CASE STUDY

Supplementary Site Investigation & Groundwater Risk Assessment

Former Boden Mill, Chard

Client

South Somerset District Council

Developer

SpellerMetcalfe

Site Background & History

The site comprises of two car parks and a former lace mill located in the South Somerset town of Chard. During the 19th century the lace mill had its own town gas works to provide artificial gas lighting. The gas works closed around 1900, and the mill itself closed in the 1930s, after which the buildings were used for a variety of industrial uses. An extract of an historic map showing the site is included below:

Figure 1 – 1888 OS Map Showing Lace Mill and Former Gas Works

Speller Metcalfe was contracted by South Somerset District Council to demolish a former works building and construct a leisure centre across its footprint and that of the two surrounding car parks. The proposed development did not extend into the footprint of the former gas works, which was to be utilised as car parking. However, the area was included within the planning permission boundary and thus it's investigation and remediation is a requirement for the wider leisure centre development.

Previous investigative work carried out by Hydrock had identified geotechnical constraints and the nature and extent of soil / groundwater contamination issues. Discussions with the Environment Agency resulted in a requirement to fully characterise the contamination identified in the investigation works to enable the relevant pre-commencement planning conditions to be discharged.

Identified Contamination

Hydrock identified contamination beneath two parts of the site. PHC (petroleum hydrocarbon) hotspots were identified in one of the car parks and beneath the former gas works, where elevated PAH were also noted. Groundwater was noted at shallow depths in the underlying Upper Greensand principal aquifer. Beneath the gas works the underlying aquifer was contaminated with naphthalene.

The Environment Agency required further investigation of the risks to controlled waters, given that the underlying Upper Greensand bedrock is classified as a principal aquifer and to fully assess the risks from the identified PHC contamination. Specifically, there was a requirement for further investigation of the PHC hotspot in the car park, and more detailed investigation of the former gas works area.

Based on the above requirements, Speller Metcalfe engaged Envirotreat to complete this work and produce a remediation strategy that would allow the pre-commencement planning conditions to be discharged.

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Site Investigation

Envirotreat undertook the supplementary site investigation works comprising machine excavated trial pits and cable percussion boreholes. Soils were recovered and logged in accordance with BS5930 by an experienced geoenvironmental engineer. Samples were collected for laboratory analysis for a wide range of contaminants to enable full characterisation of the soils.

Groundwater monitoring wells were installed across the former gas works area and beneath the proposed leisure centre footprint. The boreholes were surveyed using a total station to provide accurate location and elevation data. Monitoring wells were fully developed using a submersible pump until turbidity was negligible, i.e. allowing the collection of water samples unaffected by drilling water and sediment load.

In-situ hydraulic conductivity testing was carried out using nylon slugs and dataloggers. Groundwater monitoring was completed using low-flow techniques, comprising a peristaltic pump and YSI Multi-parameter meter.

Figure 2 – Low-Flow Groundwater Monitoring

Groundwater DQRA

The results of the site investigation were used to complete a tiered quantitative risk assessment in accordance with the EA's Remedial Targets Methodology.

Groundwater results were compared with published drinking water standards to identify which contaminants were present in the underlying aquifer at potentially unacceptable levels. Contaminants found in excess of these standards included benzene, xylenes, numerous PHC fractions, naphthalene and dichloroethane. Each of these contaminants was then taken forward for (DQRA) detailed quantitative risk assessment.

The DQRA was completed in accordance with current industry best-practice and regulatory guidance, including the EA's Remedial Target P20 worksheet and current guidance issued by SoBRA. The risk assessment identified whether the measured concentrations of contaminants in soils and groundwater presented unacceptable risks to the underlying principal aquifer. Site-specific data was utilised where available, and this included key parameters such as hydraulic conductivity and hydraulic gradient. The detailed characterisation of the hydrogeological regime was made possible due to the detail and scope of the preceding site investigation works.

The DQRA identified concentrations of benzene, naphthalene and PHC fractions above the SSAC (site-specific assessment criteria) in soils and groundwater. The soil source could be delineated due to the scope of the site investigation and was limited to the area surrounding the relic gas holder bases. No soils beneath the proposed leisure centre were identified to be presenting an ongoing risk to groundwater. However, soils in the groundwater smear zone were presenting a potential vapour risk.

The groundwater plume was noted to originate from the gas works area and extend hydraulically downgradient beneath the proposed leisure centre. The DQRA was completed with a risk evaluation. This identified source treatment as the key remedial objective.

It was concluded that treatment of contaminants that had already partitioned into groundwater would not be necessary, and that groundwater quality would improve through natural processes following source treatment.

The site investigation and DQRA was submitted to the EA for comment. It was accepted without the need for further work or clarification. The report also supported a zoned remediation strategy, which allows the leisure centre to be developed separately from the remediation of the gas works.