

Norwest Offers a Wide Range of Field Services By John Bilbo

Norwest offers a wide range of field services from turnkey exploration and development drilling projects for large world-wide clients to providing field geologists for logging drill holes for smaller clients and mines. This year, the geology group located in the Grand Junction, Colorado, office conducted several mineral exploration programs for various clients. The project execution for these projects varied significantly with regard to permitting, planning, and methodology.

The first project was for a client in the midwestern U.S., and was performed on coal deposits owned by the U.S. government with private (split estate) surface owners. The second project was conducted in the western U.S. on coal deposits owned by the client. The coal was located below surface lands that were mostly private, but were also leased for ranching.

The first project was initiated from a series of geologic studies previously commissioned by the client that identified high quality

coal deposits amenable to underground mining. Norwest filed and received an exploration license from the U.S. government, procured surface use agreements from landowners, and executed a highly safety conscious and well documented exploration drilling program that satisfied the client's objectives with regard to collection of geologic data and safe execution of drilling operations. Norwest documented safety and incident correction items that were of high importance to the client. The drilling methods required to complete this program were extensive. Drilling was conducted on a 24-hour basis, and required the use of large blow out preventer (BOP) systems.

Relatively large mud sumps and pad



Rig and Large Sub-structure

constructions were also necessary due to the nature of the soil and wildlife. Norwest hosted bidding to secure the appropriate contractors for preparing and reclaiming the drill pads, drilling, laboratory services, geophysical logging, and surveying. Once

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Executive Message - Employee Ownership: A Norwest Advantage

By Kirk Weber



Our clients often ask: "Of the many competitors in the energy and mining consulting field, what competitive advantages does Norwest offer our project?"

Many of you are aware of our long-time marketing theme: "Explore the Depths of Our Experience". Through this theme we emphasize the real-world approach Norwest's professionals bring to each of our engagements - experience which is only gained from many years of exploring for, permitting, developing, and managing mines and energy projects prior to entering the consulting field. This experience allows us to bring world-class standards to each client engagement.

Another advantage is the commitment to

excellence we bring to each project - a level of commitment that is unmatched in the marketplace. And how do we achieve this commitment? Since the company's inception, Norwest has been an employee-owned company, and currently over two-thirds of Norwest's employees share the ownership experience. This ownership structure creates a unique culture - each employee owner views their relationship with Norwest not just as a job. It's part of who we are. We take pride in our ownership, and serving clients is not just our duty, it's our privilege.

Several excellent examples of bringing together the experience and commitment of our employee owners are illustrated in this issue of the Norwest. Our field services business has expanded dramatically due to our employees focusing these advantages on clients' needs beyond traditional "desktop" engineering and consulting services. And repeat business from our worldwide client base tells us we're on to something very good.

Employee ownership is a value-added element that combines with the expertise and experience we bring to each and every project. And behind it all is the knowledge that if you succeed, we succeed. That's the Norwest advantage.

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Coal Sampling and Quality Testing in Dundgobi Province of Mongolia

By Eggy Munktogoo

Norwest was retained by a confidential client to conduct a sampling and logging program in a coal deposit located in southeastern Mongolia. The objective of this program was to address the locations for sampling and coal quality analyses in order to assess the applicability and potential for optimizing in-place coal quality characteristics. Previous coal quality assessment, by an independent consulting company, reported high in-place sulfur and ash content within the principal seams. As a preliminary stage of determining primary coal quality characteristics and improvement potential,



Norwest geologist on site in Mongolia

the coal quality testing program consisted of four components which included preparation of a coal quality testing plan, drilling and sampling, analytical testing, and data analyses.

Norwest prepared a "Priority Coal Quality Testing Plan" that addressed approaches to accomplish objectives, and proposed drillholes and cost estimates for analytical testing. Field work was initiated in mid-October 2012 and was completed after one week. Detailed core logging and sampling was performed under the supervision of a Norwest geologist. The core logging effort included lithological descriptions, variations within the coal seams, mineral alterations, and high resolution digital photography. These lithological descriptions were used for



Abundant pyrite mineralization

selecting samples (individual benches) to understand the vertical distribution quality characteristics. In addition, reducing the sulfur and ash content can be accomplished by washability analysis on some selective composite samples. Currently, analytical testing is being performed by an accredited laboratory in Ulaanbaatar, Mongolia.

Norwest Offers a Wide Range of Field Services

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field operations commenced, Norwest's professional staff collected the necessary geologic and geotechnical core data in addition to sampling the core within the coal seams for quality analysis. Norwest provided contractor oversight for execution of all field activities from permitting to reclamation and, ultimately, bond release. The project was successfully completed within five weeks.

