



AquaEo<sup>LTD</sup>  
Environmental Solutions

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# Aqua-Eo Ltd.

Mining - Oil & Gas Exploration Technologies



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President & CEO

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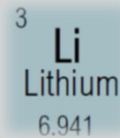
# **MISSION**

A GREEN TECHNOLOGIES LEADER IN ENGINEERING, OPERATIONS, AND MANAGEMENT OF STRATEGIC METALS MINING, OIL AND GAS EXPLORATIONS, AND TAILINGS. THE PRINCIPAL MISSION IS TO CREATE AND DEVELOP FEASIBLE, OPERATIONALLY AND ENVIRONMENTALLY SUSTAINABLE TECHNOLOGIES FOR THESE INDUSTRIES.

# Objectives

## *Lithium & Strategic Metal Technologies:*

- To pretreat and precondition oil and gas operations and geothermal brine deposits. Guarantee end product purity with minimal refinement operations and related costs.
- Reduce/eliminate the footprint and the retention time for evaporation/concentration ponds. Implementing flotation instead of sedimentation.
- All-season operations, eradicating operations variables factoring production.
- Mining operations effluent treatment and recycling to manage mining operations tailings



Brine (~160 – 1,400 ppm Li)  
Surface evaporation of Li from saline water



Granitic pegmatites  
Hard rock mining

# Objectives-



## *O&G Operations Effluents:*

- To offer a safer, greener alternative to disposal by providing a cost effective method of re-using and recycling effluent from oil and gas field operations.
- To reclaim surface waters impacted by Hydraulic Fracking Flowbacks, Produced Water and Emulsion Water Spills into ponds, lakes and ground water reservoirs back to aquatic life surface release criteria.
- To achieve Zero Discharge Liquide (ZDL) recycling Oil & Gas Flowbacks, by processing effluents treatment concentrates to harvest strategic mineral and metals.



# Technology

Aqua-Eo is an industrial products/technology and engineering company related to strategic metals mining explorations, industrial wastewater treatment, and remedial technologies. The developed technologies are customized to mine metals from ore or oil and gas production operations and hydraulic fracturing (FRAC) operations and to treat residual tailing and oil and gas flowbacks to meet surface release and/or recycle/reuse criteria.

AquaEo's Eo-Cycle Industrial Effluents Treatment & Mining's Refinement System: Comprises of 4 stages.

- ✓ Eo-Sep Unit (**Core stage** in treating and refining O&G-produced waters and mining brines.) With the in-house-developed chemicals and chemical formulas, this developed technology is the principal stage of extracting minerals from ore brines and O&G flowback operations lithium concentrates recovery.) **This unit can handle effluents with up to 30 wt.% total dissolved solids.**
- ✓ Eo-Clear Unit
- ✓ Eo-Pure Unit (**Main stage in concentrating dissolved solids to 120,000 ppm concentrates.**) A main stage in dilute lithium purity sequestering and concentrations boost.
- ✓ Eo-Ultra Unit



## Eo-Sep System

- An oil-suspended solids-water separation system can treat water at over 1 m<sup>3</sup>/min. It breaks effluents surface tension and forms sustainable flocs that will clear such effluents from impurities for subsequent mineral extraction for higher metals purity, oil and gas flowbacks effluent treatment, and mining's tailings treatment.
- Uses **customized bubble technology that controls the bubble generation saturations and bubble size** to attach, separate, and lift particles from the aqueous medium and ores washout to the surface.
- Uses in-house developed proprietary **chemical formulas to break effluents' surface tension and form stable and extractable flocs.**
- It uses in-house developed proprietary **selective ionic, cationic and non-ionic chemical formulas to oxidize metals and minerals** and remove them from the aqueous medium as floating flocs.
- Capable of sequestering metals/minerals, and treating Oil and gas effluents removing majority of the total suspended solids, hydrocarbon, and oxidizing up to 30 of the total dissolved solids into suspended solids for separation.





