ALEXANDER REY, PHD, EIT

COASTAL ENGINEERING EIT, BAIRD AND ASSOCIATES, OTTAWA, ONTARIO, CANADA

(519) 755-1728 ▪ alexander.rey@queensu.ca ▪ alexanderrey.ca

Education

Doctor of Philosophy, Civil Engineering ▪ September 2016 – October 2020
Queen's University ▪ Kingston, Ontario

- Thesis focused on the hydrodynamic behavior of shallow water, including retention times in wastewater stabilization ponds and climate enhanced hurricane driven flooding in estuaries.
- Implemented a real-time model forecast for wave, current, and water levels in North Carolina, USA.
- Completed the US Army Corps of Engineers DUNEX Coastal Processes and Engineering Training.
- Recipient of the Dean's Teaching Assistant Award
- Supervised by Dr. Ryan Mulligan, Dr. Ana Maria da Silva, and Dr. Yves Filion.

Bachelor of Science, Civil Engineering ▪ September 2012 – May 2016
Queen's University ▪ Kingston, Ontario

- Campus tour guide.
- Member of the Queen's Mostly Autonomous Sailboat Team.

Employment

Coastal Engineering EIT ▪ June 2020 - Ongoing
Baird and Associates ▪ Ottawa, Ontario

- Designed, ran, and visualized numerical and machine learning models in a variety of environments.

Cognitive Assessment Redesign Assistance ▪ April 2018 – December 2018
Faculty of Applied Science, Queen's University ▪ Kingston, Ontario

- Provided input on the suitability of the *VALUE* rubric to Queen's University design courses.

Peer-Reviewed Journal Publications

Rey, A., Mulligan, R., da Silva, A. M., Filion, Y., Champagne, P., Boegman, L., (2021) "Three-Dimensional Hydrodynamic Behavior of an Operational Waste-Stabilization Pond." *Journal of Environmental Engineering* 147.2, 05020009.

Rey, A., Mulligan, R., Filion, Y., da Silva, A. M., Champagne, P., Boegman, L., (2021) "Temperature Stratification in an Operational Waste Stabilization Pond." *Journal of Environmental Engineering* 147.6, 05021001.

Rey, A., Mulligan, R., (2021) "Influence of Hurricane Wind Field Variability on Real-Time Forecast Simulations of the Coastal Environment." *Journal of Geophysical Research: Oceans* 125.12, e2020JC016483.

Rey, A., Corbett, R., Mulligan, R. (2020). "Impacts of Hurricane Winds and Precipitation on Hydrodynamics in a Back-Barrier Estuary." *Journal of Geophysical Research: Oceans* 125.12, e2020JC016483.

Mulligan, R. P., Mallinson, D. J., Clunies, G. J., **Rey, A**., Culver, S. J., Zaremba, N., Leorri, E. and Mitra, S. (2019) "Estuarine responses to long-term changes in inlets, morphology and sea-level rise", *Journal of Geophysical Research: Oceans, p. 2018JC014732. doi: 10.1029/2018JC014732.*

Fruetel, C., Mumford, K. G., Ferreira da Silva, A. M., **Rey, A**., Bascom, K. S. (2019) "A laboratory method for the visualization and quantification of hyporheic flow paths and velocities", *Canadian Journal of Civil Engineering, 46(5), pp. 448–457. doi: 10.1139/cjce-2018-0131.*

Conference Publications

Rey, A., Mulligan, R., Corbett, R., Wadman, HM. (2019). "Numerical Modelling of Storm-Driven Sediment Transport in Currituck Sound, NC." *International Conference on Coastal Sediments 2019. St. Petersburg, Florida, United States.*

Rey, A., Mulligan, R., Boegman, L., Filion, Y., da Silva, A. M., Champagne, P. (2018). "Impact of Control Structures on Hydraulic Retention Time in Wastewater Stabilization Ponds." *1st International WDSA / CCWI 2018 Joint Conference, Kingston, Ontario, Canada, Y. Filion and M. Hulley, eds.*

