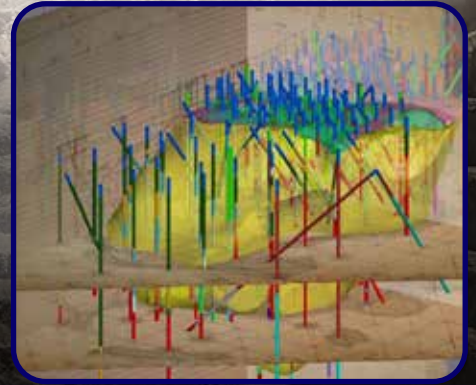




# Responsible Resource **DEVELOPMENT**



**Global Resource Engineering Ltd.**

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[www.global-resource-eng.com](http://www.global-resource-eng.com)

Founded in 2009, Global Resource Engineering (GRE) is a multifaceted engineering firm specialising in the mining industry. Our focus is to add value to your project and company by evaluating and understanding your needs, employing innovative ideas, and applying sound engineering while maintaining an economically driven approach.

We are a dynamic and growing engineering firm whose hallmark of success, through all mining cycles, has been the ability to provide quality, cost effective, engineering and creative solutions for our clients through a highly collaborative approach.

GRE's staff consists of a combination of highly experienced senior level professionals, project managers, technical staff and support personnel.

GRE's wide range of services are available to meet specific needs including mining, metallurgy, geology, water, geotechnical, tailings and environmental consulting.

# SERVICES

GRE's mining and metallurgical experience includes: precious metals, base metals, industrial minerals, coal, battery minerals.

## PROJECT VALUATION AND OPTIMIZATION

- Independent Project Review, Due Diligence
- Multi-Scenario Economic Modeling
- Project Optimization and Trade Off Studies
- Scoping Studies / Preliminary Economic Assessments, Pre-Feasibility Studies, Feasibility Studies
- Technical Reports (NI 43-101, Guide 7, JORC)

## GEOLOGY

- Mapping
- Exploration Program Design
- 3D Geological and Structural Modeling
- Mining Geology Modeling
- Slope Stability and Seismic Hazard Analysis

## RESOURCE/RESERVE ESTIMATION

- Exploration, Resource, and Production Database Creation and Management
- Creation of 2D and 3D Models
- Statistical and Geostatistical Analyses
- Geometallurgical models and Non-parametric Statistics
- Resource and Reserve Estimation and Classification
- Due Diligence Review

## MINING ENGINEERING

- Open Pit Mine Design, Planning and Engineering
- Underground Mine Design, Planning and Engineering
- Auditing and Optimization
- Mine Production and Cost Optimization
- Mining Economics and Finance
- Rock Mechanics and Pit Slope Stability
- Mine Ventilation
- Environmental Audits

## MINERAL PROCESSING

- Test Work Design and Supervision - Crush, Grind, Refractory Ore - POX, BIOX, Leach Tests (CIL/Heap), Flotation, S/L Separation
- Flowsheet Development and Design - MetSim
- Heap Leach Design and Optimization - Cu, Au
- Operating and Capital Cost Estimation
- Financial Modeling
- Auditing, Optimization, and Trouble Shooting

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# SERVICES CONT'D

## MINE WASTE MANAGEMENT

- Industry Standard on Tailings Management
- Tailings Dam Design
- Engineer of Record
- Waste Rock Facility and Global (GISTM) Compliance
- Technology Screening and Risk Assessment
- Geotechnical Stability Analysis
- Geochemical Characterization and Modeling
- Mine Waste Cover Design and Modeling
- Tailings Dam Operations Support
- Dam Safety Inspections
- Monitoring Instrumentation Design and Installation

## HYDROLOGY, HYDRAULICS, AND WATER RESOURCES

- Surface Water Management Plans
- All Aspects of Water Management Systems
- Dambreak and Floodplain Studies
- Channel Restoration
- Site Climatology
- Site Hydrology and Hydrogeology Studies
- Pit Dewatering
- Groundwater Modeling and Monitoring
- Water Balance Studies
- Monitoring Well Design and Installation

