
SERPOL

# SILPHES

## Facing halogenated compounds in groundwater with innovative solutions

Silphes

David Cazaux, Roger Jacquet, Stéfan Colombano, Alain Saada, Alain Dumestre, Antoine Joubert, Michel Chalot, Nicolas Fatin-Rouge, Pierre-Yves Klein, Annette Esnault Filet, Benoit Paris, Christophe Avril

INTERSOL 2013
March 28th

SOLVAY
asking more from chemistry®

brgm
Géosciences pour une Terre durable

SOL ENVIRONMENT

cnrs

CHRONO ENVIRONNEMENT
UMR6249

Institut UTINAM

Ma Hy Tec

INTERA

SERFIM

entrepreneurs d'avenirs

INVESTISSEMENTS D'AVENIR

ADEME
Agence de l'Environnement et de la Maîtrise de l'Energie

# Summary

1. Project birth
2. Study site: SOLVAY (Tavaux)
3. Motivations
4. Main objectives
5. Flow chart
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# SILPHES project birth

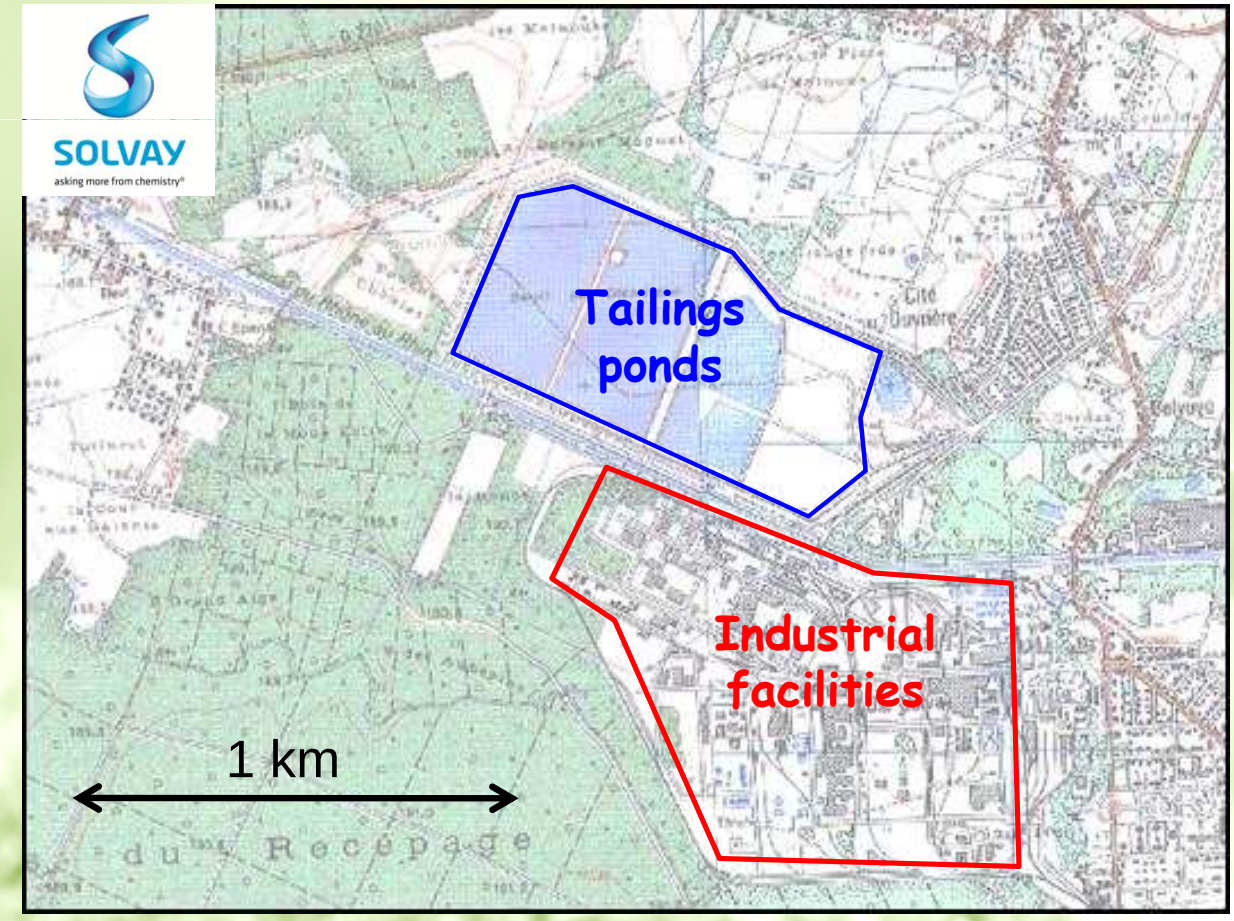
- **CONSOIL Salzbourg (2010):** Meeting between SOLVAY, BRGM, SERPOL and austrian beers!

