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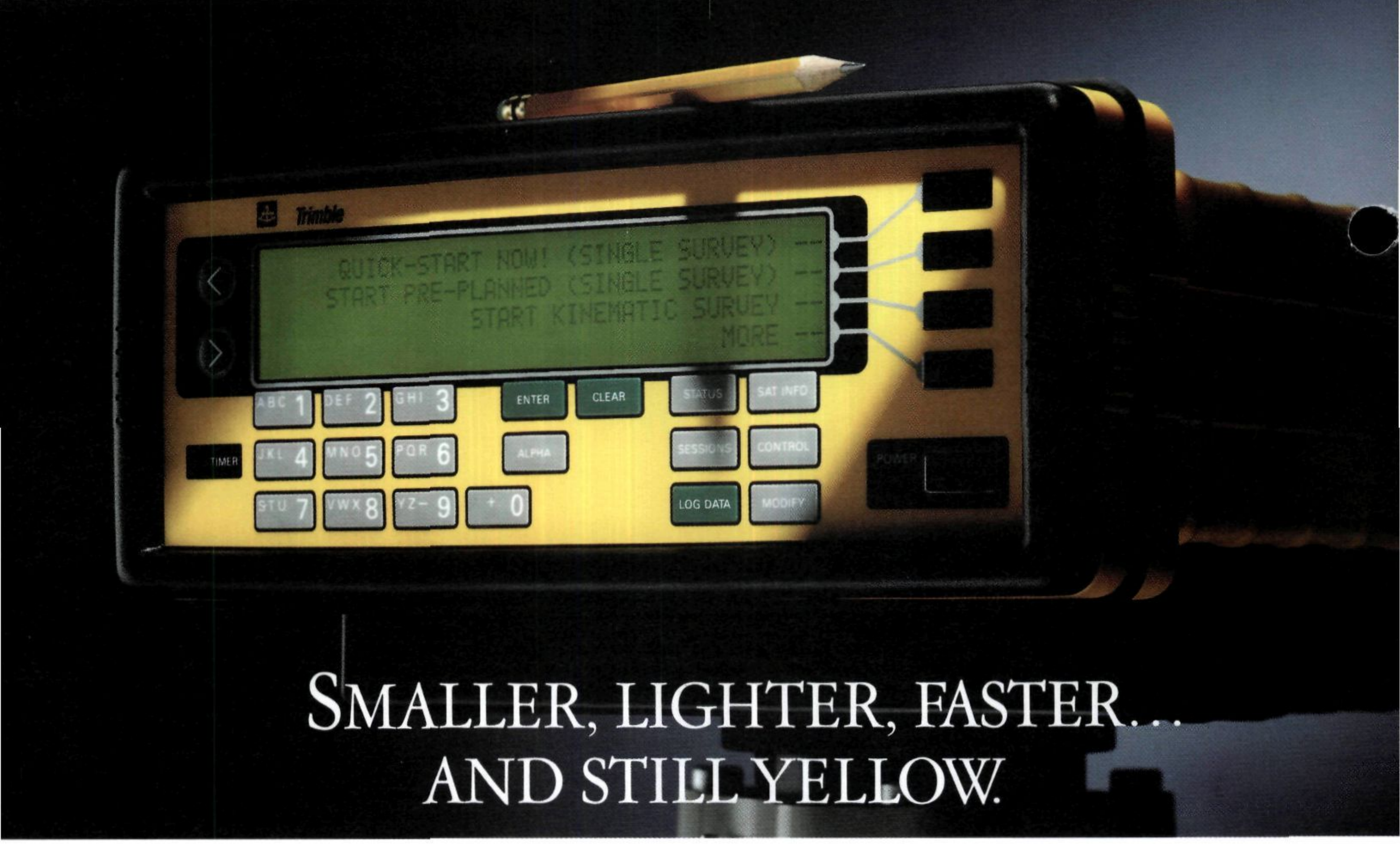
The California Surveyor

No. 97 The Voice of the Land Surveyors of California SUMMER 1992



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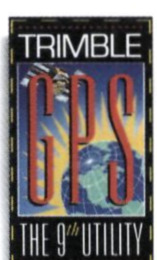

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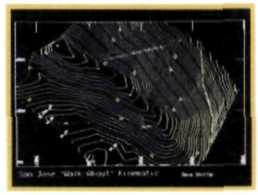

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The California Surveyor

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"Recognizing that the true merit of a profession is determined by the value of its services to society, the 'California Land Surveyors Association' does hereby dedicate itself to the promotion and pro tection of the profession of land surveying as a social and economic influence vital to the welfare of society, community and state."

"The purpose of this organization is to promote the common good and welfare of its members in their activities in the profession of land surveying, to promote and maintain the highest possible standards of professional ethics and practices, to promote professional uniformity, to promote public faith and dependence in the Land Surveyors and their work."

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All articles, reports, letters, and contributions are accepted and will be considered for publication regardless of the author's affiliation with the California Land Surveyors Association, Inc. Contributions submitted on floppy diskette medium is encouraged. For compatibility, disks should be 5.25 or 3.5 inch, MSDOS (IBM compatible) format. We can accept ASCII text files or word processor files from the following programs: WordPerfect, Microsoft Word, Windows Write, Multimate, DCA (Displaywrite III and IV), Wordstar, Xerox Writer, and Xywrite.

EDITOR'S ADDRESS

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Articles, reports, letters, etc., received after the above mentioned date will be considered for the next edition.

Opinions or assertions expressed in articles in this publication do not necessarily represent the official views of the Association.

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FROM THE EDITOR

In Memory of Nelson Myer

By Brett K. Jefferson, P.L.S.

THIS WILL BE my last editorial for the *California Surveyor.* The new editor will be Tom Mastin, who has done an exceptional job as the editor of the *CLSA News*. Tom will be preparing the next issue and I wish Tom and the CLSA Central Office staff all the best with the *California Surveyor* in the future. In addition, I would like to thank Kenney Fargen, Immediate Past President, for giving me the opportunity to contribute to the *California Surveyor* and a special thanks to Cheryle Beltrami at the CLSA Central Office for her constant assistance, support, and positive attitude during the sometimes tedious publication of this journal.

I had planned to write a particularly riveting editorial expressing my position on the issue of compulsory continuing education, its potential impact on present and future professional land surveyors, and what possible connections might be made with respect to our image in society. But an event has occurred compelling me to write about something nearer to the heart; to write about a person who has had a great impact on my career, as well as the careers of a great many other professional land surveyors — now and in the future. This person is Nelson E. Myer, Nevada P.L.S. No. 1871, and California P.L.S. No. 4037.

Nelson Emmet Myer was born on September 14, 1929, in New Philadelphia, Ohio. His career in land surveying began there and continued after he moved to Tuscon, Arizona, in 1956. He practiced in the Tuscon and Phoenix area for about seven years and subsequently relocated to Las Vegas, Nevada, where he established Delta Engineering, Inc.

Nelson's contribution to the recent evolution of land surveying in the State of Nevada is, without question, unsurpassed. He is a charter member of the Nevada Association of Land Surveyors Southern Nevada Chapter and a Past President and State Director of the organization. Nelson also participated in the Consulting Engineers Council of Nevada and the American Right of Way Association.

Nelson was appointed to the Nevada State Board of Registered Professional Engineers and Land Surveyors in 1979, where he occupied the Land Surveyor seat for twelve years, until 1991.

Nelson had the honor of serving as the Vice Chairman of the Board for four years, from 1981 to 1985, and as Board Chairman for another four of years, from 1985 to 1989.

My first contact with Nelson came at the Nevada Association of Land Surveyors Conference in Elko, Nevada. At the time I was an Associate Member of the Elko Chapter and Nelson had just been elected to the State Board. My first impression of Nelson was one of great admiration. He took time to talk with everyone at the conference, and even had a few moments to visit with me and offer encouragement towards my pursuit of a L.S.I.T.

Later, as I studied for the L.S.I.T. exam, Nelson spent time with me at his Delta Engineering Office to answer questions that I had regarding the exam. This was what I admired most about Nelson, his commitment to helping others and to passing on his knowledge. Nelson was always involved in surveying education seminars. In fact, there were times when the exam reviews would not have occurred if not for Nelson stepping in and making them happen.

After I became licensed, Nelson played an instrumental role in my decision to pursue surveying education at Cal State Fresno. He told me that the future of the profession was going to be greatly influenced by educated, "high-tech" surveyors. So I went. When I came back to Las Vegas on visits I generally ran into Nelson, who was always supportive. This might come as a surprise to some people, since Nelson was not an advocate of a four-year degree requirement for registration, or a proponent of compulsory continuing education. However, my experience was that he certainly was pro-education. I believe Nelson felt that being a professional land surveyor came with certain responsibilities beyond the minimum requirements prescribed by statute. These responsibilities included practicing in areas only where the professional is competent, staying abreast of new technology, and that it is the responsibility of the profession to educate it's own. This is what Nelson did throughout his career.

Nelson felt that being a professional land surveyor came with certain responsibilities beyond the minimum requirements prescribed by statute.

I did not always agree with Nelson's position on certain issues, nor did he expect me to. Nelson believed that through differing ideas and debate, and sometimes down-right arguing, the correct decisions and course of action would evolve.

Nelson Myer is no longer with us. He passed away Friday, January 31, 1992. I consider myself fortunate to have returned to Nevada in time for the Southern Nevada Chapter Christmas Party and have the opportunity to visit with Nelson one last time. With his passing we are witnesses to the end of an era and a breed of surveyor of whom there are not many left. Nelson experienced first hand the incredible changes that took place in our profession over the last five decades.