The second project was planned and

executed by Norwest to meet the client's needs, but was conducted on fee lands and required different drilling and reclamation methods. There were no drill pads or mud sumps constructed. All drilling was completed with water and air. A Norwest geologist provided oversight of the daylight drilling, core sampling, point load testing, and geotechnical testing. Norwest facilitated the entire contractor bidding and selection process, which included geophysical wireline services, lab services, and drilling.



Norwest geologist logging drill core



Norwest geologist logging drill core in a mobile "core lab"

The surface impact to the drilling sites was greatly reduced by eliminating the need for building drill pads or digging sumps. The drilling contractor was able to reclaim the pads by spreading out the cuttings and planting native seeds. This method was very efficient - eliminating the need for an additional contractor. This drilling project was completed within ten weeks.

Norwest successfully completed both drilling projects to the satisfaction of the clients, utilizing completely different methodologies while accommodating the client's needs and maintaining the integrity of the regulatory environment. Norwest has the expertise and experienced professional staff necessary for designing exploration projects to accomplish the objectives of a wide range of commodities and regulatory environments in the U.S. and world-wide. Let us help make your next project a success.



Michelle Eskrick in the field

Coal Exploration in the Kootenay

By Michelle Eskrick

Norwest was contracted by Jameson Resources Limited, an Australian coal exploration company, to support, plan, and supervise a drilling program in order to identify the quantity and quality of coal located in one of their western Canada lease holdings. The main area of study was on Crown Mountain, which is located in the East Kootenay region of southeastern British Columbia, northeast of the town of Sparwood. Jameson holds a 90% interest in the Crown Mountain Coal Project and has an option to acquire the remaining 10%.

There were a total of 40 holes completed during three drill programs from August through November 2012. In addition, a trenching and mapping program was completed during the summer program. The primary objectives were to confirm and expand the coal resource base in the area as well as to complete a range of analytical tests from collected samples.

The holes were drilled using a reverse circulation drill, and samples of the drill cuttings were collected across the coal seams. On a reverse circulation rig, the cuttings, made by a hammer bit, were brought to surface inside the annulus of the drill stem using air or water. As the cuttings came out of a cyclone on the side of the rig, they were collected for sampling. If the formation was wet or water was being used for the drilling, the collected sample was poured over a 100 mesh screen before being placed into

a sample bag. All collected samples were shipped to a Calgary laboratory for testing.

Crown Mountain drill pads were at elevations ranging from about 1,850m to 2,210m above sea level. The range in elevations presented several environmental challenges for working on these sites; weather ranged from hot and windy to snowy. As well, the winding mountain gravel roads, that could easily damage a tire or turn to mud in wet weather, were driving safety issues that had to be considered on a daily basis.

Norwest had several roles on the Crown Mountain property prior to, during, and following their 2012 summer drilling program. Initially, a block model was built, based on legacy wells and surface mapping data, to provide a geologic interpretation from which to build on. During the summer field program, this was checked and validated with additional field mapping performed by Norwest's geologists. Norwest was also responsible for monitoring all cuttings while drilling, deciding when to sample, and when to end each drillhole. As the project moves forward to 2013, Norwest has been asked to update the current model, write a technical report presenting current interpretations, and develop a drill plan, for Jameson to consider, in the coming year.

This was Norwest's first opportunity to support the coal exploration efforts of Jameson Resources in western Canada.

The Spirit of Giving

By Eric Swanbergson

With the beginning of the new year, it is time to reflect on what we, as employees, have been able to accomplish during 2012 and look forward to our opportunities for 2013. Obviously, our work in support of our many clients is of high importance to us but, beyond that, what also stands out is the willingness seen by our employees to support and participate in causes and goals that have real benefit to the health and well-being of those in need. Each Norwest office supports worthy charitable foundations and this article focuses on those chosen by our Calgary employees.

During the year many organizations were supported, some of which are outlined below.

- The United Way;
- The Walk/Run for Multiple Sclerosis;
- Movember (Prostate Cancer);
- Head for a Cure (Cancer);
- The Memory Walk (Alzheimer's);
- The Run for the Cure (Breast Cancer);
- Angel Giving Tree Program (Christmas);
- Heart Beats Children's Society; and
- Canadian Blood Services.

Norwest's Calgary employees were able to collect and contribute \$25,890 to the various causes. Our field team in Saskatchewan raised an additional \$13,352 during Mustache-November, or more fondly referred to as Movember, when Norwest gentlemen grew mustaches to entertain our fellow Norwesters and to raise money for prostate cancer. Our blood donation target for the year was 20, but actual donations doubled that goal. Knowing what we've been able to achieve in 2012 now gives us new targets to strive for and exceed during 2013.