## ENVIRONMENTAL MANAGEMENT & SOCIAL RESPONSIBILITY SERVICES

- Acid Rock Drainage (ARD) Prevention and Mitigation
- Reclamation and Closure Planning
- Environmental Studies - (Impact Studies, Baseline Studies, and Geochemical Studies)
- Environmental Management Planning
- Environmental Permitting
- Geofluvial Reclamation Design
- Sustainable Surface Water Management Plans
- Towards Sustainable Mining (TSM) Verifier Services

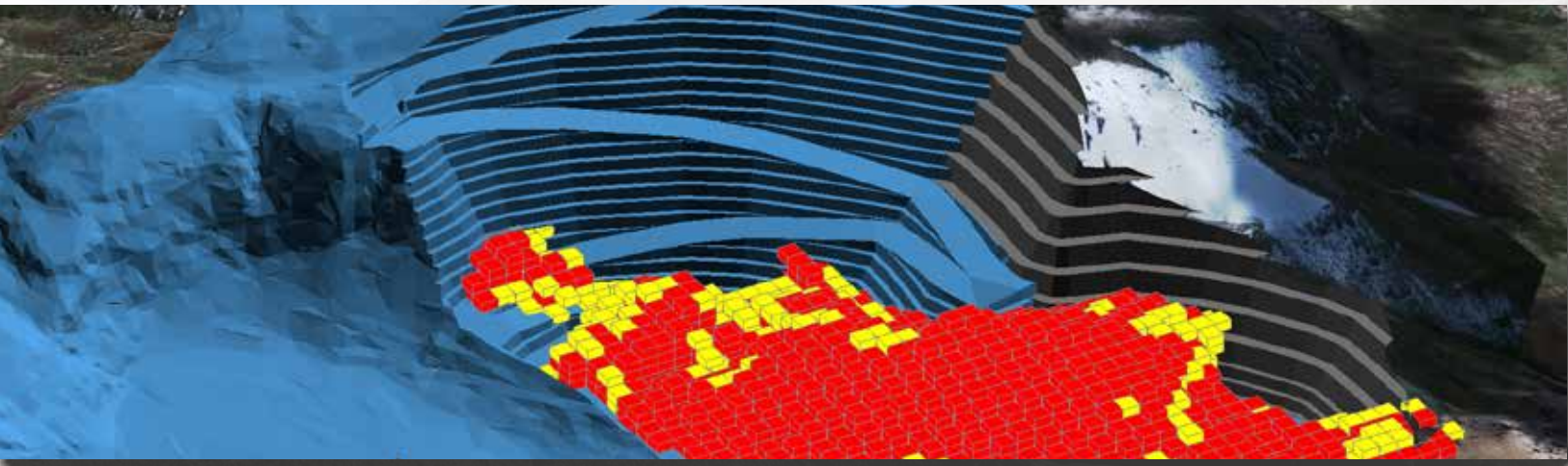
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# SERVICES CONT'D



## GENERAL CIVIL AND GEOTECHNICAL

- Heap Leach Pad and Tailings Facility Design
- Site Grading and Drainage
- Geotechnical Instrumentation
- Foundations
- Access Roads
- Retaining Systems, Tie Back, and Soil Nail Wall Design
- Rockfill and Slope Stability Assessment and Mitigation
- Erosion Control and Best Management Practice (BMP) Plans
- Training For Safe and Environmentally Friendly Operations
- Seismic Monitoring Stations



## SUPPORT SERVICES

- Owner's Engineer
- Independent Engineer
- Engineer of Record
- Construction Quality Assurance
- Construction Management
- Project Management
- Training
- Geotechnical and Materials Testing
- Post-Construction Monitoring
- Trouble Shooting and Remedial Action
- Instrumentation Monitoring



## COMPUTER SYSTEMS AND SERVICES

- Vulcan, GEMS, Datamine, Techbase, Leapfrog, Sage, Micromodel, Carlson, Surpac, Whittle
- Vadose/W, Phreeqc, MODFLOW, HyrdoCAD, GoldSim
- MetSim, Bruno, Pipe Expert, Visio
- GeoStudio, SoilVision, FLAC
- MS Access, Excel
- AutoCAD
- Flow2D
- R

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# TECHNOLOGIES

GRE's employs state of the art technology and systems in the analysis and design of all of our projects.

