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Monitoring spatial and temporal variations of permeability in constructed wetlands by time-lapse geophysical methods

J.C Tapias (1,2), M. Himi (3,4), R. Lovera (1,3), R. Blasco (1), M. Folch (1,2), A. Casas (1,3)

(1) Water Institute, University of Barcelona, Barcelona, Spain (jtapias@ub.edu), (2) Soil Sciences Laboratoty, University of Barcelona, Barcelona , Spain (mfolch@ub.edu), (3) Geochemistry, Petrology and Geological Prospecting Department, University of Barcelona, Spain (albert.casas@ub.edu), (4) Ecole Nationale des Sciences Appliquées, Université Mohammed Premier, Al Hoceima, Morocco (himi06@gmail.com)

Constructed wetlands are widely used for removing pollutants from wastewater in small communities because their simplicity and low operation costs. Nevertheless, with time the cleaning process can result in gradual clogging of the porous layer by suspended solids, bacterial film, chemical precipitates and compactation.
The clogging development causes decrease of hydraulic conductivity, reduced oxygen supply and further leads to a rapid decrease of the treatment performance. As the investment involved in reversing clogging can represent a substantial fraction of the cost of a new system it is essential to assess in advance the evolution of clogging process and detect potential failures in the system.
Since there is a lack of experiences for monitoring the functionality of constructed wedlands a combination of non-destructive geophysical methods have been tested in this study. With this purpose electrical resistivity tomography, induced polarisation, frequency domain EM and ground probing radar have been conducted at different horizontal subsurface flow municipal wastewater treatment wetlands of Catalonia (Spain). The obtained results have shown that the applied geophysical techniques may delineate the clogging expansion and help take the preventive measures for enlarge the lifetime of the treatment system.