Mahyari, F., **Rey, A.,** Boegman, L., (2018). "Three-dimensional simulation of hydrodynamics and water quality in a wastewater stabilization pond." *1st International WDSA / CCWI 2018 Joint Conference, Kingston, Ontario, Canada, Y. Filion and M. Hulley, eds.*

da Silva, A. M. F., Mumford, K. G., Mirzaei, S. H. S., Fruetel, C., **Rey, A.** (2016). "Physical and numerical modeling of hyporheic flow through a gravel bar." *River flow 2016: proceedings of the International Conference on Fluvial Hydraulics, G. Constantinescu, M. Garcia, and D. Hanes, eds, 1364–1369.*

Manuscripts In Progress

Rey, A., Mulligan, R., da Silva, A. M., "Validation of an Empirical Equation Relating Wind and Currents in Partially Enclosed Coastal Environments." *In preparation for submission to the Journal of Environmental Engineering*

Rey, A., Mulligan, R. "Long term Validation of a Real-Time Forecast of Coals Waves and Hydrodynamics." *In preparation for submission to the Journal of Geophysical Research: Oceans*

Mahyari, F., **Rey, A.,** Mulligan, R., Boegman, L. "Three-dimensional Biogeochemical and Water Quality Simulation of a Wastewater Stabilization Pond." I*n preparation for submission to Ecological Modelling*

Daudelin, F., **Rey, A**., Champagne, P., Mabee, Warren. "Temperature Models for Uncertainty-based Design of Waste Stabilization Ponds." *In preparation for submission to the Journal of Waste Process Engineering*

Halliwell, L., **Rey, A**., Shirkhani, H., Hall, G., Champagne, P. "Three-dimensional Hydrodynamic and Water Quality Behavior of a mid-Ontario Waste Stabilization Pond" *In preparation for submission to the Journal of Environmental Engineering*

Halliwell, L., **Rey, A**., Shirkhani, H., Hall, G., Champagne, P. "Climate Change Impacts on the Water Quality and Hydrodynamic Behavior of a Waste Stabilization Pond." *In preparation for submission to the Journal of Environmental Engineering*

Presentations

Rey, A. (2021). "Introduction to applying Delft3D to shallow coastal environments". *Baird and Associates, Ottawa, Ontario.*

Rey, A., Mulligan, R. (2020). "Real-time high-resolution forecasting of the coastal ocean during a hurricane." *Ocean Sciences Meeting 2020- San Diego, California, United States.*

Rey, A., Mulligan, R. (2018). "Three-Dimensional Modelling of an Operational Wastewater Stabilization Pond." *Young Coastal Scientists and Engineers Conference – Americas, Mérida, Yucatán, México.*

Rey, A., Sauder, M., Mulligan, R., Boegman, L., Filion, Y., da Silva, A. M., and Champagne, P. (2017). "Modeling and validation of stratification and hydrodynamics in a wastewater stabilization pond using Delft3D." *S2Small2017 Conference on Small Water & Wastewater Systems and Resources Oriented Sanitation- Nantes, France.*

Academic Service

- Reviewer for the Journal of Geophysical Research: Oceans.
- Reviewer for the Journal of Water Resources Planning and Management.

Committee and Community Service

Grant Review Team ▪ September 2018 – May 2020
Ontario Trillium Foundation ▪ Kingston, Ontario

- Provincially appointed committee for review of applications to the Ontario Trillium Foundation.
- Critically evaluated grant proposals against a set of criteria to maximize foundation impact.

Research Advisory Committee ▪ May 2018 – May 2020
Beaty Water Research Centre, Queen's University ▪ Kingston, Ontario

- Assisted with identifying possible grant and research funding streams.

Senate Residence Committee ▪ September 2016 – May 2020
Queen's University ▪ Kingston, Ontario

- Member of the oversight group for the Queen's residences system.
- Lead a feasibility assessment on extending discount dining hall lunches to teaching assistants.