## PROCESS TECHNOLOGY

GRE's process engineering group have experience with a wide variety of process technologies including:

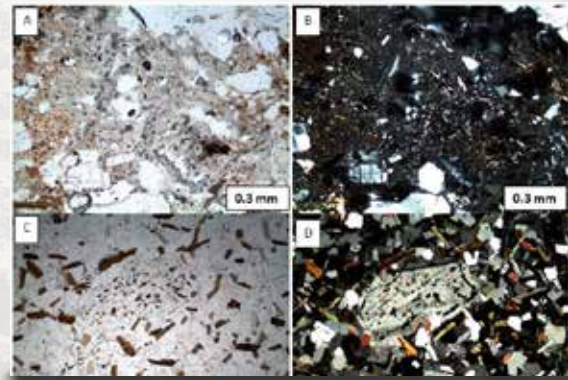
- Flotation - Cu, Mo, Pb, Zn, Au
- Precious Metal Recovery
- Lithium Recovery
- N2Tech Flotation
- Refractory Ore Treatment - POX, BIOX, Roasting
- Heap Biooxidation - gold, copper, zinc
- Ion Exchange
- Membrane Separation
- GeoMetallurgy



## MULTI SCENARIO ANALYSIS (MSA) MODELS

GRE has developed a propriety technique we call Multi-Scenario Analysis (MSA) models. If you are asking yourself, "What happens if?", we can help.

- Project Optimization Using All Project Constraints
  - Metallurgical Performance
  - Milling Rate and Process Options
  - Production Schedule, Cutoff, Pit Shells
- Fast Optimization Tools
- Identify Optimum Economics
  - Capital Costs
  - Operating Costs



## GEOMETALLURGICAL & GEOCHEMICAL CORRELATION MODELING

GRE applies a unique approach to mapping the relationship between process plant performance and ore body characteristics.

- Better Overall Representation of the Local Variability of Metallurgical Response and Relationship to Geology, Geochemistry, and Financial Metrics.
- Cluster Analysis, Recursive Partitioning, and Multiple Adaptive Regression
- Non-parametric Statistical Modeling to Analyze Multiple Variables/ Parameters to Produce Best Fit Process Model
- Produce an Optimum Mine Plan, Production Schedule and Economic Model
- Optimize Sampling and Test Work to Reflect Geomet Gaps



# GRE CORE TEAM

## Todd Harvey, MBA, Ph.D. - President and Principal Process Engineer

Dr. Harvey is a Process Engineer with over 30 years of experience in mining, renewable energy, and technology. He has solid leadership skills with C level experience combined with an excellent technical background and a proven track record of innovation and problem solving across multiple disciplines. Dr. Harvey is a Qualified Person under the Society of Mining Engineers (SME) Registered Member accreditation. Dr. Harvey's experience includes: conventional gold recovery processes and refractory gold pretreatment via pressure oxidation, roasting, biooxidation; conventional base metal processes including flotation, acid heap leaching, heap bioleaching, and stirred tank bioleaching. Dr. Harvey significant international experience, having lived in West Africa, South Africa, and Australia and has conducted a variety of large projects in several other countries including Brazil, Chile, Turkey, Mexico among others. Dr. Harvey has extensive experience designing, performing, and analyzing metallurgical test work, developing process flowsheets and conducting plant audits. He has authored over 20 peer-reviewed technical papers and numerous studies and has presented at a variety of international conferences. He holds patents related to bioheap leaching and biofuels production.

