

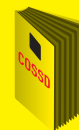
# COSSD PRODUCT CATALOGUE

for



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## Services Guide

January 2017



**ROYNORTHERN**  
Land and Environmental



## Our Mission

- We are committed to setting the highest standards by providing fair, ethical, and professional representation.
- We strive to overcome challenges and exceed expectations.
- We will continue to lead the industry in service and excellence.

## About Us

Roy Northern Land and Environmental is a Surface Land and Environmental consulting firm that directly assists clients in acquiring land and complying with industry regulations and legislation associated with project planning, development and reclamation.

Founded in 1980 by Douglas Roy, Roy Northern Land and Environmental offers interdisciplinary expertise that compliments the oil and gas, forestry, utility, agricultural and mining industries, and municipal authorities throughout Alberta, British Columbia, Saskatchewan and Canada's north.

With a team of over 65 staff, the organization offers robust services from its offices located in Fairview, AB., Fort St. John and Terrace, BC.; expanding further with resources based in Calgary, AB and Prince George, BC. Hard work, integrity and quality service are the foundation of Roy Northern Land and Environmental.

## Our Approach

We are confident in the comprehensive services we provide and in our dedicated teams that deliver them. We are committed to our corporate values of consistently delivering quality work, continuing to enhance our expertise and offering the flexibility necessary to meet each client's specific needs. At Roy Northern, we are dedicated to working closely and efficiently with our clients and applying only the most appropriate expertise to each project.

Our goal is for clients to receive the full benefit of our experience and the relationships we have fostered within the communities where we live and work. We value the many relationships we have built over the years and are inspired to continually upgrade and expand our knowledge and resources.

Leading by example is important to us and we strive to empower others through community engagement as well as social and environmental stewardship.

## Commitments

At Roy Northern Land and Environmental we value follow-through on our commitments and interactions. That is why we have created corporate commitments. Integrity is at the core of our business and we take our professionalism and commitments to clients, contractors, employees and our communities very seriously.

## Services

The Roy Northern name is synonymous with exceptional land and environmental services in Western Canada. For over 30 years, we have continued to specialize in providing a diverse range of industries and organizations with cost effective land, environmental, archaeological, remote sensing and GIS consulting services.

Roy Northern's Environmental team provide a variety of consulting expertise that specifically focuses on environmental legislation, regulations and guideline compliance related to the planning, construction and reclamation of client projects.

We work closely and constructively with each client and their respective internal teams, and are the catalyst that cultivates the stakeholder engagement necessary for projects to meet requirements and continue to progress.

## Knowledge

We will continue to develop our expertise through ongoing professional and personal development, and share our knowledge with others.

## Building Partnerships

We will focus on developing further partnerships within our industry, disciplines and communities as well as with various other stakeholders, to encourage constructive communication and business opportunities.

## Technology

We will embrace technology and use it appropriately in order to generate greater efficiencies and benefits to our clients and employees.





## Land & Regulatory Services

Successful land and regulatory services requires a broad understanding of industries and stakeholders, as well as an integrated strategy. The combination of services offered by Roy Northern ensures the unique needs of every client can be readily met.

- Acquisition of Surface Rights
- Administrative Services/ Document Preparation
- Emergency Response Planning (ERP)
- First Nations Consultations
- GIS (Geographical Information System)
- Landfill Sites/Mining and Aggregate Applications
- Municipal & Utilities Acquisitions
- Public Consultation
- Regulatory Compliance (AUC, AER, OGC, FLNRO, NEB, IOGC)
- Renewable Energy (Wind/Solar Power)
- Surface Rights Board (SRB) Applications
- Third Party Agreements

## Environmental Services

Roy Northern provides a variety of consulting expertise that specifically focuses on environmental legislation, regulations and guideline compliance related to the planning, construction and reclamation of client projects.

