THE ARIZONA PROFESSIONAL LAND SURVEYORS ASSOCIATION
GEOSPATIAL ORGANIZATION COMMITTEE

The Geospatial Debate

Considerations for the Development, Management and Use of Geospatial Data in Arizona

APLS Geospatial Organization Committee

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Introduction

Purpose

This document has been compiled to provide insight into some of the events, activities, and history of the Arizona Professional Land Surveyors (APLS) Geospatial (GO) Committee, particularly as it applies to the question of geospatial data and the safety, health and welfare of the public. A recent impetus for developing this document is a letter of inquiry from Mr. Larry Dresden, RLS, to the Arizona State Board of Technical Registration (SBTR). Mr. Dresden has requested that the SBTR clarify its interpretation of Land Surveying practice as defined in Arizona Revised Statutes (ARS 32-101.22(d)) regarding development of mapping data by individuals who are not registered as Land Surveyors or Engineers and who are not working under the supervision of such registrants.

The SBTR has given APLS permission to review and comment on this issue. To accomplish this, the GO Committee was tasked by the APLS Board of Directors to review and respond to the Dresden letter, and ultimately make recommendations that will be taken before the SBTR.

The purpose of this document is first to give an overview of the history, issues, and key concepts in order to provide an organized understanding relating to the development, management, and use of geospatial data in Arizona. Second, this document also contains information gathered at GIS/Surveying discussion forums held throughout the state. Third, this document will offer an opinion on the letter from Mr. Dresden as well as lay the groundwork for future guideline development by APLS and/or the SBTR.

Section 1: Educational Background and Information

Historical Background

Geographic Information Systems (GIS) have been on an evolutionary climb for nearly 30 years. Although the concept of GIS has existed for thousands of years, technology has pushed developmental limits. Originally, GIS was considered a simple overlay process using parched paper. Once Mylar was invented, the overlay process became easier. Although the rich database complexities of GIS were not present, the simple process of overlaying one map upon another to see geographic (spatial) relationships of features on the earth was a simple GIS. In the late 1970's and early 1980's Automated Mapping/Facilities Management (AM/FM) emerged as an upcoming methodology for managing infrastructure. Many surveyors and engineers were involved in mapping, drafting, and providing electronic copies of infrastructure locations to clients during this timeframe. Also during the early 1980's, GIS software began to emerge as the preferred technology to manage the infrastructure. At that time, the process of "locating and mapping" surveyors and engineers exclusively located the infrastructure. The reason for this exclusivity was two fold. First, the legislative criteria in all states had clearly defined the "Practice of Surveying" or the "Practice of Engineering" to include many functions, one of which was the locating and mapping of features on the earth. Second, the technology was complex in that certain surveying equipment was required (transits, theodolites, total stations, electronic distance meters, etc.) and a specific skill set was required to operate the equipment. The cost for one to acquire the equipment was also mostly prohibitive.

The then emerging role played by GIS software (and GIS software operators) was simply to provide a structure to organize, manage, attribute, and analyze the data collected by others. The use of the term "GIS software operators" in no way correlates this example with the modern day GIS professional. It simply demonstrates that in the early 1980's GIS software was a small tool used by a number of technical people to manage data within an AM/FM system. Although specific GIS professionals were also emerging to use GIS software for many of the numerous advantages seen today, the emphasis of this discussion is to highlight the correlation to, and overlap with the professions of surveying and engineering. Notably, it was at this time that the use of modern day GIS technology began the journey to become an organized profession. Please note that the term "professional" as used herein is consistent with the ordinary definition in the dictionary and is not contingent upon any type of legislative authority or voluntary certification programs.

Over the time span since the early 1980's there have been substantial technological advances in hardware and software, including surveying equipment. Most notable among these is the Global Positioning System (GPS). In the early years, this technology was even more expensive than standard surveying equipment and only affordable by those with substantial capital, which restricted its use to surveyors and some engineers with successful businesses and some government survey agencies. The GPS units at that time provided decimeter to centimeter level accuracy, and the equipment remained expensive

until the mid-1990s. At that time lower accuracy "sub-meter" GPS units became affordable which were capable of precisions of about 1 to 3 meters. At the same time GPS equipment of centimeter to sub-centimeter accuracy also became more affordable (although still much more expensive than the sub-meter units), and this equipment began to be used by increasing numbers of surveyors and engineers. The term "survey grade" GPS unit was coined to distinguish this equipment from the sub-meter equipment. This terminology highlighted that fact that "survey grade" GPS equipment was considered acceptable for accurate survey work, whereas sub-meter equipment was not. Naturally, the discussions of infrastructure location accuracy became more pronounced. "Do we really need a manhole or fire hydrant location to centimeter accuracy for purposes of infrastructure management?" Surveyors tended to ignore the sub-meter units, and overall they chose not to be a part of survey work that would consider using equipment that provides such "rough" locations. This was due mostly to existing state laws that required a surveyor 'to accurately locate' features. There was little room for sub-meter locations within the laws as written at the time and in most cases the laws remain unchanged.

A void now existed. People without substantial capital could afford the sub-meter GPS units. Therefore, non-surveyors and non-engineers began purchasing and operating sub-meter GPS units. These new users began to refer to the units as either "non-survey grade", "resource grade," or "mapping grade." The premise of the new GPS users was that if they had a "mapping grade" GPS unit they were not performing surveys. This premise stoked controversy among surveyors, yet they chose not to take the lead on this issue. Instead, they largely ignored the problem and allowed unchallenged use of sub-meter GPS units by non-registrants.

Although surveyors chose mostly to ignore the use of sub-meter GPS units, they did manage to create some waves in a few states. Surveyors also were a heavy influence in the creation of the National Council of Examiners for Engineering and Surveying (NCEES) Model Law. Throughout this period, the use of sub-meter GPS units was increasing. More specifically, the GIS profession and the availability of less expensive, higher quality GPS devices accelerated the increase. Surveyors increasingly shied away from conflict and took the position of not getting involved in GIS, claiming it to be only a cartoon. There was great hope within the general survey community that the users of sub-meter GPS units would make so many mistakes that the surveyors would be called upon to rectify their problems. There may be isolated incidents of this, but overwhelmingly there have been no disasters as anticipated.

A recent policy change affected this debate when the Federal government turned "off" Selective Availability (SA) in May 2000. SA was a deliberate degradation of the data provided by the satellites. It could only be removed by a code available only to approved (mainly military) users. In the presence of SA, data "post processing", differential corrections, or expensive relative positioning equipment (such as RTK) were required to obtain both sub-meter and sub-centimeter accuracies. Without such methods or equipment, SA degraded the real-time stand-alone (autonomous) accuracy of GPS to about 100 meters (300 feet). With SA off, even inexpensive consumer-grade GPS units could obtain real time, autonomous positional accurate to within about 20 feet, and the recent addition of the free WAAS (Wide Area Augmentation Service) signal has

improved accuracy to within (approximately) 6 feet. WAAS-enabled handheld units have become very affordable (in some case less than $200) which in some sense has made everyone a surveyor. Now the debate has heated up as to whether or not these new GPS users were performing surveying.

Arguably one can say that it has only been since the mid-1990's that locating features on the face of the earth by use of field equipment has exclusively fallen out of the hands of surveyors. One must ask the question at this point, "Since surveyors (engineers) have 'located features' for thousands of years with many different technological advances (ropes and poles, compasses and chains, sextants, transits, theodolites, total stations, EDMs, and GPS) why would this one single technological advance of a sub-meter GPS unit change history and the written laws?" This is a valid question to ask and analyze regarding a prime topic for discussion within the context of today's businesses of surveying, engineering, and GIS.

Today we see an ever-widening gap amongst the GPS community as data acquisition through inexpensive consumer-grade instruments grows (e.g., the typical hiker GPS). All data collected are in essence "GPS" and could be loosely described as a "survey." Anyone has the ability to collect GPS information (through whatever instrument is available) and publish this information to represent his or her latest quest. The gap appears to be widening, and issues surrounding the historical aspect of land surveying versus location-based services are becoming more evident. Key to this entire scenario is the data/information itself, which includes understanding and identifying the development and applicable uses of such information.

