



Insitu Chemical Oxidation and LNAPL recovery

Former industrial site, Shropshire

Client: Grocontinental

Site area: 4.5ha

Location: Whitchurch, Shropshire

Timeframe: 9 months

End use: Residential

Challenge

Insitu chemical oxidation (ISCO) and LNAPL recovery on a former industrial site, making it safe for residential development. The 4.5ha site housed a storage and distribution facility, consisting of three large warehouses and hardstanding.

Previous investigation works revealed elevated TPH levels in groundwater at locations between the two buildings.

To assess risk, TPH concentrations were monitored in groundwater and compared against the derived remedial target values, determining that:

- Nine locations had exceedances occurring in one or more TPH fractions, which posed a theoretical risk to the modelled compliance point.
- Hydrocarbon impact had not migrated significantly away from the centre of the site. No impact was recorded in the monitoring wells in the south east or along the eastern site boundary.

Solution

Our proposed solution was rigorous free product recovery/dissolved phase groundwater treatment, combined with follow-on insitu chemical oxidation/enhanced bioremediation (ISCO) treatment in the accessible sub-surface area.

This methodology and treatment train proposal gave regulators **confidence** that maximum betterment of the saturated soil and groundwater - present as a discrete plume - could be achieved.

Our methodology included:

- Operating our in-house total fluids recovery unit across 9no. 110mm OD recovery wells, for circa 8 weeks, across the main central plume area, between the two main buildings (circa 1250m²). This would remove significant hydrocarbon contaminant mass in the form of free product and dissolved phase, present in the glacial sands and gravels. Wells were slotted from 2.5m to 4m depth to maximise recovery from both the fully-saturated and smear zones.
- Re-injection of treated waters via wells located upgradient of the main injection area, by agreement with the Environment Agency, under our permit, which created additional betterment and maintained groundwater levels.
- Subsequent ISCO treatment via 43no. direct push points, spaced at 5m centres across the remediation area.



- 2no injection events were spaced approximately 7 weeks apart, injecting a total of 12.5t of our **UK-exclusive** OBC substrate.

LNAPL was disposed of offsite, with treated groundwater re-injected into an array of re-injection wells.

We installed wells up-gradient to maintain overall groundwater levels in the area, and to address concerns regarding depressing the water table (and its potential impact on a shallow irrigation borehole located offsite).

Re-circulation of treated groundwater helped aid recovery of total fluids by creating a moving system, which enhances longer-term biodegradation of residuals. These were also targeted by follow-on ISCO.

During drilling and injection works, our team had to contend with numerous obstructions and layers of reinforced concrete.

All works were carried out in-house under our own **Environmental Permit**.

RESULTS

- Our recommended treatment train approach, designed in-house and delivered using our internal resources and technologies, demonstrated the most cost-effective solution for maximum betterment of the subsurface groundwater conditions. This provided reassurance to the regulator.
- Our approach reduced the requirement to target soil impacts in the unsaturated zone in inaccessible areas under buildings.
- Pump and treat targeted areas around buildings to pull contamination out into the target area. This meant significant mass could be recovered, and residuals that had pulled into the target area could then be targeted with ISCO.