2nd European Conference on Natural Attenuation, Soil and Groundwater Risk Management

May 18-20, 2005
DECHEMA-House, Frankfurt am Main/Germany

Book of Abstracts
### Lecture Programme

**Plenary Session (Chair: T. Track, DECHEMA e.V., Frankfurt am Main/D)**

**12:00**

**The physical, chemical and biological basis for natural attenuation of soil contaminants**

W.E.H. Blum, University of Natural Resources and Applied Life Sciences, Vienna/A

**Processes (Chair: A. Hart, UK Environment Agency, Solihull/UK)**

**14:30**

**Natural attenuation of herbicides in a landfill leachate plume: the role of fringe processes**

P.L. Bierg, N. Tuxen, L. Reitzel, H.-J. Albrechtsen, Technical University of Denmark, Lyngby/DK

**15:00**

**SEDBARCAH: SEDiment bioBARiers for Chlorinated Aliphatic Hydrocarbons in groundwater reaching surface water**

W. Dejonghe, K. Hamonts, R. Lookman, Vito, Mol/B

**15:30**

**Chlorinated solvents biodegradation at meter scale**

C. Guillot de Suduiraut, O. Atteia, University of Bordeaux, Pessac/F

**16:30**

**Assessment and simulation of natural attenuation of chloroethenes at the KA/Killesfeld site**

A. Tiehm, A. Mueller, Water Technology Center, Karlsruhe/D; W. Schaefer, Steinbeis-Transferzentrum Grundwassermodellierung, Wiesloch/D; K. Busch, F. Wickert, Geo Umwelt Consult, Karlsruhe/D

**17:00**

**Comparison of oxygen delivery methods for in situ vinyl chloride treatment**

J. Buhl, Cornelsen Umwelttechnologie GmbH, Essen/D; J.F. Begley, MT Environmental Restoration, Plymouth/USA; C.R. LeBlanc, East Coast Engineering, Inc, Marion/USA

**17:30**

**Degradation of chlorinated hydrocarbons using nano-scale iron particles – principles and test results**

E. Löbel, C. Müller, P. Rissing, ALSTOM Power Environmental Consult, Stuttgart/D; T. Toda, TODA KOGYO EUROPE GMBH, Düsseldorf/D
A novel approach for identifying specific industrial activities from the study of chlorinated organic compound spectra

L. Lucas, Ecole Nationale Supérieure des Mines de Paris (ENSMP), Fontainebleau/F; C. Rauber, ARCADIS ESG, Nanterre/F; M. Jauzein, Université Henri Poincaré – Nancy I, Vandoeuvre-les-Nancy/F; R. Jacquet, SOLVAY Research & Technology, Bruxelles/B; N. Cruchot, SOLVAY Tavaux, Tavaux/F; M. Chevreuil, Université Paris VI/F

Criteria for the selection of the representative source concentration to be used in a risk analysis procedure

R. Baciocchi, University of Rome/I; S. Berardi, ISPESL-DIPIA, Rome/I; L. D’Aprile, G. Marella, APAT, Rome/I

A simple formula to estimate the maximum contaminant plume length

P. Dietrich, University of Tübingen/D; A. J. Valocchi, University of Illinois, Urbana-Champaign/USA; R. Liedl, P. Grathwohl, University of Tübingen/D

Organic (micro)pollutants in soils, what are the risks and perspectives?

M.H.A.B. Wagelmans, Bioclear bv, Groningen/NL; T. Grotenhuis, Wageningen University/NL

Use of hydrological and vadose zone modelling for risk assessment and natural attenuation for soils and groundwater in relation with diffuse or dispersed pollution: Walloon Meuse and Escaut catchments (Belgium)

C. Sohier, S. Dautrebande, University of Gembloux/B; F. Delloye, Environment and Natural Resources Department – Ministry of Walloon Region, Namur/B

ERAMAS – Grid-based Environmental Risk Analysis and Management System

Thursday, May 19, 2005, Max-Buchner-Hörsaal

**Processes** *(Chair: A. Saada, BRGM, Orléans/F)*

9:00  Evidence of natural attenuation at a MTBE contaminated site in Leuna (Germany) and different technologies to enhance the natural process