Municipal Appeals Committee ▪ November 2017 – December 2019
City of Kingston ▪ Kingston, Ontario

- Municipally appointed citizen representative on the appeals committee
- Adjudicated appeals following the Statutory Powers Procedures Act under City of Kingston bylaws.

Teaching Experience

- CIVL 200 TA: Professional Skills II — Instructor: Dr. Cole Van De Ven
- CIVL 460 TA: Civil Engineering Design and Practice (Capstone) — Instructor: Dr. Kent Novakowski
  - Recipient of the Dean's Teaching Assistant Award
- CIVL 455 TA: River Engineering — Instructor: Dr. Ana Maria da Silva
- CIVL 372 TA: Municipal Engineering — Instructor: Dr. Yves Filion
- Graduate student mentorship on Delft3D, Field Methods, and Data Processing
- Authored a "Numerical Modelling Mathematical Derivations" reference and resource booklet.

Awards and Recognition

- Robert J. Mitchel Prize (2018)
- Dean's Graduate Research Assistant Award (2018)
- Aquahacking Startup Competition Finalist (2018)
- Dean's Teaching Assistant Award (2018)
- S.D. Lash Scholarship (2016)
- NSERC Undergraduate Student Research Award (2015)

Professional Credentials

- Engineer-In-Training (EIT), Professional Engineers of Ontario
- Ontario Society of Professional Engineers
- American Geophysical Union

Languages

- English – First language
- French – Intermediate Proficiency

Recent Project Experience

Confidential Project ▪ 2021 - Ongoing
Confidential Client ▪ Confidential Location

- Leading the primary setup and calibration of a coupled hydrodynamic and water quality numerical model to understand the fate and transport of methylmercury in a river system.
- Jointly developed a mercury cycle plug in module for Delft3D.

Road Flooding Forecast System ▪ 2020
RISE Innovation Challenge ▪ Virginia Beach, VA, USA

- Team member on an innovative project to provide flood reports to the community in real time.
- Designed and implemented an algorithm for emergency operators to integrate water level observations with flood catchment zones and elevation information to estimate road flooding.

Confidential Project ▪ 2020 - Ongoing
Confidential Client ▪ Confidential Location

- Provided modelling, visualization, and analysis support as part of a contamination libation project.
- Led the primary setup, calibration, validation, and reporting of a combined hydrodynamic and sediment transport numerical model.
- Developed techniques for clearly quantifying and assessing the fate of contaminated sediment.

Barbados Wave Forecast Data Portal ▪ 2020
Coastal Risk Management and Assessment Program ▪ Barbados

- Part of a collaborative team responsible for the design and development of a customized interactive web site to display forecasted and observed wave statistics at several key sites.
- Required integrating data from several unique sources into a combined database.
- Applied several techniques to show data clearly and intuitively.

Mid Breton Sediment Diversion ▪ 2019 - Ongoing
Louisiana CPRA ▪ Plaquemines Parish, LA

- Supported the development of a sediment and vegetation modelling projects for a large sediment diversion project on the Lower Mississippi River (LMR).
- Assisted with sediment and vegetation analysis, classification, and modelling.

Confidential Project ▪ 2020
Confidential Client ▪ Confidential Location

- Implemented two coupled numerical wave-hydrodynamic models to assess impact of a proposed navigation channel on water levels as part of a port development near a mangrove area.
- Applied a unique tidally varying roughness using recent research to improve model performance.

Ongoing Projects

DUNEX-RT ▪ September 2019 – Ongoing
https://coastlines.engineering.queensu.ca/dunexrt/

- Realtime Delft3D model of the Outer Banks region in North Carolina, USA.
- Forced at the boundaries using results from large-scale models (WWIII, NCOM, HRRR).
- Publicly accessible web interface with updating maps and model validation at multiple sites.

Pirate Weather ▪ March 2020 – Ongoing
https://pirateweather.net/

- Provides HRRR and GFS weather forecast as a public API.
- Built using a serverless architecture on Amazon AWS.