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CERMET
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In Situ Thermal Desorption

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HİZMETLERİMİZ

Toprak kirliliği yönetmeliği danışmanlığı
Çevre Mevzuatı Danışmanlığı
Çevresel risk değerlendirmesi ve raporlama faaliyetleri
Kirlenmiş saha iyileştirme ve temizleme
Altyapı – Kanal – Kuyu Temizlik ve Kameralı İnceleme
Ultrasonik tank kaçak tespiti

DEVAM EDEN YATIRIMLAR

Çevresel acil durumlara müdahale,
Robot ile tank temizliği, tank kalınlık ölçümleri ve kumlama
Boru hattı kaçak tespit sistemleri ve boru hatlarının kameralı incelenmesi
Boru hatları bakım ve tamiri

MPT , Toprak Kirliliği Kontrolü Yönetmeliği Kapsamında 2013 yılından yeterlilik belgesi sahibi bir kuruluştur.

T.C. ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI

ÜRÜNLERİMİZ

Yağ – yakıt ayırıcı sistemlerin uygulaması
Tehlikeli / Tehlikesi Geçici Atık Depolama Konteynerleri
Atık Yağ & Yakıt Tankları
Acil durum müdahale kitlerinin tedariki

MPT, Mepsan & Petroltecnica Ortak Girişimidir.

MPT, İngiltere menşeli Kingspan ve Censol markalarının yetkili Türkiye distribütörüdür.

Kingspan UK

censol

Technology

Thermal Desorption (TD) is an in situ Remediation Technology that increase the soil temperature detaching VOC and semi VOC contaminants from soil matrix and permits the captation of these with traditional extraction systems (SVE).

Several Sources of energy to carry out the soil heating could be used:

- ***electrical resistances(ERH);***
- *electromagnetic radio frequency;*
- *Hot air or steam Injection.*

Energy is uniformly transmitted with heating of soil, Interstitial water and of contaminants through conductive and convective thermal process.

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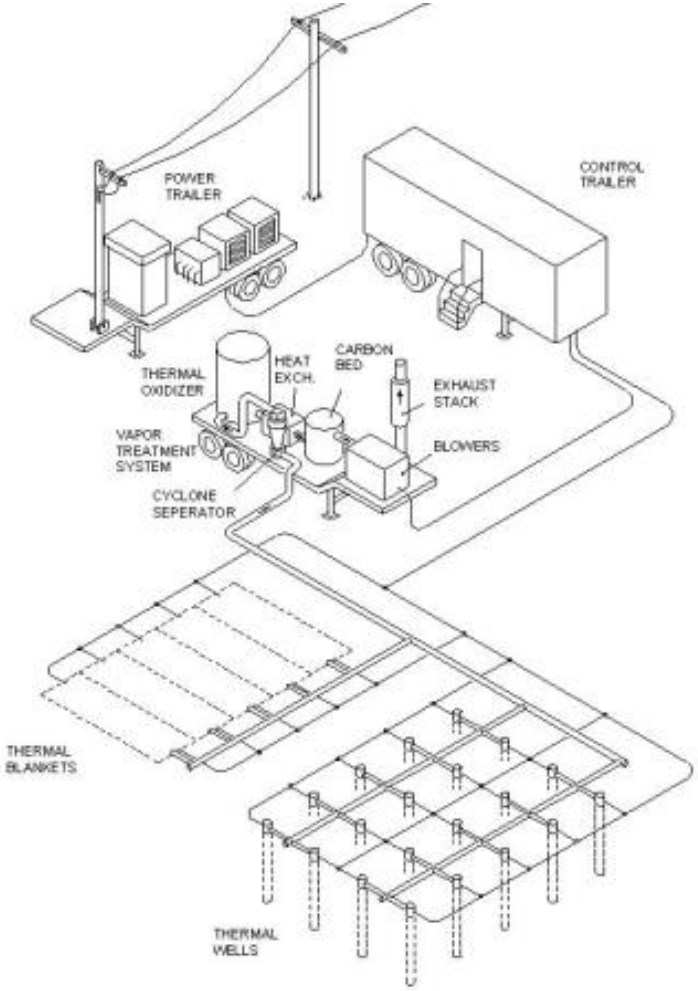
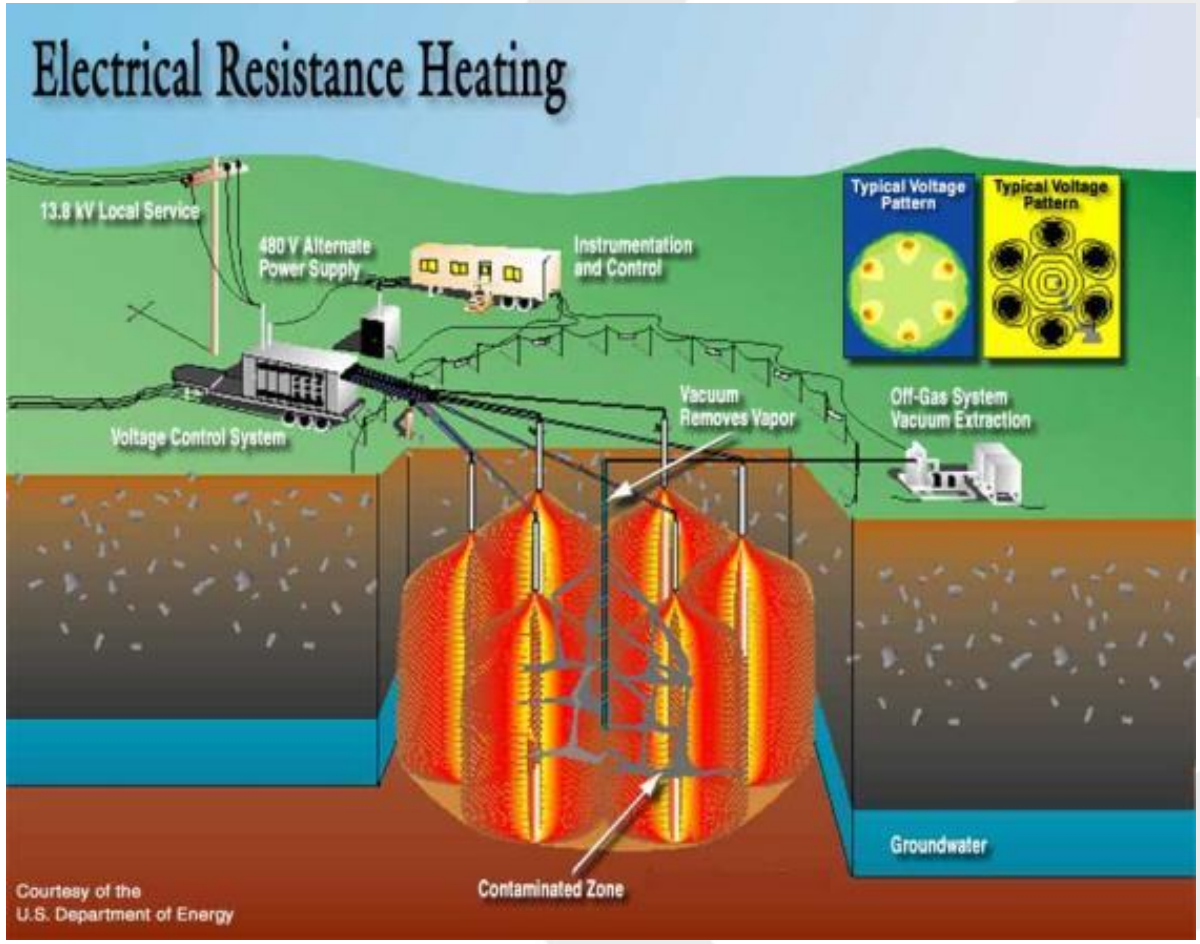
Technology