Nelson Myer has touched many of us, his contribution to the profession serves as a standard for all of us, on both sides of the Sierra. Nor will Nelson be easily forgotten. I only hope that Nelson has gone to a place where there is no brush, all traverses close flat and the ground is easy pounding. God bless, Nelson, and thank you. ⊕

Letters To The Editor

■ NSPS UPDATE

Editor's Note: This letter, dated December 16, 1991, is reprinted to update concerned individuals as to the current status of NSPS and ACSM.

The meeting in Atlanta is over and the results must be related to the members of NSPS. The efforts made by a number of individuals have resulted in progress being made in the strengthening of the present and future positions of both ACSM and NSPS.

As a result of the meeting of the NSPS Board in Denver, and the consideration of the resolution by the ACSM board, various actions have resulted. They are:

1. The ACSM Board accepted, as of January 1, 1992, NSPS, Inc., as a Member Organization (MO) and successor to NSPS.
2. The NSPS Board agreed to an amendment in its incorporation papers to indicate that the intent of the new MO was to be an integral part of ACSM.
3. That on January 1, 1992, ACSM will deposit all 1992 dues into a separate checking account, which will be the responsibility of NSPS, as well as the payment of its own bills.
4. That all assets, programs, membership, etc., will be transferred to NSPS, Inc., as of January 1, 1992.
5. At the request of the NSPS Board, the ACSM Board agreed to the transfer of the Certified Survey Technician Program to NSPS on January 1, 1992.

These achievements were the result of a very cooperative atmosphere developed by both societies' Boards, and the very positive result of the straw vote by the membership.

The ACSM Board also took action to amend the ACSM Constitution and Bylaws. These changes will be included as a part of the December ballot mailed to the entire ACSM membership. The changes would permit only the members of an MO to vote for its director candidates on the ACSM Board. It is vital and critical to both ACSM and NSPS that these changes be approved by at least a two-thirds favorable vote. The vote of each members is needed to assure that these changes are enacted.

The NSPS Board authorized that the bylaws of NSPS, Inc., be provided to each member. The board also authorized that the ratification of the bylaws be at the NSPS General Membership Meeting to be held in Albuquerque, New Mexico, on Sunday, March 1, 1992, at 8:00 A.M. It is requested that members make every effort possible to attend this very important meeting.

The NSPS Board of Directors

■ ON OUR IMAGE

I may have found one of the sources of surveyors' image problem:

"The *California Surveyor* is a quarterly publication . . . " published twice a year!

Stan Siskey
San Luis Engineering, Inc.

Editor's Response: Your interest and concern regarding the timely production and publication of the California Surveyor *is shared by all of us, in particular the Board of Directors of CLSA. The position of the Editor and the Assistant Editors are strictly voluntary. We (the* Cal Surveyor*) are always in need of enthusiastic individuals willing to dedicate their personal time toward the success of the publication. If you feel that you can contribute and make this type of a commitment, I would like to suggest that you 1) join CLSA, and 2) contact the Editor and help us to correct the image problem you have so accurately pointed out.*

■ DISCLAIMER OR DISCREDIT

I am not writing in response to Mr. Oldenberg's article *[Fall 1991]* — I will do that in a separate letter *[letter follows]* — but about your treatment of Mr. Oldenberg's article in your publication.

At the bottom of the left hand side of page 3 is your standard disclaimer that the views expressed in articles in the *California Surveyor* do not necessarily represent the official views of CLSA. You chose to repeat this disclaimer at the front of his article while you did not have any disclaimer attached to the front of any other article in the Fall 1991 issue. Why was Mr. Oldenberg's article singled out? Does the lack of specific disclaimer go into effect now?

I'm really confused! I almost believe that this could have been a way to discredit the article while claiming to support opposing viewpoints, especially since the following article by Robert D. Hennon, P.L.S., was a response to Mr. Oldenberg's article and carried no such disclaimer. Now I'm not only confused but also dismayed the apparent inequities. What's really going on here?

Ruel del Castillo, P.L.S.
Coast Surveying, Inc.

Editor's Response: Your point is well made and taken seriously. Our reprint of our standard disclaimer was an effort only to "soften" a volatile and controversial subject, which it clearly continues to be. Our goal is to present all views and opinions on compulsory continuing education in an unbiased fashion. I personally apologize for any confusion we may have caused.

■ ON COMPULSORY CONTINUING EDUCATION

While I am not completely against compulsory continuing education, as is Mr. Oldenberg, and I am not completely for it, as described by Mr. Hennon. I am, however, convinced that CLSA has not thoroughly evaluated many of the questions raised by Mr. Oldenberg. In addition, I don't believe that CLSA has gathered enough, if any, information about the current continuing education practices of the land surveyors in California. I would think that this would be a necessary ingredient for any intelligent evaluation of this entire issue. It would also provide a benchmark for any future progress evaluations should a system be implemented. For instance, the New Mexico Board of Registration has been gathering this type of information for several years on a voluntary basis from each registrant each year at renewal time.

I believe that now is the time to remove the emotionalism, take a step back, and to find out what has been done. It would then seem appropriate to gather information that would assist in clarifying whether there is even an issue to deal with. If there is, then figure out what is the best way to resolve this issue and still be protecting the public's health, safety, and welfare.

Ruel del Castillo, P.L.S.
Coast Surveying, Inc.

GOOD FOR LINE DISTANCE AND GRADE

Here is a letter printed in Gary Bogue's column which appeared in the Wednesday, September 4, 1991, issue of the Pleasanton, California, *Valley Times* newspaper. I thought this letter might be of interest to all the hot shot, high-tech surveyors of the 90s. Kinda makes you wonder who really is the dumb animal.

Cows Won't Steer You Wrong In Pursuit of Best Path

After reading the August 29 letter from the school teacher about how those "terraces" in the hills are formed by cows as they walk along eating. . . here's a true story I thought you might enjoy. Years ago, I worked for a State of California survey crew that "ran center line" for parts of a couple of current highways. Our crew ran center line faster than any other crew in California, which puzzled the top highway managers because we always seemed to start work late, finish early, and took long coffee and lunch breaks.

Several times a month a person from the main office came to spy on us from afar, with binoculars, to try and discover our secret. The "correct" method for setting center line requires a zillion transit measurements to obtain the correct grades and paths over hill and down dale. Our secret was simple. Our leader would grab a sackful of "read heads" (spike nails with bits of red ribbon tied around the nail heads) and, using a compass for general direction, walked cross country along the cow paths, pushing red heads into the dirt every few yards.

Those red heads became the center line for our highway, and our course to survey, left and right, marking trees, rock outcroppings, telephone pole, etc. Since our leader was a pretty spry gentleman, center line through the mountains was set at about four miles an hour.

I believe he was correct in his assumption that our mangers could not accept a "cow-set center line." However, the bottom line was that our rapidly set course was always the best, in slope and direction.

I still chuckle whenever I drive over the highways we surveyed, and think of that old saying, "Work smarter, not harder."

Cows, too, have their moments. By the way, deer paths are too steep.

Jon M. Lamb
Lamb Land Surveying

CLSA/NALS/ACSM JOINT CONFERENCE

Having just returned from an excellent conference in Reno, I felt compelled to express my concerns on a few points. Overall, I liked the accommodations, the speakers, and the exhibitors, and I look forward to attending next year. One of the highlights for both my wife and I was the scholarship auction held Thursday night. Bravo!!

1. *Dress Code* – I know that most everyone in attendance (save a few) can perform field work such as driving stakes, digging holes, and searching for hidden monuments, but you did not have to look like you were executing these tasks at the Nugget? This was a conference and a more "dressed-up" code should have been followed by those in attendance. Perhaps this could enhance our striving toward a more professional look. I was embarrassed when a moderator introduced a speaker and saw fit to be dressing in a black "T" shirt and jeans!
2. *Absence of Leaders* – I am aware that committee members are busy people. However, meetings of the officers and boards should be held after hours or pre-conference so that leaders could attend the various sessions. This appearance would bolster the "average" surveyors attendance. What took place almost appeared to be secret meetings. Perhaps, if all committee meetings, etc., that are scheduled were published, it would alleviate some concern.
3. *Door Prizes* – **Thanks** ever so much to all the chapters who donated door prizes! Shame on those who failed to donate. However, it is okay not to drink, and it would be nice to see fewer bottles of wine as door prizes. Just a suggestion!
4. *Dinner Show* – Perhaps an increase in attendance if the show tickets did **not** include the expensive dinner!

Glen L. Aalbers, P.L.S.

RIVERSIDE COUNTY SURVEYOR RESPONDS

Presenting a one-sided story is often a way to persuade a mob into burning witches at the stake. Professional Land Surveyors should assess all the information available before making what could be a jaded decision. It would be nice to blame all of our industry's problems on government (black and white, isn't it?). While government is very often called a red-tape nightmare that creates bureaucracy and fees simply to feed its lust for power, this is not the case in the recent change of fees for checking Records of Survey in Riverside County, as inaccurately depicted in Ernest Pintor's letter to the Editor, Volume 96, "Fees on the Rise." This letter should help clear up any confusion that there may be regarding this issue.

In 1978, the first fee collected for the checking of a Record of Survey was $160.00. In 1983, it was proposed to raise the fee to $400.00 after an analysis of actual time spent checking all Records of Survey was completed. The fee was not increased at this time. A later study in 1987 showed that the fee should be increased to $600.00, and, consequently, it was. These fees did not cover the actual costs of checking Records of Survey. The County Surveyor was subsidizing the checking fee for several years with general fund monies. With increasing constraints on all general fund allocations the County Surveyor was directed by the administration to reduce and eventually eliminate all general fund expenditures. Consequently, Record of Survey checking fees must be self-supporting. In an effort to prevent overburdening smaller and less complex surveys with an average **fee,** it was decided to go to a **deposit-based** system and charge at an hourly rate.