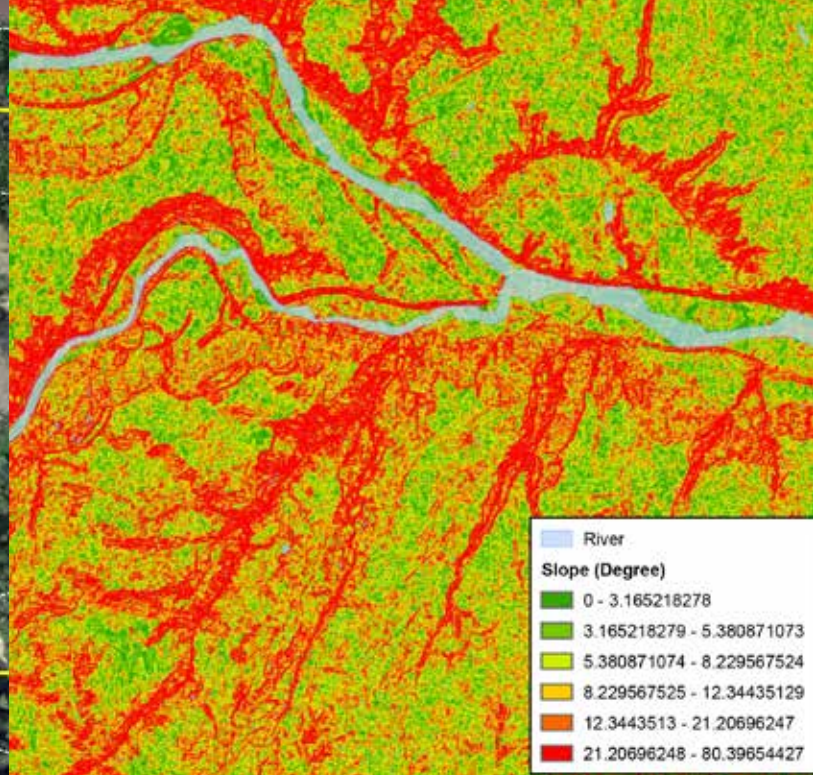
- Aggregate & Gravel Resource Testing
- BC Spill Preparedness, Response and Recovery
- Construction Environmental Management Plan (CEMP)
- Construction Monitoring and Inspection
- Contaminated Sites (Phase I, II, and III)
- Drilling Waste
- Emergency Response Plans (ERP)
- Emergency Spill Response (ESP)
- Environmental Effects Monitoring (EEM)
- Environmental Protection Plans (EPP)
- Fish & Fish Habitat Assessment
- Reclamation
- Sub-Surface Soil Testing
- Terrestrial and Wildlife Assessments & Monitoring
- Watercourse/Water Body Classification

## Archaeological Services

Roy Northern provides a full range of heritage consulting services including Archaeology and Heritage Planning to the forestry, oil and gas sector, private developers, municipalities, utility providers and First Nations throughout British Columbia, Alberta, Yukon and the Northwest Territories.

- Archaeological Overview Assessments (AOA)
- Archaeological Impact Assessments (AIA)
- First Nation Services
- Historical Resource Impact Assessments (HRIA)
- Predictive Modelling
- Preliminary Field Reconnaissance (PFR)
- Statements of Justification (SOJ)
- Site Mitigation
- Traditional Use Studies





## UAV and Remote Sensing Services

Our Unmanned Aircraft Vehicle provides the capability to gather actionable, extremely high-resolution remote sensing data through an easy-to-use, low-cost and reliable unmanned aircraft. With an array of sensors available such as multispectral, thermal, visual and hyperspectral we can customize a solution for any job or industry.

- Agriculture
- Cultural Heritage
- Environmental Monitoring and Change Detection
- Forestry
- Infrastructure Surveying
- Mineral Exploration
- Mining & Quarrying
- Oil & Gas
- Topographic Data & Landforms

## Geographic Information Systems (GIS) Services

With the use of industry-standard ArcGIS software, Roy Northern provides clients with the most effective GIS tools on the market to help manage spatial and non-spatial information throughout the stages of project development. GIS also plays a fundamental role in the decision making process and is used to help reduce project cost, increase efficiency, improve communications, create interactive queries (user-created searches), perform project based analysis and manage projects geographically.