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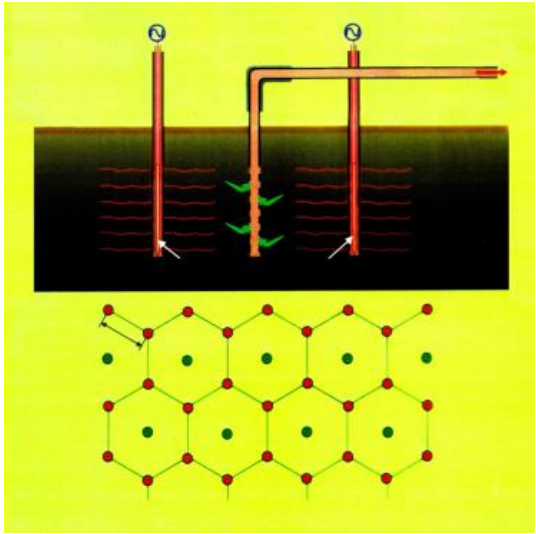
Technology

The Heating of soil is obtained using horizontal or vertical heating piping installed into the soil. Temperature is increased up to 550-650 °C that is necessary to permit the extraction of compound that can't be volatilized at ambient temperature. Vapors of contaminants are extracted and treated on site with a dedicated treatment system.



The front heat spreads throughout the area to be treated gradually depending on the water and vaporization of the contaminants contained in the soil.

