

Prevalence and Extent of cVOC Contamination in Sanitary Sewers due to Groundwater Contamination in the San Francisco Bay Area

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Background/Objectives. A number of recent studies have identified chemical vapors present in sanitary sewer systems as the primary source of indoor volatile vapor concentrations that pose direct threats to the health of building occupants and exceed regulatory limits. The extent, nature, and variability of hazardous chemicals in sanitary sewer systems are not well understood. However, at several sites, groundwater chemical plumes have been identified as the source of contamination in the sanitary sewer system and at least one recent study has shown that this contamination follows the sewer effluent downstream from the point of contamination. The objective of this work is to determine the extent and frequency with which groundwater contamination leads to the presence of elevated chemical vapor concentrations in the sanitary sewer system. In this case, the chemical TCE has been the contaminant of interest.

Approach/Activities. The sanitary sewer systems adjacent to six known TCE groundwater plumes in the San Francisco Bay Area were evaluated for the presence of TCE in the sewer headspace vapor. Sanitary Sewer headspace was sampled using the AROMA chemical analyzer at a depth of 1 foot below man-hole cover, with an MDL of $< 0.1 \mu\text{g}/\text{m}^3$. In most cases, sampling was performed through vent holes in the man-hole cover. Sampling programs were designed, to the greatest extent possible, to target up- and down-gradient segments of the sewer system to highlight the plume as a source. The spatial extent of sanitary sewer concentrations were mapped. Multiple sampling events were performed in the vicinity of two EPA Superfund sites where short- and long-term temporal variations were recorded. Two additional sites were considered for study but sealed type manhole covers were installed preventing access. 121 manholes were sampled in total. At all sites, the depth of the water table was close to the depth of the sanitary sewer system.

Results/Lessons Learned. Concentrations of TCE were detected at five of the six sites that were sampled. At four of the sites, concentrations in the sanitary sewer system would exceed the proposed California DTSC screening levels. At two sites, concentrations were mapped as far as one mile distant from the contamination source. Significant short- and long-term temporal variation was observed with concentrations varying by as much as 100x over 7 days. A maximum of more than two times variation was recorded between consecutive 15-minute minimum sampling intervals of the AROMA instrument.