Other issues are evolving that are directly applicable to surveying/engineering practice and GIS, such as data distribution and mixing of datasets. Another key issue is the "authority" of the data being presented to the "public." Rather than continuing to ignore the past ten or so years, APLS formed an ad-hoc committee in April 2002 (which has since become the permanent Geospatial Organization (GO) Committee). The initial committee consisted of thirteen prominent Arizona GIS and survey professionals who as instrumental professionals, were invited to the first meeting. The relationship and bond that was formed at that time has created an organizational structure within APLS where GIS professionals can become full voting members of APLS and the GO has been designated as an official "chapter" within APLS thereby giving the GIS profession, and other geospatial professionals, full APLS Board representation and APLS Board voting rights. This accommodation offered GIS professionals an opportunity to have a structured professional organization recognized in the State of Arizona. This would allow the GIS professionals the opportunity to participate in a state professional organization as well as provide a structure and financial backing to solve issues of professional interest. The committee members clearly recognize the need for multi-discipline participation to solve issues that could potentially lead to a collision of practices. Legal battles, State Board of Technical Registration complaint issues, and all out disrespect of each other are all possibilities without cooperation. We in Arizona have recognized and prepared for a proactive and participatory solution to avoid Judgment Day.

APLS Geospatial Organization Committee

The APLS Board of Directors first commissioned Geospatial Organization (GO) as a subcommittee in July of 2002. The mission of the subcommittee was to determine the differences between the surveyor and the "geospatialists" (geospatial professionals) and to bridge the gap between these disciplines to expand the outreach of the association and by assimilating the practices for the protection of the public.

In 2004, the GO subcommittee became a full committee of APLS with the development of a geospatial chapter, which included a geospatial representative on the APLS board. With this advancement, the GO Committee developed a mission statement:

"*To act in the best interest of the public by providing Geospatial Professionals with a forum for promoting best practices, developing spatial standards, fostering education, and encouraging participation with Land Surveying and other relevant geospatial disciplines."*

Harmony between the two professions within APLS was established, and the technically detailed education about both practices has been an on-going and positive activity amongst the APLS members. While the mission of the GO Committee continues to be met and expanded, the focus of the committee has been the development of spatial standards that would set a national trend model for other entities to emulate. More importantly, one of the most significant of these standards is to assist with defining the delineator between the practice of data collection for surveying and data collection for feature attributes used in thematic mapping and analysis by geospatialists.

The Dresden Letter

In the early months of 2007, Larry Dresden, RLS (City Surveyor, City of Yuma) submitted a letter of concern to the State Board of Technical Registration (SBTR) highlighting portions of the Arizona Revised Statutes pertaining to the responsibility of the SBTR and the definition for the practice of Land Surveying. His letter also reflected on the perpetuation of City Atlases showing Public Works Utilities created by the City of Yuma and the Geographic Information System (GIS), which the City uses for the maintenance and distribution of those maps.

After providing some detail of the City of Yuma's GIS development and the City's GIS coordinate systems and datums, Mr. Dresden's letter continued describing the City's mapping practice and his interpretation of the ARS, as they may be applied to survey mapping. Mr. Dresden further identified a statement used by the City that purports to exempt planners from having to use surveyors to develop maps used for planning purposes in the City of Yuma. Elimination of the clause would ultimately prevent all of Arizona GIS and mapping practices unless performed under the supervision of a Licensed Surveyor.

Mr. Dresden's letter reads: 'Can a statement "***for planners and their planning purposes only***" allow people to circumvent what I feel are applicable statutes in regard to actively practicing Land Surveying and the licensing requirements as Land Surveyors or Civil Engineers?'

It is agreed that Mr. Dresden presents a good case for the SBTR's consideration, but this request requires much consideration before a determination is made. A decision that may have far reaching affects on the industry and the very charge of the SBTR, "provide for the ***safety, health and welfare*** of the public".

The APLS GO Committee was tasked to review, respond to Mr. Dresden's letter, and make a recommendation to the SBTR with the approval and support of APLS Board of Directors.

APLS is committed to finishing the work that was started by the GO Committee and in that process should provide the community and the SBTR a solid, organized understanding of the issues and possible solutions before any decisions rendered by the SBTR are made that could have long lasting repercussions on the concerned professions and associated industries.

A defendable position can support either opinion on this issue. Conceivably, one position could hamper GIS development and one position could take survey data collection out of the hands of surveyors. APLS sincerely supports the idea that neither of these unilateral solutions are in the best interest of the public. In order to best "Protect the Public" there may need to be several actions initiated in the future, one possible action including the assimilation of geospatialists into the realm of profession registration.

Problems

Changing Technologies

Technology has dramatically advanced through recent years. Innovations in computer technology, GIS technology, easy-to-use software, GPS devices, and other systems have made it easier for a greater number of users to create geospatial data. In many ways, the technology has changed faster than policies and laws governing the use of geospatial technology. While users may now generate very precise data, these users may not understand the geodetic realities of the data they generate. This can lead to data use for purposes that are not appropriate for how the data were developed.

The spectrum of GPS instruments (survey, mapping, and consumer-grade products) has increased throughout our environment, location based services have added a new dimension to society's ability to provide spatial context as well as informational context to any applicable situation. These instruments provide society a tool to easily collect (survey) data and publish geospatial data for the masses to review, use, and in some cases misuse. Key to the situation at hand is both the acquisition of the data, as well as proper classification of the processes used to obtain the positional data. Users of this data should be provided with reasonable, identifiable, and recognized standards for the collection and distribution of location based information. Otherwise, it would be unwise to utilize the product, or one must simply assume such products have little value for large-scale mapping.

Two concerns come to mind with respect to this increased technology – people and data. Since the technology is market driven, the products (all grades) are obtainable by anyone

willing to pay the price – using this technology is NOT licensed to an individual, nor is the generation of any information through the use of this technology licensed. It is imperative to the geospatial professions that any information provided have proper metadata associated to ensure proper use within any applicable system. Education of users and development of data collection standards is paramount to the proper interpretation of information. Geospatial technology now allows for (relatively) easy dissemination of location information to regional levels; hindering this technology has the potential to greatly affect emergency management (which speaks directly to "protecting the public").

Arizona Revised Statutes Interpretations

This section of the document provides for educating the reader on, both the *Strict* and *Flexible* application of the ARS 32-101.22(d). Without a definitive interpretation of the statutes, it would remain too easy for a ruling in a judgment to be considered subjective, and would open any such case to challenge in a court of law. The following interpretations are illustrative; however, they serve as the foundation for any recommendations provided to the APLS Board of Directors and ultimately a recommendation from APLS to the SBTR.

Strict Interpretation of Arizona Revised Statute 32-101.22(d)

Regarding the main example of non-registrants using GPS equipment to locate infrastructure we need to examine closely the applicable Arizona statute.

"Measurement by angles, distances and elevations of natural or artificial features in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water for the purpose of determining or establishing their location, size, shape, topography, grades, contours or water surface and depths, and the preparation and perpetuation of field note records and maps depicting these features."

Knowing that legislatures attempt to write laws to withstand the test of time and not be subject to frequent updates due to technology or methodology we can examine this statute. We also know that surveying equipment and methods have changed greatly over time. Even since the first registration laws in Arizona, circa 1921, the equipment and technology has changed significantly. Additionally, if one is to consider interpretation of statute, one should bear in mind that GPS (i.e., satellite-based positioning systems) is currently the most "advanced" positioning system, but it is virtually guaranteed that even more advanced and efficient systems will be developed.

Originally, surveyors/engineers used transits, chains, alidades, and levels to measure "*by angles, distances, and elevations…features…on the surface…of the earth…for the purpose of determining or establishing their location…*"

Then surveyors/engineers began using theodolites and electronic distance measuring (EDM) equipment to do the exact same thing.

Then surveyors/engineers began using "total stations" (an electronic combination of a theodolites and EDM) to do the exact same thing.

Then surveyors/engineers began using total stations and electronic data collectors to automate the exact same thing.

Then surveyors/engineers began using sub-centimeter GPS units to do the exact same thing.

The point here is that regardless of, or in spite of, technology it is the "*Measurement by angles, distances and elevations…features…on the surface…of the earth…for the purpose of determining or establishing their location…*" that has not changed. In other words, no matter what the technology might be, the way measurements are taken is not of issue. It is the act of measuring that constitutes surveying in accordance with this statute.

Along with this understanding, we address the use of photogrammetry. In Arizona, by Attorney General Opinion and subsequent State Board of Technical Registration support, if photogrammetry is used to locate features or topography, or anything else indicated by the statute then the "acts" of the photogrammetry company constitutes the practice of land surveying in accordance with this statute. This makes sense in that the legislature could never predict and anticipate all the changes in technology that may offer new and improved methods for measurement. The "act" of measurement must withstand the test of time. So rather than measurement using a transit, theodolite, or GPS unit the photogrammetrist uses a machine, aerial photographs, precise survey control, and technical expertise to perform the "measurement".

