

EDUCATION

PhD Environmental Systems Engineering (2016 -2021)

University of Regina, Faculty of Graduate Studies, and Research

Project Funded by Fedoruk Centre, Small Modular Reactor Site Selection in Saskatchewan: Site Selection Risk Assessment with Focus on Surface Water Availability and Dissolved Strontium Monitoring.

Research focused on water quality and availability to support SMR construction and operation over the lifetime of the infrastructure. Climate change and water availability were a large part of the research. Additionally, water quality as a requirement for operation and safety were also addressed through the work. Another objective was to develop a model that aids in the assessment of the fate and transport of strontium in surface waters in natural environment conditions. An experiment involving water tests and minerals precipitation observation was performed in the field. The ICP-MS is used in water samples analysis for metals, where distribution of the species and saturation state of minerals along with surface complexation model was performed using PHREEQC program. Sample media was analyzed using XPS and Raman spectroscopy. The information collected was used to develop the strontium precipitation potential model that can be used in surface water quality assessment. The tool was then applied to different rivers in the province and strontium precipitation potential was estimated.

MASc Environmental Systems Engineering (2010 - 2014)

Analysis and Optimization of Ozone Assisted Biological Filtration
University of Regina, Faculty of Graduate Studies, and Research

BASc Environmental Systems Engineering (2005 - 2010)

University of Regina, Faculty of Engineering and Applied Science

RELEVANT EXPERIENCE

Vista Springs subdivision development, SK.

Water quality and quantity assessment with the objective to determine proper treatment and municipal infrastructure required for potable water delivery. Preliminary report on optimum water treatment systems options along with capital and operational cost submitted to the client. (April 2022)

Helmeken Island Residence, British Columbia.

Water quality and quantity assessment with objective to determine the proper treatment required for potable use of the water. (July 2021)

Melville WTP, SK – Lead Process engineer for SaskWater.

Selecting pretreatment, type of membranes, and blending ration for raw water coming from Hatfield aquifer. Optimization of the new plant after commission with focus on green sand filtration optimization, CIP frequency, water blend ration to minimize the use of the treatment chemicals.

(2020)

Membrane Autopsy – Nano filtration plant in Town of Craik

Physical destruction and analysis of the NF membranes used in water treatment. The membranes failed after 2 years of operation. The analysis assisted in determination of the main cause of the membranes plugging. Report with detailed analysis, explanation and recommended operational improvements was produced for the community. (July 2022)

Reverse Osmosis Plant, Pilot Butte, Saskatchewan.

Determination of the main cause of membrane fouling and provide recommendations. (March 2020)

Plant Optimization

RM of Manitou Beach, Saskatchewan.

Determining the main cause of frequent membrane replacement and provide optimization recommendations. (September 2019).

Town of Big River (January 2023)

Biological Filtration followed by RO membranes built in 2021. Autopsy of the first element showed clay build up on the membrane. Investigation of the issue is resolved. Recommendations with corrective actions have been forwarded to the community.

Town of Bengough (August 2022)

Biological Filtration followed by NF membranes built in 2020. Corrective action plan created in order to correct the poor bio filtration performance and to improve membrane train operation and maintenance. After the corrective actions were implemented, the plant started operating significantly better.

RM of Manitou Beach, SK (September 2019)

Data analysis of the WTP performance supported identification of the main cause of frequent membrane replacement.

Membranes in Water Treatment Workshops (0.6 CEU by OCB)

Ongoing courses for water treatment plant operators on RO and NF membranes operation, maintenance, and troubleshooting. (January 2019- ongoing)

CURRENT EMPLOYMENT

November 203 – Present

Principal Engineer – **DE Water Solutions Inc.**

Engineering in Water and Wastewater Treatment, Regina

I specialize in water and wastewater treatment processes and design as well as optimization of conventional and membrane treatment plants. As a part of the troubleshooting process, I perform membrane autopsies. As part of the autopsies, I perform a number of tests which I provide data interpretation for the vacuum and membrane integrity tests. I send materials for further testing such as ICP Whole Rock Assay for MS, MS Fusion Trace Element, SEM imaging. These are a few of the techniques I employ when analyzing different materials and identifying contaminants.

