“KCB offers excellent quality, service and rates and have consistently remained either on or under budget. Their reports are clear, concise and well organized. KCB also takes the time to provide suggestions on ways to better a program and save costs. We are always pleased with the quality of their work.”
ABOUT US

Klohn Crippen Berger is an international engineering, geoscience and environmental consulting firm with its head office in Vancouver and eight offices in strategic locations in Canada, Peru, and Australia. We are registered and have an ongoing presence in the United States, United Kingdom, Papua New Guinea, Indonesia, Mauritania, Mongolia and Brazil. We have a strong reputation for quality and technical expertise in a range of sector services including: Oil and Gas, Water, Power, Transportation and Mining. Since forming in 1951, we have a long history of participation in local projects, as well as a strong international reputation. We are working on some of the largest, most challenging projects, both nationally and internationally.

Our commitment to excellence, the driving force behind everything we do, is reflected in more than 50 national and international awards for business leadership and project innovation. Highlights include: Canada’s Best Managed Companies (Platinum Member); PSMJ Circle of Excellence (Platinum Member), and PSMJ Best Employer; Zweig Group Hot Firm; BC Top 25 Exporter Award; Consult Australia Gold Award; and many others.

KCB AND THE PIPELINE INDUSTRY

We have provided solutions to the pipeline industry for decades and are continually looking for opportunities to provide innovative solutions to meet the unique needs of our key pipeline and industry clients. Our project experience includes environmental solutions as well as geotechnical and hydrotechnical engineering for the life-cycle of pipelines and their associated facilities. KCB also has experience with multidisciplinary projects, combining traditional engineering and environmental services to cost effectively and efficiently complete all facets of a project from concept to design to construction to decommissioning. In addition to our project experience KCB has experience developing programs to: monitor depth of cover and crossing integrity; manage geohazards; and to ensure companies are in compliance with health, safety, security, and environmental regulations and guidelines.
CLIENT SERVICE NEEDS

- Environmental assessments and investigations
- Remediation and reclamation of pipelines and associated facilities
- River crossing bioengineering
- Regulatory compliance and approvals
- Construction inspection

KC B SERVICE AREAS

Environmental assessments and investigations

- Pre-construction / pre-disturbance site assessments – soil, vegetation, and migratory birds
- Baseline studies and environmental impact assessments – soil, wildlife, habitat, biodiversity, weeds, and rare plants
- Environmental protection plans and environmental alignment sheets
- Spill Response
- Wildlife management plans including species at risk and habitat screening
- Conservation and reclamation plans
- Surface water and groundwater quality assessments
- Wetland assessments and compensation plans
- Fisheries and habitat assessments
- Fish habitat enhancement and habitat protection planning

Remediation and reclamation of pipelines and associated facilities

- Liability assessments
- Decommissioning of pipeline facilities
- Phase I and II environmental site assessments
- Various remediation strategies such as bioremediation, and dual phase extraction
- Detailed site assessments and remediation / reclamation applications

Regulatory compliance and approvals

- Federal and provincial permitting and approvals
- Health, safety, security, and environmental compliance audits
- Public consultation

Environmental inspection during pipeline construction

- Federal and provincial requirements monitoring and daily reporting
- Silt and sediment erosion control monitoring

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Jason Duxbury, Ph.D., Senior Wildlife Biologist, Edmonton, has over 23 years of environmental work experience. He has participated in over 35 environmental assessments throughout Alberta, British Columbia, Saskatchewan, Yukon and Northwest Territories.

Chad Wawrinchuk, P.Ag., Senior Remediation Scientist, Calgary, has over 13 years of experience managing projects involving hydrocarbon, heavy metal and salinity contamination at oil and gas facilities throughout Western Canada.

James Harrison, Ph.D., Senior Aquatic Biologist, Calgary, has provided environmental guidance and support for over 16 years within the consulting and private sectors.

Dan McCrank, P.Geol., Senior Environmental Scientist, Calgary, has over 13 years of experience in contaminated sites investigation, hydrogeological investigations, and remediations.