9:30  A multi tracer experiment to quantify the *in situ*-biodegradation of toluene in a BTEX contaminated aquifer

10:00 Natural and enhanced biodegradation of NSO-heteroaromatic compounds in tar-oil polluted groundwater
A. Sagner, A. Tiehm, Water Technology Center, Karlsruhe/D

**Monitoring** *(Chair: J. Michels, DECHEMA e.V., Frankfurt am Main/D)*

11:00 Contaminant mass discharge estimation in groundwater: evaluation of expected errors
M. Kuebert, M. Finkel, University of Tübingen/D

11:30 Time-integrated monitoring of PAHs in ground water using the Ceramic Dosimeter passive sampling device

12:00 *Monitored* Natural Attenuation: sampling bias caused by monitoring equipment
M. Piepenbrink, University of Tübingen/D; T. Ptak, University of Göttingen/D; P. Grathwohl, University of Tübingen/D
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<th>Time</th>
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<tr>
<td>12:30</td>
<td><strong>Monitoring of subsurface pollution by use of vegetation samples</strong>&lt;br&gt;S. Trapp, Technical University of Denmark, Kongens Lyngby/DK; U. Karlson, National Environmental Research Institute, Roskilde/DK; D. Pieper, German Research Centre for Biotechnology, Braunschweig/D</td>
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<tr>
<td>14:30</td>
<td><strong>Short chained alkyl phenols- a process oriented tracer for identification of natural attenuation potential</strong>&lt;br&gt;T. Licha, M. Sauter, University of Göttingen/D</td>
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<td>15:00</td>
<td><strong>In situ microcosms to evaluate natural attenuation potentials in contaminated aquifers</strong>&lt;br&gt;M. Kästner, H.H. Richnow, UFZ-Centre for Environmental Research Leipzig-Halle, Leipzig/D</td>
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<td>15:30</td>
<td><strong>Microbial laboratory examinations accompanying natural attenuation of VCHCs at a site in Düsseldorf (Germany): optimization and critical data evaluation</strong>&lt;br&gt;A. Eisentraeger, C. Grundke, RWTH Aachen/D; T. Held, Arcadis Consult GmbH, Darmstadt/D</td>
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<tr>
<td>16:30</td>
<td><strong>Uncertainties associated with the assessment of in situ biodegradation using the isotope fractionation concept</strong>&lt;br&gt;A. Fischer, I. Nijenhuis, UFZ-Centre for Environmental Research Leipzig-Halle, Halle/D; R.U Meckenstock, GSF-National Research Centre for Environment and Health, Neuherberg/D; H.H. Richnow, UFZ-Centre for Environmental Research Leipzig-Halle, Leipzig/D</td>
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<td>17:00</td>
<td><strong>Quantification of geochemical variability of NA-processes at the BTX-contaminated site Zeitz by geostatistical methods</strong>&lt;br&gt;T. Wachter, A. Dahmke, University of Kiel/D</td>
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<td>17:30</td>
<td><strong>Monitoring aerobic ethene biostimulation in a low-concentration vinyl chloride plume</strong>&lt;br&gt;J.H. Archibald, inVentures Technologies Inc, Oakville/CDN; C.R. LeBlanc, East Coast Engineering Inc, Marion MA/USA; S. Fogel, Bioremediation Consulting, Inc, Watertown MA/USA; J.F. Begley, MT Environmental Restoration, Plymouth MA/USA</td>
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### Lecture Programme

