

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



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21<sup>e</sup>  
Edition

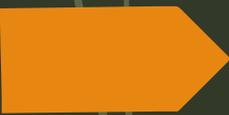
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# Agenda

- ▶ 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

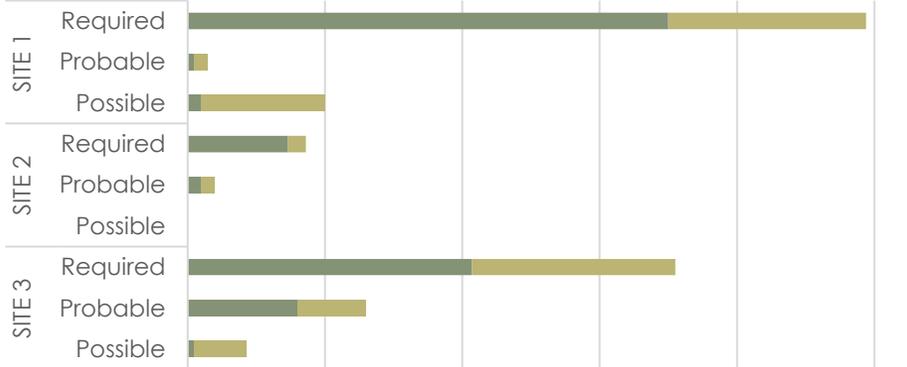
# Background - Due Dilligence of 3 active sites (2 SEVESO Haut)

→ Closed non ferrous smelting activity

Site closure

Estimated Cost (k€)

