



Site Background

The site formed part of the historic former town gasworks and occupies an 'L' shaped area of approximately 0.35 hectares.

The River Welland directly adjoins the southern boundary of the site. The area to the west of the site formed the remaining part of the town gasworks – this area has been remediated and is now occupied by a level car park owned by South Kesteven District Council [SKDC]. The areas to the east and north of the site are occupied by residential properties.

The historical gas works is shown in Figure 1. The 'L' shaped area is outlined in red. A large gas holder existed in the centre of the site.

Figure 1 – Historical Photograph of Stamford Gas Works



The client had obtained planning permission to develop the site for the erection of 13 residential houses with private gardens and associated parking areas. The site had remained undeveloped for several years due to the identified contamination on site and the need to provide a cost effective and acceptable remediation solution to SKDC and the Environment Agency.

The contaminants of concern reflected the historical usage of the site (as a gasworks) and included arsenic, lead, zinc, sulphate, cyanide, ammonia, total petroleum hydrocarbons and polycyclic aromatic hydrocarbons. Site investigations had shown that soil contamination was essentially concentrated in the western area of the site adjoining the SKDC Car Park (associated with the former Gas Purifier), in a localised area in the northern section of the site and within the large Gas Holder Base (almost certainly due to the Gas Holder void space being backfilled with contaminated materials on demolition).

The underlying groundwater was also contaminated with gas works derived pollutants including dissolved / emulsified hydrocarbons, BTEX, naphthalene, phenols, cyanide and ammonia. The groundwater contamination was predominantly located in the south western corner of the site and in the vicinity of the gas holder. The groundwater contamination appeared to extend under the adjoining car park area.

A number of remediation options were considered and precluded on the basis of cost and / or inability to achieve site remediation criteria. Working closely with Hallam Contracts, SKDC and the Environment Agency, Envirotreat developed a remediation strategy which was commercially viable and compliant with designated human health and environmental remediation criteria.

Remediation Strategy

Envirotrear were commissioned by Hallam Contracts to undertake the following:

1. Formulation and approval of a remediation strategy to satisfy planning and EA requirements including RTM [P20] modelling as required
2. Management and validation of all on-site soil excavations
3. Management and implementation of the agreed remediation strategy for the excavation and treatment of contaminated soils and associated groundwaters utilising E-Clay Stabilisation
4. Management (and implementation) of the reuse of treated and validated soils on site – soils to be reused as a substitute for imported fill
5. Preparation and submission of a comprehensive validation report to satisfy the requirements of SKDC and the EA (for the site as a whole and for each of the individual building plots)
6. Discharge of relevant planning conditions

Methodology

Envirotrear produced a Method Statement, outlining the site history, contamination issues, proposed remediation strategy & technical rationale, environmental protection measures required during remediation works and validation protocols for key aspects of the remediation. Following a consultation period with SKDC and the Environment Agency, approval was achieved to undertake the proposed remediation works. Site specific target criteria had previously been agreed with the regulators for human health protection (derived from CLEA modelling and Generic Assessment Criteria / Soil Guideline Values).

Site specific leachate target criteria were agreed for the E-Clay stabilisation process [to enable treated soils to be reused on site].

The first phase of the works involved the demolition of an existing building together with the excavation and crushing of concrete from hardstanding areas.

The second phase involved the excavation and stockpiling of contaminated soils. The bases and sides of the excavations were validated in accordance with agreed protocols – the identified contamination was found to be more pervasive than initially thought. The prime contaminated areas were confirmed as the south western corner of the site (location of the Gas Purifier), the Gas Holder and the area in the vicinity of the 'Booster House' in the northern section of the site.

The contaminated soils associated with the former Gas Purifier were highly impacted with tarry waste. Excavations in this area were hampered by the remnants of the gas purifier structure which extended underneath the adjoining car park. This tarry contamination is shown in Figure 2 and the remains of the gas purifier are shown in Figure 3.

Figure 2 – Tarry Waste associated with the Gas Purifier



Figure 3 – Remains of Gas Purifier extending under SKDC Car Park



Approximately 650m³ of contaminated soils were excavated, treated and re-used on site.

The treated soils were preferentially reused under hardstanding areas of the site (car parking and roads). The former Gas Holder was backfilled as shown in Figure 4.

Figure 4 – Backfilling of Former Gas Holder



A low permeability cut-off wall was designed and installed along the south western boundary to address the potential risk of recontamination from the adjoining car park area.

Other recovered soils and crushed concrete were separately stockpiled and tested pending possible reuse on site.

VOC and dust monitoring were undertaken throughout the remediation works.

The works were undertaken within an eight week timeframe.

Validation

The works were undertaken in accordance with the approved Method Statement. It was agreed that the suitability of treated material for reuse on site would be determined by compliance with designated leachate target values. The treated materials were seen as a necessary part of the works - the material would replace the requirement to utilise imported fill to return the site to pre-remediation formation levels. The material was identified as having a specific purpose with any deficit of material resulting in the necessity to import fill.

Following a suitable period of “curing” representative samples of treated soils were leach tested and compared with the derived leachate target criteria for the contaminants of concern. A total of 13 samples were tested and all leachate values were compliant with the remediation criteria. The treated material was therefore considered suitable for reuse on site and re-emplaced in the void spaces created by the validated excavations as a substitute for imported fill.

SKDC required each building plot to be separately validated for planning purposes. The local EA office additionally requested the installation of two monitoring boreholes along the southern boundary of the site adjoining the river.

The completed housing development is shown in Figure 5 below.

Figure 5 – Housing Development



Conclusions

Enviro-treat were able to demonstrate through a comprehensive validation report that the overall remediation strategy had been successfully implemented.

The prime drivers for the remediation works were the protection of human health and controlled waters.

The Validation Report was approved by SKDC and the Environment Agency.

The relevant planning conditions relating to contamination issues were discharged enabling the development to proceed.