## Terre Lane - Principal Mining Engineer

Ms. Lane is a Mining Engineer with more than 35 years of experience. Her career has included full charge management of feasibility studies, mine and process engineering, and project development for surface and underground greenfield mines, and brownfield expansions. She has experience with a range of minerals, including base and precious metals, coal, potash, beryllium, uranium, talc, and sand and gravel; and she has managed projects throughout the world including the U.S., Canada, Mexico, India, Ireland, Russia, China, Chile, Bolivia, Peru, Costa Rica, Africa, and New Zealand. Ms. Lane's professional experience includes conceptual and detailed engineering, project optimization, project development, construction, start-up, and operations. She has directed engineering studies for numerous mine development projects and has managed engineering and feasibility study budgets as high as \$25M/year. She has been responsible for underground exploration programs in foreign countries. She is an expert at resource estimation and mine design and has completed several hundred projects using all modeling techniques; estimates included: statistical analysis, geo-statistical analysis, inverse distance estimation, Kriging, single stage and multiple Indicator Kriging, geometallurgical modeling, and estimation of error. Her broad range of experience allows her to optimize mining projects to maximum profits by improving the efficiency of both open pit and underground mines. Ms. Lane is a Mining and Metallurgical Society of America (MMSA) Qualified Professional in Ore Reserves and Mining and she is a SME Registered Member.



# GRE CORE TEAM

## Larry Breckenridge, P.E. - Principal Environmental Engineer

Mr. Breckenridge has over 25 years of experience in mine water engineering, focused on hydrogeology, hydrology and geochemistry. His experience includes a diverse array of projects including: Creating stochastic (probabilistic) predictive water balances for mining projects including predicting hard-to-quantify values like runoff from mine-impacted surfaces, seepage from mine waste, and water release from tailings consolidation; Determining and quantifying water-related risk for due diligence projects for major mining investment houses like Orion Resource Partners; Simulating air and water flow through mine waste structures (for geotechnical and environmental applications). This includes dry stack tailings storage facilities; Pit dewatering predictions (underground and open pits); Creating the environmental, water, and geochemistry sections NI 43-101 reports; Characterizing, evaluating, modeling, and preventing Acid Rock Drainage (ARD); Writing mine closure plans with detailed cost assessments; and Assisting with site-wide water management, water conveyance, and water use efficiency. He has worked in North America, South America, Central America, Europe and Asia. Key accomplishments include simulating the seepage behavior of a dry-stack TSF in Mexico, creating a water balance for a world-class precious metals mine in Peru, finding a sustainable water source for a gold/silver mine in Sonora Mexico, evaluating the containment of an unlined TSF in Guatemala, and determining the best water management strategies for a large gold mine in Armenia. Mr. Breckenridge has written numerous mine Feasibility Studies, Environmental Impact Assessments (EIA) and Environmental Management Plans (EMP) and Closure Plans for mine projects. He is skilled at written and verbal communication in English and Spanish, project management, and technical presentations. He is also a Licensed Verifier for the Towards Sustainable Mining (TSM) initiative.



## Rick Moritz - Principal Mining and Process Engineer

Mr. Moritz is a Mining Engineer with over 30 years of experience in mining and mineral processing as an employee and manager for several mining companies, an engineering company, and as a consulting engineer. He is a Mining and Metallurgical Society of America (MMSA) Qualified Professional in Mining and Metallurgy/Processing. His mining and metallurgical consulting experience includes clients such as Newmont Gold, Royal Gold, Anglo Gold, Bateman Engineering, and AMEC. He has worked in senior management, surface and underground mine operations, and mineral processing, in capacities such as VP Operations, Operations Manager, Process and Plant Manager, Mine Superintendent, Process Superintendent, and various engineering roles. His work includes assignments in the US, Uzbekistan, Nicaragua, and Australia. Mr. Moritz has been involved in the construction of numerous mines and plants, including process commissioning, start-up, and training of new staff.



