Subject: DDMI Submission – Terms of Reference for Water Quality Modelling Independent Review Panel and Selection of Panel Membership

Please find attached Diavik Diamond Mines (2012) Inc.’s (DDMI) proposed Terms of Reference (TOR) for the establishment of a Water Quality Modelling Independent Review Panel (the Panel) and a list of panel membership candidates for consideration by the Wek’èezhii Land and Water Board (WLWB or Board). The intent of the present submission is ultimately to fulfill Measure 4, the need for the establishment of an independent review panel for water quality modelling, as recommended by the Mackenzie Valley Environmental Impact Review Board (MVEIRB) in its Report of Environmental Assessment for the Processed Kimberlite to Mine Workings (PKMW) Project (Report of EA), if approved by the Responsible Minister. Acknowledging that the Responsible Minister has not yet made a Decision on the Report of EA, DDMI has identified that advancing the TOR and Panel membership selection as soon as possible will allow the independent review process to advance within a timeframe that leaves adequate time for the Panel to carry out the required water quality modelling review tasks without potentially impacting operational project timelines (as required by Measure 4). Advancing this process as soon as possible will also help ensure that the necessary water quality modelling updates can be completed as part of the Diavik Water Licence (W2015L2-0001) Amendment as recommended by a number of Indigenous Government Organizations.

As part of this submission, DDMI is proposing, recommending or requesting the following:

- DDMI has provided a pool of six (6) candidates with appropriate expertise in hydrodynamic water quality modelling and clay hydrodynamics for consideration as Panel members (see Attachment 2). DDMI has contacted these candidates and they have confirmed their names could be put forward as part of the WLWB Independent Review Panel selection process.
- DDMI recommends, as identified in the TOR, that the Panel should consist of 1 to 3 members.
DDMI recommends that reviewers consider these candidates and provide feedback on their expertise to assist the WLWB in their selection process.

Reviewers and the WLWB should propose other panel membership candidates with appropriate expertise, if preferred.

DDMI appreciates the WLWB’s consideration of this submission. Please do not hesitate to contact the undersigned or Kofi Boa-Antwi (867 447 3001 or kofi.boa-antwi@riotinto.com) if you have any questions related to this submission.

Yours sincerely,

Sean Sinclair
Principal Advisor, Environment and Closure Readiness

cc: Anneli Jokela, WLWB
    Kassandra DeFrancis, WLWB

Attachments:
- DDMI’s List of Panel membership candidates and their curriculum vitae.
ATTACHMENT 1
Terms of Reference
Water Quality Modelling Independent Review Panel
PKMW Project
Terms of Reference
Water Quality Modelling Independent Review Panel
Depositing Processed Kimberlite into Pit(s) and Underground
Diavik Diamond Mine – W2015L2-0001

Introduction

In 2018, Diavik Diamond Mine applied to the Wek’èezhìı Land and Water Board (WLWB) for an amendment of its existing water licence (the Water Licence Amendment) to allow for the deposition of processed kimberlite into pit(s) and the underground. Part way through the Water Licence Amendment process, the application was referred for an Environmental Assessment by the Mackenzie Valley Review Board (MVEIRB). The MVEIRB released its Report of Environmental Assessment and Reasons for Decision EA1819-01 – Diavik – Depositing Processed Kimberlite into Pit(s) and Underground (the Report of EA1819-01) in January 2020; the Water Licence Amendment process will reinitiate once the Responsible Minister approves the report.

Measure 4 of the MVEIRB Report of EA1819-01 specifies that Diavik is to establish an independent review panel for water quality modelling related to its proposed project amendment.

Measure 4: Diavik will establish an independent review panel for water quality modelling

To prevent significant adverse impacts on cultural use of Lac de Gras, Diavik will establish and fund an independent review panel for the updated modelling described in Measure 3.

Diavik will develop the terms of reference for this panel for approval by the Wek’èezhìı Land and Water Board. The Wek’èezhìı Land and Water Board will engage Diavik and intervenors to identify and select panel members with appropriate expertise in:

- hydrodynamic water quality modelling, and
- extra-fine processed kimberlite or clay hydrodynamics.

The terms of reference and panel member selection will be approved in a timeframe that leaves adequate time for it to carry out the tasks below.

For each modelling update defined in Measure 3, the panel will review and make recommendations on:

a) model selection and design,
b) model input data, assumptions, and processes,  
c) monitoring requirements for informing the modelling process, and  
d) model results.

The panel will provide reports to the Wek’èezhìi Land and Water Board for inclusion on its public registry. Diavik will report to the Wek’èezhìi Land and Water Board and communities about how it responded to panel recommendations. If Diavik does not accept, or modifies, panel recommendations, it will explain why and provide reasons. The Wek’èezhìi Land and Water Board will consider panel reports and Diavik’s responses when reviewing and approving any plans for updated modelling.

The following quote from page 84 of the MVEIRB’s Reasons for Decision gives context to Measure 4 and to the requirement for the Panel:

“The Review Board also agrees that the panel should be involved in all stages of updating the modelling, both to reduce uncertainty and to increase Indigenous people’s confidence in the predictions, thus reducing concern. The panel will provide the Wek’èezhìi Land and Water Board with information to assist in making decisions on putting PK in the pits and reconnection.”

These Terms of Reference define the scope of work for the Panel.

**Composition**

The Panel will be composed of one to three individuals who are technically qualified and, to the extent possible, complementary in skill to review and make recommendations on Diavik Diamond Mines (2012) Inc.’s (DDMI) water quality modelling of processed kimberlite deposition in completed open pits(s) and underground workings. The WLWB will engage DDMI and other interested Parties\(^1\) to identify and select panel members. The WLWB will determine the final composition of the Panel.

**Chair**

The Panel will select a Chair within 10 days after the Panel is formed and will identify the Chair to the WLWB and DDMI. The Chair will be responsible for compiling and submitting reports to the WLWB and will serve as the point of contact. The Panel may rotate the role of Chair amongst its members and will notify the WLWB and DDMI whenever the Chair changes. The WLWB will post all notices on the Public Registry.

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\(^1\) “other interested Parties” include both intervenors to the Mackenzie Valley Impact Review Board Environmental Assessment - EA1819 and the Kitikmeot Inuit Association.
**Panel Duties**

The first task for the Panel is to review the water quality modelling that is being completed by DDMI as part of the Water License Amendment process. The modelling is intended to show whether water will meet water quality objectives defined in MVEIRB Measure 1. The water quality modelling and related Independent Panel review will be considered by interested Parties and the WLWB as part of the License Amendment Process, prior to issuance of an amended water licence. As part of the Amendment Process, the WLWB will review and consider approval of the water quality modelling. This independent model review will address the first independent modelling review required by MVEIRB Measure 3:

- **Before depositing processed kimberlite into the pit(s) and underground**

With respect to the modelling performed by DDMI, the Panel will review and make recommendations on:

- model selection and design,
- model input data, assumptions, and processes,
- monitoring requirements for informing the modelling process, and
- model results.

In addition to reviewing and making recommendations on DDMI’s water quality modelling, the Panel may be required to participate in Technical Sessions as part of the Water Licence Amendment Process.

It is recognized that independent model reviews will also be required at two future dates as specified in MVEIRB Measure 3:

- **Before filling the pit(s) with water from Lac de Gras:** This update will include the detailed conditions of the processed kimberlite in the pit(s) and the planned pore water layer depth.
- **Before reconnecting (partially or fully) the pit lake(s) containing processed kimberlite to Lac de Gras:** This update to the model will include real data from monitoring of the pit lake(s) to calibrate the model predictions.

It is anticipated that these two future water quality modelling exercises will be done during the term of the amended water licence; although continuity of membership in the Panel is preferred, these Terms of Reference and Panel membership will need to be updated prior to those reviews.
Schedule

The Panel is expected to be available for the duration of the Diavik Mine Water License Amendment, which is expected to reinitiate in 2020. The future reviews of updated water quality modelling (before filling the pit(s) with water from Lac de Gras and before reconnecting the pit lake(s) containing processed kimberlite to Lac de Gras) are not anticipated until around 2025 and 2027, respectively.

Communications

The Panel shall communicate/meet as necessary to complete their duties. The Panel is encouraged to communicate/meet directly with DDMI and other interested Parties to obtain information necessary to perform their duties. If required to attend the Technical Session as part of the WLWB’s process, the WLWB will record the Panel’s communications and post them to the WLWB’s public registry. To maintain independence from DDMI, communication between the Panel and interested Parties will be coordinated through WLWB Staff. WLWB Staff will be responsible for retaining minutes of any external communications/meetings of the Panel and may post these minutes on the WLWB’s public registry.

During the review of the water quality model, the Panel may engage Diavik on topics including, but not limited to: model selection and design; model input data; assumptions, and processes; and monitoring requirements for informing the modelling process. Diavik will respond directly to any Panel engagement on the model to support their review.

In advance of any Public Hearing and prior to submission of the final water quality modelling results by DDMI to the Board, DDMI will provide the model to the Panel for final review. The Panel will then provide its preliminary report, including recommendations, to DDMI for review and comment; DDMI may propose changes based on additional evidence or revised plans to address deficiencies. The Panel will then consider comments, suggestions and changes, before submitting a final report to the WLWB. This final report represents completion of Panel duties related to the first of three independent modelling reviews required by MVEIRB Measure 3.

Diavik will report to the Wek’èezhìı Land and Water Board and communities about how it responded to panel recommendations. If Diavik does not accept, or modifies, panel recommendations, it will explain why and provide reasons. The Wek’èezhìı Land and Water Board will consider panel reports and Diavik’s responses when reviewing and considering approval of the updated modelling.

Dispute Resolution

In the event of any dispute amongst the members of the Panel, the Panel members will attempt to reach an agreement amicably. Failing that, any member may notify the WLWB, in
writing, of the dispute. The WLWB will determine the process for resolution and make the ultimate decision.

**Funding**

DDMI will pay for all reasonable direct and indirect costs associated with completing the duties of the Panel. Costs do not include payments to any parties other than the Panel.

