

# When Invasive Alien Species break through remedial management plans of the national methodology for contaminated land and sites management



**intersol'2022**  
Congrès-Exposition International sur les Sols, les Sédiments et l'Eau  
International Conference-Exhibition on Soils, Sediments and Water



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# Agenda

- Site presentation and issues
  - Background
  - Site contamination issues assessment
  - Contaminations distribution
  - Site invasive Alien Plant Species
- Integrative approach
  - Usual recommendations on Japanese knotweed
  - Alternatives appraisal
  - Costs-benefits approach
  - Final remediation design
  - Assets of an integrative approach
- Conclusion





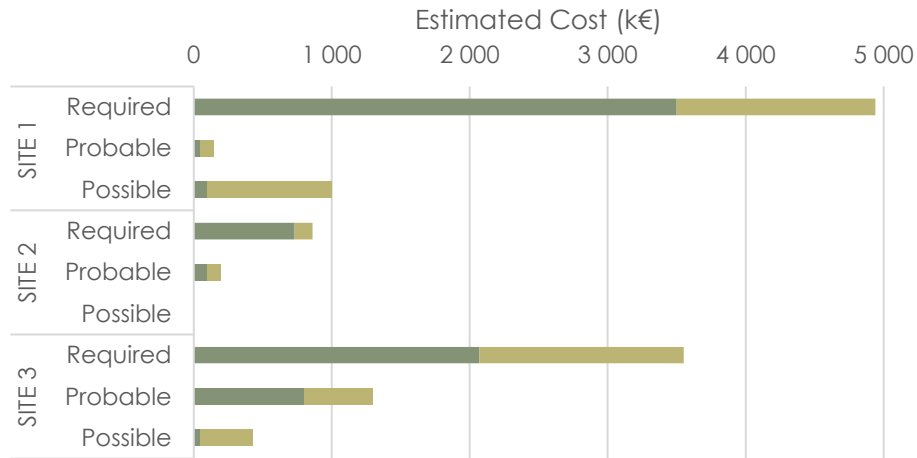
# Site presentation and issues

- Background
- Site contamination issues assessment
- Contamination distributions
- Site Invasive Alien Plant Species