# GRE CORE TEAM

## Luis Quirindongo - Senior Geological Engineer

Mr. Quirindongo is a geological engineer with over 19 years of experience in the field of geotechnical engineering, including mine tailings and waste facilities. His experience is broad, versatile, and includes sub-surface investigations, geotechnical analyses and design, preparation of grading plans, material management and handling, construction quality control / quality assurance, and performance as a Project Manager on major mining projects. As a Project Manager, Mr. Quirindongo applies his past experience as a resident engineer to improve communication between contractors and the client or other team members. His design experience includes feasibility-level design, conceptual design, and final design of waste facilities. His current projects have been located throughout Mexico, including the states of Chihuahua, Durango, Mexico, Sonora, and Zacatecas, among others. Mr. Quirindongo is fluent in both written and verbal communication in English and Spanish and has extensive field experience in North America and Latin America

## Hamid Samari, Ph.D., M.Sc., - Senior Geologist

Dr. Samari is a Geologist with over 20 years of experience in the mining, petroleum, and civil industries. He graduated from Azad University, Sciences and Research Division, Tehran-Iran in 2000 with a Ph.D. in Tectonics. He has expertise in structural geology, mining geology, economic geology, seismic hazard assessment and engineering geology. Dr. Samari's professional experience includes: site visits, investigation of structural geology and geological data analysis, lithologic and structural mapping, satellite image studies and LIDAR image processing. He has been an advisor of mining exploration projects and exploration drilling of iron, copper, gold, silver and cobalt mines. Dr. Samari has developed many geological maps. Techniques employed include use of base topographical maps, aerial photos, satellite images, and other techniques. He has conducted structural analysis of joints, faults, collapse gravity structures, salt plugs, and other structural elements using modern techniques and software. He collected and analyzed earthquake data for various projects using probabilistic and deterministic methods. Dr. Samari has 19 years' experience as a university lecturer in the fields of photo geology, field geology, tectonics, and mineralization, preparation of geological maps, volcanism and mineralization, ophiolites, sedimentary ore deposits, and research methods at the prestigious IAU-Mahallat College.





# GRE CORE TEAM

## **Mariel Quevedo, M.Sc., P.E. - Senior Geotechnical Engineer**

Mrs. Quevedo has more than 20 years of experience specializing in geotechnical engineering including mine tailings and waste facilities. Her experience includes: dam safety inspection and risk analysis, geotechnical analyses and design, laboratory testing, field exploration, and project management. Ms. Quevedo excels in geotechnical analysis for the solution of a wide variety of challenges relating to the design, construction, operation, and rehabilitation of tailings dams; dry stacks; embankment dams and reservoirs; canals and levees; and various concrete and underground structures.



Responsible Resource  
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# RECENT KEY PROJECTS

## Summary

Over the last 14 years, GRE has been involved in projects ranging from feasibility studies to internal technical reports for both large and small projects from a 100 tpd lead/zinc mine in Mexico to a 120,000 tpd gold mine in Canada. GRE has also conducted investment due diligence; mine, process and tailings facility audits; geometallurgical optimization; exploration direction and supervision; geological mapping; ARD site review and mitigation; closure plans; water balances; and geotechnical analysis and design. From placer gold to lithium, and narrow vein gold to porphyry copper open pit and open cast coal and everything in between.



GRE personnel have experience working in a wide variety of countries including: USA, Canada, Mexico, Venezuela, Peru, Bolivia, Brazil, Chile, Guyana, Argentina, Costa Rica, Columbia, Honduras, Puerto Rico, Ireland, Greece, Armenia, Turkey, Tajikistan, Kazakhstan, Papua New Guinea, Australia, New Zealand, Ghana, Mali, Burkina Faso, Namibia, South Africa, Zimbabwe, Botswana, Tanzania, India, Russia, and China. Many of GRE's staff are fluent in Spanish.