A Riverside County ordinance was adopted in 1991 that allowed the County Surveyor to collect a $1,500.00 deposit. After this ordinance was adopted, a committee formed by Ernest Pintor met to work on a compromise to the adopted ordinance. A modified format for fee collection was agreed upon by a committee comprised of:

- The Riverside County Director of Transportation;
- The Riverside County Surveyor;
- A group formed by Ernest Pintor including members from: CLSA; California Council of Civil Engineers and Land Surveyors; and members of the private surveying community.

CONTINUED ON PAGE 8

Letters . . . .

CONTINUED FROM PAGE 7

Together, with agreeing to the following outlined format for collecting fees, this committee formed a follow-up committee including:

- The County Surveyor;
- Bill Green (California Council of Civil Engineers and Land Surveyors);
- Darrell "Skip" Harness (President, Riverside/San Bernardino Chapter CLSA).

The fee for checking a Record of Survey in Riverside County is $45.77 per hour. When a Record of Survey is submitted to the county for checking, a $735.00 deposit is required; this is the maximum charge for a one-sheet RS. For a multi-sheet RS, additional $500.00 deposits up to $1500.00 may be requested as funds are used. The maximum charge is $2,235.00 with the surveyor having the option to continue the checking process at $45.77 per hour in either case.

During the first six months after the implementation of this deposit based system, approximately 50% of all submitted Records of Survey have recorded. The average refund for a single sheet RS has been $366.38 (a cost of $367.38 per RS). A multi-sheet RS average cost was $647.19 (a cost of $269.66 per sheet).

The previous fee was $600.00 per Record of Survey. The number of sheets, scope, technical accuracy, or completeness of the RS had no effect on the fee. Now, if you submit a single-sheet "mom and pop" RS you can greatly reduce your county fees, e.g., two Records of Survey have recorded at a cost of $192.23 each. This should encourage people to file an RS for small and complete surveys.

The County Surveyor is required to sign all Records of Survey filed with the county per Sec. 8767 PLS Act. This brings quite a bit of liability upon the County and the County Surveyor who personally puts his license, and assets, up for grabs (ask the San Bernardino County Surveyor).

Should the public pay the checking fees for Records of Survey? That is for the public to decide, but by charging an hourly rate to check an RS we have shown a reduced cost to smaller and more complete surveys.

Why shouldn't larger and more complex surveys, together with poorly submitted maps, bear the expense that they create?

Raymond L. Mathe, P.L.S.
Survey Party Chief
Riverside County Transportation Dept.

■ TOWILL ANNOUNCES NEW GENERAL MANAGER

Towill, Inc. is pleased to announce the appointment of Dennis R. Curtin as General Manager. He succeeds William S. Robinson who steps into semi-retirement after 36 years with the firm. Mr. Robinson will remain as President and devote his time to business development activities. James S. Kor and Warren P. McKean continue as department managers of surveying and photogrammetry, respectively.

Towill, Inc.

■ HORIZONTAL CONTROL AVAILABLE

Recently CLSA made available to its members the National Geodetic Survey's horizontal control station data for California. This data can be purchased directly from the National Geodetic Survey (NGS) for about $120 for the entire state. CLSA has made this available to its members for $40.00, and non-members for $80.00. *[See Publication Order Form on page 37.]* The data consists of about three megabytes of control station coordinates and related information. The data comes on a 3.5 inch disk, IBM compatible. The information is in ASCII form in a 148 column format. Each station appears as one line of data in alphabetical order. Each data line contains 13 items of information explained as follows:

1. A unique station identifier.
2. The agency's name that established the monument.
3. The station name in alphabetical order.

4&5. The geodetic latitude and longitude in degrees, minutes, and seconds to five decimal places.

6&7. The state plane coordinates, north and east in meters. Stations that fall in overlapping state plane coordinate zones appear twice, listing the state plane coordinates for each zone.

8. State plane coordinate zone.
9. Convergence angle at the station.
10. The scale factor for the station.
11. The orthometric height (elevation above sea level); 12) The separation of the geoid from the NAD83 ellipsoid in meters; and 13) The positional accuracy of the station given as first, second, third, or fourth order.

Three million bytes of information isn't much help if the stations of interest cannot be found quickly. If a station name is know then the user could use a word processor or some other utility program to search through the file looking for a matching string. The most practical method is to search the file by location. A program called *WINDOW* was developed on behalf of CLSA for this purpose. *WINDOW* is a 55k byte program that runs on an IBM compatible using the DOS operating system. *WINDOW* allows the user to enter the latitude and longitude at the center of a search area and the number of miles north/south and east/west to be included in the search windows. All points found within the window are extraced and duplicated in a separate file with the same format as the orignal file. Information such as a header, the date the file was created, and the location and size of the search window are added to the file. A second file is created containing a line number which can double as a point number for reference, the north and east state plane coordiantes converted to feet, the stations positional accuracy and the station name. This file can be read direclty into the user's COGO program for additional calculations or converted into a DXF file by the *WINDOW* program. The price of the *WINDOW* program is $20.00 for CLSA members, and $40.00 for non-members. *[See Publication Order Form on page 37.]*

Michael McGee, Chairman
CLSA Advanced Technologies Committee ⊕

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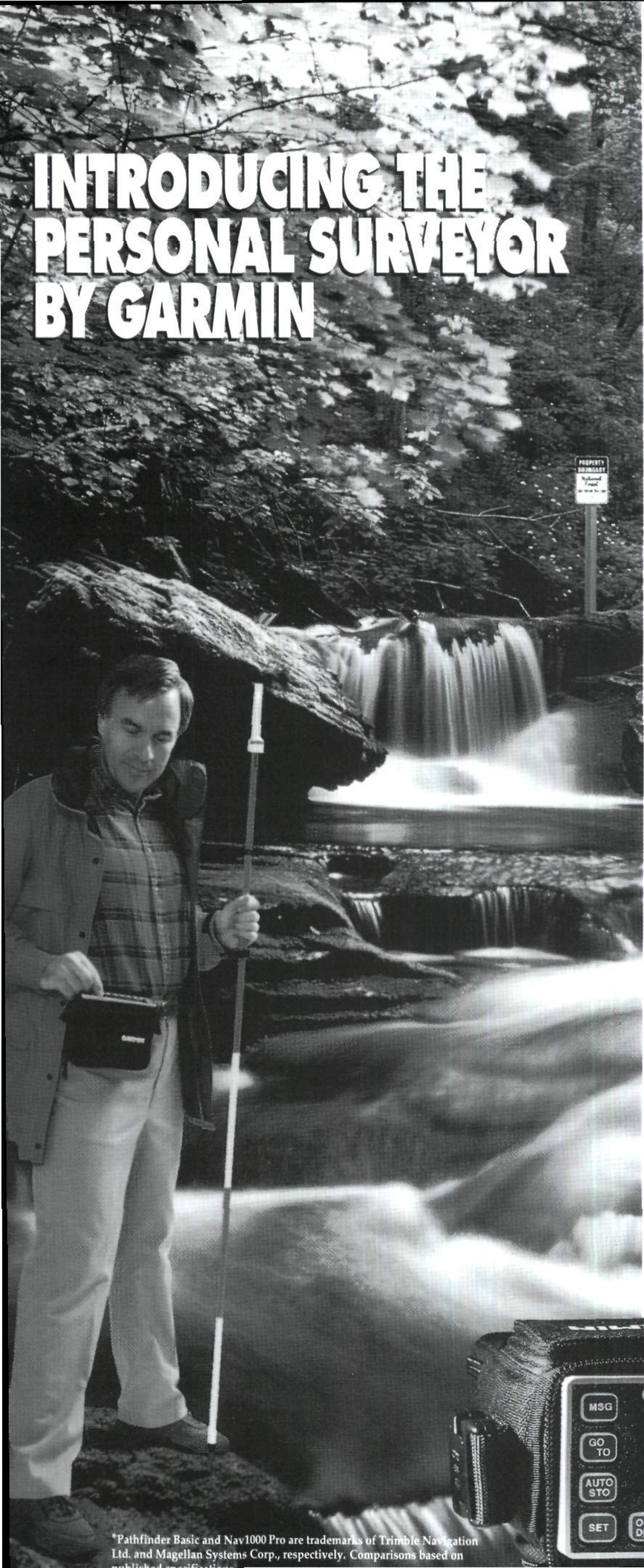

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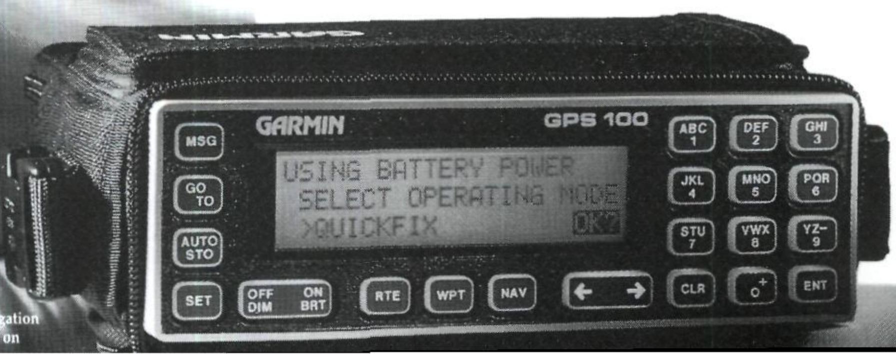


*Pathfinder Basic and Nav1000 Pro are trademarks of Trimble Navigation Ltd. and Magellan Systems Corp., respectively. Comparisons based on published specifications.