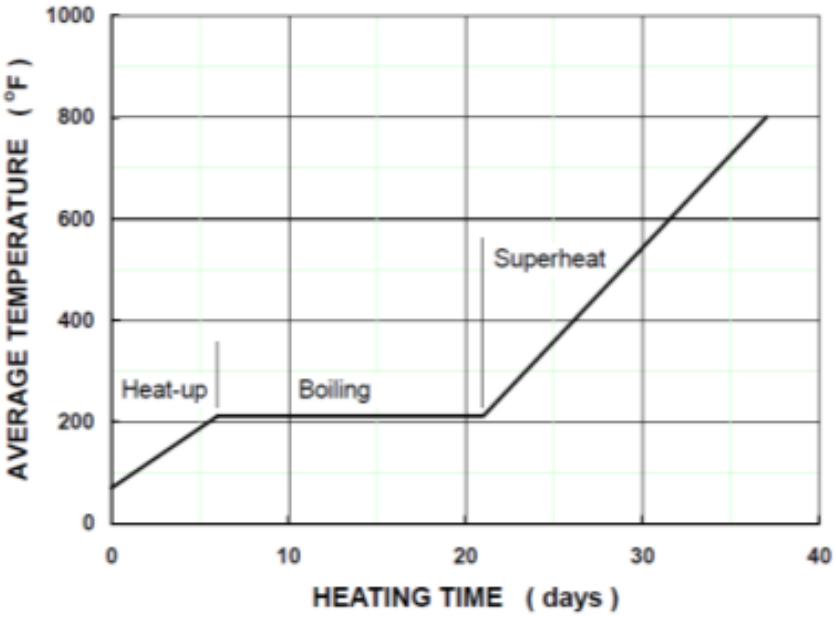


Figure 6 Theoretical Temperature Rise in Soil

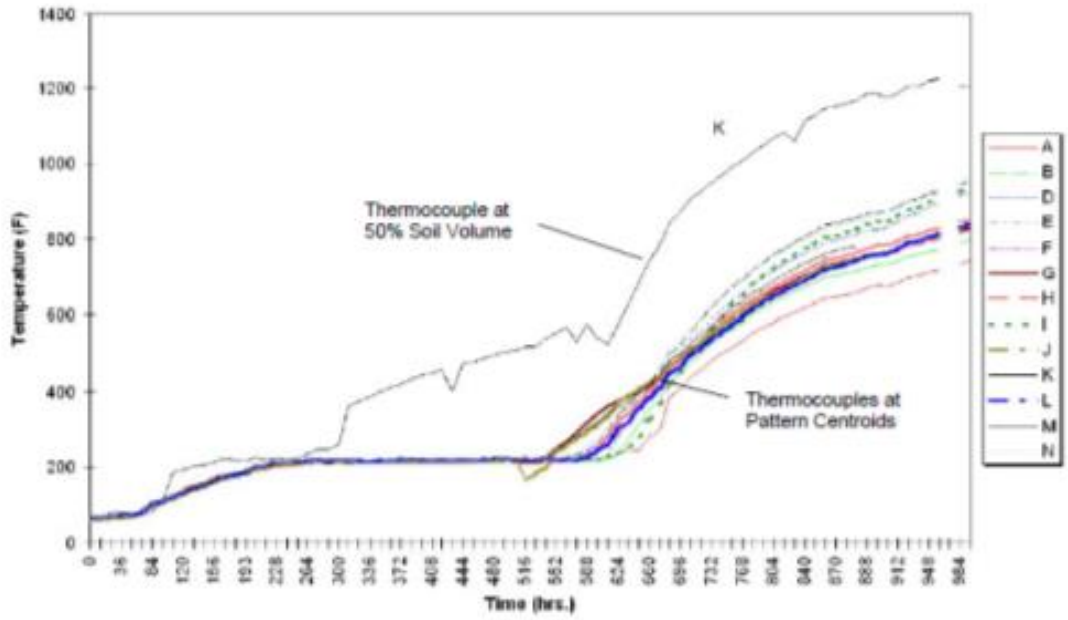


Figure 7 Temperature Rise in MEW Triangular Patterns

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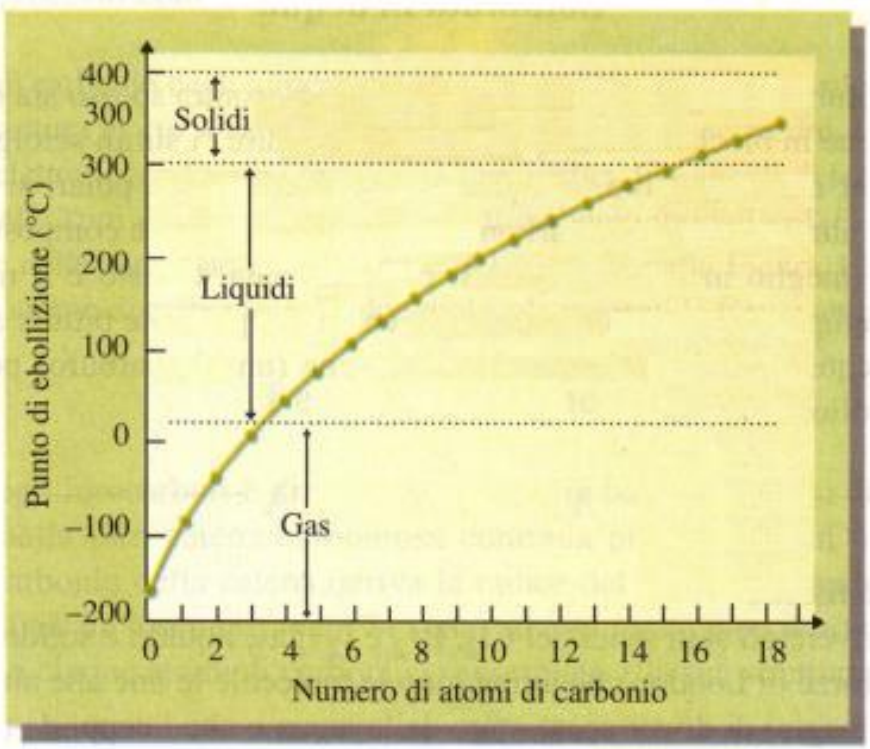
Technology

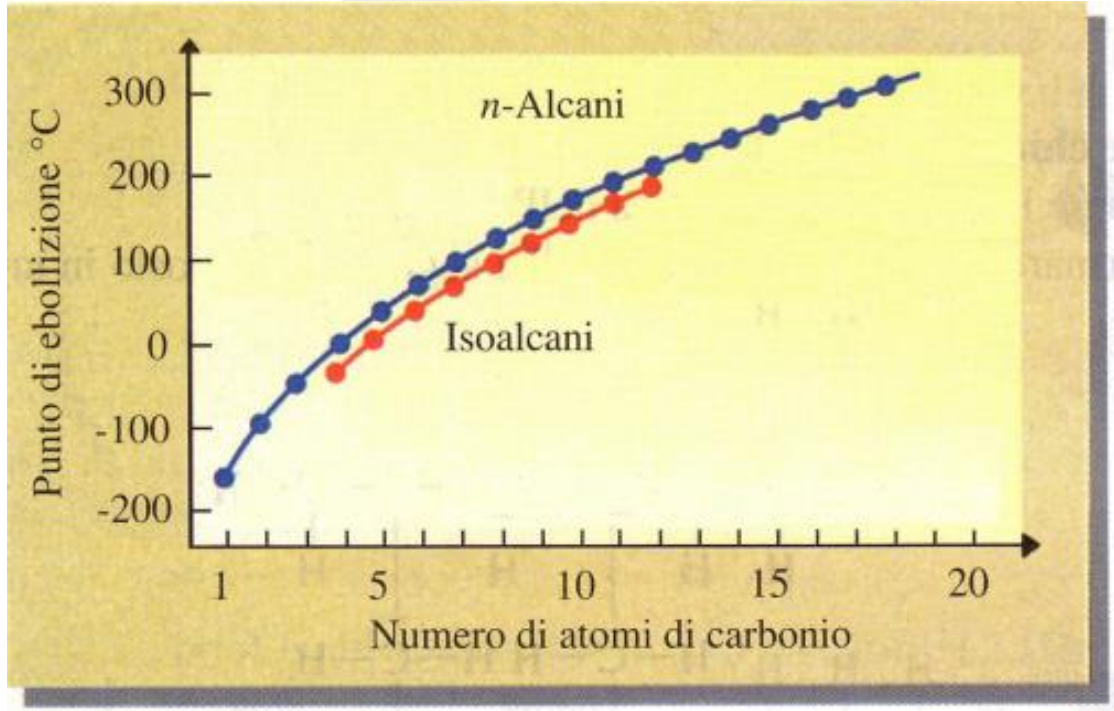
Laboratory studies and field test demonstrated the effectiveness of Thermal Desorption to treat several contaminants:

- TPH C<12 and C> 12;
- PAH;
- Chlorinated Solvents;
- PolyChlorinated Biphenyls (PCB);
- Pesticides.

Contaminants listed above can be removed with high efficiency (close to 100%) because the whole treatment area could be heated at high temperature for several days.

Technology


Punto di ebollizione (°C)
400
300
300
200
100
0
−100
−200
Solidi
Liquidi
Gas
0 2 4 6 8 10 12 14 16 18
Numero di atomi di carbonio


Punto di ebollizione °C
300
200
100
0
-100
-200
n-Alcani
Isoalcani
1 5 10 15 20
Numero di atomi di carbonio

Technology

The transport of the volatilized contaminants from the extraction wells (SVE) is improved by increased permeability of the subsoil, resulting from the vaporization of water present and resulting in drying and shrinkage of the soil.

The technology (TD combined with SVE) is effective even in the presence of fine soils (silt and clay), which for their natural features have reduced permeability.