After many years of evolving measurement techniques including EDMs (measurement by wavelength for reflected light) and GPS (measurement of satellite signals used for satellite trilateration), the statute defining the practice of land surveying was not seriously debated. There was no need to debate a statue, which seemed to make legal and operational sense.

Now introduced are the sub-meter GPS units, which operate much more easily than sub-centimeter GPS units do operate and are less expensive than the more accurate units. Nevertheless, <u>they perform the same function regarding the location of features on the earth</u>. However, now should the statute be interpreted to mean something entirely different from how it has historically been applied? Are we to think that accuracy alone is the sole reason to consider the "acts" of these measurements to be something other than surveying?

The answer is undeniably "no." The statute does not address "accuracy" as a component to the location method. Generally, it is certain that sub-meter GPS is far more accurate than using the alidade, or transit and stadia. Typically, we see improving accuracy through new technology, but efficiency is also a benefit.

If accuracy is not a component to defining the practice of surveying then can it be affordability? Now that non-surveyors can afford less expensive GPS units, then do they automatically get a pass to perform the tasks clearly outlined in ARS 32-101.22(d)? The answer is, "Absolutely not." The statute does not refer to changing the "acts" of surveying based on what a person might be able to afford.

The statute has been in effect through numerous technological changes, accuracy changes, and affordability changes. None of the equipment or methodology changes has offered an entirely different interpretation of the statute until the hand held GPS units and the sub-meter GPS units fell into the hands of non-registered people. It has been neglectful marketing and in many case misrepresentation of this equipment by the manufacturers of the equipment (and software) that has caused this problem.

Failure by surveyors or engineers to take an aggressive and proactive stance against non-registrants using this equipment is not cause to believe there has been acquiescence in the neglect of this statute.

Whether one is using a transit, alidade, or sub-meter GPS unit to locate by measurement the features indicated in the statute they are practicing land surveying.

Flexible Application of Arizona Revised Statute 32-101.22(d)

Regarding the main example of non-registrants using GPS equipment to locate infrastructure we need to examine closely the applicable Arizona statute.

"Measurement by angles, distances and elevations of natural or artificial features in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water for the purpose of determining or establishing their location, size, shape, topography, grades, contours or water surface and depths, and the preparation and perpetuation of field note records and maps depicting these features."

Legislatures make every attempt to write laws that withstand the test of time and are not subject to frequent updates due to technology or methodology. However, that does not mean the laws never need to be changed, nor does it mean interpretations of the laws must remain fixed and rigid. In fact, we have seen the Constitution of the United States - interpreted with slight advances as society evolves. In addition, there does tend to be a trend in law making that is reactionary legislation. Rarely do we see a law enacted that is truly visionary and ahead of it's time. We usually see laws written either to correct an operation of society, or to catch up to society. Often times when statutory laws fall behind the societal aspects, the courts will step in and apply an "equitable" solution. They often stretch the meaning of the statute to accommodate real life, providing such interpretation will cause no harm.

The question at hand is whether the statute cited above is written in a way that can only be interpreted in one way or if the statute could be interpreted in a flexible manner.

Arizona Land Surveyors and Engineers were first regulated in 1921. At that time, Land Surveyors could only perform boundary surveys. They could not even perform the type of survey currently under examination. In 1956, the law was revised so that surveyors could do construction staking and topographic surveys. This changed because surveyors were in fact doing those types of surveys for many years. The law has remained essentially the same since then, 50 years. The change in 1956 did not include any revolutionizing language that points to technology being a factor in the change. It simply accommodated the societal change that had already occurred. There has been minor

tweaking of the language since 1956, but never to the extent technology was the driving factor. So, we are essentially looking at a statute that was implemented over 85 years ago. At that time lawmakers did not consider technology advancing to where it is today. It is doubtful anyone could have anticipated the evolution of total stations, let alone GPS. So at that time and subsequent thereto, the mindset of the legislation regarding surveying was that lawmakers envisioned a surveyor with crew and equipment making measurements in the field. Surely when we examine the term "measurement" within the statutes the legislature had a clear picture of a surveyor standing in the field making physical field measurements with some type of "survey instrument". In examining many definitions of a "surveyor", one will see that the emphasis to define a surveyor as one who performs "detailed examination" and uses a "survey instrument". When examining the many definitions of "survey instrument" one will occasionally find generic reference to "electromechanical or mechanical" devices used to measure features. GPS does fall within the "electromechanical" category. However, up until GPS the mechanical operating skills required to operate survey instruments far surpassed the abilities of a non-surveyor. Interpretation of the mechanics of the equipment, understanding of trigonometry and geometry, calculations, and physical skills were necessary to make proper measurements.

GPS has changed the skill set. GPS requires knowledge of coordinate systems, geographic projections, data transfer, and understanding software operation. The physical skills have given way to mental skills. The need to apply specific measurement techniques is substantially less than ever before. Granted someone may need to hold a rod in the plumb position, but the primary measurement skills acquired by a surveyor used with all prior survey equipment is not a part of the equation. As such, it seems reasonable to believe that the intended application of the word "measurement" in the statute has an entirely different meaning than any lawmaker imagined. A surveyor does possess the new skill set as mentioned and is certainly qualified to utilize GPS as a measurement tool, but cannot claim they are the only "qualified" people to operate such equipment.

Additionally the main reasons surveyors/engineers would perform topological surveying was primarily for construction of subdivisions, roads, utilities, etc. Rarely did surveyors (aside from the AM/FM projects in the 1980's) accomplish surveys for simply locating fire hydrants, or manholes, etc. In fact many of the old utility maps, some still in use today, were created by field workers making measurements from curb lines and poles, etc. Surveyors and engineers have used these maps as reference for many years and never contended the field workers were "surveying". That is because everyone knew the nature of the maps. They were "rough" measurements used by maintenance staff to facilitate asset management. The clear analogy to be drawn here is that the Tax Assessors do not perform land surveying although their product (tax maps) sure does look like a survey in many cases. We all know these maps are nothing more than a "rough" diagram for reference.

However, a caveat can be offered. The old school method of locating and plotting asset features was often accomplished on maps with very small scales. In addition, these maps were not readily distributed to the public. In addition, when they were given to

surveyors/engineers they often contained a stamp indicating the relative accuracy of the features with a disclaimer. It is this area of "Data Distribution" that offers potential to harm the public. Since GPS data collection offers many decimal place coordinate values, rather than to the nearest foot, when data files are transferred or displayed on a website there may be a presumption that the accuracy is greater than any disclaimer might attempt to clarify. This topic of "Data Distribution" is a separate issue and may not even be a component for discussion within the context of the "Practice of Surveying."

In conclusion, sub-meter GPS location of infrastructure assets for the use in maintenance operations is no different from "roughly" locating the very same features by crude methods and plotting them on utility maps. That practice has never been considered the "Practice of Land Surveying" and should not be considered as such now simply because technology has improved efficiency.

Since we have concluded that the location of infrastructure assets using sub-meter GPS by non-registrants is not in violation of the law it is fair to offer other examples of modern day GIS practices for thought that "might be" considered the "Practice of Surveying/or Engineering".

APLS GO Committee Observations

The National Council of Examiners for Engineering and Surveying (NCEES)
The NCEES is a national non-profit organization composed of engineering and surveying licensing boards representing all states and U.S. territories. The NCEES has provided recommendations for adoption by states to better define the issues that have arisen from the use of Geographic Information Systems and their associated tools for the development of informational maps and analysis. While NCEES Model Laws and Model Rules are guidelines for voluntarily use by state regulatory boards across US Territories, it is not the recommendation of this organization to use the NCEES Model Law or Model Rules to make revisions to the ARS or to SBTR policies or rules. The vast majority of the NCEES document deals with testing and other issues that are beyond the scope of this study. However, there are some key concepts that the NCEES does provide which may be useful to the issues currently faced in Arizona.

For example, a portion of the NCEES definition of the Practice of Land Surveying states:

"… the making of geometric measurements and gathering related information pertaining to the physical or legal features of the earth, improvements on the earth, the space above, on, or below the earth… providing, utilizing, or developing the same into survey products such as graphics, data, maps, plans, reports, descriptions, or projects."