## Bonnie Claire, Nevada - 2020 - Present

In 2021, GRE created an NI 43-101 Preliminary Economic Assessment (PEA) for the Bonnie Claire lithium project in Nevada. GRE is currently involved in advancing this work into a Pre-Feasibility Study. This project involved the following elements: Calculation of a mineral resource estimate; Creation of a mine plan for lithium-rich clay extraction; Design of a metallurgical testing program and a metallurgical plant, and Creation of an economic model

To access deeper high-grade lithium, GRE evaluated the use of innovative borehole mining methods which will allow for the exploitation of the high-grade lithium clays below lower-grade cover. The borehole mining involves the drilling of a large-diameter borehole to the target depth and liquefaction of lithium-rich clays through high-pressure water injection followed by pumping. Pilot tests of borehole mining are planned.

Additionally, GRE's team is working with Bonnie Claire and a respected metallurgical lab to design a process flowsheet for producing battery grade lithium carbonate. Bonnie Claire has successfully produced battery grade lithium carbonate at laboratory scale. GRE will be the lead author on the upcoming Pre-Feasibility Study.

## **Cangrejos Mine, El Oro Province, Ecuador, 2023 - Present**



GRE has been involved with the Cangrejos Gold-Copper project since 2018. Cangrejos is a porphyry-copper/gold open pit mining development project located in Ecuador. GRE has been the QP firm for geochemistry and groundwater in the PEA, PFS, and continuing into the FS. Our field work scope includes: geochemical sampling, packer testing to assess hard-rock conductivity, and aquifer testing to determine the overburden conductivity. Utilizing the field data, GRE has assessed geochemical risk and the impact the project may have on local and regional

water resources. In addition, for the PFS, GRE created groundwater flow models of the pit wall hydrogeology which was integrated into a slope stability analysis. GRE also manages the environmental data and presents bi-annual environmental monitoring reports to the project team.

## **Clayton Valley, Nevada - 2018-Present**

GRE is currently engaged on a Feasibility Study for the Clayton Valley project owned by the Century Lithium Corporation. This is a continuation and expansion of the Pre-Feasibility Study created by GRE and Continental Metallurgical Services in 2021. GRE's contribution to the Feasibility study includes the following: an NI 43-101 compliant mineral resource estimate, a mine plan, a production schedule, a field geotechnical program, and pit slope designs. GRE is also will create the necessary



portions of the mine economic model and sections of the Technical Report. The preliminary process development was conducted by GRE and the final metallurgy and plant design will be conducted by Wood.

## **Pinto Valley Mine, Arizona - 2018-Present**

GRE has been involved with the Pinto Valley porphyry copper project since 2018 (Capstone Mining). Initial work involved analysis of the concentrator performance and recommendations for performance improvements. GRE was the QP for the 43-101 update report. The project scope has since evolved to include operator flotation training, mass balance reconciliation and sampling program, geotechnical analysis of the heap leach, heap leach optimization, pumping systems review, site water balance, MetSim modeling (Mill and HLF). Most

recently GRE has been tasked with examining the heap leach performance in both a column test program and a large demonstration heap (designed and operated by GRE). The goal is to better understand the performance of the Jetti technology.



## **Minera Inde, Mexico - 2013-Present**

GRE has been involved with the multiple narrow vein Inde Mine (ECI Exploration) since 2013 including resource updates, plant refurbishment, tailings facility construction design, plant restart operational audit, mine closure liabilities assessment, mining operations support, and historic tailings deposit resource assessment. The initial tailing facility construction design involved the adapta-



tion of a partially constructed facility to meet current industry standards.

This involved modifying the constructed decant system to safely discharge recycled water to the process plant and fully lining the facility. The plant audit included oversight of a comprehensive plant stream sampling program to identify different ore types and maximize recovery of gold and silver. The mining operations support consisted of mine planning training and forensic account analysis to develop an 18-month operating budget using site specific productivity, unit costs, and consumption rates. The operating budget was used to develop a new accounting system to better track capital and operating costs expenditures. A significant success story of the operation is the conversion of the historic tailings facility into a mining resource. The conversion of the facility from an environmental liability into plant feed resulted in

a 2-year positive cash flow for operations. GRE's continued involvement consists of a new tailings dam design and construction including preparation of documents for permitting including technical translation to Spanish.