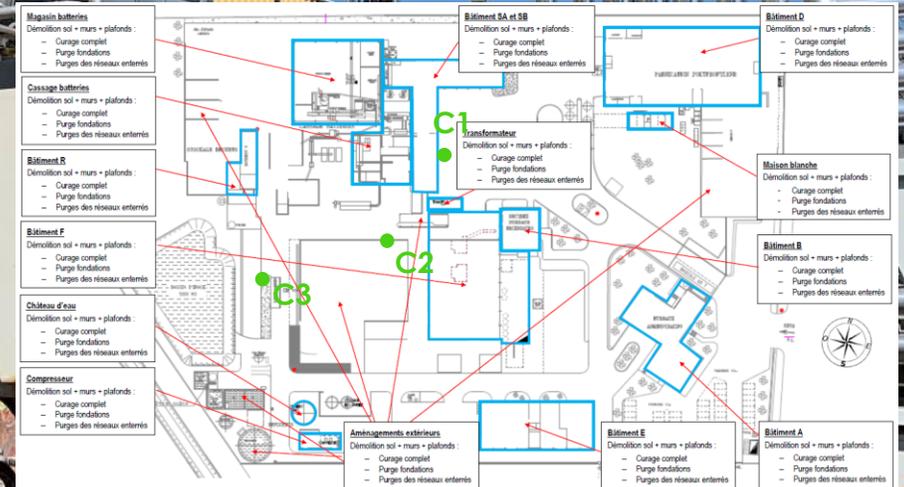
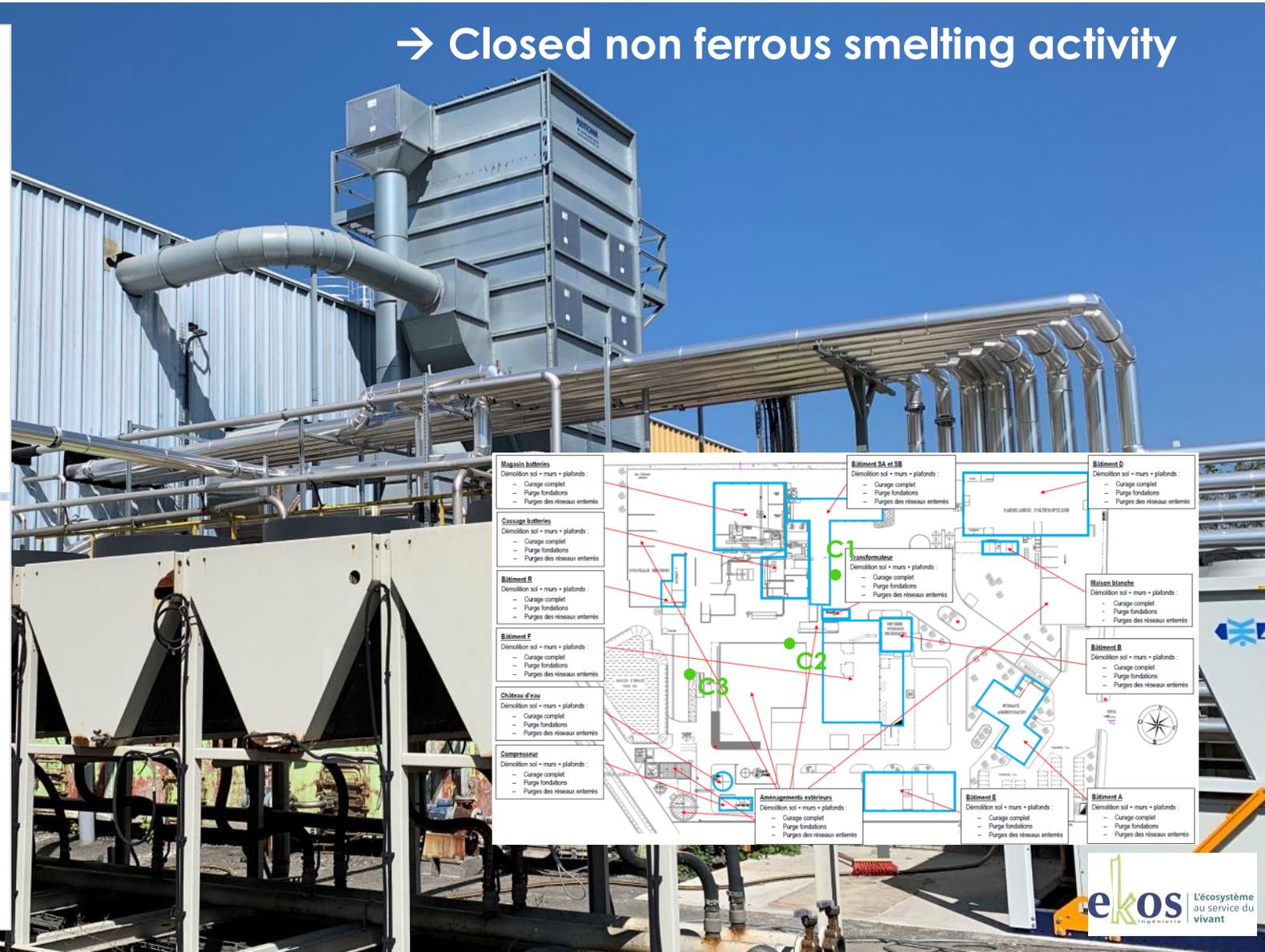
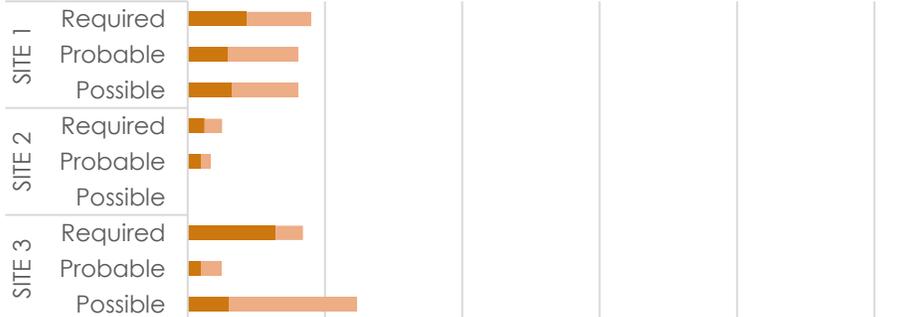
0 1 000 2 000 3 000 4 000 5 000



Ongoing operations

Estimated Cost (k€)

