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CASE STUDY

Integrated Remediation Strategy

Mill Street, Great Bridge, Tipton

Client

MAR CITY HOMES

Regulatory Bodies

Sandwell Metropolitan Borough Council

Environment Agency

Environmental Consultants

GIP Ltd. Ground Investigation & Piling Limited

Site Background & History

The site is located on the eastern side of Mill Street in Great Bridge, West Midlands. The site comprises of a roughly triangular parcel of land, approximately 140m by 90m wide at its widest point. The site is bounded to the north by residential and commercial properties fronting Market Place, Great Bridge; to the west by Mill Street; to the south by open land and to the east the east by a former canal (now infilled) and the River Tame.

The site was historically utilised for industrial purposes – a timber yard was formerly located on the north of the site with the Limerick Iron Foundry / Boiler Works located in the central / southern areas (subsequently restructured as an engineering works). The site in 2006 is shown in Figure 1 below – the remaining buildings were subsequently demolished leaving a cleared site with extensive residual concrete slabs / underground obstructions on the site (see Figure 2 below).

Figure 1 – Mill Street Site [2006]

Figure 2 – Mill Street Site [2011]

The proposed development will comprise of 38 affordable houses / apartments and associated access roads / car parking / landscaping areas as shown in Figure 3 below.

Figure 3 - Proposed Development Layout

Site Investigations

Initial site investigations were carried out by Randall and Walsh in 2005 and 2007. The 2005 investigation focused on the central and northern areas of the site with the 2007 investigation targeting the southern and eastern areas (and in particular the previously identified contamination 'hot-spots' associated with the historical locations of above and below ground oil storage tanks).

Ground Investigation & Piling [GIP] carried out supplementary site investigations in 2013 and 2015 focusing primarily on the previously identified contamination 'hot-spots' and on groundwater contamination.

The site investigations identified total petroleum hydrocarbons [TPH] and polycyclic aromatic hydrocarbons [PAH] as the prime pollutants of concern (in both soils and groundwater) and it was concluded that a specialist remediation solution would be required to address the risks posed to both human health and controlled water receptors (primarily the River Tame located in close proximity to the site on the eastern side).

Discussions were held with the regulatory bodies to address both the planning and human health / environmental concerns.

Sandwell Metropolitan Borough Council [SMBC] were responsible for planning and for the protection of human health. A suitable remediation strategy was developed to address the concerns of SMBC and to enable the development to proceed on successful remediation of the site.

The Environment Agency [EA] was responsible for the protection of controlled waters and it was necessary to develop an acceptable remediation strategy to protect both the groundwater and the River Tame.

Envirotreat was engaged by Mar City Homes [now Aurora] to develop an appropriate remediation strategy for the site. The approved integrated remediation strategy comprised of *in-situ* [in-place] E-Clay® Stabilisation of the two identified soil contamination 'hot-spots' and the installation of an E-Clay® Permeable Reactive Barrier System [PRB] designed to protect the adjacent River Tame – the integrated treatment approach was required by the EA to ensure that the River Tame was suitably protected.

The approved integrated remediation strategy is shown in Figure 4 below.

Figure 4 – Integrated Remediation Strategy

The site prior to remediation is shown in Figure 5 below. The stockpiles of crushed demolition materials shown at the rear of the picture were assessed for potential asbestos contamination prior to reuse on-site as sub-base material.

Figure 5 – Site Prior to Remediation

Installation of the PRB

The PRB was installed by trenching techniques utilising a conventional 20 tonne tracked excavator. Each trench section was advanced 'end on end' and 'keyed' into the underlying impermeable clay layer. The designated pillared E-Clay was added in slurry form to the trench excavations at predetermined quantities and thoroughly mixed with the soils using the excavator to produce a homogenous treated mix. The barrier installation is shown in Figures 6, 7 and 8 below.

Figure 6 – Barrier Installation – Trench Excavation

Figure 7 – Barrier Installation - E-Clay / Soil Mixing

Figure 8 – Barrier Installation – Completed Mixing

Each section of the barrier was capped with inert soils on completion as shown in Figure 9 below.

Figure 9 – Barrier Installation – Capping Layer

E-Clay Stabilisation [Soil Hot-Spot Areas]

Envirotreat carried out extensive trial pitting prior to this stage of the works to delineate as accurately as possible the extent of the identified soil contamination 'hot-spots'. Once confirmed the respective areas were marked out ready for treatment.

The two identified 'hot-spot' areas were treated *in-situ* using a conventional 20 tonne excavator. A site-specific E-Clay formulation was added in slurry form and combined with cementitious materials during the mixing process to produce a homogeneous treated [stabilised] material. The methodology was similar to the barrier installation – the 'hot-spot' areas were treated in sections using a grid system.

The E-Clay Stabilisation treatment process is shown in Figures 10 – 13 below.

Figure 10 – Hot–Spot Treatment – Soil Excavation

Figure 11 – Hot-Spot Treatment - Mixing Process

Figure 12 – Hot-Spot Treatment - Mixing Process

Figure 13 – Hot-Spot Treatment - Completion

Validation and Verification

Representative samples were taken from the treated soils for validation purposes. A composite sample was prepared representative of every 250m^3 treated.

Following a suitable period of 'curing' the composite samples were sent for leach testing at an accredited laboratory and compared with the designated leachate target criteria [Drinking Water Standards for TPH and Environmental Quality Standards for PAH].

All leachate values were fully compliant with the designated leachate remediation target criteria. The treated material was therefore considered suitable for reuse on site as a substitute for imported fill.

Two groundwater monitoring boreholes were installed to validate the performance of the PRB. The results from the validation monitoring demonstrated that the PRB was performing satisfactorily and achieving the required aim of reducing the offsite migration of the identified contaminants of concern.

Conclusions

Envirotreat demonstrated that the remediation objectives for the site had been achieved through the submission and approval of a comprehensive Validation / Verification Report for the Site.

The remediation works enabled the relevant planning conditions on land contamination to be discharged by SMBC. The site was subsequently developed for residential use with the full support of the regulatory bodies.

2018 Update

Aurora [formerly Mar City Homes] has recently completed the development which is being marketed as 'Tame View'. All the properties have now been sold.

The development is shown in Figure 14 below.

Figure 14 – 'Tame View' Development