## Eo-Clear System

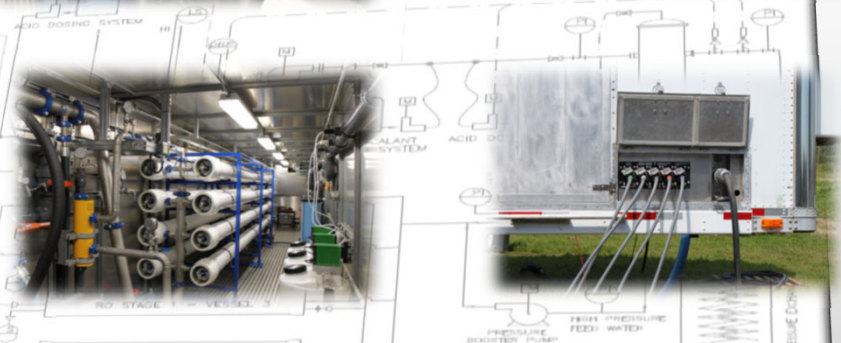
- Pre-treats and precondition mining partially treated tailings for the concentration and sequestering stage.
- Is a media based treatment system that cleans water to  $< 1$  micron absolute particle size at a rate of  $1\text{m}^3/\text{min}$ .
- Removes majority of oxidized and other suspended organics/inorganics solids. Reduces (Polish) hydrocarbons content and other solids particulates including colloids, and silt.

This system has many applications on its own and as part of our Aqua Cycle-Eo system it plays a key role in pre-treating/pre-filtering the water for our Aqua-Pure unit.



## Eo-Pure

- Batch desalination/reverse osmosis system. 45-92% return processing put-through at 1m<sup>3</sup>/min.
- Key component in concentrating targeted minerals with input concentration of 5-8 wt%.
- Key component in treating tailing effluent for recycling applications, water conservation, and tailings footprint reduction
- The Pure-Eo unit will remove up to 99.9% of organic/inorganic carbon including hydrocarbons, NORMS, bacteria, viruses, and reduce the total dissolved solids to 500 ppm.



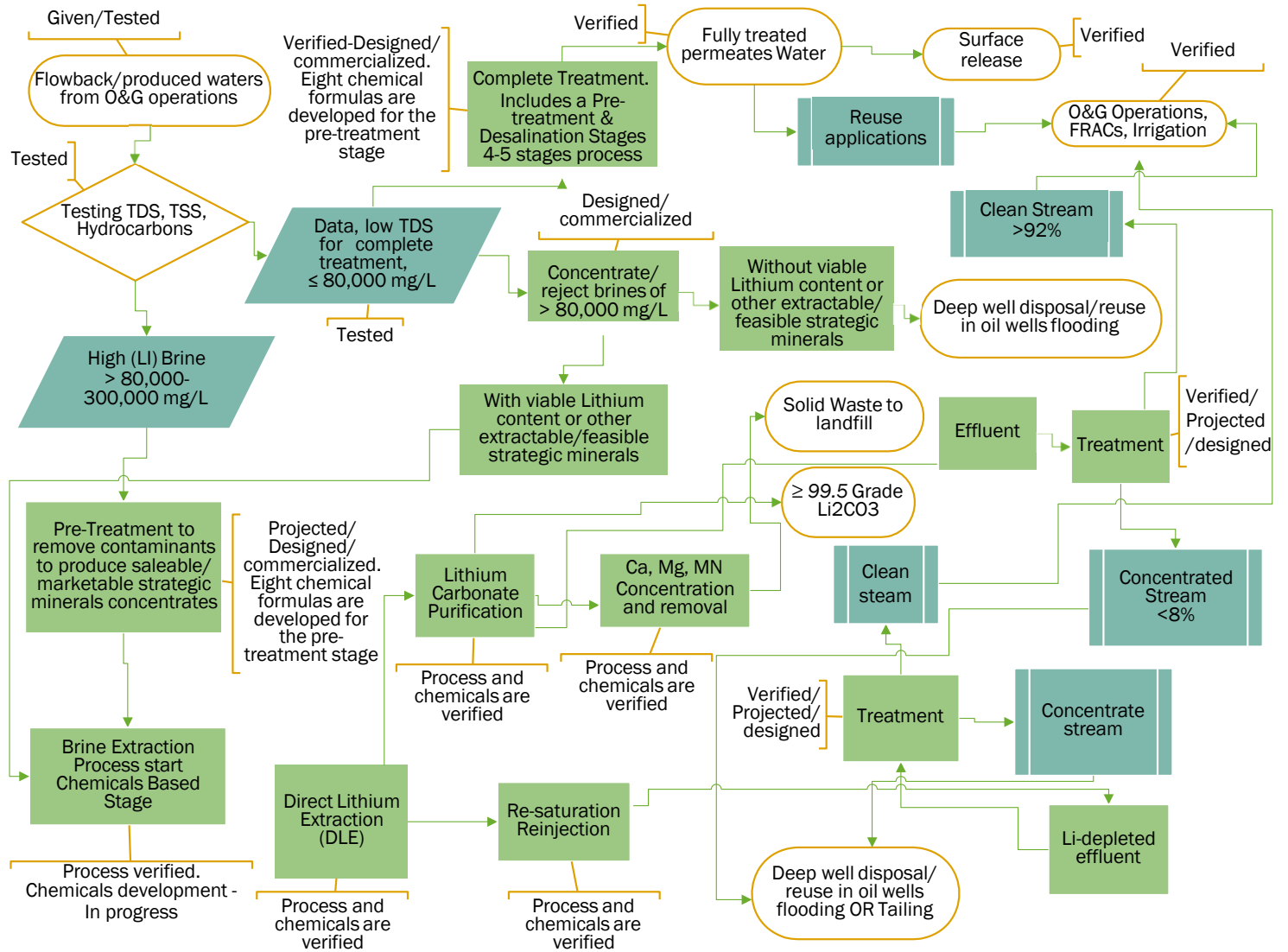
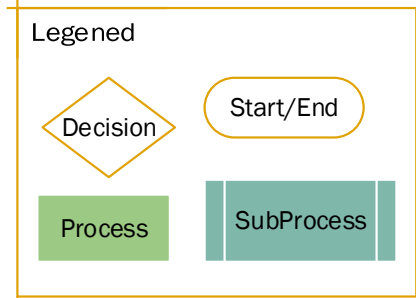
## Eo-Ultra