This can be compared to Arizona Revised Statute, which contains similar language:

"…Measurement by angles, distances and elevations of natural or artificial features in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water for the purpose of determining or establishing their location, size, shape, topography, grades, contours or water surface and

depths, and the preparation and perpetuation of field note records and maps depicting these features…"

In 2000, the American Photogrammetrists and Remote Sensing Association (ASPRS), assembled a Geospatial Committee, made up of individuals from several professional associations representing surveyors, geodesists, photogrammetrists and GIS professionals to review and make recommendations to the NCEES to incorporate geospatial practices into the Model Law. The group met for over a year and developed a series of consensual recommendations, which they presented to the NCEES. These recommendations were incorporated into the current version of the NCEES Model Law and Model Rules. These guidelines provide examples of activities and uses of geospatial data to be included or excluded from the Practice of Land Surveying.

The GO Committee is not recommending utilization of the NCEES Model Law to modify Arizona Revised Statutes or the way the SBTR conducts testing and registration of practitioners in Arizona. However, these guidelines were developed by a group of geospatial professionals, with diverse backgrounds, and may provide useful information for the GO Committee, and others, to consider.

A major guideline of the NCEES Model Rule regards how geospatial data are used, rather than by whom or how it was developed. The NCEES Model Rules do not focus on what the equipment used or the accuracy of the data developed, but whether the data is used to 'authoritatively' represent the definitive location of a boundary or mapped feature. If it is to be the authoritative location record, then it should by developed by a registrant. If it is not the authoritative location record, it may not need to be developed by a registrant.

As a rule, the GO Committee believes the best approach is to focus on the use of geospatial data and not on the licensing, registration or certification of geospatial professionals. The Committee believes that whether geospatial data are used as an "authoritative" location of a boundary or geographic feature is the most relevant aspect of whether geospatial data must be developed by a registered professional.

Additional information regarding the NCEES' Model Law can be found on the NCEES web page (www.ncees.org).

The State of Oregon (An Example from another State)

Oregon State Board of Examiners for Engineering and Land Surveying and Oregon Geographic Information Council

In the State of Oregon, a task force was charged with looking at the issues being faced by the disciplines of geospatialist and surveyors. The issues were all very similar to the issues faced by the practitioners of these industries in the NCEES Geospatial Committee and here in Arizona and documented by the APLS GO Subcommittee. The key recommendations resulting from the Oregon State Task Force are:

- GIS Data and products should always be accompanied by a clear disclaimer

- GIS Professionals should AT A MINIMUM be certified

- State Law should be changed to reflect NCEES Model Law & Rules

The Oregon Geographic Information Council (OGIC) officially adopts the following spatial data disclaimer, developed in collaboration with the Oregon Attorney General's Office in 2002, for inclusion on all printed (hardcopy) map products:

"This product is for informational purposes and may not have been prepared for, or be suitable for legal, engineering, or surveying purposes. Users of this information should review or consult the primary data and information sources to ascertain the usability of the information."

Furthermore, the OGIC defined its official policy to include that:

- the adopted disclaimer be used on all hard copy maps produced from geospatial data, and that the date and source of the data be included on the map;
- spatial data producers be allowed to extend the adopted disclaimer with additional language further defining the limits of their liability;
- a more robust disclaimer may be used in conjunction with any and all geospatial data published on the Internet, on a separate page preceding access to the data, with an accept/reject option for users; and
- standardized metadata be included with any distribution of all geospatial data.
- the disclaimer above may be used as a blanket disclaimer for documents containing a number of small maps

Oregon State Board of Examiners for Engineering and Land Surveying (OSBEELS) adopted the exceptions to the NCEES Model Rule, which provided a platform for delineation between surveying and geospatial map production.

* Please Note: Disclaimers alone do not necessarily promote "Protecting the Public" nor do they offer true education or understanding for user benefit. Disclaimers are self-serving vehicles to reduce liability and put users on notice. The Geospatial professions must take steps in addition to recommendation of disclaimers to minimize misuse of data by the public, or others. Scale dependency, vintages, and analytical data may be governed by standards the GO Committee plans to develop in the future.

The Delineation Test for Non-Surveying

If you could answer "Yes" to the following questions, you ***were not*** considered to be surveying.

1. Was data brought into a GIS/LIS format by means clearly not intended to represent authoritative delineations?
2. Did generation of data involve transcribing cadastral, zoning, or other public information where information were clearly not intended to represent authoritative property delineations?
3. Were data developed used to depict cultural resources, features, or phenomena and clearly not intended to represent authoritative delineations?

4. Was act performed by Feds (or contractor), for military, quad, or topo maps not depicting real property?
5. Was act performed by Feds (or contractor) for incorporation to a GIS/LIS?
6. Was act performed by law enforcement to depict events relevant to respective needs?
7. Was act performed by peace officer in connection to an official investigation?
8. Did act result in generation of general map product for private of governmental agencies used in:
    - Transportation Guide
    - Gazetteer information
    - Curriculum data/information
    - Graphic illustration of location (event)
    - Use in advertising

The Oregon Delineation Test for Surveying (Example)

If you could answer "Yes" to the following questions, you ***were*** considered to be surveying.

1. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **physical or legal features of the earth into graphics, data, maps, plans, reports, descriptions, projects or other SURVEY products**
2. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **improvements on the earth into graphics, data, maps, plans, reports, descriptions, projects or other SURVEY products**
3. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **the space above or below the earth into graphics, data, maps, plans, reports, descriptions, projects or other SURVEY products**
4. Does it provide of offer to provide professional services that apply mathematics, geodesy and other sciences and involve the making of geometric measurements and related information pertaining to **the development of measurements and information**
5. **Is it a geodetic survey?**
6. **Does it establish or re-establish control points (reference monumentation)**
7. **Does it establish or re-establish property lines or boundaries?**
8. **Was it a survey for the division of land or consolidation of lands?**
9. **Does it involve construction layouts?**
10. **Does it involve consulting to items expressed above?**
11. **Does it involve collection, prep, manipulation, or mods of items above?**

12. **Did it fall within the new definition of photogrammetric mapping?**
13. **Did it result in surveys resulting in horizontal or vertical mapping or geodetic control?**

The above *"delineation tests"* are checklists that follow the NCEES Model Rules and adhere to the intention developed through the NCEES Process. This was the process developed through a joint effort of nationally recognized "professionals" considering the current situation concerning Land Surveying, Engineering, Photogrammetry, and other sources of Geospatial Information.

The key to the development of language within the Oregon model is that it speaks to the data rather than methodology or personnel used in the collection process. Separating the data/information from the process allows users to understand the limitations of any data set provided. This is valuable when entities utilize shared resource (data) to provide information to users. Understanding the collection methodology and the proper use of such information is inherent to the metadata associated to any shared data source. The focus is the separation of technology (acquisition tools) from either side of the people equation and only leverages how this information should be used in context to the environment they exist. It also assists in the understanding of appropriate / applicable use for information – a key component for data management.

Section 2: Results from Surveying/GIS Forums

Introduction

The APLS Geospatial Committee (GO) embarked on an effort to gather feedback and opinions from a wide audience of geospatial professionals (surveyors, engineers, photogrammetrists, GISers, etc.) regarding the issues raised by the letter of concern that was submitted to the State Board of Technical Registration. The following forums were utilized to gather this feedback, and a summary of the conclusions along with supporting comments are presented below. The discussions always led beyond the scope of what the letter of concern addressed, but they served to open up a very positive dialog concerning issues facing the geospatial community.

Panel Discussions

1) June 7, 2007, Northwest GIS Interest Group, Bullhead City.

   Participants: Gene Trobia, Timothy Smothers, Mike Fondren.

   Note: This meeting was not a formal panel discussion, but served to set the framework for the following three panel discussions.

2) July 13, 2007, APLS Geospatial Panel Discussion, Peoria.

   Moderator: Jack Avis.

   Panel Members: Mike Fondren, Rudy Stricklan, Lari Spire, Gene Trobia, Timothy Smothers.

3) August 9, 2007, APLS Geospatial Panel Discussion, Prescott.

   Moderator: Steve Whitney.

   Panel Members: Mike Fondren, Rudy Stricklan, Ron Platt, Gene Trobia, Timothy Smothers.

4) August 24, 2007, APLS Geospatial Panel Discussion, Tucson

Moderator: Ron Platt.

Panel members: Dave Preisch, Peter Cote, Grey Passerelli, Steve Whitney, Gene Trobia, Timothy Smothers.

Overall Observations: The following statements and comments were gathered from participants of the Geospatial Panel Forums. The forum participants who made these statements my have been surveyors, geospatial professionals or laypersons.