**Thursday, May 19, 2005, Carl-Duisberg-Hörsaal**

#### Policy Support *(Chair: D. Müller, Federal Environment Agency - UBA, Vienna/A)*

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<tr>
<th>Time</th>
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<tr>
<td>9:00</td>
<td>Criteria evaluation for the MNA protocols application on remediation of contaminated industrial sites in Italy.</td>
<td>P. Carrera, M.C. Mastronardi, M. Gavinelli, Snamprogetti spa, San Giuliano Milanese/I</td>
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<td>9:30</td>
<td>The role of the risk assessment in the Hungarian regulations concerning the remedial tasks</td>
<td>L. Ádám, VITUKI Kht., Budapest/HU</td>
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<td>10:00</td>
<td>Implementation of the RBCA model in conducting human health risk assessment within the UK legislative context</td>
<td>Elizabeth Waterfall, M. Chen, CL Associates, Wokingham/UK</td>
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#### Modelling *(Chair: P. Bjerg, Danish Technical University, Copenhagen/DK, D. Lerner, University of Sheffield/UK)*

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<tr>
<td>11:00</td>
<td>Analytical solutions for fringe-controlled natural attenuation</td>
<td>D. Lerner, M. Gutierrez-Neri, I. Wilson, University of Sheffield/UK</td>
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<td>11:30</td>
<td>Analysis of the effects of variable recharge on the processes of natural attenuation by a longterm transient simulation</td>
<td>A. Spinola, H. Gerdes, M. Kämpf, BGS Umweltplanung GmbH, Darmstadt/D</td>
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<td>12:00</td>
<td>Effects of sulphate emission from the unsaturated zone on natural attenuation processes within a benzene and naphthalene contaminated aquifer – a numerical scenario analysis</td>
<td>G. Hornbruch, D. Schäfer, A. Dahmke, University of Kiel/D</td>
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<td>12:30</td>
<td>Kinetic re-supply of oxygen for variable saturated flow conditions: modelling of sequential aeration events</td>
<td>G.U. Balcke, S.E. Oswald, S. Meenken, H. Geistlinger, UFZ-Centre for Environmental Research Leipzig-Halle, Halle/D</td>
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<td>14:30</td>
<td>Modelling concepts for mixing-controlled bioreactive transport</td>
<td>O.A. Cirpka, Swiss Federal Institute for Environmental Science and Technology (EAWAG), Dübendorf/CH</td>
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Lecture Programme

15:00  Benchmarks assuming different approaches to simulate microbial degradation
       D. Schäfer, A. Dahmke, University of Kiel/D

15:30  Comparison of various methods for the quantification of NA processes at a creosote contaminated site
       P. Blum, P. Martus, R. Melzer, URS Deutschland GmbH, Wennigsen/D; C. Oik, RAG Coal International AG, Essen/D;
       K. Schnell, URS Deutschland GmbH, Wennigsen/D

16:30  Scenario specific modelling for the length of steady state plumes and field scale predictions for Natural Attenuation
       U. Maier, P. Grathwohl, University of Tübingen/D

17:00  On the role of chlorinated solvents degradation sequences for the simulation of natural attenuation at real sites
       O. Atteia, C. Guillot de Suduiraut, University of Bordeaux, Pessac/F

       B. Miles, A. Peter, Tübingen Groundwater Research Institute (TGF)/D; E.A. Sudicky, R. Maji, University of Waterloo/CDN; G. Teutsch, UFZ-Centre for Environmental Research Leipzig-Halle, Leipzig/D

Friday, May 20, 2005, Max-Buchner-Hörsaal

Case Studies  (Chair: R. Jacquet, Solvay SA, Brussels/B; T. Track, DECHEMA e.V., Frankfurt am Main/D)

9:00  Natural and enhanced natural attenuation of a soil polluted with radionuclides and heavy metals
       S.N. Groudev, M.V. Nicolova, I.I. Spasova, P.S. Georgiev, University of Mining and Geology, Sofia/BG

9:30  The use of directed and controlled crystallization processes from supersaturated solutions to enhance natural attenuation
       G. Ziegenbalg, TU Bergakademie Freiberg/D

10:00 Stimulated anaerobic bioremediation as an integral part to the management of a landfill leachate plume in the Dutch Province of Zuid Holland
       A.A. Bowker, J.H.A.M Verheul, Municipality of Rotterdam/NL
Is natural attenuation subsequent to a soil excavation effective?
P. Eckert, L. Richters, Stadtwerke Düsseldorf AG/D; F. Wisotzky, U. Schulte, University of Bochum/D; C. Griebler, GSF-National Research Centre for Environment and Health, Neuherberg/D