- Activated granulated carbon (GAC) system. Key stage in treating the end stream to allow its return back to nature or reincorporate it back into the production stream for reuse.
- Adsorbing residual volatile hydrocarbon benzene, ethylene, toluene, ethylbenzene and xylene (BETEX), and residual chlorines.

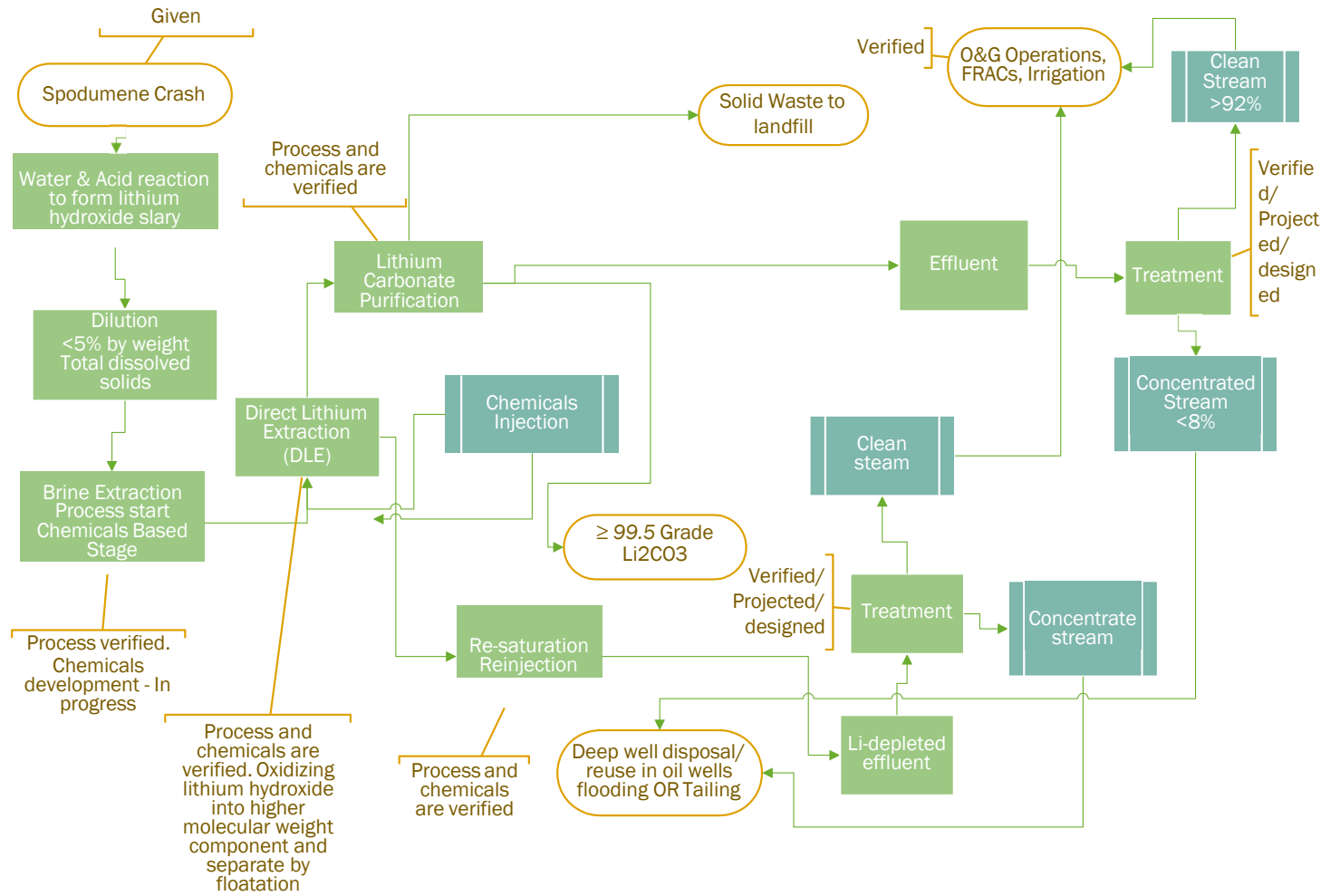
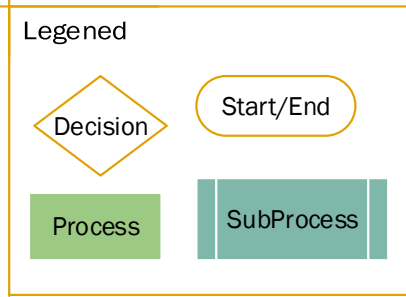




