

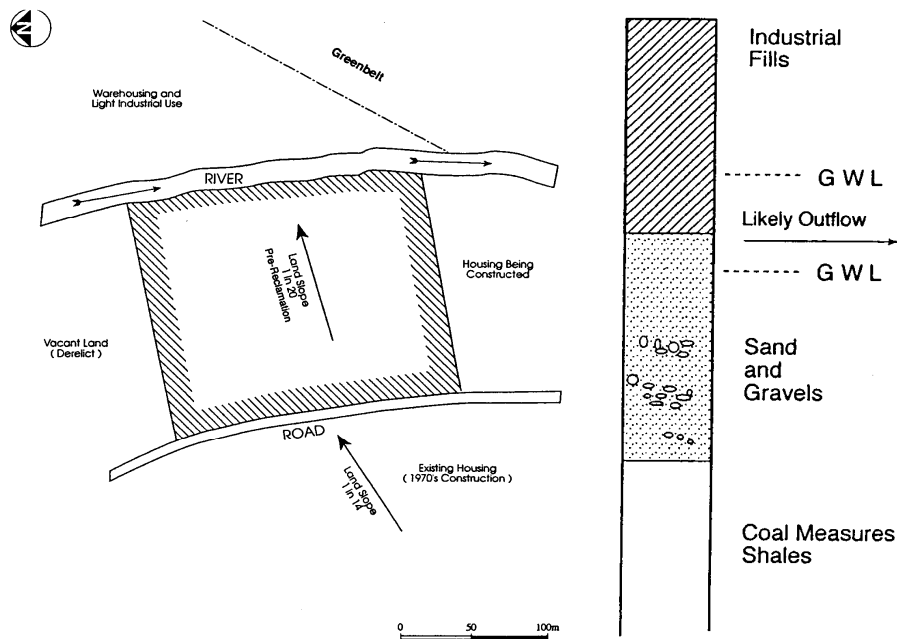
**UNIVERSITY OF PORTSMOUTH
SCHOOL OF EARTH & ENVIRONMENTAL SCIENCES**

1GS312 Contaminated Land

**Contaminated Site No. 2
Former Iron Foundry-South-West Midlands**

Site location and layout

South-western fringe of Birmingham and adjacent to greenbelt. Planned re-use Domestic housing, some gardens and some blocks of flats.



Site history: Former Foundry Site (3.21 Ha)

Till 1860s - agricultural use.

1860s to 1800 - unknown industrial use.

1880s to 1960s - iron foundry

1964 - foundry demolished.

1964 to 1986 - site derelict and capped with concrete (roadways and foundation slabs).

Site topography (pre-reclamation)

Surface slopes to adjacent river. Land to south slopes steeply towards the site. Improvements occur to various sewage treatment works.

Natural geology

Water-bearing sands and gravels (up to 4 m thick) are the uppermost natural deposits. Below these are unmined Coal Measures Shales (42 m thick) above Carboniferous Limestone rocks. The limestone was mined in the 19th century.

Site investigation (October 1987)

43 trial pits, at 30m spacing, and to depths of 4.2 m. Eight boreholes to prove the depth and condition of the Coal Measures rocks. Iron foundry fills which occurred as a 4.0 m thick layer were sampled at three depths in each trial pit and chemically analysed (T1). Groundwater

occurred in the fills at 3.0 m depth, and also in the underlying sands and gravels. No sampling or analysis of groundwaters was carried out. Landfill gas investigation were limited to a gas spike test survey, to depths of 1.0 m into exposed foundry fills (T2).

Table 1 Proven chemical contamination of the foundry fills

| Contaminant | Level | Contaminant | Level |
|--------------------------|--------------|--------------------------|---------------|
| PH | 7.06 to 8.04 | Sulphates (acid soluble) | 659 to 4375 |
| Arsenic (total) | 0.1 to 10.2 | Sulphides | <1.0 to 6.4 |
| Cadmium (total) | 0.5 to 29.7 | Phenols | 0.3 to 8.4 |
| Chromium (total) | 8.8 to 33.1 | Cyanide (free) | 0.06 to 24.7 |
| Lead (total) | 51.7 to 4355 | Toluene-extract content | 633.0 to 1148 |
| Mercury (total) | <0.1 to 10.4 | Loss on ignition | 13 to 44.2% |
| Cooper (plant-available) | 8.1 to 49.3 | Free oils | <1000 |
| Nickel (plant-available) | 0.7 to 10.73 | Asbestos | ND |
| Zinc (plant-available) | 51.0 to 179 | | |

Higher concentrations typify upper layers of foundry fills. Site investigation revealed that iron foundry wastes invariably existed over the site. Chemical investigations indicated that the upper 1.5 m of these fills were distinctly more contaminated than were the lower layers. The upper layers also contained wood and fabric scraps, which gave rise to low concentrations of methane (up to 2 % by vol) and of carbon dioxide (up to 4.2% by vol).

Reclamation choice

It had been hoped that all the contaminated fills could have been removed, but the quantities present proved to be too great. Thus it was decided to remove only the more contaminated materials (to 2.0 m depths) and then lay a clean cover over the remaining fills. A source of clean quarry sand and gravel provided materials for the cover. During reclamation, the site was terraced to reduce the previous gradient to the river and a final land surface 1.5 m above mean river water level was constructed. A clay-rich soil (300 mm thick) was provided in garden areas. Considerable care was taken to avoid any contaminated fluids entering the river during reclamation, to confirm the uncontaminated nature of the clean cover materials. To prove that compaction of the cover had been satisfactory, a QA system was operated. House units were founded on slabs laid on the compacted clean cover.

Table 2 Gas concentrations in the site

| Survey Method | | CH ₄ | CO ₂ | O ₂ |
|---------------|---|-----------------|-----------------|----------------|
| 1. | Initial surveys (spike tests to 1.0 m depths) | <0.1 | <3.6 | >18.0 |
| 2. | Later surveys (boreholes to 15 m depths) | Nil | Up to 15% | < 1% |

Later concerns

A potential purchaser of the site voiced concerns over the continued existence of foundry fills at 2.0 m depths in the site. A minor re-investigation did also indicated the presence of high carbon dioxide concentrations and very low oxygen levels in areas of the site (T2).

Reference

Carney T (1995) The Re-use of Contaminated Land – A Handbook of Risk Assessment. Wiley.