Name: Colin T. Carver

Position: Project Geoscientist
Technical Expertise: Geochemistry, Well Testing

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EXPERIENCE SUMMARY

Mr. Carver joined Geologica Geothermal Group, Inc. in late 2017 and specializes in geochemical evaluation and well testing of geothermal resources to support exploration, development, and management strategies. Specific skillsets include two-phase geochemical sample collection and evaluation of brine, gas, and steam chemical composition for resource assessment and management. Mr. Carver has experience in the design, implementation, management, and evaluation of geothermal well testing programs used to determine the production or injection capacities of individual geothermal wells, stimulate wells to increase near-wellbore formation permeability, determine reservoir connection and properties between wells, and gather data used to model wellbore and reservoir behavior. Additional experience includes the design, oversight, and evaluation of downhole wireline surveys and downhole pressure monitoring equipment.

EXPERTISE

Geochemistry Sampling
Geochemistry Evaluation
Geochemical Modeling
Geothermal Well Testing (Production, Injection, Stimulation, and Pressure Interference)
Reservoir Engineering

EDUCATION

B.A. in Chemistry and Environmental Studies, 2015, Lewis & Clark College, Portland, OR.

AWARDS AND CERTIFICATIONS

Certificate in Geothermal Resource Decision-Making: A Module of the National Geothermal Academy at the University of Reno, Nevada

REPRESENTATIVE PROJECT EXPERIENCE

Selected Geothermal Resource Development Projects

International Projects

Electricite de Djibouti

- Preformed primary role in a multi-well testing program that included production, injection, stimulation, and pressure interference testing of deep, high temperature exploration wells. Responsible for technical well test oversight including well test design, SOPs, instrumentation selection; installation; and maintenance, stimulation of wells to begin flow, production/injection testing, geochemical sampling, and subsequent evaluation to determine reservoir characteristics and well production/injection capabilities. Additionally, responsible for project management duties such as flow line

modifications, consumables inventory, procurement of supplies, budgeting, sub-contractor management, and site logistics. All work was in support of a feasibility study and the **Fiale Caldera, Asal Rift, Djibouti.**

PT Sokoria Geothermal Indonesia

- Providing assessment of regional and reservoir geochemistry from exploration through commissioning stages of development to determine geothermal reservoir characteristics, scaling potential, resource capacity, and location of geothermal upflow and outflow. Additionally, providing well test plans and well test analysis, and on-site geochemical sampling and well testing oversight for the 30 MW Sokoria geothermal field near Kelimutu volcano on the island of **Flores, Indonesia.**

Sorik Marapi Geothermal Power

- Providing assessment of regional and reservoir geochemistry from exploration, development, commissioning, and expansion stages of operation to determine geothermal reservoir characteristics, scaling potential, resource capacity, and location of geothermal upflow and outflow. Additionally, providing plans, project management, oversight, and evaluation of well completion testing, well production and injection testing, pressure interference testing and tracer testing of the 240 MW Sorik Marapi field in **North Sumatra, Indonesia.**

Veizades & Associates, Inc.

- Providing chemical modeling of silica scale potential and inhibition with brine acidification by determining proper pH range for silica scale inhibition in a double-flash power plant and injection wells while minimizing corrosion risks for the Rantau Dedap geothermal field in **South Sumatra, Indonesia.**
- Providing chemical modeling of silica scale potential and inhibition with brine dilution for two high-enthalpy wells in Olkaria in **East African Rift, Kenya**

Energy Development Corporation (EDC)

- Providing independent review of existing conceptual model, including geochemistry, production and injection strategies, and resource characteristics. Additionally, providing geochemical modeling of effects of lowering WHP on the chemistry of produced fluids, including NCG emissions, changes to reservoir chemistry, and injection/cold water intrusion in **Leyte, Philippines.**

USTDA (Power Engineers)

- Preformed on-site well test support, geochemical sampling, and analysis for a production test with transient pressure monitoring in **El Ceibillo Geothermal Field, Amatitlan, Guatemala** with Power Engineers as prime contractor**.**

Sis Enerji

- Desktop assessment of reservoir temperature and carbonate and silica scaling potential of moderate temperature geothermal fields in **Tepekoy, Turkey**.

EG Energy

- Desktop assessment of a geothermal concession in Mederas graben, Western Turkey to determine resource potential and future exploration steps in the development of a potential blind geothermal resource in **Karacasu, Turkey**.

Orka Terra

- Desktop assessment of a large geothermal lease, included evaluation of hyper-saline lake water to determine mixing geothermal fluids in moderate temperature springs in the **Magadi, Kenya**.

JRG Energy
- Providing independent review geochemical sampling procedures, lab analysis results, and geochemical interpretations of fumarole gas chemistry and shallow soil gas survey for the Tulu Moye geothermal prospect in **East African Rift, Ethiopia**

Kalahari GeoEnergy
- Providing resource assessment including reservoir temperature and chemistry of a moderate temperature reservoir and regional waters. Evaluation of reservoir chemistry, temperature, and development of a preliminary conceptual model used for targeting slimholes in **Bwengwa River Geothermal Project, Zambia, Africa.**

East Africa Geothermal Energy Facility (EAGER)
- Desktop geochemistry evaluation of 24 known resource areas for the feasibility of further exploration and/or development **Uganda, Africa.**

KS Orka Renewables
- Providing resource assessment including reservoir temperature and chemistry of a moderate temperature, carbonate hosted reservoir. Evaluation of reservoir chemistry, temperature, and development of a preliminary conceptual model to be used for the future development for the Turawell geothermal field in **Tura, Hungary.**

HVC
- Providing independent review of geochemical sampling procedures, lab analysis results, and geochemical interpretations focused on the scaling potential of a low temperature direct use project in **Netherlands, Europe.**

Domestic (USA) Projects

City of Akutan
- Geochemical evaluation of regional and geothermal well brine samples for fluid type determination and geothermal reservoir characterization for **Akutan, Aleutian Islands, AK.**

CalEnergy Operating Corporation
- Geochemical reservoir evaluation and monitoring, temporal analysis of chemical parameters, and reservoir tracer test sampling and analysis in the **Salton Sea Geothermal Field, CA**.

Open Mountain Energy
- Geochemical evaluation of several liquid-dominated, fault-hosted deep circulation geothermal systems including on-site fluid sampling, determination of reservoir temperature, development strategy recommendations, well productivity, and single and multi- well production and injection test support in **Nevada, USA**.

U.S. Navy Geothermal Program Offices
- Preform annual geochemical and production data evaluation to inform short- and long-term reservoir management considering geochemical characteristics of brine and vapor and measurements of pressure, temperature and mass flow to assess reservoir behavior including boiling, condensation, and injection/natural recharge at **Coso Geothermal Field, CA**

Hawaii

- Desktop study of the potential for geothermal energy resources outside of proven resource areas for a confidential client on the islands of **Hawaii and Maui, HI**.

PacifiCorp

- Preforming annual on-site geochemical sampling and subsequent data evaluation to inform short- and long-term reservoir management considering geochemical and production/injection characteristics of wells. Additionally, performing well testing including historical data evaluation, well test design, oversight, and evaluation to determine current injection capacity, changes in injection capacity over time, and sources of diminished or increased injection capacity. Tests were preformed at an operating field, and designed to minimize impacts to power production at **Blundell Geothermal Field, UT**.

Publications

Carver, C. T., Garg, S. K., Davis, L. C., & Jalludin, M. (2019). Reservoir Characterization from Exploration Well Completion Tests in the Fiale Caldera, Djibouti. *GRC Transactions, 43*. Palm Springs: Geothermal Resource Council.