# Lithium Extraction and Processing from O&G/Geothermal Brines with Water Usage & Effluent's Treatment/Recycle & Tailings



# Lithium Extraction and Processing from Spodumene Generated Brines with Water Usage & Effluent's Treatment/Recycle & Tailings



# Aqua-Eo Milestones Timeline

## Start

Started R&D and Piloting treating O&G flowbacks for Surface release applications.

The company completed and deployed its first mobile commercial system with a treatment capacity of 1 m<sup>3</sup> per hour. The system conducted a spill cleanup for Harvest Energy in Viking, AB. Cleaned another spill for Harvest in 2012—treated flowback for Petro Bank in Weyburn and Estevan, Saskatchewan.

- Completed treating to surface discharge quality testing on frac water flowback for Jupiter Energy in Grand Cash in association with AER
- Treated an emulsion water spill for Twin Butte. Treated a leachate spill for Ridgeline in Lloydminster, Progress Energy, and Aquatera in Drumheller
- Treated an emulsion pipeline spill for Trilogy Energy in Grand Prairie. The end product was surface discharged.

- Developing formulas for strategic metals and minerals processing.
- Developed new chemical and formulas and pilot plants to process emulsion type flowbacks with hydrocarbon and total suspended solids content of up to 10 % with > 98 % end product purity and treatment recoveries.

2005

2010-2011

2012-2013

2015-2016

2014

2017-2019

2020-2022

- The company treated an Apache spill in Zama. A total of 110,000 cubic meters were treated for surface discharge.
- The company developed its Eo-Sep unit to handle flowbacks with tight surface tension, heavy hydrocarbons and organic loads of emulsion nature.

- The company treated Apache emulsion spill in Shaklee, Zama. A total of 60,000 cubic meters were treated for surface discharge
- The company developed eight fundamental chemical formulae to precondition and coagulate heavy loads of organics and hydrocarbons from a wide range of hydraulic fracking flowbacks, produced waters, and emulsion spills.

- Completed the design of the second generation of Eo-Cycle technology. The new units' blueprints were generated and ready for further action.
- Conducted bench testing and piloting of > 3,000 effluent sources.
- Developed and optimized selenium treatment operation for metallurgical coal facility in BC.
- Developed, designed and managed oil wells produced water treatment for recycling application for PEMEX in Mexico.

# Value Proposition Aqua-Eo's System

## STRATEGIC METALS MINING

- DIRECT LITHIUM EXTRACTION THAT WILL OUTFRONS LONG TERM RETENTIONS.
- ELIMINATES LARGE FOOTPRINTS FOR BRINE EVAPORATION AND CONCENTRATIONS.
- 40-90 % OPERATION EFFLUENTS TREATMENT AND RECYCLING.
- SIGNIFICANTLY REDUCES EFFLUENT TAILINGS.
- REDUCING OPERATIONS COSTS WITH PROCESS OPERATION EFFICIENCIES EXCEEDS 93%.
- REDUCES THE CO<sub>2</sub> EMISSIONS FOOTPRINT COMPARED TO CONVENTIONAL OPERATIONS.
- REDUCES MINERALS EXTRACTION COST BY 15 % COMPARED TO CONVENTIONAL OPERATIONS.