- The data is, and should be, the central focus and driving force behind discussions that address potential guidelines and/or regulations concerning the creation and use of geospatial data. Some sort of effort to classify/qualify geospatial data would greatly assist in determining appropriate and proper use of particular data sets. A dividing line between "survey-grade" and "non-survey-grade" data could made by looking at what the data is intended to represent, in that the terms "authoritative" vs. "representative" have been used to make this distinction. "Authoritative" indicates that the geometric features correspond to the definitive location on the ground to a specified accuracy, and are derived from field-based measurements. "Representative" indicates that the data is only a reference to the authoritative record containing the definitive location on the ground to a specified accuracy, and may or may not be derived from field-based measurements. Accuracy assessment relative to the use of the data is critical.
- Metadata (data dictionary) is paramount as a tool to guide end-users in the appropriate and proper use of geospatial data. Metadata, as opposed to general disclaimers, is absolutely needed to provide the necessary background information for how a particular geospatial data set was developed, and should adhere to a minimum set of metadata standards. Metadata content that includes details of how the data was created, what it is intended to be used for, an accuracy assessment and/or classification, and known errors and qualifications, are the type of information metadata should contain that is vital to the end-user. Metadata may be applied down to the feature level as well, providing very detailed information for determining appropriate and proper use.
- Education of both professional and public end-users on the appropriate and proper use of geospatial data needs to be an on-going effort. We must strive to ensure that geospatial data are used appropriately, and that end-users are presented with complete information that clearly defines limitations on the use of a particular data set. We must ensure that 1) professional end-users use geospatial data appropriately for analysis, enforcement, and/or regulatory purposes, and 2) public

end-users are well aware of the potential for harmful misinterpretation of the inappropriate use of geospatial data.

Committee Summary of Forum Comments

- Letter of concern:
  - Letter of concern to the BTR regarding the collection/creation (via GPS) of asset information may be considered “surveying” under strict interpretation of Arizona Statute.
  - The foundation of the letter of concern is accountability to the public (protecting the public).

- Data:
  - Technology is not the issue in data collection, nor is the person that is collecting the data. It is more about the intended use of the data, and where (who) gets the data. The intended use of the data needs to be reviewed to ensure that proper data collection methods are utilized, and the accuracy of the resulting data must be verified as appropriate for meeting the requirements of the intended use.
  - There is a concern about the potential for misuse within the public arena of any distributed data.
  - Data collected within the confines of any agency is not an issue – the assumption would be that data managers are collecting geospatial data using appropriate means for the requirements of the project. The concern arises when the data is distributed outside of the developing agency, and how others subsequently utilize the same data.
  - Real world problem: misuse of the information, i.e. public agency staff using GIS data for determining boundary locations and/or for making inappropriate regulatory decisions. Perhaps we need a directive within government organizations to prohibit the use of representative geospatial data for regulatory decisions/advice at public counters. Management needs to understand the data too.
  - If data is intended to be "Authoritative,” then a registrant should be involved in writing, reviewing, and/or approving the metadata, to ensure that the necessary information is included to support the "Authoritative" nature of the data.
  - In any case ALL DATA requires metadata to assist in describing the how’s of the data, including how the data was collected and how it may be used appropriately.
  - Geospatial Data Standards are being developed through the GO Committee and are necessary.
  - Use the appropriate technology and methodologies to meet the standards for the intended use of the data. If the data is intended to be "Authoritative", then a registrant must be involved in the process.

- Can any GIS data be determined as non-authoritative and how can we ensure the data collected will not be used as though it were authoritative?
- Collecting Park locations vs. legal boundaries have a (potentially) different intent (requirement) and business need.
- What is the impact of poorly located boundaries? Can a “fuzzy – thick line” collection method affect the public through perpetuation of improper use?
- Data needs to be defined through both scale and usage to identify proper use as to whether a record is intended to be "authoritative.”
- Assessor Data is generated to meet the business need of the office, but due to Public Records law, the county MUST makes this information available. This geospatial data is representative and is NOT considered legal (or Authoritative) location data, and the intent is merely to provide information, making the business of assessment and taxation more efficient. Cadastral mapping is built to provide equity in the assessment process and does not require parcel boundaries that are the definitive legal location to meet appraisal and assessment requirements..
- Any boundary issues are resolved via a registrant, not the cadastral layer. All extreme issues are resolved through the courts.
- Collecting all geospatial data via a registrant can be cost prohibitive for many government agencies. Agencies need to demonstrate fiscal responsibility.
- Must review the proper methods for use of data – function and process.
- Who is responsible for data that is pushed out (distributed) by a public entity that was derived by a private consultant (vendor) based on requirements defined by the public entity? The information are “certified” via the vendor to be of a particular quality – are they responsible for the misuse of these information by the public sector? Data must be sealed and certified – documentation of the process and intent should be identified. Data development and the criteria for its use should be clearly shown regardless of what may be done with the data (distribution). Problems with data still exist. Question whether this statute is the correct statute to be reviewing. Need verbiage that speaks to the use (appropriate) after data are collected. All of this is intended to protect the public.
- Geospatial data will only become more prominent, migrating from a project-oriented environment to true enterprise development.
- DO NOT publish data for the sake of its existence.
- Publish geospatial data to appropriate scale.
- Beware of garbage in, gospel out. As soon as it's on the web, it may be taken for gospel.
- Purpose is the key issue.
- Accountability is NOT in any derived product, but is held within the source document (document of record).
- Note: accuracy cannot be known, but merely estimated.
- Data harvested via GIS is NOT the authoritative record of the definitive location of a feature. If the data are distributed to the public, then they need to be made fully aware of the fact that the data is not the "authoritative" or legal document.

- Who is using the data comes into play as well, i.e. internal or external users.
- Look at how non-survey grade measurements relate to and are used to represent property boundaries.
- Scale dependency could be used to guide the appropriate display of the data, especially on public web sites.

- Metadata:
  - Legacy knowledge is required.
  - Inform users as to the "goodness" of your data – focus not on disclaiming data, but rather informing users to appropriate usages. Get away from negating your data through disclaimers, but qualify the data on appropriate use.
  - Metadata is usually inadequate to effectively describe the entire dataset. The reality is such that most geospatial data sets are heterogeneous (not homogeneous). A solution would be to develop Feature Level metadata.
  - Accountability is the responsibility of the data manager – making metadata a necessity. How does the public know that data managers have the authority to distribute and identify (properly) spatial information?
  - Ensure (as a data manager) that we understand the data. Currently, task the data provider to give direction for the appropriate use and representation of the spatial information.
  - Disclaimers DO NOT work – they do not alleviate liability in almost all cases.
  - Concerning potential distribution, both metadata and disclaimer (or clarification) verbiage is required.
  - Look at the business case. Even the document of record can be considered as a representation. Verification is done on the ground via appropriate methods (e.g. Survey or Bluestake).
  - A data classification system could be used that includes metadata and use guidelines.

- Education:
  - We cannot save the public from themselves – but must be diligent in our efforts to limit the possibility for harmful misinterpretation of data.
  - Define process to ensure non-authoritative records never are considered the authoritative definitive location when geospatial data is distributed.
  - Engage GIS managers to educate the governmental staff and managers on the appropriate and proper use of geospatial data that is consistent with how it was developed.

- State Statute:
  - There cannot be a flexible interpretation of the state statute, as registrants are held to a higher standard, through liability.
  - Current statute is ambiguous, the historic intention (as developed) was to be used for boundary and engineering projects.

- Statute does not allow leeway – the key is a focus on the data, and who is collecting it.
- Request we look at addressing the intent of the data collection in statute – this is not currently part of the statute.
- Example: Students "mapping" vegetation through simple gridding method. These students could be considered in violation as they were mapping with strict interpretation of statute, however, the methodology utilized for the project was appropriate.
- Statute needs to be changed – it does not speak to our current situation, however, BTR will rule using current statute as the guide.
- Example: Person develops a Site Plan using bearings and distances that were derived from a source document – however, there was no reference on the site plan to the source document – this was determined to be surveying without a license. Requires a statement indicating where data were obtained and/or derived. GIS has similar issues.
- A strict interpretation of ARS 32-101.22(d) could harm many disciplines, i.e. social sciences, health, etc.
- There are arguments on how the statute is interpreted in terms of who it applies to.

- Technology:
  - Technology is not the issue – technology evolves, processes evolve, neither technology nor process can be regulated via statute.
  - Cannot restrict measurement technologies – these are dynamic processes and will have constant change.

