structure. Subslab samples can be collected by drilling through the foundation of a structure to determine whether underlying contaminated gasses are present. Indoor air sampling can be performed to identify the possible presence of contaminants in indoor air. A typical subsurface intrusion sampling event can involve collecting various types of these samples.

Sampling for groundwater infiltration can involve sampling groundwater, as well as sampling of any water that has infiltrated into the structure (if present) and wipe sampling of precipitates or residues associated with the intruded groundwater.

14. How do I prepare if my house is to be sampled for vapor intrusion?

If your house is going to be sampled during a vapor intrusion investigation, EPA will provide you in advance with instructions on how to prepare. For example, you may be given a checklist to complete that will provide EPA with additional information, such as the layout of your house and the types of chemicals that are present indoors, including paint or other household cleaners. Generally, it may require, several days prior to sampling, the removal of any chemicals from the house that may be volatilizing into the air, so as to not influence sample results. Additionally, indoor air sampling may require turning the heating, ventilation, and air conditioning (HVAC) system on or off, depending on the situation. If subslab samples are to be collected then appropriate space must be cleared for collecting the samples.