## O&G FLOWBACK TREATMENT

- REDUCES THE OVERALL USE OF FRESHWATER BY INDUSTRY.
- REDUCES THE DISPOSAL OF EFFLUENTS BY 42-98% AND THE POSSIBLE CONTAMINATION OF GROUNDWATERS.
- > 40% SAVINGS COMPARED TO TRUCKING & DISPOSAL.
- REDUCES THE CO<sub>2</sub> EMISSIONS AND COSTS ASSOCIATED WITH TRUCKING, AND DEEPWELL DISPOSAL.
- DEMONSTRATES A PROACTIVE ENVIRONMENTAL PROGRAM.
- IMPROVES THE QUALITY OF WATER BEING INJECTED INTO DISPOSAL WELLS.

# ELEMENTS DESIGN & SUCCESSFUL TESTING



Projecting



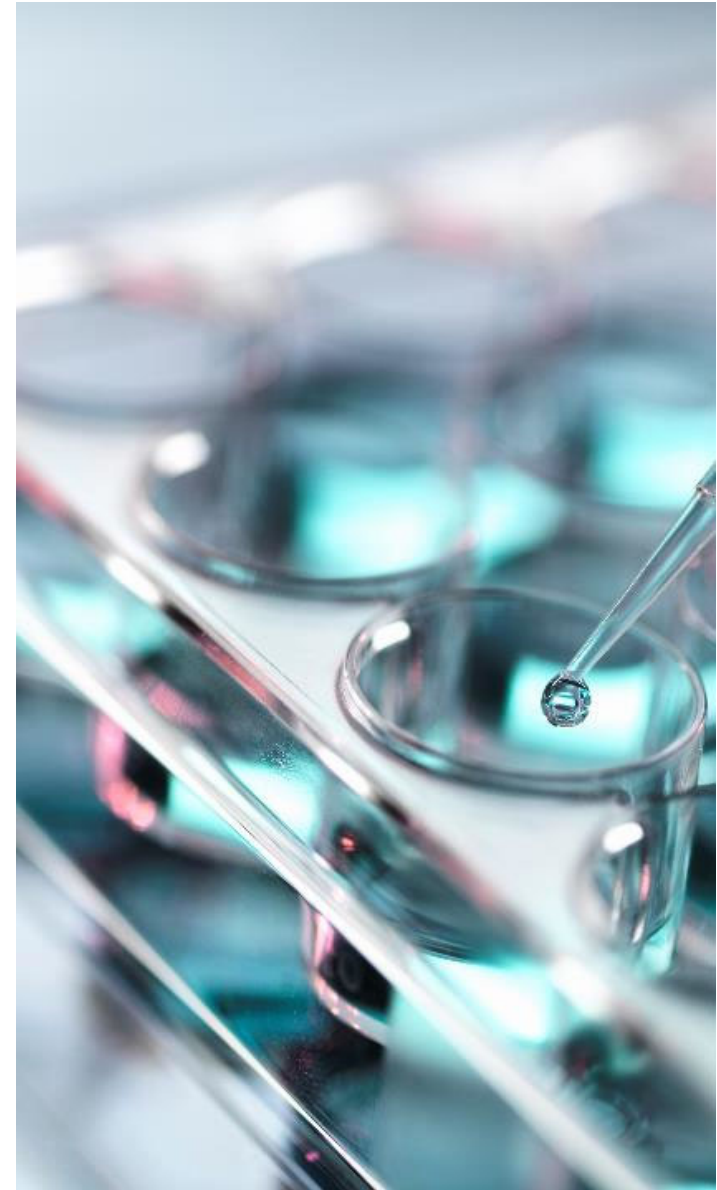
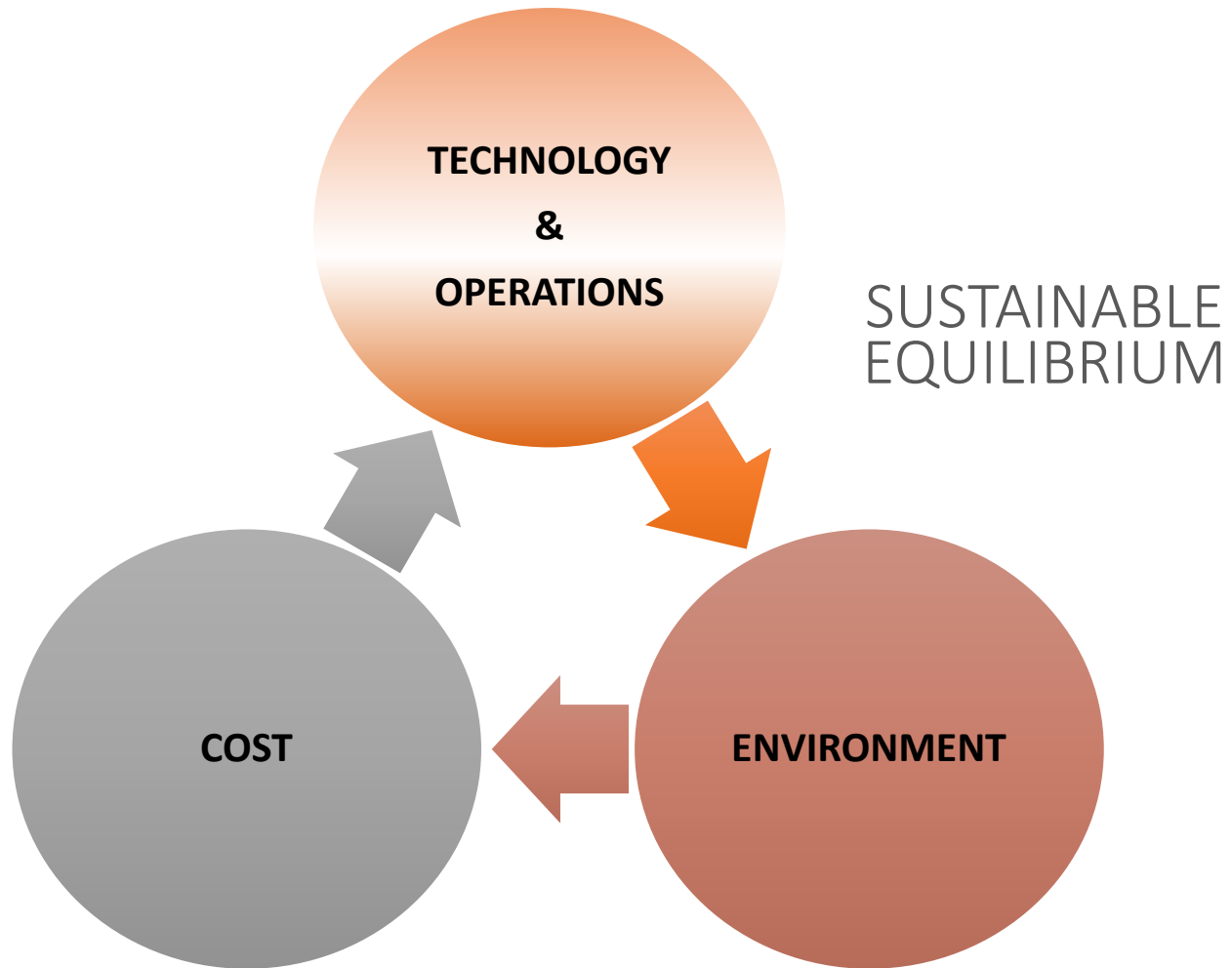
Chemical  
Testing



