

Review Team

Discipline	Consultant	Qualifications
Health Impacts and Cumulative Effects	Ron Haley, M.Sc., QP _{RA}	Mr. Haley, is a human toxicologist and risk assessor and a Qualified Person for Risk Assessment (QP _{RA}) with over 22 years of consulting experience in human toxicology, risk assessment, and regulatory approvals.
Environmental Noise and Regulatory Approvals	Scott Penton, P.Eng.	Mr. Penton has more than 15 years of experience in environmental noise and vibration impact assessment, specializing in assessment of impacts from industry and transportation, and is a qualified expert in noise and vibration.
Air Quality and Climate Change	Xin Qiu, Ph.D., ACM	Dr. Qiu, has over 20 years of experience in air quality, meteorological and climatological modelling.
Odour and Fugitive Dust	Nigel Taylor, M.Sc., QP	Mr. Taylor has over 15 years of experience in the environmental field and is recognized as an expert in air quality, dust and odour.
Hazard and Risk Analysis	Sarah Lantz, M.A.Sc.,	Ms. Lantz has more than 10 years of experience in hazard/risk analysis, emergency response, and review of emergency planning zone boundaries and land use requirements.
Aquatic Habitat	Brian Fraser, M.Sc. (Ecometrix)	Mr. Fraser has 14 years of experience dealing with fisheries resource evaluation, habitat inventories, water quality objectives and management, and effluent toxicity.
Surface Water Quality and Management	Renate Sadowska, M.Eng., P.Eng. (XCG)	Ms. Sadowska has more than 17 years of experience in stormwater and floodplain management, planning and design of stormwater management and road drainage systems.
Groundwater and Soil Quality	Chris Rancourt, M.Sc., P.Geo. (XCG)	Mr. Rancourt has over 11 years of experience as a geoscientist/hydrogeologist with expertise in groundwater resource protection.

BRIAN FRASER, M.Sc., Principal

SENIOR SCIENTIST

Brian Fraser is a Principal at EcoMetrix with fifteen years of consulting experience. Brian provides his clients with expert advice on issues dealing with the ecological sciences and impact assessment. His project experience includes:

- the characterization of the chemical and toxicological nature of industrial and municipal wastewaters and their effects on aquatic receivers (freshwater and marine);
- the development of site-specific and/or use-specific water, sediment and soil quality objectives;
- resource evaluation and use management strategies in relation to proposed/ongoing industrial activities;
- fisheries resource and habitat inventories for water courses influenced by industrial activities and/or land development; and
- the assessment of factors affecting the abundance and distribution of biota in the environment.

Brian works within a broad spectrum of industry sectors including pulp and paper, mining, power generation, the nuclear industry and the land development sector and has project experience throughout Canada, as well as in the United States of America and South America. He brings holistic and innovative approaches to the study of aquatic systems. His knowledge of and ability to integrate the various disciplines within the aquatic sciences allows him to provide his clients with expert technical advice so that they can deal more effectively with issues relating to the identification, mitigation and management of environmental issues.

Brian's particular expertise is the planning and implementation of ecological baseline, impact assessment and environmental monitoring studies. Recently, he has participated in several related assignments including assessments for proposed mine and port developments in South America, pulp and paper mill developments in South America and a green-field mine site development in Marathon, Ontario.

Brian has also provided expert advice on environmental matters in a number of legal proceedings and has provided testimony to the Ontario Municipal Board.

EDUCATION

- B.Sc., Ecology and Environmental Biology, University of Toronto
- M.Sc., Environmental Studies, University of Toronto

SELECTED PROJECT EXPERIENCE

MINING

Environmental Impact Assessment (Stillwater Canada Inc.)

Brian is currently managing the environmental impact assessment of the Stillwater Canada Inc. Marathon PGM-copper project at Marathon, Ontario. This is a proposed open pit project at a green-field site near Town of Marathon on the north shore of Lake Superior. He is managing the project for the client, including writing of the formal project description, coordination of specialty technical teams, organization and implementation of the baseline sampling programs and ultimately the development of the Environmental Impact Statement and participation in the First Nations and stakeholder communications programs.

Environmental Impact Assessment (Heath Steele Mines)

Brian managed the EIA (under the CEA Act) for the removal of two freshwater dams as part of closure at the site. The project involved an assessment of the potential environmental and ecological impacts on proposed options for the final closure of two dams that had been built to create reservoirs to provide the mining operation with a clean water source. Existing ecological and land use conditions were documented. The impacts associated with construction and post-construction activities were assessed, mitigative activities were proposed and habitat compensation and enhancement plans were developed.

Fisheries Resource Assessment (Blackbird Mine)

For the last number of years Brian has been involved in the evaluation of the recovery of the salmon and trout fishery in the Panther Creek watershed near Salmon, Idaho. The Blackbird Mine, a US EPA Superfund Site, has been engaged in site closure and river remediation activities. EcoMetrix applies the state's fishery assessment framework to determine the status of Panther Creek and its tributaries potentially affected by mine drainage as a means to assess rehabilitation performance.

Environmental Effects Monitoring (Xstrata)

Brian managed the first-cycle EEM program at the Xstrata Montcalm Mine. The project included field-level assessment and interpretative documentation of aquatic resources (stream habitat, fisheries communities, and benthic community structure) in the local environment and a subsequent assessment of the potential effects of mine waste water discharge on fish and benthic invertebrates.

Watershed Level Assessment of Mine Waste Water Discharge (Noranda)

Brian managed a multiyear closure study at the Brenda Mine near Kelowna, BC. The project involved the derivation of site-specific effluent discharge criteria through lab and field studies that would be protective of biological communities within the receiver watershed, as well as use of the receiver as an irrigation source for small to medium scale agricultural operations. The 5-Year multidisciplinary study evaluated the effects of the mine discharge on fish, benthos, riparian plants, water, sediment and agricultural crops and soils.

Water Quality and Stream Loadings Assessment (*Agnico Eagle*)

Brian evaluated water quality and hydrological conditions in several watersheds near Cobalt, ON to determine the effects of ongoing mine closure and restoration activities on arsenic and metal loadings to a series of surface water systems. The resulting models were used to predict potential effects on aquatic biota, as well as to guide future restoration plans so as to maximize net reductions in arsenic and metal loading to the systems.

Development of Mine Effluent Discharge Criteria and Site-Specific Receiving Water Quality Objectives (*Lake Shore Gold*)

Brian developed site-specific receiving water quality objectives and associated mine effluent discharge criteria in relation to a Certificate-of-Approval amendment for a gold mine in the Timmins area. Species sensitivity distributions (SSD) for each of the target parameters were derived as a means to develop the objectives in a manner analogous to the US EPA method for deriving water quality criteria. For metals, hardness-based “objective” values using relationships provided by the US EPA and jurisdictions in Canada were also derived as a means to ground truth the SSD-derived numbers.

Mine Closure Plan (*Noranda*)

Brian managed the Closure Plan EA for Noranda’s No. 12 Mine in Bathurst, NB, an area renowned for its salmon fishery. The study evaluated current environment conditions and modeled the potential recovery of the fishery in rivers receiving treated mine effluent during different phases of closure. Metal loading and hydrology models were used to predict water quality. These predictions were compared against threshold effect levels developed through extensive fisheries research completed in the area to assess the likelihood of the recovery of the fishery.

PULP AND PAPER

Environmental Effects Monitoring (*various clients*)

One of Brian’s specialties is “Environmental Effects Monitoring” (EEM). EEM studies are completed at all pulp and paper mills across Canada, as required under the federal legislation (*Fisheries Act*). The objectives of EEM are to assess potential mill-related effects on fish, fish habitat (benthic invertebrates) and the beneficial use of fisheries resources (tainting) in downstream receiving environments. Brian has managed more than 35 projects in six provinces across Canada over the first five cycles of the program.

Contaminated Sediment Assessment at Thunder Bay Harour (*Cascades*)

EcoMetrix completed an independent review of data collected in the study area by the Ontario Ministry of the Environment (MOE) and Environment Canada (EC) over the last few (five) years (EcoMetrix, 2007). The focus of this review was to assess the potential need for sediment management in the vicinity of the Thunder Bay facility based on the application of the draft Contaminated Sediment Assessment Decision-Making Framework (Canada-Ontario Agreement, 2006). Subsequently, EcoMetrix identified and summarize available remediation options; identified and summarized a set of screening criteria for the evaluation of these options; applied the screening criteria to each option; and selected a preferred option based on the results of the screening.

Caged Bivalves to Assess Effluent Impacts (Corner Brook Pulp and Paper; Stora Endo Port Hawkesbury Ltd.)

Brian has completed several caged bivalve studies on Canada's east coast as a means to assess the effects of pulp mill effluents in coastal environments. The caged mussels were used in environments where it was not possible to utilize more standard means of assessing potential impacts (e.g., benthic invertebrates, fish). The bivalve studies were implemented in a control-impact fashion and involved the assessment of various individual, population, biochemical and immunological based endpoints.

Regional Reference Assessment of Fish Health and Condition Endpoint Variability (Neenah Paper; Norampac; Environment Canada)

A number of health and condition endpoints are used to assess potential effects on fish at pulp and paper mills in Canada. The assessment of effect is based on a comparison of key endpoint measures in effluent-exposed fish and "reference" fish however, "reference" as yet is poorly defined in space and time for many of the sentinel fish populations. EcoMetrix, together with industry partners and Environment Canada has undertaken an assessment of fish health and condition endpoint variability in white and longnose sucker populations from Lake Superior (fall 2006). Brian Fraser is the Project Manager and co-technical leader for the study.