Survey Records Past, Present, And Future

By Clyde Elmore

Author's Note: I am the Senior Land Surveyor in charge of all surveying done by the City of San Diego Engineering and Development Department. As such, I am also the present custodian of all of the original historic surveying records. In our files we have surveying records dating back well over a hundred years. We are now changing over from traditional transit-tape surveying to fully computerized data processing. The character of our survey records has, necessarily, changed also. A responsibility of my position is to ensure that useable survey records are available to the public in a form that they can understand and use. The following article voices some of my concerns regarding the character of surveying records of the future.

FROM THE EARLIEST days of surveying, when the pyramids were built and the Nile Valley flooded every year and had to be resurveyed, historic records of those surveys were kept. In the pyramid days the records were sometimes carved in stone. In later times, they were written on papyrus, parchment, or animal skins. However, they had in common the fact that all of them were written by hand by someone involved with the survey.

A characteristic of hand-written notes is that anyone who understands the language can read them, no matter how old they may be. Surveys that are hundreds of years of age may be interpreted, and surveys can sometimes be retraced using only a copy of the original data. We have in our files survey notes dating to the 1870s that are as easily understood as notes from five years ago.

In the last few years, computerization has changed all of that. Today survey records are generated, processed, and stored electronically. The data is, literally, never touched by human hands. This has been a tremendous revelation to the surveying industry, in that the time required for a particular job is greatly reduced. Also, the error rate is diminished to the point where mistakes are nearly eliminated, the human element having been removed at several critical points of data processing. There are now many wonderful systems available for handling survey data. The technological needs of today are met very nicely and work is done faster and better than ever before.

But while enjoying today's technology, we, the surveyors of today, must seriously consider the nature and quality of the historic records we are generating. While our present systems work very well now, they are only "now" systems. They may or may not be in place a century from now, in the year 2100. Most probably, the systems we use today will be totally archaic in 2100. This is where the old, hand-written note taking methods depart from today's methods. The surveyor of tomorrow may not be able to pick up a copy of today's survey data and read it directly, as we can with historic, hand-written information.

Let's contrast today's surveying computerization to something with which we are all familiar — recorded sound. The phonograph was invented by Edison in 1877. In the original form, it played a grooved cylinder, and for that day and age it worked wonderfully well. Later the cylinder was replaced by round disc records, and then by different sizes and speeds of those discs.

As better ways of doing things were discovered, the 8-track tape came along, and about the same time the cassette tape. These were followed by the Compact Disc commonly used today. Is the CD the last stop and will the technology end there? Not likely. Who knows where the next century of technology will take recorded sound.

Today a person would be hard pressed to find a machine that can play the old cylinder records. Soon it will be hard to find phonographs to play "regular" records, and it is already difficult to find an 8-track player. As things progress, it will probably be very hard to find a CD player in the year 2100. So called, "present day technology" has a way of disappearing without a trace.

This scenario represents a valid comparison to the problem we must address when archiving electronic survey records. We are now in the "cylinder record" era of electronic surveying, and we are using the "cylinder record player" hardware and software. While everything is in place today to handle the records we generate today, will the researcher in the year 2100 be frustrated in trying to access them? We have no way of knowing what electronic systems will be in place a century from now. We do not know if it will even be possible to access today's records using tomorrow's electronics. Even if they could be accessed, could they be understood? Each system we have today has it's own coding setup. Sometimes the people who operate one system cannot understand data from another. If we have this difficulty now, how will the user a century from now be able to sort it out?

At one time or another, every surveyor has had to deal with a subdivision map that was prepared in the 1870s. Usually they show no dimensions or give no bearings or angles at all. Often there are only large rectangles representing blocks, within which are smaller rectangles representing lots. Land was cheap, and surveying procedures were limited and more casual. There were few, if any, standards covering the final maps produced. The user today must deal with maps that sometimes give few clues to discern the intent of the original surveyor.

Suppose a meeting had been held in the 1870s by all of the surveyors of that day, for the purpose of creating surveying and mapping standards that would produce a more useable product for surveyors a century later — us. They would have to try to anticipate our needs, the tools we would be using, etc. Of course, they could not have foreseen the computer revolution, any more than we can anticipate the systems that will be in place in a century. Had they held such a meeting, the result may have been standards that would have yielded better maps which more clearly show the intent of the original surveyor. Some of our frustration today would have been eliminated.

There is only one statement that can be made about surveying in the year 2100 with absolute certainty. There will, absolutely, be a need for the surveyor of that era to be able to research all historic records and be able to understand them. We, the people generating those historic records, must be certain that they will be in a retrievable, understandable and useable form. If they are not, they will be worthless.

It is precisely because we do not know what tools the future surveyor will use that we have to prepare records that may be used by anyone. If the stored data is to be in electronic form, there must be an assurance that machinery will be available then to retrieve and use the data. If the records are to be printouts, then that also must be in some fully understandable format.

We should not make it necessary for the future surveyor to search for an "electronic Rosetta Stone," to find the key for translating electronic records. All necessary information should be up front and available to the future researcher. The records should be as easy for them to understand as are the hand-written, historic notes we use today.

We can learn a valuable lesson from the surveyors of the 1870s. We can hold the meeting they didn't hold. We can make definite provisions for the future they failed to make. We can save future surveyors many frustrating hours, trying to interpret the historic survey records we will generate. ⊕

RIGHT OF ENTRY

Cards Available

The California Land Surveyors Association has prepared a field notebook insert of the surveyors' "Right of Entry" law, Section 846.5 of the State of California Civil Code and Section 8774 of the Business and Professions Code. This heavy duty, water resistant (varnished) card can be carried in the field book; handy for showing to property owners, as needed. Just hole punch it to fit your particular notebooks. To order your "Right of Entry" Cards, fill out the CLSA Publication Order Form, which can be found on Page 37 of this issue of the California Surveyor.

NEW SIZE!

The **Subdivision Map Act** and the **Land Surveyors Act with Board Rules** are now available in a booklet form (5½" x 8½"), in addition to the letter-size (8½" x 11"). Order your copies today using the Publication Order Form on page 37.

SURVEYING EDUCATION

The Dogs Don't Like It

By Angus W. Stocking

THE DEBATE OVER a required four-year degree for land surveyors reminds me on the old joke about the big company that introduced a new brand of dog food. Determined to have a winner, the company mounted a huge advertising campaign and hired extra salesmen. Inexplicably, sales were flat. So the company spent **more** money and hired **more** salesmen. Still, no sales. Finally, the company arranged a conference, attended by all the top management and all the salesmen. For days, they wrangled and debated the question, "Why can't we sell this dogfood?" On the last day of the conference a timid salesman finally got up the courage to speak. He raised his hand, and declared that he knew why the dogfood wasn't selling. All eyes turned to him, waiting for the answer. He gulped, and said, "Well, you see, sirs, ***the dogs don't like it."***

The fact is, those who make the most noise in this debate — the chapter presidents, the magazine editors, etc. — are the very ones who will be least affected by the outcome. After all, no one has seriously proposed that the requirement be retroactive, so that a surveyor without a degree would be forced to get one to keep his license. Those who would be **most** affected are the beginning land surveyors, who are just getting started in this wonderful profession and hope to make a career out of it. And we are just the ones who are rarely heard from.

Well, you see, sirs, **the beginning land surveyors don't like it!**

At least, this one doesn't — and I feel I'm representative. At 26 years old, after owning two different businesses and working in several different trades, I have discovered surveying — a profession I love and hope to stay in for the rest of my life (despite the fact that I get poison oak). Also, I've been in college, in pursuit of a liberal arts degree. I spent one year at a community college and two at Cal Poly San Luis Obispo, in California. I left for personal reasons, unrelated to grades or finances. So my opinions spring from a fairly broad background.

The main argument advanced by those in favor of a mandatory degree is that it will raise the professionalism of surveying. One comment in a recent issue of *P.O.B.* said that, "We will never be recognized as professionals until we meet the basic minimum requirements of true professionals, e.g., a four-year degree."

But is that actually true? Is a four-year degree really a "minimum" requirement to be recognized as a "true" professional? It is possible to become an engineer without spending any time in college. Yet as a class, engineers are spoken of as professional. And consider a member of the acknowledged "learned" professions (doctor, lawyer, etc.) who is incompetent. If we were misrepresented by a lawyer and lost a case that we should have won, we wouldn't call him a professional, not even if he were a Ph.D. We would call him a boob, and with good reason. But, suppose we took our ailing car to a mechanic, and he fixed it quickly and at reasonable cost. Would we not refer to him as a "real professional"?

The fact is, true professionalism is not linked to four-year degrees or other certificates. True professionalism is linked to competence. And there is no automatic link between formal education and competence. Consider Thomas Edison, who received only three months of formal education. Certainly he was both competent and professional.

Another argument in favor of a degree is that, "The scope of the work has expanded so much that a good background in math, physics, and computer technology has become a must."

This is a comment from the same issue of *P.O.B.* Apparently, the writer feels that since surveyors now use G.P.S., E.D.M.'s, and computers, they should be conversant with the science underlying these devices. It's an interesting idea, but why stop there? Why not include optics, geology, plate techtonics, metorolgy, uranography, chronometry, and all the other sciences that surveyors depend on?

Because life's too short, that's why. Like it or not, we live in an age of specialization. Surveyors are specialists in the sciences of measurement, construction layout, and deed interpretation. Other sciences are means for surveyors, not ends. We must be able to apply them, but it's somebody else's job to understand them. So we don't need to be astronomers to take an accurate sun shot but we do need to know how to run the program in our 41s (or is that 48s now?)