**Continuance**

At its discretion, and after consultation with DDMI and other interested Parties, the WLWB may revise the Terms of Reference. DDMI and/or other interested Parties may submit to the WLWB recommendations for revisions to the Terms of Reference at any time. Approved revisions to the Terms of Reference supersede the previous version and take effect either immediately or as directed by the WLWB.
ATTACHMENT 2
DDMI’s List of Panel membership candidates and their curriculum vitae

Water Quality Modelling
1. Daniel Potts https://www.linkedin.com/in/daniel-potts-b7a5b2107/
4. Craig Swanson https://www.linkedin.com/in/craig-swanson-895758a/

Clay Hydrodynamics
1. Randy Mikula https://www.linkedin.com/in/randy-mikula-24a1b899/
2. Heather Kaminsky https://www.linkedin.com/in/heatherkaminsky/
EXPERIENCE SUMMARY

Mr. Potts is a Hydrotechnical Engineer in Vancouver, BC. He holds a Master’s Degree in hydrotechnical engineering, and has experience in coastal and oceanographic engineering projects and 3-D modelling. He has explained technical concepts to non-technical audiences ranging from regulators to lawyers to the general public and has developed numerical tools and models for many applications.

RELEVANT EXPERIENCE

Relevant project experience for Mr. Potts includes the following:

- Reviewed drill cuttings dispersion modelling and oil spill modelling for offshore drilling applications in New Zealand
- Reviewed regular monitoring data from Quesnel Lake, BC, for Mt Polley Mining Corporation in support of their discharge permit
- Reviewed court documents and public data for a civil case involving flooding in Black Creek, BC
- Assessed risks related to sanitary sewer overflows for a metropolitan coastal city using stochastic hydrodynamic modelling (confidential client)
- Simulated the fate of fugitive sediments from dredging and other construction activities for the proposed marine terminal expansion on Roberts Bank in Vancouver, BC
- Developed and operated an oil spill trajectory model accounting for wind and current advection and shoreline trapping
- Reconstructed sequence of underwater events in Quesnel Lake, following the Mt Polley Mine Tailings Storage Facility failure, using survey data and 3-D modelling
- Simulated delta formation in Lake Okanagan for Mission Creek in the freshet of 2012
- Assessed wave attenuation and wind, wave and current forces for various marina designs; implemented hydrodynamic, wave propagation, and wave-structure interaction models
- Designed hydraulic systems for deep-sea mine tailings placement, and evaluated pipe stresses during pipe sinking procedures
- Assessed the adequacy of mooring systems to withstand extreme wind and wave events
- Developed and updated protocols for a multi-firm project to model and assess Chicago's trunk sewer network; quality-controlled model construction and updates made by others
- Evaluated capital improvements planned for City of Chicago sewers by simulating before-and-after levels of service
PROFESSIONAL EXPERIENCE

Manager, Environmental Geoscience and Permitting/Inspector of Mines

- Manage and mentor a team of highly specialized technical staff and professional contractors related to water quality, geoscience and hydrogeology to meet legislative requirements and support an environmentally responsible mining industry.
- Provide expert advice to the Chief Inspector of Mines, Deputy Chief Inspector of Mines and senior executive on sensitive operational initiatives/issues and major mine approval matters.
- Negotiate technical resolution on difficult issues with multiple stakeholders, including other government agencies, indigenous groups, and mining proponents, and other government agencies to ensure consistency and coverage of environmental issues.
- Provide technical guidance to mining industry clients and consultants and liaison with Indigenous groups on technical aspects of mining projects.
- Conduct extensive technical review and analyses of mining proposals, applications and technical submissions to ensure mines are designed, constructed, operated and closed using methods and techniques that protect land and watercourses, and prevent, minimize and manage environmental liabilities associated with ML/ARD.
- Perform routine and reactionary inspections of environmental aspects of mines sites to assess compliance with regulations, permit conditions and environmental protection requirements, including the Mines Act and Health Safety and Reclamation Code for Mines in BC.
- Assess the long-term environmental liabilities of major mines sites and establish the amount of financial security required to cover environmental protection and reclamation requirements.
- Final reviewer of multidisciplinary regulatory permits for statutory decisions makers.
- Provincial represented on National Mine Environment Neutral Drainage; Ministry representative on the BC Technical and Research Committee on Reclamation.
- Develop and update internal policies and procedures for technical staff, and external policy and guidance documents for the mining industry.

Senior Environmental Geoscientist/Inspector of Mines

- Conducted extensive technical review and analyses of mining proposals, applications and technical submissions to ensure mines are designed, constructed, operated and closed using methods and techniques that protect land and watercourses, and prevent, minimize and manage environmental liabilities associated with ML/ARD.
- Performed routine and reactionary inspections of environmental aspects of mines sites to assess compliance with regulations, permit conditions and environmental protection requirements.
- Assessed the long term environmental liabilities of mines sites and establish the amount of financial security required to cover environmental protection and reclamation requirements.
- Prepared regulatory permit conditions designed to evaluate the environmental effects of mining.
- Negotiated technical resolution on difficult issues with multiple stakeholders, including other government agencies, indigenous groups, and mining proponents, and other government agencies to ensure consistency and coverage of environmental issues.
- Provided technical guidance to statutory decisions makers and senior executive, and liaison with Indigenous groups on technical aspects of mining projects.
- Provincial represented on National Mine Environment Neutral Drainage; Ministry representative on the BC Technical and Research Committee on Reclamation.

ERM Rescan, Vancouver, British Columbia 2012-2014
Consultant – Geochemist

- Managed and conducted the examination of the geochemical behavior and reactivity of ore and mine wastes (waste rock and tailings materials) of existing and proposed mines, and their potential impacts on the environment.
- Responsible for ML/ARD prediction and assessment for projects in the environmental assessment and permitting phases within Canada, and Internationally. Responsibilities include ML/ARD program design, geological sampling, data management, memorandum and report writing, communication with project managers and clients, and budget development and management.
- Performed water quality prediction modeling for proposed and active mining operations, including water balance validation, geochemical source term development, scale-up predictions, treatment options, dewatering of open pit and underground facilities, cyanide and blast residual degradation rates, discharge criteria, and dilution ratios to the receiving environment.
• Provided third-party scientific reviews of the surface water quality and ML/ARD assessments, and water quality prediction models included in applications for environmental assessment certificates and mines act permits for industry and First Nations clients.
• Reviewed technical work completed by colleagues and provided technical guidance and advice to junior geologists and engineers. This includes data calculation and analysis, memorandums, and reports, such as responses to information requests and technical working group comments generated during the environmental assessment and permitting phases of mine project applications.

University of Waterloo, Department of Earth and Environmental Sciences, Waterloo, Ontario 2007-2012

Research Assistant
• Launched an innovative geochemical and microbiological field sampling program of waste rock piles at an industrial site.
• Established the laboratory facilities to perform microbial analysis related to PhD research (study design, budget development, procurement of supplies, method development, and mentoring of laboratory assistants).
• Contributed in a collaborative multi-disciplinary research team to design and execute specific research activities including hydrology, thermal and gas transport.
• Analyzed geochemical and microbiological data to prepare a thesis dissertation, scientific publications and reports to sponsors and stakeholders.
• Communicated scientific results to fellow students, principal investigators, project sponsors and stakeholders through daily communication and collaboration, written progress reports, scientific journal publications, and oral presentations in project team meetings and at industry conferences.
• Performed geochemical equilibrium modeling using MINTEQ and PHREEQC
• Supervised undergraduate and graduate research assistants at the Diavik Diamond Mine during field work to ensure the research team followed NWT Mine Act and Rio Tinto safety standards.
• Co-supervised undergraduate UW research assistants in laboratory facilities to achieve quality results.


Junior Environmental Scientist
• Assisted project managers with water and soil quality monitoring programs to fulfill landfill Certificate of Approval monitoring and reporting requirements to the Ministry of Environment (Ontario).
• Conducted field studies related to groundwater and surface water monitoring of operating and closed landfills, groundwater supply and protection studies, hydrogeological site assessments, and indoor air quality assessments.
• Performed data analysis and interpretation, prepared reports and proposals, and conducted literature reviews.
• Developed a site-specific statistical tool to evaluate the water quality at an operational landfill site. This tool was designed to estimate changes in the background water quality as a result of local sources (landfill) or downstream sources. This method was accepted as a tool for evaluating if site-specific water quality guidelines were met on a seasonal basis.


Environmental Technician
• Designed and launched an experimental hydrocarbon contaminant remediation project.
• Performed extensive field work including water quality sampling of collection ponds, Lac de Gras lake water, seepage wells and streams, water treatment facilities and ground water wells in -40°C working conditions.
• Collected data for wildlife monitoring programs in locations accessed by helicopter, snow machine, boat and foot.
• Conducted laboratory analysis of water samples for ammonia, total suspended solids, turbidity, pH, and dissolved oxygen.
• Maintained water quality and wildlife data using environmental data manager program Envista and Microsoft access.
• Provided geographic information processing using ArcGIS 8.0 to create various maps such as dust gauge locations, water sampling stations, and Raptor nest locations.
• Organized 2003 Fish Palatability Study involving five aboriginal groups from five communities to determine fish quality.
• Co-dissected fish for samples of the liver, kidney, flesh and otoliths (ear bones) to establish fish health.

EDUCATION

Doctor of Philosophy (Ph.D) in Earth Sciences,
• Specialization in aqueous geochemistry, University of Waterloo, Waterloo, Ontario
• Thesis: The geochemical and microbiological characterization of low sulfur content waste rock at the Diavik Diamond Mine

Master of Science (MSc) in Earth Sciences,
• Specialization in chemical and environmental toxicology, Carleton University, Ottawa, Ontario
• Thesis: The potential role of bacteria as a bioremediation technique at the Sydney Coke Ovens site
Bachelor of Science (BSc) in Environmental Sciences (Highest Honours),

- Minor in Geographic Information Systems, Carleton University, Ottawa, Ontario, Canada
- **Thesis**: The removal of hydrocarbons from contaminated crushed granite rock at the Diavik Diamond mine site.