Reference Condition Approach Benthic Survey in the Northumberland Strait (Neenah Paper)

Brian managed an RCA-style study to assess potential impacts of pulp mill effluent on the benthic community. Previous Control-Impact, as well as Multiple Control-Impact studies had produced conflicting results. For the RCA study, benthic invertebrate samples (and supporting environment data) were collected from 30 locations representing typical near shore habitat conditions in the Northumberland Strait. Multivariate ordination (Principal Components Analysis) was used to both define the reference condition in XY space and also to distinguish between those exposure area sampling stations that could be characterized as "equivalent to reference". The 90% probability ellipse was the threshold for a site being considered "equivalent to reference". Stations between the 90% and 99% probability ellipses were considered "possibly different" (there is a 1 in 10 chance that sites will fall in this band through normal variability). Exposure sampling stations between the 99% and the 99.9% probability ellipse were considered "different". Stations located outside the 99.9% ellipse were designated as "very different".

Effluent Toxicity Identification (Neenah Paper)

Brian managed an effluent toxicity identification study whose purpose was to predict potential effluent toxicity based on proposed effluent treatment system changes. Effluent testing was conducted on various mill waste streams, at different points in the effluent treatment system and under different retention time scenarios to help the mill assess how changes to the treatment process might affect toxicity.

Pulp and Paper Mill Effluent Dispersion in Aquatic Receiving Environments
(Bowater Canada; Stora Enso Port Hawkesbury Ltd.; Marathon Pulp Inc., Corner Brook Pulp and Paper)

Brian was involved in pulp and paper mill effluent dispersion studies in freshwater and marine environments. In each case, the studies involved the release of a conservative dye tracer (rhodamine), which was tracked in the environment over several days. Brian provided in-field technical expertise during these studies.

Risk Assessment for a Fuel Distribution System (Kruger Inc.)

Brian completed a risk assessment of a Bunker C Fuel distribution system for a pulp and paper mill located on the east coast. The study assessed system operation relative to existing “best practices”, as well as various spill scenarios as the result of pipeline ruptures to ground, to a nearby freshwater brook and to an estuarine environment.

NUCLEAR POWER GENERATION AND URANIUM MINING

Peer Review – Pickering B NGS refurbishment and Continued Operation EA (Aquatic Component) (DPRA Canada on behalf of the City of Pickering)

Brian was part of a team assembled by DPRA Canada to review the EA for the refurbishment and continued operation of the Pickering B NGS. His focus was the review of the aquatic component of the EA including issues dealing with the effects of impingement and entrainment, station releases to the aquatic environment and the thermal plume on aquatic biota and habitats.

Sculthorpe Marsh SLRA (Atomic Energy of Canada Limited)

EcoMetrix Incorporated (EcoMetrix) was retained by Atomic Energy of Canada Limited (AECL) to conduct a Screening Level Risk Assessment (SLRA) of the Sculthorpe Marsh. Elevated levels of uranium and other metals were identified in Sculthorpe Marsh as part of the Port Hope Area Initiative (PHAI). Brian’s primary role was to provide senior level technical review of all project-related documentation as part of the quality management process.

Monitoring Framework Development for CANDU Facilities (CANDU Owners Group)

Brian is part of a small team of EcoMetrix staff that were retained by the CANDU Owners Group to develop the technical aspects for monitoring frameworks for sites operating CANDU reactors in Canada. Brian’s role was to assess what tools would be best suited to evaluate potential impacts related to both routine discharges to aquatic receivers (i.e., those that part of the normal operations of a nuclear generating station – e.g., cooling water, sewage waste effluent) and release as the result of large-scale unplanned spill events.

Radiological Environmental Monitoring Program (REMP) (Ontario Power Generation)

Brian is the project manager for the aquatic component of the REMP at OPG’s Pickering and Darlington nuclear generating facilities. The program includes the collection of water, sediments and fish in the vicinity of the facilities and at provincial background locations in the Great Lakes. The program data are reported as part of an annual report, which is an operating license commitment to Canadian Nuclear Safety Commission (CNSC).

Baseline and Environmental Impact Assessments (Atomic Energy Canada Limited)

The Port Hope (ON) area has long been home to a radioisotope processing facility. A program is currently underway to clean up wastes associated with historical site operations. As part of the Port Hope Area Initiative, Brian was part of the EcoMetrix team that documented baseline aquatic conditions at Port Hope and Port Granby and subsequently completed the of impact assessment (under CEAA) related to the proposed clean up activities.

Peer Review – Baseline Environmental Studies at the Kiggavik Sissons Uranium Project (Nunavut) (AREVA Resources Canada Inc.)

Brian was retained by AREVA to review the baseline natural environmental data (climate and air quality, hydrology and water quality, aquatic biology, soils, vegetation, wildlife), as provided in a Technical Information Document, for its Kiggavik Sissons Uranium Project in Nunavut. The information provided in the TID will be the basis for the effects assessment for a uranium mine development at the site.

Environmental Impact Assessment for New Acid and Oxygen Plants at the Key Lake Operation (Cameco)

Brian completed the technical components associated with the EIA for proposed new Acid and Oxygen Plants at the Key Lake Operation in northern Saskatchewan. Potential Project-environment interactions were assessed to determine the nature and magnitude of effects resulting from the implementation of the Project. The air emissions pathway was identified as the primary contaminant pathway of concern. Effects were assessed by modeling air emissions and comparing likely exposure levels (expected and upper bound cases) to known exposure thresholds for local wildlife, vegetation communities and humans.

Status of the Environment (Cameco)

Brian was the lead author of a Status of the Environment Report for Cameco's McArthur River Operation in northern Saskatchewan. The characterization of the status of the environment was taken from routine monitoring and special investigation data reported over the period 1999 to 2005, as well as other relevant historical documentation. This information was compiled, reviewed and assessed to: (1) identify predictions made in the original EIS; (2) summarize existing environmental monitoring program designs and collected data; (3) compare existing environmental data to EIS predictions; (4) identify instances where EIS predictions are not accurately represented in existing biophysical data; and (5) present and discuss updated and refined predictions that relate to potential environmental impacts. The assessment included an evaluation of the adequacy of the current monitoring data, a discussion of the agreements between observations and predictions as well as a discussion of potential reasons for any important observed discrepancies between EIS predictions and existing monitoring data.

Link Lakes Information Synthesis (Cameco)

This assignment included the development of a comprehensive report of the existing information describing the condition of the Link Lakes system to aid in the decommissioning process for the Rabbit Lake Mine. The objectives of this assignment were to integrate existing information and document current (or most recent) conditions; to complete a gap analysis that identifies what data would be required to address potential ecological risks in the system and how the available data fit these

requirements; and to provide recommendations for additional data collections to better understand the mass balance and transfer of COPCs within the system.

Human and Ecological Radionuclide Dose Estimation (Rio Algom, Dennison Environmental Services)

This work was undertaken as a contribution to the State of the Environment (SOE) Report for the Serpent River Watershed. The specific objective of this assignment was to update the information about radiological dose and risk in the Serpent River Watershed, based on the most recent available measurements of radionuclide concentrations in the water, sediments and fishes of the watershed lakes. A related objective was to compare the recent dose estimates for human and ecological receptors with those predicted in the Environmental Impact Statement (EIS) documents for the decommissioning of the mines.

Monitoring Program Design (Rio Algom)

Brian provided technical input during the design phase of the Serpent River Watershed Monitoring Program. The area, near Elliot Lake (ON), contained 11 uranium mines variously in operation from the mid 1950s to the mid 1990s. The monitoring program included water quality, sediment quality, benthic community assessment and fish health assessment, as well as an assessment of terrestrial receptors and linkages to human food chains.

POWER GENERATION

Fisheries Issues for Power Station Permitting

Brian has provided technical support, with regards to fisheries issues and water taking and discharge, for a number of proposed gas-fired generating stations in New Brunswick and Ontario. Similar technical support has been provided to a number of hydroelectric station upgrades along the Trent River (ON) with EA activities largely supporting the permitting process of these stations.

CHEMICAL MANUFACTURING AND FOOD PROCESSING

Receiving Environment Studies

Brian has managed several aquatic receiving environment studies at large scale chemical manufacturing facilities, such as a soda ash plant near Windsor (ON), a plastic packaging manufacturer near Toronto (ON), an alum plant in the Niagara peninsula and a citric acid manufacturing facility near Port Colborne (ON). The studies have involved effluent plume delineation, characterization of sediment and water quality and the assessment of impacts on fish, fish habitat and benthic invertebrates.

Remedial Action Plan Strategy for the Wheatley Harbour Area of Concern

Historically, Wheatley Harbour has had significant water pollution problems due to industrial discharges, primarily from fish and vegetable processing plants. Brian was retained to assess the potential environmental constraints and risks associated with the various remedial option proposed.

LEGAL

Litigation Support or “Fisheries Act” Charges

Brian has provided expert technical advice on matters typically dealing with compliance issues and accidental release or spill related events. Project roles vary case-to-case but has included “forensic ecology” (e.g., detailed technical review of evidence, recreating scenarios), participating in negotiations between clients and regulators and providing litigation support during court proceedings.

WATERSHED PLANNING AND LAND DEVELOPMENT

Watershed Management Plans

Brian has provided technical input to a number of watershed and subwatershed planning and environmental management plans (e.g., City of London (Dingman Creek); City of Ottawa (Carp River). These studies focused on understanding watersheds at the ecosystem level and developing management plans, which provide for the long term protection, restoration and enhancement of environmental resources and the needs of future and existing urban development. Typical issues addressed within these studies include guideline development for the identification and protection of “valued” aquatic and terrestrial resources, water quality and water quantity, identification and management of flood and erosion risks and stormwater management.

Ontario Municipal Board Testimony

Brian provided expert testimony relating to fisheries and fisheries habitat issues for a proposed development in Burlington. At issue was the degree to which habitat on the development site could be classified as fisheries habitat and the extent and nature of necessary habitat compensation measures (under the Fisheries Act) would be appropriate.