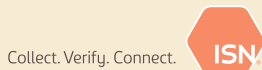
- Cartography/GIS Query and Analysis
- Data Management/Digitizing and Data Manipulation
- Hydrogeology Analysis
- Printing/Plotting/Mapping
- SharePoint Integration
- Spatial Analysis, 3D Modelling and Analysis
- Watershed Delineation using Digital Elevation Models (DEMs)

Please see our individual services brochures for more detailed information.



## Commitment to Safety

We will adhere to a comprehensive safety program that is management-driven and addresses overall health and safety of all employees and contracted personnel, and includes certified memberships and registrations with various industry compliance associations such as ComplyWorks' CanadianHSE Registry, ISNetworld, ENFORM, Avetta and CQN Advantage.



## Communication Solutions

Roy Northern is committed to using the latest industry solutions, including Divestco's iLand software allowing the client to effectively manage project communication, and the land broker to upload project data.

We also offer solutions for electronic invoicing to meet our client's requirements for invoice review, accounts payable and automated payment. The collaboration with ADP OpenInvoice and Cortex allow efficient uploading and allow for timely approval and payment.



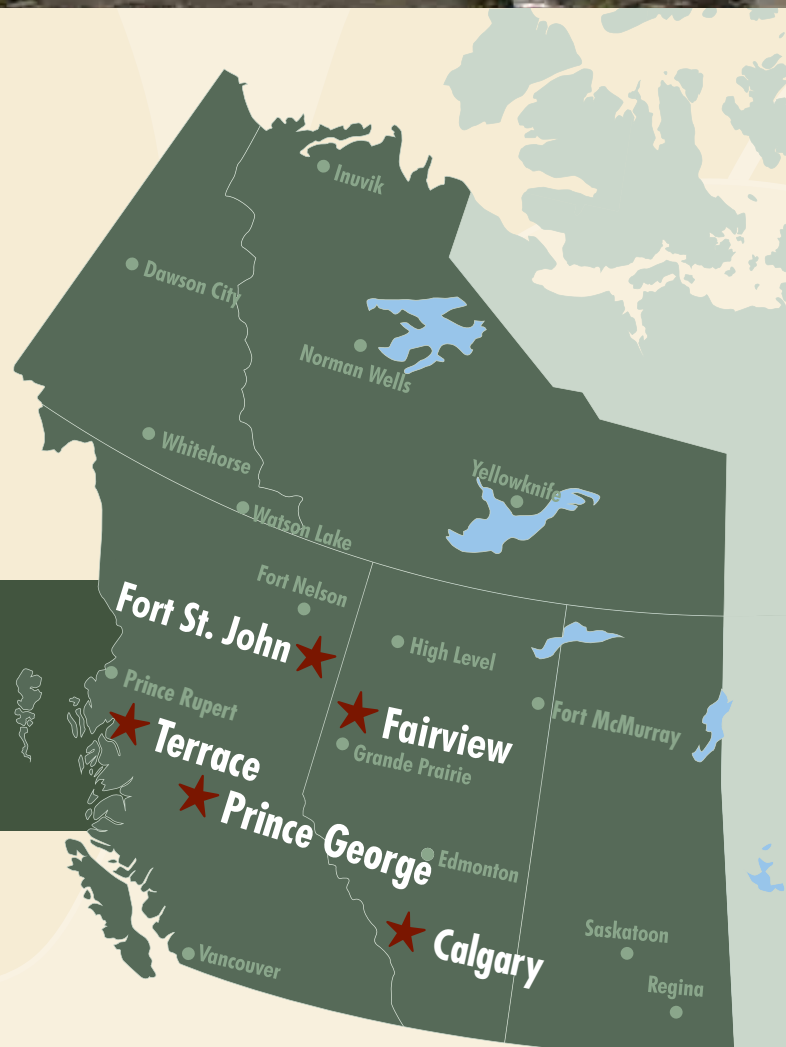




## Community

We are proud to be a locally owned and operated company. We will always be located in the regions where we work, in order to provide convenience and cost savings to our clients. We will make ourselves, information and resources readily accessible. We will continue to use current technology to keep us connected and assist in delivering our work.