**SELECT PROFESSIONAL TRAINING**

- Various BC Mine Inspector Training 2014- present (e.g. administrative law, confined space awareness, defensive driving and winter driving, H2S awareness, transportation of dangerous goods, compliance and enforcement skills, note taking, incident command system, WHIMIS)
- BC Mine Supervisor Certificate 2020
- Wilderness First Aid (4 day training course) 2018
- Mine Rescue Training Surface and Underground (5 day, BC Gov’t Internal Training) 2016
- Annual Metal Leaching / Acid Rock Drainage Field School; (5 day Bulkley Valley Research Centre) August 2015
- Environmental Geochemistry, Mineralogy, and Microbiology of Arsenic, Scheduled June 15-16, 2014
- Rare-Metals: Geology, Mineralogy and Geochemistry, March 5, 2011
- Geoenvironmental Modeling of Ore Deposits (192 hours), February 13-20, 2010
  - Modules: Introduction to Geoenvironmental Modeling, Geoenvironmental Models of Ore Deposits, Environmental Mineralogy, and Hydrogeochemistry in Mining and Exploration
- Laboratory Research Visit Bangor University, Bangor, Wales, UK, February 2008 and December 2009
  - Facilitated the development of appropriate sample collection techniques for Diavik waste rock and effluent samples
  - Learned molecular biology techniques including DNA extractions, electrophoresis, T-RFLP, and PCR
- Standard First Aid with CPR-C and AED
- Occupational Safety and Health Administration (OSHA), 2007-2013
- HAZWOPER - OSHA 29 CFR 1910.120 - 40 hr. course plus annual 8 hr. recertification
- Northwest Territories and Nunavut Mine Supervisor II, 2008-2012
- Environmental Monitoring Techniques Course, 2004
  - Practiced precision and accuracy in mock environmental monitoring programs related to Canada’s Diamond industry monitoring regulations, including water quality and wildlife monitoring. Discussed sampling techniques, accepted field book practices, data sheet creation, data management, and quality control/quality assurance.

**PROFESSIONAL VOLUNTEER SERVICES**

- BC Technical and Research Committee on Reclamation, Treasurer 2018 - present
- MEND committee member for Province of British Columbia 2017 - present

**MEMBERSHIPS & ASSOCIATIONS**

- Professional Geoscientist, Engineers and Geoscientists BC, 2014 - present
- Member, CIM – 2018

**PUBLICATIONS**

Articles published in refereed journals


Articles submitted to refereed journals


Articles in preparation for refereed journals


Other contributions


Short Course Volumes


Public Technical Reports

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Biographical sketch
Ph.D. from Cornell University in Civil and Environmental Engineering, Master's degree in Civil Engineering at Massachusetts Institute of Technology, BS in Civil Engineering at Tennessee Technological University. Since 1987 he has been at Portland State University and is currently Professor of Civil and Environmental Engineering and is an Institute for Sustainable Solutions Fellow. His research areas are in modeling of environmental fluid mechanics: surface water quality and hydrodynamics and solid-liquid separation processes. He has written over 100 technical publications and is a co-developer of the latest version of the CE-QUAL-W2 water quality and hydrodynamic model. He has been called in for expert peer review by the USEPA, the State of California, the State Department, and many other organizations and has been used by EPA to conduct webinars in water quality modeling.

He has been involved in about 150 water body studies. In Oregon, he has been involved in hydrodynamic/water quality modeling on the Tualatin River, Hagg Lake, Barney Reservoir, the Columbia Slough system (Lower Columbia Slough, Upper Columbia Slough, Smith and Bybee Lakes, Peninsula Canal), Klamath River, Russel Creek (near Eugene), Coast Fork of the Willamette River, Bull Run Reservoir #2, Bull Run Reservoir #1, Bull Run Reservoir #3, Bull Run Lake, Upper and Lower Bull Run River, Dexter Reservoir, Willamette River (Oregon City Falls to Columbia River, including Multnomah Channel, Willamette River basin), Johnson Creek, Ashland Creek, Cooper Creek Reservoir, Skipanon River, Schooner Creek, Siletz Bay, South Santiam River, Middle Fork Willamette River, Bear Creek, Stone Creek below Timothy Lake, Larurance Lake, Wald Lake, South Slough off Coos Bay, Yaquina Bay and Yaquina River, the Clackamas River Basin (Clackamas River, Timothy Lake, Lake Harriet, Frog Lake, North Fork Reservoir, Faraday Lake, Estacada Lake) and areas of Tillamook Bay and the Columbia River (Bonnieville Dam to St. Helens). His experience also includes water quality and hydrodynamic studies in Hawaii (Wahiawa Reservoir), Virginia (N. Anna Reservoir), Tennessee (Center Hill Lake), Kentucky (Laurel River Reservoir), Idaho (Boise River, Lower Snake River from Brownlee Reservoir to C. J. Strike Reservoir, Brownlee Reservoir, C. J. Strike Reservoir, Spokane River, Oxbow Reservoir, Hells Canyon Reservoir, Coeur D’Alene Lake, Pend Oreille River and Lake), California (Klamath River, Philbrook Reservoir, DeSabla Reservoir, Butte Creek, Millerton Lake, Lake Spaulding, Bowman Lake, Rolls Reservoir, Fordyce Reservoir, Jackson Meadows Reservoir, Oroville Thermalito diversion pool, Oroville Reservoir, Thermalito Afterbay, Feather River, Folsom Reservoir, Lake Curry), Washington (Columbia River, Clear Lake, Spirit Lake, Spokane River, Long Lake, White and Puyallup Rivers, Snohomish River and Estuary, Green River, Lake Roosevelt, Chelan River, Pend Oreille River, Tolt Reservoir, Lake Chaplin, Budd Inlet/Capitol Lake/Deschutes River, Chester Morse Reservoir, Cedar River, Banks Lake, Kachess Reservoi, Keechelus Reservoir), Colorado (Cherry Creek Reservoir, Three Lakes: Shadow Mountain, Granby Lake, Grand Lake), Wisconsin (Kinnickinnic River, Lake George), North Carolina (Jocassee and Keowee Reservoirs, High Rock Lake), Oklahoma (Tenkiller Reservoir on the Illinois River, Eucha Reservoir, Spavinaw Reservoir), Texas (Lake Lavon, Lake Travis, Trinity River), Montana (Warm Springs Ponds, Butte, MN), New York (Conesus, Hemlock, Cayuga, and Honeoye Lakes), West Virginia/Pennsylvania/Ohio (Ohio-Alleghany-Monongahela Rivers), Florida (Tampa Bay Water Supply Reservoir, Reservoir C-44), Israel (Lake Kinneret or Sea of Galilee, Jordan River, Dead Sea, experimental ponds at Dead Sea Works), China (Three Gorges Reservoir, Xiangxi Bay), Spain, Peru (Chaglla Reservoir), Brazil (Tabajara Reservoir), Costa Rica (El Diquis Hydroelectric Project), Guyana (Amaila Reservoir), Canada (Lake Lagopede, Pit Lakes region lakes, Lac des Manages), Iraq (Tigris River), and in the Ukraine (Dnieper River-reservoir system and Kieven Sea), where he spent the 1993-1994 year as a Fulbright scholar. For the 2007-2008 year, he was selected again as a Fulbright Scholar and taught and did research at the Earth Institute at Hebrew University and at the Israeli Geologic Survey in Jerusalem. During that time, he worked on the environmental impacts of the proposed Peace Conduit between the Gulf of Aqaba and the Dead Sea and was an advisor for the PBS NOVA special on ‘Saving the Dead Sea’ in 2019.

EDUCATIONAL BACKGROUND:
Ph.D. Cornell University 1990
PROFESSIONAL EXPERIENCE:

Principal Investigator, Collaborative Center for Geo-hazards and Eco-Environment in Three Gorges Area, Hubei Province, Three Gorges University, Yichang, China, 2016-2019.

Chair, Department of Civil and Environmental Engineering, Portland State University (September 2002 to December 2014)

Professor (September 1995 to present)

Associate Professor (September 1990 to August 1995)

Assistant Professor (September 1987 to August 1990)

Department of Civil Engineering, Portland State University

Graduate Research Assistant (September 1984 to August 1987)

Cornell University

Visiting Assistant Professor (January 1983 to August 1984)

Department of Mechanical and Aerospace Engineering, Boston University

Research Engineer (April 1982 to December 1982) R. M. Parsons Laboratory for Hydrodynamics, Massachusetts Institute of Technology

Graduate Research Assistant (September 1980 to March 1982)

Massachusetts Institute of Technology

Graduate Research Assistant (March 1979 to August 1980)

Tennessee Technological University

HONOR SOCIETIES, AWARDS, REGISTRATION, MEMBERSHIPS AND PROFESSIONAL SOCIETIES:

Committee and Advisory Board Memberships:

- Project Advisory Committee (PAC) for American Water Works Association (AWWA) Research Foundation for "Hydrodynamic Distribution of Pathogens in Lakes and Reservoirs," 2000/2001
- ASCE Energy Engineering Division (EY) Environmental Effects Committee Task Committee on Effects of Energy Production on Reservoir Water Quality, 2001-2004
- Member, Bronson Creek Water Quality Technical Advisory Committee, Unified Sewerage Agency, 1995-1998
- Member, Tualatin Basin Water Quality Technical Advisory Committee, Department of Environmental Quality, 1995-1998
- Member, Winchester Tidelands Restoration Project Advisory Group, South Slough National Estuary Reserve, Charleston, Oregon, 1993-1997
- Member, Technical Advisory Committee, Columbia Slough Water Quality Implementation Plan, 1993-1999
- Member, METRO Wetlands Technical Advisory Committee for Smith and Bybee Lakes, 1991-1993
- Member, METRO St. John's Landfill Technical Advisory Committee, 1990-1993
- Member, Portland Water Bureau Technical Advisory Committee, 1989-1990
- Member, Water Treatment Residuals Committee, AWWA, 1988-1990
- Member, ASCE Student Affairs Committee, Oregon Section, 1991-1993
- Member Task Force for PORT of Portland’s NPDES Permit for Deicing Chemicals, 1997-1998
- Portland State University Committees (Academic Requirements Committee, CE and EAS Scholarship Committees, Honors Program advisor, ASCE advisor, Tau Beta Pi advisor, Departmental Promotion and Tenure Committee
Reviewer:
- Reviewer for National Science Foundation Research Proposals
- Reviewer for USGS Water Resource Research Institute Proposals
- Reviewer for Journal of Freshwater Ecology
- Reviewer for Fluid/Particle Separation Journal
- Reviewer for Powder Technology
- Reviewer for Separations Technology
- Reviewer for Separation Science and Technology
- Reviewer for Journal of Environmental Engineering, ASCE
- Reviewer for Journal of Geotechnical Engineering, ASCE
- Reviewer for Journal of Hydrologic Engineering, ASCE
- Reviewer for Journal of Hydraulic Engineering, ASCE
- Reviewer for Journal of Irrigation and Drainage, ASCE
- Reviewer for Environmental Science and Technology
- Reviewer for Water Resources Research
- Reviewer for International Journal of Heat and Mass Transfer
- Reviewer for Estuarine, Coastal and Shelf Science
- Reviewer for AFS Book: Introduction to Filtration
- Reviewer for Journal of HydroInformatics
- Reviewer for Water
- Reviewer for Water Research
- Reviewer for Science of the Total Environment
- Reviewer for American Society of Agricultural and Biological Engineers
- Reviewer for CRDF (U.S. Civilian Research and Development Foundation for the Independent States of the Former Soviet Union) Proposals for Armenian-US Bilateral Grants Program III and the BRHE Program
- Judge Intel Northwest Science Expo 2002

Expert Peer Review (other than those mentioned in University and private contracts)
- Fulbright Peer Review Committee for Middle East and Israel: 2012-2014, CIES, Washington, D.C.
- Fulbright Research and Development Program, 2019, Ukraine engineering research proposals

Professional Societies:
- Water Environment Federation
- Past affiliation: American Society of Civil Engineers; American Filtration and Separations Society (Member, Board of Directors 95-96, 97-99; Chair, Education Committee 96-2000)

Honor Societies:
Phi Kappa Phi, Tau Beta Pi, Kappa Mu Epsilon, Chi Epsilon, Sigma Xi

Fellow
Institute for Sustainable Solutions at Portland State University

Awards:
- Fulbright Scholar Award 1993-1994 Academic Year to Kiev, Ukraine
- Fulbright Scholar Award 2007-2008 Academic Year to Jerusalem, Israel
- PSU CECS Faculty Research Award, 2001
- Pathfinder Award of Excellence – HDR Engineering, Boise ID, 2002
- PSU Branford Price Millar Award, 2019, for demonstrated excellence in the areas of scholarship, instruction, university service, and public service, and whose performance in the area of scholarship and research is judged to be exceptional.

**Registration:**
Professional Engineer: P.E. (Oregon #15050) (Civil Engineer, Environmental Engineer)

**Conference Moderator:** American Filtration Society, Cake Filtration Session, St. Louis, Mo., 1998; American Filtration Society, Fundamentals of Cake Filtration Session, Boston, MA, 1999; American Filtration Society, Fundamentals of Cake Filtration, Myrtle Beach, SC, 2000; AGU Conference 2004 Session co-chair; Yearly CE–QUAL-W2 Seminar

**Science Advisor for PBS Nova Special on Dead Sea:** Served as reviewer for narrator script and animations for PBS special “Saving the Dead Sea” [https://www.pbs.org/wgbh/nova/video/saving-the-dead-sea/] which premiered in the US on April 24, 2019.

**COURSES DEVELOPED:**
Boston University, Department of Mechanical and Aerospace Engineering:
- EK 390, 391, 392 Calculus and Differential Equations, Fluid Mechanics and Thermodynamics, Solid Mechanics
- EK 401, 402, 403, 404 Fourier Series and Partial Differential Equations, Linear Algebra for Engineers, Vector Field Theory for Engineers, Approximation Methods for Engineers
- AM 513 Compressible Fluid Dynamics
- AM 519 Heat Transfer
- AM 701 Advanced Fluid Mechanics

Portland State University, Department of Civil and Environmental Engineering:
- CE 112 Computations in Civil and Environmental Engineering
- CE 315 The Civil and Environmental Engineering Profession
- CE 361 Fluid Mechanics
- CE 364 Water Resources Engineering
- CE 371 Environmental Engineering
- CE 410/510 Water Quality Modeling: Sediment Dynamics
- CE 474 Unit Operations of Environmental Engineering
- CE 510 Near-Field Mixing Modeling
- CE 569 Groundwater Hydraulics and Contaminant Transport
- CE 572 Environmental Fluid Mechanics I
- CE 573 Numerical Methods in Environmental and Water Resources Engineering
- CE 574 Advanced Physical/Chemical Environmental Engineering Processes
- CE 576 Environmental Fluid Mechanics II
- CE 578 Water Quality Modeling

Technion University, Department of Water Resources, Faculty of Civil Engineering, Haifa, Israel: “Water Quality and Hydrodynamic Modeling”, Spring 2001


**EPA Region 6 Water Quality Modeling Conference and Workshop**, November 2013, Dallas, TX, invited workshop session on CE-QUAL-W2 and 2 presentations.


**FUNDED UNIVERSITY RESEARCH PROJECTS:**

- "Environmental Engineering Laboratory Development and Demonstration Project," Portland State University, Faculty Development Grant, 1988, $3000.
- "Field Study and Analysis of Water Level Management in the Upper Columbia Slough," City of Portland, Oregon, 1993-1995, $80,000.
- "CE-QUAL-W2 Model Development," Waterways Experiments Station, Vicksburg, MS, 1997, $12,000.
▪ "CEQUALW2 Model Development," Corps of Engineers, Waterways Experiments Station, Vicksburg, MS, 1998, $17,000.
▪ "Habitat Restoration in the Columbia Slough", City of Portland, Bureau of Environmental Services, 1998-2000, $68,792.
▪ Water Quality and Hydraulic Modeling of the Green River Estuary in Washington,” King County METRO Seattle, WA, 2002-2003, $52,000.
▪ “Lake Waldo Environmental Assessment”, US Forest Service, 2003-2005, $80,000 (Total PSU project funding: $400,000).
▪ CE-QUAL-W2 Model Development, Waterways Experiment Station, Corps of Engineers, Vicksburg, MS, 2003-2004, $38,500.
“Laurance Lake Hydrodynamic and Temperature Model,” Middle Fork Irrigation District, Oregon, 2005, $8,000.
“Modeling the Impact of Increased Water Use in the Clackamas River,” Clackamas River Water Management Group, Sunrise, OR, 2007-2008, $55,000.
“CE-QUAL-W2 and RESSIM Integration,” Corps of Engineers, Waterways Experiments Station, 2008, $82,000.
“CE-QUAL-W2 and RESSIM Integration Phase II,” Corps of Engineers, Waterways Experiments Station, 2009, $75,000.
“Snake River Temperature Study,” Columbia River Intertribal Fish Commission, 2009, $45,000.
“Spokane River water quality and hydrodynamic modeling for TMDL development,” EPA Region IX, 2009, $80,000.
“Clackamas River Model: Impact of Increased Drinking Water Usage on Water Quality – Model Updates,” Clackamas River Water Management Group, Sunrise, OR, 2009, $12,000.
“CE-QUAL-W2 and RESSIM Integration Phase III,” Corps of Engineers, Waterways Experiments Station, 2010-2011, $90,000.
“Snake River system model support”, Idaho Power, Boise, ID, 2012-2013, $19,800.
“Cherry Creek Reservoir Model Peer Review,” Cherry Creek Management Association, Aurora, CO, 2014-2015, $27,000.
“CE-QUAL-W2 Integration into HEC WAT for Columbia River System Model,” Corps of Engineers, HEC, Davis, CA, 2015, $64,000.
“Yakima Reservoir Model Development with Fish Bioenergetics,” Washington Department of Ecology, 2015-2016, $147,000.
“Prineville Reservoir Model Development,” Deschutes Water Control Board, 2016, $39,000.
“Willamette River Model Update,” Water Environment Services, Clackamas County, Oregon, 2019-2020, $55,000.