- **R&D call for proposal (AMI)** « Innovative solutions for sites and sediments remediation »

- Ideal **context of SOLVAY Tavaux** site to develop innovative techniques and used as a « demonstrator »

# SOLVAY site (Tavaux)

## Site background




**50's:**
- Organochlorine production

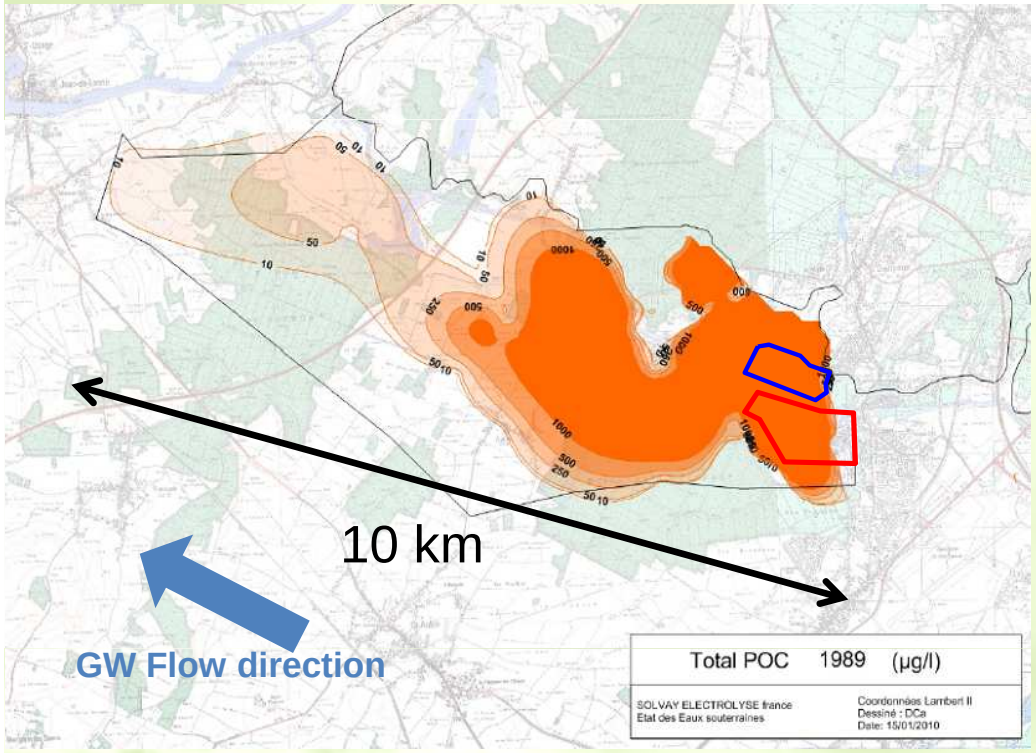
**60's:**
- Liquid waste stored in clay lined storage facility