> ***If we were misrepresented by a lawyer and lost a case that we should have won, we wouldn't call him a professional, not even if he were a Ph.D. We would call him a boob, and with good reason.***

Knowing the applications is a job in itself. Even the smallest of shops has dozens of unread manuals laying around. What's more, it is a continual struggle to keep up with the "bubble" of current technology. If a surveyor tried to use the equipment and techniques of five years ago, he would soon be out of business because he would be slower and less accurate than everybody else. And if a modern surveyor was transported just five years into the future, it would take him months to learn new equipment, new programs, and new terminology.

Higher education does not make this struggle to stay current any easier. A degree in computer technology gives a person no special advantage when it comes to learning a new COGO program — the manual still has to be read and commands still need to be memorized. One way or another, the ability to learn under real-life pressures and to make sense of instructions is instilled long before the college years — or it's never instilled at all.

Other participants in this debate maintain that a degree can impart necessary business skills. I would seem so, but, in fact, studies of the self-employed show no significant correlation between higher education and business success. If anything, the successfully self-employed tend to have lower than usual grade averages, and to have spent less time in school. The point is, small businessmen and entrepreneurs are able to meet real-life business challenges, whether or not they have a degree. Since, aside from the actual product, surveyors face the same problems as other business owner, this should be true of them as well.

Finally, consider the fact that college is for the young. This is not invariable, but obviously it is easier for those who are single, unencumbered, and supported by their parents to spend four years of their life in pursuit of a degree.

A required four-year degree then, by extension, will usually require that a person decide to become a surveyor before he finishes high school. I can't back this up with a study or a poll, but it's my observation that at least half of all surveyors get into the profession relatively late in life, after trying out other types of work — or even acquiring a degree in another subject. (When I took the L.S.I.T. exam, I met a fellow who had majored in philosophy; he maintained that it was excellent training for a surveyor.) Thoreau said, "The mass of men lead lives of quiet desperation." And at least it's true that there are a lot of people who hate their jobs. But surveyors love their jobs (Again, this is just an observation . . . but wouldn't you agree?). I think this is strongly connected to the fact that surveyors are allowed to find their own way to the profession, after gaining some experience in life. After all, how many of us would really want to be **now** what we thought we wanted to be when we were in high school?

So please, those of you out there who make these decisions, don't take away my career.

None of this is to say that college is a waste of time or a bad place to be. I enjoyed my years at Cal Poly and learned a lot there. For many people, the process of getting a degree is a very good way to acquire knowledge, competence, and maybe even common sense.

But it's not the only way.

Why not continue with the present system? It's certainly not broke, and it may not need fixing. It makes room for two types of people — those who like school and can learn there (and can afford it), and those who learn better on the job. The two types are not competitors, and one is not "better" than the other — they're just different.

If professional standards are slipping — actually, the opposite seems to be the case — then make the tests harder and put some backbone into a continuing education requirement.

And have a little faith in the customer and in the invisible hand of the marketplace. True, as a profession, surveying is largely misunderstood; still, shoddy work does not go unpunished, and good work will not go unnoticed.

Let me conclude by admitting that I write in extreme self-interest. I am no dispassionate observer. If the rules were changed and I had to get a degree to become a surveyor . . . well, I just couldn't do it. Not with a wife and a one-year old daughter to take care of.

So please, those of you out there who make these decisions, don't take away my career. ⊕

1992 CLSA/NALS JOINT CONFERENCE

Staking Our Claim For the Future

Held in affiliation with the Southern California Section of ACSM March 12–14, 1992, at John Ascuaga's Nugget, Sparks, Nevada

WITH THE STATE of surveying and the state of the economy these days, the theme of the conference was appropriate. The conference committee made every effort to thread the theme through the talks, the exhibitors' hall, and even some of the social events. The committee and conference staff are to be commended for the effort they put into making this conference the success that it was. There were 262 paid registrants and at least as many who slipped in unannounced.

There is not enough space to let all of you who did not attend know what you missed, and no reason to make you feel worse then you already do. However we can highlight a few of the talks and events.

The conference opened Thursday morning with award presentations for the CLSA Member of the Year and an a Distinguished Service Award. Robert Foster, P.E., President of ACSM, gave the keynote address. This was followed by talks on GPS. The honorable Mills Lane was the guest speaker at the luncheon. Mr. Lane has no problem keeping a full room of overstuffed surveyors entertained for hours.

Thursday afternoon had the crowd considering the professional future of land surveying with talks by Dr. Nader on "Land Surveying; the Subservient Profession," and Mr. Connin, P.L.S., on the increasing liability of land surveyors.

As all this was going on, the exhibitors were showing some of the newest equipment, software, and surveying techniques in the exhibit area. Also exhibiting their wares were CSUF Fresno, Cal Poly Pomona, and the Mt. Diablo Historical Society. Thursday evening brought about the Exhibitors' Cocktail Party with the Scholarship Auction.

Friday brought us reports on the status of the current legislation in California that affects surveyors — including legislation that CLSA is looking at introducing. This brought a lively discussion on the need for having Records of Surveys checked by County Surveyors. Also, there was a self-motivation lecture and a discussion on Fremont's surveys in Nevada. As far as the guest speaker for lunch went, suffice to say, don't trust traveling Russian Ministers.

The afternoon brought talks on ALTA/ACSM standards and how they should be modified and a detailed talk on how to determine if fee title or an easement is being transferred in older deeds.

Saturday morning introduced us to the new LS member on the Board of Registration of California, Mr. David Slawson, as well as the executive Officer of the Board, Darlene Atkinson Stroup; the Enforcement Program Manager, Debra Price, and Reginald Rucoba a Deputy Attorney General who works with the Board. That was followed by a Mock Trial presided over by the honorable Mills Lane and finally the closing ceremonies.

With a break from tradition, there will be no remark on the events at the gaming tables in the evening, except to say that the Fresno Students sold an inordinate amount of their shirts as the attendees were leaving.

AWARDS

The conference was the site of two special awards presentations for CLSA members.

Gary Leonard of the Sacramento Chapter was presented with the Member of the Year Award, for his outstanding service to the association and its membership. He is a Past President of the Sacramento Chapter and is currently serving as a Chapter Representative to the Board of Directors, as well as chairing the important Legislative Committee. His dedication to improving and expanding the activities and membership of his chapter and representing CLSA at both the Board of Registration and the State Legislature has been invaluable to our association.

Hal Davis of the East Bay Chapter was honored with the Distinguished Service Award for his untiring and continuous support of, and service to, CLSA and the profession. He has served in both chapter and state offices, has represented the East Bay Chapter as a Chapter Representative. He has served on and chaired numerous committees, including the all-important and demanding Legislative Committee. He continues to generously share his considerable knowledge and experience with a new generation of professional leaders.

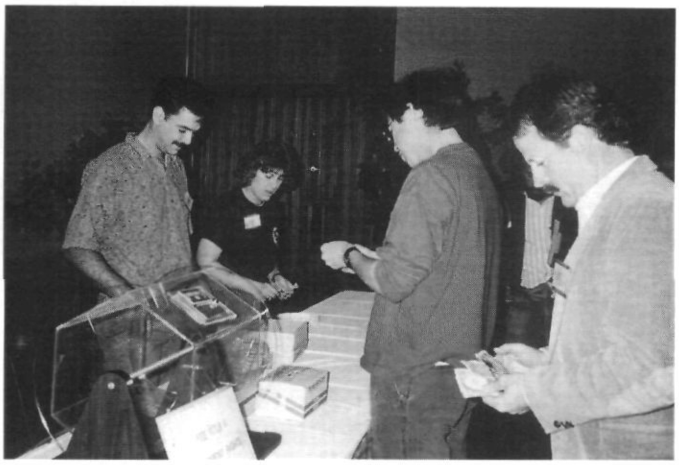
FIRST ANNUAL SCHOLARSHIP AUCTION

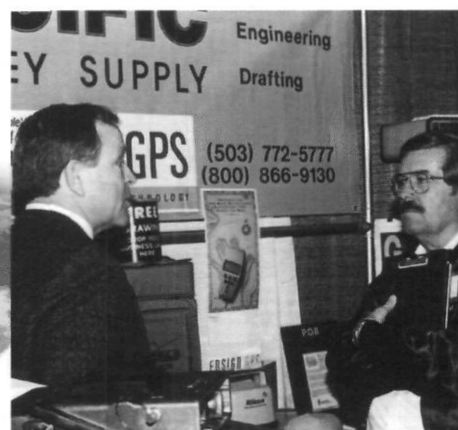
One of the highlights of the '92 Conference was our First Annual Scholarship Auction which was held in conjunction with the Exhibitors Cocktail Party. Not only did we raise over $9,000 for the CLSA and NALS scholarship programs but it looked like a great time was had by all.

Special thanks are in order for our auctioneer, Larry Tardy; his crew from B&S Industries; the Fresno students who kept those items coming (and cheerfully accepted your checks); and last, but not least, our own "Vanna White" of the surveying world, Howard Brunner.

Our exhibitors really came through for us with great donations, and considering the slow economy, CLSA and NALS would like to extend a sincere thanks to them for their continued support of our conference and associations. Most important of all, a well-deserved thank you goes out to those who bid on the items, because you made the auction such a successful and entertaining event. We hope to see you in San Diego for next years auction.