CONSULTANT TO:
- Portland Water Bureau, Portland, Oregon (Waybo landfill effect on groundwater pollution for Portland wellfield, 1988)
- Metropolitan Portland District Commission, Portland, Oregon (Effect of St. John's landfill on water quality in Columbia River Slough, 1989)
- Rhone-Poulenc Chemical Company, Shelton, Connecticut (Conditioning aids for sludge dewatering processes, 1988-1989)
- State of Oregon, Division of State Lands, South Slough, Oregon (Design and construction of stream gaging sites, 1989)
- Linda K. Williams, Attorney, Portland, Oregon (Near field and far field analysis of Boise Cascade/City of St. Helens discharge into the Columbia River, 1989)
- OBEC Consulting Engineers, Eugene, Oregon (Design of modifications for the Leaburg Power Canal Fish Screens, 1989)
- EWEB (Eugene Water and Electric Board), Eugene, Oregon (Hydraulic impacts of baffles after placement behind the Leaburg Power Canal Fish Screens, 1990)
- Woodward-Clyde Consulting Engineers, Portland, Oregon (Evaluation of storm water master plan for the City of Portland, 1990)
- Fishman Environmental Services, Portland, Oregon (Johnson Creek Water Resources management program including water quality, flood, natural resource, and human environmental issues in the watershed, 1990)
- Cornforth Consultants, Inc., Portland, Oregon (Finite element modeling of the groundwater levels associated with pumping to fill a reservoir for a pumped storage project, 1991)
- Unified Sewerage Agency, Hillsboro, Oregon (Assessment of groundwater contamination from a temporary wastewater sludge storage facility; modeling the unsteady leachate plume, 1992)
- Cascade Environmental Services, Bellingham, Washington (Dissolved oxygen modeling of the discharge of Timothy Lake to Stone Creek near Mt. Hood, Oregon, 1993)
• CH2M Hill, Portland, Oregon (Water quality modeling of the Klamath River system in Southern Oregon, 1995-1996)
• Carollo Engineers, Portland, Oregon (Water quality modeling of the Wahiawa Reservoir in Oahu, Hawaii, 1995-1996)
• Carollo Engineers, Portland, Oregon (Water quality modeling of the near-field mixing of the Caldwell treatment plant discharge into the Boise River, Idaho, 1996)
• Carollo Engineers, Portland, Oregon (Water quality and hydraulic assessment of Bear Creek and Ashland Creek, in Ashland, Oregon, 1996, 1997)
• R. M. Towill Corporation, Honolulu, Hawaii (Water quality modeling of Wahiawa Reservoir, Oahu, Hawaii, 1997)
• SECOR International, Portland, Oregon (Water quality modeling of near-field mixing in the Willamette River, Oregon, 1997)
• Seifer, Yeats, and Mills, LLP, Portland, Oregon (Stormwater and hydraulic modeling of the February 1996 flood in Lake Oswego, Oregon, 1997)
• METRO, Portland, Oregon (Water quality monitoring plan for Smith and Bybee Lakes, Portland, 1997)
• Carollo Engineers, Portland, Oregon (Water quality assessment of Ashland Creek, in Ashland, Oregon, 1998)
• Crawford Engineering, Portland, Oregon (Assessment of City of Astoria, Oregon, near-field mixing problems, 1998)
• R. M. Martin, Inc., Lake Oswego, Oregon ( Hydraulic modeling of 100-year flood events for sub-basin in Lake Oswego, Oregon, 1998)
• Abiqua Engineering, Salem, Oregon (Water quality modeling of Russel Creek and Coast Fork of Willamette River, Oregon, 1998/1999)
• Ogden-Beeman Engineers, Portland, Oregon (Evaluation of velocities and water levels around St. John’s Landfill, 1998/1999)
• HDR Engineering, Inc., Boise, Idaho (Water quality and hydrodynamic modeling of Snake River, Brownlee Reservoir, Hells Canyon Reservoir, and Oxbow Reservoir, Idaho/Oregon, 1999-2001)
• U.S. Environmental Protection Agency, Seattle, Washington (technical review of temperature modeling of the Columbia River system, 1999)
• HDR Engineering, Inc., Boise, Idaho (Tampa, Florida Water supply reservoir modeling, 1999-2001)
• City of Sutherlin, OR (Water quality modeling of hypolimnetic aeration for Cooper creek Reservoir, OR, 2000)
• Lincoln City, OR (Far field water quality modeling of the Lincoln City discharge into Schooner Creek and Siletz Bay, OR, 2000)
• Duke Engineering, Bellingham, WA (Water quality modeling of the Clackamas River-Reservoir systems, OR, 2000-2001)
• SECOR, Inc., Portland, OR (Water quality analysis of the tidal river Skipanon River near Astoria, OR, 2000)
• Parsons Brinckerhoff, Quade & Douglas, Portland, Oregon (Evaluation of new discharge structure at the entrance between N. Slough and Smith/Bybee Lakes around St. John’s Landfill, 2001)
• Lincoln City, Oregon (Near field mixing modeling of the WWTP outfall into Schooner Creek), 2001.
• Tulalip Indian Tribes, Tulalip, Washington (Snohomish River system model review), 2001-2002.
• City of Portland, Water Bureau, Portland, Oregon (Boeing-Cascade groundwater pollution study), 2002.
• Duke Engineering through Loginetics, Inc., TN (Temperature and hydrodynamic modeling of the Keowee Reservoir for the Oconee Nuclear Plant), 2003.
• Idaho Department of Environmental Quality, Boise, ID (CE-QUAL-W2 training), 2003
- EPA Region IX, CA (Water quality and hydrodynamic modeling of the Klamath River system workshop), 2003.
- US Bureau of Reclamation, Sacramento, CA (CE-QUAL-W2 training), 2004
- City of Kansas City, Kansas City, MI through Kennedy-Jenks Consulting Engineers (Temperature modeling of biological activity in a trickling filter), 2004.
- City of Toledo, OR (Mixing zone study for WWTP outfall in the Yaquina River), 2005.
- EPA, Region IX (Review of Klamath TMDL model), 2005.
- HyQual Engineering, Boise, ID (Technical modeling assistance for modeling hydraulics and water quality in the Boise River), 2006.
- Quantitative Environmental Analysis, LLC, Austin, TX (Technical assistance with water quality modeling of Lake Travis, Texas), 2007.
- EPA, Region IX (Peer review of Budd Inlet, Capitol Lake, and Deschutes River modeling), 2008-2009.
- Alan Plummer Associates, Ft. Worth, TX (Water quality and hydrodynamic modeling of Lake Lavon, TX and Trinity River, TX), 2009.
- SAIC, Inc. (Temperature and water quality modeling of the Eucha and Spavinaw Reservoir system, OK), 2009-2010.
- MWH, Inc. (Temperature modeling of the Oroville Thermalito diversion pool below the Oroville dam, CA), 2010.
- Brown and Caldwell (Hydrodynamic modeling of the Clackamas River and peer review of watershed modeling in Bull Run reservoir basin), 2010.
- Idaho Power Company, Boise, ID (Modeling support for the Snake river complex of Brownlee, Hells Canyon and Oxbow Reservoirs), 2010-2011
- ARCO/BP (Modeling the Warm Springs Ponds, Butte Montana), 2010-2012.
- Alan Plummer Associates, Ft. Worth, TX (Water quality and hydrodynamic modeling of Lake Lavon, TX and Trinity River, TX), 2011.
- Odebrecht Perú (Water quality and hydrodynamic modeling of the Chaglla hydropower project in Peru), 2011
- Environnement Illimité inc, Montreal, Canada (Water quality and hydrodynamic modeling support for Lake Lagopede, Canada), 2011.
- City of Klamath Falls, OR (TMDL assessment of the Klamath River, OR using CE-QUAL-W2 model), 2011-2012
● Cumulative Environmental Management Association (CEMA), Fort McMurray, Alberta, Canada (Technical review of pit lakes model for sediment diagenesis), 2011
● McMillen, LLC and Idaho Power Company, Boise, ID (Review of Hells Canyon Reservoir water quality model), 2012
● Cardno-Entirex, Sacramento, CA (Hydrodynamic and temperature modeling of Folsom Reservoir, CA), 2012-2016
● Dead Sea Works, Beer Sheva, Israel (Modeling of the Dead Sea ponds), 2012-2014
● CDM Smith, Ft. Worth, TX (Hydrodynamic and surface water quality modeling of the Trinity River, TX), 2013-2014
● CEMA, Alberta, Canada (Greenhouse Gas modeling and sediment diagenesis for Pit Lakes region in Canada), 2013-2014
● CDM Smith, OH (Peer review of the Ohio-Allegheny-Monongahela River model), 2013
● JGP Consultoria, Brazil (Water Quality and Hydrodynamic Modeling of Tabajara Reservoir and tailrace in Brazil), 2014-2015.
● ERM Inc., PA (Peer review of water quality and hydrodynamic modeling of a new reservoir in Panama), 2015
● Waterkeeper Alliance Inc., NY (Expert review of High Rock Lake, NC, water quality and hydrodynamic model), 2015.
● Deltares/TVA, TN, (Model code development for the CE-QUAL-W2 TVA models for integration into FEWS) 2015.
● Waterkeeper Alliance Inc., NY (Expert review of Neuse and Tar/Pamlico water quality studies, NC), 2016.
● ICE (Instituto Costarricense de Electricidad), San Jose, Costa Rica (Modeling the El Diquis hydropower project), 2016-2017.
● Cooper Environmental, Butte, Montana (Development of Solar Bees in CE-QUAL-W2 model of Warm Springs Pond), 2017
● Stantec, Inc., Sacramento, CA (Development of Feather River, Afterbay, and Oroville Reservoir Model and Update to Thermalito Model, Oroville, CA), 2017-2019
● John Harrison Consulting, CA (Review of Tillamook Wastewater Treatment Plant Temperature permit regulations), 2018.
● Rune Consultants, CA (Modeling of Lake Curry, CA), 2018-2019.
● Brown and Caldwell on behalf of Bellingham County, WA, (Water quality and hydrodynamic modeling of Lake Whatcom, WA), 2020-2021.

**PUBLICATIONS (Journals, Peer-reviewed Proceedings, Articles):**


14


**CE-QUAL-W2 TECHNICAL REPORTS**


**TECHNICAL REPORTS:**


TECHNICAL PRESENTATIONS:


Wells, S. A. (1998) "Modeling the Columbia Slough System," invited seminar Oregon Graduate Institute, October 2, Beaverton, Or.


Graduate Student Supervision
I have graduated 6 PhD students (Drs. Makina, Berger, Annear, McKillip, Muhanned Al-Murib, Hussein Al-Zubaidi) and currently have 1 PhD student in-progress. Besides PhD committees at PSU, I have also served on PhD committees at the University of Idaho (Sarah Burnett, Jack Harrison) and the University of Iowa. I have also served on many PhD and MS graduate committees at PSU.

I have graduated over 30 MS and MENG students. Some of these include Juza, Holly; Schwarz, Tracy; Karl, Joanna; LaLiberte, David; Plaskett, Joe; Knutson, Mike; Huang, Qinsheng; Buzzone, John; Bashkitov, Dmitry; Gould, Sam; Kraft, Tim; McCullough, Andrew; Slominski, Spencer; Winter, Verena; Wells, Vanessa; Xu, Wenwei; Al-Murib, Muhanned; Al-Zubaidi, Hussein; Shojai, Nasim; Rivas, Andres; Posovich, Michael; Dickerson, Peter; Whelan, Ela; Khan, Sher-Jamal; Annear, Rob; Berger, Chris; McKillip, Michael; Hanna, Rachel; Lu, Minh; de Wit, Kieth; Van Glubt, Sarah; Overman, Corina; Jensen, Tel; and Stevens, Seth. Current (2020) Master’s students include Amory Ceravich and Bernadel Garstecki.