On behalf of all of those that involve themselves with supporting worthy causes and to those of you that willingly donate; thank you so much for your kindness and generosity.



Movember - Some of our Calgary office moustached members (l to r) Tim Davies, Steve Kinzel, Darryl Soderberg, Rob Moloney, Cornelius Waldner, Jordan Zimmerman, Tom Becker, and Danny Ko

Norwest Supports Oil & Gas Industry in Trinidad, Colorado

By Kevin Ritter

Norwest established a field presence in the heart of the Raton Basin of Colorado in 1998, and launched an office in Trinidad in 2000 to provide hydrologic and environmental consulting services for existing and proposed coal bed methane (CBM) operations. Our personnel have extensive experience in developing appropriate water management strategies; design, and construction of water handling facilities; implementation of stormwater management plans and practices; and providing National Pollutant Discharge Elimination System (NPDES) permitting and compliance support. Field technicians routinely collect a variety of samples for compliance with Colorado Oil and Gas Conservation Commission regulations, from baseline domestic water quality sampling to soil sampling for

production pit closure and reclamation. We have also developed permitting and water quality database management systems for our clients including a web-based GIS interface to more easily share compliance status and information with clients in multiple locations simultaneously.

The expertise of our Trinidad office technicians ensures our clients will be provided with unsurpassed environmental compliance on their projects. Water quality sampling, surface water monitoring, and stormwater management specialists work cohesively to ensure all permit requirements are met. The office location allows Norwest to be easily accessible to our clients for ongoing support and maintenance of area stream monitoring stations, monitoring wells, and



Wellhead water sampling

stormwater management installations, along with immediate response to investigation of environmental compliance related issues.

Another important aspect of a local presence in Trinidad is our ability to live in the community and to participate in community outreach through civic and other local organizations such as the Trinidad and Las Animas County Chamber of Commerce, Las Animas County Economic Development, Action 22, Purgatoire River Anglers Trout Unlimited, and Raton Basin API/COGA Chapters to name just a few. By being involved in the community, Norwest strives to educate and continually disseminate information on the measures we take to protect the environment and our water supplies and to be good stewards of both in the process.

Norwest's experience in water resources has benefited many clients in planning and permitting new projects, as well as offering an understanding of the hydrologic impacts and environmental constraints facing existing operations. We value the partnerships established with our clients and look forward to supporting their long-term needs.



Testing samples in the field

Keeping Our Resources Safe

By Mark Samber

Norwest provides field services clients with a knowledgeable workforce capable of working safely and efficiently in any situation. Our goal is to provide an injury-free work environment while meeting client objectives and expectations. To achieve this goal we provide our employees with a high degree of responsibility, enabling them to make decisions and take action to ensure a safe work environment. This employee empowerment is backed up by a world-class health and safety management program which adheres to the highest international standards. Our relentless focus on our values

of operational excellence, and our team's commitment to the highest standards of safety provide the impetus to succeed efficiently and with exceptional value for every job we perform. The most valuable resource we have is our people. While quality and productivity are critical to our field operations, they will never take precedence over ensuring that our employees, clients, contractors, and support staff return home safely each and every day.





JOSCo hydrology testing crew prior to installing a borehole packer assembly

Norwest in Jordan

By Landon Beck

The Jordan Oil Shale Company (JOSCo) is a Dutch company registered in Jordan for the purposes of exploring and evaluating the commercial potential of the deeper layers of Jordanian oil shale. If conditions prove ideal, JOSCo will use proprietary In-situ Conversion Process (ICP) technology to produce shale oil and gas. JOSCo is a wholly-owned subsidiary of Royal Dutch Shell and, as such, has access to a network of experts world-wide, including Norwest, providing invaluable technical know-how, operational expertise, cutting edge research capabilities, and global commercial insight.

Norwest has been involved in JOSCo hydrogeology characterization efforts since early 2011, which builds on oil shale expertise developed in Colorado at the Shell Mahogany Research Project throughout the last decade.

Norwest efforts to date have included design, specification and procurement of aquifer testing equipment for application in Jordan. This design work was followed by implementation of subsurface hydrology testing programs to characterize aquifer and seal intervals vital to JOSCo appraisal efforts. These programs were designed to investigate both the physical and chemical hydrogeology of the oil shale sequence, as well as the overlying and underlying hydrostratigraphy. Implementation of these programs included training of the JOSCo staff with the challenging goal of achieving self-proficiency in data collection and analysis in a matter of months. This goal was achieved, and Norwest continues to provide support in peripheral areas as the project grows with the next milestone goal of a small scale pilot production plant.