Technology

Bibliographic Data	Water Content	Density	Specific Heat	Specific Heat vol.	Thermal conductivity	Thermal Diffusivity x10^{-7}
	$\%_{Vol}$	ρ	C_s	C_{sV}	λ	α
	U	kg/m^3	J/kg·K	MJ/m^3·K	W/m·K	m^2/s
Sand	0	1.600	800	1,28	0,3	2,4
	20	1.800	1.200	2,16	1,8	8,6
	40	2.000	1.500	3	2,2	7,4
Clay	0	1.600	900	1,44	0,25	1,8
	20	1.800	1.250	2,25	1,2	5,2
	40	2.000	1.650	3,3	1,6	5
Peat	0	300	1.900	0,57	0,1	1
	20	700	3.300	2,31	0,3	1,2
	40	1.100	3.600	3,96	0,5	1,2

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Technology

The surface of intervention area must be well insulated (capping) in order to:

- minimize heat losses from the surface;
- optimize the extraction of the contaminants through the recovery systems;
- ensure that all the vapors released are captured;
- protect the treatment area by the infiltration of rainwater.

Case History

Background

- Petroltecnica has developed the TD in-situ technology, associated to a system of SVE and P&T, using electrical resistances positioned in the area to be treated, housed inside suitable stuck pipes in the ground subject to remediation activity.
- The technology is being applied in a clean-up of abandoned area, used in the past for the storage and marketing of petroleum products (former gas station)
- On this area it has been active for some years a traditional remediation system of SVE / Bv, which led to the removal of much of the contamination; the residual amount exceeding the remediation targets (Maximum Allowable Concentration - MAC residential) are treated with the TD.

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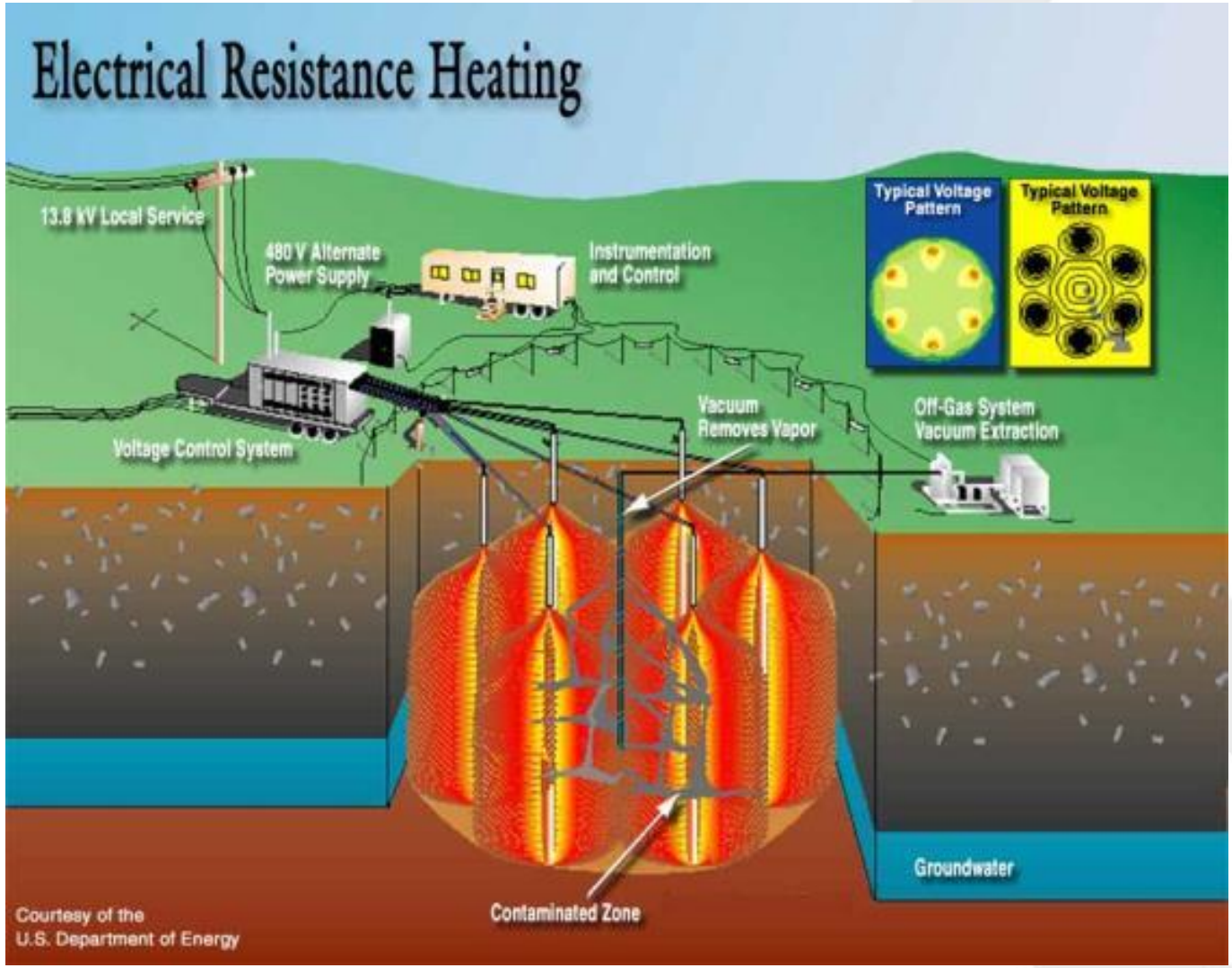
Case History

Project sketch



Case History

Project Data

Location

Densely populated urban environment, characterized by the presence of commercial, tertiary and housing units.

Underground soil

The site has the following stratigraphic sequence:

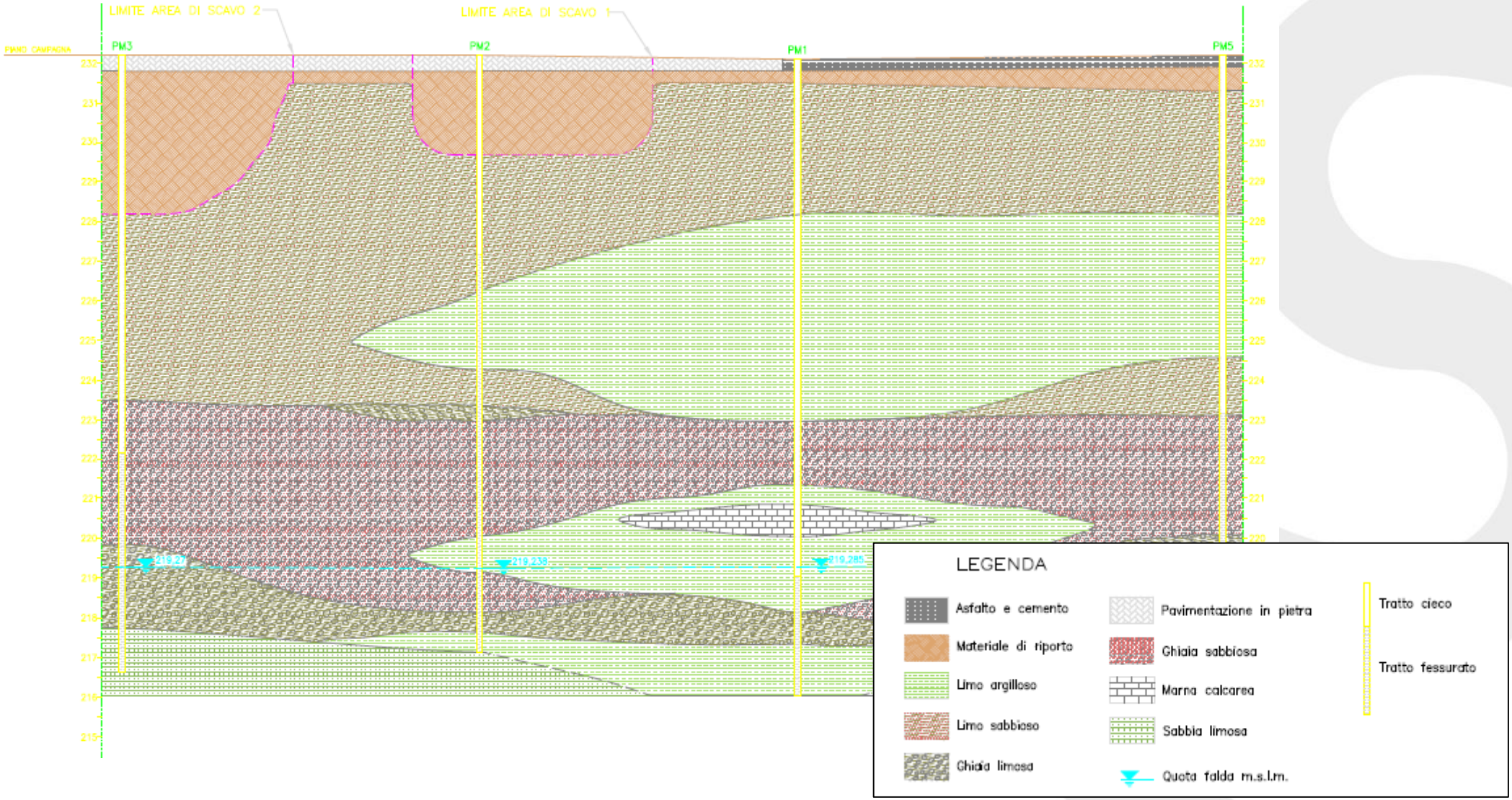
- 0,0 – 9,0 m from ground level : fine soils (silts and clays);
- 9,0 – 16,0 m from ground level : gravels in sandy matrix.

Groundwater

Aquifer of phreatic type with a water table depth to average about 13.5 m from ground level and excursion seasonal average of ± 1 m.

Case History

Project Data



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Case History

Project Data

<u>Contamination</u>

- Contamination adsorbed to the unsaturated soil within the site spread for approximately 30 m2.
- Contamination in the unsaturated soils vertically distributed from about 2.5 m to about 13.5 m from ground level, for a total thickness of 11.0 m, mainly represented by heavy hydrocarbons C> 12.
- No contamination in Groundwater.

Case History

Project Data

Campione	Idroc. leggeri C<12	Idroc. pesanti C>12	Benzene	Toluene	Etil-benzene	Xileni	MtBE (*)	Piombo
	mg/kg							
S1 prof. 1,50 - 1,70 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	13,2
S1 prof. 2,50 - 2,70 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	20,3
S1 prof. 3,00 - 3,20 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	13,4
S1 prof. 3,00 - 3,20 m (ARPA)	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	<5
S1 prof. 5,00 - 5,20 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	17,7
S1 prof. 7,00 - 7,70 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	20,0
S1 prof. 10,0 - 10,20 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	14,9
S1 prof. 12,30 - 12,50 m	< 1	< 5	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	11,5
S1 prof. 12,30 - 12,50 m (ARPA)	*< 1*	*269*	*< 0,01*	*< 0,01*	*< 0,01*	*< 0,01*	*< 0,01*	*10*
S2 prof. 2,50 - 2,70 m	3	**1715**	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	17,1
S2 prof. 2,50 - 2,70 m (ARPA)	*< 1*	*7,5*	*< 0,01*	*< 0,01*	*< 0,01*	*< 0,01*	*< 0,01*	*10*
S2 prof. 3,00 - 3,20 m	< 1	24	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	16,0
S2 prof. 5,00 - 5,20 m	< 1	**292**	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	13,1
S2 prof. 5,00 - 5,20 m (ARPA)	< 1	*171*	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	*10*
S2 prof. 7,00 - 7,20 m	9	**370**	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	16,8
S2 prof. 7,50 - 7,70 m	**14**	**702**	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	17,7
S2 prof. 10,00 - 10,20 m	< 1	**1442**	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	10,0
S2 prof. 12,30 - 12,50 m	2	**2055**	< 0,01	< 0,01	< 0,01	< 0,01	< 0,01	9,1
S2 prof. 12,30 - 12,50 m (ARPA)	*< 1*	*865*	*< 0,01*	*< 0,01*	*< 0,01*	*< 0,01*	*< 0,01*	*<5*
D.Lgs. 152/06 ALLEGATO 5, TAB.1, COLONNA A	**10**	**50**	**0,1**	**0,5**	**0,5**	**0,5**	**n.n**	**100**