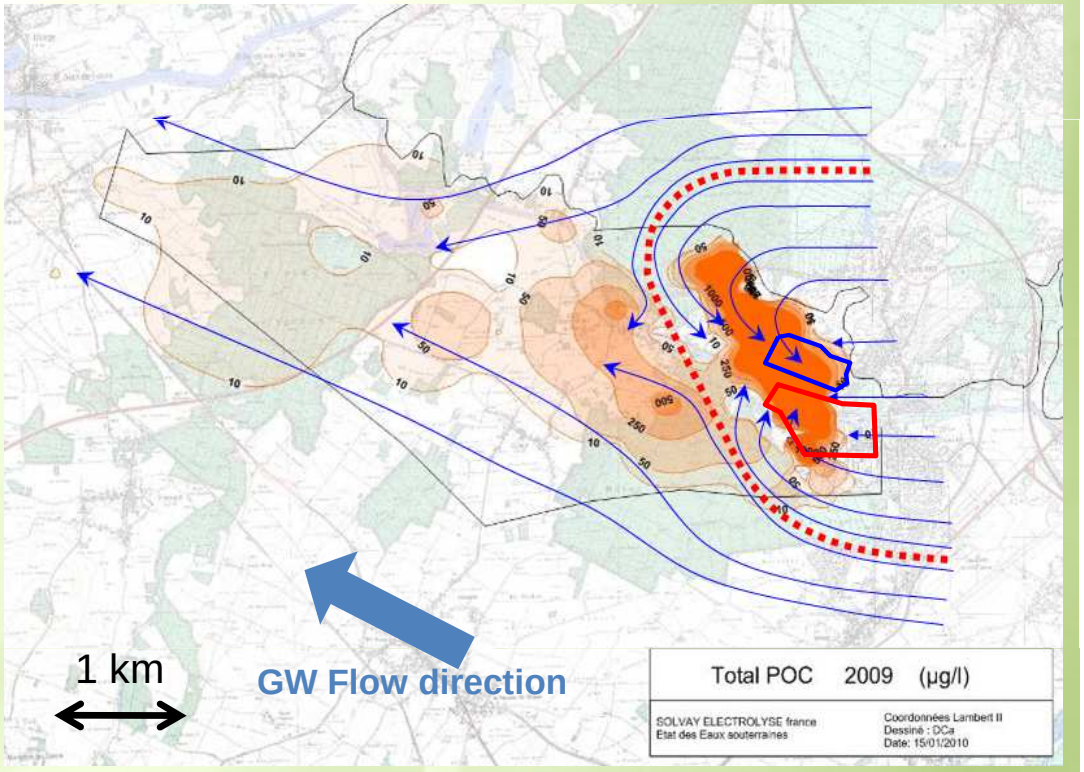
**70's:**
- Chlorine plume then organochlorine plume discovered
- Source identification: leakage from storage facility
- Hydraulic containment by pumping wells

