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CASE STUDY

E-Clay Stabilisation

Residential Development
Former Southend Gas Works

Client

BARRATT HOMES

robertleonard

Main Contractor

KNIGHT DEVELOPMENTS

Site Background & History

The site was formerly occupied by the Southend Gas Works. The site is located on the Eastern Esplanade, Southend-on-Sea and is bounded by the Thames Estuary 50m to the south and residential properties to the north, east and west of the site. The site occupied an area of 2.5 hectares and has planning permission for over 200 residential properties.

The site was historically utilised for coal / coke storage and gas purification.

In recent years the site has been utilised as a gas distribution depot, a contractor's yard and a boat maintenance / storage yard.

The former gas works is shown in Figure 1 below.

Figure 1 – Former Southend Gas Works

The historical usage of the site as a gas works had resulted in significant soil and groundwater contamination. The identified contaminants on-site reflected the historical usage of the site and included heavy metal pollutants (arsenic, trivalent and hexavalent chromium, copper, lead and nickel), total petroleum hydrocarbons, polycyclic aromatic hydrocarbons, phenols and 'total' cyanides (free and complex) associated with spent oxide ('Blue Billy') wastes identified on-site.

Objectives

The remediation strategy for the site was designed to address the identified source contamination with the intention of protecting both human health and groundwater / surface water receptors (in particular the River Thames).

Methodology

The *ex-situ* remediation works involved the source treatment (E-Clay Stabilisation) of circa 14,300m^3 of contaminated soils and 1,500m^3 of spent oxide waste (containing high levels of total cyanides).

The treatment process involved mixing the contaminated materials with the designated E-Clay slurry and cementitious materials (to assist drying). A specialist mix formulation was utilised to treat the spent oxide wastes to ensure that free cyanides were not generated by the treatment process – the objective was to drive the reaction equilibrium to form complex cyanides which have low toxicity and solubility – these complex cyanides were then stabilised by the treatment process.

The contaminated soils / spent oxide wastes (and associated groundwater) were treated in discrete batches utilising a specialist processing bucket. The contaminated materials were mixed with the treatment materials to produce a homogeneous mass.

The treatment operation is shown in Figure 2 below.

Figure 2 – Treatment Operation

The processing bucket incorporate rotating blades at the bases facilitating a high degree of mixing (particularly applicable for clayey soils as identified at the Southend Site).

The mixing process is shown in Figure 3.

Figure 3 – Mixing of Soils with E-Clay Slurry (Utilising Specialist Processing Buckets)

The remediation works were progressed across the site in phases – the residential properties were constructed directly following the completed remediation works as shown in Figure 2.

Representative samples were taken throughout the treatment process – these samples were combined to produce composite samples for validation purposes.

The treated soils were temporarily stockpiled before being reused on-site as a substitute for imported clean fill.

The works were conducted over a 12 week period under the auspices of Envirotreat's Mobile Process Licence (MPL). Specialist technology, materials and supervision were supplied by Envirotreat. The main contractor (Knight Group) supplied all the required plant and labour for the application of the Envirotreat Process.

Validation

Validation of the treated material was carried out on 32 composite samples of the treated contaminated soils and 4 composite samples of the treated spent oxide waste. These samples were leached and analysed at a UKAS accredited laboratory**.** The leachate values were fully compliant with the agreed Site Specific Target Levels thereby enabling the soils to be reused on-site for a beneficial purpose.

The residential development is shown in Figure 4 below.

Figure 4 – Residential Development