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CASE STUDY

E-Clay Stabilisation

Wind Turbine Enabling Works, Tilbury

Client

SSE

Main Contractor

Balfour Beatty

Site Background & History

The Port of Tilbury as part of their "continued drive to achieve sustainable clean environmental solutions " planned to install four new wind turbines in 2013 at the Port of Tilbury.

The new 2.3MW, 80 metre turbines will operate continuously and provide up to 60% of the ports electricity needs for the Port.

Balfour Beatty was commissioned to undertake the enabling works as part of this development.

The majority of the site area is recovered marshland which has been infilled with imported materials (to enable the site to be suitable for development and to raise site levels). The resulting made ground on the surface is generally 2 - 3m in thickness.

A Materials Management Plan for the enabling works indicated a net surplus of soils (generated by the need to install the foundations for the turbine bases / pads within the made ground).

Based on the assumption that the surplus soils would be removed from site and disposed of at a suitable landfill a Waste Classification Assessment was carried out in 2012 by RSK to determine the likely waste classification of surplus materials generated from each of the four turbine installation areas. It was determined that the soils were a mixture of inert, non-hazardous and hazardous – the hazardous classification was determined on the basis of H14 ecotoxic. The identified contaminants of concern were heavy metals (particularly copper, lead, nickel and zinc, polycyclic aromatic hydrocarbons [PAHs] and total petroleum hydrocarbons [TPH].

Figure 1 – Wind turbine foundations.

Balfour Beatty subsequently decided to implement a more cost-effective and sustainable remediation solution for the turbine development project. The agreed remediation strategy was to treat surplus soils classified as hazardous / non-hazardous for reuse on-site and only remove from site soils classified as inert (in accordance with the soil management plan for the site).

The remediation strategy was developed and agreed with the Environment Agency. A Remediation Method Statement was produced by Envirotreat to document the proposed works and remediation objectives.

The treatment technology utilised in the remediation process was Advanced (E-Clay) Stabilisation. This was designed to treat both heavy metal and organic PAH / TPH contamination within the made ground as previously identified.

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Methodology

The remediation works were implemented in accordance with the Remediation Method Statement and comprised of the following elements:

- Excavation of contaminated soils (by Balfour Beatty)
- Segregation of soils by waste classification (by Balfour Beatty)
- Transfer of soils designated for on-site remediation to treatment area (by Balfour Beatty)
- *Ex-situ* treatment of contaminated soils by E-Clay Stabilisation (by Envirotreat)
- Validation of treated materials in accordance with the designated remediation target criteria (by Envirotreat)
- Reuse / redeposition of treated and validated materials on-site (by Balfour Beatty)
- Removal of soils designated for off-site disposal (by Balfour Beatty)

The contaminated soil stockpile pending treatment is shown in Figure 2 below.

Figure 2 – Contaminated Soil Stockpile

The E-Clay Stabilisation process was designed to chemically and physically treat the contaminated soils on the site using a combination of cementitious materials and proprietary E-clays.

The treatment operation was designed to treat the waste soils (as a waste recovery operation) to produce a material suitable for use as a substitute for imported fill.

The waste recovery operation was carried out in accordance with reuse requirements and in compliance with the agreed remediation target criteria.

The contaminated soils were treated *ex-situ* utilising the designated E-Clay Stabilisation formulation. The soils were treated in 10m^3 batches utilising a mixing bin. The treatment process involved mixing the soils with the designated E-Clay formulation in slurry form and cementitious materials. The soils were mixed with the treatment materials to produce a homogeneous mass. Representative samples were taken throughout the treatment process – these samples were combined to produce composite samples for validation purposes.

The treatment process is shown in Figure 3 below.

Figure 3 – Treatment Process

Approximately 600m^3 of contaminated soils were treated by the stabilisation process.

The remediation works were completed within 7 working days.

Figure 4 Treated soils.

Validation

The reuse on-site of the treated material was facilitated by compliance with leachate target criteria. The leachate target criteria were derived by Remedial Targets Methodology (RTM) / P20 modelling - the Tier 3 derived values were utilised as leachate target criteria for each of the identified contaminants of concern.

Following a suitable period of "curing" representative composite samples of treated soils were leach tested and compared with the derived leachate target criteria. A total of six samples were tested and all leachate values were compliant with the designated remediation criteria. The treated material was therefore considered suitable for reuse on site as a substitute for imported fill.

Conclusions

Envirotreat were able to demonstrate through a comprehensive Validation Report that the overall remediation strategy had been successfully implemented.

The prime driver for the remediation works was the protection of controlled waters [the River Thames].

Figure 5 – Installed wind turbines.