



Plate 1 – Sixfields and Harvey Reeves Road Sites.

Development:	Mixed
Consultants:	Halcrow & English Partnership
Contractor:	Carillion

Site Overview

Northampton is within one of four major growth areas identified in the Government's 2003 "Sustainable Communities Plan". The two former landfill sites of Sixfields and Harvey Reeves Road had been identified as key areas for redevelopment. Remediation of the sites was necessary to protect the local surface and groundwater from the impact of landfill leachate.

The site is essentially a combination of two former landfill sites, located to the west of Northampton city centre.

In respect to development, it was proposed to construct homes, jobs and leisure opportunities on the 97 hectare of identified Brownfield land. Comprehensive studies by Halcrow identified serious contamination of groundwater and risk to associated surface waters

Objective

Groundwater remediation was the largest challenge facing the development at the Sixfields and Harvey Reeves Road sites. The

following contaminants were identified as being a source of risk; ammoniacal nitrogen, arsenic, iron, manganese, Diesel Range Organics, Extractable Petroleum Hydrocarbons, nickel, Petrol Range Organics and Polyaromatic Hydrocarbons (PAH).

Removal of the source was quickly dismissed, the size of the site precluded a complete circling with an impermeable groundwater barrier and that it would unacceptably affect the overall groundwater regime of the area.



Plate 2 – General water contamination at the Sixfields site.

Methodology

To address the contamination and site issues, the installation of an Envirotreat Soil Mixed Barrier, was considered the best available technique. On the basis it would allow groundwater to flow into and out of the site, and the active sections would absorb the harmful substances so ensuring that water of an acceptable quality left the site.

Following extensive site-specific laboratory treatability trials and flux calculations in accordance with Environment Agency (EA) permeable reactive barrier guidelines and using MODFLOW groundwater simulation modeling

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Envirotreat were able to design, demonstrate and warrant the effectiveness of the barrier for 50 years.

A total of 3300 piles were installed over a length of 1500m, incorporating 34,500 linear metres of columns. The active and passive sections of the barrier were installed using a system on contiguous piles formed by soil mixing process using flight auger rigs. The passive section consisted on single line of contiguous piles and the active section by the installation of a double line of contiguous piles, necessary to achieve sufficient thickness of E-Clay material. The depth of the barrier ranged from 6m to 14m, the toe-in-depth of the barrier had to be sufficient to ensure any leachate from the landfill did not flow under the barrier, this was achieved by keying at least 1m into either the Upper Lias Clay deposits or Glacial Lacustrine deposits as necessary.



Plate 3 – Typical piling rig used at the Sixfields site.

During installation numerous obstacles and large concrete blocks were encountered, those at shallow depth were excavated, however those encountered at depth resulting in the barrier being extended around these obstructions.

The installation required Envirotreat's Mobile Treatment Licence and associated Site Specific Working Plan to the requirements of the EA.

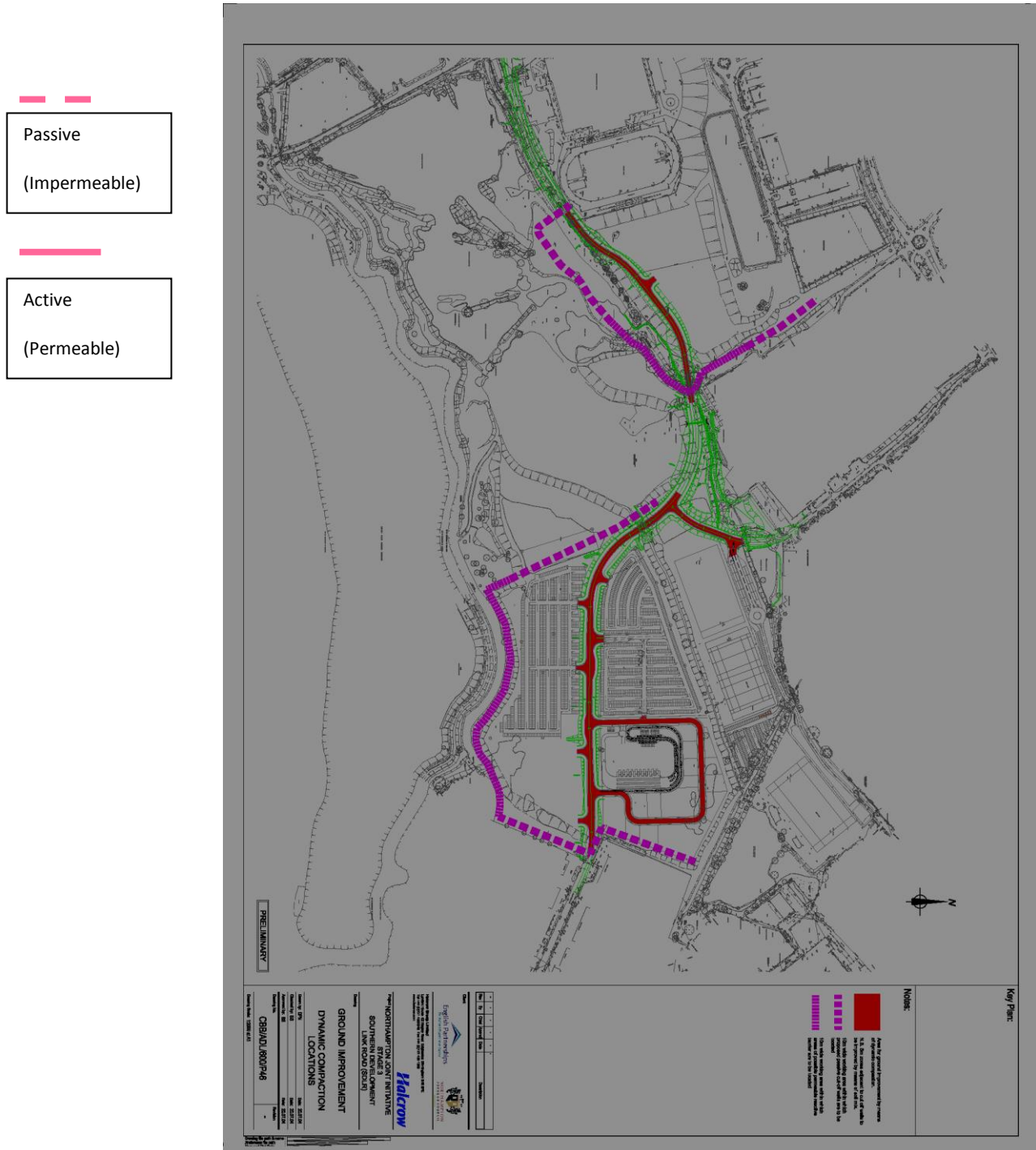
Results and Validation

The effectiveness of the barrier was determined by a systematic and comprehensive groundwater monitoring program. The results obtained showed that the proposed Soil Mixed Reactive Barrier System (SMRBS) containing Envirotreat E-Clay and natural zeolite had effectively treated and reduced the concentrations of identified pollutants in groundwater.

Borehole sampling and analysis is ongoing.

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Plate 4 Schematic of Barrier installation.



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