**With offices in Fairview, Fort St. John, Terrace, Prince George, and Calgary, we provide a wide range of services across Western Canada.**







Visit **[www.roynorthern.com](http://www.roynorthern.com)** to learn more



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# UAV and Remote Sensing Services

Our UAV provides the capability to gather actionable, extremely high resolution remote sensing data through an easy-to-use, low-cost and reliable unmanned aircraft. The unmanned aircraft system, a small robotic plane with associated software on computers and experienced personnel, can collect extremely high resolution remote sensing data with a minimum effort and will provide invaluable input for applications such as land surveying, agriculture, oil and gas, mining, security, forestry, environmental, archaeology, monitoring, risk planning and analysis, emergency preparedness planning and response, and field conditions. Beside imagery, processing provides 3D data suitable for generating contours, 3D measurements of cut/fill volumes and 3D analysis.

## Our UAV

### Artificial Intelligence

- In-the-air flight calculations and decision making
- Plug-and-play sensors

### Hardware

Aircraft Weight: 4.4lbs / 2.0 kg  
Payload Capacity: 2.2lbs / 1.0 kg swappable  
Wingspan: 4.9ft / 1.5m  
Processor: 720 MHz CPU with Linux OS embedded processing  
Interfaces: USB



### Flight Plans

Flight plans are created by importing the area of interest via a pre-defined shapefile. Flight planner will then generate a new flight plan consisting of transects that covers the complete shapefile. During this stage the user has the ability to define the resolution of the image, though later edits to the resolution and shapefile can be made in the field. The data is then uploaded into the UAV.



### Onboard Intelligence

The UAV autonomously flies based on the predefined flight plan. The UAV's inflight artificial intelligence detects weather conditions in the air and creates its own optimal flight path in real-time. For additional safety, the UAV continually monitors itself while in flight, checking battery life, operational weather/wind limitations, structure cracks and other internal performance checks.



### Interchangeable Sensors & 3D Processing

Roy Northern's UAV has the ability to interchange a variety of sensors. These sensors may include but not limited to visual, multispectral and thermal. The data recorded by the UAV also has the ability to record point cloud data, allowing for the creation of 3D elevation models.



### Geospatial Application

Data can be used in a variety of different programs including: ArcGIS, Quantum GIS, Google Earth, Global Mapper, AutoCAD and Erdas Imagine.

## Safety

Roy Northern Land and Environmental Services has Certified Civil and Commercial Unmanned Aircraft System (UAS) Flight Operators. Our specialized UAV system complies with the Transport Canada exemption requirements (Section 602.41 and 603.66 of the Canadian Aviation Regulations) to operate an Unmanned Aircraft Vehicle without the required Special Flight Operation Certificate (SFOC). The Transport Canada exemption requirements also include conditions which address the need for the safe and responsible use of the UAV system. In special cases it is illegal to fly without an SFOC application, and in these cases Roy Northern staff are certified to apply and hold an SFOC application.

## Why a fixed wing?

Fixed-wing aircraft tend to be more forgiving in the face of both piloting and technical errors, as they have natural gliding capabilities with no power. Fixed Wing UAVs can provide long flight times, greater distances and heavier payloads making it perfectly suited for vertical mapping of extended areas. With flight planning and autonomous flying, our fixed wing is the ideal cost effective and safe solution for all your aerial needs.