0 1 000 2 000 3 000 4 000 5 000



# 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

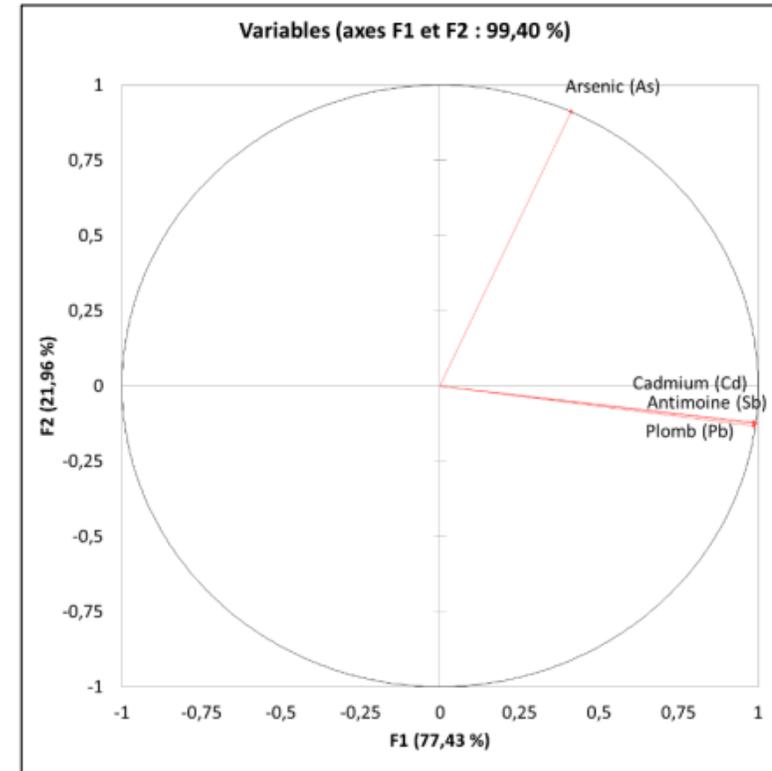
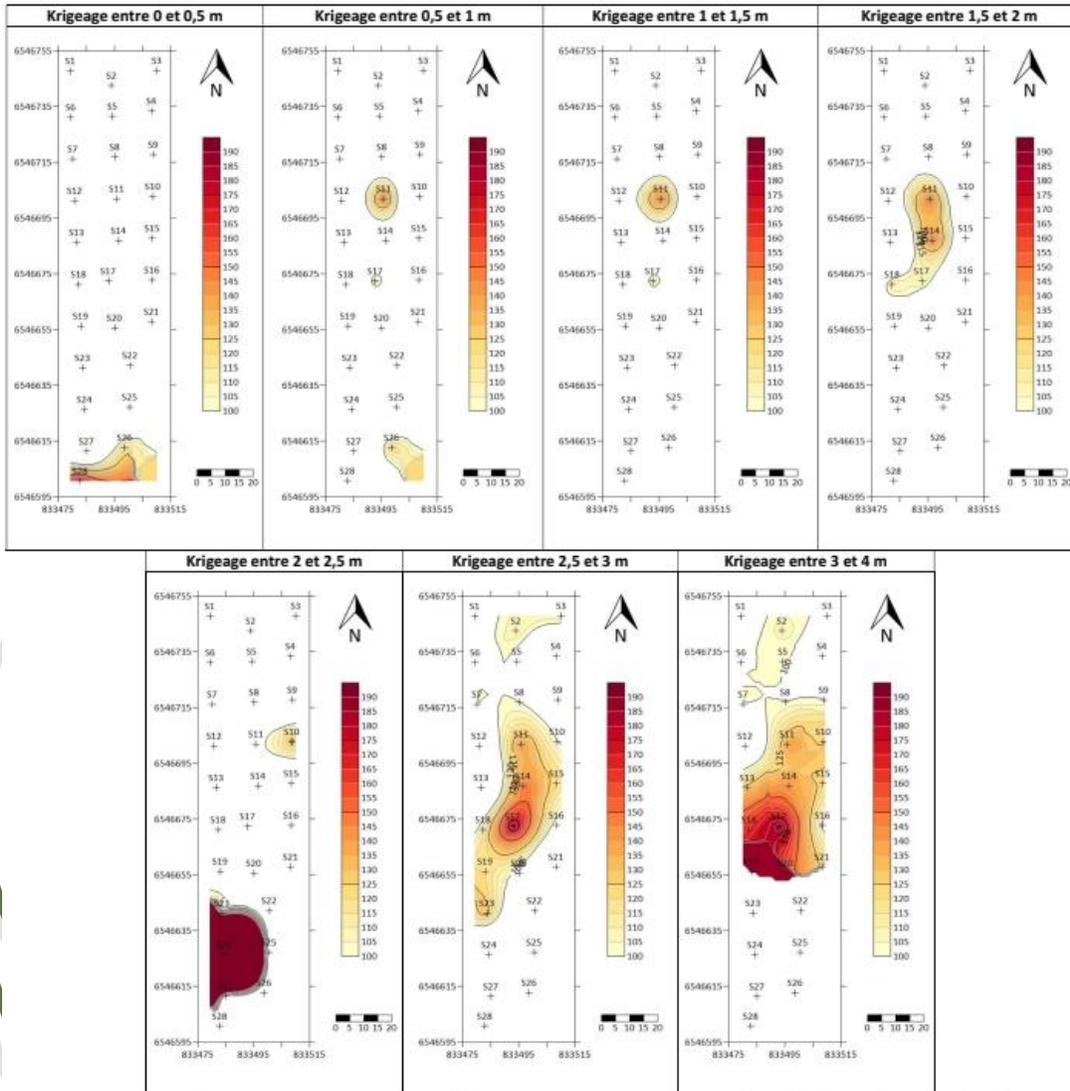


