

# Rehabilitation

of a polluted site

## REHABILITATION OF THE TRAPÈZE EAST GROUND

BOULOGNE BILLANCOURT - HAUTS DE SEINE - FRANCE



### Cleaning up works on a part of a former automotive factory

Until 1992 Renault operated a car manufacturing plant in the commune of Boulogne Billancourt.

After operations ceased Renault requested the company Antéa to carry out investigations on a 10m x 10m sampling grid representing, for the works zone, 830 probes, 3,100 samples and 101,700 parameters analysed. These surveys enabled the soil quality to be quantified. Operations on this site over almost 100 years had resulted in localised infiltration of hydrocarbons and volatile organic solvents into the subsoil.

The work of cleaning up the Trapèze Est site was entrusted to Sol Environment in March 2007.

The preparation works necessitated shoring up a site boundary located at the edge of a public highway using secant piles and the creation of watertight treatment cells (11,500m<sup>2</sup>).

The polluted materials (concrete and unsaturated and saturated soil) were selectively extracted using mechanical apparatus, transferred to



Skimming in open excavation

CONTRACTING AUTHORITY:	RENAULT SAS
PROJECT MANAGER:	ANTÉA
GENERAL CONTRACTING:	SOL ENVIRONMENT
DURATION OF WORKS:	APRIL 2007 - SEPTEMBER 2008

#### MAIN QUANTITIES:

- Surface area of the site: 85,000m<sup>2</sup>
- Retaining supports: 130 ml by secant piles representing 1,500m<sup>2</sup> of wall
- Extraction of surface and buried concrete: 4,300m<sup>3</sup>
- Excavation above the water table: 18,500m<sup>3</sup> of clean earth and 31,500m<sup>3</sup> of polluted earth
- Excavation under the water table: 17,500m<sup>3</sup> of polluted earth
- Skimming: 250m<sup>3</sup> of floating hydrocarbons in open excavation and in well
- Acceptance of excavation limits: soil sampling every 25m<sup>2</sup> representing: 1,135 soil and soil gas samples
- On-site treatment of earth polluted by volatile organic compounds: on-site venting of 1,500m<sup>3</sup>
- On-site treatment of earth polluted by hydrocarbons: Activation of bacterial breakdown over 47,500m<sup>3</sup>
- On-site treatment of concrete: crushing (20/80) of 4,300m<sup>3</sup>
- Acceptance of extracted and treated materials: soil sampling every 60m<sup>3</sup> representing 1,200 soil and concrete samples
- Laboratory analyses: 2,538 samples with 40 chemical parameters on raw earth (total hydrocarbon (THC), aromatic volatile organic compounds (BTEX), volatile halogenated organic compounds (chlorinated solvents) and polycyclic aromatic hydrocarbons (PAH)) and on leachates (heavy metals) representing a total of 101,520 parameters analysed.
- Infill of excavations: use of 79,000m<sup>3</sup> of accepted materials treated on site
- 99% of polluted materials treated and recovered on site



*Extraction under the water table: sheet pile section and shoring up with piles*



*Treatment of materials in a watertight cell*



*Extraction of materials above the water table*

watertight treatment zones and treated on-site before backfilling. Acceptance of excavation limits and of clean, treated materials was done by sampling soil, concrete and soil gas by surface area units of 25m<sup>2</sup> of ground and volume units of 60m<sup>3</sup> of dispersed materials. These checks represented around 2,500 samples and 101,500 parameters analysed.

Pumping into the alluvial deposits of the Seine by the commune resulted in hydraulic containment under the site. The hydrocarbons that had infiltrated became trapped in the alluvial deposits when pumping stopped.

The excavation works under the water table conducted in open excavation or inside sheet-pile sections required skimming of the hydrocarbons released by the excavation works. 250m<sup>3</sup> of free hydrocarbons were collected in this way and disposed of either in a

special industrial waste incinerator or via a cement works approved for energy recovery.

The biological treatment carried out through activation of autochthonous fauna by introducing oxygen and nutrients enabled the hydrocarbons adsorbed or absorbed in the soil to be broken down. During the biological treatment, an increase of around 1 million CFAs (colony forming units) was observed inside the treatment windrows, associated with an increase in temperature of approximately 10°C. 47,500m<sup>3</sup> of earth polluted by hydrocarbons was treated in compliance with the cleaning objectives determined in a detailed risk evaluation carried out by Antéa and fixed by Prefectoral Decree. The earth treated on site was recovered for use as backfill on the site.

The earth polluted by volatile organic compounds (chlorinated solvents and naphthalene) was treated by on-site

venting. 1,500m<sup>3</sup> of earth polluted by chlorinated solvents was treated on site and recovered for use as backfill after characterisation in batches of 60m<sup>3</sup>.

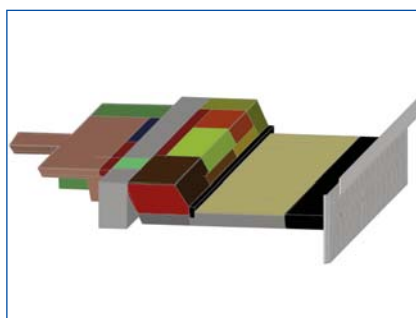
The concrete on the site, blocks and buried blocks, were broken up using hydraulic rock breakers and crushed into 20/80mm using mobile crushers. Thus 4,300m<sup>3</sup> of concrete was treated on site and recovered for use as backfill after characterisation in batches of 60m<sup>3</sup>.

The works were subject to specific working procedures depending on the tasks to be accomplished and to regular monitoring, both internal and external, of health and safety conditions.

The laboratory analysis results form a large database enabling precise traceability of the materials extracted, treated and used as backfill.



*Alluvial deposits during skimming operations*



*Traceability of materials used as backfill*



*Monitoring biological treatment of earth polluted by hydrocarbons*