Enhanced natural attenuation at a former manufactured gas plant
A. Bender, Björnsen Beratende Ingenieure, Koblenz/D; A. Tiehm, Water Technology Center, Karlsruhe/D

Complete natural attenuation of methylene chloride in groundwater at an industrial site in the US
E. E. Mack, T. Ei, R. Buchanan, D. Ellis, DuPont Co., Wilmington/USA

Demonstration of the use of natural attenuation (MNA) as a remediation technology – DEMO-MNA

Nicole project on monitored natural attenuation: demonstration of MNA at 8 industrial field sites.
H. Slenders, TNO Environment and Geosciences, Apeldoorn/NL; A. Sinke, BP, Sunbury/UK; R. Jacquet, Solvay SA, Brussels/B

Identification of different redox zones within a chlorinated solvent plume with respect to complete biodegradation
T. Held, H. Jacob, ARCADIS Consult GmbH, Darmstadt/D
No. 1
Sorption of hydrophobic organic pollutants by a low organic carbon London Clay liner (UK)
A. Simoes, A. Stringfellow, D.J. Smallman, University of Southampton/UK;
H. Potter, UK Environment Agency, Solihull/UK

No. 2
Microbial basics of in-situ bioremediation of chlorinated ethenes,
benzenes, dioxins, furans, biphenyls, and similar compounds
L. Adrian, TU Berlin/D

No. 3
Element enrichment/depletion in Finnish lake sediments: a perspective covering thousands of years
J. Mäkinen, H. Pajunen, Geological Survey of Finland, Kuopio/FIN

No. 4
In Situ Chemical Reduction (ISCR) using EHC Substrate for Accelerated Remediation by Natural Attenuation (RNA)

No. 5
Kerosene biodegradation by Pseudomonas fluorescens and Bacillus subtilis
T.X. Ortega-Trejo, R. Edyvean, The University of Sheffield/UK

No. 6
Monitoring of in-situ biodegradation using a test system (BACTRAP) with 13C-labelled substrates
N. Stelzer, M. Kästner, A. Fischer, H.H. Richnow, UFZ-Environmental Research Centre, Leipzig/D

No. 7
Redox control of natural attenuation of chlorinated solvents
T. Kuchovský, O. Sracek, Masaryk University, Brno/CZ

No. 8
Microcosm studies as a method to assess PAH degradation at a former gas plant
A. Berghoff, B. Mahro, University of Applied Sciences Bremen/D
No. 9  
ENA of NSO-Heterocyclic hydrocarbons by adding hydrogen peroxide to the groundwater using groundwater circulation wells - a study on a large scale physical model  
O. Trötschler, T. Haslwimmer, H.-P. Koschitzky, University of Stuttgart/D; A. Sagner, A. Tiehm, Water Technology Center, Karlsruhe/D

No. 10  
Hydrogen threshold concentrations during methanogenesis and dechlorination  
M.D. Alter, M. Steiof, Technische Universität Berlin/D

No. 11  
Chemical oxidation combined with microbial/chemical reduction techniques - a pilot test in fractured bedrock environment  
P. Kvapil, T. Lederer, M. Cernik, B. Topinkova, Aquatest a.s., Prague/CZ

No. 12  
Terminal electron acceptor processes in the unsaturated zone of a boreal, petroleum hydrocarbon contaminated aquifer  
J. M. Salminen, Finnish Environment Institute, Helsinki/FIN; J. Leveinen, P. Hänninen, P. Lintinen, Geological Survey of Finland, Espoo/FIN; K.S. Jorgensen, Finnish Environment Institute, Helsinki/FIN

No. 13  
Quantification of colour tracers distribution in porous media  
M. Kasper, C. Eberhardt, N. Leopold, M. Piepenbrink, P. Grathwohl, G. Gauglitz, University of Tübingen/D

No. 14  
Natural gradient experiment on transport of jet fuel derived hydrocarbons in an unconfined sandy aquifer  
M. Klonowski, Polish Geological Institute, Wroclaw/PL; G.D. Breedveld, P. Aagaard, University of Oslo/N