0 10 20 m

Cartographie des sondages de sol complémentaires réalisés

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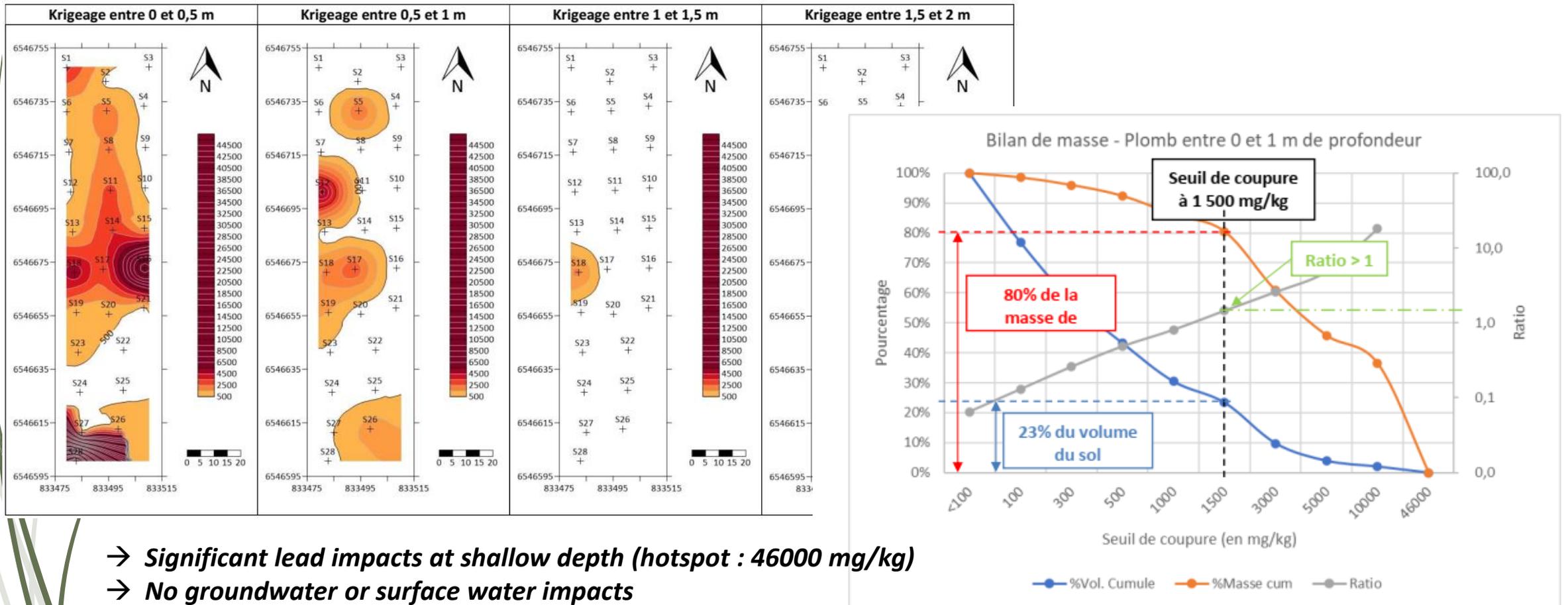
# Contaminations distribution



