



Providing solutions through mapping technology

# Siting and Routing PROFILE

4DM is a team of professionals that are able to offer an extensive skill set to provide sophisticated engineering, and scientific solutions using mapping technology to a wide range of planning and management needs. Our integrated multi-disciplinary approach to problem-solving and our commitment to quality and cost-control are the basis of our success as a consulting company. We take pride in serving clients in the areas of energy, infrastructure, environment, natural resources, and social sciences.

We provide our services to a diverse group of clients within a variety of business sectors, public and private, who all share common goals and face similar challenges. Acknowledging the triple bottom line means they must improve the cost efficiency of their operations while minimizing their impacts on the environment and balancing social concerns.



## 4DM SERVICE AREAS

1. **Strategic Planning and Consulting**
  - Requirements analysis
  - Technical reviews
  - Planning support
2. **Mapping and Visualization**
  - Landcover mapping
  - 2D/3D/4D maps and multimedia
  - Cartographic
  - LiDAR/Satellite and aerial imagery
3. **Siting and Routing Analysis**
  - Stakeholder consultation using Delphi and AHP process
  - Spatial constraints mapping
  - Siting and route optimization
  - Environmental Assessment support
4. **Evaluation Analysis**
  - Statistical modeling
  - Comparative studies
  - Community consultation
5. **Applications Development**
  - Software design and implementation
  - Programming and data modeling

## SUPPORTING YOUR SITING AND ROUTING NEEDS

For the past 13 years, 4DM has been helping its clients to determine better suited areas for siting and routing infrastructure projects. Our team of scientists and engineering specialists leverage mapping technology and tools in a robust manner to provide the information required for our clients to evaluate the economic viability of the project while meeting consensus with stakeholders and public interest.

Our approach to siting and routing utilizes an inclusive method that considers economic, technical, environmental, and social values. Through an engagement process with experts, stakeholders, and community persons, our team collectively determines the opportunities and constraints associated with the project. Scenarios are generated through consulta-

tion to determine the needs coverage or suitable areas. Our siting and routing models are based on optimizing least impact options using sophisticated algorithms to determine the best routes or locations. A set of alternatives are also created and evaluated against the consensus criteria to determine a preferred site or route. This is an iterative approach that is geared towards success of the project.

Our services include consultation support, data collection, visualization, location modeling, evaluation, and designing software tools to support data gathering. Our approach can be applied at the feasibility stage or as part of an environmental assessment as well as for technical review or auditing of a proposed route or site.



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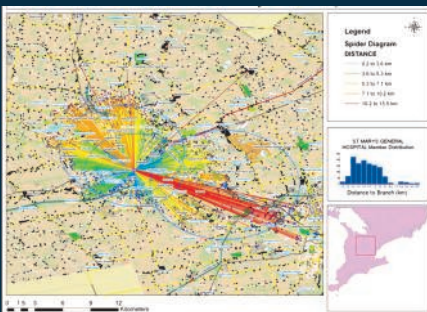
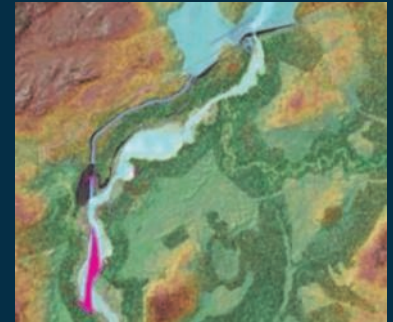


## Strategic and Consultation Support

4DM has experience conducting routing and siting modeling (transmission line routing, highway routing, renewable energy siting, pipelines, hydro and other infrastructure), land suitability mapping, and stakeholder consultation as input into the process. Our team uses a consensus method such as the Delphi and Analytical Hierarchy Process to achieve quantitative information from qualitative input. Our dedicated engineers and GIS specialists customize their efforts to meet your specific modeling, mapping, interpretation, and reporting needs, whether you require high-impact visualization products for communicating technical results to your stakeholders, need technical documents to meet your legal compliance requirements, or would like to have a presentation expertly crafted and professionally delivered to your corporate team.

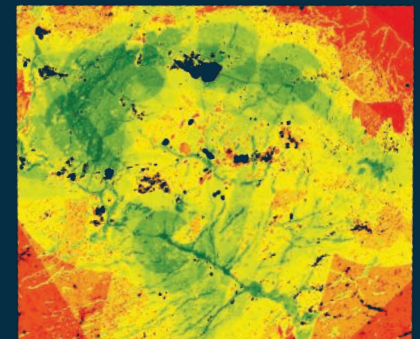
## Data Collection and Analysis

With 13 years of experience in the field of GIS, GPS, photogrammetry, and remote sensing, we have total confidence in our ability to serve all of your analysis and mapping needs. We can build, collect, and process field data and mapping layers to create information to support your siting and routing project. Our team has performed complex surface rendering and 2D/3D/4D spatial analyses to produced a variety of visualization and mapping products for numerous clients, including utilities, conservation authorities, municipal clients, environmental agencies, mining companies, nuclear safety agencies, retail companies, and emergency preparedness organizations.



