7.1 SOIL VAPOR TRANSPORT MECHANISMS AND CONCEPTUAL MODELS

Soil vapor is transported in the subsurface by advection (i.e., the bulk movement of soil vapors in the subsurface) and diffusion (the movement of soil vapor due to concentration gradients in the subsurface). A detailed discussion and presentation of soil vapor transport mechanisms can be found in the American Petroleum Institute (API) publication titled Collecting and Interpreting Soil Gas Samples from the Vadose Zone (API, 2005).

Consideration of subsurface vapors and the potential for soil vapor intrusion should be included in an overall **conceptual site model (CSM)**. The conceptual model should be used to develop a general understanding of the site, evaluate potential risks to public health and the environment, and assist in identifying and setting priorities for planned activities at the site. All conceptual models should include information on the expected lithology, depth to the potential source contaminants or groundwater, and actual or potential human or environmental receptors, as well as other specific information described in Section 3.

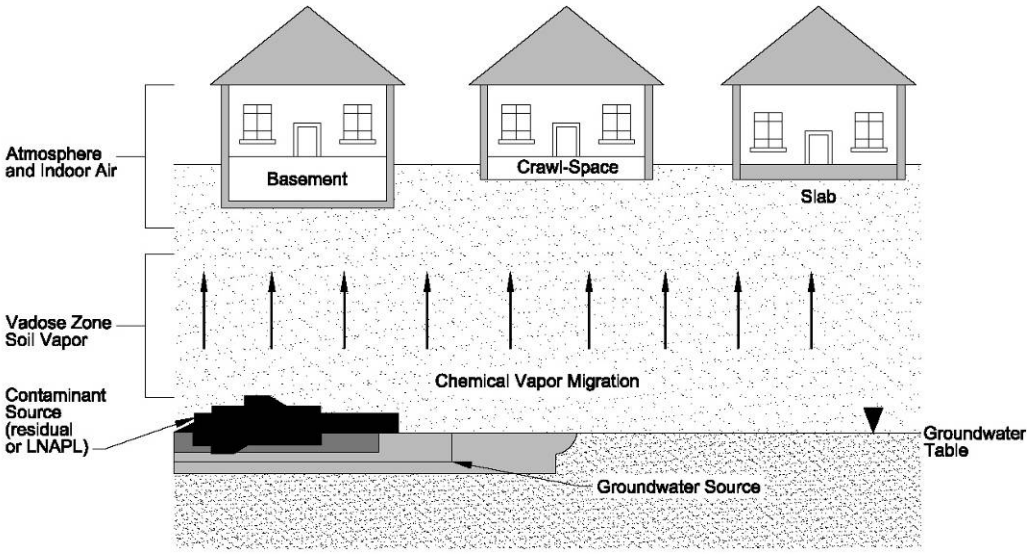

Figure 7-1 Common Vapor Intrusion Pathways
Source: Adapted from API, 2005

A simple conceptual model of soil vapor transport includes the volatilization of chemicals from impacted soil or groundwater and migration of the chemicals in the subsurface due to advection and diffusion. The chemicals may migrate to, intrude, and accumulate within residential or commercial/industrial building interiors.

Common vapor intrusion pathways into buildings include basements, crawl spaces, or cracks and utilities in concrete slabs (Figure 7-1).

A more complex conceptual model of soil vapor transport may consider biodegradation processes commonly observed with petroleum hydrocarbon or volatile organic compounds (VOC) impacted soil and groundwater (Figure 7-2). The biodegradation processes include aerobic and anaerobic degradation of contaminants and production of additional chemicals of concern (referred to as daughter products). The vapor transport of oxygen, CO_2, and in the case of petroleum hydrocarbons, methane, must be considered when assessing aerobic or anaerobic biodegradation processes.

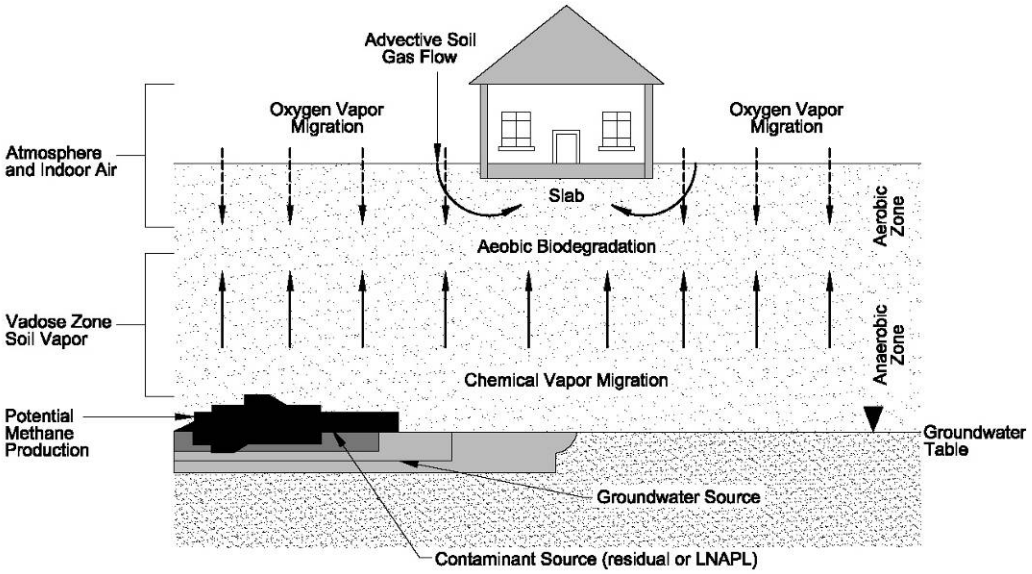

Figure 7-2 Conceptual Model of Soil Vapor Transport Including Biodegradation Process

Source: Adapted from API, 2005