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

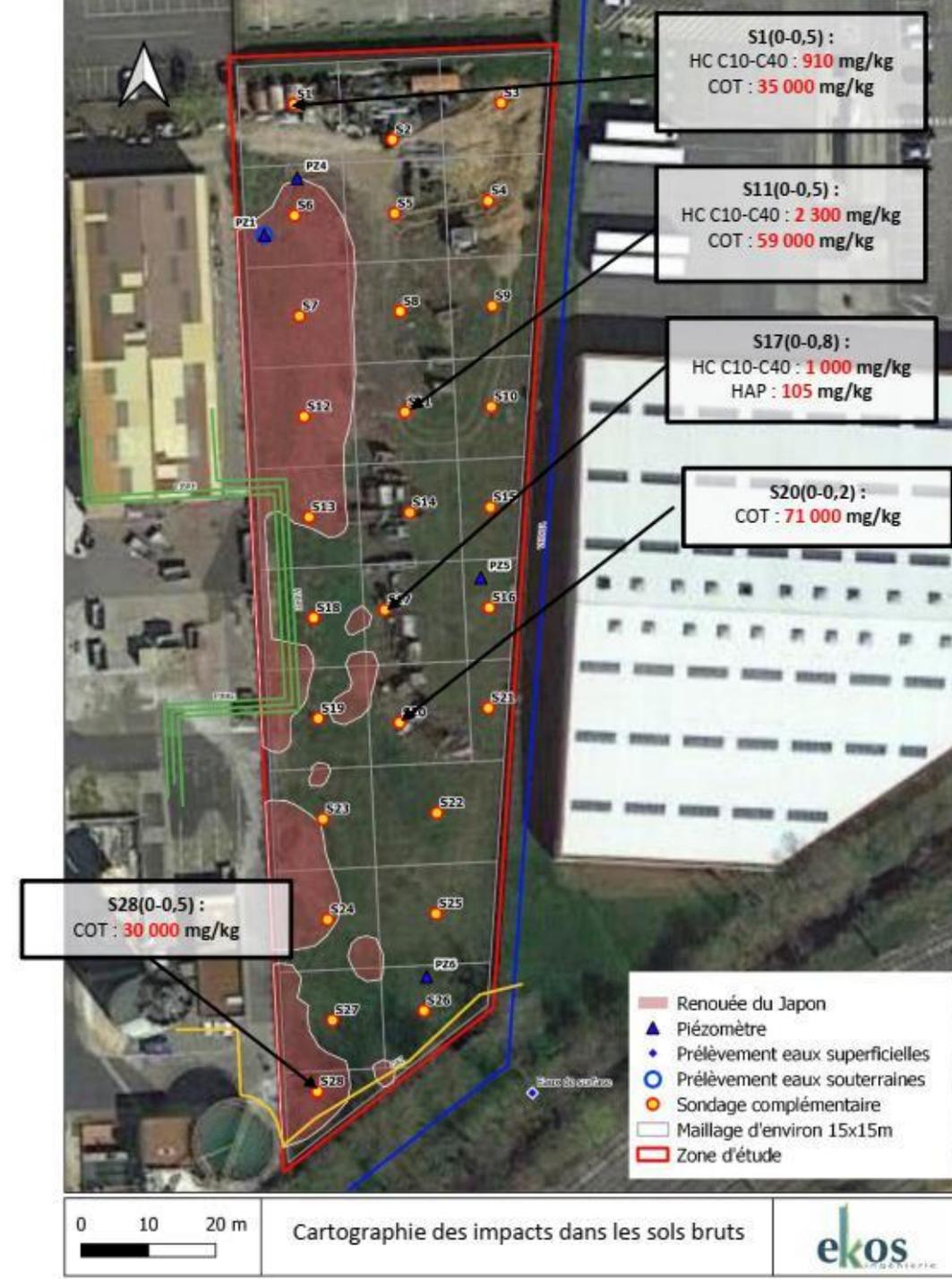


- Significant lead impacts at shallow depth (hotspot : 46000 mg/kg)
- No groundwater or surface water impacts

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)**

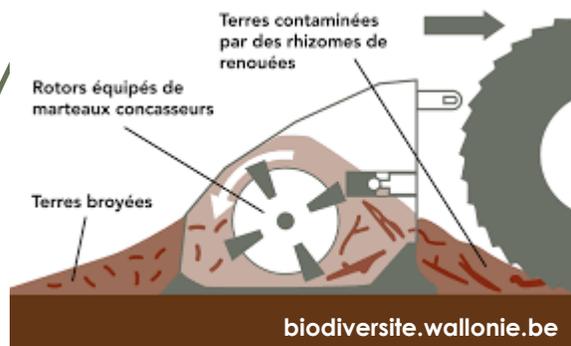
Others:  
Authorized Burning  
Solarization  
Burying ...