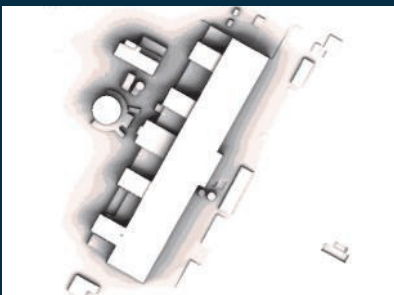
## Visualization and Mapping

Visualization not only provides a powerful means to analyze and interpret data but can also be very effective at conveying the results of scientific investigations and numerical simulations, as well as for providing meaning to decision-makers, stakeholders, and the public during consultation. 4DM can develop and produce strong visualization products that are tailored to your specific needs, ranging from simple graphs to information-rich static maps, viewshed analysis, and animated 3D renderings of complex geospatial datasets. Whether you require interpretive products in support of your routing and siting management decision-making activities, or need data exploration tools to facilitate corporate level planning processes, or are looking for visualization products that are easily interpreted by a non-technical audience, 4DM is here to help you.



## Siting and Routing Analysis

4DM utilizes an inclusive approach to siting and routing that solicits input from technical experts, engineers, environmental scientists, and community representatives, in a manner that is quantifiable and accountable. A unique aspect of our modeling approach, compared to other modeling techniques, is the type of dialog conducted with experts, regulatory stakeholders, and community representatives that provides insight into the importance of each thematic layer used to identify the potential corridors and eventually the preferred routes. Moreover, this dialog identifies the criteria used and their influence in the modeling process. We then use sophisticated algorithms to find optimum location or routes resulting in least impact results and viable cost assessment



## Application Tools

Our capabilities in supporting siting and routing includes design and development of customize tools that can be used by the clients teams as well as for data modeling to support scenarios and queries. For example, our tools can be implemented for route optimization, alternative site selection, or batch processing of large data volumes. We can also create decision support systems for managing siting and routing projects. Our team can program for desktop, web-based, and mobile applications.



## Sample Projects

### Northwest Transmission Expansion Project

#### *Hydro One Networks (SENES Consultants Limited)*

4DM developed and implemented a spatial routing model to identify preferred locations for a 450km 230Kv transmission corridor that integrated biological, socio-economic and technical geospatial information, inputs from multiple stakeholders and different scenarios. 4DM produced several visualization products for the project team, government ministries and the public, enabling the communication of large amounts of information in a concise, audience-appropriate manner.

### Next Generation Weather Radar Network Design Needs Analysis

#### *Meteorological Service of Canada, Environment Canada*

Environment Canada, through Meteorological Service of Canada (MSC), maintains 31 sites across Canada and is currently undergoing a renewal project. 4DM provided technical support and performed a needs analysis to determine coverage gap areas across Canada, and offered options and recommendations to MSC for the strategic planning and design of the next generation of the MSC weather radar network.

### Transmission Line Routing Study to Connect the CCEG Communities to the Provincial Electrical Grid

#### *Central Corridor Energy Group (CCEG) (SENES Consultants Limited)*

4DM, in partnership with SENES Consultants Ltd., was commissioned by the CCEG to identify, analyze, and evaluate the potential routing options to extend a 115kV transmission corridor north from Pickle Lake to their 10 First Nations member communities. 4DM was involved in stakeholder consultation, provide spatial data and cartographic support, and undertook network modeling to identify optimized transmission corridors to the CCEG First Nations communities based on Land Suitability Indices and other technical considerations (i.e. cost, electric design, distance, opportunities, OPA proposed radial lines, etc.).

### Niagara Escarpment Road Crossing Study Environmental Assessment

#### *Niagara Region (Hatch Mott MacDonald)*

The Region of Niagara commissioned a EA study to address the issues associated with the travel of heavy trucks on steep grades and through residential areas across the Niagara Escarpment in order to identify a new or improved escarpment crossing that could accommodate commercial traffic, while minimizing negative impacts to residents and motorists. 4DM was sub-contracted by HMM to provide spatial data and cartographic support for the project as well as to determine the least impact solutions for alternative and preferred truck routes across the Niagara Escarpment utilizing a spatial multi-criteria decision support model.

### Renewable Energy Siting and Screening Analysis

#### *EDF Energies Nouvelles (EN) Canada*

4DM was contracted to identify and map lands suitable for renewable development in as a part of Ontario's FIT program taking into account socio-economic considerations, environmental, and legislative constraints, and site limitations. Site specific analysis was then conducted to determine property parcels suitable for the development. Key deliverables provided included a siting maps, priority properties for development, and a geospatial database containing all spatial data developed during the project.

### Little Jackfish River Hydro Development and Transmission Project

#### *Ontario Power Generation (OPG) (SENES Consultants Limited)*

Little Jackfish River, located in northwestern Ontario draining into Lake Nipigon, is a potential location for establishing a generating station under the provincial energy production mandate. OPG currently operates a control dam at the top of Little Jackfish River and has conducted an environmental assessment studies to assess the viability of a potential hydropower generating station. 4DM has provided geospatial and technical modeling support that included a hydrological assessment, transmission routing viewshed analysis, erosion susceptibility mapping from LiDAR data, climate analysis, and ongoing mapping, as well as the generation of advanced visualization products for corporate use and to disseminate information to public stakeholders ([www.littlejackfish.com](http://www.littlejackfish.com)).

### Rooftop Solar Potential Siting

#### *4DM Solar Services*

4DM has developed a geo-spatial approach to identifying suitable sites for hosting solar projects within urban areas with limited space for development (e.g. building rooftops) by calculating the cumulative solar irradiance distribution (direct and diffuse) over all 3D surfaces. This approach can be use to assess the location of solar panels on a building roof as well as the impacts from surrounding buildings (see right).