Project Case Study: Kirkstall Forge – Plots E & F, Leeds

Services: Remediation, Enabling Earthworks & Civil Engineering

Demolition | Enabling Earthworks | Remediation | Drilling | Civil Engineering | Plant & Technology | Geotechnical | Environmental | Planning | Renewable Energy

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Client: Commercial Estates Group

Project: Former Forge Site, Kirkstall Forge, Leeds

Duration: Phase 1: 5 months
Phase 2: 10 months

Services: Remediation, enabling earthworks and construction of a new road and reinforced river wall

Sector: Residential

Contract value: £2.2M

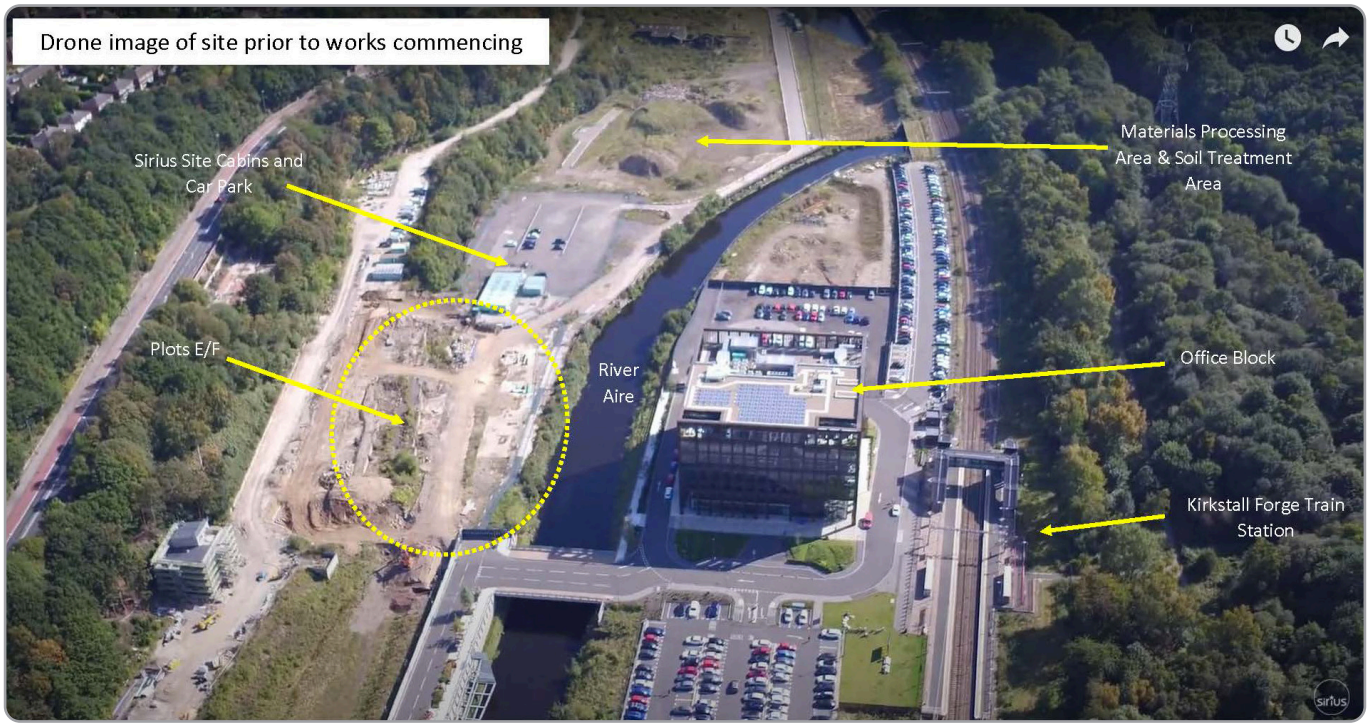
Installation of a temporary sheet pile wall in the river creating a dry working area to carry out earthworks and river wall construction

Site summary

Kirkstall Forge has been of industrial importance since the 12th century after Cistercian Monks built Kirkstall Abbey in 1152 on the wooded banks of the River Aire. The same monks then built Kirkstall Forge ironworks and it became one of the longest continually used industrial sites in Europe. More recently the Forge manufactured vehicle axles and steel bars until its closure in 2003.