- GIS:
  - Technology marches on, GIS technology is multi-disciplinary and has a greater focus.
  - GIS uses geospatial data that is not authoritative, but an inventory (representative). It has opportunity to point users to the authoritative products. Internal relationships (topology) of geospatial data is a major requirement for most GIS (accurate with respect to adjacency). GIS can be used to assist to make reasonable assumptions about the area of interest.
  - GIS can provide timeliness that benefits the public.
  - Back up GIS data with legal documents, i.e. at least provide links to the legal documents from the GIS and/or web-based mapping systems.
  - There are issues with how data accuracy is being represented by GIS and conveyed to the users, including the public.
  - Why is GIS so usable? It is because of topology, and the geographic data manipulations and operations that it provides.

- Miscellaneous:
  - Protecting the Public is the paramount function of licensure.

- There are three classes of interest: People, Technology, and Data (geospatial).
- Look at the NCEES Model Rules to assist in our definitions of authoritative vs. representative locations of geospatial data.
- Look at the Oregon model (incorporation of the NCEES model of 2001)
- Need to identify the definitions between RLS and GIS, define the separate issues, and identify joint opportunities.
- Found that public entities take authority upon themselves and build accountability where it may not be warranted – or valid.
- There are different definitions of "responsible charge" depending on who you talk to.
- There are different definitions of "boundary" depending on whom you talk to.
- Short-term goal = guidance to the SBTR, long-term goal = change the statute.
- Can standards/guidelines be developed for defining authoritative vs. non-authoritative (representative?) locations of boundaries or features? How about regulatory locations?
- Do standards/guidelines need to be developed for the display and distribution of data?
- Could collection methodologies and intended use be incorporated into the Spatial Data Accuracy and Georeferencing Standards for Arizona? Alternatively, would this be a better fit in data classification standards/guidelines?
- Develop a laundry list of geospatial data uses (don't forget engineering).
- Look at the future in terms of what our professions may look like in 10 to20 years or more.
- Example: A person calls 911 on their GPS enabled cell phone in an area where Phase 2 E911 is supported and a Lat/Lon is established for that person's position. Is this surveying?
- How can surveyors state, "that's not surveying"?

Section 3: Comment on the Letter of Concern and Recommendations to the SBTR

Parts 1 and 2 of this document provide the detail necessary to understand the history and events that have led the APLS Geospatial Committee to pursue a multilateral solution to the growing concerns within the GIS and surveying professions regarding data. In addition, APLS has provided a studied response to the letter of concern submitted to the State Board of Technical Registration (SBTR) by Larry Dresden in early 2007. Our opinion is that technology has driven electronic data collection and distribution to a point where "data representation" has suffered. Whether a surveyor or a geospatialist distributes data, the key element is the manner in which the data are represented. Our opinion is that this key point be the interpretive mechanism used by the SBTR to offer guidelines and to assist with future issues of relating to data collection, distribution, and representation by non-registrants. We believe our multilateral approach of working with the GIS community provides a proactive, healthy, and non-confrontational way for the SBTR to address "data representation" issues in the future without the need to overburden the disciplinary structure.

Part 1 of this document was intended for educational purposes and served as the starting point for statewide discussions. It further offered two (2) separate interpretations of the statute in question, ARS 32-101.22(d). Although only one interpretation (Strict Interpretation) has ever been used by the SBTR, the discussion offered an alternative idea to consider (Flexible Interpretation) in applying reason to a statute within our current societal reality. Part 1 further touched on how portions of the NCEES guidelines have been utilized to begin addressing the issues at hand.

Part 2 of this document highlights the results of three (3) primary statewide forums held to discuss the letter of concern as well as other GIS data distribution/representation issues. The first forum was held in Peoria as a separate 2-hour event hosted by the Geospatial Information & Technology Association (GITA). The second forum was held in Prescott at the annual Arizona Geographic Information Council (AGIC) conference. The third forum was held in Tucson and was sponsored by the Pima Association of Governments and GITA. All events were advertised through the APLS member roster, GIS list servers, AZSURVEY on TOPICA, and word of mouth. All forums were well attended. The discussions raised good points, were non-confrontational, and constructive. In all three forums, one common and loud point was made and agreed upon by nearly every attendee, regardless of profession, and that is the issue of how data are represented when distributed or displayed.

APLS analysis and recommendations

ARS 32-101.22(d) reads as follows (with relevant operative words in bold and underlined):

"***Measurement*** *by angles, distances and elevations* ***of*** *natural or artificial* ***features*** *in the air, on the surface and immediate subsurface of the earth, within underground workings and on the surface or within bodies of water* ***for the purpose of determining*** *or establishing* ***their location****, size, shape, topography, grades, contours or water surface and depths,* ***and the preparation*** *and perpetuation* ***of*** *field note records and* ***maps depicting these features****."*

If we extract the operative words without changing the meaning of the statute we can better see exactly what the statute is attempting to convey with respect to the issue at hand:

"Measurement…of…features…for the purpose of determining…their location…and the preparation…of…maps depicting these features."

The statute clearly indicates that locating features on the earth **AND** the subsequent production/distribution of maps showing those features is the practice of land surveying. This shows that measurement alone is not surveying, which makes sense since no harm could come to the public if nothing is done with the acquired data. However, when the data are placed on a map (either paper or electronic) and subsequently distributed, there is potential for harm to the public. Additionally, it is important to note that the mere depiction of features on a map can cause no harm if the map is not "distributed". The statute must presume to apply to situations where the maps will be published or distributed.

This reasoning is consistent with the input received at the three (3) forums conducted by APLS throughout the state. Surveyors, engineers, and the geospatialists overwhelmingly agreed that it is the *representation and intended use of data* that has potential to cause harm to the public. APLS believes representation of data is the critical issue that provides the premise for a reasonable, legal, contemporary, and meaningful interpretation and application of the statute in determining if a person is in fact practicing land surveying.

The issue raised in the Dresden Letter involves "non-registrants" using GPS units to locate asset infrastructure features and the subsequent **publication of those features in an atlas for planning and maintenance purposes only**. **In concert with all forums conducted the key issue was whether this atlas is published at a scale that could be harmful to the public**. For instance, if the atlas were published at a scale of 1 inch = 400 feet, and the features were in error by 5 – 10 feet, the feature symbols would cover the entire area of possible error. At such a scale there

would be little chance any member of the public could utilize the data in a way that would cause harm. Another real life similar example is a road atlas showing schools, bridges, and even the roads themselves. These maps would never be considered a product of surveying because the scale is such that the symbols representing the features would likely never be utilized to develop locations that a way that could harm the public. In contrast, a surveyor will prepare a map of features that is accurate enough for design (or other designated authoritative purpose). Upon distribution, such a map will contain information as to its accuracy (usually in the form notes or other statements) that will prevent the map from being used in ways not intended. Along this line of reasoning, **if an atlas showing infrastructure features were published at a scale where accurate relationships to other critical features (such as buildings or property lines) might be determined, then there is a possibility that the public could be harmed.**

If the only concern at hand was the production of an atlas at a small scale to be used only for planning and maintenance purposes there would be little debate as to whether land surveying or engineering were being practiced. In all likelihood, the maps would be considered much like the road atlases for informational (planning) purposes only. However, the concern of APLS is with the data. **If one were to take the location (coordinate value) information of the features gathered by non-registrants using non-survey grade GPS and distribute those coordinates, either as a printout or electronically, the potential for harming the public is possible. In this case APLS does believe the practice of land surveying is likely.** Registrants can control this distribution through contractual language, notes on the maps, etc. There is an obligation directly related to being a registrant that puts the onus explicitly on the registrant, and there is no statutory recourse for products prepared by a geospatialist (non-registrant) as there is with a registrant. In the case at hand, a non-registrant may be able to distribute data beyond the simple small-scale map. If there were some fail-safe guarantee that the coordinate data would never reach the public without the appropriate survey notes (i.e., metadata) then the production of the atlases for planning and maintenance purposes would not be of concern. **In the case at hand, there is no evidence that the data were intended to be distributed as coordinate values.** However, because no registrant was involved, there is no guarantee that the data were or will be scrutinized. Although it has not happened, **the possibility exists that someone could distribute the electronic file without any idea of the potential for harm.** And, as much as APLS would like to make recommendations that might prevent such a scenario, to do so is not practicable. Each instance must be examined on a case-by-case basis.