**80's:**
- DNAPL discovered
- Control and monitoring program of DNAPL

# SOLVAY site (Tavaux)

## Plume



# SOLVAY site (Tavaux)

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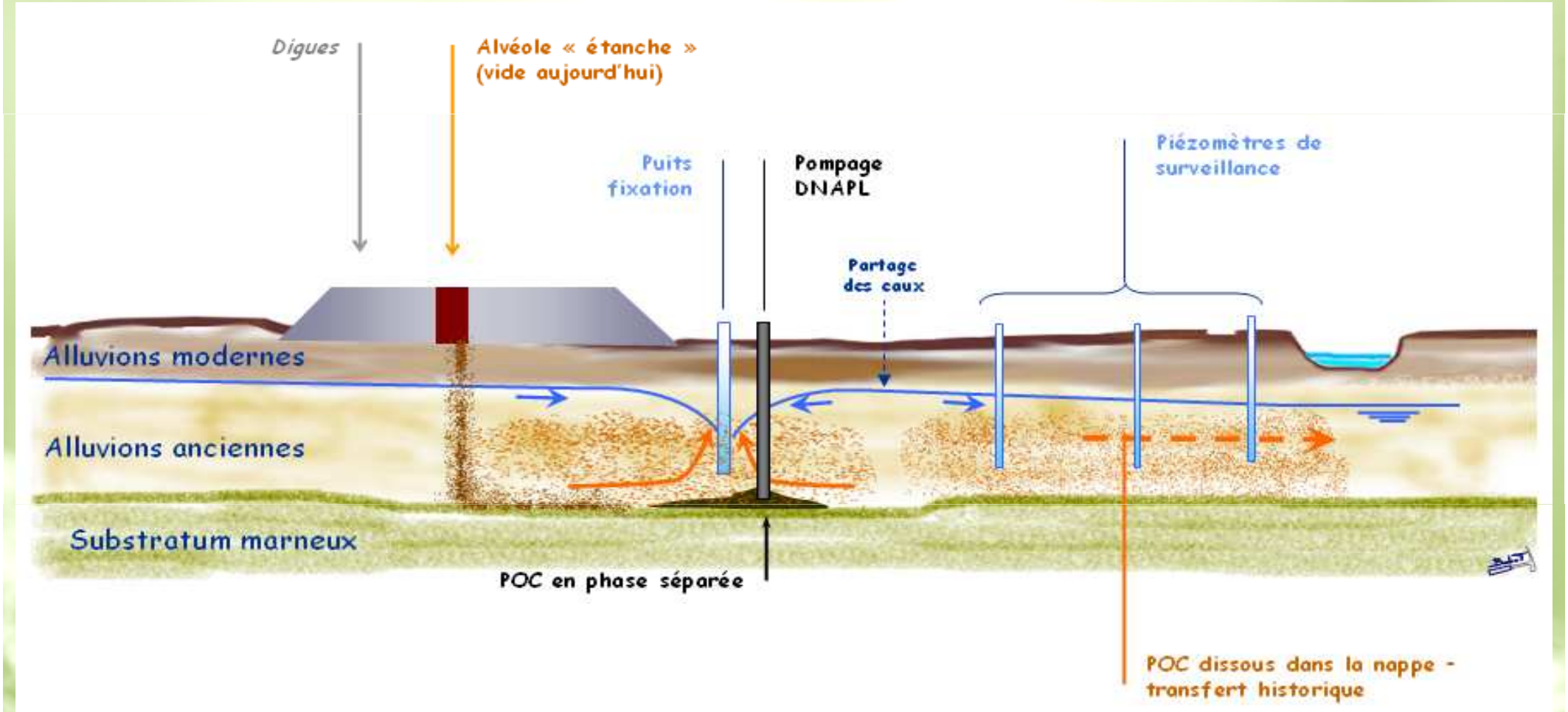
## Conceptual scheme