October 2017 – Present

Water and Wastewater Engineer – **Integrated Water Systems Inc.**
Engineering & Research in Water and Wastewater Treatment, Regina

I specialize in wastewater and water treatment processes design as well as optimization of conventional and membrane treatment plants. As a part of the troubleshooting process, I perform membrane autopsies. I completed a number of tests while providing interpretation of the results from the both the vacuum and membrane integrity tests. I send materials for further tests such as ICP Whole Rock Assay for MS, MS Fusion Trace Element, and SEM imaging. These are a few of the techniques I employ when analyzing different materials and identifying contaminants.

I am well versed in cold climate infrastructure operation and design. Additionally, I have outstanding skills in troubleshooting using data analysis/interpretation and environmental monitoring.

I am the owner, project manager, principal researcher, and technical resource at the company.

I am very skilled in project management, pilot project/experiment set up, data analysis, interpretation, and recommendations. Risk management is an integral part of my work.

February 2023 – Present

Manager, Integrated Engineering Services, **City of Regina**
Sustainable Infrastructure, Regina

I am accountable for the management of the Integrated Engineering Services Branch within the Department of Sustainable Infrastructure. In this position I am providing strategic leadership and advanced multi-disciplinary engineering expertise in support of effective and efficient strategy in planning, construction, and upgrade of municipal infrastructure services to support growth, meet regulatory requirements and meet service level for transportation, water, wastewater and drainage systems and the provision of related services.

My branch bears the responsibility for prioritization of short, intermediate, and long-term infrastructure planning and delivery. To support our work prioritization process we conduct feasibility studies, pilot projects and data collection. Using those results we prioritize the projects in a manner that will increase the efficiency of the infrastructure.

October 2015 – December 2022

Specialist Engineer - **SaskWater**
Engineering Support & Research, Regina

I provided support to the corporation through collaboration with Senior Management, Construction Management, and Operations Division. In support of Senior Management/Executives, I developed a strategy on GHG reduction performance measurement and forecast.

I provided support to Construction Management, and Operations Division by determining and recommending effective design of the infrastructure as well as optimization, ground water monitoring and data analysis. High level summary of the work:

- Lead in municipal infrastructure design and RFP documentation.
- Identifying critical infrastructure upgrade requirements through waterworks operations performance analysis.

- Identifying major factor(s) contributing lower than optimum performance within the treatment train at water treatment plants (WTP).
- Pilot projects design, monitoring, and performance analysis.
- Monitoring performance of the lagoon(s) through wastewater quality analysis and making performance improvements recommendations.
- Member of in-house Green House Gases committee. Developed a strategy on GHG determining a baseline, measurement, reporting, forecasting. Working to bring innovation in reduction of GHG footprint.

OTHER EMPLOYMENT

January 2023 – April 2023

Sessional Lecturer - **University of Regina, Regina, Saskatchewan**

Developing and teaching an undergraduate class –ENEV 469 Groundwater Development and Contaminant Transport. The class focuses on geology of aquifers, geochemistry of the aquifers, interaction and interconnection of surface and ground water, waste management and impact on water resources.

August 2014 – October 2015

Water Systems Manager - **Ministry of Central Services**

Property Management Division, Sustainability Branch, Regina

- Monitoring of BOMA and LEED buildings performance and recertification qualifiers
- Project management – from RFQ, RFP, construction to project closure.
- Ongoing optimization of newly created strategic plan for the identification of priority facilities where there are opportunities to increase water conservation through water retrofit projects.
- Ensuring that all waterworks and wastewater works owned by the Government of Saskatchewan are maintained in compliance with current regulations.
- Summer staffs' direct supervision.