n.n.: parametro non normato dal D.Lgs. 152/2006

Case History

Remediation Design

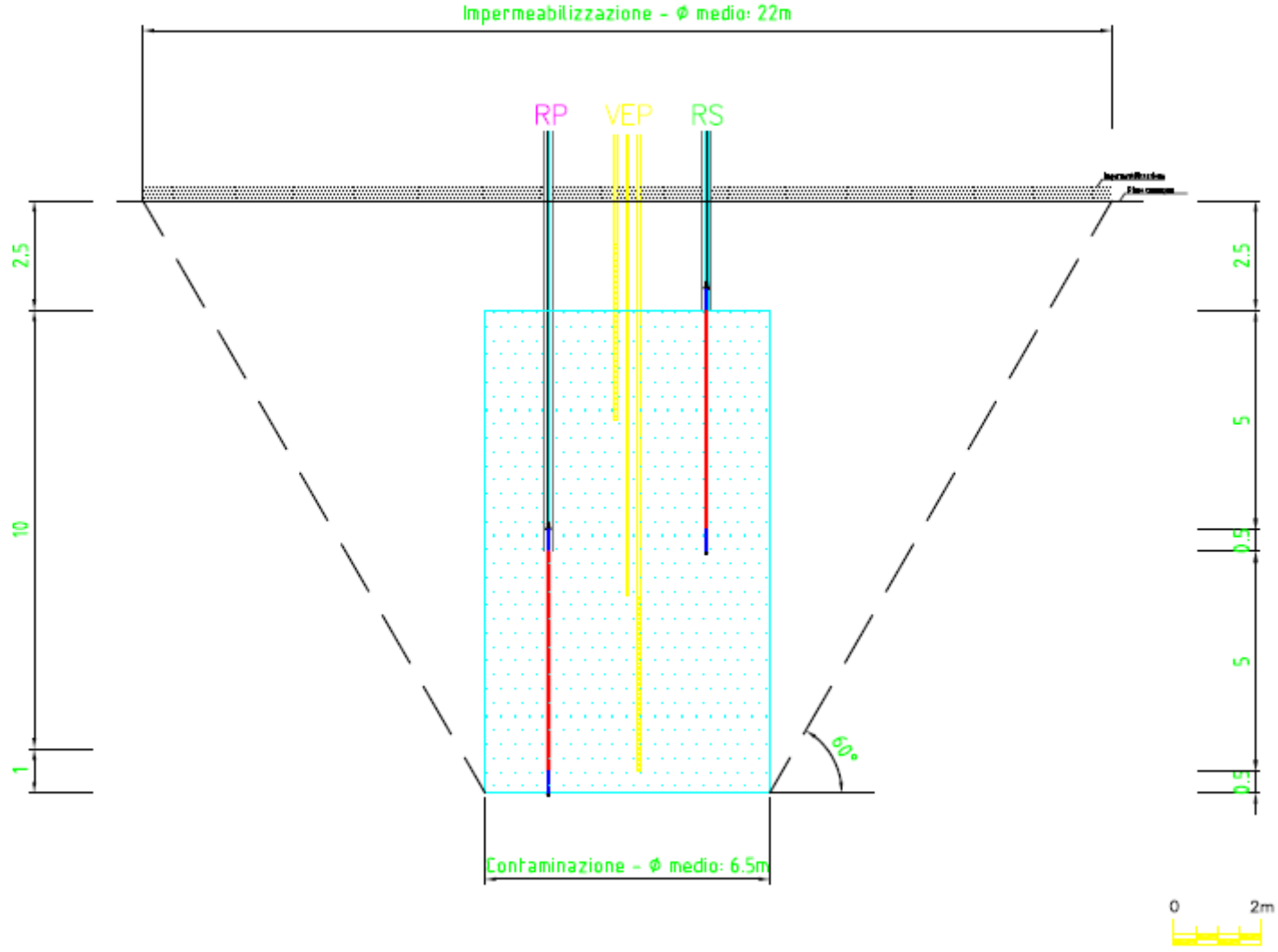
The design of the TD system in Situ, has been defined on the basis of several case histories reported in the scientific literature, the specific site information gathered during characterization and on previous direct experience of Petroltecnica in terms of applications of this technology.

Considering of the soil thickness to be treated (about 11.0 m) and the engineering properties of the electrical resistances in use (maximum length of 5.5 m), the remediation by TD it is designed by dividing the horizon of interest in two layers:

- 1st layer between 8,0 m and 13,5 m from g.l.
- 2nd layer between 2,5 m and 8,0 m from g.l.

Case History

Remediation Design



Stima della distribuzione della contaminazione nel terreno – 30

RS1 DESORBITORE TERMICO AD ALIMENTAZIONE ELETTRICA E RELATIVA AREA DI INFLUENZA TERMICA - LIVELLO SUPERIORE

RP5 DESORBITORE TERMICO AD ALIMENTAZIONE ELETTRICA E RELATIVA AREA DI INFLUENZA TERMICA - LIVELLO INFERIORE

POZZI DI ASPIRAZIONE SVE E AREA DI INFLUENZA

TC3p TUBO GUIDA POSIZIONAMENTO TERMOCOPPIA DI MONITORAGGIO SUPERFICIALE/PROFONDA

Case History

Remediation Design

The application of the technology is carried out for subsequent steps, first by acting on the deep layer and subsequently on the most superficial.

The system configuration in the project plans to use for each soil level five heating pipes. Each heating pipe have a radius of influence (ROI) defined in a cautionary manner of about 1.5 m.

The heating tubes are constituted by blind steel pipes with a diameter of about 6 ", inside which the electric heaters are positioned. The heating tubes are installed through the borehole drilled up to the depth provided for each phase of the reclamation.