***Depending on local authorizations***

# Alternatives appraisal – underground parts

Infested soil treatment

Crushing - Sheeting

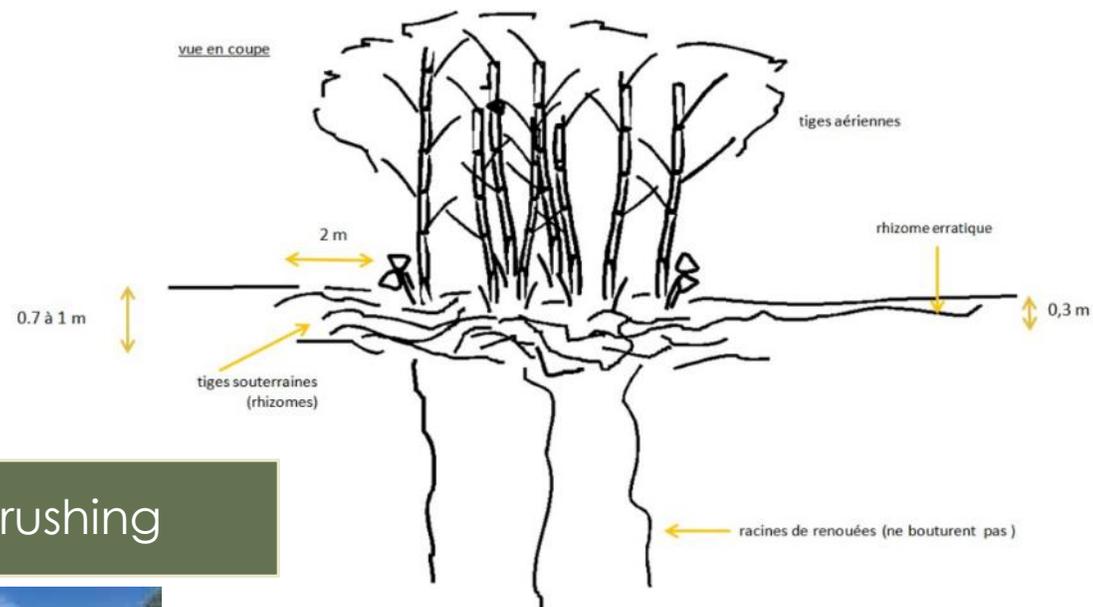


*Small quantity of soil  
Capping required  
Treatment duration 18 months*

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



Southwest Climate Adaptation Science Center  
University of Arizona

# 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