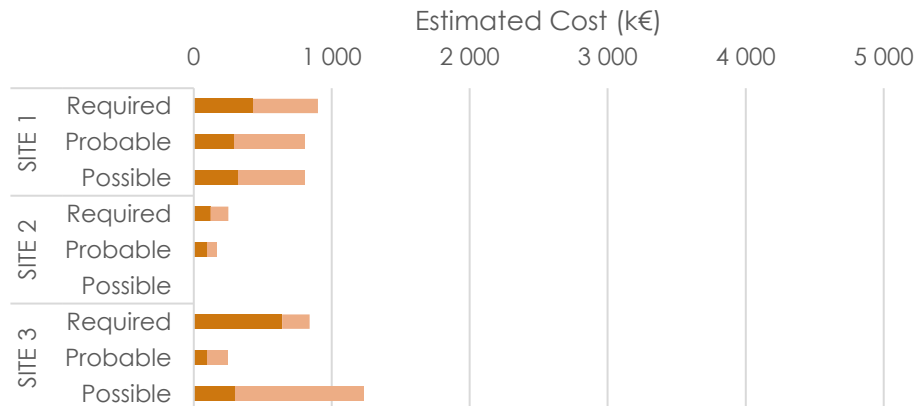


# Background - Due Dilligence of 3 active sites (2 SEVESO Haut)

Site closure