Auction Contributors: B&S Industries; Larry Cloney; California Drafting Supplies, Lloyd Cook; Carl's Blueprinting & Instruments; George Dunbar; Harry's Business Machines; Susan Jensen; Ingenuity, Inc.; Mark Lewis; Lewis & Lewis; Martin, Northhart & Spencer; Oakman's; Michael McGee; Pacific Survey Supplies; Alexi Rapkin; Seco; Toiyabe National Forest; Sokkia; Twin Cities Engineering; Surveyors Module, Inc.; Lahontan Chapter, NALS; Surveyors Service Co.; The Wild Dealers; Wood's Surveying; Tripod Data Systems; and the East Bay, Motherlode, Orange County, and San Diego Chapters of CLSA. ⊕

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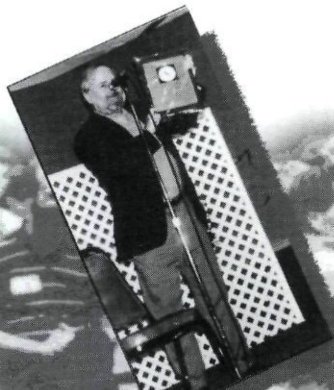


ACSM/ALTA Land Surveying Standards

By Herbert W. Stoughton, Ph.D., P.E., L.S., Geodetic Engineer

AT THE 1991 Annual Meeting of the American Congress on Surveying and Mapping, this writer agreed to rewrite Table 2 of the ACSM/ALTA land surveying requirements. The previous table and the supporting documentation were reviewed. Due to numerous negative comments concerning the table, it was determined to delete the original and rearrange the information into a more meaningful format.

Based upon previous work — developing/designing survey projects, executing surveys, computing and analyzing the survey results, and preparing technical specifications for survey instruments and survey projects, it was decided that a totally different presentation of the information in Table 2 would provide clearer guidance to land surveyors and understanding to attorneys and land title personnel.

Good surveys are the result of good instrumentation, proper field procedures, and good survey personnel. Deficiencies in any one of these elements will result in inadequate survey results. In order to establish viable survey criteria, the premise was stated that the survey personnel were at least journeyman level experience survey technicians, If these criteria were applied to geodetic surveyors, it would mean that the surveyors would be competent to perform Second-Order surveys. Employing this assumption established the survey observations statistics and the ability to set instruments and targets over (center) the survey stations.

The first part of Table 2 identifies the minimum characteristics of the theodolites and distancers (surveying tapes and electronic distance meters) deemed acceptable to insure the specific precisions and accuracies for each class of survey. The criteria for theodolite observations permit use of electronic theodolites, optical micrometer theodolites, *and* repeating engineers' transits for various classes of survey. These are the instruments used every day by consulting land surveyors. Likewise, the distancers are commonly used by land surveyors.

Probably the most criticized aspect of Table 2 will be the requirement for calibration/certifications. The most controversial aspect concerning any boundary survey focuses on the analysis of the accuracy and the goodness of the survey. The approach is to state a series of procedures that provide the land surveyor with irrefutable technical knowledge to support and substantiate the stated survey results. The knowledge of the observer's capabilities, the condition (calibration/certification) of the instrumentation, and resulting statistics provide documentary evidence of the goodness of the quantitative data.

The office computations and adjustment of the field surveys can be performed in a variety of procedures. The land surveyor must employ a survey adjustment which does *not* contain unreasonable (in numerical value) corrections to one or more measurements. It is imperative that the surveyor perform a comparison between the corrected observations (for field/systematic effects) and the final adjusted values.

The last, and probably the most significant, change in Table 2 is inclusion of surveying criteria employing GPS technology. There has been considerable discussion of using GPS technology. However, its use to perform boundary surveys has been ignored. After studying reports describing GPS surveys for geodetic, mapping, engineering, and navigation projects, it was decided that with suitable procedures, Class C and D boundary surveys were possible. Because the bearings and distances between boundary points are not always measured directly (are measured indirectly utilizing control surveys), the requirements have been stated to insure geometrical integrity. The use of GPS is quite new, and land surveyors must be cautious in designing the survey and executing the checks.

Two types of survey instrumentation have been omitted. These are inertial positioning and photogrammetry. The usage of these two techniques can be acceptable when employed correctly. However, their use as a primary survey procedure is discouraged. If a land surveyor decides to utilize these technologies, a stringent set of technical instructions coupled with appropriate independent checks can be used to execute boundary surveys. However, the entire burden of proof of goodness and accuracy of such a survey is solely the responsibility of the land surveyor.

Good surveys are the result of good instrumentation, proper field procedures, and good survey personnel.

The land surveyor's responsibility is to prepare, execute, and publish a boundary survey. Table 2 provides guidance that minimizes opportunity to have quantitative blunders that would be considered a professional liability (errors and omissions). Table 2 does *not* eliminate the land surveyor's liability for failure to reasonably interpret the written and physical evidence, and incorporate both into an exhibit (map and legal description).

CONTINUED ON PAGE 20

AMERICAN CONGRESS ON SURVEYING AND MAPPING
Table 2

Minimum Instrumentation, Angle, Distance, and Closure Requirements for Classes of Surveys

CLASS OF SURVEY	THEODOLITE								
	Type (1)	Minimum Circle Graduation	Level Sensitivity (2)			Minimum Optical Magnification	Optical Plummet Accuracy (3)	Maximum Trunnion Axis Tilt (4)	Maximum Inspection Intervals (5)
			Spherical	Plate	Vertical Circle				
A	D	5"	30′	30"	30"	25 x	± 2 mm / 2 m	2′	6 mo.
B	D	10"	30′	30"	30"	25 x	± 3 mm / 2 m	4′	6 mo.
C	D / R	30" / 20"	30′	30"	30"	20 x	± 10 mm / 2 m	20′	12 mo.
D	D / R	30" / 20"	30′	30"	30"	20 x	± 10 mm / 2 m	30′	12 mo.

CLASS OF SURVEY	SURVEYOR'S STEEL TAPES			ELECTRONIC DISTANCE METERS		
	Minimum Graduation (6)	Maximum Calibration Intervals	Source of Calibration (7)	Minimum Accuracy (8)	Maximum Calibration Intervals	Source of Calibration (7)
A	0.01	3 mo.	p	± (3 mm ± 3 ppm)	3 mo.	p
B	0.01	3 mo.	p	± (3 mm ± 3 ppm)	6 mo.	p
C	0.02	6 mo.	s	± (10 mm ± 5 ppm)	6 mo.	s
D	0.02	12 mo.	s	± (10 mm ± 5 ppm)	6 mo.	s

NOTES

(1) Type of theodolite is directional "D" and repetition "R." "D/R" indicates that either type of theodolite is acceptable.

(2) Level sensitivity is the sensitivity of the level vial *or* the compensator of the instrument used to determine the local vertical/horizon. The stated units are equivalent to a sensitivity of arc seconds per 2 mm division of a vial.

(3) The optical plummet accuracy is the error of centering the theodolite's (or survey target) tribrach vertical axis over the survey point at a specified height above the point (usually 2 meters).

(4) This is the tilt of the theodolite's collimation axis with respect to the theodolite's vertical axis.

(5) The inspection interval refers to the period between inspection, certification testing, and/or calibration of the instrument.

(6) The minimum graduation is expressed as a decimal of the unit length of the tape (i.e. hundredth of a foot).

(7) "p" is the comparison to a standard that has been *compared* at the National Institute of Science and Technology (NIST, formerly the National Bureau of Standards), or the Coast and Geodetic Survey EDM calibration baseline. "s" is the comparison to a standard that is traceable directly (through documentation) to a standard that has been compared at NIST. Note: This secondary standard should not be more than two levels of comparison form the NIST or C&CS standards.

(8) The manufacturer's stipulation is acceptable.

(9) "2" means two circle positions (sets) of directions. "3L/R" means six repetitions (3 direct plus 3 reverse). Note: in lieu of 3 L/R, two sets of 2 L/R (4 repetitions is acceptable).

(10) The object sighted is a traverse target mounted in a tribrach.

(11) The object sighted may be a range pole or a plumb bob.

(12) Means the spread of the field observed measurements *not* corrected for the usual systematic errors.

(13) Means the spread of the field observed measurements *after* applying correctic.ns for the known systematic errors.

(14) "r" means the refraction correction (also called the first velocity correction) and is based upon meteorological data. "i" means the inclination or slope correction. "e" means the instrument and reflector corrections and the eccentricities.

(15) Means the spread of the field observed measurements *after* applying corrections for the known systematic errors.

(16) "c" means the standardization correction. "t" means the thermal/temperature expansion-contraction correction. "i" means the inclination or slope correction. "s" means the suppor (catenary) correction.

(17) For *n* the *number of angles* in the traverse not exceeding four, the first number is the total misclosure. For five or more angles, the maximum misclosure is the second number multiplied by the square-root of the number of angles in the traverse.

(18) If the angles are *not* adjusted for the azimuth closure, then the greater linear precision for the coordinate misclosure precision is employed. If the angles are adjusted for the azimuth closure, then the lesser linear precision for coordinate misclosure precision is employed. If a least squares adjustment is employed, then the correction (residual) to each length shall not exceed the mall index of precision.

(19) GPS surveys for urban and suburban classes are not permitted because there exists a higher opportunity for inadequate satellite coverage due to horizon obstructions.

(20) The "master" station shall be established to an accuracy of 1:100,000 directly from a Class B station established and incorporated into the national geodetic network by the Coast and Geodetic Survey.

(21) If *n* equals the number of GPS vectors from the master station to unique boundary corners, a subset of these vectors *must be reobserved* to validate the survey's integrity. The minimum number of reobservations is:

$$\text{Integer} \mid \sqrt{n} = 0.5 \mid - 1$$

e.g. $n = 8$ vectors, then

$$\text{Integer} \mid \sqrt{8} + 0.5 \mid - 1 = \text{Integer} \mid 2.8 + 0.5 \mid - 1 = 2$$

(22) To insure that the GPS determined boundary corners are correctly interrelated geometrically, several GPS vectors between the boundary corners must be observed. The minimum number of check GPS vectors is *one*, or $\sqrt{n} - 2$, whichever is greater.