**DNAPL zone : hectares**
**Plume : 30 km²**

# SOLVAY site (Tavaux)

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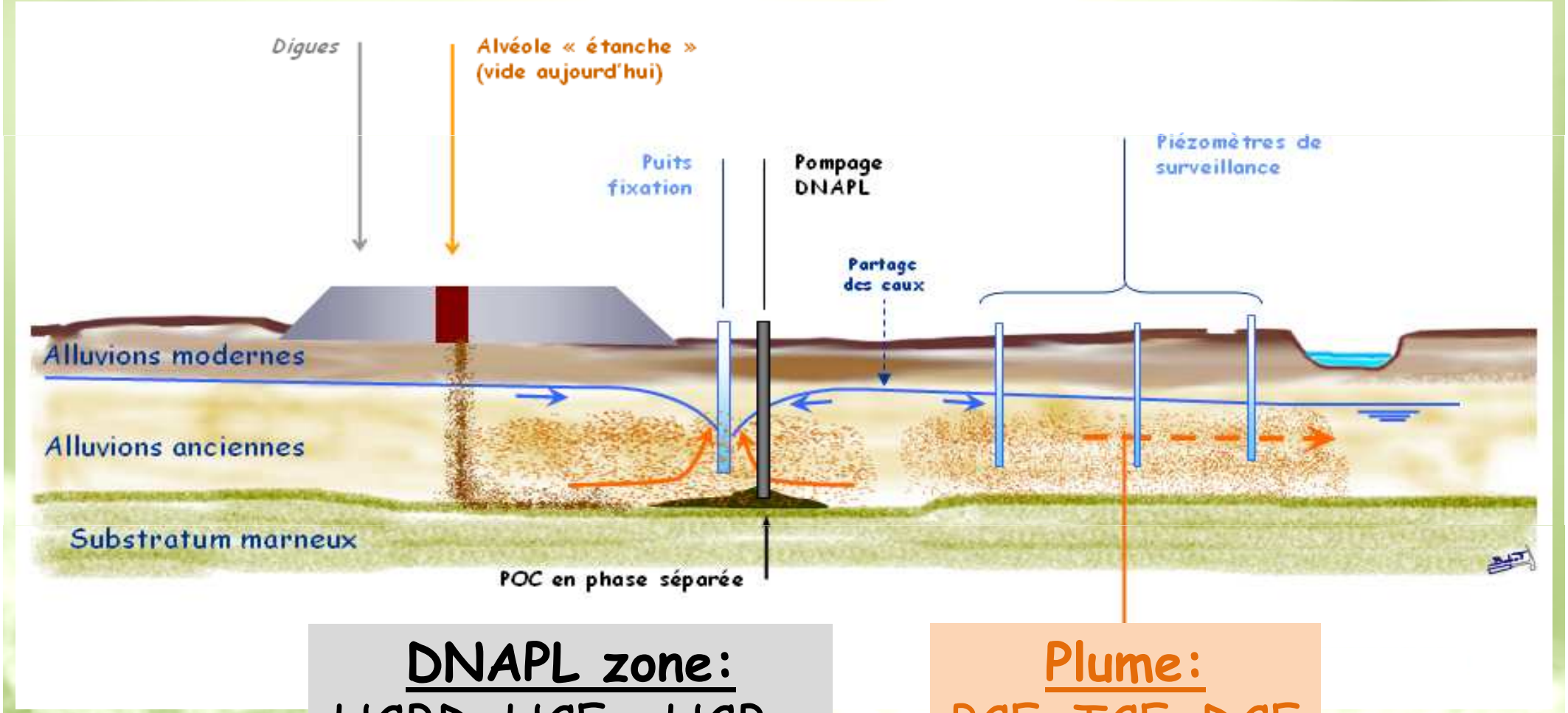
## Study areas




**DNAPL zone:**
HCBD, HCEa, HCBz, PCE

**Plume:**
PCE, TCE, DCE
TeCA et DCA
TCP et DCP

# Motivations

- **Chlorinated solvents** is a major and common issue of contaminated sites

- Confidence lack of decidors for innovative techniques application => SOLVAY site : **« Demonstrator »**

- **Ecotechnology needs** (carbon footprint decrease, waste re-use)

- International **ambitious** project / Wish to develop export activities

- **Refundable financial advance** stimulates implication of motivated company to develop practical techniques !!

# Main objectives

## Characterization and monitoring:

=> Develop quick, representative and cheap methods

## Remediation:

=> Cost-effective technologies and process

## Decision support tools :

=> Multicriteria, quick, easy and cheap

# Flow chart

SILPHES

| SOLVAY | SERPOL | BRGM | BRGM |
|---|---|---|---|
| Workpackage 0: Management and Dissemination | Workpackage 1: SOURCE (DNAPL) treatment | Workpackage 2: PLUME treatment | Workpackage 3: Stakes management |

# Flow chart

SILPHES

| SOLVAY | SERPOL | BRGM | BRGM |
|---|---|---|---|
| Workpackage 0: Management and Dissemination | Workpackage 1: SOURCE (DNAPL) treatment | Workpackage 2: PLUME treatment | Workpackage 3: Stakes management |

Task 0.1:
Technical administrative and financial management

Task 0.2:
Results exploiting and dissemination

# Flow chart

SILPHES

| SOLVAY | SERPOL | BRGM | BRGM |
|---|---|---|---|
| Workpackage 0: Management and Dissemination | Workpackage 1: SOURCE (DNAPL) treatment | Workpackage 2: PLUME treatment | Workpackage 3: Stakes management |