Ongoing operations

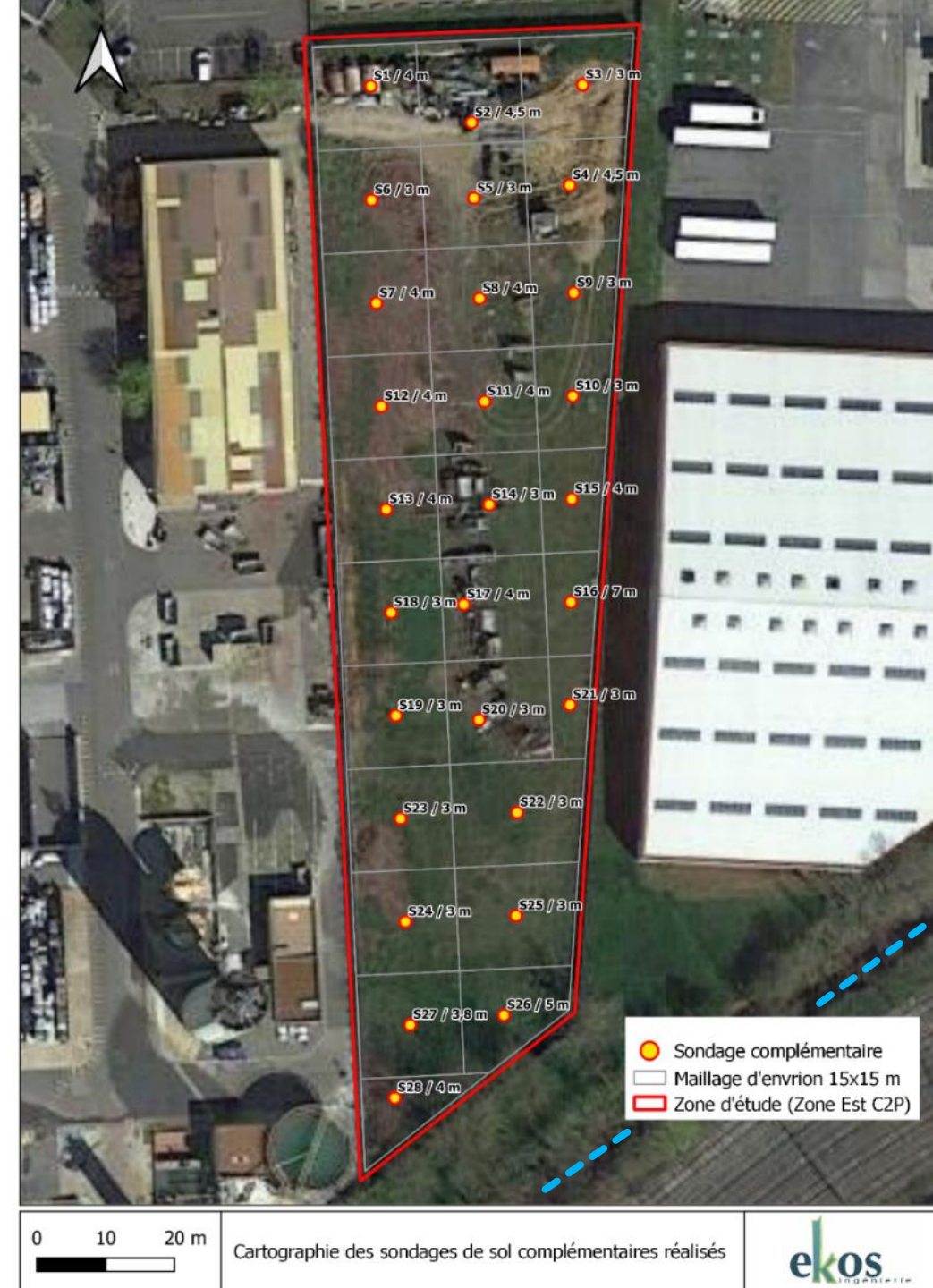


→ Closed non ferrous smelting activity