In addition to the technical expertise provided directly to JOSCo, Norwest also co-authored a presentation at the Jordan International Oil Shale Symposium in May 2012 regarding subsurface containment testing for the evaluation of ICP oil shale projects. Norwest's growing expertise in oil shale project development offers our unconventional energy clients a broad range of services aimed at helping them achieve their objectives.



JOSCo crew breaking out tubing while pulling a submersible pump from a test well

Automated Instrumentation

By Michael Davis



Laying out the Shape Accel Arrays prior to installation in the MSE wall

Norwest recently completed an automated instrumentation system to monitor the performance of a Mechanically Stabilized Earth (MSE) Wall at an oil-sands mine. Historically, because of access issues in this dangerous and sensitive area, geotechnical monitoring of the structure has been difficult and unreliable. By installing data collection stations at the base of the MSE Wall, transmission of piezometer data can now be transmitted on a daily basis utilizing Measurand's ShapeAccelArray (SAA) automated inclinometer sensors (which measure foundation performance) by radio signal to a data logger in a safe location away from the wall. This data logger is paired with a cellular modem so that the remote monitoring software package (Vista Data Vision) has real time access to all these sensors. The software verifies the data and, if the structures performance falls outside of engineering tolerances, alarms are sent to the geotechnical engineers on record automatically and promptly.



Laying out the Shape Accel Arrays prior to installation in the MSE wall

Norwest Management on the Move By Paul Brown

Norwest Corporation's Board of Directors recently announced the following appointments effective January 1, 2013:



Steve Cameron has assumed the role of President Norwest Canada. In this role he will have the responsibility for management and performance of Norwest's Canadian offices and operations. Prior to this appointment, Steve served as a Senior Vice President in Norwest's Calgary office. He is a 31-year veteran of the mining industry and joined Norwest in 1994.

Richard Dawson was appointed Executive Vice President with responsibility for several key corporate initiatives, including management of the company's strategic planning process. Richard retains his responsibilities for managing Norwest's Vancouver office and leading Norwest's geotechnical practice. He has been with Norwest for 16 years and has over 34 years of experience consulting in the areas of geology, mining engineering, and geotechnical engineering.



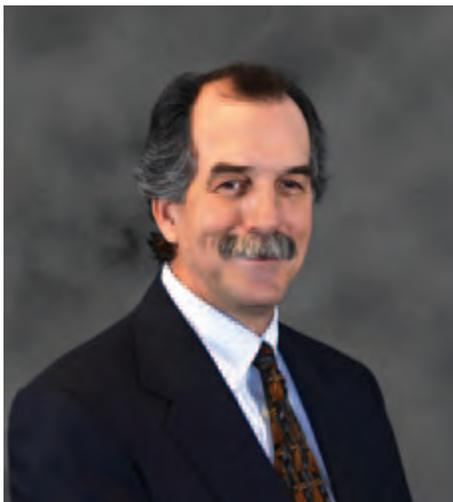
Robert Evans continues in his role as President of Norwest U.S. as well as Chairman of the Board. Bob has been with Norwest for 15 years and has over 40 years of mining industry experience. Prior to joining Norwest, Bob served in a variety of management and engineering roles including subsidiary president, mine general manager, and general superintendent.

Norwest Staff Recognitions – January 2013

By Toni Jack

Norwest is pleased to announce the following individuals have recently joined our organization.

John Imse has joined Norwest as our Vice President of Water Resources and Environmental Services. In this role, John will lead the growth of Norwest's hydrological and environmental practice as well as assuming management responsibility for Norwest's Denver office. John brings with him over 30 years of experience in providing high-value hydrogeology and environmental consulting services to a wide variety of clients including mining companies and oil and gas producers.



Judy Bolis

Senior Project Manager (Denver)

Gary Buchan

Senior Project Manager (Denver)

Jessica Cole

Office Administrator (Trinidad)

Mandy Barnett - Receptionist (Calgary)

Taryn Bitner

Mining Engineer (Calgary)

Si Wen Chen

Jr. Mining Engineer (Calgary)

Ivy Lee - Accountant (Calgary)

Tosin Oluwafemi

Mining Engineer (Calgary)

Nicole Bowden - Receptionist (Vancouver)

Sonny Chizar

Drafting Technician (Vancouver)

Marissa Quinlan

Geotechnical Engineer (Vancouver)

Greg Shaughnessy

Systems Administrator (Vancouver)

Diana Trieu - Mining Engineer (Vancouver)

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