Task 1.1:
Equipement installation

Task 1.2:
Source characterisation

Task 1.3:
DNAPL pumping

Task 1.4:
Laboratory experiments on residual treatment

Task 1.5:
In situ residual tretment

# SOURCE treatment (DNAPL)

## WP 1 (SERPOL)

| Task 1.1 (SOLVAY): Equipement installation | Task 1.2 (INTERA): Source characterisation | Task 1.3 (SERPOL): DNAPL pumping | Task 1.4 (BRGM): Laboratory tests for residual treatment | Task 1.5 (Sol Environment): In situ residual treatment |
|---|---|---|---|---|
| Soil compartment, wells and pumping unit installation | Geophysical techniques for source characterisation | Assisted DNAPL pumping | Physico-chemical tests :<br>• ISCO<br>• Fe(0) catalyzed ou vectorized<br>• Surfactant and foam<br>• Thermal | In situ tests |
| | Geophysical and PITT tracers tests to monitor remediation | Modelling | Type of injection:<br>• Recirculation<br>• Soil mixing<br>• Jet grouting | Monitoring |
| | | System optimization | | |

# Flow chart

SILPHES

| SOLVAY | SERPOL | BRGM | BRGM |
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| Workpackage 0: Management and Dissemination | Workpackage 1: SOURCE (DNAPL) treatment | Workpackage 2: PLUME treatment | Workpackage 3: Stakes management |

Task 2.1:
Phytoscreening / Dendrochemistry

Task 2.2:
Natural attenuation

Task 2.3:
Dynamized Natural Attenuation

Task 2.4:
PRB feasibility study

# Plume treatment

## WP 2 (BRGM)

**Task 2.1 (LCE):** Phytoscreening / Dendrochemistry

- Analytic method development
- Plume cartography by phytoscreening
- Pollution chronicle by dendrochemistry

**Task 2.2 (BRGM):** Monitored Natural Attenuation

- Feasibility study:
  - Gaz analysis
  - Microbiology
  - Isotopy
- Modelisation coupling transfert and biogeochemistry

**Task 2.3 (SERPOL):** Dynamized Natural Attenuation

- Development of H2 diffusion and storage system
- Comparison of reductive biostimulation between carbon and H2 amendment
- Modelling

**Task 2.4 (BIOREM):** PRB feasibility study

- Laboratory tests with Fe(0) + catalyst(s)
- On site tests

# Flow chart

SILPHES

| SOLVAY | SERPOL | BRGM | BRGM |
|---|---|---|---|
| Workpackage 0: Management and Dissemination | Workpackage 1: SOURCE (DNAPL) treatment | Workpackage 2: PLUME treatment | Workpackage 3: Stakes management |