While in the position I performed a gap analysis of existing waterworks and wastewater works operations. My findings resulted in a number of required improvements. Some notable improvements are as follows:

- Initiated and ensured a budget allocation for waterworks and wastewater works Operator's training and certification.
- Organized and executed an investigation and improvements into the quality of water in treatment facilities and buildings throughout Northern Saskatchewan. This investigation uncovered numerous inefficiencies with regard to the operational alignment with Regulations. Provided with these findings I directed restructuring of operational procedures and implemented numerous water supply upgrades.

May 2010 – August 2014

Approvals Engineer - **Water Security Agency Saskatchewan (WSA)**

Environmental and Municipal Management Services Division (former branch of Ministry of Environment), Regina

I was in a lead position for monitoring surface water quality of transboundary streams in collaboration with Environment Canada for 4 years. As a part of the program, I initiated and

completed Metagenomic sampling of the transboundary streams and sensitive water bodies in southern Saskatchewan over a period of time in 2012.

- My daily responsibilities consisted of review of applications and related documentation for issuance of permits to construct new, extend or alter existing waterworks such as water treatment, booster stations and distribution system; or sewage works such as lagoons, lift stations, distribution systems. I also wrote reports and worked on policy development.
- Stakeholder Management was through cooperation with cross functional regional branches of WSA to maintain compliance in surface water sampling program co-funded by Environment Canada from May 2010 to March 2014.
- Assisted with MWWE sampling regime and data analysis.
- Accompanied Environmental Project Officers in their routine inspection of water and wastewater works as well as landfill inspections ensuring that operation and management of the facilities were in compliance with provincial regulations.

PROFESSIONAL MEMBERSHIP

Professional Engineer, Association of Professional Engineers & Geoscientists of Saskatchewan (APEGS)

Professional Engineer, Association of Professional Engineers & Geoscientists of Alberta (APEGA)

Permission to Consult, Water and Wastewater, Association of Professional Engineers & Geoscientists of Saskatchewan (APEGS)

Class 1 Water Treatment Operator Certificate, Operator Certification Board of Saskatchewan

TRANSFERABLE SKILLS

Outstanding analytical and research abilities

- Effective time management
- Effective team player
- Results driven

PUBLIC SERVICE

- Papers reviewer for The International Water Association – IWA World Water Congress & Exhibition (2024, Toronto)
- Membranes – Similarities and Differences in Operation, presented at SWWA in 2023, Saskatoon, SK
- The Saskatchewan First Nations Water Association Annual General Meeting, Conference, Trade Show & Banquet, September 19-21, 2023 – scheduled to present two workshops on membranes.
- Ongoing online and in- person workshops:
 - Membranes in Water Treatment:
 - MF & UF Operation (3 credit hours)

- NF & RO Operation (3 credit hours)
 - Membranes in Water Treatment (6 credit hours)
 - Ammonia and Chlorine in the Water (3 credit hours)
- Member of the Canadian Advisory Committee (CAC) of ISO/TC 282 Water re-use
 - Subcommittee 1(SC 1)- Treated wastewater re-use for irrigation
 - Subcommittee 2(SC 2)- Water re-use in urban areas
 - Subcommittee 3(SC 3)- Risk and performance evaluation of water re-use systems
- Mentor to the future Virtual School of Communications Research (VSCR) 2022 participants, Bosnia & Herzegovina Futures Foundation 2022
- Judge for 3MT competition 2021-22, Bosnia & Herzegovina Futures Foundation
- Abstracts reviewer for IWA World Water Congress and Exhibition, scheduled for September 2022, Copenhagen, Denmark
- Retention Ponds for Water Treatment Plants Residuals, Association of Consulting Engineering Companies Saskatchewan (ACEC-SK) & SaskWater Virtual Tech Exchange - Improving Infrastructure Sustainability, 2022
- Ammonia and Chlorine in Water, presented at SSWA in 2021, Saskatoon, SK
- Pyrolusite – Filtration Media, presented at CWC and SSWA in 2017, Saskatoon, SK
- Analysis and Optimization of Ozone Assisted Filtration System Used in Surface Water Treatment in Saskatchewan at 2014 CWC conference, Regina SK
- Moderator at Canadian Coalition of Women in Engineering, Science, Trades and Technology (CCWESTT) conference held on May 22-24, 2014.
- Review and organization of technical program for the 16th Canadian National Conference on Drinking Water (CNCDW) that is scheduled for the October of 2014 in Gatineau, Québec
- Assisting in organizing the technical workshops and facilities for 2014 Western Canada Water (WCW) conference scheduled for September 2014 in Regina.
- Wastewater Regulated by WSA, SSWA Workshop, May 31, 2013, Moose Jaw
- Analysis and Optimization of Ozone Assisted Filtration System Used in Surface Water Treatment in Saskatchewan at 2014 CNCDW, Gatineau QC
- Fluctuation of Metals in Qu'Appelle River in Period from 2008-2012, at Bridging Environmental Science, Policy, and Resource Management, 2013 Joint Scientific Congress of the CMOS, CGU, and CWRA, May 28, 2013, Saskatoon