(23) The vector precision to the master station indicates the precision of the difference between the two determinations to the vector length.

(24) The vector precision between two boundary points indicates the precision in the comparison of the inverse distance between the GPS derived positions from the master station and the directly observed GPS vector.

(25) If a traverse is specifically designed, then a minimum number of the GPS vectors must be reobserved. The minimum number is identical to the quantity calculated in note 21. If, however, a traverse is not specifically used, but a number of points are established in a "leap-frog" manner, then *twenty-five* percent of the GPS vectors must be reobserved.

(26) For a polygon of *n* corners, the number of diagonals is:

$$0.5 * n * (n - 3).$$

The minimum number of observations of diagonals is:

$$\sqrt{0.5 * n * (n - 1)}$$

(27) The repeat vector precision indicates the precision of the difference between the two determination to the vector length.

TABLE AND ARTICLE CONTINUED ON PAGE 20

AMERICAN CONGRESS ON SURVEYING AND MAPPING
Table 2 (continued)
Field Observations

CLASS OF SURVEY	ANGULATION			
	Minimum Sight Distance	Directions/Angles Minimum Obs. (9)	Maximum Difference	Object Sighted (10) (11)
A	30 m	2	5"	target
B	30 m	2	7"	target
C	25 m	2 - 3 L / R	20"	rp / pb
D	25 m	2 - 3 L / R	30"	rp / pb

CLASS OF SURVEY	ELECTRONIC DISTANCES				TAPED DISTANCES		
	No. of Obser.	Maximum Difference (12)	Maximum Difference (13)	Minimum Corrections Applied (14)	No. of Obser.	Maximum Difference (12)	Minimum Corrections Applied (16)
A	10	7 mm	5 mm	r, i, e	6	5 mm	c, t, i, s
B	8	10 mm	5 mm	r, i, e	4	10 mm	c, t, i, s
C	5	15 mm	10 mm	i, e	2	20 mm	t, i
D	5	20 mm	15 mm	i, e	2	40 mm	t, i

CLASS OF SURVEY	SURVEY ACCURACIES	
	Angle/Azimuth Closure (17)	Linear Precision of Closure (18)
A	10" / 5"	20,000 / 15,000
B	20" / 7"	15,000 / 10,000
C	40" / 15"	10,000 / 7,500
D	60" / 30"	7,500 / 5,000

CLASS OF SURVEY	RELATIVE POSITIONING FROM A SINGLE MASTER STATION					
	Permitted (19)	Maximum Distance to Master (20)	No. of Repeat Obs. (21)	No. of Boundary Checks (22)	Vector Precision to Master (23)	Vector Precision to Boundary (24)
A	No	—	—	—	—	—
B	No	—	—	—	—	—
C	Yes	75 km	Yes	$\sqrt{n}$ - 1	1 : 50,000	1 : 15,000
D	Yes	75 km	Yes	$\sqrt{n}$ - 1	1 : 50,000	1 : 15,000

CLASS OF SURVEY	RELATIVE POSITIONING BY A GPS TRAVERSE				
	Permitted (19)	No. of Repeat Obs. (21)	No. of Diagonals (26)	Vector Precision Repeat (27)	Vector Precision Diagonal (28)
A	No	—	—	—	—
B	No	—	—	—	—
C	Yes	Yes	Yes	1 : 30,000	1 : 30,000
D	Yes	Yes	Yes	1 : 30,000	1 : 30,000

Standards . . . .

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Classification and Specifications For Cadastral Surveys

INTRODUCTION

Cadastral surveys have been classified into four categories: Class A – *Urban*; Class B – *Suburban*; Class C – *Rural/Agricultural*; and Class D – *Mountain and Marshlands*. Table 1 provides a descriptive overview of each category. In most instances, the accuracy of lengths, angles, and areas decreases from Class A to Class D, but this requirement may be negated or altered due to extraordinary circumstances (i.e. ecological, economic, recreational, historical, or other unique factor). When these conditions arise, the land surveyor and other interested individuals must agree upon which category of minimum standards should be employed.

One of the most important aspects of any survey is its "goodness." The word "goodness" is used for lack of a more elegant term. *Every* cadastral survey has two aspects, which are considered separately, but are equally important. These aspects are *mensuration* information and *legal/title evidence* information. Mensuration information is the survey data (angles, distances, and area) observed/acquired for the survey and map. Legal/title evidence information is the "facts and observations" concerning all physical evidence which could affect the real property boundaries and title. The land surveyor's responsibility in performing a boundary survey is to report *all* physical facts affecting the title *and* most probable location and dimension.

The ambiguous aspect of all boundary surveys concerns the accuracy, thus the validity, of the field surveys. There exist two surveying terms — *accuracy* and *precision* — which are misunderstood. Accuracy is the statement of the relationship between the actual measurement and the absolute definition of the measurement. For instance, a measured distance must be traceable to the fundamental definition of length. When a statement of accuracy of a measured quantity is stipulated, then the expositor must be able to demonstrate that the stated dimension is related directly to a certifiable standard, or an accepted representation, thereof.

The term precision is not analogous to accuracy. Precision is a statement of the consistency of a set of measurement of a given quantity (i.e. angles, distances, etc.). Accuracy is the statement of the departure of a measured quantity, corrected for all known error sources, from the "truth" (definition of the standard of the measure — i.e. standard of length). Every measured quantity in a survey must be assessed for both precision and accuracy. When a survey is completed, more geometrical elements of the traverse (polygon) must be measured in order that two, or more, mathematical solutions could result. For example, only two angles and three lengths of a four-sided polygon provide a unique solution of a four-sided polygon. Any additional measured element is redundant, thus adding other mathematical solutions. Land surveyors include these measurements in order to assess the validity of the survey (both for accuracy and precision). Because the survey is "over determined," a rigorous mathematical adjustment is utilized to compute a statistically acceptable mathematical model for the field measurements. The differences between the measured values and the resulting adjusted values, called residuals, can be employed to calculate a set of positional precision terms for all the survey points. The procedure utilized complex mathematical theory, and required sophisticated computer software to provide the statistical information.

Although statistical theory provides the "best insight" into the validity of the survey measurements, there exist alternate approaches for evaluating the goodness of the survey measurements. The procedures result from several decades of statistical analysis of historical data. This historical data has established a performance baseline. Also, from this data, information has been gleaned to develop field procedures whereby an instrument with particular capability, operated by an observer of journeyman level experience/capability, could achieve a stipulated result. The standards have been devised to stipulate a conservative, but reasonable, set of statistics which guarantees a minimum accuracy and precision for all the observed data.

Because few land surveyors have the technical capability to utilize the sophisticated mathematical routines to compute positional precisions, most land surveyors resort to employing precisions of observations and error of misclosure to state the goodness of a survey. This is not unreasonable, but the land surveyor must exercise sound statistical and professional judgement in stipulating the survey's results.

STATISTICAL BASIS FOR THE SPECIFICATIONS

The misclosure specifications were defined for each class of survey based upon a review of statutory or regulatory requirements established by state boards of licensure/registration and professional societies. The consensus is that the minimum misclosures are: Class A – 1:15,000 (60ppm); Class B – 1:110,000 (100 ppm); Class C – 1:7,500 (130 ppm); and Class D – 1:5,000 (200 ppm). These are *minimally* acceptable standards for each class of survey, and can be more restrictive if other factors warrant more stringent misclosures.

The statement of minimum misclosures has been developed from evaluation of all error sources affecting the angular and linear observations. In order to insure that these precisions are attained, each of the observed quantities must have an accuracy and precisions substantially superior to the final stated accuracy of the survey. This is stipulated in order to insure that no untoward measurement would degrade the survey, and that compensating small errors would reduce the survey accuracy below the stipulated accuracy. When stating an accuracy, the land surveyor must be sure that *all* measurements *must be more accurate that the accuracy stated for the entire project.* The error of misclosure is *not* a statement of accuracy, but *is* a statement of precision.

If a survey is to have a stated precision of one part in 5,000 (1:5,000), this equates to 0.02 foot (about one-quarter inch) per one hundred feet of length or an angular error of forty-one arc seconds for a one hundred foot sight distance. It is the intent that in any survey the errors be distributed equally between the linear and angular measurements. For example: assume an inherent accidental error of 0.01 foot (one-eight inch) per one hundred feet. Then, the error in length measurement is:

$$\frac{0.01}{100} = 1{:}10{,}000$$

The error in angular measurements is:

$$\frac{0.01}{100 * 4.85 * 10^{-6}} = 0°00'21''$$

From the theory of statistics, the combined error is:

$$\sqrt{0.0002} = 0.01\sqrt{2}$$

The resulting accuracy would be about one part in seven thousand (1:7,000).

Although this discussion is theoretical in nature, it demonstrates the importance of statistics.

If a question concerning the accuracy of a survey arises, a historical compilation of the observer's observations will provide a baseline of credibility of the resulting measurements. Every land surveyor should have personal knowledge and understanding of the equipment and personnel's capabilities. If queried about the accuracy of a survey and assessing the accuracy of individual elements of the survey, the land surveyor is professionally liable and accountable for any pronouncements.