# UAV and Remote Sensing Services



## FORESTRY

- Forest classification/Inventory
- Tree height monitoring
- Forest fire mitigation and assessment
- Plant disease detection
- Assessment of tree stocking density
- Stand variability
- Digital Elevation Model Generation
- Tree stocking evaluation and monitoring regeneration
- Forest health and stress monitoring



## INFRASTRUCTURE SURVEYING

- Monitoring railroad ties
- Road damage assessment
- Power line and transformer monitoring
- Municipal water supply monitoring
- Surface extraction for hydrologic modeling
- Pipeline oil leak detection
- Evaluation of urban land use



## AGRICULTURE

- Crop count
- Crop Status
- Plant height
- Tiling/drainage evaluation
- Planting evaluation and replanting requirements
- Pathogen introduction and track (weed levels)
- Topographic survey



## TOPOGRAPHIC DATA & LANDFORMS

- Rivers/floodplains – catchment mapping
- Coastline morphology and characteristics
- Geohazard mapping
- Geomorphological interpretations
- Topography (leading to digital terrain models)



## OIL & GAS

- Pipeline right of way design and assessment survey
- Environmental Monitoring and Change Detection
- Environmental Liability Assessments
- Environmental Impact Assessments
- Facility security and Risk Management
- Disaster response and drills
- Flare monitoring & inspections



## MINERAL EXPLORATION

- Aerial photography at project/prospect scale
- High resolution digital elevation models at project scale and for integration into 3D GIS models
- Multi spectral satellite imagery for mineral mapping and analysis
- Recording of ground disturbance and rehabilitation



## MINING & QUARRYING

- High-resolution digital terrain models for volume audits and cut/fills estimations
- Resource reconciliation of stock-piles, tailings facilities, and dumps
- Subsidence monitoring



## CULTURAL HERITAGE

- Identification of sites of cultural significance
- Recording of archaeological sites
- Recording of heritage sites

**Roy Northern also has access to Satellite imagery (Natural Color, Infra-Red, Multispectral), and to LiDAR 3D data for Environmental, Infrastructure, Archaeology and Land applications.**



## QUALITY IMAGERY

It costs roughly the same amount to purchase outdated high resolution stock imagery as it does to get real time imagery from our UAV.

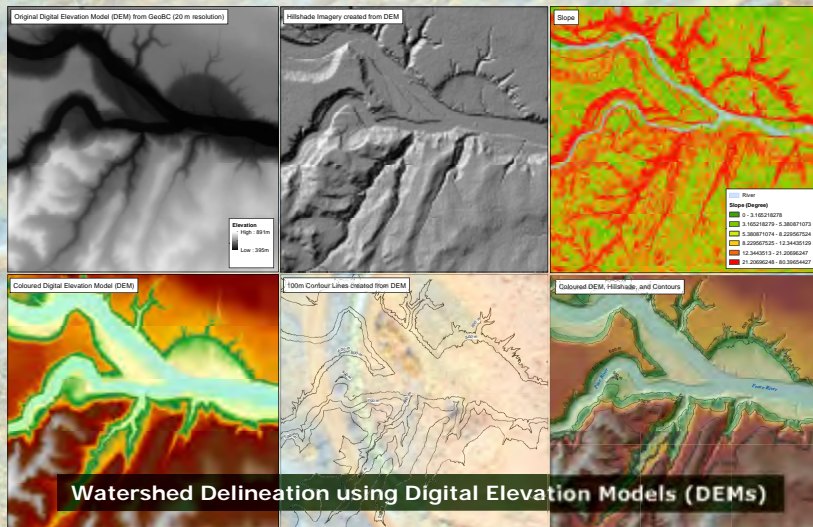
# Geographic Information Systems (GIS) Services

With the use of industry-standard ArcGIS software, Roy Northern provides clients with the most effective GIS tools on the market to help manage spatial and non-spatial information throughout the stages of project development. Our GIS department assists with all applications related to Roy Northern Land, Environmental and Archaeology services, however, GIS capabilities are limitless and can provide specialized functions used in a variety of other applications in fields of science, government and business developments. GIS also plays a fundamental role in the decision making process and is used to help reduce project cost, increase efficiency, improve communications, create interactive queries (user-created searches), perform project based analysis and manage projects geographically.