Liza Flemming, P.Geol., Senior Environmental Scientist, Calgary, has 13 years of experience in contaminated sites investigation and remediation, environmental liability assessment, and long-term asset liability and retirement management.
EXPERIENCE

Peppers II Pipeline, Alberta
KCB conducted a scouting alignment and developed an environmental design basis: providing DFO with an authorization application; conducting a salvage and environmental inspection; provided fisheries and creek monitoring and enhancement; and completed a fisheries report.

Pipeline Leak of Condensate Impacting Groundwater in a Domestic-Use Aquifer
KCB managed and executed a Multi-Phase Extraction (MPE) system for a pipeline break. The project remedial action plan, design and operation of a MPE system to mitigate the impact of a hydrocarbon plume originating 400 m from the pipeline break through a complex system of fractured rock.

Environmental Site Assessments and Reclamation Certificate Applications
KCB undertook site assessment (Phase II ESA soil and groundwater assessments), remediation, and groundwater monitoring work at various facilities including decommissioned compressor station; industrial oil storage site; oil battery; receipt stations, etc.

Gas Plant Liability and Phase I Environmental Site Assessments (ESAs), Western Canada
KCB completed Phase I ESAs and liability assessments at 25 gas plants in Alberta, British Columbia, and Saskatchewan. The Phase I ESAs recommended environmental work with respect to regulatory guidelines and assessed the environmental liabilities.

Little Bow Reservoir Rehabilitation
KCB conducted a Comprehensive Study for Alberta Transportation to assess the potential environmental impacts of the rehabilitation project. Baseline data was collected in order to characterize the existing aquatic resources, surface water quality, wildlife, vegetation, hydrology, hydrogeology, geophysical environment, climate, air quality, First Nations land use, recreation, navigability, land and resource use, and public health and safety.

Pipeline Leak of Brine Impacting Soil and Groundwater
KCB managed and executed a remedial excavation and ongoing for a pipeline break. The project remedial action plan, design and operation of a groundwater collection system to mitigate the impact of a chloride plume originating from the pipeline break through superficial soils.

Pipeline Leak of Potable Water Impacting Surface Water Bodies
KCB managed a water treatment plan for a potable water pipeline break. The project involved dechlorinating the water prior to its release into freshwater aquatic life bearing water bodies. Recovered fluids were treated with dechlorination pucks and held in containment cells until the chlorine levels were suitable for release.
GEOTECHNICAL

Gregg O’Neil, M.Eng., P.Eng.,
Calgary, has over 30 years of experience in civil engineering design and project management with a focus on the pipeline and oil sands mining industries. His pipeline experience includes route selection, design of pipeline river crossings, integrity management and risk assessments.

Tim Keegan, Ph.D., P.Eng.,
Edmonton, has 31 years of domestic and international experience in dam safety, geological and geotechnical engineering applied to roads, railway, water resource dams, tailing containment and dams, heavy civil, environmental remediation, mining and infrastructure projects.

Pam Fines, M.A.Sc., P.Eng.,
Edmonton, has more than 10 years of experience as a geotechnical engineer and project manager with a focus on tailings dam and waste rock dump design.

Chris Gräpel, M.Eng., P.Eng.,
Edmonton, is a civil / geotechnical engineer with 20 years of experience in water resources, mining, and transportation engineering.

CLIENT SERVICE NEEDS

• Route selection
• Design, construction and maintenance of:
  – Pipelines and crossings
  – Pipeline facilities, plant facilities, wellsites and associated facilities

KCB SERVICE AREAS

Pipelines and crossings

• Geotechnical evaluation and design of Horizontal Directional Drills (HDD)
• Slope stability at river crossings
• Buoyancy control
• Geohazard management of pipeline right-of-ways
• Drainage and erosion control
• Construction inspection and QA / QC
• Permitting and regulatory approvals

Pipeline facilities, plant facilities, wellsites and associated facilities

• Risk assessment
• Site drainage and surface water management
• Permitting and regulatory approvals
• Groundwater management
• Facilities foundation design and construction inspection
EXPERIENCE

**Keystone XL Pipeline**
KCB was commissioned to conduct a desktop hydrology baseline study in order to characterize the hydrology of streams crossed by the Keystone XL pipeline. This section of the pipeline is 526 km long.