Formulas



# COMPANY PHILOSOPHY



# Management

## Head Office

Lethbridge, AB  
(403) 892-2838

## Manufacturing Plant

Sparwood, BC  
(250) 425-5073

## Engineering

Calgary, AB  
(403) 607-5005

## Key Personnel



Robin Ray, CEO, CFO

Robin is a CPA with an accounting practice in Lethbridge, and also a journeyman welder. He and his family own a custom fab shop in Sparwood BC. Robin also has twenty years of experience managing water treatment companies.

Mohammed Al-Mofty, PEng., MBA, M.Sc.

Mohammed is a chemical engineer with over twenty years of industrial water/wastewater treatment engineering and operations knowledge. He received his MBA from Smith School of Business in 2019. Possesses a master knowledge of industrial effluent treatment and mining operations. Has developed and engineered processes and chemical formulas for treating diverse produced waters, explorations effluent flowbacks. Also developed processes for tailings selenium and strategic metals sequestering and production and treatment plants principle design and management.

Brett Ray, Mfg. Plant Mgr

Brett has run Rayco Steel in Sparwood BC for the past twenty years building Mining and industrial processes, and other custom fabrication work for the coal industry in the Crowsnest Pass, and oil and gas industry in Alberta and BC.



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## Contact Us

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THANK YOU