As such **the case at hand does not contain enough information to render a final opinion of the concern. We have shown there are additional criteria that would lend credence to making a decision. We can only speculate as to some possibilities so we may offer the SBTR some guidance regarding a letter of concern that at first glance may have been passed off as clear violation to the statutes.** APLS does recognize that this case is but the first of other potential complaints to the SBTR. For this reason, APLS proposes addressing such complaints by using guidelines and criteria based on those developed by another state for similar issues.

APLS respectfully offers discussion and proposed guidelines to assist the SBTR in interpretation of certain concerns/complaints that may come before the SBTR in the future, as follows:

Premise

The purpose for registration of Land Surveyors is, amongst other things, to protect the interests of the public from adverse impact caused by incorrect surveys. Arizona statute defining "Land Surveying Practice" (ARS 32-101.22) is meant to define those practices, which should be performed by a Registrant due to the likely potential of adverse impact to the Public. Therefore, the key issue is the potential for misuse and harm that could be caused by geospatial data distributed beyond its original intent and limitations.

Discussion

The statute under discussion was enacted when the practice of mapping required, for the most part, special equipment and skills to perform the necessary data collection, data processing (e.g., computations), and data publication (e.g., a map or plat). Therefore, the language of the statute was appropriate at the time written.

With the advent of modern positioning technologies (e.g., ubiquitous and accurate Global Positioning System equipment) and simple, inexpensive computers and mapping software, the statute now appears to extend the practice of land surveying into disciplines where oversight by a Registrant is unnecessary or perhaps inappropriate.

In the three forums conducted by the APLS Geospatial Committee, two basic majority opinions held that:

1. the intended uses of the data are the best indicators as to whether a Registrant should oversee or review the data and,

2. the Oregon State Board of Examiners for Engineering and Land Surveying (OSBEELS) "Surveying or GIS Checklist" (below) seems an appropriate method to determine whether the data collection should be performed under the supervision of a Registrant.

A concern expressed at all forums was the use of geospatial data collected for a non-regulatory purpose that eventually is misused in a regulatory activity that could negatively impact the public.

Recommendations

1) In determining if a geospatial data collection activity is land surveying and, therefore, must be conducted under the supervision of a Registrant, the SBTR should use a version of the OSBEELS "Surveying or GIS Checklist" recast in a form appropriate for Arizona. This checklist should be provided to the all geospatial professionals, governmental agencies, and the public to provide guidance for those collecting or distributing spatial data.

2) In cases where geospatial data are used in a regulatory activity affecting the public, and those data were not collected under the supervision of, or certified by, a Registrant, the person or entity publishing the geospatial data in support of the regulatory activity should be found to be practicing land surveying in violation of state statute.

The OSBEELS checklist is provided below in its existing form. If the SBTR elects to use such a checklist, it must be modified to suit the situation in Arizona. To give context to the OSBEELS checklist, it is followed by a list of relevant Oregon Revised Statutes (ORS).

In addition to the foregoing recommendations, it is further recommended that issues of GIS data accumulation and distribution practice as they potentially overlap the area of professional land surveying be treated in the spirit of the ORS legislation, to wit:

- There should be minimal restrictions placed on the collection of geospatial data that are used within the confines of a particular entity, public or private. Prudent business practice should govern what type of technical professionals ought to be involved in such privately held geospatial data collection, uses, and internal distribution.
- If geospatial data is distributed externally as an authoritative survey product, then a measurement accuracy description needs to be prepared and/or certified by a registered professional land surveyor (along with complete metadata as described below).
- Any geospatial data prepared wholly or in part by public taxes needs proper metadata to proactively describe its usefulness. Blanket disclaimers disavowing any potential use or benefit are not acceptable. However, statements qualifying the intended use of the data are appropriate.
- Geospatial data certification by professional land surveyors must include metadata formatted according to the version of the [currently proposed] Arizona Professional Land Surveyors Geospatial Metadata Standard in force at the time of certification.

The recommendations given here apply to the issues at hand within the context of existing Arizona statute. In the longer term, the APLS Geospatial Committee recommends that greater specificity needs to be incorporated into Arizona Revised Statutes, including ARS 32-144, which

deals with exemptions to the practice of those professions regulated by the SBTR (including land surveying). This should be done by providing more detailed and comprehensive exemptions and limitations to the practice of land surveying in particular. Example legislation of this sort is contained in ORS Chapter 672.060 (included below).

OSBEELS "Surveying or GIS Checklist"

1. Does it provide or offer to provide professional services that apply mathematics, geodesy, and other sciences and involve the making of geometric measurements and gathering of related information pertaining to the physical or legal features of the earth?

2. Does it provide or offer to provide professional services that apply mathematics, geodesy, and other sciences and involve the making of geometric measurements and gathering of related information pertaining to improvements on the earth?

3. Does it provide or offer to provide professional services that apply mathematics, geodesy, and other sciences and involve the making of geometric measurements and gathering of related information pertaining to the space above or below the earth?

4. Does it provide or offer to provide professional services that apply mathematics, geodesy, and other sciences and involve the development of measurements and information described in questions 1 through 3 above into graphics, data, maps, plans, reports, descriptions, projects or other survey products?

5. Is it a geodetic survey?

6. Does it establish, reestablish, or replace boundaries, geodetic control monuments, or reference points?

7. Does it locate, relocate, establish, reestablish, or retrace any property lines or boundaries for any tract of land, road right of way, or easement?

8. Was it a survey for the division or subdivision of a tract of land or the consolidation of tracts of land?

9. Did it involve locating and laying out alignments, positions, or elevations for the construction of fixed works?

10. Did it involve performing or offering to perform any investigation, interpretation or evaluation of, or any consultation or testimony about any of the services described above?

11. Did it involve the collection, preparation, manipulation, or modification of data related to any of the services described above, other than acting as a scrivener?

12. Did it fall within the new definition of photogrammetric mapping?

13. Did it result in surveys involving horizontal or vertical mapping control or geodetic control?

(Note: If the answer to one or more of the above questions was yes, then the act or acts performed may fall within the definition of the practice of land surveying. However, new exemptions were added to ORS 672.060, and if the act or acts fall within any of these exemptions, the act would likely be exempt from being regulated as the practice of land surveying).

1. Did the person maintain or transcribe existing georeferenced data into a GIS or LIS format by manual or electronic means and the data are clearly not intended to indicate the authoritative location of property boundaries, the precise shape or contour of the earth or the precise location of fixed works of humans?

2. Did the person perform activities under ORS 306.125 or 308.245 involving transcribing tax maps, zoning maps or other public data records into GIS or LIS formatted cadastre and maintain those cadastre where the data are not modified for other than geographical purposes and the data are clearly not intended to authoritatively represent property boundaries?

3. Did the person prepare maps or compile databases depicting the distribution of natural or cultural resources, features, or phenomena and the maps or data are not intended to indicate the authoritative location of property boundaries, or the precise shape or contour of the earth, or the precise location of fixed works by humans?

4. Was the act performed by a federal agency or its contractors in the preparation of military maps,

quadrangle topographic maps satellite imagery or other maps that do not define real property?

5. Was the act performed by a federal agency or its contractors in the preparation of documents or databases into a GIs or LIS format, including but not limited to the preparation or transcription of federal census and other demographic data?

6. Was the act performed by a law enforcement agency or its contractor in the preparation of documents or maps for traffic accidents, crime scenes or similar purposes depicting physical features or events or generating or using georeferenced data involving crime statistics or criminal activities?

7. Was the act performed by a peace officer as defined in ORS 161 .015 or fire service professional as defined in ORS 181.610 in conducting, reporting on or testifying about or otherwise performing duties regarding an official investigation?

8. Did the act result in the creation of general maps prepared for private or governmental agencies: (1) for use as guides to motorists, boaters, aviators or pedestrians; (2) for publication in a gazetteer or an atlas as an educational tool or reference publication; (3) for use in the curriculum of any course of study; (4) for use as an illustrative guide to the geographic location of any event (if produced by electronic or print media); or (5) for use as advertising material or user guides (if prepared for conversational or illustrative purposes)?

(Note: If the answer to one or more of the above questions is yes, then the act or acts performed may fall within an exemption from regulation of the practice of land surveying. These exemptions were added to ORS 672.060).

ORS 306.125 Property tax appraisal program; maps, plats, standardized record systems for assessors and tax collectors. (1) The Department of Revenue is authorized to institute programs for the appraisal of property in counties of the state and to make appraisals for the use of county assessors and boards of property tax appeals in assessing property and reviewing assessment rolls, and may install, and assist in the preparation and maintenance of, maps, plats or standardized record systems, as prescribed by the department, in the offices of assessors and tax collectors.