## **El Aguila Mine, Mexico – 2019-Present**

The El Aguila Mine, in Oaxaca, Mexico, engaged GRE to evaluate and design a filtered tailings project (dry stack). Several site locations for the dry stack deposition were evaluated. The final design considered the placement of filtered flotation tailings within the mined-out open pit area.

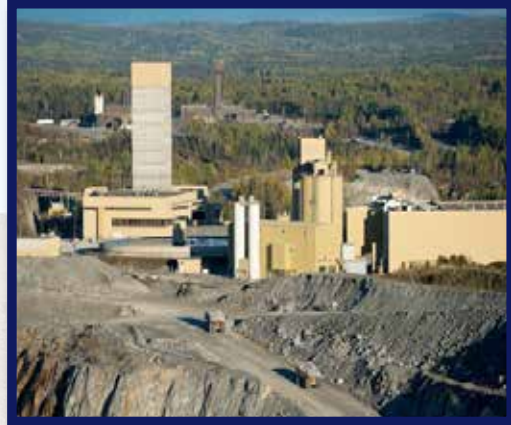
Major challenges for this project included designing for the potential of high seismicity, and cyclonic storm events. The design produced by GRE was



permitted, and then constructed and placed into operation. An Operations, Maintenance and Surveillance (OMS) Manual was also prepared by GRE.

### **Hemlo Mine, Ontario 2020**

GRE was engaged to conduct a mill reconciliation for the Hemlo mill. The project included sample collection systems, work flows related to sample assays, determination of sampling errors (per Gy) and reconciliation of the overall gold balance.



### **Mantoverde Mine, Chile 2020 - Present**

GRE is currently engaged in a production review of the copper heap leaches at MV. This includes an On/Off pad with crushed ore and three ROM dump leaches. The review is focused on improving copper extraction and reducing acid consumption. Further, MV/GRE are examining the addition of a pyrite/cobalt flotation cleaner tail concentrate to the On/Off pad. This involves designing an aeration and bacteria growth system. The goal is to



reduce acid consumption, capture additional copper and establish a cobalt recovery circuit.

## **Detour Lake Mine, Ontario 2019**

GRE in cooperation with 911Metallurgy was engaged to conduct a mill audit and optimization program for the Detour Lake Mine in 2019. The audit reviewed the gold mill reconciliation, plant performance, safety and ESG components. The review also focused on processing improvements related to availability, throughput and gold recovery.



## **Argonaut Gold, Ontario, Nevada, Mexico 2022 - Present**

GRE has been retained by Argonaut Gold on a service contract to provide technical services for their active mining operations. Argonaut currently has three gold operations of interest: Magino (Ontario), Florida Canyon (Nevada), El Castillo (Mexico). GRE has recently completed an audit of the Magino project (open pit with a gold mill currently in the startup). GRE has also been commissioned to review expansion opportunities. GRE is working with Florida Canyon to assess the heap leach performance and El Castillo has asked GRE to examine their heap leach closure plan.



## Expert Witness Project List:

### Major South American Mining Operation

GRE was part of an expert witness team to support the mining company during the arbitration case where a \$2.0B process plant failed to meet the process design criteria. The team's responsibility was to assess the metallurgical testing for completeness, representative sampling, and appropriate selection of plant operational parameters. The scope also included determining how the testing was incorporated into the geology model, resource estimate, and mine plan and ultimately used to determine related project performance guarantees.



### Large USA Gold Mill and Heap Leach



GRE was part of an expert witness team to support the mining company during the legal case related to the purchase of the \$800m mining asset. The team's responsibility was to assess the metallurgical testing for completeness, representative sampling, and appropriate selection of plant operational and economic parameters. GRE produced a new economic model including an evaluation of the resource, production schedule and metallurgical recoveries.

### Mid Tier Gold Company

GRE most recently was engaged as an expert witness representing a mid tier gold mining company. GRE has been asked to provide expert support for issues





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