

CHAPMAN M. ROSS, P.E.

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WORK EXPERIENCE

- **04/2020 – Present: FRx, Inc.**

Director of Technology

Responsible for advancing FRx capabilities in technology development and optimization, data collection, analysis and visualization, and remediation design and implementation. Lead the development and application of higher standards of quality assurance across the company to increase equipment reliability and process consistency, thereby ensuring that tools and methods best meet the needs of both clients and field teams.

- **07/2010 – 04/2020: Geosyntec Consultants, Inc.**

Senior Remediation Engineer, Acton Massachusetts

Technical expert in injection methods for in situ treatment, specializing in amendment delivery techniques for low-permeability formations (e.g., hydraulic fracturing, direct injection, and high-pressure jetting). He has spearheaded the development of new technologies for remediation amendment injection (i.e., DPT Jet Injection), conceptual site model development using 3-D printing, passive sediment sampling, and slow-release remediation amendment formulation.

Technical expert in the design of in situ remediation programs and has led the design process for remediation projects utilizing in situ chemical oxidation (e.g., permanganate, persulfate, peroxide, and ozone), in situ chemical reduction with zero-valent iron (ZVI), enhanced in situ bioremediation, and physical removal technologies. Provided senior technical support for remediation design or implementation on more than 150 projects in 20 states and internationally.

From 2012 to 2020 served on steering committee for Geosyntec's Groundwater Action Group, a 600-person technical group established to guide company-wide remediation and site investigation best practices, new technology development, and focused marketing efforts.

- **2001 – 07/2010: Geosyntec Consultants, Inc.**

Remediation Engineer, Acton Massachusetts

Designed and managed the implementation of large-scale soil and groundwater site investigation and remediation programs, vapor intrusion (VI) assessment and mitigation projects, and real-time environmental monitoring installations.

Contributed to the design of remediation programs utilizing in situ chemical oxidation, in situ chemical reduction, enhanced in situ bioremediation, and physical removal technologies.

- **2000 – 2001: FRx, Inc**

Field Engineer, Cincinnati, Ohio

Supported development of encapsulated, slightly soluble oxidative materials for use as reactive agents in support of in situ oxidation processes.

Conducted field operations involving jet injection technologies for two Department of Energy sites.

EDUCATION

- M.S., Environmental Engineering and Science, Clemson University, 2001
- B.S., Civil Engineering, Clemson University, 1998

CERTIFICATIONS

- Registered Professional Engineer, Massachusetts No. 48170
- OSHA Hazardous Waste Site Worker (40 hr HAZWOPER)
- US DOE Radiological Worker I & II

OTHER EXPERIENCE

- Guidance Document Co-Author, ITRC Optimizing Injection Strategies and In Situ Remediation Performance Team (2018-2020)
- Trainer, ITRC Optimizing Injection Strategies and In Situ Remediation Performance (2020-present)

PATENTS

- Slack, W.W., Ross, C.M., Durant, N.D., Terkelsen, M., (2019), U.S. Patent No. 10,471,484, Injection tip and method for nucleating and propagating hydraulic fractures from probe rods, Issued: November 12, 2019.

SELECTED PUBLICATIONS / PRESENTATIONS

- Ross, C.M., Eberle, D.E., Durant, N.D., Slack, W.W., Jørgensen, T.H., Johansen, P., (2019), "Full-Scale In Situ Remediation of Chlorinated Solvents in Clay Till by Microscale ZVI Emplaced by Direct Push Jet Injection: Results After 4 Years." 15th International Conference on Sustainable Use and Management of Soil, Sediment and Water Resources (AquaConSoil), Antwerp, Belgium, May 20-24, 2019.
- Ross, C.M., Martin, C.S., Wealthall, G., (2018), "3-D Printing for Conceptual Site Models." Network for Industrially Co-ordinated Sustainable Land Management in Europe (NICOLE) Fall Workshop – Data & Risk, Bristol, UK, November 14-16, 2018.
- Ross, C.M., Eberle, D.E., Durant, N.D., Slack, W.W., Baird, D., Jørgensen, T.H., Weeth, E.B., Johansen, P., (2018), "DPT Jet Injection for Remediation of Low-Permeability Zones: Full-Scale Case Study Results from 3 Years of Treatment." Proc. Eleventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, California, April 8-12, 2018.
- Huda, S., Jeray, J.M., Ross, C.M., Connolly, J.C., (2017), "Evaluating the Shutdown of Sub-Slab Depressurization Systems Downgradient of a Former Drum Burial Site." 33rd Annual International Conference on Soils, Sediments, Water, & Energy, Amherst, MA, October 16-19, 2017.
- Ross, C.M., Chlebica, D., Durant, N.D., Slack, W.W., Johansen, P., Jørgensen, T.H., Weeth, E.B., (2016), "Direct-Push High-Pressure Jet Injection for Controlled Amendment Delivery in Low-Permeability Zones: Full-Scale Demonstration", Proc. Tenth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Palm Springs, California, May 22-26, 2016.
- Tomlinson, D., Cox, E., Reynolds, D., Grant, G., Major, D., Ross, C.M., Chlebica, D., Durant, N. D., (2016) "Development of Innovative Technologies for the Remediation of DNAPL Source Zones throughout their Lifecycle", 252nd American Chemical Society National Meeting & Exposition, Philadelphia, PA, August 21-25, 2016.