(2) The department and county courts are authorized to enter into agreements for the sharing of the expenses of such appraisals and installations including salaries and expenses of department employees engaged therein.

(3) Counties entering into agreements pursuant to this section may pay to the Department of Revenue from time to time:

(a) Moneys to be disbursed by the department as part of the county's share in the expenses authorized under this section and agreed to under such agreements; and

(b) Moneys to reimburse the department where department disbursements under such agreements, whether from the department's appropriations from the State General Fund or from moneys credited to the Assessment and Taxation County Account, have exceeded its proportionate share of expenses and a rebalancing of expense-sharing accounts is deemed desirable or necessary.

(4)(a) All moneys received by the Department of Revenue under subsection (3) of this section shall be immediately turned over to the State Treasurer, who shall deposit the moneys in the General Fund to the credit of an account to be known as the Assessment and Taxation County Account, and such account hereby is continuously appropriated to the Department of Revenue for the purposes of this section.

(b) The Department of Revenue may use the moneys to the credit of the Assessment and Taxation County Account, or any part thereof, for expenditures in connection with appraisals and installations contracted for, including cash advances for travel and living expenses of employees, and including payments to any county made to rebalance expense-sharing accounts, from time to time, where a county's disbursements under agreements entered into pursuant to this section have exceeded its proportionate share of expenses under such agreement. Any moneys received in reimbursement of these cash advances shall be deposited in the Assessment and Taxation County Account. Refunds of unexpended receipts may be made to the counties. [1953 c.232 §1; 1959 c.115 §1; 1963 c.84 §1; 1985 c.604 §6; 1997 c.541 §95; 2005 c.94 §29]

ORS 308.245 Maps; taxpayers' index. (1) The assessor of each county shall maintain a set of maps upon which are outlined the boundaries of each land parcel subject to separate assessment within the county, with the parcel's tax lot or account number shown on the parcel. In addition, the assessor may show on the maps the code area boundaries and the assigned code area numbers.

(2) The assessor shall also make a diagram or drawing of all property within the county of the assessor submitted to the provisions of ORS 100.005 to 100.910, and shall note thereon the assigned account or tax lot number.

(3) The assessor shall maintain an index of the names of every taxpayer against whom any tax is charged in the

county, in alphabetical order with reference to the first three letters of the surname of taxpayers who have surnames, and of the first names of any others. The index shall be indexed to the assessment rolls and the place therein where the assessment of such taxpayer is found.

(4) The maps and the index provided for in this section shall be public records. [Amended by 1963 c.541 §44; 1965 c.344 §7]

ORS 672.060 Exceptions to application of ORS 672.002 to 672.325. ORS 672.002 to 672.325 do not apply to:

(1) A registered architect practicing architecture.

(2) A registered environmental health specialist or registered environmental health specialist trainee working under the supervision of a registered environmental health specialist practicing environmental sanitation, or a registered wastewater specialist or registered wastewater specialist trainee working under the supervision of a registered wastewater specialist practicing waste water sanitation.

(3) A person working as an employee or a subordinate of a registered professional engineer if:

(a) The work of the person does not include final engineering designs or decisions;

(b) The work of the person is done under the supervision and control of and is verified by a registered professional engineer; and

(c) The person does not purport to be an engineer or registered professional engineer by any verbal claim, sign, advertisement, letterhead, card or title.

(4) A person practicing land surveying under the supervision of a registered professional land surveyor or registered professional engineer. The exemption in this subsection does not allow an engineer to supervise a land surveying activity the engineer could not personally perform under ORS 672.025.

(5) An individual, firm, partnership or corporation practicing engineering or land surveying:

(a) On property owned or leased by the individual, firm, partnership or corporation, or on property in which the individual, firm, partnership or corporation has an interest, estate or possessory right; and

(b) That affects exclusively the property or interests of the individual, firm, partnership, or corporation, unless the safety or health of the public, including employees and visitors, is involved.

(6) The performance of engineering work by a person, firm, or corporation, or by full-time employees thereof, provided:

(a) The work is in connection with or incidental to the operations of the persons, firms or corporations; and

(b) The engineering work is not offered directly to the public.

(7) A person executing engineering work designed by a professional engineer or supervising the construction of engineering work as a foreman or superintendent.

(8) A landowner performing land surveying within the boundaries of the landowner’s land or the landowner’s regular employee performing land surveying services as part of the employee’s official duties within the boundaries of the land of the employer.

(9) An individual, firm, partnership, or corporation offering to practice engineering or land surveying if:

(a) The individual, firm, partnership or corporation holds a certificate of registration to engage in the practice of professional engineering or land surveying issued by the proper authority of any other state, a territory or possession of the United States, or a foreign country; and

(b) The offer includes a written statement that the offeror is not registered to practice engineering or land surveying in the State of Oregon, but will comply with ORS 672.002 to 672.325 by having a person holding a valid certificate of registration in this state in responsible charge of the work prior to performing any engineering or land surveying work within this state.

(10) A person making plans or specifications for, or supervising the erection, enlargement or alteration of, a building, or an appurtenance thereto, if the building is to be used for a single family residential dwelling or farm building or is a structure used in connection with or auxiliary to a single family residential dwelling or farm building, including but not limited to a three-car garage, barn or shed or a shelter used for the housing of domestic animals or livestock. ORS 672.002 to 672.325 do not prevent a person from making plans or specifications for, or supervising the erection, enlargement or alteration of, a building, or an appurtenance thereto, if the building has a ground area of 4,000 square feet or less and is not more than 20 feet in height from the top surface of lowest flooring to the highest interior overhead finish of the structure.

(11) A construction contractor licensed under ORS chapter 701 that offers services constituting the practice of engineering if:

(a) The services are appurtenant to construction services to be provided by the contractor;

(b) The services constituting the practice of engineering are performed by an engineer or engineers registered under ORS 672.002 to 672.325; and

(c) The offer by the construction contractor discloses in writing that the contractor is not an engineer and identifies the registered engineer or engineers that will perform the services constituting the practice of engineering.

(12) A person transcribing existing georeferenced data into a Geographic Information System or Land Information System format by manual or electronic means, and the maintenance of that data, if the data are clearly not intended to indicate the authoritative location of property boundaries, the precise shape or contour of the earth or the precise location of fixed works of humans.

(13) A person carrying out activities under ORS 306.125 or 308.245. This exemption applies to the transcription of tax maps, zoning maps and other public data records into Geographic Information System or Land Information System formatted cadastre and the maintenance of those cadastre, if:

(a) The data are not modified for other than graphical purposes; and

(b) The data are clearly not intended to authoritatively represent property boundaries.

(14) A person preparing maps or compiling databases depicting the distribution of natural or cultural resources, features or phenomena, if the maps or data are not intended to indicate the authoritative location of property boundaries, the precise shape or contour of the earth or the precise location of fixed works by humans.

(15) A federal agency or its contractors, in the preparation of military maps, quadrangle topographic maps, satellite imagery or other maps or images that do not define real property boundaries.

(16) A federal agency or its contractors, in the preparation or transcription of documents or databases into a

Geographical Information System or Land Information System format, including but not limited to the preparation or transcription of federal census and other demographic data.

(17) A law enforcement agency or its contractors, in the preparation of documents or maps for traffic accidents, crime scenes or similar purposes depicting physical features or events or generating or using georeferenced data involving crime statistics or criminal activities.

(18) A peace officer, as defined in ORS 161.015, or a fire service professional, as defined in ORS 181.610, conducting, reporting on, or testifying about or otherwise performing duties regarding an official investigation.

(19) A person creating general maps prepared for private firms or governmental agencies:

(a) For use as guides to motorists, boaters, aviators or pedestrians;

(b) For publication in a gazetteer or an atlas as an educational tool or reference publication;

(c) For use in the curriculum of any course of study;

(d) If produced by any electronic or print media, for use as an illustrative guide to the geographic location of any event; or

(e) If prepared for conversational or illustrative purposes, including but not limited to for use as advertising material or user guides. [Amended by 1971 c.751 §4; 1981 c.143 §4; 1981 c.159 §2; 1983 c.614 §2; 1995 c.572 §22; 1997 c.210 §5; 1999 c.830 §1; 2001 c.362 §2; 2003 c.547 §117; 2005 c.445 §8]