Drawing the Line

THE ROLE OF SURVEYING IN RIGHT OF WAY

BY WENDY LATHROP, PLS, CFM

To the outside world, surveying and engineering are mutually compatible and even overlapping professions. However, for those of us who work inside these two arenas, we recognize the important distinctions that exist. These differences extend far beyond our areas of expertise into the very way we approach problem solving.

Turning Dreams into Reality

Despite its broad reach and application, surveying is not the same as engineering, although the two professions are closely tied. Among surveyors, the saying is that engineers dream and surveyors make the dream a reality. In other words, the engineer is about design, and the surveyor is about spatial relationships.

Surveyors can sometimes make corrections while they are on location in real time. Surveyors specializing in construction stakeout have practical experience to recognize problems in the field and may be able to make the designs fit the conditions. There are, of course, many situations when the surveyor cannot or should not "make it work," and the design will have to go back to the engineer whose own professional expertise and license must support that design. But the surveyor will be the one reporting on the actual conditions and providing site details so that the design can be appropriately modified.

There are myriad applications of surveying skills and knowledge, from managing environmental resources to designing and planning land use, creating maps and reports, and collecting, analyzing and managing data for land and geographic information systems. It is a field that expands with the times and technology, serving clients in new and innovative ways.

Role in the Right of Way Process

New applications of a surveyor's special knowledge evolve as the world around us changes its need to measure, locate, and analyze real property, its uses, and its ownership on, above, and below the earth's surface.

How does this help other right of way professionals? Certainly, the planning aspects of any right of way project include learning all that is possible about real property interests of the parties owning the land where the future corridor is to run.

Professional surveyors are experts at examining deeds to identify property interests, discerning what interests can or cannot be acquired for the desired purposes. Further, surveyors can identify the physical limits of real property interests on the ground and create maps or other visual representations of those limits. Assuredly, the survey should be completed before, rather than after an acquisition of land interests, whether those rights and interests are fee or easement in nature.

Precision vs. Accuracy

In a rapidly evolving technological age, there has been some concern that surveyors may become obsolete. But surveying is not about what new instruments and software are used; it is about knowing what tools to use for which projects to achieve the appropriate results.

Surveyors choose the appropriate technology to employ to meet specifications that will achieve the required level of

accuracy while acquiring the desired data. Unfortunately, the general public often misunderstands the difference between precision and accuracy, the first addressing the repeatability and consistency of results and the second equated with truthfulness.

In explaining the distinction between the two, a popular analogy often used is bullet holes in a target. All of the holes can be closely clustered together, but located on the outer ring of the target. They are therefore precise, but since the intent was to hit the bull's eye, none of them are accurate. On the other hand, we can have a series of shots less tightly clustered, but all in the immediate vicinity of the target's center. These are considered less precise, but infinitely more accurate than the first set.

"… surveyors take into account the relevant legal, economic, environmental and social aspects affecting each project…"

Ideally, we want both accuracy and precision, and a surveyor understands the proper use of technology, hardware and software to achieve both of these goals simultaneously. Surveyors are also able to analyze older surveys for both accuracy and precision, and it may surprise non-surveyors to find that work performed centuries ago was often extremely accurate, despite the very different tools and knowledge base from what is now available.

Scope of Work

The surveyor's professional tasks involve activities that may occur either on, above or below the surface of land or sea and may be carried out in conjunction with other professionals. In the application of these activities, surveyors take into account the relevant legal, economic, environmental and social aspects affecting each project.

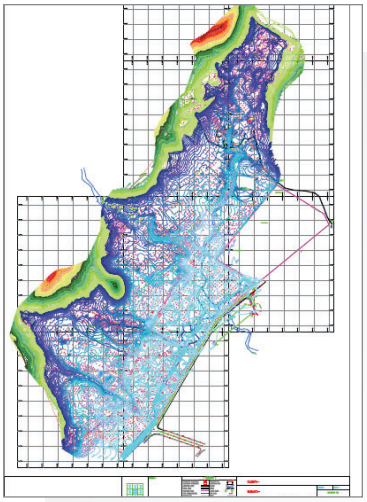
While some of the surveyor's functions may be familiar, the extent of their responsibilities may be relatively unknown.