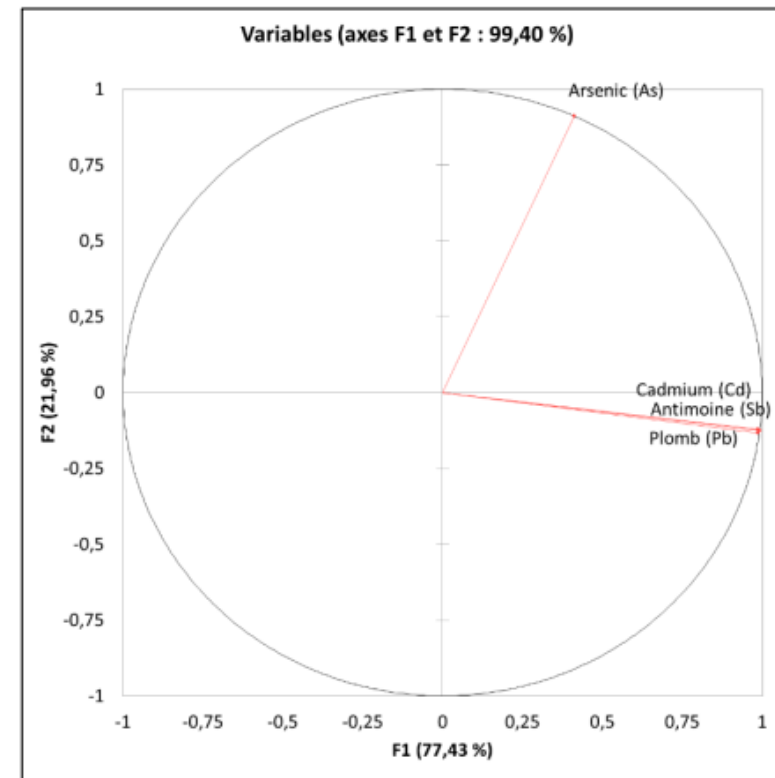
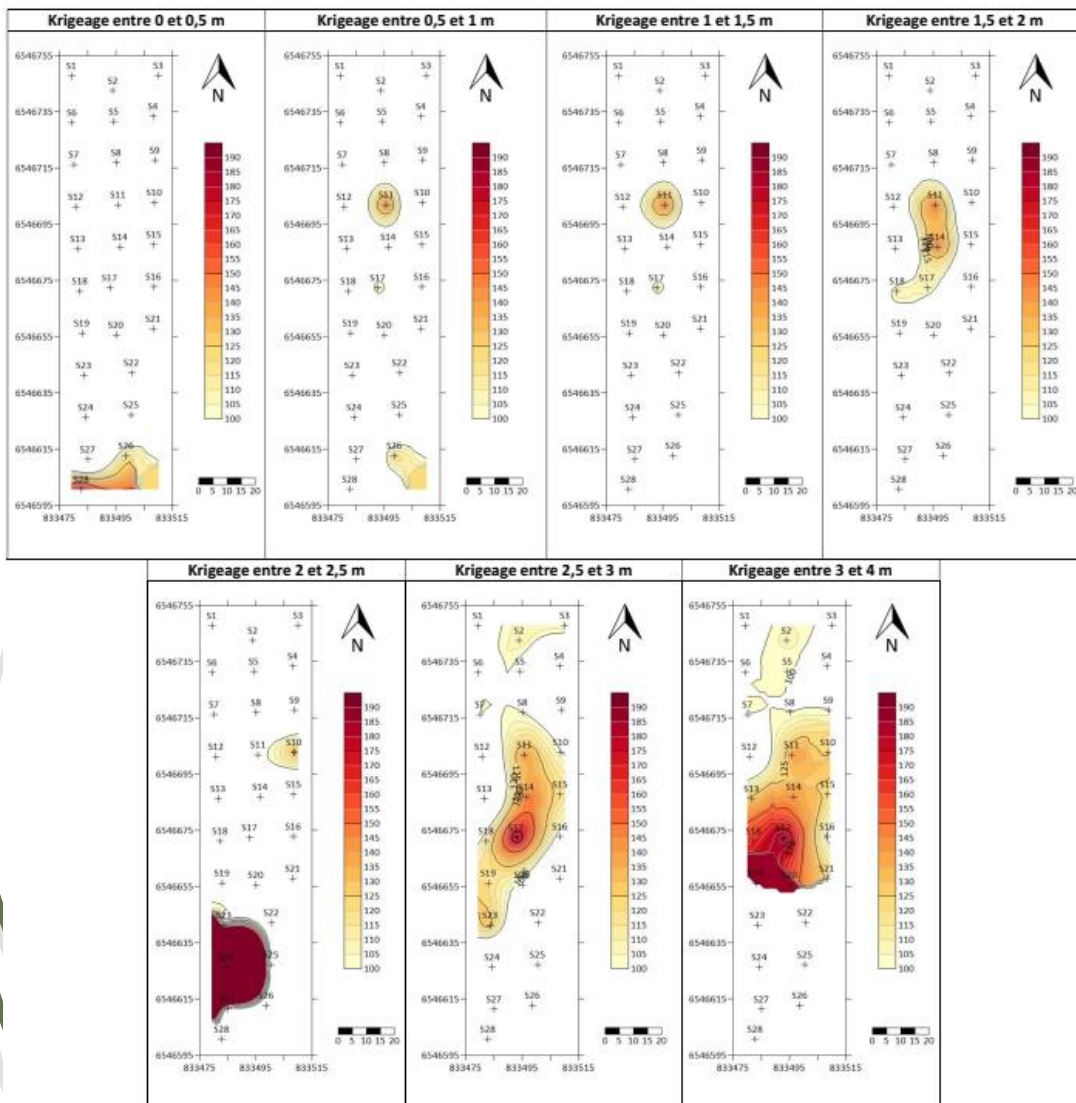
# Site contamination issues assessment