- Ross, C.M., Slack, W.W., MacKinnon, L., Nielsen, S., Wang, J., (2016), “Workshop: Remediation Tools for Challenging Geology – Cutting Edge Technology for Cleanups in Clay & Fractured Bedrock”, 32nd Annual International Conference on Soils, Sediments, Water, & Energy, Amherst, MA, October 17-20, 2016.
- Slack, W.W., Ross, C.M., Durant, N.D., Knight, D. E., Jørgensen, T.H., Begtrup Weeth, E., Rügge, K., Johansen, P., Terkelsen, M., (2015), “Direct-Push High-Pressure Jet Injection for Rapid Amendment Delivery in Low-Permeability Zones: Full-Scale Demonstration.” 13th International UFZ-Deltares Conference on Sustainable Use and Management of Soil, Sediment and Water Resources (AquaConSoil), Copenhagen, Denmark, June 9-12, 2015.
- Ross, C.M., Chlebica, D., Durant, N., Slack, W.W., (2015), “Direct-Push High-Pressure Jet Injection for Rapid Amendment Delivery in Low-Permeability Zones: Full-Scale Demonstration.” 31st Annual International Conference on Soils, Sediments, Water, & Energy, Amherst, MA, October 2015
- Ross, C.M., Durant, N.D., Cadwalader, G.O., Slack, W.W., Christiansen, C., Terkelsen, M., (2014), “Direct-Push High-Pressure Jet Injection for Amendment Delivery in Low-Permeability Zones”, Proc. Ninth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, California, May 19-22, 2014.
- Ross, C.M., Durant, N.D., Slack, W.W., Terkelsen, M., Christiansen, C., “Direct Push High-Pressure Jet Injection Method for In situ Remediation of Low-Permeability Zones”, Danish Academy of Technical Sciences (ATV) – Winter Meeting 2014, Vejle, Denmark, March 11-12, 2014.
- Ross, C.M., Jeray, J.M., Martin, C.S., Cadwalader, G.O., (2013), “Successful Treatment of a VOC and Petroleum Hydrocarbon Source Zone Combining Ozone, Air Sparge and SVE”, 20th Annual International Petroleum Environmental Conference (IPEC), San Antonio, TX, November 11-14, 2013.
- Ross, C.M., Larson, D.G., Phillips, K.L., Wanty, D., Roberts, J.D., (2013), “Biobarrier Pilot Test for PCE and TCA Treatment in Marine Clay in Coastal Maine”, Proc. Second International Symposium on Bioremediation and Sustainable Environmental Technologies, Jacksonville, FL, June 10-13, 2013.
- Ross, C.M., Cadwalader, G.O., Marvin, B.K., Zeeb P.J., (2012), “A Combined Ozone Remedy for a Mixed VOC DNAPL Source Zone”, Proc. Eighth International Conference on Remediation of Chlorinated and Recalcitrant Compounds, Monterey, CA, May 21–24, 2012.
- Ross, C.M., Cadwalader, G.O., Marvin, B.K., Zeeb, P.J., (2010), “Successful Pilot-Scale Treatment of a Mixed VOC DNAPL Source Zone with Ozone and SVE”, SERDP-ESTCP Partners in Environmental Technology Symposium & Workshop, Washington DC, November 30-December 2, 2010.
- Ross, C.M., Murdoch, L.C., Freedman, D. L., Siegrist, R.L., (2005), “Characteristics of Potassium Permanganate Encapsulated in Polymer”, J. Environ. Eng., 131(8), 1203–1211.