I also have been the advisor to one BS honor’s thesis through the PSU honor’s program with Michelle Henry who wrote a thesis on wind fetch corrections in numerical hydrodynamic models.
J. Craig Swanson – Principal Associate

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78 Sycamore Lane
Saunderstown, RI 02874

Capabilities

- Strategic technical advice to public and private clients on solutions to marine and freshwater related environmental problems
- Expertise in coastal and estuarine circulation; offshore alternative energy and LNG related projects; climate change effects on coastal infrastructure; thermal effluents and wastewater discharge; sediment dispersion from dredging, cable and pipeline burial; pathogen and other pollutant transport and water quality (nutrients, dissolved oxygen problems
- Development and/or application of hydrodynamic, water quality and sediment dispersion models in rivers, lakes, estuaries, and coastal regions
- Expert consulting in coastal physical oceanography, environmental impact assessments, and environmental data collection and analysis
- Litigation support including expert document review, developing strategic and tactical strategies, providing expert testimony.

Career Overview

Dr. Swanson is a Principal Associate of Swanson Environmental Associates, which he founded in 2015. He was a Senior Associate of RPS ASA between 2011 and 2015 and a cofounder and principal of Applied Science Associates from 1979 to 2011. He received a B.S. and M.S. in Mechanical Engineering from Purdue University and the University of Bridgeport, respectively, and an M.S. and Ph.D. in Ocean Engineering from the University of Rhode Island.

His initial professional focus was on the development and use of hydrodynamic, water quality, sediment and pollutant transport computer models to provide quantitative solutions for public and private sector clients in river, lake, estuarine, coastal and shelf environments. Dr. Swanson has directed the application of these models and associated field programs to solve a wide variety of problems in these aquatic surface water environments located in the United States and abroad. He has managed a large number of projects in his career that have incorporated a number of disciplines including physical oceanography; lake, riverine, coastal and marine processes; water quality; sediment dispersion and quality; and biological impact analyses from these physical and chemical processes.

Dr. Swanson’s professional activities have included:

- Industrial Advisory Board to the Ocean Engineering Department at the University of Rhode Island
- Environmental Business Council, former Rhode Island Chapter Chair and former member of the Board of Directors
- American Society of Civil Engineers, Life Member
- Marine Technology Society
- Water Environment Federation
- International Association for Hydraulic Research
- Coastal and Estuarine Research Federation

Dr. Swanson has recently served as an advisor to senior level undergraduates for OCE 495/496 Ocean Engineering Systems Design Project:

- Fall 2014 / Spring 2015: Impact of Climate Change on Rhode Island Marinas: Sea Level Rise and Storm Surge
- Fall 2015 / Spring 2016: Assessment of Damage from Storm Surge and Sea Level Rise along Matunuck Beach Road and Surrounding Communities
- Fall 2016 / Spring 2017: Assessment of Damage to the Misquamicut Beach Community from Storms and Evaluation of Mitigation Strategies
- Fall 2017 / Spring 2018: Application of Coastal Environmental Risk Index (CERI) to Providence and Fox Point Hurricane Barrier
Fall 2018 / Spring 2019: Evaluating and Improving the Resilience of Waste Water Treatment and Hazardous Material Storage Facilities in Upper Narragansett Bay to Coastal Flooding
Fall 2019 / Spring 2020: Improving Coastal Resilience with the Addition of Design Load Determination and Mapping Capability to CERI

Example Project Experience

Hydrodynamics

- Managed a study to assess the effects of various dredging scenarios of the lower reach of the Narrow River, Narragansett, RI, to increase the tidal prism and thus reduce flushing times to improve water quality.
- Directed a study to assess the effects on circulation, water quality and sedimentation of a proposed channel deepening project at Quonset Point, Rhode Island. The study included an extensive field program and application of models for a range of areas surrounding the site.
- Developed a general three-dimensional boundary-fitted coordinate finite difference hydrodynamic model. The model used a semi implicit solution technique to solve the hydrodynamic equations. Forcing included tides, wind, river flow and density differences.
- Directed a hydrodynamic and suspended sediment modeling study of the effects of the removal of bridge piers and abutments for the Sakonnet River Bridge in Rhode Island.
- Performed wave climate and wave refraction analyses for various sites in Rhode Island, Massachusetts, and New York.
- Directed a study to develop a hydrodynamic and pollutant transport model for Salem Sound in Massachusetts for use by state regulators. The model was applied to a wastewater treatment plant outfall to assess its effects on the sound.
- Directed a modeling study to estimate the circulatory and sediment effects of various bridge replacement configurations in Missisquoi Bay on Lake Champlain.
- Assessed the impacts of a restrictive bridge opening on the circulation and flushing in the Narrow River, Narragansett, RI. Analysis included and measurement program to determine the tidal characteristics of the estuary and application of analytical models to estimate changes with a new bridge.

Offshore Alternative Energy

- Responsible for preparing the water quality section of the Construction and Operations Plan for the lease holder of a portion of an offshore wind energy area off the northeast coast of the U.S. Included was an assessment of the potential water quality impacts of discharges and spills related to the wind farm and export cables with specific oversight of cable burial-related sediment dispersion modeling.
- Responsible for preparing the physical oceanography and water quality sections of the Environmental Assessment for the Massachusetts Wind Energy Area for the Bureau of Ocean Energy Management in support of commercial offshore wind energy lease activities.
- Led a study to develop a data base and synthesis of reference literature for selected scientific areas for use by the Minerals Management Service in support of developing Environmental Impact Statements for proposed alternative energy facilities on the mid and north Atlantic outer continental shelf. The project included performing a series of literature searches in the disciplines of chemical and geological oceanography, physical oceanography and air-sea interaction as well as research and development technology for alternative energy. A synthesis report was generated from the information gathered.
- Directing a study of the environmental effects of proposed Cape Wind farm of 130 turbines in Nantucket Sound. Studies included assessing the transport and fate of: a potential spill of insulating oil used in the turbines; estimating the recovery time of seabed scars from construction activities; predicting water column suspended sediment levels and bottom deposition patterns from jet plow burial of the connecting cables; assessing the cumulative effects of the turbine pile array on the waves, currents and sediment transport; and evaluating potential cable exposure from migrating sand waves.
- Directed a study to acquire environmental data via a multi component field program and perform an environmental characterization of a site of a proposed wave energy system off the south coast of Rhode Island. An assessment was performed on the environmental impacts of the deployment and operation of the floating structure.

Liquefied Natural Gas (LNG)

- Directing modeling studies of the effects of the thermal discharges from proposed LNG regasification facilities located on Cartagena Bay in Colombia and Sokhna Port in Egypt.
SWANSON ENVIRONMENTAL ASSOCIATES LLC

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- Directed a study for a proposed LNG terminal on the St. Croix River in Maine. The project involved preparing estimates of potential flooding at the site due to storm surge for various return periods, seiches, and tsunamis from regional and large scale events.
- Directed a modeling study of the discharge and effluent dilution from LNG Shuttle and Regas Vessels (SRV) for a site offshore Tampa Bay, FL. The SRV discharge was modeled with a near field computer model to assess the extent of the thermal plume under different operational and environmental conditions.
- Managed a study of the environmental effects of a deep water port on a constructed island off the coasts of New York and New Jersey designed to receive, store and regasify LNG. The analyses included assessing the environmental effects of suspended sediment and subsequent deposition from jet plowing the connecting pipeline into the ocean floor and the effects of the discharge of process water and wastewater from the terminal.
- Directed a study to evaluate the potential biological effects of dredging a channel and turning basin for a proposed LNG facility in the Taunton River in Massachusetts. The study included a month-long field program and applications of a hydrodynamic model to predict the currents, a dredged sediment transport model to estimate water column sediment concentrations and deposition patterns, and a biological model to calculate doses and effects to categories of marine species and their life stages.

**Thermal Effluent Discharges**

- Managing the application of a baroclinic hydrothermal model to assess the effects of future buildout of Jubail Industrial City on the Arabian Gulf in Saudi Arabia.
- Directed CORMIX modeling to investigate the beneficial reuse of power plant heated effluent to control harmful algal blooms.
- Performed a technical review of a thermal plume mapping and modeling study for the once through cooling water discharge from a coal-fired facility located on the Mississippi River in Missouri.
- Directed a mixing study based on field data collected in the thermal plume downstream of a nuclear powered electric generating facility on the Connecticut River in Vermont.
- Managed a modeling study to evaluate the downstream thermal effects in a dammed pool on the Connecticut River located in Massachusetts below a nuclear-powered facility.
- Oversaw mapping of the thermal plume from a fossil-fueled plant on the Providence River in Rhode Island.
- Directed the hydrothermal modeling for a fossil-fueled power plant on the Merrimack River in New Hampshire. Three-dimensional modeling included simulation of the thermal structure of the discharge canal and the dammed pool in the River.
- Oversaw the thermal modeling of the discharge canal from a fossil-fueled power plant in Mt. Hope Bay, MA during phased conversion of the four units from once-through cooling to cooling towers. Also evaluated the effects of increased salinity discharge from cooling towers.
- Directed an extensive, multi-year field program planning and hydrothermal modeling study for a nuclear facility on the Hudson River in New York in support of discharge permit renewal. Additional tasks included review of documents and providing expert witness testimony.
- Oversaw the study of thermal effects for a proposed upgrade to a power plant on Lake Maracaibo in Venezuela. The primary focus was to optimize the location of intake and discharge structures to minimize recirculation of heated effluent and to efficiently disperse the thermal plume to minimize environmental impacts.
- Directed a study to assess the thermal effects on a pool in the Connecticut River in Vermont from a cooling water discharge. The study included a field program to measure existing temperatures and included a three dimensional application of a hydrothermal model in support of a §316(a) demonstration.
- Oversaw the study of the thermal effects of increasing flow from a power plant in Jubail Harbor, Saudi Arabia. The study included a thermal mapping survey to develop a model calibration data set and a modeling study to evaluate the extent of possible temperature increases in the harbor and surrounding waters.
- Critically reviewed the three-dimensional hydrothermal modeling performed in support of a permit for a New England electrical generating facility. The review was part of a due diligence study for a possible buyer.
- Directed a study analyzing the thermal effects of a large electrical generating plant on the circulation and thermal structure in Mt. Hope Bay, MA. The study included an extensive field program and a three-dimensional model application. Later studies included simulation of the discharge canal thermal structure.
- Directed the analysis of thermal impacts from a proposed expansion at an electrical generating facility located on the Cape Cod Canal, Sandwich, MA. The study included application and calibration of a three-dimensional model to the canal and adjacent waters to estimate the increase in plume size with greater heat discharge.

