The UNIVERSITY CONSORTIUM

Dr. Neil Thomson

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Dr. Thomson is a Professor of Civil and Environmental Engineering, Director of the Soil and Groundwater Remediation Engineering Group, and a member of the Environmental and Water Resources Engineering Research Group and The Water Institute at the University of Waterloo. He was Chair of the Department of Civil and Environmental Engineering from 2008 to 2016.

Dr. Thomson has over 30 years of research experience in the use of field investigations, laboratory experiments, and numerical models to explore subsurface contaminant fate and remediation issues. Current research topics include emerging soil and groundwater remediation technologies, petroleum hydrocarbons and polycyclic aromatic hydrocarbons, chemical oxidants, functional nanoparticles, electrokinetics, high resolution monitoring, isotopes and biomarkers, delivery methods, site characterization, and physical model and comprehensive pilot-scale studies.

Dr. Thomson is currently the Editor-in-Chief of Groundwater Monitoring & Remediation, a National Ground Water Association publication.

Dr. Thomson teaches a number of undergraduate and graduate courses including: Fluid Mechanics, Water Quality Engineering, Advanced Mathematics, Hydrology, Environmental Chemistry, Contaminant Transport, Finite Element Methods, Soil and Groundwater Remediation Engineering, Numerical Methods for Environmental Applications, and Water Quality Management.

In 2018, 2014 and 2005 he received an Outstanding Performance Award from the University of Waterloo for outstanding performance in teaching and scholarship. In 2008 he was awarded the Faculty of Engineering Distinguished Performance Award for his outstanding contribution in teaching, scholarship and service. In 1999 he was awarded the Sir Sanford Fleming Teaching Excellence Award for recognition of an exemplary record of outstanding teaching, concern for students and a commitment to the development and enrichment of engineering education at Waterloo.

He provides expert technical assistance on topics that include conceptual site model development; groundwater flow and fate analysis; and remedial alternative selection, design, and monitoring.

Dr. Thomson's research interests include:

- Hydrogeology
- Groundwater and Soil Contamination
- Brownfields
- Contaminant Fate and Transport
- Non-Aqueous Phase Liquids
- Remediation Engineering
- Modelling
- Laboratory Experiments
- Pilot-Scale Investigations

Current research projects:

- Carbon Based Injectates for Groundwater Treatment
- Chaotic Advection to Enhance Reagent Delivery
- Delivery of Functional Nanoparticles
- Nanoparticles as Contrast Agents
- Low Grade Heat to Enhance In Situ Treatment

Former research projects:

- Treatment of PFAS using a Dual Oxidant System
- Delivery of Sulfate to Enhance Sulfate-Reducing Biodegradation of Petroleum Hydrocarbons
- Multi-Component Mass Transfer and Chemical Oxidation
- Integrated Plume Treatment using Persulfate Coupled with Microbial Sulfate Reduction
- Nano-Metal Catalysts for ISCO
- Dipole Flow and Reactive Tracer Test
- Agricultural Impacts on Groundwater Quality
- Treatment of Gasoline Range Organics with Persulfate
- Performance of Large Diameter Wells
- Permanganate Natural Oxidant Demand
- Stability of Hydrogen Peroxide in Subsurface Systems
- Treatment of a Creosote Source Zone
- Supersaturated Water Injection to Recover Volatile LNAPLs

Selected Papers

Linley, S., N.R. Thomson, K. McVey, K. Sra, F.X. Gu, 2020. Factors affecting pluronic-coated iron oxide nanoparticle binding to petroleum hydrocarbon-impacted sediments, Chemosphere. doi.org/10.1016/j.chemosphere.2020.126732

Stonebridge, J., R. Baldwin, N.R. Thomson, C. Ptacek, 2020. Fluoride-selective electrode as a tool to evaluate the degradation of PFAS in groundwater: A bench-scale investigation. Groundwater Monit R., 40(2), 73-80. doi.org/10.1111/gwmr.12374