Peer Review of a Hazardous Waste Landfill Expansion Plan

Brian is part of multidisciplinary team that is reviewing the plans for the possible expansion of the Clean Harbors Lambton Landfill Expansion near Sarnia on behalf of the Township of St. Clair. His role is to assess the possible impacts of the expansion on the aquatic environment. The assessment of the proposed expansion is being conducted under the provincial Environmental Assessment Act.

WASTEWATER AND LANDFILLS

Seasonal Sewage Lagoon Discharge in the Far North

Brian participated in a sewage lagoon discharge assessment in Tuktoyaktuk, NWT, as a joint project with IEG Environmental (Inuvik), on behalf of the Government of the Northwest Territories (GNWT) Department of Municipal and Community Affairs (MACA). The primary objective was to investigate the potential impacts of the seasonal sewage discharge from the municipal sewage lagoon on the estuarine and marine receiving environment (water, sediment, invertebrates and fish).

Phosphorus Cycling Downstream of a Biosolids Landfill

Brian evaluated nutrient (phosphorus) cycling at the watershed level in support of a permit application for a biosolids landfill. In-field observations were combined with modeled discharge scenarios to predict potential impacts in downstream receivers.

RESEARCH AND DEVELOPMENT

Aquatic Sampling Tool Assessment

Brian is actively involved in the development and testing of novel approaches and tools for use in aquatic effects monitoring. This includes the evaluation of benthic invertebrate fitness measures for the Aquatic Effects Technology Evaluation program (NRCan) during the development of the mining EEM program. Other innovations currently being applied within studies for the pulp and paper industry include caged bivalves and novel artificial substrate samplers.

INTERNATIONAL PROJECT EXPERIENCE

Baseline Environmental Assessment for a Proposed Port Facility at Salaverry, Peru (Newmont Mining)

EcoMetrix completed the baseline environmental assessment for a proposed concentrate transshipment facility at Salaverry, Peru. Brian's role was as the lead technical expert for the aquatic environment and was been involved in the field collections and report preparation. Studies were undertaken to assess fish habitat, the fish/shellfish community and fish health, the benthic invertebrate community, the local plankton community, sediment quality and water quality.

Baseline Aquatic Studies for a Proposed Port Facility at Bayovar, Peru (Monterrico Metals)

EcoMetrix completed the aquatic component of the baseline environmental assessment for a proposed port facility at Bayovar, Peru. Brian's role was as the lead technical expert for the aquatic environmental studies and was been involved in the field collections and report preparation. Studies were undertaken to assess fish habitat, the fish/shellfish community and fish health, the benthic invertebrate community, the local plankton community, sediment quality and water quality.

Aquatic Environmental Effects Monitoring at an Operational Port Facility at Huarmey, Peru (Compañía Minera Antamina)

Brian has participated in the preparation of annual Environmental Effects Monitoring reports for studies involving the collection of sediments, water, benthos and fish and fish tissues, as well as, fish and benthic community analysis, at a mine concentrate handling port at Huarmey, Peru about 300 km north of Lima.

Cumulative Impact Assessment [CIS] for a Proposed Pulp Mill Development at Frey Bentos, Uruguay (International Finance Corporation [IFC])

EcoMetrix was retained by the IFC to revise the original draft CIS for a proposed pulp mill development near Frey Bentos, Uruguay. The CIS entailed the assessment of the combined environmental and social impacts of the construction and operations of the two pulp mills and their respective raw material sourcing. Brian's participated in the assessment of potential impacts of mill effluents on the aquatic environment and aquatic

biota and developed recommendations for post-operational aquatic effects monitoring programs.

Valdivia Pulp Mill, Evaluation of Alternative Discharge Locations (*Celulosa Arauco y Constitución S.A*)

EcoMetrix was retained in April 2007 to analyse alternatives for the location for the final disposal of waste (liquid) from the Arauco mill at Valdivia, Chile. The study was undertaken at the request of COREMA (the regional regulatory authority) as concerns had been raised regarding potential effects on local biota, fishing, tourism and the overall health and well being of the area. Brian participated in the assessment of potential impacts of mill effluent on the aquatic environment and aquatic biota at the various discharge option locations.

Fish and Benthic Invertebrate Studies at a Mine in the Peruvian Andes (*Compañía Minera Antamina*)

Brian has participated in the preparation of annual Environmental Effects Monitoring reports for studies involving the collection of sediments, water, benthos and fish tissues, as well as, fish and benthic community analysis, at a base metal mine in the Peruvian Andes.

Soil and Crop Studies at Farms in the Vicinity of a Mine in the Peruvian Andes (*Compañía Minera Antamina*)

Brian completed crop and soil sampling studies at farms in the vicinity of the Antamina Mine in Peru. The objective of the studies is to determine the extent to which (or if) metals have accumulated in local soils and crops as the result of mine activities and/or mine-related releases (e.g., dust, liquid effluent).

PUBLICATIONS/PRESENTATIONS

Racher, K.I., N. Hutchinson, D. Hart, **B. Fraser**, B. Clark, R. Fequet, P. Ewaschuk and M. Cliffe-Phillips. 2011. Linking Environmental Assessment to Environmental Regulation through Adaptive Management. *Integrated Environmental Assessment and Management* 7(2).

Fraser, B.G., D. Farara and N. Ali. 2007. Regional Reference Variability in EEM Effect Endpoints in White and Longnose Sucker in Lake Superior. *Proceedings of the 34th Annual Aquatic Toxicity Workshop*. October 1 to 4, 2007, Halifax, NS.

Fraser, B.G. 2006. The Adoption and Application of the Mining EEM Program in Peru. *Proceedings of the 33rd Annual Aquatic Toxicity Workshop*. October 1 to 4, 2006, Jasper, AB.

Fraser, B.G. 2004. Emerging trends in Environmental Effects Monitoring. *Proceedings of the 12th Annual Canadian Environment Conference*. May 12 and 13, 2004, Toronto, ON.

McKee, P., **B Fraser** and M. Patterson. 2003. Five-year Receiving Environment Study, Brenda Mines. *Proceedings, Molybdenum issues and post-closure reclamation, B.C.'s 27th Annual Mine Reclamation Symposium*. 15-18 September 2003, Kamloops.

- Fraser, B.G.** and D. Farara. 2000. Use of the Beak Artificial Sand Substrate Sampler to eliminate the use of confounding effects of historic deposition from pulp and paper mills. Proceedings of the 27th Annual Aquatic Toxicity Workshop.
- Fraser, B.G.** and D.D. Williams. 1998. Seasonal boundary dynamics of a groundwater/surface water ecotone. Ecology, 79:2019-2013.
- Fraser, B.G.** and D.D. Williams. 1997. Accuracy and precision in sampling hyporheic fauna. Canadian Journal of Fisheries and Aquatic Sciences, 54-1135-1141.
- Feltmate, B.W. and **B.G. Fraser**. 1997. Determining mining related impacts utilizing benthic macroinvertebrate fitness parameters. A report for the Aquatic Effects Technology Evaluation Program (AETE project 2.1.5), Canada Centre for Mineral and Energy Technology and the Mining Association of Canada.
- Lenting, N., D.D. Williams, and **B.G. Fraser**. 1997. Qualitative differences in interstitial organic matter and their effect on hyporheic colonization. Hydrobiologia, 344:19-26.
- Fraser, B.G.**, D.D. Williams and K.W.F. Howard. 1996. Monitoring biotic and abiotic processes across the hyporheic/groundwater interface. Hydrogeology Journal, 4(2):36-50.
- Fraser, B.G.**, C. Nalewajko and M. Olaveson. 1996. A summary of long-term phytoplankton trends in Plastic, Harp and Blue Chalk lakes. An Environment Canada and Ecological and Monitoring Assessment Network publication.
- Nalewajko, C., **B.G. Fraser**, K. Nicholls, M. Olaveson, H. Shear, and P. Dillon. 1996. Assessing the impacts of environmental and climate change using long-term phytoplankton records. Proceedings of the Ecological Monitoring and Assessment Network National Meeting.
- Fraser, B.G.**, D.D. Williams, K.W.F. Howard and I.D. Hogg. 1993. Monitoring hyporheic processes - implications for solute transport from groundwater to running water. Third annual symposium on Groundwater and Soil Remediation.



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RESPONSIBILITIES

- Client Liaison and Marketing
- Expert Leadership, Work Plan Design and Data Analysis
- Expert Advice, Peer Review, Technical Guidance
- Research and Development
- Public Consultation

QUALIFICATIONS

- Qualified Person for Risk Assessment (QP_{RA})

EDUCATION

- Master of Business Administration, Wilfrid Laurier University, 1997
- Master of Science, University of Western Ontario, 1990
- Bachelor of Science, University of Western Ontario, 1987

MEMBERSHIPS

- Society of Toxicology Canada
- Canadian Brownfield Network
- Air and Waste Management Association

BIOGRAPHY

Mr. Haley is a human toxicologist and risk assessor and a Qualified Person for Risk Assessment (QP_{RA}) with over 20 years of consulting experience in human toxicology, risk assessment, worker exposure assessment, risk management, risk communication and regulatory toxicology. He has conducted over 250 assignments for private and public sector clients for a wide range of programs related to pollutant releases from mines, brownfields, manufacturing facilities, power plants, hazardous waste disposal sites, landfills, pulp and paper mills, and chemical spill sites.

RELEVANT EXPERIENCE

He has considerable experience evaluating health impacts associated with various air quality issues. He has provided advice to Canadian and international regulatory agencies, including the United Kingdom Environmental Agency. Recently, he has focused on the assessment of community health impacts associated with regional and local level air quality and noise and the quantification of economic costs related to such impacts.