Task 3.1: Renewable Energy

Task 2.2: Decision tools

# Stakes management

## WP 3 (BRGM)

**Task 3.1 (SILEX International):**
Renewable Energy

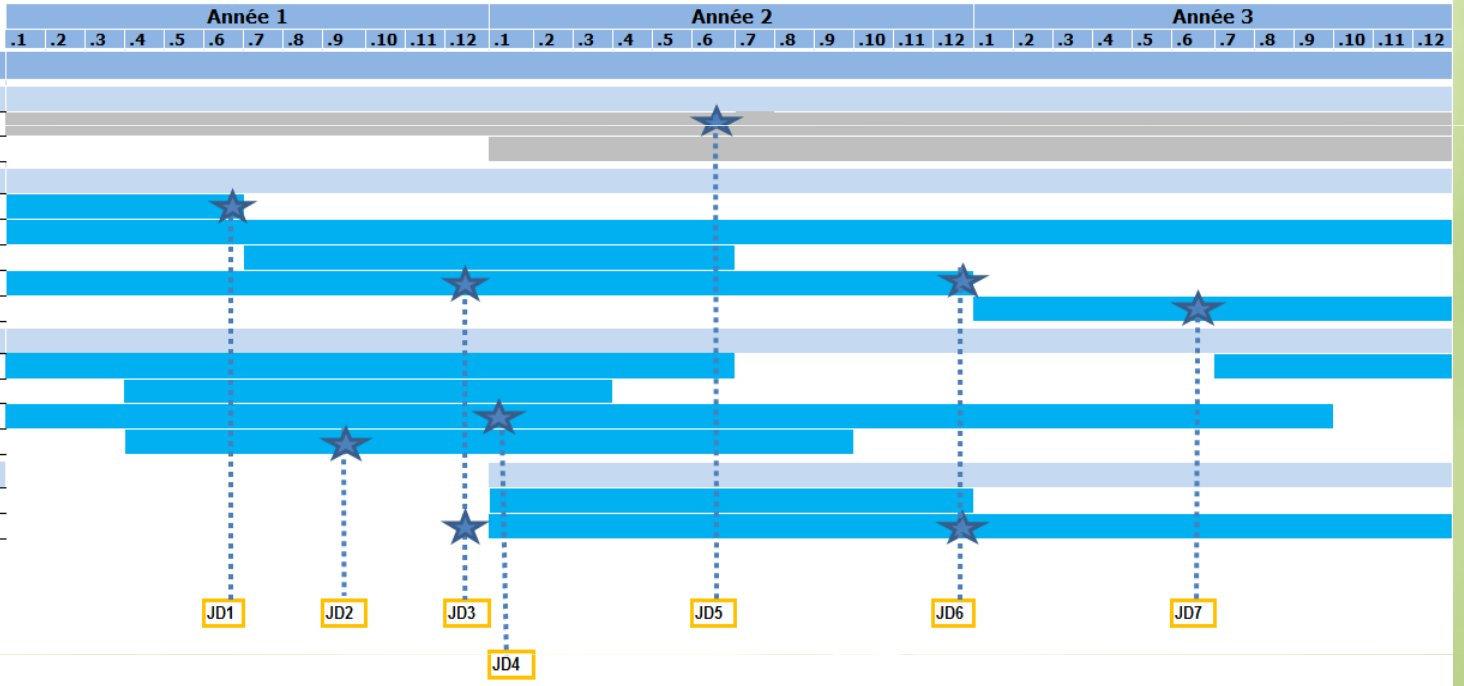
- Development of Renewable Energy technologies
- DNAPL pumping unit powered by Renewable Energy

**Task 3.2 (BRGM):**
Decision tools

- Cost benefit analysis
- Multicriteria analysis

# Planning

| Lots et Tâches | | Leader |
|---|---|---|
| Lot 0 | Management et dissémination | Solvay |
| T0.1 | Management technique, administratif et financier | SOLVAY |
| T0.2 | Dissémination, valorisation et exploitation des résult | BRGM |
| Lot 1 | Source | Serpol |
| T1.1 | Installations / Equipements | SOLVAY |
| T1.2 | Caractérisation des sources | INTERA |
| T1.3 | Pompage DNAPL | SERPOL |
| T1.4 | Labo sur traitement résiduel | BRGM |
| T1.5 | Traitement in situ résiduel | SOLENV |
| Lot 2 | Panache | BRGM |
| T2.1 | Caractérisation Phyto | LCE |
| T2.2 | AN surveillée | BRGM |
| T2.3 | AN dynamisée | SERPOL |
| T2.4 | Essais faisabilité BPR | BIOREM |
| Lot 3 | Enjeux | Solvay |
| T3.1 | Energies Renouvelables | SILEX |
| T3.2 | Analyse Multi-Critères | BRGM |




- 3 years of research
- 33 Delivrables
- 7 decision « check-points»

# SILPHES management

<u>Coordinator:</u>
David Cazaux (SOLVAY)