- **Study area :**
  - 5 800 m<sup>2</sup>
  - May have been used for the storage of slag from the smelting of non-ferrous metals and/or demolition wastes from the smelters
- **Investigations conducted**
  - Grid of 28 soil boring (15 x 15m) : more than 100 samples collected from various depths for analyses of metals and inert waste acceptance criterias
  - 3 monitorings wells
  - Surface water sampling along the area boundary
  - Delineation of Japanese knotweed





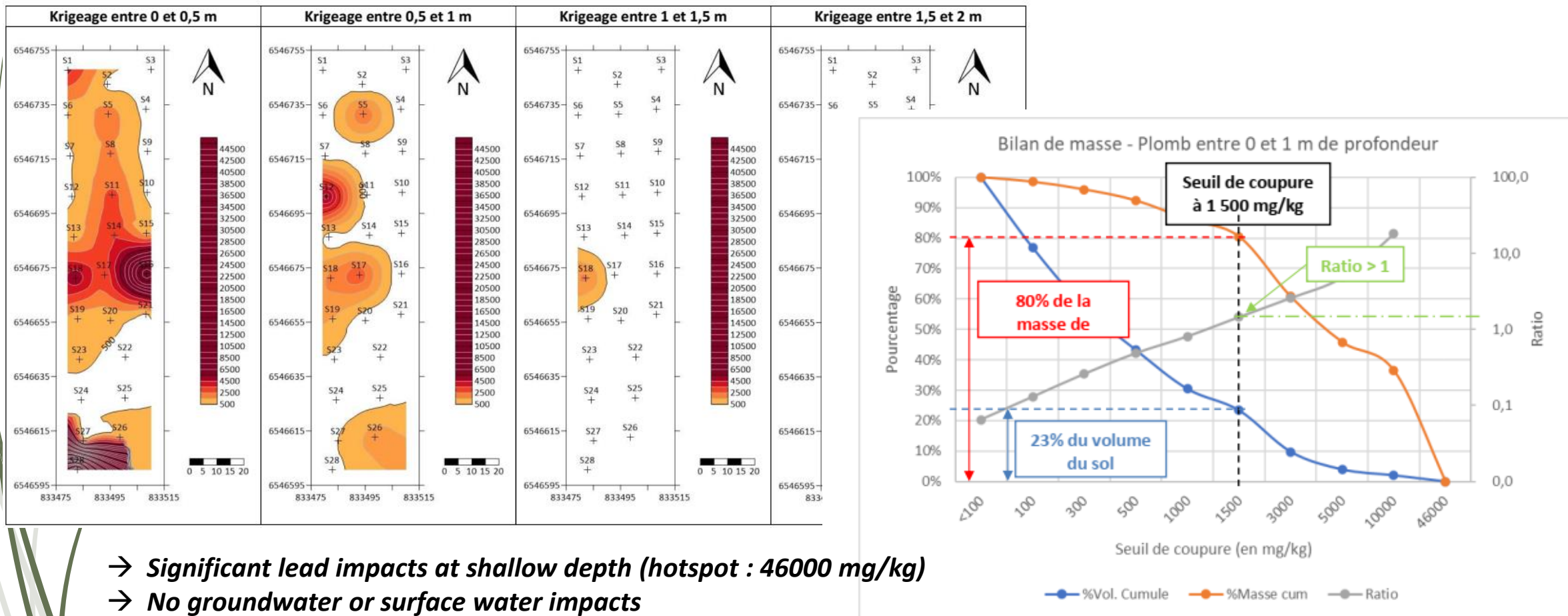
# Contaminations distribution



Analyse en composantes principales (ACP) sur les différents éléments présentant des anomalies dans les sols

→ Arsenic impacts are related to a local natural background in deeper clayey layers