Cho, M.S., Z. Zhao, N.R. Thomson, W. Illman, 2020. Use of steady-state hydraulic tomography to inform the selection of a chaotic advection system. Journal of Contaminant Hydrology, 229, 103559. doi.org/10.1016/j.jconhyd.2019.103559

Longpré-Girard, M., R. Martel, T. Robert, R. Lefebvre J-M, Lauzon, N.R. Thomson, 2020. Surfactant foam selection for enhanced LNAPL recovery in contaminated aquifers, Transp Porous Med, 131m 65-84. doi.org/10.1007/s11242-019-01292-0

Linley, S., N.R. Thomson, K. McVey, K. Sra, F. Gu. 2020. Influence of Pluronic coating formulation on nanoparticle transport in natural and oil-impacted sandy aquifer media. Can J Chem Eng, 98, 642-649, doi.org/10.1002/cjce.23650

Cho*, M.S., F. Solano*, N.R. Thomson, M.G. Trefry, D.R. Lester, G. Metcalfe, 2019. Field trials of chaotic advection to enhance reagent delivery. Groundwater Monit R., 39(3), 23-39. doi.org/10.1111/gwmr.12339

Shafieiyoun, S., & Thomson, N. R.. (2019). Intra-NAPL diffusion and dissolution of a MGP NAPL exposed to persulfate in a flow-through system. Journal of Hazardous Materials, 366-374. doi:10.1016/j.jhazmat.2018.10.096

Linley, S., Holmes, A., Leshuk, T., Nafo, W., Thomson, N. R., Al-Mayah, A., McVey, K., et al. (2019). Targeted nanoparticle binding & detection in petroleum hydrocarbon impacted porous media. Chemosphere, 353-361. doi:10.1016/j.chemosphere.2018.10.046

Bouchard, D., Hunkeler, D., Madsen, E. L., Buscheck, T., Daniels, E., Kolhatkar, R., Derito, C. M., et al. (2018). Application of Diagnostic Tools to Evaluate Remediation Performance at Petroleum Hydrocarbon-Impacted Sites. Groundwater Monitoring and Remediation, 38, 88-98. doi:10.1111/gwmr.12300

Solano, F. M., Marchesi, M., Thomson, N. R., Bouchard, D., & Aravena, R.. (2018). Carbon and Hydrogen Isotope Fractionation of Benzene, Toluene, and o-Xylene during Chemical Oxidation by Persulfate. Groundwater Monitoring and Remediation, 38, 62-72. doi:10.1111/gwmr.12228

Bouchard, D., Marchesi, M., Madsen, E. L., Derito, C. M., Thomson, N. R., Aravena, R., Barker, J. F., et al. (2018). Diagnostic Tools to Assess Mass Removal Processes During Pulsed Air Sparging of a Petroleum Hydrocarbon Source Zone. Groundwater Monitoring and Remediation, 38, 29-44. doi:10.1111/gwmr.12297

Wei, Y., Thomson, N. R., Aravena, R., Marchesi, M., Barker, J. F., Madsen, E. L., Kolhatkar, R., et al. (2018). Infiltration of Sulfate to Enhance Sulfate-Reducing Biodegradation of Petroleum Hydrocarbons. Groundwater Monitoring and Remediation, 38, 73-87. doi:10.1111/gwmr.12298

Shayan, M., Thomson, N. R., Aravena, R., Barker, J. F., Madsen, E. L., Marchesi, M., Derito, C. M., et al. (2018). Integrated Plume Treatment Using Persulfate Coupled with Microbial Sulfate Reduction. Groundwater Monitoring and Remediation, 38, 45-61. doi:10.1111/gwmr.12227

Shafieiyoun, S., Thomson, N. R., Brey, A. P., Gasinski, C. M., Pence, W., & Marley, M.. (2018). Realistic expectations for the treatment of FMGP residuals by chemical oxidants. Journal of Contaminant Hydrology, 1-17. doi:10.1016/j.jconhyd.2018.08.007