WORK HISTORY

<i>2010 – Present</i>	Principal, President	Novus Environmental Inc.
<i>1996 – 2010</i>	Senior Consultant	RWDI AIR Inc.
<i>2003 – 2006</i>	Principal	Stantec Consulting (Acquired ESG)
<i>2001 – 2003</i>	Vice President	ESG International
<i>1991 – 2001</i>	Senior Consultant	GlobalTox International

KEY REPRESENTATIVE PROJECTS

Ron has conducted over 250 projects related to risk assessment, toxicology, public consultation, and regulatory toxicology. The following are examples of representative projects.

AIR QUALITY (Recent Examples)

- State of the science review of operational air quality monitoring and forecasting system worldwide and evaluation of the Ontario Ministry of Environment’s system.
- Screening level risk assessment of potential health risks associated with vehicle pollutant emissions from the 407 East ETR.
- Evaluation of human health risks for the Sithe Southdown Station Partnership proposed power plant, Oakville / Mississauga.
- Evaluation of potential health impacts for local residents associated with particulate matter emissions from the GO Aldershot parking lot and access road in Burlington, Ontario.

REGULATORY TOXICOLOGY

- Toxicologist, Health Effects Associated with Hazardous Air Pollutants (Health Canada). This project involved the review of national and international ambient air quality standards for substances identified as hazardous air pollutants (HAPs). The approaches, scientific data and socio-economic considerations were evaluated for their suitability for use in the Canadian regulatory context. Findings were presented to the National Air Issues Coordinating Committee.
- Toxicologist, Review of Ambient Air Standards (Ontario Ministry of the Environment). A comprehensive review and assessment of ambient air quality standards (AAQS) developed by the MOE was completed based on an assessment of national and international ambient air quality standards and supporting scientific and technical information. The suitability and defensibility of the AAQS were determined.
- Toxicologist, Review of the Effects of Oxides of Nitrogen on Humans and Wildlife (Environment Canada). This project involved review of the National Ambient Air Quality Objective (NAAQO) for oxides of nitrogen. Review of the scientific literature to identify exposure-dose information on the effects of oxides of nitrogen on vegetation and wildlife was used to support the development of a rationale document to support the recommended NAAQO.
- Toxicologist, Review of the Effects of Total Reduced Sulphur Compounds on Humans and Wildlife (Environment Canada). This project involved a review of the National Ambient Air Quality Objective (NAAQO) for Total Reduced Sulphur (TRS) compounds. Review of the scientific literature to identify exposure-dose information on the effects of TRS compounds on vegetation and wildlife was used to support the development of a rationale document to support the recommended NAAQO.
- Toxicologist, Human Health Risks Associated with Hydrogen Fluoride, Toronto, Ontario (Confidential Client). Identification of the Acute and Chronic Health Effects Associated with Exposure to Hydrogen Fluoride and Determination of the Potential for Delayed Type Respiratory Problems.
- Toxicologist, Toxicity of Alternative Transportation Fuels, Ottawa, Ontario (Health Canada). Evaluation of human toxicity associated with various alternative transportation fuels and determination of the potential health impacts due to the increased use and burning of alternative fuels in Canada.
- Toxicologist, Health Outcomes Associated with Implementation of the Strategic Option Plan, Ottawa, Ontario (Environment Canada). Potential improvement or decline in the health status of Canadians associated with implementation of the Strategic Option Plans for the base metal and mining sector were evaluated. Various option scenarios were considered to facilitate understanding of the potential benefits and a cost-benefit analysis.
- Toxicologist, Human Health Effects Due to Diesel Engine Emissions (Environment Canada). Critical review of the scientific literature on human health effects associated with exposure to emissions from diesel engines. Findings were presented at the Environment Canada conference on emissions from heavy-duty vehicles.
- Toxicologist, Review of Drinking Water Quality and Assessment of Potential Health Implications (Walpole Island First Nation). A detailed assessment of drinking water quality was conducted to determine the quality of water and potential health impacts to members of the Walpole Island First Nation consuming water obtained from the St. Clair River.
- Toxicologist, Review and Identification of Research Priorities for the Toxic Substances Research Initiative (Environment Canada). A comprehensive literature review of the human and environmental effects associated with Endocrine Disrupting Compounds (EDCs) and heavy metals was completed to identify gaps in the current understanding of these

substances and identify research priorities. Study findings were presented to the TSRI scientific management committee.

- Toxicologist/Project Manager, Review of the US EPA's Reassessment of Vinyl Chloride (Confidential Client). Review and assessment of the toxicity and carcinogenicity of vinyl chloride based on the US EPA's reassessment of vinyl chloride was conducted. Report findings were used to support use of the revised (lower) cancer slope factor for a risk assessment for this substance.
- Toxicologist, Toxicological Evaluation of Trihalomethanes in Drinking Water (Health Canada). A comprehensive literature review and toxicological evaluation of the cancer and non-cancer endpoints associated with exposure to trihalomethanes in drinking water was completed to identify scientifically defensible dose-response curves for human health.
- Toxicologist, Drinking Water Quality Evaluations (Regional Municipality of Waterloo). Periodic drinking water quality evaluations of various municipal water supplies were completed to monitor compliance with Ontario Drinking Water Objectives and trends in overall water quality.
- Toxicologist, Worker Exposure Assessment to Dioxins, Brantford, Ontario (Sonoco Ltd.). Occupational exposure assessment of workers potentially exposure to dioxins and other chemicals present in a cardboard manufacturing facility.
- Toxicologist, Health Risks Associated with Use of a Dust Suppressant (Tembec). Health risks to individuals potentially exposed to chemicals present in a novel dust suppressant developed from pulp mill biosolids used as a suppressant on gravel roads were evaluated. Particulate generation rates were estimated based on various application scenarios.
- Toxicologist, Occupational Exposure Assessment to Plastic Curing Agents, Cambridge, Ontario (Canadian General Tower). Due to worker concern, potential health risks to workers exposed to substances present in novel plastic curing agents were evaluated. Study findings were communicated to facility management and the Joint Health and Safety Committee.

RISK ASSESSMENT AND RISK MANAGEMENT

- Development of an Acute Health Risk Model Procedure Handbook for the United Kingdom Environment Agency based on a comprehensive review and assessment of international risk assessment frameworks and methodologies for prioritizing and determining acute health risks.
- Risk assessment for residents exposed to dioxins, reduced sulphur compounds and acid aerosols living in the vicinity of a pulp and paper mill, Aberdeen Washington, USA.
- Comprehensive literature review of the human and environmental effects associated with Endocrine Disrupting Compounds (EDCs) and heavy metals and identification of data gaps and research priorities.
- Risk Assessor/Project Manager, Area Wide Risk Assessment of the Gloucester Landfill, Ottawa, Ontario (Transport Canada). A comprehensive risk assessment examining the potential impacts to existing and future residents of a new housing development located downgradient of the landfill was completed. Potential health risks associated with exposure to Volatile Organic Compounds (VOCs) based on predictive vapour transport modelling and soil gas vapour monitoring results were estimated. Impacts to ecological receptors within an adjacent wetland were also evaluated. Various remedial options were developed and the existing monitoring program for the landfill updated. Public consultation and risk communication were an integral part of this project.
- Risk Assessor, Microbial Health Risk Assessment for the Oshawa Gun and Skeet Club, Oshawa, Ontario (Cantox Environmental). Potential for adverse health impacts associated with exposure to microorganisms in groundwater and air by residents living in the vicinity

of the Oshawa Gun and Skeet Club were evaluated based on type, concentration and pathogenicity of the organism measured.

- Risk Assessor/Project Manager, Development of an Acute Health Risk Model Procedure Handbook (United Kingdom Environment Agency, under contract to Golder Associates Ltd., UK). This project involved a comprehensive review and assessment of international risk assessment frameworks and methodologies to identify suitable approaches for prioritizing and determining acute health risks at contaminated sites. A handbook of model procedures was developed to facilitate a consistent approach to acute health risk assessment at contaminated sites in the UK.
- Risk Assessor, Risk Assessment of Residents Living Downstream of the Deloro Mine Site, Deloro, Ontario (Ontario Ministry of the Environment, in association with Golder Associates). This study evaluated potential the potential health risks to full-time residents and cottagers living along the Moira River downstream of the Deloro mine site. An exhaustive sampling program for fish tissue, sediment, river water, and groundwater was conducted to determine potential exposures. Technical and lay language summaries were prepared to facilitate communication of the study findings to the MOE and area residents.
- Risk Assessor, Risk Assessment to Workers at an Industrial Facility, Brantford, Ontario (Confidential Client). Vapour transport modelling and exposure assessment was conducted to determine health risk assessment to site workers potential exposed to trichloroethene and its degradation products present in soil and groundwater at a manufacturing facility.
- Risk Assessor/Project Manager, Risk Assessment to Users of a Commercial Building Potentially Exposed to Trichloroethene and Vinyl Chloride, Scarborough, Ontario (Confidential Client). Predictive contaminant migration and degradation modelling, vapour transport modelling and exposure assessment was conducted to determine health risk assessment to individuals potential exposed to trichloroethene and its degradation products present groundwater at a commercial building. Measured soil gas vapour concentrations were used to calibrate and verify model results.
- Risk Assessor/Project Manager, Peer Review of Comprehensive Site Assessment, Belleville, Ontario (City of Belleville). Peer review of a comprehensive site assessment and a human and ecological risk assessment completed under the Cleanup Guideline for Use at Contaminated Sites in Ontario.
- Risk Assessor, Site-Specific Risk Assessments for Hydro One Distribution Stations in Ontario (Hydro One Networks Inc.). Site-specific risk assessments were completed for eight different Hydro One transmission facilities across Ontario to determine potential human health and ecological risks.
- Risk Assessor, Site-Specific Risk Assessments for Ontario Power Generation Sites in Ontario (Ontario Power Generation). Site-specific risk assessments were completed for eight different Ontario Power Generation (OPG) electrical generating stations across Ontario to determine potential human health and ecological risks.
- Risk Assessor/Project Manager, Health Risks to Residents Living Downstream of a Pulp and Paper Mill, Mississippi, USA (Confidential Client). A comprehensive environmental sampling program and multimedia risk assessment was conducted to determine the potential health risks to individuals potentially exposed to dioxins present in wastewater effluent from a pulp and paper mill. Exposures were estimated based on measured or predicted concentrations of dioxins in surface water, sediments, fish and soil and dust in homes.
- Risk Assessor/Project Manager, Health Risks to Residents Exposed to Substances Released by an Aerated Stabilization Basin, Aberdeen, Washington, USA (Confidential Client). Acute and chronic health risks to residents living in the vicinity of a pulp and paper mill aerated stabilization basin were estimated base on measured concentrations of dioxins, reduced sulphur compounds and acid gas aerosols. The study results demonstrated that off-site

migration of dioxins as aerosols released from aerated stabilization basins occurs and represents a potentially important pathway of exposure.