# Contaminations distribution

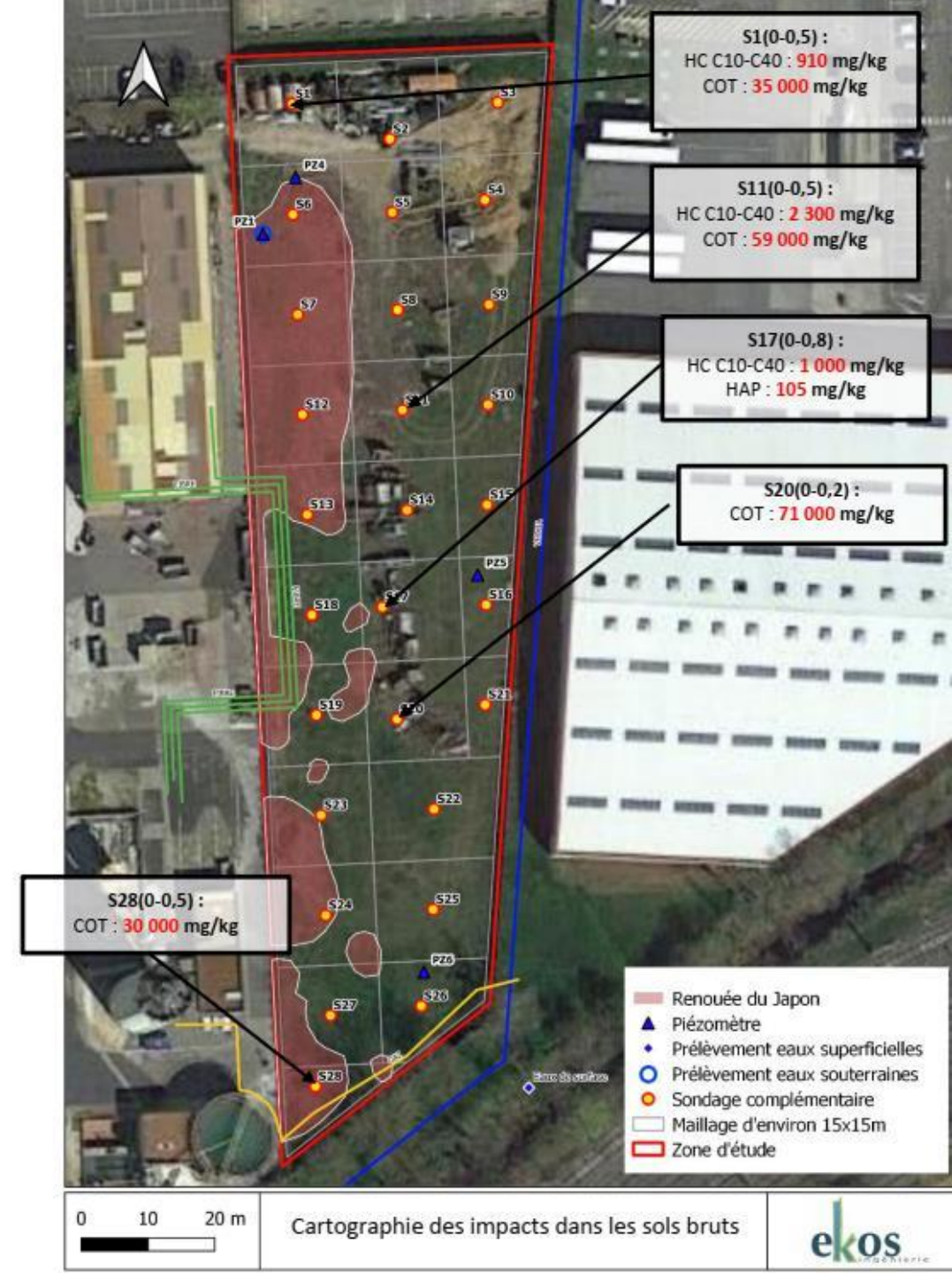


- Significant lead impacts at shallow depth (hotspot : 46000 mg/kg)
- No groundwater or surface water impacts

Figure 27 : Bilan massique sur la base d'une distribution des concentrations en Plomb entre 0 et 1 m

# Site Invasive Alien Plant Species :

- Japanese knotweed: introduced in Europe in 1825
- Considered as one of the 100 worst IAPS by Global Invasive Species Database
- At site:
  - Large areas covered by Japanese knotweed evidenced
    - 1 400 m<sup>2</sup>
    - well-established copses
  - Superposition of Japanese knotweed settlement and soil contamination





# Integrative approach

- Usual recommendations on Japanese knotweed
- Alternatives appraisal
- Costs-benefits approach
- Final remediation design
- Assets of an integrative approach





# Usual recommendations on Japanese knotweed

- ▶ **Well-established copses**
  - ▶ Mowing of aerial parts and valorization of green waste
  - ▶ Treatment of infested soils
  - ▶ Surface capping (geomembrane) and implementation of a vegetative competition
- ▶ **General recommendations**
  - ▶ Avoid bare ground
  - ▶ Limit day light (which encourages opportunistic species spreading)
  - ▶ Plant local species to limit and compete Japanese knotweed recolonization





# Alternatives appraisal – aerial parts

## Aerial parts destination

Composting



**Technical prescriptions to follow:  
temperature control, duration, pile  
turning...**

Méthanization



**Good methanogenic power  
Advise against this technique by IUCN (woody plant)**

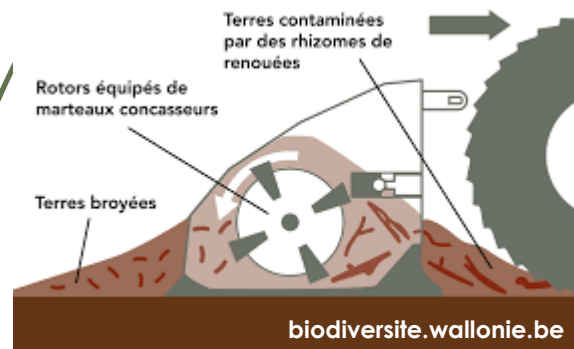
Others:  
Authorized Burning  
Solarization  
Burying ...