Shafieiyoun, S., & Thomson, N. R.. (2018). The role of intra-NAPL diffusion on mass transfer from MGP residuals. Journal of Contaminant Hydrology, 213, 49-61. doi:10.1016/j.jconhyd.2018.04.002

Mellage, A., Holmes, A. B., Linley, S., Vallée, L., Rezanezhad, F., Thomson, N., Gu, F., et al. (2018). Sensing Coated Iron-Oxide Nanoparticles with Spectral Induced Polarization (SIP): Experiments in Natural Sand Packed Flow-Through Columns. Environmental Science and Technology, 52, 14256-14265. doi:10.1021/acs.est.8b03686

Shayan, M., Thomson, N. R., Aravena, R., Barker, J. F., Madsen, E. L., Marchesi, M., Derito, C. M., et al. (2017). Integrated Plume Treatment Using Persulfate Coupled with Microbial Sulfate Reduction. Groundwater Monitoring and Remediation. doi:10.1111/gwmr.12227

Ferreira, I. D., Prieto, T., Freitas, J. G., Thomson, N. R., Nantes, I. L., & Bechara, E. J. H.. (2017). Natural Persulfate Activation for Anthracene Remediation in Tropical Environments. Water, Air, and Soil Pollution, 228. doi:10.1007/s11270-017-3322-8

Yao, Y., Volchek, K., Brown, C. E., Vogan, J., Burdick, J., Ross, I., Pancras, T., et al. (2016). Degradation of perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) in aqueous film forming foam (AFFF)-impacted groundwater and soil by oxidation methods. In 39th AMOP Technical Seminar on Environmental Contamination and Response (pp. 383-407). Retrieved from https://www.scopus.com/inward/record.uri?eid=2-s2.0-85012009172&partnerID=40&md5=8e0d406d25cee6ca401241b8dfec8d20

Oliveira, F. C., Freitas, J. G., Furquim, S. A. C., Rollo, R. M., Thomson, N. R., Alleoni, L. R. F., & Nascimento, C. A. O.. (2016). Persulfate Interaction with Tropical Soils. Water, Air, and Soil Pollution, 227. doi:10.1007/s11270-016-3000-2

Gale, T., Thomson, N. R., & Barker, J. F.. (2015). An Investigation of the Pressure Pulsing Reagent Delivery Approach. Groundwater Monitoring and Remediation, 35, 39-51. doi:10.1111/gwmr.12102

Cho, M. S., Trefry, M. G., Thomson, N. R., Lester, D. R., Metcalfe, G., & Regenauer-Lieb, K.. (2014). Field trials of subsurface chaotic advection: Stirred reactive reservoirs. In Proceedings of the 19th Australasian Fluid Mechanics Conference, AFMC 2014. Retrieved from https://www.scopus.com/inward/record.uri?eid=2-s2.0-84959129260&partnerID=40&md5=be1e4c54f72d1cc2c9aa95944b38a722

Esmaeili, S., Thomson, N. R., Tolson, B. A., Zebarth, B. J., Kuchta, S. H., & Neilsen, D.. (2014). Quantitative global sensitivity analysis of the RZWQM to warrant a robust and effective calibration. Journal of Hydrology, 511, 567-579. doi:10.1016/j.jhydrol.2014.01.051

Sra, K. S., Thomson, N. R., & Barker, J. F.. (2014). Stability of Activated Persulfate in the Presence of Aquifer Solids. Soil and Sediment Contamination, 23, 820-837. doi:10.1080/15320383.2013.722142

Marchesi, M., Thomson, N. R., Aravena, R., Sra, K. S., Otero, N., & Soler, A.. (2013). Carbon isotope fractionation of 1,1,1-trichloroethane during base-catalyzed persulfate treatment. Journal of Hazardous Materials, 260, 61-66. doi:10.1016/j.jhazmat.2013.05.011

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