



Collection of subsurface vapor samples.

**Client:** Confidential

**Services Provided:**

- ✓ Strategy development
- ✓ Scoping and method selection
- ✓ Stakeholder and regulatory liaison
- ✓ Risk Assessment
- ✓ Reporting

### Project Objective

As a requirement of corporate standards environmental managers established a program for identifying and mitigating any potentially unacceptable risks to human health and the environment associated with a former waste disposal site. During an initial screening of potential exposure pathways, subsurface vapour intrusion was identified as a possible concern. Residential properties are present in very close proximity to two former sandstone quarries that were used from around 1930 until the 1970s for the disposal of waste materials that included lime slurry from chlorinated solvent production processes. Although both quarries had been covered for several years, the potential for vapour intrusion through dual porosity fractured sandstone bedrock into the properties built adjacent to the former quarries led to the extensive program of ground investigations, indoor air monitoring and remediation works.

### Geosyntec's Scope of Services

Environmental specialists at Geosyntec were retained as lead consultant from the late 1990s to provide technical direction, data management, and reporting services for one of the world's largest vapour intrusion investigations. Geosyntec prepared the technical arguments to identify and demonstrate the subsurface vapour fate and transport processes, specified and validated the data to support the evaluation, presented the results and interpretations to the regulatory agencies, and documented the study in a series of comprehensive reports for the site.

Geosyntec:

- conducted (or reviewed/validated) detailed studies on characterization of indoor air ventilation properties, subsurface gas permeability's, geologic material properties, the influence of weather conditions on subsurface and indoor concentrations, and spatial, temporal and laboratory analyte variability
- conducted mathematical modelling of subsurface vapour transport
- conducted calculations to provide an assessment of vapour intrusion for analyte that were not sampled in indoor air
- conducted a plant uptake assessment that incorporated the findings of a research study
- integrated all available information into an assessment of total human health risk by ten exposure pathways, including vapour intrusion, in accordance with UK regulations
- is currently performing an assessment of Controlled Waters, as defined by UK regulations

### Notable Accomplishments

Geosyntec demonstrated that vapour intrusion was limited to a small fraction of the properties, located immediately adjacent to the former waste disposal areas and constructed on highly permeable backfill materials over formerly quarried land. The fractured sandstone bedrock was shown to impose significant resistance to vertical vapour migration because of the tendency for infiltrating water to be retained at fine-grained layers and the impact of swelling clays, which act as vapour barriers. This site has become a leading reference site for subsurface vapour intrusion analyses not only in Europe but also North America. Geosyntec's work along with that of our project colleagues (industry, leading universities, and specialty consultants) has been widely distributed among regulators and policy makers as representing the state-of-the-practice and a benchmark in subsurface vapour intrusion data collection, assessment, and analysis.