SCHOLARSHIP AND AWARDS

- University of Regina, Graduate Scholarship University of Regina, 2019
- University of Regina, Graduate Scholarship University of Regina, 2018
- University of Regina, Graduate Scholarship University of Regina, 2017
- University of Regina, Scholarship University of Regina, Summer/Fall 2016
- Silverhill Institute of Environmental Research and Conservation, 2012 Award recipient-Major Grant

PUBLICATIONS AND CERTIFIED WORKSHOPS

1. Zanicic E; McMartin DW. 2022. Calibration and Validation of Calcium Carbonate Precipitation Potential (CCPP) Model for Strontium Quantification in Cold Climate Aquatic Environments, <http://www.mdpi.com/2076-3298/9/6/74>

2. Zanacic E; McMartin DW. 2022. Analogue Application of Behaviour and Transport of Naturally Occurring Strontium in Cold-Region Aquatic Environments to ⁹⁰Sr; <https://www.mdpi.com/2076-3298/9/6/72>
3. Zanacic E. 2021. Small Modular Reactor Site Selection in Saskatchewan: Site Selection Risk Assessment with Focus on Surface Water Availability and Dissolved Strontium Monitoring. Doctoral (PhD) Thesis. University of Regina, Canada.
4. Zanacic E; McMartin DW; Stavriniades J. 2017. From source to filter: changes in bacterial community composition during potable water treatment, Canadian Journal of Microbiology 63(6): 546-558. DOI: 10.1139/cjm-2017-0077
5. Zanacic E; Stavriniades J; McMartin DW. 2016. Field-Analysis of Potable Water Quality and Ozone Efficiency in Ozone-Assisted Biological Filtration Systems for Surface Water Treatment, Water Research 104: 397–407. DOI: 10.1016/j.watres.2016.08.043
6. Khalil B, Ou C, Proulx-McInnis S, St-Hilaire A, Zanacic E. 2014. Statistical Assessment of the Surface Water Quality Monitoring Network in Saskatchewan, Water, Air, & Soil Pollution 225:2128. DOI:10.1007/s11270-014-2128-1
7. Zanacic E. 2014. Analysis and optimization of Ozone Assisted Biological Filtration Systems Used in Surface Water Treatment. Master of Applied Science (MAsc) Thesis. University of Regina, Canada. [LINK](#)

Operator Certification Board of Saskatchewan Certified Workshops (search Integrated Water Systems Inc. in <https://saskocb.ca/wp-content/uploads/CEU-Approved-Listing-March-24-2023.pdf> , document)

- Membranes in Water Treatment – online and classroom (0.6 CEU)
 - Biofiltration and membranes in water treatment (0.6 CEU)
 - NF & RO Membranes Operation – online and classroom (0.3 CEU)
 - MF & UF Operation – online and classroom (0.3 CEU)
 - Ammonia and Chlorine in the Water (3 credit hours)
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