No. 15  
In situ STimulation and REMediation of contaminated fractured SOIL (STRESOIL) at Kluczewo, Poland  
No. 16
Biodegradation of chlorehthenes, research on MNA in a plume downstream of a bioscreen, using molecular techniques and stable isotopes
H. Slenders, N. Hoekstra, TNO Environment and Geosciences, Apeldoorn/NL

No. 17
Aerobic degradation of 1,2-DCP and 1,2-DCA in a contaminated groundwater plume at a former Industrial Site
S. Marczinek, Kiel/D; R. Breiter, University of Erlangen-Nürnberg/D; S. Peiffer, University of Bayreuth/D; R. Reh, Das Baugrund Institut, Hann. Münden/D; M. Woisnitza, HIM GmbH, Wiesbaden/D

No. 18
Natural Attenuation Processes in a Smelter Slag Dump
A. Kassahun, Groundwater Research Institute, Dresden/D; D. Rammlmair, Federal Institute for Geosciences and Natural Resources, Hannover/D

No. 19
Characterisation of substrates for sulfate-reducing bacteria (SRB) in lignite overburden dumps
A. Kassahun, E. Stiebitz, Groundwater Research Institute Dresden/D; N. Hoth, A. Simon, University of Mining and Technology Freiberg/D

No. 20
Quantification and modelling of kinetics, sustainability and technical influenceableness of NA-processes in lignite mining dumps – batch and column tests
A. Simon, M. Dilbat, N. Hoth, A. Storch, TU Bergakademie Freiberg/D

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A mesocosm study of enhanced anaerobic biodegradation of petroleum hydrocarbons in groundwater
X. Fan, S. Guigard, J. Foght, K. Semple, K. Biggar, University of Alberta, Edmonton/CDN

Modelling

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Understanding natural attenuation: prognosis of NA processes in a widespread complex CHC-plume in an urban area
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Soils contaminated by petroleum hydrocarbons - Modelling contaminant degradation with parameters optimization through Monte Carlo methods
A.M. Fiúza, M.C. Vila, M.J. Padrão, University of Porto/P

No. 24
Detailed estimates of groundwater vulnerability using three dimensional geological models
C. Lerch, A. Hoppe, Technische Universität Darmstadt/D

No. 25
How and to what extent are available data sets suitable for numerical model approaches to assess MNA?
S. Grandel, Götz Hornbruch, Dirk Schäfer, Bastian Schlenz, Thimo Stender, Andreas Dahmke, CAU Kiel, IfG, Kiel/D

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Phase change phenomenon in natural attenuation and influence of biofilms
B. Cousin, N. Angellier, A.-L. Lozano, J.-C. Bénet, University Montpellier 2/F

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Reactive transport modeling of natural attenuation of petroleum hydrocarbons at Hnevice site
Z. Vencelides, Ochrana podzemnich vod, s.r.o., Liberec/CZ; O. Sracek, Ochrana podzemnich vod, s.r.o., Praha/CZ; H. Prommer, CSIRO Land and Water, Wembley/AUS

No. 28
Application and optimization of artificial neural networks for modelling at the river basin scale for early identification of trends from highly variable data sets
S. Busche, G. Gauglitz, University of Tübingen/D

No. 29
Risk assessment of sewer leaks for soils and groundwater by means of numerical flow and transport studies
U. Mohrlok, C. Cata, M. Bücker-Gittel, University Karlsruhe/D

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The quantitative impact of groundwater sampling errors on quality assessment - a virtual aquifer study
B. Schlenz, D. Schäfer, S. Grandel, A. Dahmke, Christian Albrechts University Kiel/D
No. 31
CORONAScreen: a refined NA assessment approach to predict plume length or compliance concentration
R.D. Wilson, S.F. Thornton, A. Huettmann, D.N. Lerner, University of Sheffield/UK

No. 32
Uncertainty assessment of plume length estimates in heterogeneous media using the virtual aquifer method
C. Beyer, S. Bauer, O. Kolditz, Eberhard Karls University Tübingen/D