- Risk Assessor, Health Risk to Workers and Residents Exposed to Arsenic, Giant Mine, Northwest Territories (Resources Futures International). A human health risk assessment was conducted to evaluate the potential risks associated with exposure to arsenic by site workers and residents living in the vicinity of the Giant Mine, Northwest Territories.
- Risk Assessor, Health Risk Evaluation of the Polychlorinated Biphenyl Regulation, Ottawa, Ontario (Headwater Environmental). Potential improvements in the health status of Canadians associated with implementation of proposed changes to the polychlorinated biphenyl regulation were estimated under various PCB reduction scenarios. Environmental fate and food chain modelling focused on exposure to individuals in northern communities.

BROWNFIELD REDEVELOPMENT

- Risk Assessor/Project Manager, Site Assessment and Risk Assessment for Federal Waterfront Properties, City of Belleville, Ontario (City of Belleville). A comprehensive program involving site assessment, risk assessment, risk management and waterfront redevelopment planning was completed for federal waterfront properties in the City of Belleville. Based on the environmental conditions, a risk assessment and risk management plan for the site was prepared.
- Risk Assessor/Project Manager, Brownfield Site Assessment and Risk Assessment for Two Federal Properties, Port Colborne, Ontario (Transport Canada). Comprehensive risk assessment and risk management services for two federal waterfront properties with a long industrial history were provided. Project objectives included the development of an interim risk assessment in order to address the current risk of contaminated soils and/or groundwater to humans, completion of a SSRA to evaluate the potential human and ecological health risks, and the development of remedial options and cost estimates for various Brownfield land use redevelopment scenarios.
- Risk Assessor/Project Manager, Risk Assessment of Lands Comprising the LeBreton Flats, Ottawa, Ontario (National Capital Commission). A comprehensive risk assessment and supplemental field investigation was conducted for lands comprising part of the LeBreton Flats redevelopment project. A site-specific risk management plan was developed to mitigate possible future exposures based on the conceptual redevelopment plans for the property.
- Risk Assessor, Brownfield Risk Assessment of a Former Waste Disposal Site, Waterloo, Ontario (City of Waterloo). Potential health risks to workers and users of a proposed institutional building to be constructed on a former waste disposal site were estimated. An environmental risk management plan was prepared to guide the contractor on the appropriate management of contaminated soil and groundwater.

SARAH LANTZ

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HAZARD AND RISK ANALYSIS

- Managed and prepared quantitative and qualitative reviews of hazard and risk analyses for large scale energy generation facilities (including natural gas and sour gas applications) to review emergency planning zone boundaries and land use requirements for both internal due diligence and external regulatory requirements
- Quantitative hazard and risk analysis of industrial processes, transportation corridors, and chemical and petrochemical facilities, including the oil and gas industry following Environment Canada and international standards and regulatory requirements
- Regulatory hearing support for OMB (Ontario Municipal Board), EUB (Alberta Energy and Utilities Board) and NEB (National Energy Board) hearings
- Forensic analysis of loss of containment following accidental release incidents from storage and operating facilities
- Emergency response and land use planning support and recommendations for industrial and development applications and transportation corridors using Environment Canada and international guidelines and protocols
- Third party peer review and analysis of third party consequence and risk analysis reports for development projects

SELECTED PROJECT DESCRIPTIONS

Existing Industrial Facilities, Various Locations, ON

Provided analysis and support for several clients with ammonia storage on site to meet Canadian Federal Government requirements for emergency planning, including hazard assessments, the potential impact on the surrounding areas for toxicity in the case of an accidental release, and employee training as specified under CEPA E2 regulations

Proposed Warehouse Expansion, Halton Region, ON

Provided analysis and support for client with several chemicals on site to meet local fire department requirements in support of a building permit application, including hazard assessments and the potential impact on the surrounding areas in the event of an accidental release

Proposed Tank Farm Development, Strathcona County, AB

Provided risk assessment and technical reports in accordance with local regulatory requirements, focusing on the hazards associated with the ignition of a flammable vapour cloud or liquid pool; results were compared with risk acceptability criteria to illustrate that the levels of risk associated with the proposed facility were localized to the immediate area and consistent with existing land uses in the area

Proposed Residential Development, Toronto, ON

Provided risk assessment and review of transportation corridor risks associated with transportation of hazardous goods on railway lines adjacent to a proposed residential development, including support for the subsequent OMB hearing

SELECTED PROJECT DESCRIPTIONS (Continued)

Proposed Oil Battery Facility, Argentina

Provided estimates of potential overpressure that could result from the ignition of a flammable vapour cloud at a proposed oil battery facility, including review of a number of potential explosion scenarios and a transient overpressure analysis to assess the potential effect of ignition at various points in the proposed system

Forensic Analysis, Immokalee, FL

Provided estimates of toxic effects and impact on surrounding populations from a release of pesticides in support of an insurance investigation into a workplace accident involving a punctured pressurized storage tank containing toxic chemicals

Peer Review of Explosion and Overpressure Analysis, Miami, FL

Provided a peer review of a third party analysis of overpressure related structural damage and heat effects from a potential release and ignition of fuel in a proposed refuelling facility in an aboveground parkade complex adjacent to an airport

Proposed Health Laboratory Expansion, Boston MA

Provided technical support for a review of the public health risk associated with a worst-case scenario anthrax release at a proposed laboratory site for a series of hypothetical accidental laboratory release scenarios and assisted the client with their regulatory submissions and communications with the public

Proposed Expressway and Tunnel Corridor, Pittsburgh, PA
Provided screening level risk assessment and estimates of the risk of exceeding EPA based permissible exposure limits (PELs) for a proposed covered roadway, the results of which were used to assess the benefits of proposed risk reduction strategies through various ventilation options under consideration

EDUCATION

- Graduate Studies, Department of Mechanical Engineering
University of Alberta (1995-2000)
- Master of Applied Science, First Class Honours Mechanical Engineering
University of Waterloo (1995)
- Bachelor of Applied Science, First Class Honours Mechanical Engineering
University of Waterloo (1993)

EMPLOYMENT HISTORY

- Specialist, Hazard and Risk Assessment, RWDI AIR Inc., Guelph, ON
2002-2009
- Applications Engineer, Flomerics Inc., Southboro, MA
2000-2002
- Research Assistant, Department of Mechanical Engineering, University of Alberta
1995-2000
- Research Assistant, Department of Mechanical Engineering, University of Waterloo
Solar Thermal Energy Laboratory
1993-1995

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- Additional project descriptions and references available on request •



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RESPONSIBILITIES

- Client Liaison and Marketing
- Expert Leadership, Work Plan Design and Data Analysis
- Technical Guidance and Quality Assurance
- Research and Development
- Participation in Management Committees
- Public Presentations
- Expert Witness Testimony

QUALIFICATIONS

- Registered Professional Engineer (Professional Engineers Ontario)
- Registered Professional Engineer (Association of Professional Engineers, Geologists, and Geophysicists of Alberta)
- MTO Registered Qualified Noise and Vibration Consultant
- Qualified Expert Witness in Noise for the Alberta Energy Resource Conservation Board, National Energy Board, Ontario Municipal Board, Ontario Superior Court

EDUCATION

- Bachelor of Applied Science, Systems Design Engineering, University of Waterloo, 1995
- Noise Assessment in Land Use Planning Certificate, Ontario Ministry of the Environment, 1997
- Certificate in Noise Control for Buildings, Manufacturing Plants, Equipment and Products, Hoover and Keith Inc., 1999

MEMBERSHIPS

- Professional Engineers Ontario
- Ontario Society of Professional Engineers
- Association of Professional Engineers, Geologists, and Geophysicists of Alberta
- Canadian Acoustical Association

R. L. Scott Penton, P.Eng.

Principal, Acoustics Noise and Vibration

BIOGRAPHY

Mr. Penton has 15 years of experience in the fields of noise and vibration. He has an undergraduate Degree in Systems Design Engineering from the University of Waterloo, and has published numerous papers on environmental noise impact assessment. He has considerable management experience as the technical director of environmental noise and vibration for a group of technical specialists spanning many geographical regions, ensuring that a sound technical product and a high level of service was provided. Scott has worked on hundreds of environmental noise impact assessments, covering everything from new subdivisions to major power plants, for projects in Canada and around the world, and is a respected specialist providing expert testimony.