Quaterly meeting

<u>Steering committee</u>
Coordinator + representative of each partner

Bi-annual meeting

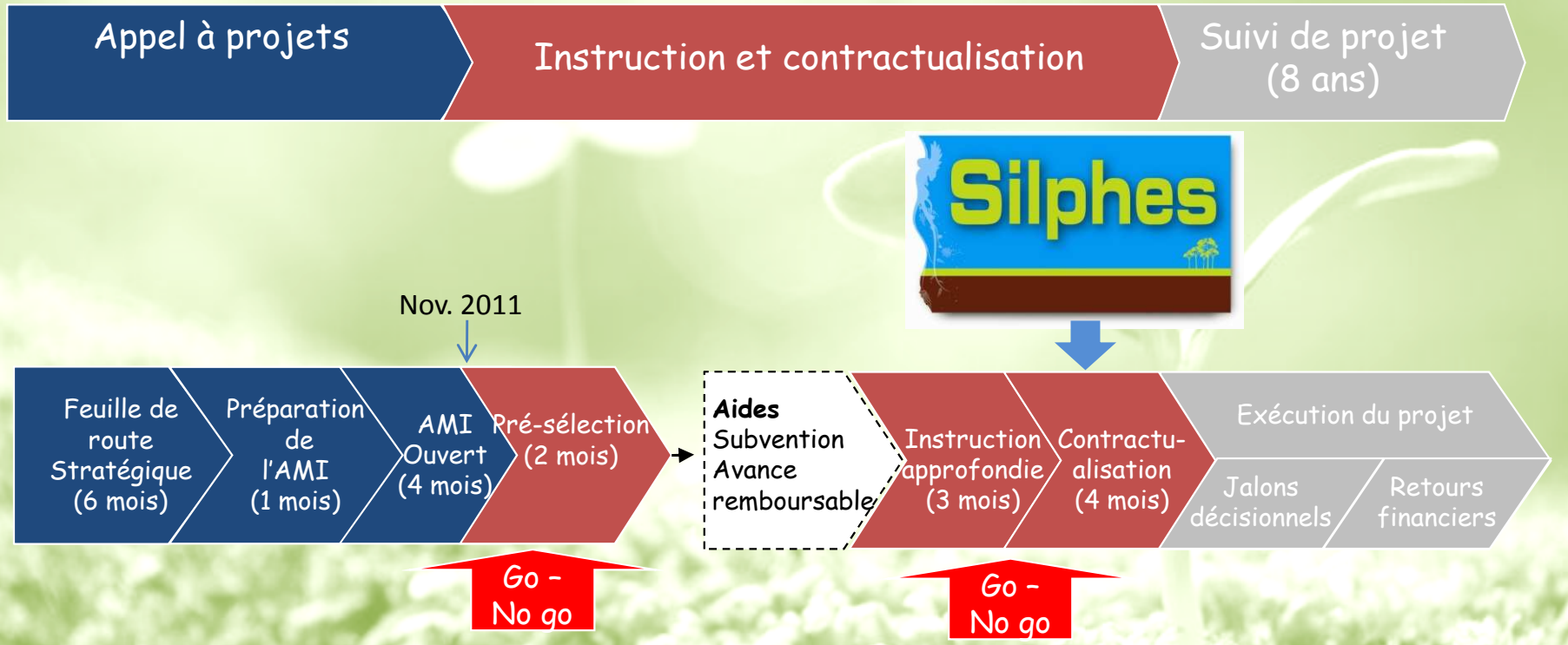
<u>Follow-up comittee:</u>
Coordinator + representative of each partner + ADEME

# Consortium strenght

- Pluridisciplinary and complementary consortium:
  - Work firms (SERPOL, SOL Environment)
  - Engineering offices (INTERA, MAHYTEC, *S/T SOLDATA & SILEX International*)
  - Products provider (*S/T BIOREM Engineering*)
  - Public laboratory / University (LCE/CNRS, UTINAM/CNRS)
  - French geological survey (BRGM)
- Experience of common works
- Multi-scale approach

# Fundings

- SILPHES global budget : 3,5 M€
- Financial support (Subv + AR): 1,5 M€
- Project signed by Ministry of Investissement
- Current phase of contract signing between Ademe and partners with refundable financial advance



# Contacts

**SILPHES Coordinator :**

David Cazaux
David.cazaux@solvay.com

**Leader WP 1 « DNAPL »**

Alain Dumestre
Alain.dumestre@serpol.fr

**Leader WP 2 « Plume » and WP 3 « Stakes management »**

Stéfan Colombano
s.colombano@brgm.fr