Case History

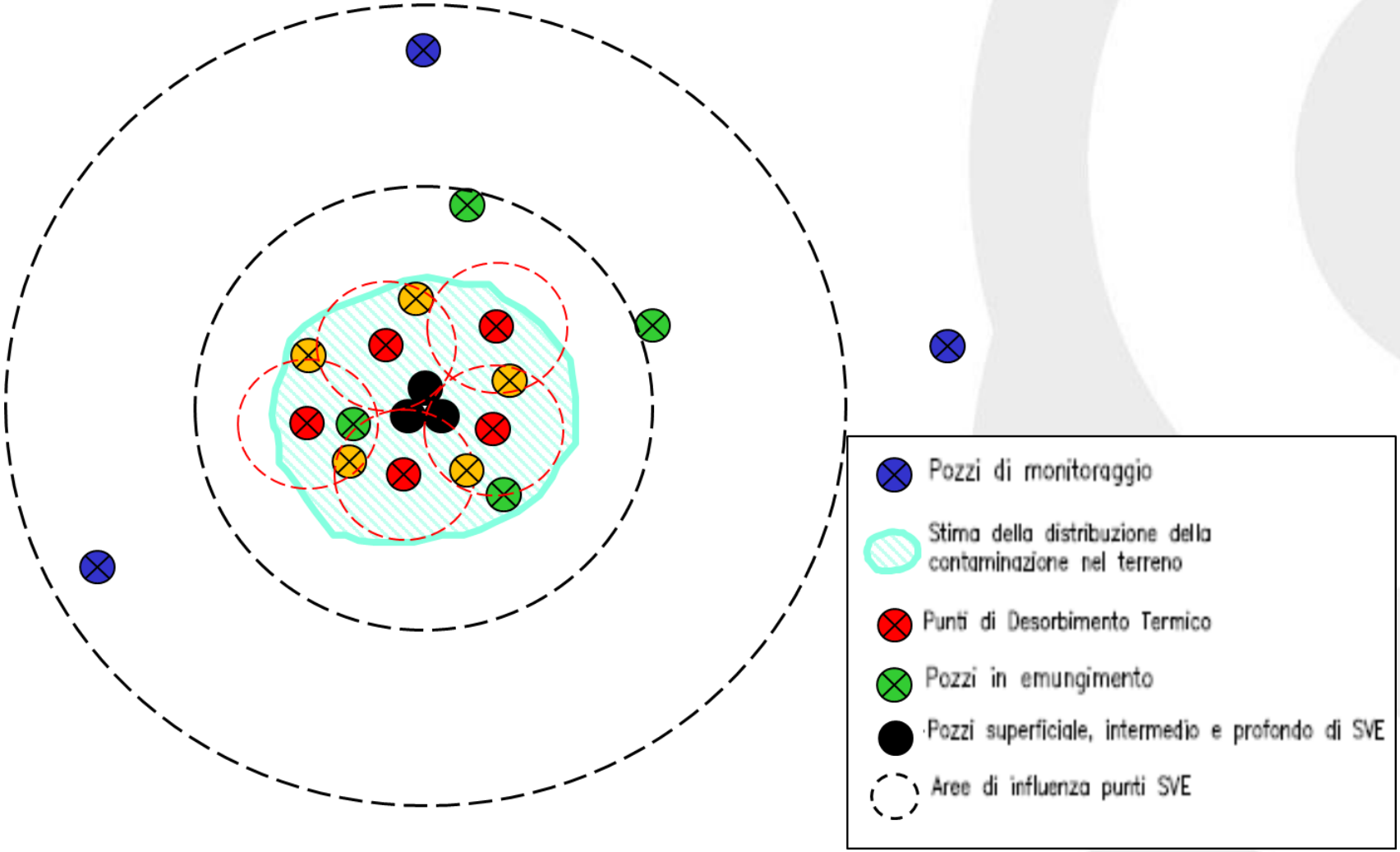
Remediation Design

The remediation system is completed by means of:

- The installation of three vapor extraction points (SVE), slotted at different heights from ground level to allow efficient capture of the volatilized vapors in the various layers to be treated. The extracted vapors are sent to a traditional system of treatment with activated carbon in order to ensure compliance with the emission limits set by law;
- the installation of 4 pumping wells (P&T) that guarantee the maintenance of the groundwater level below 14.0 m from ground level, so that any elevations do not affect the regular operation of the TD system. The extracted water is discharged into a suitable receiving body of water after treatment with a conventional activated carbon system.

Case History

Remediation Design



Case History

Remediation Design

The plant is composed of the following major equipment:

- TD in situ:
  - Steel heating pipes and their electrical resistances
  - thermocouples for temperature monitoring
- SVE
  - Vapors extraction points using carbon steel pipes
  - vapor extraction system with condensate trap
  - vapor treatment system with Granular Activated Carbon (GAC)
- P&T
  - Pumping wells with casing in carbon in steel and related pumps
  - water treatment system with Granular Activated Carbon (GAC)
- Certified electric control and command panels
- surface thermal insulation (capping)

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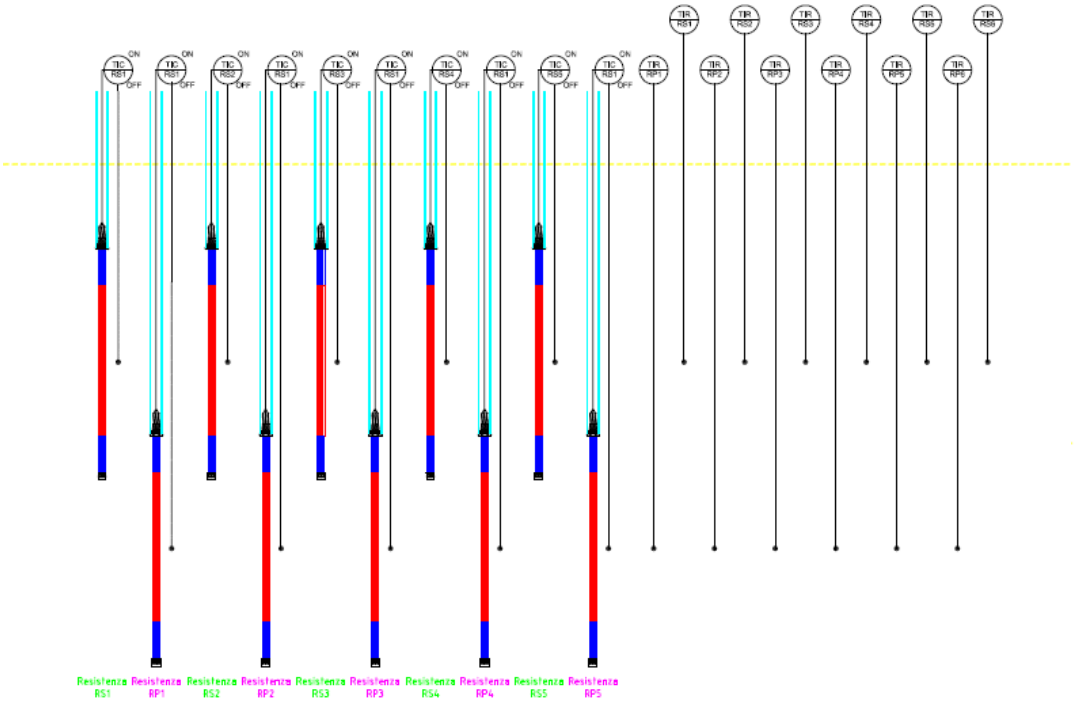
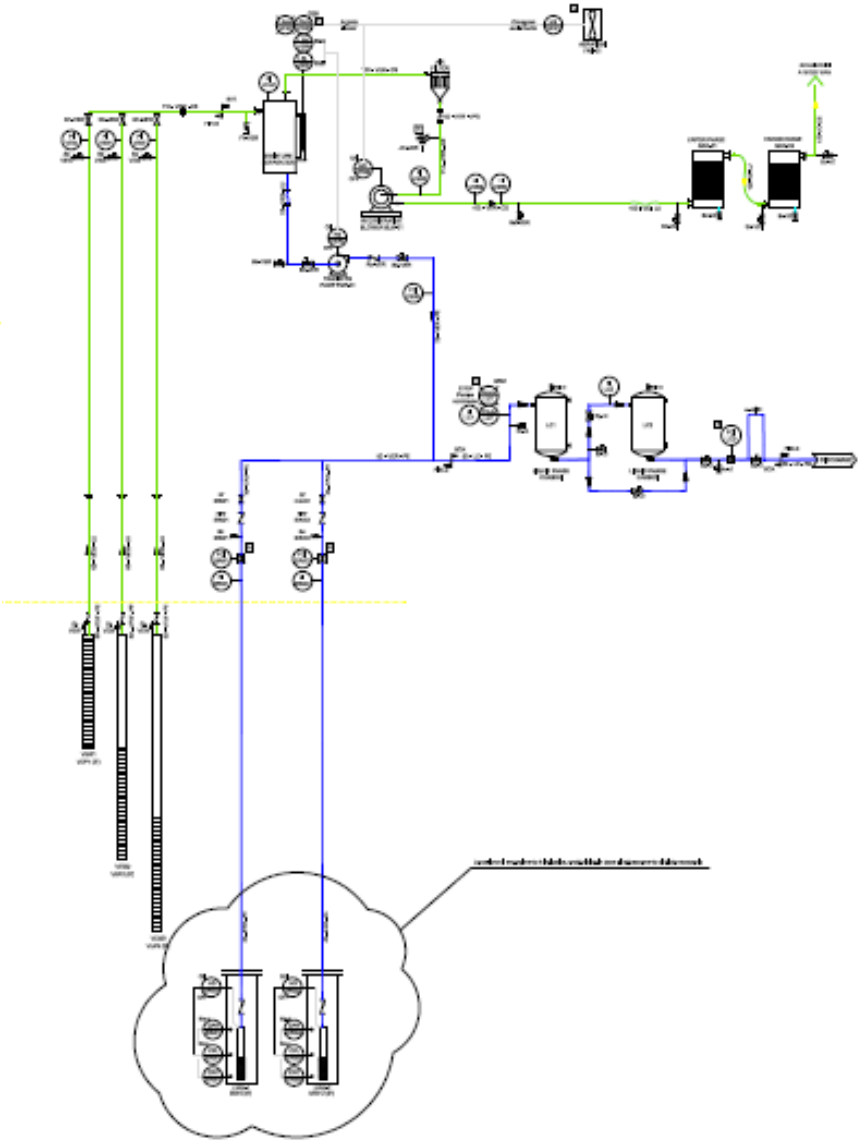
Case History

