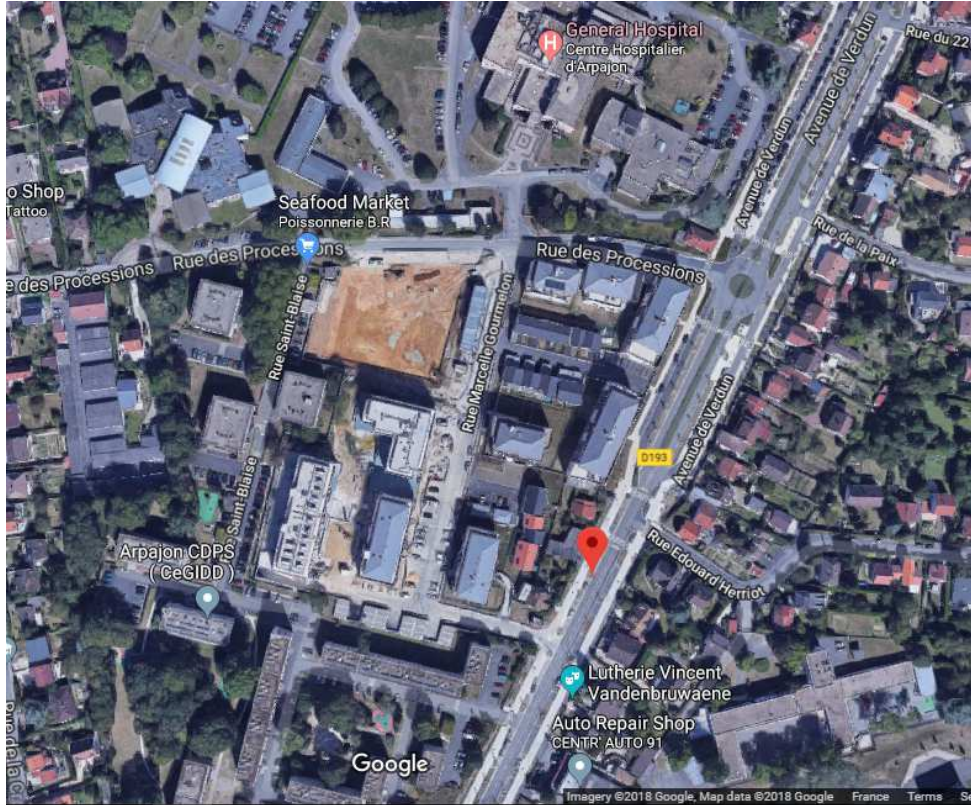


Situation & operational context:

Context of the remediation intervention:

The remediation project follows the dismantling of a logistical base for civil works, with a total surface area of 23 200 m² and including fuel and emulsion storage tanks.

The site is located in a residential area approximately 30 km to the south of Paris (Arpajon City).



Customer: “Eiffage Aménagement” (real estate development company)

Originality of the project conducted by OGD:

Operations of a remediation project in a real estate context generally consist of the rapid excavation of contaminated soils and their transport to an off-site treatment plant.

For the project at Arpajon, OGD carried out the remediation on site, in parallel with the construction work.

The project was studied upstream with the customer in order to organize and optimize the work schedule (phasing) and to integrate the treatment of the contaminated soils thanks to the rotation of successive batch operations.

Using this approach, OGD secured the budget for the remediation works (initial budget halved when compared to a conventional approach of excavation and off site treatment).

The following factors contributed to the cost optimization:

- o the compatibility of on-site treatment with construction deadlines
- o the potential for the reuse of a part of the treated materials as on site embankments

In addition, OGD provided:

- Commitment according to a fixed-price
- Commitment for a maximum duration of 28 months
- Commitment to the following performance achievements :

- o soils traceability at any time
- o treatment optimization to ensure the achievement of the soil quality objectives
- o control of eventual atmospheric releases

Contamination characteristics:

- Soils nature : heterogeneous - sandy clay with stones type “meulière” (stone flint)
- Contaminants (Average / Maximum) :
 - o BTEX : 50 / 150 ppm
 - o TPH : 10 000 / 25 000 ppm
 - o PAH : 90 /1500 ppm

Remediation targets:

The remediation targets mainly concerned the soils impacted with hydrocarbons (TPH):

For moderately impacted soils - which will leave the site after treatment:

- Implementation of an On-site treatment (biological treatment - biopile) in order to respect acceptance criteria of inert materials

For strongly impacted soils – which will be reused on site:

- Implementation of an On-site treatment (biological treatment - biopile) in order to reuse the material as backfill for reinforcements

Concentrations to reach this objective:

- Those used in the residual risks analysis led by the engineering consulting firm in 2011, presented below :

Substance	Maximal content retained in the EQRS soil gas (ug/m ³) – receptive objective
HAP	
Naphtalène	6,50E+01
BTEX	
Benzène	5,70E+03
Toluène	9,80E+03
Ethylbenzène	5,30E+03
m,p-Xylène	1,82E+04
o-Xylène	1,50E+04
Cumène	6,50E+01
pseudocumène	6,50E+01
mésithylène	6,50E+01
Hydrocarbures	
Fraction aliphatiques C5-C6	7,70E+04
Fraction aliphatiques C6-C8	7,70E+04
Fraction aliphatiques C8-C10	6,10E+03
Fraction aliphatiques C10-C12	2,20E+03
Fraction aliphatiques C12-C16	2,20E+03
Fraction aliphatiques C8-C10	4,00E+04
Fraction aliphatiques C10-C12	3,80E+03
Fraction aliphatiques C12-C16	2,20E+03
COHV	
1,1-Dichloroéthane	6,50E+01
1,1,1-Trichloroéthane	6,50E+01
Dichlorométhane	6,50E+01
Trichlorométhane	6,50E+01
Tétrachloroéthylène	6,50E+01
Trichloroéthylène	6,50E+01
cis-1,2-Dichloroéthène	6,50E+01
Trans-1,2-Dichloroéthylène	6,50E+01
Chlorure de Vinyle	6,50E+01
Tétrachlorométhane	6,50E+01
1,1,2-Trichloroéthane	6,50E+01
1,2-Dichloroéthane	6,50E+01
1,1-Dichloroéthylène	6,50E+01

- An abatement rate of 70% required on BTEX and TPH (C5 – C16) with regard to the initial state (state “0”) for every plot of land to manage.

For soils extremely impacted: off-site treatment (in a thermal treatment plant)

Scope of works:

Ortec made:

- sorting 35 000 t of contaminated soils removed
- design, implementation and operation of on-site treatment of contaminated soils by biopile (with controlled ventilation) and biotertre

The treatment of a total volume of approximately 24 000 m³ of contaminated soils, was split in :

- 2 biopiles of 7 000 and 5 300 m³ of contaminated soils each
- 3 biotertres of 4 400, 4 200 and 2 800 m³ of contaminated soils each

For biopile treatment:

- Creation of a 3000 m² waterproof platform
- Preparation and amendment of land contaminated with TPH, PAH and BTEX (mix of green waste compost type)
- Laying drains and stacking
- Connecting of treatment unity and soil bioremediation
- Gas treatment by biofilter
- Monitoring of treatment by GSM network with gas emissions control (PID + laboratory analysis on TPH, PAH, VOC and BTEX)
- Monthly monitoring of treated soil quality (microbiological monitoring / DNA control of the bacteriological activity)
- Control of nuisances and expositions (dusts, odors, volatile pollutants) by measures and specific devices of control and management
- Pump and treat solution for polluted groundwater (pollution by hydrocarbons) before rejection.

Mass balance of the operation:

Soil put into treatment	Biopile 1	Biopile 2	Biotertre 3	Biotertre 4	Biotertre 5	Volume total
Volume of soil per treatment	7097 m ³	5360 m ³	4433m ³	4187m ³	2787m ³	23864m ³
Off-site evacuation	≈3600 m ³	5360 m ³	4433m ³	4187m ³	2584m ³	20164m ³
Embankment use	≈3500 m ³	0 m ³	0 m ³	0 m ³	≈200m ³	3700m ³

Specific management of 4000 T of soil mixed with paste like tars in a thermal treatment plant

Duration and costs:

Commitment flat-rate price: 1, 4 M€ H.T.

On-site treatment duration: from 4 to 6 months per batch (rotation)

Global duration of the project: 18 months from 2014 to 2016

Illustration:

Overview



Work sequences



**Creation of the waterproof platform
with drainage layer**



Creation of the main network



Land preparation and amendment



Establishment of secondary networks



Connection and covering of the biopile