WORK HISTORY

<i>2010 – Present</i>	Principal	Novus Environmental Inc.
<i>1996 – 2010</i>	Senior Consultant	RWDI AIR Inc.
<i>2003 – Present</i>	Course Instructor	Conestoga College

HEARING EXPERIENCE

- Mackenzie Gas Pipeline Project, Northwest Territories, Canada (National Energy Board / Joint Review Panel GH-1-2004)
- 181 Nugget Ave. / Friends of Jesus Christ Church Re-zoning, Toronto, ON (Ontario Municipal Board File PL091072)
- Amexon 60-80 Park Lawn Road Development, Toronto, ON (Ontario Municipal Board File PL050003)
- Shell Scotford Upgrader Expansion Project (Alta Energy Resource Conservation Board 2006-085)
- Jilek v. Stiller Centre, London Ontario (Ontario Superior Court)
- Alma Crossings Development, Mapleton, ON, Canada (Ontario Municipal Board File PL030903)
- McCarthy Pit, Ramara, ON, Canada (Ontario Municipal Board File PL010055)
- Sumas Energy 2, Abbotsford, BC, Canada (National Energy Board File 2200-S040-1)

KEY PROJECTS – LAND USE PLANNING

- Corus Quay Building, Toronto, ON, Canada
- East Bayfront West Precinct Zoning Bylaw, Toronto, ON, Canada
 - Examining Impacts of nearby Redpath Sugar operations on a state-of-the-art television and communications studio / office complex (Corus) and on proposed residential land uses.
 - Conducted source measurements, ambient measurements, impact assessment and mitigation design
 - Negotiations/ liaison with the Ministry of the Environment on assessment techniques. Helped negotiate alternative guidelines allowing receptor-based mitigation.

- Amexon 60-80 Park Lawn Road Development, Toronto, ON, Canada
 - Examination of impacts of Kraft Mr. Christie bakery industrial noise on proposed residential development
- Urbancorp 1100 King Street Development, Toronto, ON, Canada.
 - Examination of impacts of various industrial and commercial noise sources on proposed residential town house and tower development, including an adjacent City of Toronto waste transfer station.
- Town of Oakville Official Plan Policy for Power Projects, Oakville, ON, Canada
 - Working with Town to develop Official Plan policies to address power plant impacts, including audible noise, low frequency noise, and cooling tower plume impacts (visible plumes, sun shading, fogging and icing)

KEY PROJECTS – INDUSTRIAL CERTIFICATES OF APPROVAL / ACOUSTIC AUDITS

- DaimlerChrysler Windsor Assembly Plant acoustic assessment, Windsor, ON.
- General Motors Oshawa Autoplex, St. Catherines Components Plant, St. Catherines Engine Plant, and Windsor Transmission Plant, ON, Canada.
- Abitibi Consolidated Canada Inc. Kenora Division Boiler Retrofits, Kenora, ON, Canada.
- Toronto Transit Commission Birchmount Garage, Toronto, ON, Canada.

KEY PROJECTS – VIBRATION IMPACT ASSESSMENT

- Nortel Networks Palladium Drive Building, Kanata, ON, Canada.
- Emory University Whitehead Research Building, Atlanta, GA, USA.
- Brigham and Womens Hospital proposed operating theatre, Boston, MA, USA.
- University of Michigan Life Science Building, Ann Arbor, MI, USA.
- Yale University School of Medicine Congress Avenue Building, New Haven, CT, USA.

KEY PROJECTS – ENERGY SECTOR

- Sithe Energies Goreway and Southdown Stations Environmental Assessments, ON, Canada.
- Shell Scotford Upgrader Expansion, Fort Saskatchewan, Alberta.
- Devon Canada Corporation Beaufort Sea Exploration Drilling Program, NT, Canada.
- BA Energy Heartland Upgrader Project, Fort Saskatchewan, Alberta.
- Devon Jackfish SAGD Project, Cold Lake, Alta.
- Waste to Energy Incineration Facility site selection, Hong Kong SAR, PRC.
- Wärtsilä Termoriente Power Plant, Shushifundi, Ecuador.
- AES Haripur and Khulan Power Plants, Bangladesh.
- Wärtsilä Plains End Generation Plant, Denver, CO, USA.

KEY PROJECTS – TRANSPORTATION SECTOR

- “BoomCast” Sonic Boom Prediction Model development and field validation, CFB Goose Bay NL and CFB Cold Lake, AL, Canada
 - Developed noise prediction model accounting for meteorological effects, conducted extensive remote monitoring program
- Transport Canada – Surface Transportation Noise Guideline development, Ottawa, ON
 - Conducted extensive international review of transportation noise guidelines for Transport Canada (road, rail, LRT)
 - Developed a draft “national guideline” and document outlining minimum requirements to meet CEAA screening requirements

- Highway 407 Eastern Extension Environmental Assessment, ON, Canada
 - Noise impact assessment, background noise measurements, public and agency consultation in support of the EA application for the project.
- Region of Waterloo / University of Waterloo Centre for Pavement and Transportation Technology – Quiet Pavement Technology Evaluation, Waterloo, Ontario.
 - Worked with Region and UW staff to conduct noise testing on new noise reducing asphalt designs
 - Conducted literature review and developed testing protocol for wayside and on-board vehicle measurements
- Airport Noise Modelling of the New Quito International Airport, Quito, Ecuador
- GO Transit Stouffville Corridor New Layover Facility, Stouffville, ON, Canada.
- GO Transit Snider Site Rail / Rail Grade Separation, Noise and Vibration Assessment, Vaughan, ON, Canada.
- Ottawa Carleton Light Rail Transit Pilot Project, Ottawa, ON, Canada.
- TTC Subway Emergency Ventilation Fans Upgrades, Toronto, ON, Canada.
- Toronto City Centre Airport proposed fixed link, Toronto, ON, Canada.
- Red Hill Creek Expressway, Hamilton, ON, Canada.
- Seaway International Bridge North Channel Bridge Renovations Noise and Vibration Assessments, Cornwall, ON, Canada.
- Peace Bridge Expansion Environmental Assessment, Buffalo, New York and Fort Erie, ON, Canada.

KEY PROJECTS – LANDFILLS AND RELATED INDUSTRIES

- Browning Ferris Industries (BFI) Ridge Landfill expansion, Chatham, ON, Canada.
- Hong Kong North West Waste Transfer Co. NWNT Refuse Transfer Station Environmental Statement, Hong Kong SAR, PRC.
- Trail Waste Facility Landfill site expansion, Ottawa, ON, Canada.

KEY PROJECTS – PITS AND QUARRIES

- Greenock Quarry, Greenock Township, Bruce County, ON, Canada.
- Everest Quarry, Amabel Township, Bruce County, ON, Canada.
- Sutherland Artemesia Pit, Artemesia Township, Grey County, ON, Canada.
- Preston Quarries Wolf Pit, Waterloo, ON, Canada.

KEY PROJECTS – ARCHITECTURAL AND BUILDING ACOUSTICS

- Jamaica Station New Main Portal, Queens, NY, USA.
- Yale University School of Medicine Congress Avenue Building, New Haven, CT, USA.
- U.S. Naval Sea Command (NAVSEA) Headquarters, Washington, DC, USA.
- Brigham and Womens Hospital helicopter vibration, Boston, MA, USA.

KEY PROJECTS – AIR QUALITY IMPACT ASSESSMENTS

- Amundsen Scott South Pole Research Station Power Plant Expansion, Antarctica.
- NIH Bayview Research Centre Design Guidelines, Baltimore, MD, USA.
- Merck and Company West Point Building 45 Expansion, West Point, PA, USA.
- Food and Drug Administration Laboratories Generator Sets, MD, USA.
- Lehigh Valley Hospital Expansion, Allentown, PA, USA.

SELECTED RELEVANT PUBLICATIONS AND PRESENTATIONS

- Penton, S. et al., (2009), *Airport Noise Modelling for the New Quito International Airport*, presented at the Alberta Acoustical Society 2009 Spring Conference on Environmental and Occupational Noise.
- Penton, S. (2008, 2010) *Low Noise Pavement Technologies in the Canadian Context – A Review of Recent Studies Conducted in Alberta and Ontario*, Air and Waste Management Association (AWMA) Environmental Nuisances: Noise, Light, Odour, & Fugitive Dust Conference, Toronto (2008) and Calgary (2010)
- Penton, S, J.W. Bolton et al, (2007) *BoomCast: Sonic Boom Noise Forecasting for Flight Planning and Wildlife Impact Reduction*, presented at the Alberta Acoustical Society 2007 Spring Conference on Environmental and Occupational Noise.
- Leung, Y-T. F., S. Tighe, G. MacDonald and S. Penton (2006) *Development of Tools to Evaluate Quiet Pavements in the Laboratory and Field*, presented at the Annual Conference of the Transportation Association of Canada (TAC).
- Penton, S and C. Hubble, *Noise and Odour Guidelines for Development*, presented at the Law Society of Upper Canada “6-Minute Municipal Lawyer” Conference, 2006.
- Penton, S. and J. Wrobel, (2005) *Uncertainty In Noise Analysis*, presented at the Alberta Acoustical Society 2005 Spring Conference on Environmental and Occupational Noise.
- Penton, S., and J. Tsang, (2005) *Environmental Considerations For Noise Barriers*, presented at the Alberta Acoustical Society 2005 Spring Conference on Environmental and Occupational Noise, and published in Canadian Acoustics, Vol. 33 No. 4 (2005) pp.55-56.
- Penton, S., and Chin-Quee, D.A., (2002) *Current Low Frequency Noise (LFN) Assessment Guidelines and Their Use in Environmental Noise Impact Assessment*, presented at the Canadian Acoustical Association Annual Meeting, and published in Canadian Acoustics, Vol. 30 No. 3 (2002) pp.79-79.
- Chin-Quee, D.A., and Penton, S., (2004) *A Review of Acoustical Design Standards in K-12 Schools*, presented at the Canadian Acoustical Association Annual Meeting, and published in Canadian Acoustics, Vol. 32 No. 3 (2004) pp. 32-33.
- Chin-Quee, D.A., and Penton, S., (2004) *Design of a Classroom for Deaf / Hearing Impaired Student Educators*, presented at the Canadian Acoustical Association Annual Meeting, and published in Canadian Acoustics, Vol. 32 No. 3 (2004) pp. 36-37.
- Penton, S., and Chin-Quee, D.A., (2002) *Current Low Frequency Noise (LFN) Assessment Guidelines and Their Use in Environmental Noise Impact Assessment*, presented at the Canadian Acoustical Association Annual Meeting, and published in Canadian Acoustics, Vol. 30 No. 3 (2002) pp.79-79.
- Penton, S., et al., (2002) *The Effect of Meteorology and Terrain on Noise Propagation – Comparison of Five Modelling Methodologies*, presented at the Canadian Acoustical Association Annual Meeting, and published in Canadian Acoustics, Vol. 30 No. 4 (2002) pp.30-33.