***Depending on local authorizations***

# Alternatives appraisal – underground parts

## Infested soil treatment

### Crushing - Sheeting

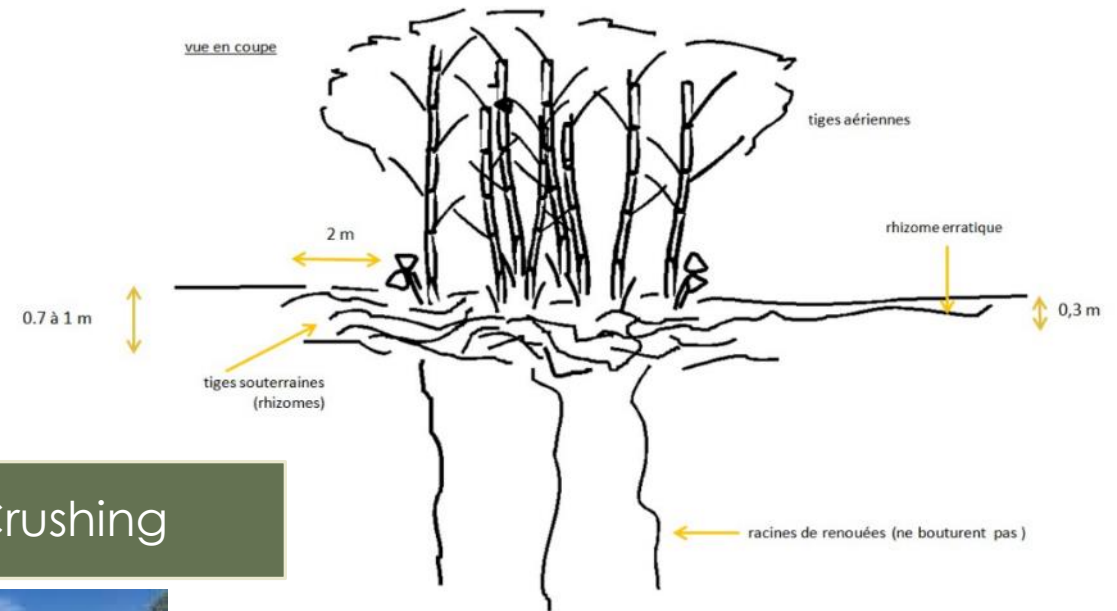


**Small quantity of soil**  
**Caping required**  
**Treatment duration 18 months**

### Screening - Crushing



**Large quantity of soil**  
**No capping required**  
**Immediate mortality**





# Costs-benefits approach

## ➤ Scoring parameters:

### ➤ Environmental criteria:

- Air impact
- Soil impact
- Underground and surface waters impact
- Ecology impact
- Natural resources impact
- Waste production

### ➤ Social criteria:

- Neighbourhood impact
- Community contentement
- Compliance with strategy and regulatory objectives

	Scenario 1	Scenario 2	Scenario 3
	Excavation and off-site disposal (contaminated soil > 300 mg/kg [Pb] + Japanese knotweed)	<ul style="list-style-type: none"><li>- Excavation and off-site disposal (contaminated soil &gt; 1500 mg/kg [Pb])</li><li>- Screening-crushing of soil infested with Japanese knotweed</li><li>- Surface capping (geomembrane)</li><li>- Implementation of a vegetative competition</li><li>- Implementation of public utility easements</li></ul>	<ul style="list-style-type: none"><li>- Screening-crushing of soil infested with Japanese knotweed</li><li>- Surface capping (bituminous membrane)</li><li>- Implementation of public utility easements</li></ul>
<b>Total cost</b>	1,3-1,6 M€	0,9 – 1,1 M€	0,4 – 0,5 M€
<b>Scoring</b>	4,7	7,5	6,4

# Final remediation design

- **Incorporation of Japanese knotweed issues in the remedial management plan**
  - Mowing of aerial parts and valorisation of green waste
  - Screening – crushing of infested soils
  - Onsite landfilling in contaminated soil excavations
  - Surface capping (geomembrane) and implementation of vegetative competition
- **Precautions to avoid Alien Species spreading**
  - Engines and equipment cleaning
  - Staff awareness
  - Monitoring and potential regrowth eradication



# Assets of an integrative approach

- Full integration of all environmental issues of the site
- Synergy of contamination and Invasive Alien Plant Species management solutions assessed and discussed with the Authorities before implementation : backfilling at depth within excavation pits for lead sources removal
- Prevention of two steps intervention at higher costs and of risk of spreading the Japanese knotweed elsewhere onsite and offsite
- Proposition of a unique remediation & renaturation solution, much more effective from an ecological and ecosystemic perspective



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# Conclusion





# Benefits of good practices outreach

- ▶ Integration of Biodiversity in the remedial management plan allowed identifying a relevant and site-specific “ecological trajectory”
- ▶ This consideration follows the current paradigm shift which prevails for land planning and reuse of brownfield sites

