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Large/Old Industrial Buildings: Will the Real Attenuation Factor Please Stand Up

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Background/Objectives. Chlorinated volatile organic compounds (cVOCs) have been detected at elevated concentrations in soil, soil gas/subslab, and groundwater in various locations at Naval Air Station North Island, Coronado, California. The primary cVOC is trichloroethene (TCE). The Navy is conducting vapor intrusion (VI) investigations at 22 buildings (10,000 square feet to over 100,000 square feet area). These buildings overly groundwater cVOC contamination or are in close proximity.

Approach/Activities. The VI investigation included subslab soil gas probes, screening of indoor air using two sensitive field instruments (a gas chromatograph/mass spectrophotometer [HAPSITE] and an electron capture detector [ECD]); and indoor air sampling, using Summa canisters at 22 buildings. Sampling was conducted in summer and winter months; the number of events at these buildings for each season ranged from one to three. Between the 22 buildings, 125 subslab soil gas probes were sampled, along with over 330 indoor air locations. Collectively, these constitute a robust data set, both in terms of spatial distribution, and temporal.

Building-specific subslab attenuation factors (BSSAFs) were calculated by taking the ratio of indoor air to subslab soil gas concentrations for select chemicals. They were compared to DTSC and USEPA SAFs (0.05 and 0.03). BSSAFs can also be used to predict indoor air concentrations based on future subslab soil gas sampling and analysis.

Results/Lessons Learned. Our study indicated indoor concentrations below our project screening levels (PSLs) for 21 out of the 22 buildings. For example, in these 21 buildings, TCE in indoor air was well below the PSL of 2 $\mu g/m^3$. One building exceeded the PSL and is currently undergoing mitigation with a horizontal soil vapor extraction (SVE) well. Soil gas levels of TCE in the 22 buildings ranged widely, from a few hundred to several thousand (and in two cases, few million) $\mu g/m^3$. One of the buildings had TCE at 6,000,000 $\mu g/m^3$, while another had 9,000,000 $\mu g/m^3$. The highest indoor air levels in these two buildings were 67 and <2 $\mu g/m^3$; which were orders of magnitude below model predictions.

BSSAFs were found to range from less than 0.00001 to 0.001 (likely due to thick floors) versus the more conservative DTSC and USEPA SAFs. The condition of the floor appeared to be the driving factor. For the two buildings with elevated TCE in subslab soil gas, indoor air levels were higher in the floor that was in poor condition.

Our study indicated that BSSAFs are lower for higher sub-slab soil gas concentrations (i.e., higher subslab concentrations show more attenuation than the lower). This suggests that if subslab soil gas concentrations were to increase in the future, corresponding indoor air concentrations may not increase commensurately. Temporal variations in subslab soil gas and indoor air within the 21 buildings were not significant across summer and winter. The building with PSL exceedance was excluded from this analysis as it is being subjected to SVE.