Mr. Rancourt has 11+ years' experience as an environmental geoscientist/hydrogeologist in the design, development, implementation, instruction, and Quality Assurance processes for a full range of environmental services including: groundwater resource and groundwater protection studies; management of landfill monitoring and engineering services; soil and groundwater contamination characterization; soil and groundwater remediation (including phyto and bio-remediation); subsurface evaluation and mapping using both physical and geophysical data; phased environmental site assessments (ESAs); environmental audits; phytoremediation research, design and implementation; peer reviews of hydrogeology and surface water studies for quarry proposals and water supply and terrain analysis studies for plan of subdivision and condominium applications; instruction of College and University curricula (geology, hydrology, hydrogeology, math and physics). Serve as hydrogeology technical advisor to Groundwater Protection Implementation Committee.

- Education**
- Master of Science (Geology), University of Toronto, 2009
 - Bachelor of Science Honours (Geology), University of Toronto, 1996

- Professional Affiliations**
- Association of Professional Geoscientists of Ontario, Practicing Member
 - Qualified Person (ESA)

Project Experience

Professional Experience

- Conduct and peer review Well Head Protection Area Studies (WHPAs) for numerous municipal drinking water supplies in Ontario.
- Multiple municipal clients - peer review hydrogeology and surface water studies for proposed quarry operations. Peer review water supply and terrain analyses reports for plan of subdivision applications. Evaluate attenuation of nitrate and phosphorous in groundwater.
- Conduct environmental site assessments including re-evaluation of complex sites that had previously been evaluated by others. Evaluate contaminant fate, natural attenuation potential and present remedial options to industrial and municipal clients.
- Conduct multiple environmental audits for a large multinational client that associated with the use and handling of chlorinated solvents, fuels, other hydrocarbons and hazardous materials. These audits often included evaluation of complex geologic and hydrogeologic settings.
- Daily management of a former municipal landfill including monitoring leachate control systems, permitting, alternative management research, sampling, data interpretation and reporting.
- Prepare reasonable use reports for a municipal snowfluent (septage) operation and municipal landfill.
- Evaluate efficacy of hydrocarbon plume control at a former service station and obtain amendment to certificate of approval for reduced frequency of monitoring obligation.
- Derive an alternative geologic and hydrogeologic interpretation of a municipal groundwater resource. The initial interpretation made by others would have had dire economic implications to the municipality.
- Arrange and supervise the drilling, testing and permitting a new municipal well. Assignment included hydraulic testing, chemical testing, application for permit to take water (PTTW), evaluation of data, and application for Certificate of Approval.
- Project leader of a large research program looking at demonstrating and optimizing the use of plants for containment and treatment of glycols, dioxanes and biphenyls. The project included a multi-national client, federal government and university researchers.



Ms. Sadowska has more than 17 years experience in the areas of watershed hydrology, stormwater and floodplain management. Her experience includes watershed studies, water quantity and quality analysis, planning and design of stormwater management/road drainage systems, site development, various hydrologic/hydraulic analysis and peer reviews. Ms. Sadowska's experience includes project management, presentations and consultation with approval agencies.

- Education**
- Environmental Management Certificate – Ryerson Polytechnic University, Toronto, 1994
 - Masters of Engineering (Water Resources Engineering), Faculty of Civil Engineering, Wroclaw, Poland, 1986

- Professional Affiliations**
- Association of Professional Engineers of Ontario
 - Canadian Water Resources Association (CWRA)
 - Water Environment Federation (WEF)

Project Experience

Water Management Studies

- Toronto Wet Weather Flow Master Plan for the Rouge River and Highland Creek Watersheds and the Waterfront Area; City of Toronto - Development and assessment of various water management scenarios for the City including a comprehensive hydrologic and water quality modelling analysis using the HSP-F program to address the issues related to controlling and reducing the impacts of the urban stormwater discharges and infiltration. The study also included the development of preferred short-term and long-term strategies, associated implementation plans and cost-benefit analysis.
- Water Balance Analysis for the Rouge River and Highland Creek Watersheds; Toronto and Region Conservation Authority - Estimation of key water balance components and distribution within the watersheds to provide the basis for development of new water management tools and strategies. Completed the water balance analysis using the HSP-F watershed models developed through the WWFMP study.
- Humber River and Highland Creek Watershed Hydrology Updates; Toronto and Region Conservation Authority - Hydrologic analysis and assessment of various land use scenarios and Stormwater Best Management Practices (BMPs) for the subject watersheds using SWYMHYMO and Visual OTTHYMO models.
- Hespler West Subwatershed Study Updates; Grand River Conservation Authority - Review and update of existing hydrology and development and assessment of various water management scenarios for the subwatershed.
- Various activities pertaining to watershed, floodplain and stormwater management, including model development, technical reviews and liaison with private and public sector clients; Toronto and Region Conservation Authority.

Municipal Infrastructure

- 58th Street Drainage Corridor Assessment, Town of Wasaga Beach - Hydrologic/hydraulic analyses were carried out using EPA Stormwater Management Model (SWMM5) to verify system conveyance capacity and to identify potential upgrade requirements.
- Beach Road Drainage Assessment, Township of Brock - Detailed hydrologic and hydraulic analysis of the drainage system. The study included development of the drainage improvement alternatives, costing of different stormwater measures and Implementation Strategy to support Town's planning and decision making process.

Project Experience

- Stormwater Sewer System Evaluation and Analysis – Township of Coboconk and Bobcaygeon; City of Kawartha Lakes - Inventory, assessment and analysis of existing systems to determine upgrade requirements and provide cost estimates for proposed works.

Stormwater Management Studies for Urban Planning & Design

- Stormwater Management Study - Robinson Road Development Area, Town of Wasaga Beach - Development of the Stormwater Management Plan for the Site including detail design of the stormwater facility and proposed stormwater outlets .
- Functional Residential Servicing Study – Oak Ridges Moraine Area - Development of the Stormwater Management Plan to identify site-specific requirements and development constraints to provide appropriate mitigation methods. Tasks included water balance analysis, preliminary design of stormwater facilities in conjunction with other services and the overall project management.
- Class EA and Detail Design Study for the Retrofit of two SWM Facilities; Town of Aurora. - Retrofit of two stormwater ponds, associated creek, and channel improvements including field assessment, hydrologic analysis, development of the stormwater alternatives and public consultation.
- Ajax North Secondary Plan, Servicing Study - A study in support of the Secondary Plan to address the area's environmental and water management requirements and provide guidelines for the proposed developments including development of the comprehensive Stormwater Management Plan.

Urban Flood Reduction

- Trillium Creek Drainage Improvement Study, Town of Wasaga Beach - Detailed hydrologic/hydraulic analysis and preliminary design of approved drainage solutions, including approval process. The key study objective was to determine drainage system requirements to reduce/eliminate existing flooding problems due to natural spills from Trillium Creek.

Road Reconstruction and Design Build

Completed a number of projects involving highway/road drainage improvements, planning and design of drainage infrastructure and associated hydrologic/hydraulic analysis in support of highway/road design and improvement projects.

- Bayview Ave./Sunset Beach Road Reconstruction; Town of Richmond Hill
- Wellington Road Reconstruction and Culvert Replacement; Town of Newmarket
- Reconstruction and Widening of Taunton Road (Reg. Rd. 4) from East of Lake Ridge Road (Reg. Rd. 23) to Valleywood Drive, Town of Whitby; Durham Region
- Highway 417 – From West of Highway 416 Easterly to Anderson Road G.W.P. 663-93-00; MTO
- South Arterial Road Design/Build, Town of Orangeville; MTO
- Markham By-Pass Extension, from HWY 7 to North of 16th Avenue; York Region
- Harmony Road from Olive Ave. Northerly to Rossland Road; City of Oshawa - Class Environmental Assessment and Detail Design Study
- 19th Avenue Bridge Class EA, Little Rouge Creek; Town of Markham

Road Crossing Hydraulic Structure Design

Completed hydraulic portion of the design for a number of structures in support of the road reconstruction works, bridge replacement and drainage improvement projects, including agency approvals. The analyses included structure sizing, scour analysis and environmental considerations using a variety of methods including HEC-RAS, Culvert Master and MTO charts.



Project Experience

Peer Review

Reviewed a number of stormwater management reports for a variety of projects ranging from individual site design to large scale subdivisions prepared by various consultants within the Toronto Metropolitan Area, Township of Springwater, Innisfil and Brock. All submissions were reviewed to ensure that the proposed stormwater design was acceptable to the municipal and/or local conservation authority requirements. The local Conservation Authorities included TRCA, NVCA, LSRCA, CLOCA.