**Facilities Foundation Design**
Klohn Crippen Berger provided geotechnical foundation engineering and inspection services during drilling of the bedrock to ensure that minimum effective pile lengths were installed. Material testing and quality control of the grout material being batched and placed by the piling contractor was provided during the pile grouting operation. Pile foundations for the skid-mounted building modules were designed and constructed by grouting steel pipe-piles in holes drilled into bedrock.

**HDD Evaluations and Design, Western Canada**
KCB coordinated route selection, geotechnical assessments, and geophysical surveys for trenchless HDD crossings of water bodies throughout Western Canada. KCB also provided engineering support during installation of the HDD crossings.

**Geohazard Management on Right of Ways, Western Canada**
KCB has undertaken a number of assessments of geohazards on or near pipeline right of ways – geohazards include slope instability, drainage and erosion, and buoyancy control failures. Assessments identify the hazard, determine the cause, assess potential impacts, and recommend mitigative measures. KCB has also provided construction inspection during management of geohazards.

**Mackenzie Gas Project, Northwest Territories**
KCB led the development of the Integrity Management Plan (IMP) for the Mackenzie mainline. The IMP identified pipeline hazards, monitoring methods to track progress of each hazard, and mitigative measures for each hazard. Hazards included frost heave, thaw settlement, slope stability, and river crossings.

**Pembina River Crossing Installation, Alberta**
KCB conducted crossing inspections during the “lowering-in” of NPS 48, double sagbend concrete coated pipeline at a crossing of the Pembina River. The nature of the construction required a pump and bypass technique for placing the pipe. The pipeline route also extended through the river floodplain, requiring buoyancy and control design using both river weights and screw anchors.

**Smoky River Crossing Feasibility, Alberta**
KCB investigated terrain and subsurface conditions, as a basis for evaluating the feasibility of an HDD or open cut crossing on the Smoky River. The project included a detailed review of regional and site-specific ground information, a geotechnical site investigation, and a terrain assessment. KCB also estimated the risk and costs of future maintenance with each crossing design to aid in the company’s pipeline integrity program.
CLIENT SERVICE NEEDS

• Design and construction of waterbody crossings
• Operations and maintenance of crossings
• Surface water runoff / erosion management
• Geohazard assessments

KC B SERVICE AREAS

Design and construction of waterbody crossings

• Baseline data collection - bathymetric surveys, bed / bank material sampling, records review
  - Crossing classifications - flow regime, channel morphology, and stability
  - Hydrologic analysis
  - HDD design including entry and exit points
  - Regulatory support
  - Bank restoration / protection measures
  - Installation procedures - isolation techniques, vertical cover requirements, and construction access
  - Field engineering and construction inspection

Operations and maintenance of crossings

• Channel surveys and electromagnetic scoping of pipe
• Depth of cover / crossing integrity assessments
• Development and implementation of programs to monitor depth of cover
• Field engineering and construction inspection during repairs
• Design of in-stream scour protection or bank stabilization
• Pipeline rupture investigations
• River engineering

Design of surface water runoff / erosion control plans

Completion of geohazard assessments and avoidance during routing

Chuck Slack, P.Eng., Calgary, has more than 26 years of experience in a variety of surface water engineering-related projects.

Rob Cheetham, P.Eng., Calgary, is a senior civil engineer with more than 18 years of experience in civil engineering and water resources projects.

Wes Dick, M.Sc., P.Eng., Calgary, has over 25 years of experience in hydrotechnical engineering with an emphasis on hydrology, hydraulic analysis, and civil engineering design.

Sarah McArthur, M.Sc., P. Geol., Calgary, is a senior hydrogeologist with over 13 years of experience applying a variety of hydrogeological and geophysical methods towards characterizing the geological subsurface.

Warren Vincent-Lambert, P.Geol., Calgary, is a senior hydrogeologist with over 18 years of experience in water management and environmental investigations.
**EXPERIENCE**

**Depth of Cover and Integrity Assessments, Western Canada**
KCB conducted site inspections, electromagnetic pipe scoping, flood analyses, and channel stability investigations for numerous waterbody crossings throughout BC, Alberta, and Saskatchewan. KCB provided site specific monitoring requirements for the crossings and evaluated repair and replacement options for crossings at risk of exposure.