No. 33
Modelling of Enhanced Natural Attenuation Processes at a Former Industrial Site in Italy
M. Mailloux, Golder Associates Ltd., Montreal/CDN; N. Lazovic, C. Rampi, Golder Associates S.r.l., Turin/I

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Determination of redox zones in a mineral-oil contaminated aquifer
R. Huth, R. Hartmann, M. Kiesel, W. Pyka, A. Stallauer, Fachhochschule Weihenstephan, Weidenbach/D

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AWACSS - A EU-project and beyond
N. Käppel, J. Tschmelak, G. Gauglitz, University of Tuebingen/D

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In situ assessment of biodegradation potential using BACTRAPS amended with $^{13}$C-labeled benzene or toluene
R. Geyer, Center for Environmental Research, Leipzig/D; A.D Peacock, Univ. of Knoxville/USA; A. Miltner, H. Richnow, UFZ, Leipzig/D; D.C. White, University of Knoxville/USA; K. Sublette, University of Tulsa/USA; M. Kästner, UFZ, Leipzig/D

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Degradation kinetics and isotopic fractionation during aerobic degradation of chlorinated ethenes
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First results: identification and cartography of the in situ biodegradation in aquifers polluted by chlorinated organic compounds
L. Lucas, Ecole Nationale Supérieure des Mines de Paris (ENSMP), Fontainebleau/F; M. Chevreuil, Université Paris VI, UMR 7619 Sisyphe, Paris/F; M. Jauzein, Université Henri Poincaré - Nancy I, Vandoeuvre-les-Nancy/F; R. Jacquet, SOLVAY Research & Technology, Bruxelles/B; P. Monier, ARCADIS ESG, Nanterre/F

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Integrated methodology for technology monitoring
L. Leitgib, K. Gruiz, Budapest University of Technology and Economics, Budapest/HU; É. Fenyvesi, Cyclolab Cyclodextrin R&D Lab. Ltd., Budapest/HU

No. 40
In situ monitoring of natural attenuation by isotope fractionation analysis - practical application

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Chemical indicators for in-situ bioremediation of petroleum hydrocarbons

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Gaiasafe passive collectors for water and gas analysis
R. Haas, F. Pfeiffer, gaiasafe gmbH, Marburg/D

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Gaiasafe redox detectors for linear groundwater surveillance
R. Haas, F. Pfeiffer, gaiasafe gmbH, Marburg/D

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Evaluation of a diffusion sampling system for MNA assessment
O. Iwakun, K. Biggar, J. Armstrong, D. Morin, R. Donahue, D. Sego, University of Alberta, Edmonton/CDN
No. 45
Risk analysis on groundwater contamination at the megasite Port of Rotterdam
A. Marsman, J. Valstar, TNO-NITG, Utrecht/NL; J. Ter Meer, TNO-MEP, Apeldoorn/NL

No. 46
Reliable estimation of contaminant degradation rates yielded by various tracer tests
M. Dietze, P. Dietrich, University of Tübingen/D

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Natural attenuation and risk assessment of groundwater contamination
P.F. Otte, A.J. Verschoor, RIVM, Bilthoven/NL

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Development and prototype testing of an integrated concept for risk communication during NA-/ENA remedial actions at contaminated sites
P. Doetsch, K. Hammerich, M. Romich, H. Wolf, H. van Norden, RWTH-Aachen/D

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Application of a receptor-oriented, multi-compartmental approach to petroleum hydrocarbon contaminated megasites
D. Wabbels, University of Tübingen, Centre for Applied Geoscience/D;
H. Rügner, G. Teutsch, Centre for Environmental Research UFZ Leipzig-Halle/D;
M. Finkel, M. Kübert, University of Tübingen, Centre for Applied Geoscience/D;
M. Bittens, Centre for Environmental Research UFZ Leipzig-Halle/D

No. 50
Dead men’s broth: potential groundwater pollution from cemeteries
A. Hart, Environment Agency, Solihull/UK

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Operating windows to determine whether monitored natural attenuation (MNA) is a technically feasible remediation option
D.I. Scott, M.H. Ashmore, C.P. Nathanail, University of Nottingham/UK
### Poster Programme