Research

Participated in research studies involving the hydrology of watersheds, drainage design for agricultural lands and erosion control practices, development of best management practices and programs for application in rural watersheds. Academy of Agriculture, Wroclaw, Poland

Publications & Presentations

Available upon request



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ATTRIBUTES

- Expert Leadership
- Technical Guidance, Analysis and Quality Assurance
- Public Presentations

QUALIFICATIONS

- Environmental Professional (EP), Air Quality and Environmental Management, Canadian Environmental Certification Approvals Board

EDUCATION

- Master of Science Degree (Land Resource Science), Ontario Agricultural College, University of Guelph, 1996.
- Hons. Bachelor of Science (Geography and Environmental Science), McMaster University, 1993.
- Environmental Noise and Land Use Planning, Mohawk College, 2006
- Air Quality Management, ESAA, 2006
- PSMJ Project Management, 2004
- Strategic Leadership, Canadian Management Centre, a branch of the American Management Association, 2003

MEMBERSHIPS

- 2003 to present – member of Ontario Energy Association, Joint Sector Environment Committee (past vice-chair; current chair)
- 1999-2002 – Industry representative, Canadian Energy Pipeline Association, Climate Change Subcommittee

BIOGRAPHY

Mr. Taylor has 15 years of experience in the environmental field with research and professional experience in matters of air quality. He received his Master of Science Degree in Land Resource Science from the Ontario Agricultural College at the University of Guelph. During this time, he was employed as a research assistant focusing on the measurement of trace gas fluxes from farm land. The research included methodology development.

Nigel started as a sole proprietor providing field services and assessment for evaluating environmental impact due to pipeline construction in Southwestern Ontario and has since provided consulting services with two specialty consulting firms. For five years Nigel was an environmental analyst for a large energy pipeline company based in Alberta, Canada.

With a specialty in air quality assessment and emission inventories, Nigel has provided technical consultation and managed numerous air quality and noise impact related studies. Environmental assessment, regulatory permitting, environmental assessment and design are services that have been provided to a number of sectors including the energy and land use planning sectors. With respect to land use planning, Nigel has focused on odour and dust studies to determine compatibility between various land use types, since 2004. He has also presented at professional conferences with respect to odour and air quality regulatory issues.

WORK HISTORY

<i>2010 – Present</i>	Principal	Novus Environmental Inc.
<i>2004 – 2010</i>	Project Manager / Senior Specialist	RWDI AIR Inc.
<i>1999 – 2004</i>	Environmental Analyst	Enbridge Gas / Pipelines
<i>1996 – 1999</i>	Project Manager	ESG International
<i>1994 – 1996</i>	Sole Proprietor	Field Services
<i>1993 – 1996</i>	Research Assistant	LRS, Univ. of Guelph

KEY PROJECTS – AIR QUALITY AND NOISE ASSESSMENTS

- FJC Church, air quality dust and odour assessment, Scarborough ON, OMB Case #PL091072
- East Bayfront re-development, odour, dust, air quality, light, environmental noise, Toronto, ON
- 3M Canada Company, odour, general air quality and thermal oxidizer efficiency studies, Brockville and London ON
- Nitta Gelatin Canada Inc., odour, general air quality and noise assessment, Toronto, ON
- Cooper Standard, odour, general air quality, regulatory and compatibility studies, Mitchell and Georgetown, ON

- Enbridge Gas Distribution Inc., regulatory assessment, Toronto, ON
- Enbridge Gas Storage Facility, regulatory assessment and mitigation planning, Tecumseh, ON
- Enbridge Pipelines Inc., regulatory assessment, Sarnia, ON
- Enbridge Pipelines Inc., developed odour measurement methodology for crude oil storage tanks using modified flux chamber method, Westover, ON
- Hendrickson International, regulatory assessment, Stratford, ON
- Johnson Matthey, regulatory assessment, Brampton, ON
- Lafarge Canada, Inc., regulatory assessment and fugitive dust, Bath, ON
- Terrasan Corporation, Toronto, ON, odour and general air quality, (OMB Case No. PL060854)
- Amexon Property Management, odour, noise and general air quality, North York, Ontario (OMB Case No.'s PL040456 and PL050003)
- FVB Energy Inc., design consultation and regulatory assessment, Vaughan, ON
- Diamond and Schmidt, design and regulatory assessment, Toronto, ON
- SC Johnson Canada, odour noise and general air quality, Brantford, ON
- Hartmann Canada Inc., odour, noise and General air Quality, Brantford, ON
- Losani Homes, Baker Waste Treatment Facility, odour and air quality study, Grimsby, ON
- Town of Oakville, air quality and noise assessment, Oakville, ON
- Quartek Group Inc, land use planning study, air quality, odour and noise, Niagara-on-the-Lake, ON
- Environment Canada, mercury emissions study, Montreal, QC
- The Highlands Company, regulatory consultation and odour review, Township of Melancthon, ON

KEY PROJECTS - DUST ASSESSMENTS

- Arvin Meritor Suspension Systems Company, compatibility assessment, Milton, ON
- Murray Group, Inverhaugh / Inverhaven Aggregate, Fergus, ON (OMB Case No. PL050956)
- D & J Lockhart Excavators Ltd., Martin Pit, Township of Woolwich, ON
- Lowndes Holdings Corp., Carlisle, ON
- Irving Pulp & Paper Ltd., Saint John, NB
- Lafarge Canada, Inc., Bath, ON
- Smurfit-Stone, La Tuque, PQ
- Dufferin Aggregates, Acton Quarry, Acton, ON
- Capital Paving, Puslinch, ON
- Five W Farms, Fenelon Falls, ON
- Preston Sand and Gravel, Township of Puslinch, ON
- N. J. Excavating, Township of Woolwich, ON

KEY PROJECTS – HAZARD RISK ASSESSMENTS

- Ketch Resources Trust, Hazard Assessment, sour gas, Calgary, AB
- Chinook Engineering Ltd., Hazard Assessment, sour gas, Vancouver, BC
- Electrical Contacts Limited, CEPA E2 Consultation and training, hazard assessment for ammonia storage, Hanover, ON
- Bissett Resource Consultants Ltd., Hazard Assessments, Calgary, AB

KEY PROJECTS – GENERAL ENVIRONMENTAL IMPACT ASSESSMENTS

- Goreway Station, environmental assessment, Brampton, ON
- Southdown Station, environmental assessment, Mississauga, ON

- City of Mississauga, Greenfield South Power Corporation, cooling tower impacts, Mississauga, ON (OMB Case No. PL060319)
- Darlington B, Nuclear Facility, peer review air quality and noise, Pickering ON
- MEG Energy, environmental assessment, Calgary, AB
- Enbridge Pipelines Inc. / PetroCanada, McKay River, Fort McMurray, Cold Lake, Petroleum Transmission and Storage Expansion, Regulatory Assessment, Fort McMurray AB
- St. Clair Pipelines, Millennium Project, regulatory assessment, Southwestern ON
- Enbridge Gas Distribution Inc., environmental assessment submissions to Ontario Energy Board, ON
- Enbridge Pipelines Inc., environmental assessment submissions to National Energy Board
- Enbridge Pipelines Norman Wells Inc., environmental audit of transmission and storage system, NW
- Enbridge Pipelines Saskatchewan Inc., environmental audit of transmission and storage system, SK
- Enbridge Pipelines Inc., environmental audit, Eastern Region, ON
- Enbridge Pipelines Inc., stress corrosion cracking study, AB, SK, ON, NY, QC
- Enbridge Pipelines Inc., environmental due diligence study, Calgary, AB
- Enbridge Pipelines Inc., Line-9 Reversal Project, Regulatory Assessment,

SELECTED RELEVANT PUBLICATIONS AND PRESENTATIONS

Taylor, N. (2009) *GHG Management for the Environmental Manager*, Canadian Environmental Conference and Trade Show (CANECT), Toronto

Vandelden, P., B.Sulley, N. Taylor (2009) *Comprehensive C of A Maintenance: Air Quality and Noise*, Canadian Environmental Conference and Trade Show (CANECT), Toronto

Taylor, N. (2009) *Sustainability, Fitting the Building Blocks Together*, Canadian Environmental Conference and Trade Show (CANECT), Toronto

Taylor, N. (2008) *Managing GHG Emissions*, Environmental Compliance Essentials For Supervisors, Managers and Practitioners provided by Envirogate, Toronto

Taylor, N. (2008) *Managing Odour Compliance Issues*, Environmental Compliance Essentials For Supervisors, Managers and Practitioners provided by Envirogate, Toronto

Taylor, N. (2008) *GHG Management and GHG Plan*, Environmental Compliance Essentials For Supervisors, Managers and Practitioners provided by Envirogate, Toronto

Taylor, N. (2007) *GHG Inventorying – How to Get Started?* Reduce Your Carbon Footprint: ABCs of GHG Reduction seminar, November 14, 2007, Toronto

Taylor, N. (2007) *GHG Reduction – Case Studies*, Reduce Your Carbon Footprint: ABCs of GHG Reduction seminar, November 14, 2007, Toronto

Taylor, N. (2007) *When Do Odours Become a Problem?* Air and Waste Management Association (AWMA) Environmental Nuisances: Noise, Light, Odour, & Fugitive Dust Conference, February 12, 2007, Toronto.

Qiu, X., M. Lepage, V. Tang and N. Taylor (2005) *Rainfall Analysis by Calibrating Weather Radar Images*, 39th CMOS Congress Vancouver, British Columbia, May 31 - June 3, 2005.

Taylor, N.M., C. Wagner-Riddle, G.W. Thurtell and E.G. Beauchamp, (1999) *Nitric Oxide Fluxes from an Agricultural Soil using a Flux-Gradient Method*, Journal of Geophysical Research, Vol. 104.