

Gas Works Remediation for Mixed - Use Development

Introduction

This 2 hectare site encompasses the whole of a former gas works, which operated from 1852 to the mid 1970's (Figure 1 & 2). Historical studies showed the gas works were complex and contained up to five gasholders as well as range of underground and production structures. Part of the site was used more recently as an Electricity Board Depot and, thereafter, the majority of the site then comprised a builders merchant (approx 1.37ha), with the remaining area redeveloped with an office building and car park (approx 0.51ha), with an area of overgrown waste ground remaining in one corner (0.19ha).

Regeneration

198 residential apartments incorporating communal soft landscaping, a 72 bed Nursing Home, and 800m² of mixed use including offices and a crèche. The development also incorporates access roads, parking (including a semi basement car park), and pedestrian access. From the start of remediation to first residential sales was a period of 20 months.

Community and Stakeholder Acceptance

The site is located in a highly sensitive residential area, adjoined by a busy mainline railway, and considerable objections were raised by a local resident action group. Extensive consultations were held with the residents, Environment Agency (EA), Environmental Health Officer (EHO), and Planning Authority (PA) from a very early stage. The Specialist Remediation Contractors were closely involved in this process. An investigation strategy was discussed upfront and submitted for approval. The regulators were consulted throughout the investigation and monitoring phases, conceptual design, pilot and laboratory trials.

Site Characterisation

Southern Testing carried out several phases of investigation and monitoring to determine the scope of remedial works required to meet planning conditions. Analysis showed the site to be heavily contaminated with Arsenic, Cyanides, PAHs, TPH, BTEX compounds and SVOC's, largely correlating with the location of historic gas works structures

A shallow fluvial aquifer that underlies the site is classified as a Principal Aquifer and, therefore, sensitive to potential groundwater contamination. Characterisation of the groundwater contamination beneath the site formed an important part of the investigation and risk assessment process. BTEX compounds, Naphthalene and BaP were identified as critical contaminants. Elevated concentrations of these contaminants were found at the northern end of the site, associated with the below ground gas holders, with a lesser degree of contamination at the location of a sunk liquor-tank. Monitoring showed that significant concentrations were not present at the downgradient site boundary. Modelling of the contaminants was in good agreement with the measured distribution and showed no significant off-site migration. Therefore, no specific groundwater remediation was required. However, groundwater was the most sensitive receptor in elements of the risk assessment, and was the controlling factor in setting a number of key remedial targets for the soils remediation.

Assessment of Remedial Options

A dig and dump solution was considered to be unsustainable, excessively expensive, and unacceptable given the sensitive surroundings. Both in-situ and ex-situ techniques were considered. An innovative and sustainable treatment system was designed incorporating elements of in-situ bioremediation, stabilisation to aid excavation for treatment (figure 4), and a multi-phased in-situ approach to DNAPL recovery from the gasholders. Treatability trials were carried out for bioremediation and stabilisation. Overall it was felt that bioremediation offered benefits on a site of this nature, given the generally granular nature of the soils and the heterogeneous distribution of the contamination. Excavation to place the material in treatment would also deal with physical obstructions, thereby facilitating development, and improve the overall validation process. The other in-situ techniques offered additional benefits in that they minimised the visual impact in a sensitive residential environment, reduced the need for prolonged open excavations or stockpiles, and so allowed odours to be more effectively controlled.

Other components of the scheme include: hydrocarbon vapour membranes within floor slab construction, with well-ventilated sub floor voids; suitably resistant utility services and drainage pipes; and an engineered clean cover layer, comprising a capillary break and imported topsoil, to soft landscaped areas.

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