#### Management

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Groundwater resources assessment and managing perspectives in Southern Italy  
P. Celico, P. De Vita, S. Fabbrocino, University of Naples/I; G. Monacelli, G. Tranfaglia, APAT, Rome/I  

#### Policy Support

**No. 53**  
OVAM guideline for the evaluation and application of monitored natural attenuation  
T. Gregoir, F. De Naeyer, OVAM, Mechelen/B  

**No. 54**  
Stratigraphic and groundwater resource information: the role of governmental laws  
C. Campobasso, L. Martarelli, A.R. Scalise, L. Serva, APAT, Rome/I  

**No. 55**  
The Hessian Manual "Arbeitshilfe MNA", guideline for the use of Monitored Natural Attenuation by the competent and enforcement authority and problem owners  
S. Ruwwe, Hessian Agency of Environment and Geology, Wiesbaden/D  

**No. 56**  
Science-policy integration needs preparing common approaches to manage groundwater resources in Europe  
P. Quevauviller, EC-DG Environment, Brussels/B; A.-M. Fouillac, BRGM, Orléans/F; D. Müller, Federal Environment Agency -UBA, Vienna/A  

#### Case Studies

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Natural attenuation processes in groundwater contamination caused by landfills  
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Quantification of natural attenuation of N-S-O heteroaromatic compounds in groundwater at field scale
T. Ptak, University of Goettingen/D; M. Piepenbrink, P. Grathwohl, University of Tuebingen/D

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Monitoring natural attenuation of petroleum hydrocarbons and BTEX in the vadose zone
K. Hettwer, J. Warrelmann, W. Heyser, University of Bremen/D

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Natural attenuation of chlorinated solvents - Case study
J.P. Davit, Golder Associés Ltée, Montréal/CDN; E. Antonucci, D. Boccardo, M. Pupeza, Golder Associates, Torino/I

No. 61
Natural attenuation of TCE via the bacterium *dehalococcoides ethenogenes*: importance and global distribution
E. Hendrickson, D. Ellis, R. Buchanan, J. Payne, E. Mack, H. Huang, Tom A. Ei, DuPont Co., Wilmington/USA

No. 62
Assessment of NA-processes at chlorinated solvent sites - preliminary results from six site investigations
S. Grandel, CAU Kiel, IfG, Kiel/D

No. 63
Enhanced Natural Attenuation for the in-situ biodegradation of N-S-O heteroaromatic compounds in groundwater: overview of the joint project at the former gasworks site "Testfeld Süd"
M. Piepenbrink, T. Ptak, P. Grathwohl, University of Tübingen/D; A. Sagner, A. Tiehm, Technologiezentrum Wasser, Karlsruhe/D; O. Trötschler, H.-P. Koschitzky, T. Haslwimmer, University of Stuttgart, Stuttgart/D

No. 64
Enhanced natural attenuation of MTBE & benzene in a low permeability colorado site using iSOC technology
S. Induchny, Barrier Matrix, London/UK; W. Mulica, Global Technologies Inc, Fort Collins/USA; N. Mathis, O & G Environmental Consulting, Inc, Englewood/USA

No. 65
Geochemical and mineralogical study of natural attenuation processes at Hnevice site, CZ
B. Topinkova, J. Datel, Charles University, Prague/CZ
No. 66
2-Step approach for CHC-Degradation with FNA / Planning and basic design
T. Schenk, E. Kohlmeier, IBL Umwelt- und Biotechnik GmbH, Heidelberg/D

No. 67
MONitored NATural attenuation in a fractured bedrock aquifer on the site STAdtallendorf (MONASTA), Hesse
A. Messling, ahu AG, Aachen/D; C. Weingran, HIM GmbH, Stadtallendorf/D;
U. Lieser, ahu AG, Aachen/D; S. Tränckner, GFI, Dresden/D; V. Giurgea, AGK, Karlsruhe/D; R. Toussaint, AGK, Karlsruhe/D; T. Schmidtke, ahu AG, Aachen/D