**Deep Valley Creek Crossing, Alberta**
KCB undertook a hydraulic analysis of two oil pipelines cross Deep Valley Creek to assess the risk of exposure at the crossing location. Review of historical air photos showed that the channel had shifted substantially over the past 30 years and was experiencing channel migration. Deep Valley Creek is known to carry high flows during spring runoff and pipe exposure was a significant concern.

**River Crossing Installation, Alberta**
KCB undertook the design of an NPS 48 double sagbend, concrete-coated river crossing segment based on hydraulic analyses. KCB was part of the crossing inspection team during “lowering-in” of the pipe, which required crossing isolation using pump and bypass techniques. The pipeline route also extended through the river floodplain, requiring buoyancy control design using both river weights and screw anchors.

**Keystone XL Pipeline, Western Canada**
KCB was commissioned to conduct a hydrology baseline study to characterize the hydrology of streams crossed by the Keystone XL pipeline. This study supported planning for pipeline crossing design and construction, and supported fisheries and aquatic resource components of the baseline study.

**Nordegg River Diversion and Crossing Replacement, Alberta**
KCB investigated problems with bank erosion and shallow in-stream burial depth at a bundled sour gas pipeline crossing on the Nordegg River. KCB was involved from assessment to construction, providing recommendations for replacement by isolated open trenching and field engineering advice during installation and operation of the diversion.

**Pembina River Crossing, Alberta**
KCB was retained to review pipeline burial depths at three crossings of the Pembina River in west-central Alberta. The primary objectives were to review the history of the flooding in the crossing area; analyze the behaviour of the river with respect to bed scour, bank erosion, and channel shift; and evaluate the need for repair and/or replacement of the crossings.
QUALITY, HEALTH & SAFETY AND ENVIRONMENT

Our business is governed using an integrated management system (IMS) consisting of quality, health and safety, and environment procedures. This system steers our business conduct, the manner in which we undertake our projects, and how we interact with our clients, the community and the environment. Supported by KCB’s management team, our IMS is implemented to ensure we comply with applicable legislative, regulatory and client requirements. KCB employees are expected to adhere to our IMS, and we reinforce this responsibility through leading by example, training, audits, and setting company objectives. We are committed to continually improving the effectiveness of our IMS in collaboration with our employees and clients.

KCB is a proud member of:

QUALITY
ISO 9001

ENVIRONMENT
ISO 14001

HEALTH & SAFETY
OHSAS 18001

SUSTAINABILITY

We are committed to sustainability in all aspects of our business, design and construction practices. To support our vision to “Build a Better World”, we endeavour to balance social, environmental and economic concerns both internally and in our project work to meet the needs of our clients, the community, our employees and other key stakeholders.

IN OUR PROJECTS

We endeavour to minimize the impact of our operations on the environment, including the prevention of pollution to the land, water and air, and to integrate sustainability considerations in our professional practice. We also advise our clients on ways to eliminate, mitigate or remediate the environmental impact of their operations or facilities, and include opportunities to incorporate sustainable options into their projects.

IN OUR OFFICES

As a consulting firm, our greatest opportunity to positively impact the environment is through our project work. This however, does not deter us from continuing to focus on our office operations as we believe in maintaining a culture of sustainability throughout all aspects of our work. Details on our in-office initiatives can be found in our sustainability report.

FOR OUR COMMUNITY

We have a robust Corporate Social Responsibility program driven by our employees. We believe that by supporting causes that employees are passionate about, we build an environment in which employees feel engaged and supported. This positively impacts our professional practice and the communities that we serve. We also support educational institutions through endowments, co-op programs and guest lectures.
OFFICES

Canada
- Vancouver
- Calgary
- Edmonton
- Saskatoon
- Sudbury
- Toronto

Peru
- Lima

Australia
- Brisbane
- Perth

Brazil
- Belo Horizonte

ALSO REGISTERED IN
- Indonesia
- Mauritania
- United Kingdom
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