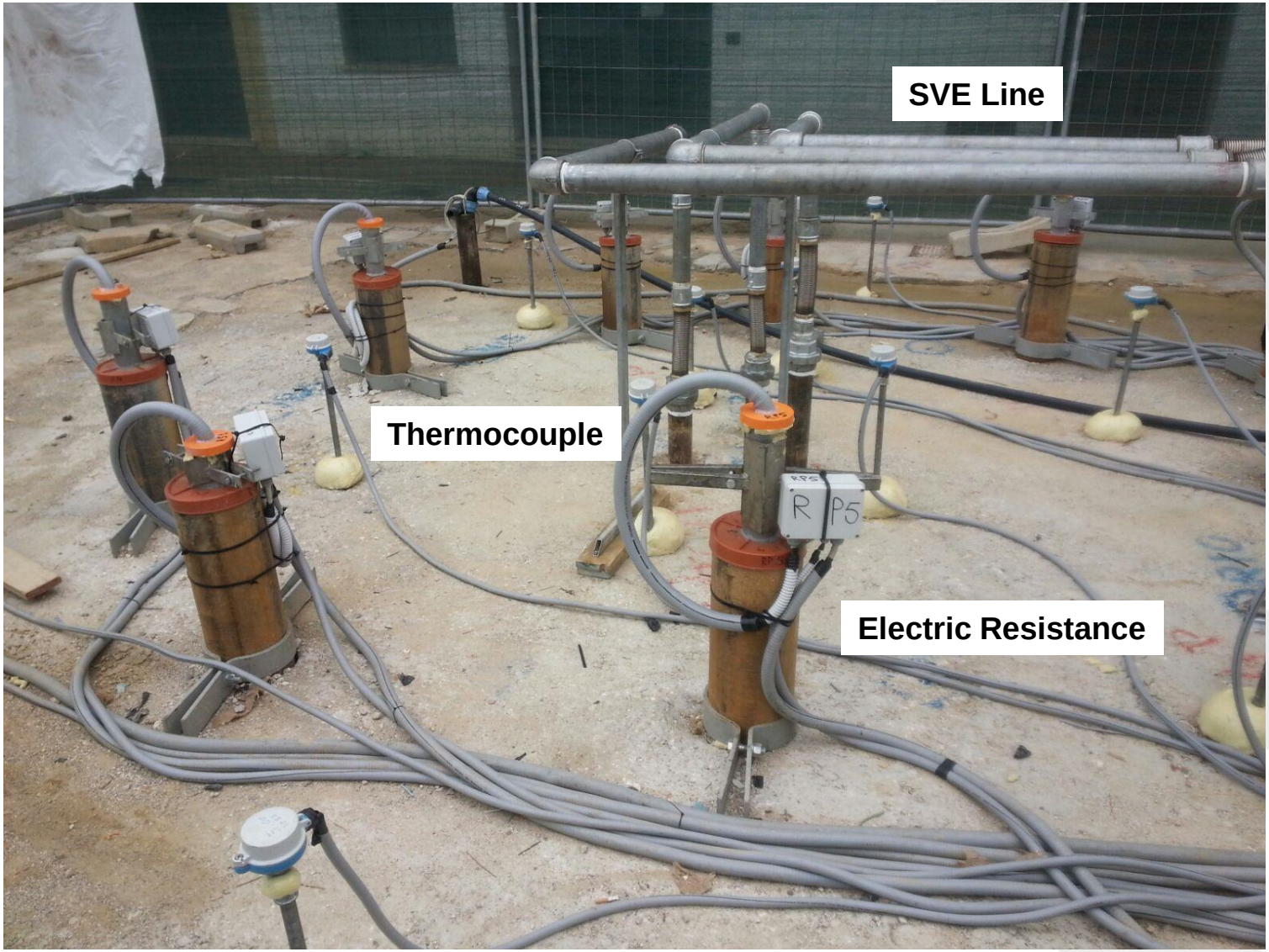
System P&ID





Case History

System Detail



Case History

Monitoring and verifying the achievement of remediation targets

During the whole TD process, temperatures of the heating tubes and the temperatures of the soil in the areas of influence will be monitored using special thermocouples.

In this way it will be possible to optimize the heating process in the various areas to be treated and the associated energy consumption, while ensuring the achievement of temperatures necessary to the volatilization of the contaminants.

At the end of the treatment period, expected in about 6-8 months, a series of test surveys will be made to assess effectiveness of the system and the achievement of remediation targets.

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