## GIS Services

- Cartographic Design
- Data Management
- Data Translations or Data Transformation
- Digitization
- Data/Statistical Analysis
- GPS Surveying/Data Collection
- 3D Modeling
- Custom Plotting
- Spatial Analysis
- Various types and sources Data integration into a unified mapping, processing and analysis environment



## GIS Specialized Services

- Data Submissions to the Private and Public Sector
- Land Consultation and Notification Modelling
- Natural Resource Damage Assessment
- Terrestrial Ecosystem Mapping (TEM)
- Watershed Delineation using Digital Elevation Models (DEMs)
- Visibility Analysis (Field of View, Line of Site)
- Normalized Difference Vegetation Index (NDVI) Analysis
- Hydrogeology Analysis

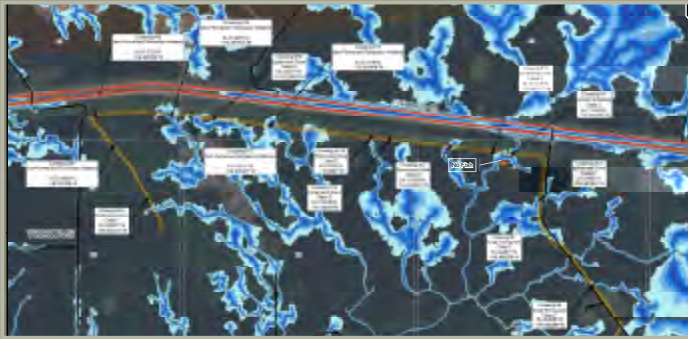
## Extended Services

With GIS technology steadily growing, our Specialists have been continually adding and improving services at Roy Northern to help achieve client needs. Please see our UAV and Remote Sensing section as part of our extended services integrating Geographic Information Systems.



# Geographic Information Systems (GIS) Services

## GIS Applications



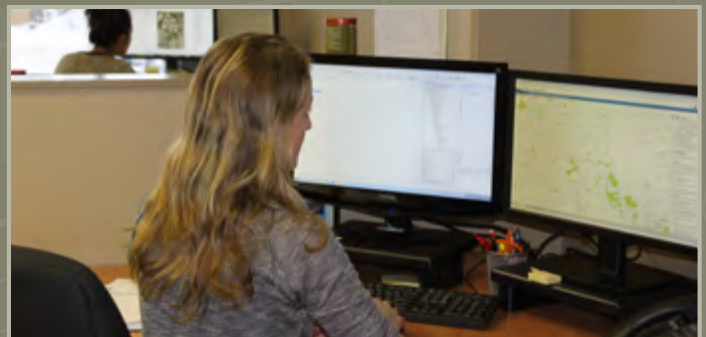
### PRE-CONSTRUCTION PLANNING

Oil and Gas construction planning involves a large amount of information regarding design, construction methods, unit costs and production rates. Roy Northern Specialists can use GIS as a tool that will integrate and manage various types of information for spatial and non-spatial data required for the pre-construction planning.



### OIL SPILL PREVENTION AND RESPONSE

GIS is applied as a tool for oil spill prevention, emergency response plans, and an aid for measuring natural resource damage.



### LAND CONSULTATION AND NOTIFICATION (C & N) ANALYSIS

Roy Northern Specialists can use GIS as a tool to provide clients with C & N line lists and identify current land restriction and ownership details required in land acquisition and construction applications.



### DIGITIZING

Roy Northern Specialists can use GIS as a tool to create, manipulate and geometrically correct data by the use of a hard copy map or survey plan to assist with urgent requests.

Our Specialists will continually add and improve Roy Northern's services to help achieve client needs. Please contact us for further information or to enquire about our services.