In addition to simply determining the size, shape and boundaries of land, a surveyor may be tasked with:

- Studying the natural and social environment, measuring land and marine resources and using data in planning the development in urban, rural and regional areas.
- Designing, establishing and administering geographic information systems (GIS) and collecting, storing, analyzing, managing, displaying and disseminating data.
- Analyzing, interpreting and integrating spatial objects and phenomena in GIS, including the visualization and communication of data in maps, models and mobile digital devices.
- Determining the position of boundaries of public and private land, including national and international boundaries, and the registration of those lands with the appropriate authorities.
- Assessing the value and management of property, and planning, developing and redeveloping urban and rural land or buildings. Planning, measuring and managing construction works, including cost estimation.
- Acquiring, automating and using spatial information from close range, aerial and satellite imagery.
- Developing, testing and calibrating sensors, instruments and systems for surveying purposes.

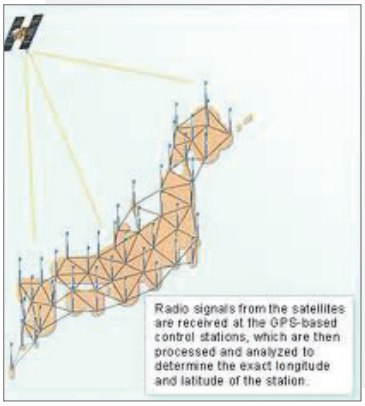
Surveying Applications

It may surprise some readers to discover that there are many sub-specialties within surveying. The following provides some of the many different types of surveying applications used today.

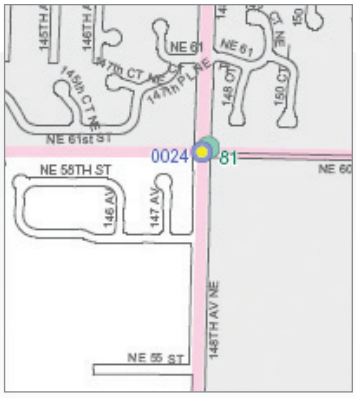


Hydrographic surveys determine depth of water, configuration of the bottom of water bodies for mapping and navigation, directions and forces of currents, heights and times of tides and water stages.

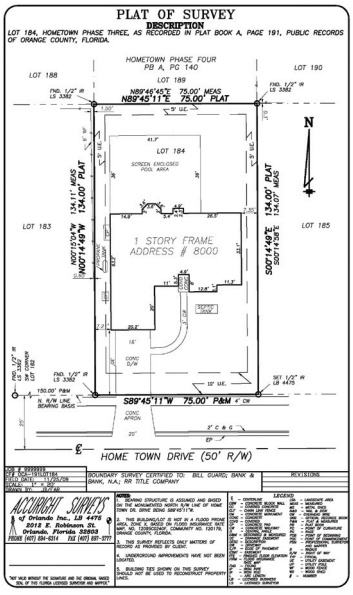
Judicial surveys are ordered by the courts to resolve boundary disputes.



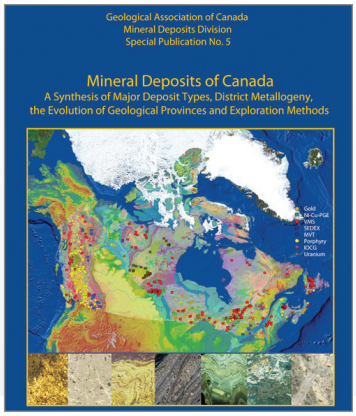
Geodetic surveys take into account the shape and size of the earth when distances are long and must curve to accurately describe the land.



Control surveys provide horizontal or vertical position data for dependant surveying or mapping projects.



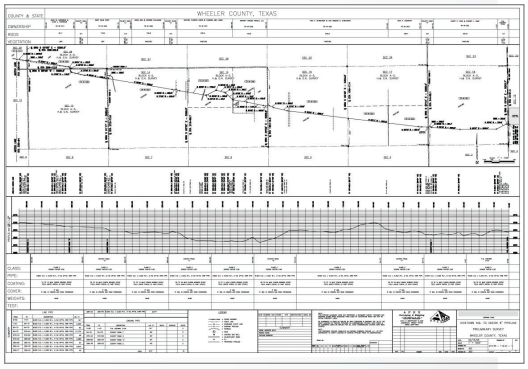
Boundary surveys establish or re-establish limits of privately or publicly owned tracts of land.



