



Environmental monitoring at a sediment source site to qualify for reuse

Valérie Laperche, Gabriel Billon, Bruno Lemièrre, Ludovic Lesven, Pierre Superville, Marija Margus, Claire Alary, Olivier Bour, Florian Liénard, Pascal Auger, et al.

► To cite this version:

Valérie Laperche, Gabriel Billon, Bruno Lemièrre, Ludovic Lesven, Pierre Superville, et al.. Environmental monitoring at a sediment source site to qualify for reuse. SedNet Conference 2019, Apr 2019, Dubrovnik, Croatia. hal-01950600

HAL Id: hal-01950600

<https://hal-brgm.archives-ouvertes.fr/hal-01950600>

Submitted on 10 Dec 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Environmental monitoring at a sediment source site to qualify for reuse

Valérie Laperche¹, Gabriel Billon², Bruno Lemièr¹, Ludovic Lesven², Pierre Jean Superville², Marija Margus², Claire Alary³, Olivier Bour⁴, Florian Liénard⁵, Pascal Auger¹, Mathieu Henry⁴.

¹ BRGM, F-45060 Orléans, France

Phone: +33-(0)-238643434

² U-Lille-CNRS / LASIR / Equipe PCE, 59655 Villeneuve d'Ascq

E-mail: v.laperche@brgm.fr

³ IMT Douai, France

⁵ ISSeP, Colfontaine, Belgique

⁴ Centre Terre et Pierre, Tournai, Belgique

Conference theme number(s): 5

Introduction: The Interreg FWVL VALSE project aims to promote sustainable dredged sediment reuse [1]. Reuse options and supporting research were investigated during an earlier project [2]. In order to provide waterways operators and related industries, with case studies, full scale pilot tests are planned at Belgian and French sites.

A former sediment disposal site of the French Waterways (VNF) at Saint Omer, Northern France, is considered as a potential source of mature sediment (14 to 40 years old) for reuse applications (landscaping, cycle paths, dikes). Sediments are now comparable to soil in terms of water content and mechanical behaviour. Sediment environmental characteristics are assessed with laboratory methods, and its variability with on-site methods [3].

Methods: The site survey was completed using a portable XRF (pXRF) to test the presence potential inorganic contaminants in stored sediments and their spatial variability. A new field colorimetric method was used for Acid Volatile Sulfides. Existing boreholes allowed a shallow groundwater survey for inorganic contaminants (water sampling, field electrochemical techniques). This survey is aimed at testing field measurements for effective site monitoring.

Sediments were analysed similarly to raw soil with Olympus Delta Premium and Niton XL3t980 pXRFs at < 15 m intervals. No dehydration by filter press was needed to reach standard water contents (25-35%). In this range, measurements carried out on wet pressed pellets correlate well with laboratory analyses [3].

Results: The resulting map (Fig.1) suggests that sediments are generally homogeneous for inorganic contaminants, with Pb-Zn-Cr levels similar to target site soils. One exception is the northwesternmost storage cell, with moderately higher values.

In the sediments, the S-AVS contents measured in the field are quite low, even under the limit of detection (< 50 ppm) in most cases. Electrochemical measurements (EM) were able to detect Zn after a short acid attack in the field. Samples were analysed in the laboratory with further optimisation of EM, Cu and Pb were detected as well.

In porewater, EM on solid electrodes indicate the presence of metals at low concentrations, most of them under the detection limit (< 0.5 ppb). Further optimisation is required due to the complex matrix.

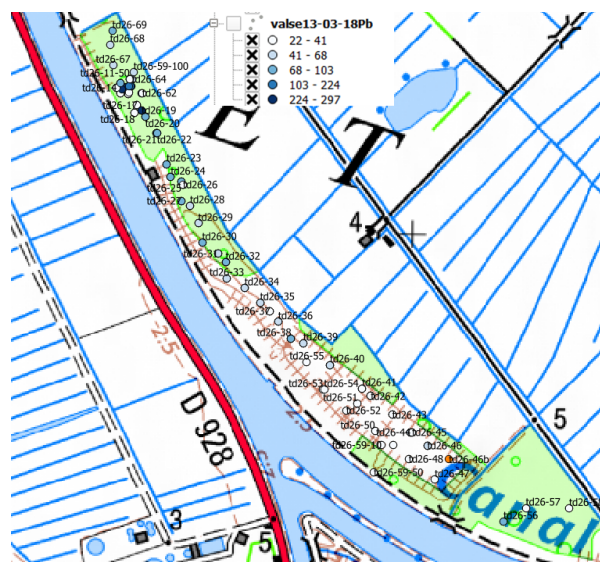


Fig. 1: Map of Pb measurements by pXRF (mg/kg).

Discussion: Site-specific threshold values for pXRF measurements can be derived from regulatory limits or risk-based targets after calibration. Measurements will be used during works to identify potentially off-specification sediments in quasi real time. pXRF measurements will be used at each reuse application site, prior to and after works, in order to monitor application impacts. The low AVS contents indicate that the sediment has been re-oxygenized, and would promote a progressive change in metal speciation with time.

On-site electrochemical analyses for contaminants in groundwater offer flexibility and rapidity when monitoring works impact, and provide an improved response for public awareness.

Acknowledgements: This research is funded by InterReg FWVL, project VALSE.

References: [1] Alary, C. et al., (2017) *SedNet conference*; [2] Alary, C. et al., (2015) *SedNet conference*; [3] Lemièr, B. et al., (2014) *GEEA* 22:222-233.