**Wastewater Discharges**
Perform an analysis of the potential effects of increasing the discharge from an oyster processing plant in Willapa Bay, WA.

Led the effort to analyze receiving water quality benefits of Phase III of the planned combined sewer overflow system upgrade for the Seekonk and Providence Rivers and Upper Narragansett Bay for the Narragansett Bay Commission.

Managed a study to evaluate the water quality impacts of an upgrade of a wastewater treatment facility upgrade from secondary to tertiary treatment that included a hydrodynamic and pollutant transport model of Tarut Bay, Saudi Arabia.

Directed a critical review of a Massachusetts Estuary Program nutrient loading and receiving water impact analysis for the Nauset Harbor Embayment System on Cape Cod.

Directed a study to evaluate the optimal location for a wastewater treatment facility discharge from a proposed mixed use development at Weaver Cove in the East Passage of Narragansett Bay, RI that included a field program collecting physical and chemical and a flushing analysis to determine the effects of a proposed wave fence protecting the development marina.

Managed a series of studies of the effects of the Portsmouth, Kittery and South Berwick individual municipal wastewater treatment facility discharges on the Great Bay / Piscataqua River system in New Hampshire to determine their relative roles in adding nutrients that impact water quality.

Reviewed potential environmental impacts from proposed Botnia paper / pulp mill on River Uruguay, an estuarine river, between Uruguay and Argentina in support of a lawsuit between the countries.

Directed a review of RIDEM’s assessment of the nutrient reductions necessary to achieve water quality protection and enhancement in Green Hill Pond in South Kingstown and Charlestown, RI which found that smaller reductions in nutrient loading could still achieve water quality goals. An analysis was also performed to increase flushing rates in Green Hill Pond with the creation of a breachway.

Managed a peer review of New Hampshire state documents establishing numeric nutrient criteria for wastewater discharge from the Town of Portsmouth, NH treatment facility to Piscataqua River and Great Bay.

Directed a critical review of a Massachusetts Estuary Program nutrient loading analysis for the Town of Fairhaven, MA relative to its discharge into New Bedford Inner Harbor.

Managed a study to evaluate wastewater discharge alternatives for the Town of Portsmouth, RI. The study focused on evaluating the potential water quality impacts at two alternative sites, one in the East Passage of Narragansett Bay and the other in the Sakonnet River.

Managed a study to estimate the likely elevated levels of pathogens from the proposed new offshore outfall for the Sanitary Districts of Los Angeles County. A particle based Lagrangian model was used in the calculation with hydrodynamics supplied by an extensive current meter field program conducted by LACSD.

Directed a study to develop a hydrodynamic and pollutant transport model for Salem Sound in Massachusetts for use by state regulators. The model was applied to a wastewater treatment plant outfall to assess its effects on the sound.

Directed a study to evaluate temporary ocean discharge from a barge of squid processing wastes into Rhode Island Sound while a facility upgrade was constructed.

Directed a study analyzing characteristics of receiving water quality impacts of various combined sewer overflow design alternatives for Fall River, Massachusetts system. A hydrodynamic and pollutant transport model system was applied to Mt. Hope Bay and the lower Taunton River supported by a field program.

Directed a series of studies to evaluate the water quality benefits of a series of combined sewer overflow design alternatives for the Providence River and upper Narragansett Bay. The study included modeling of hypothetical load reductions for various alternatives and two one-year simulations of receiving water quality based on the preferred alternatives.

**Sediment Dispersion from Cable/Pipeline Embedment and Dredging**

Consulted on dredging-induced sediment dispersion from the proposed installation of downstream oil pipelines by side cast and back filling and dredging vessel access channels at Berri Islands, Saudi Arabia.

Directed a hydrodynamic and sediment dispersion modeling effort to assess the effects of a proposed buried electrical cable crossing of Little Bay, a component of the Great Bay Estuarine System in New Hampshire.

Directed a multifaceted modeling and analysis study to evaluate the environmental impacts of construction and operation of a maritime yard (construction and maintenance) on the Arabian Gulf coast of Saudi Arabia. Components of the study included hydrodynamics, flushing and dilution, channel and harbor dredging and disposal, and the resulting biological effects.
Oversaw a sediment dispersion modeling study evaluating the construction impacts of a lateral pipeline tie in to an offshore gas pipeline in Massachusetts.

Directed an analysis of the potential sedimentation effects of a proposed bottom located screened intake for once through cooling water for a nuclear powered facility on the Hudson River.

Managed a modeling study to evaluate the transport and fate of suspended sediment from dredging operations related to installation of a natural gas pipeline across the Hudson River in New York. Sensitivity analyses were conducted to ascertain the effects of different hydrodynamic effects and sediment loading estimates.

Directed a study to evaluate the potential biological effects of dredging a channel and turning basin for a proposed LNG facility in the Taunton River in Massachusetts. The study included a field program and applications of a hydrodynamic model to predict the currents, a dredged sediment transport model to estimate water column sediment concentrations and deposition patterns, and a biological model to calculate doses and effects to categories of marine species and their life stages.

Managed a study in the Thames River, CT to evaluate the environmental effects (elevated sediment and pollutant levels) from disposal of dredged material from a U.S. Navy submarine berth. Project used hydrodynamic, dredged sediment transport and pollutant transport models.

Directed a study to assess the dredged material plume created from dredging operations for a berth deepening project at a U.S. Navy pier in Sandy Hook Bay in New Jersey. The study included applications of a hydrodynamic model, a dredged sediment transport model and a pollutant transport model.

Directed a study to evaluate the environmental suitability of two potential disposal sites in Buzzards Bay, MA. Primary emphasis was on the long term stability and transport of disposed material under a variety of storm conditions.

Co-directed a study to estimate suspended sediment concentrations, deposition patterns and erosion potential along a proposed route from Connecticut to Long Island for a gas pipeline.

Co-directed a multi-phase study to estimate the deposition of suspended sediment from jet plow operations between Connecticut and Long Island for a proposed cable replacement project. The study also included a new cable installation to a different landfall on Long Island.

Directed a modeling study to assess the suspended sediment and contaminant concentrations from disposal of dredged material taken from the channel in New Bedford Harbor.

Co-directed a study to estimate the water column concentrations and deposition of suspended sediment from jet plow operations in the lower Hudson River for a proposed electrical cable crossing between New Jersey and Manhattan.

Directed a modeling study to estimate the circulatory and sediment effects of various bridge replacement configurations in Missisquoi Bay on Lake Champlain.

Directed a study of the deposition of suspended material from jet plow operations in New Haven Harbor for a proposed electrical cable to determine effects on adjacent leased oyster beds.

Directed a modeling study of the plume from proposed dredging operations in the Providence River and upper Narragansett Bay. The purpose of the study was to estimate suspended sediment concentration levels in relation to biologically based environmental windows.

Performed a modeling study of a proposed dredging project in Inner Boston Harbor. The analysis provided estimates of the resulting concentrations in Boston Harbor of suspended sediment.

Directed a modeling study to evaluate changes in hydrodynamics due to disposal operation at a series of proposed dredged material disposal sites in central Narragansett Bay, RI for the Corps of Engineers.

Directed a modeling study to assess the hydrodynamic environment at potential disposal sites in Narragansett Bay for the RI Coastal Resources Management Council.

Directed a study to develop a PC-based dredged material management system for New York City. The system combines Corps of Engineer fates models with data display capabilities.

Assessed the impacts of a proposed dredging project in the Thames River, Groton, CT. The influence on circulation in the river was investigated using a series of analytical models to estimate longitudinal changes and a numerical model was employed to estimate lateral changes.

Pollutant Transport and Water Quality (Pathogens, Brine, Nutrients)

Performed CORMIX modeling to evaluate potential outfall locations of a brine discharge from a reverse osmosis plant in Saudi Arabia.

Managing the application of hydrodynamic and water quality models to assess the impacts of future buildout of Juball Industrial City on the Arabian Gulf in Saudi Arabia.
Consulted on the water quality and biological impacts of the discharge from a road salt storage and distribution facility on Newark Bay, NJ.

Managed a technical review of a critical nitrogen loading threshold analysis the Nauset Harbor Embayment System for the towns of Orleans and Eastham, MA.

Directed a hindcast modeling study of a lampricide release and into the Missisquoi River and eventual transport and dilution in Missisquoi Bay at the northern end of Lake Champlain, VT. The study successfully predicted the trend and timing of the plume evolution based on data collected by the state.

Managed a field and modeling study to determine the potential changes in salinity from discharging treated water to Sag Harbor Cove on Long Island, NY from a proposed remediation project.

Directed a study to evaluate the water quality impacts from the trap shooting range in Middletown, RI that launches targets into Rhode Island Sound. A hydrodynamic and pollutant transport model system was used to predict circulation in the area and the resulting concentrations of iron and sulphate.

Directed a study to evaluate the transport and extent of a high concentration brine discharge into the Gulf of Mexico from the proposed construction of an oil storage facility in an underground salt cavern. A particle based Lagrangian model was used in the calculation to simulate the saline plume.

Managed a study to estimate the stormwater impacts on Scarborough Beach in Narragansett, RI under present conditions and for a series of collection and disposal scenarios to prevent beach closures from bacterial contamination.

Managed an integrated field program and hydro and pollutant transport modeling system application to identify the location and evaluate the distribution of bacteria sources responsible for closure of recreational shellfish beds in Southport Harbor, CT. Both forward and backward-in-time modeling was performed to establish likely pollutant sources.

Directed a field and modeling study to assess the effects on the salinity structure in the Palmer River of water withdrawal and brine discharge related to a desalinization facility for Swansea, MA.

