CASE STUDY

REMEDIATION OF A FORMER CHEMICAL FACTORY, FOUR ASHES, STAFFORDSHIRE

LOCATION: FOUR ASHES, STAFFORDSHIRE
SERVICES PROVIDED: EXCAVATION & EX-SITU BIOREMEDIATION OF SOIL, SITE WIDE GROUNDWATER MANAGEMENT & TREATMENT, IN-SITU CHEMICAL OXIDATION (CHEMOX), ASBESTOS MANAGING & PROCESSING, MATERIALS MANAGEMENT WITH >99% RE-USE ON SITE

We were contracted to remediate the former Four Ashes Chemical Plant. The 32 hectare site was used for chemical manufacture from the 1960's and demolished in 2007. The site was redeveloped in two phases for manufacturing and commercial use.

Investigations identified wide ranging contaminant impact to the soils and groundwater associated with the previous manufacturing activities. The primary contaminants included chlorinated solvents, phenol, PAH's, TPH and BTEX.

We worked with Hydrock Consultants to develop a robust and cost effective Remediation Strategy and implemented it as part of the redevelopment programme. This involved working closely with Readie Construction and key subcontractors (piling, groundworks and utilities tomanage the site's shallow water table and phase the remediation works efficiently, enabling the successful completion of a 450,000 sq ft manufacturing facility.

Fixed price delineation, bioremediation and chemical oxidation treatment of contaminated soils/groundwater

Extensive delineation works including 150 trial pits excavated and over 300 soil samples, enabling upfront validation of excavations and rapid handover of critical zones

Bioremediation and materials management of 23,000m³ of contaminated soils.

In-situ chemical oxidation of 10,500m³ of saturated zone soils.

Provision of a bespoke water treatment system and treatment of 44,000m³ of groundwater

Excavation and processing of 2,000m³ of asbestos impacted soils under license. Over 1,200kg of asbestos removed and disposed off-site.

Mass balance calculations estimated 115,000kg of hydrocarbon mass destroyed, primarily BTEX and phenol

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FLI QDS Role:

Soil and groundwater remediation

Site investigations identified five hotspots of contamination totalling 33,000 m³ requiring remediation in two phases to fit with the build programme. The shallow water table (under 1.5m) and swampy ground required extensive water abstraction to enable groundworks and treatment of soils within the saturated zone.

A delineation exercise to precisely define the extent of contamination included excavation of 150 trial pits and extensive soil sampling with over 300 lab samples, backed up by field readings using a photo-ionisation detector (PID). The data was combined into a detailed 3-D map of the contaminant distribution.

Four hotspots required immediate excavation to maintain the build programme. A total of 13,000 m³ of material was excavated to the top of the Sherwood Sandstone (3 mbgl) and stockpiled within the Phase 2 area for subsequent bioremediation.

Delineation works on the fifth and largest hotspot confirmed a heavily impacted 9,900 m² source area, comprising 20,000 m³ of soils requiring remediation.

Owing to space constraints and the shallow water table, we implemented a combined technique approach where the top 1 - 1.5 m of material above the water table was excavated.

All excavated soils exceeding the target concentrations were transported to a soil treatment area for screening and were engineered into windrows. A breathable cover was placed over the windrows to encourage aerobic bioremediation. The windrows were regularly turned, monitored and sampled to track the progress of the treatment process. After 6 months of bioremediation, 100% of excavated soils had achieved remedial targets and were re-used on site.

10,500 m³ of deeper saturated soils were treated by in-situ chemical oxidation. We undertook extensive laboratory trials to establish the most effective chemox design and to optimise their treatment technique. 1,200,000 litres of reagent were applied in liquid form over a six week programme and mechanically mixed into the soils.

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The works were validated through multiple soil and groundwater samples across the remediation area. 90% reductions in both soil and groundwater concentrations were achieved, leading to successful regulatory signoff.

Asbestos management

Asbestos pipe lagging was identified in 2,000m³ of impacted soils and required treatment. We avoided off-site disposal of this soil through the implementation of licensed asbestos picking solution. Over 1,200 kg of licensable asbestos was removed from the soils for off-site disposal. Once validated, the processed soils were reused at depth under landscaped areas in accordance with the Remedial Method Statement.

Water treatment

We managed all surface and ground water abstracted during groundworks, piling and remediation aspects of the project. Our engineers designed a bespoke water management system comprising two lagoons and 3km of pipework with multiple pumps and a water treatment system including oil and silt separators with sand and carbon filtration.

Following treatment, over 44,000 m³ of water was discharged into the adjacent canal under consent from The Canal trust with NO exceedances of the compliance limits were recorded over the treatment period.

Additional services

Throughout the works we were able to provide the following additional services for the Principal Contractor:

- A site wide environmental monitoring role
- Deployment of Mobile plant Permit and Regulatory liaison
- Materials management planning and re-use
- Decommissioning of Nitrogen storage tanks
- Dust and odour suppression
- Removal of buried drums and barrels of grossly contaminated waste to a licensed waste facility
- Detailed validation report enabling planning sign-off.

Remediation Outcome

Mass balance calculations estimate 115,000kg of contaminant mass was destroyed by the remediation technologies applied by us. The results were collated into a detailed validation report confirming that all targets were achieved and that the Remediation Strategy was successfully implemented. As a result, the planning condition relating to contamination was discharged without delay.

The works were completed in a 12 month period in a phased approach to fit with the Principal Contractor's construction programme and enabled project completion on schedule.

Added Value

We provided detailed design input to an updated Remediation Method Statement, which enabled the works to be completed more rapidly and at lower cost than previous proposals. In particular, the chemical oxidation design greatly reduced the volume of soils requiring excavation and allowed access to large areas of the site which would otherwise have been required for bioremediation.

We designed an asbestos management strategy approach that allowed re-use of 2,000 m^3 of licensed asbestos impacted soils, providing an 85% saving in comparison to off-site disposal.

Holistic project management approach and good communication with all stakeholders resulted in the successful and efficient remediation of a complex, previously heavily contaminated site.