The site is bisected by the River Aire and this area (Plots E/F) was historically occupied by the former long machine shop where the large stamps/hammers and anvils were used to shape and form the metal products. As a result of these previous uses the underlying ground was contaminated with petroleum hydrocarbons, hence the need to remediate/clean-up the site.

Aerial view of the Kirkstall Forge Site, Plots E/F area circled



Project brief

The site is situated immediately adjacent to the River Aire where the riverbank was simply vegetated, therefore the ground required reengineering to create a development platform for 2 no. apartment blocks and also enable construction of a river wall and river road with bespoke parapet. In addition, identified hydrocarbon hotspots were excavated and treated using the remedial technique stabilisation/ Solidification. The river wall and road works were carried out in accordance with an Approval In Principle process Leeds City Council and to the under the auspices of an Environment Agency permit in order to carry out the works adjacent a main river. The works were validated (both chemically and geotechnically by a Sirius Resident Engineer) regularly inspected by independent consulting engineers (WSP) employed by the Client.

Project description

Engineered earthworks involving removal of relic structures, treatment of grossly contaminated soils and groundwater to enable future residential development. Specifically:

- Complete remedial earthworks: contaminated soil treatment (Stabilisation/Solidification) so the material is suitable for retention on site and site turnover (removing substructure/obstructions)
- Construction of an Allan Wall Block Retaining Wall along the river behind already installed Temporary Sheet Pile River Wall
- Processing of site won concrete to produce recycled aggregate for reuse on site and reengineering of site won soils
- Construction of new road, pathway and sewers adjacent to river

The crane unloads materials for the construction of the temporary sheet pile wall

The initial steel frame construction to assist in building the temporary sheet pile wall in the river

Panoramic view of the projects early stages

Site features

Given the proximity of the earthworks and river wall construction to the river Sirius were required to install a temporary sheet pile wall in the river in order to create a dry working area to carry out the earthworks and river wall construction.

Give the previous uses this area of the site contained significant substructures i.e., stamp bases and a 70tonne anvil which required breaking out and relocating respectively.

Remediation design

Whilst an overarching Remediation Strategy existed for the Kirkstall Forge development, Sirius followed a plot-specific Remediation Strategy for Plot E/F.

Remedial Targets were calculated through further detailed quantitative risk assessment (DQRA) and a treatability study was undertaken to demonstrate that the preferred remedial technique (Stabilisation/ Solidification) would be effective in treating the contaminants within the soils.

Following regulatory approval of the Remedial Strategy, Environmental Permits were deployed to carry out the proposed soil and groundwater treatment and allow the earthworks and temporary works (a cofferdam) to be undertaken adjacent and in a main river respectively.

Temporary sheet pile wall completed in the river enabling earthworks and the construction of a new river wall behind the sheet piles

Completed construction of the new river wall after the sheet piles have been removed

The crane arrives on-site ready to install the sheet pile wall

Installation of temporary sheet pile wall in the river

Ongoing construction of reinforced soil & Allan block wall

Construction of reinforced soil steps and Allan block wall, with rip rap (coarse rocks) placed at the foot of wall to mitigate river erosion

Remediation phase

Key aspects remediation and preparatory works:

- Specialist implementation of a double stage Stabilisation/Solidification technique developed during the design stage.
- On site treatment and retention of 4,500 tonnes of significantly contaminated soil.
- Excavation, processing, and engineering of ~40,000m^3 of highly problematic soils.
- Surface and groundwater treatment compliant with the discharge consent obtained from the water authority.
- Implementation of a wide range of environmental controls to successfully protect sensitive receptors from dust, odour and Volatile Organic Compounds.

Earthworks turnover with removal of contaminated materials and obstructions as they are identified

Ongoing construction of anchor slab and edge beam

Post completion

A fully warranted validation report was prepared incorporating all chemical, geotechnical, environmental testing and supporting analysis to demonstrate that the objectives of the approved Remedial Strategy had been successfully achieved. Yorkshire Water and Leeds City Council Highways regularly inspected and approved drainage and highway construction respectively.

The site is now available for construction of 2 no. apartment blocks and associated car parks for use by existing tenants.

Excavator fitted with stabilisation bucket mixing stabilisation/ solidification binder into hydrocarbon contaminated soils

Construction of the river road

Demolition, earthworks, remediation, drilling and civil engineering contractors.
Geotechnical, environmental and planning consultants. Renewable Energy.

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