Co-directed a field study to assess water quality in the Madaket Harbor / Long Pond system on Nantucket Island. A hydrodynamic and flushing model was developed to determine flushing times for various components of the system.

Directed a circulation and flushing study of a series of proposed marina designs in Yarmouth, MA assessing the configuration of the marina connection to the Parker River.

Directed a field and modeling study of water withdrawal and brine discharge on the Taunton River in Dighton, MA for a proposed desalinization facility.

Oversaw a modeling study in support of a nutrient TMDL for the Providence River in upper Narragansett Bay that included a baroclinic hydrodynamic model and an eutrophication model.

Directed a field and modeling study to estimate flushing times in the Parker and Swan Rivers and Lewes Bay on Cape Cod as part of a larger study to estimate critical nutrient loading to the water bodies.

Oversaw a modeling study in support of a nutrient and pathogen TMDL for Greenwich Bay in Rhode Island that included baroclinic hydrodynamic, pollutant transport and full eutrophication models.

Performed a modeling study using CORMIX to optimize the dilution of brine from a proposed desalinization facility submerged multiport diffuser to the Mediterranean Sea in Gaza.

Directed a study to evaluate the flushing of the Acushnet River Estuary. The study included measurements of the salinity distribution and a dye study and resulted in a comparison of flushing estimates by alternative techniques.

Managed a study to develop conceptual design plans for a small brine discharge for a proposed desalinization project in the Sakonnet River. The study used CORMIX to optimize the design of a multiport submerged diffuser.

Analyzed water quality effects of the proposed Rhode Island Central Energy Facility at Quonset Point, Rhode Island. Thermal and chemical impacts were analyzed for both the once through cooling design and the stack emissions.

Directed a field program and water quality modeling study of the Blackstone River, Rhode Island, to assess potential impacts of withdrawal of water for cooling of an electrical generating facility.

Analyzed water quality data for the Thames River, Connecticut and recommended a research and modeling strategy to reduce eutrophication in the estuary.

**Litigation Support**

Provided expert witness testimony in permit proceedings before the New Hampshire Site Evaluation Committee relative to a proposed installation of an electrical cable crossing beneath a portion of the Great Bay Estuary System.

Provided expert witness deposition in legal proceedings relative to the once-through cooling water discharge from a nuclear powered electrical generating facility located on the Hudson River in New York. Worked with technical consulting team to review technical documents and develop strategy against opposing parties.
Testified as an expert witness in a legal proceeding in the Vermont Environmental Court on the effects of thermal discharge from the Vermont Yankee power plant on the Connecticut River. Worked with attorneys and technical team on technical approach before and during hearings.

Served as an expert witness in a legal suit concerning discharge of hydrocarbons to a tidally influenced Penobscot River in Maine.

Testified before the Connecticut Siting Council on model-predicted deposition effects of sediment transport and deposition from jet plow technology to bury an electrical cable in New Haven Harbor.

Directed an analysis of water quality effects of the proposed Rhode Island Central Energy Facility at Quonset Point, Rhode Island. Thermal and chemical impacts to Frys Pond and Narragansett Bay were analyzed from both the once through cooling design and the stack emissions under dry and wet conditions. Provided expert testimony at Rhode Island Department of Environmental Management hearings on the technical aspects of the project.

Assessed the water quality impacts of a large marina development at Weaver’s Cove in Narragansett Bay, Portsmouth, RI. An analysis of flushing in the marina and the conceptual design of a breakwater were performed. Provided testimony before the Rhode Island Coastal Resources Management Council.

Assessed the impacts of three wastewater treatment plans on the Pawtuxet River in Rhode Island. Provided expert testimony at public hearing.

Data Management, Mapping and Analysis

Oversaw planning of a multi-year field program to assess the physical characteristics of the tidal estuary portion of the Hudson River, NY. The program consisted of three fixed bottom ADCPs, six CTDs and 400 thermistors on multiple moorings as well as mobile ADCP and thermistor surveys. Two two-month deployments occurred in 2009 and 2010. Data analysis included quality control, time series analyses, and interpretation of data, including public sources of meteorological and oceanographic monitoring.

Managed a large field and modeling program for Mt. Hope Bay, MA. Oversaw the quality control, data management and interaction of data use with models.

Publications:
Dr. Swanson has authored or co-authored 16 journal articles or book chapters, 47 conference proceeding papers and over 300 technical reports.

*Articles in Journals and Books*


Conference Proceedings


Cornillon, P., M. Reed, M.L. Spaulding and J.C. Swanson, 1980. The application of SEASAT-1 radar altimetry to continental shelf circulation modeling. 14th International symposium on remote sensing of environment, San Jose, Costa Rica, April.

EDUCATION/HONOURS

1975    BSc. in Chemistry, (Magna Cum Laude) University of Saskatchewan
1981    Ph.D. in Chemistry, University of British Columbia
2003    Elected as a Fellow of the Canadian Institute of Chemistry
2013    Winner of the ASTECH Award for Oil Sands Tailings Research

EXPERIENCE

Dr. Mikula was the team leader of Natural Resources Canada’s research group in oil sands extraction and tailings science and technology and since 2011 is the owner of Kalium Research, a company devoted to developing new and improving existing oil sands processes. Randy Mikula has more than 30 years experience researching oil sands tailings behaviour, including water chemistry and clay interactions. Projects have included pilot and commercial scale demonstrations of the gypsum consolidated tailings (CT) process, as well as work on carbon dioxide as a CT process aid. This research involves investigation of the fundamental chemistry of the carbon dioxide-clay interaction, including CT formation mechanisms and the potential for carbon dioxide sequestration. The program of fundamental research directed at practical oil sands tailings handling solutions has been a powerful combination. This has resulted in varied opportunities to discuss his work, ranging from testifying as an expert witness in the Shell-Albian and TOTAL environmental impact review, to public lectures on the role of nanotechnology in oil sands development (Visioning Alberta’s Future: The role of Nanotechnology in the Oil Sands Industry). Dr. Mikula has coordinated the scientific program around development and pilot scale demonstration of centrifuged fluid fine tailings, a process that Syncrude commercialized in the early 2010’s.

His understanding of oil sands tailings behaviour, including water chemistry and clay/flocculant interactions is supported by expertise in oil sands process chemistry for the slurry tank, hydrotreatment, Clark, OSLO, and other novel extraction processes. This includes fundamental, pilot and commercial scale projects on tailings and extraction behaviour as a function of water chemistry.

Dr. Mikula’s expertise in microscopy and fine particle characterization is widely recognized and has resulted in significant technical contributions to a variety of research projects outside of his nominal expertise in oil sands and heavy oil. Examples include contributions to research into lead exposure in the inner city, co-supervision of a Ph.D. thesis in sol-gel synthesis of metal sulphides, and co-supervision of a Ph.D. thesis on stabilization of hazardous wastes in cement. He has served at various times on the executive of the local and national sections of the Microscopical Society of Canada and treasurer of the Alberta section.

PUBLICATIONS

Over 60 Refereed papers and Conference proceedings

10 Book contributions

8 Patents

Over 160 Divisional Reports
Heather Kaminsky

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E-mail: heather.kaminsky@yahoo.com

Summary of Research Interests
Heather has a passion for Clays and Tailings and hopes to play a key role in solving tailings as an issue for the oil sands industry. This passion has earned her the moniker “Queen of Clay”

Education
Doctor of Philosophy in Materials Engineering
University of Alberta   Edmonton, Alberta   [09/2003-10/2008]
- Thesis Title: Characterization of an Athabasca oil sand ore and process streams.

Bachelor of Science in Materials Engineering (Co-op)
University of Alberta   Edmonton, Alberta   [09/1998-05/2003]
Graduated with first class honors.

Work Experience
Lead Researcher – Mining team
NAIT   Edmonton, Alberta   [07/2016-present]
- Program lead for the Mining team at the center for oil sands sustainability, directly responsible for managing 4 technical staff and initiating and managing ~$1 Million in projects annually.
- Organized the 54th Clay Minerals Society Annual meeting and 5th Oil Sands Clay Conference along with the 10th Powder diffraction workshop.

Research Engineer
Suncor Energy Inc.   Calgary, Alberta   [07/2014-07/2016]
- Developed and managed the work scope for tailings research programs worth approximately $1M with a focus on understanding and measuring the behavior of tailings as they transition from slurries to soils.
- Vice chair and Suncor representative on the COSIA research Working Group, responsible for evaluating and stewarding over 22 academic and industrial research projects representing over $3 million of research on oil sands tailings.
- Chair of the COSIA Soft Deposit Capping committee, responsible for assessing technology gaps in economically capping ultra soft tailings deposits.
- Chaired the organizing team for the 4th COSIA-PTAC Clay conference and workshop

Tailings Planning Engineer
Total E&P Canada   Calgary, Alberta   [04/2013-06/2014]
- Wrote the Operational philosophy documents for the external tailings facilities of the Joslyn North Mine
- Chair of the COSIA Clay Focus group, responsible holding quarterly meetings bringing together academia, oil sands operators, regulators and service companies to discuss fundamental clay science and measurement methods.
Research & Development Mine Specialist
Total E&P Canada Calgary, Alberta [05/2009-04/2013]
• Evaluated the mineralogy of the Joslyn lease and how changes in mineralogy impacted extraction and tailings.
• Organized the 2nd CONRAD Clay workshop and co-organized the 3rd CONRAD Clay workshop & conference, both of which made a profit, attracted 150 attendees and had 86% and 98% of attendees respectively indicating that the conference was worthwhile or very worthwhile.

Select Volunteer experience
Brander Gardens Parent’s Advisory Council -(03/2018-present)
Edmonton International Folk Dancers – Vice President (05/2017- present)
ISEESA/FUSE - Advisory Board Member (05/2013-07/2016)
MentorUp Calgary! – Co founder/Chair – 05/2010-05/2012

Select Publications

Znidarčić, D., Van Zyl, D., Mittal, K., & Kaminsky, H.A.W (2016) “Consolidation Characteristics of Flocculated MFT – Experimental Column and SICT data” Proceedings of the Fifth International Oil Sands Tailings Conference (IOSTC), Lake Louise, Canada.