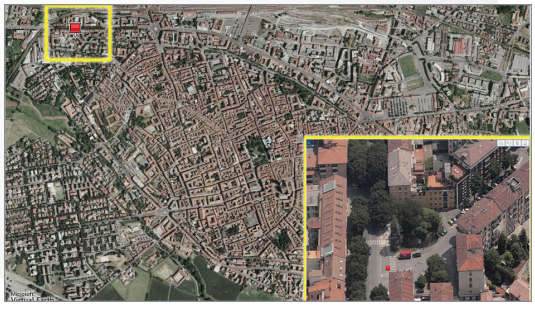
Mines and minerals surveys determine positions and dimensions of underground passageways, ore deposits or mineral formations.

Construction surveys establish horizontal and vertical positions and dimensions for construction, to determine adequacy of project completion and to compute quantities of materials and soil volumes.

Historic surveys recover and preserve ancient evidence of property lines and archaeological discoveries.



Route surveys determine feasibility of different routes for railroad, highway, canal, pipelines, and transmission lines for alignment, grade, and property to be acquired.



Photogrammetric surveys establish scale of ground or aerial photographs for mapping.

Professional-Level Status

In the U.S., the surveying profession is regulated by each of the separate states, commonwealths and territories, each with their own legal definition of practice and set of rules and regulations guiding that practice. Some states define professional surveying in relation to real property interests and locations. Some include engineering functions, such as site grading and drainage design, while others add horizontal and vertical control for the base mapping that underlies geographic information systems.

There are, of course, many surveying activities beyond what is identified in the legal jurisdictional definitions. However, certain functions are limited to licensed professionals, which ensures a certain level of competence. Proof of licensure represents successful accomplishment of specialized experience, education and examination more rigorous and comprehensive than what is included in certifications that may be proffered by educational institutions or professional societies. It represents a special status in the eyes of the law, overseen by a regulatory body charged with protecting the public from inept, incompetent, outdated and dishonest practices.

Some unlicensed practitioners may be as knowledgeable as those holding professional status and simply have not gone through the process of intensive examination to achieve professional licenses. Unfortunately, others have just enough knowledge to make some dramatic errors. In some cases surveying undertakings by unlicensed individuals are even considered illegal criminal activity.

Worldwide View

Beyond state, provincial and national professional surveying societies and regulatory bodies is an international organization, the Fédération Internacionale de Géomètres (FIG). Taking a worldwide view, FIG has developed a broad definition of surveying that takes into consideration the fact that different nations encompass even more arenas than those recognized as surveying here in the Northern Hemisphere.

According to FIG, a surveyor is a professional person with the academic qualifications and technical expertise to conduct one or more of the following activities:

- Determine, measure and represent land, three-dimensional objects, point-fields and trajectories;
- Assemble and interpret land and geographically related information;
- Use that information for the planning and efficient administration of the land, the sea and any structures thereon; and,
- Conduct research into the above practices and develop them.

Collaborating with our Colleagues

Despite the different functions of surveying and engineering, there is a single common theme. Our mutual goal is to protect the health, safety and welfare of the general public by assuring that licensed individuals practice in a consistent, safe, reliable and professional manner.

The underlying mission of IRWA's International Surveying and Engineering Committee is to advise and assist the Association and its members on all matters relating to surveying and engineering. This includes keeping abreast of all issues related to the process or procedures required for surveying real property or interests in property for right of way purposes. We are also responsible for examining, monitoring and reporting on legislation or changes in legislation, studying practices and procedures for surveying real property, or interests in real property.

Above all, the International Surveying and Engineering Committee is committed to fostering a better working relationship among our colleagues. We hope to accomplish this through improved communication and by collaborating with the various professions intertwined in the work of acquiring, creating, and maintaining rights of way.

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