REVISED ACCURACY SPECIFICATIONS

The previous discussion illustrates that in every survey there exist two independent errors requiring quantification. These errors contribute to one to two types of errors affecting the survey. The two types of error affecting a survey are called *instrumental positional* and *surveying positional.* Instrumental positional errors are the errors due to the imperfections of the instrumentation and the ability to position the instrumentation in the local vertical through the survey point/station (also called centering). These errors are usually ignored by land surveyors, but are in fact, significant contributors to survey accuracies. For example, a miscentering of the spherical level (incorrectly called the bullseye bubble or circular level) of one half the bubble sensitivity could result in a positional error of about 0.01 foot at an instrument height of four feet above the station. It is not unusual for survey tribrachs to have centering errors of one or two times the spherical level vial's sensitivity (most spherical levels have an equivalent sensitivity of between twenty and thirty arc minutes). The other instrumental positional errors contribute additional errors. Also, these errors do not necessarily follow the square root of the sum of the squares of the contributing errors. The more stringent the accuracy requirement, the greater the

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necessity that the survey instrumentation be in excellent (perfect) adjustment. The instrumental positional error should not exceed specific tolerances for various classes of survey.

Land surveyors stipulating specific accuracies, especially Class A and Class B, must be able to demonstrate unequivocally that the survey instrumentation was in satisfactory adjustment *and* properly maintained to insure the instrumentations's geometrical integrity. The instrumentation must be calibrated and tested to validate that the instruments are functioning within specifiable tolerances. It is recommended strongly that at a minimum quarterly inspections and calibration/certification tests be performed for the instrumentation being used in Classes A and B title surveys. For Class C and D title surveys, six month to annual inspections are acceptable. These inspections and calibrations/certifications are necessary to document the instrument's capabilities, *and* historical record of the deviations from the "perfect adjustment." Good quality instruments exhibit systematic behavioral characteristics which can extrapolated to specific times to demonstrate the instrument's deviation since the previous inspection.

It is anticipated that the boundary surveys will be executed employing classical theodolites, levels, and distancers. For each class of survey the utilized instrumentation must have specific minimal accuracy capabilities. Theodolites require geometrical integrity, good optical characteristics, and accurate circle graduations that insure the measured quantities (horizontal and vertical dihedral angles) achieve specified results. The same philosophy applies to distancers, levels, and other survey equipment (instruments). To insure minimal satisfactory survey instrumentation integrity, these instrumentation shall be subjected to periodic inspection and testing. All the standard tests can be performed by the land surveyor. The availability of calibration baselines and angulation networks provide sufficient validation. This process is particularly necessary for the electronic theodolite-distancer (total station). It should also be noted that with careful measuring procedures, the observations provide real-time certification validation. This requires an understanding of the instrument's mensuration theory and the significance/meaning of the resulting data. Incidents have occurred where the instrument was out of adjustment, and was observed by the field party. When this was noticed, either the instrument was adjusted in the field, or the observing program (procedure) was revised to compensate for the problem, and acceptable accurate data was obtained. For angulation, employing a one arc second optical micrometer theodolite, and sighting on traverse targets at sight distances of 100 feet, journeyman surveyors can observe two, or more, set of angles with a maximum spread of five arc seconds. Also, new procedures must be developed to accommodate the new technology that has evolved for the electronic circles in the electronic theodolite.

SURVEY OBSERVATION ADJUSTMENTS

After the field survey has been executed, there follows three sequential set of computations. The first set is the field reduction/adjustment, usually referred to as the station adjustment. The station adjustment is the reduction of all the field observations (mean angle for repetition angle observations, mean direction angles, electronic and taped distanced for meteorological, calibration, and inclination errors, etc.). The station adjustments permit preliminary survey computations to ascertain the goodness of the survey or the shortfall in the observed data.

Employing these reduced observations, geographic positions (geodetic latitude and longitude, geocentric coordinates, plane coordinates, etc.) of all the survey points (and evidence) are computed. This set of positions is called a mathematical model. If the field survey observations exceed the minimal number required to calculate a unique solution, then assuming the observations are sufficiently precise and accurate, there are a number of *different* solutions. Although these extra observations provide different mathematical models, the noted differences provide invaluable insight into the goodness of the survey observations.

For over two centuries, surveyors have investigated procedures to utilize all observations, and compute a simple mathematical model. The computational procedure, called a *network adjustment*, must demonstrate that the difference between the adjusted field observations and the post adjustment of these observations *must not exceed* the uncertainties of the original observations. Furthermore, the adjustment must demonstrate impersonal computation of the most probable set of value from the observations that determine a single mathematical model. The accepted adjustments are based upon the mathematical laws of statistics.

There exist four basic approaches (methods) in performing adjustments. Method 1 is to fix the "best" observations and adjust the remainder of the data. Method 2 is to compute all possible combinations, and compute a mean of average solution. Method 3 is to perform a sequential series of adjustments. Method 4 is to perform a simultaneous and rigorous adjustment based upon specific criterion (statistics). An example of method 3 is the angle closure adjustment followed by the coordinate misclosure adjustment (Bowditch, Crandall, transit rules, etc.). Method 4 is usually considered the least squares adjustment.

The question which invariably arises is: What is a valid adjustment? There exist various approaches that could be employed to assess the "goodness" of the original observations and the resulting adjustment. Some of the approaches are personal inspection, while others utilize statistical theory. The latter approach is to calculate the standard errors of unit weight for each observation and the error ellipse (confidence region) for the survey points. These two techniques result from mathematical computation of least squares solutions. The error ellipses can be considered a graphical display of the confidence region for the survey point. In the adjustment solution appear three geometrical quantities that define the error ellipse — semimajor axis, semiminor axis, and the orientation of the ellipse's major axis with respect to the local coordinate system. The ideal error ellipse is a circle. The long, narrow error ellipse indicates weakness in survey geometry normal to the ellipse's major axis. The use of the error ellipse for simple traverses with no observed diagonals must be carefully analyzed due to the inherent geometrical weakness of the network.

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Here's Some Important Information About CLSA

The goal of the California Land Surveyors Association is to promote and enhance the profession of surveying, to promote the common good and welfare of its members, to promote and maintain the highest possible standards of professional ethics and practice, and to elevate the public's understanding of our profession. CLSA represents all land surveyors, whether they are employees or proprietors, whether in the public or the private sector.

Representation

LOCAL: Your local chapter represents you in local issues. Through your chapter representative to the State Board of Directors, the individual member can direct the course CLSA will take. STATE: The surveyor is represented at the state level through an active legislative program, legislative advocate, and liaison with the State Board of Registration. REGIONAL: CLSA is an active member of the Western Federation of Professional Land Surveyors. This federation is composed of associations throughout the western United States and addresses regional issues. NATIONAL: Through institutional affiliation with the National Society of Professional Surveyors and the American Congress on Surveying and Mapping, CLSA is represented at the national level.

Education Opportunities

CLSA presents annual conferences which provide technical and business programs, as well as exhibits of the latest in surveying and computing technology. Seminars and workshops are presented to assist in continuing education. CLSA publishes the *California Surveyor* magazine and the *CLSA News* to keep the membership abreast of changing legislation, legal opinions, and other items which affect our profession.

Business and Professional Services

CLSA provides a fully staffed central office which is available to answer questions or to provide up-to-date referrals concerning legislation, educational opportunities, job opportunities, or other issues concerning our membership. Health and professional liability insurance programs are available to members.

Join CLSA Today!

Application for Membership in the California Land Surveyors Association

Mail Your Completed Application To:

CLSA Central Office
P.O. Box 9098
Santa Rosa, CA 95405-9990

Questions?

Phone (707) 578-6016
Fax (707) 578-4406

** First year's annual dues are to be prorated from date of application*

Name ____________ Work Phone (____) ________

Firm or Agency ____________ Home Phone (____) ________

Mailing Address ____________ Suite or Apartment No. ________

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Signature ____________ PLS , PS, CE, or LSIT No. ________

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Mailing Address (above) is: ☐ Home ☐ Business

Employment: ☐ Private (principal) ☐ Private (employee) ☐ Public ☐ Retired

☐ $132.00 CORPORATE MEMBER: Shall have a valid Calif. Professional Land Surveyor or Photogrammetric license.
☐ $ 66.00 AFFILIATE MEMBER: Any person, who in their profession, relies upon the fundamentals of land surveying.
☐ $ 66.00 ASSOCIATE MEMBER: Any person who holds a valid certificate as a Land Surveyor in Training.
☐ $ 13.20 STUDENT MEMBER: A student in a college or university actively pursuing the study of land surveying.
☐ $264.00 SUSTAINING MEMBER: Any individual, company, or corporation desirous of supporting the association.

Dues (prorated* from above) $ ________ + Entrance Fee $15.00 = Total Amount $ ________

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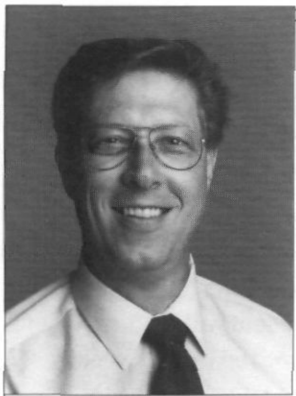

L. Paul Cook

There is a Reason for Optimism for Southern California Real Estate

By L. Paul Cook, P.L.S., President and CEO C.W. Cook Co., Los Angeles

EVERYONE AGREES that the real estate industry is in recession in much of the nation, including Southern California. But it's important to keep in perspective the cyclical nature of the real estate industry.

I'm beginning to see an end to the recession. As a licensed land surveyor and president of the oldest surveying, civil engineering, and entitlement firm in Los Angeles, I am privileged to see the first indication of an upturn in the real estate market.

Development begins with the work of the land surveyor. That's why I believe that to get a good picture of the real estate market's recovery, you have to see what is happening at the area's land survey firms.

Like other segments of the real estate industry, land surveyors have all been affected by the recession. We've experiences layoffs and cutbacks. But in recent months, since about June 1991, we've noticed a marked increase in developers ordering preliminary surveys.

Some observers call what we're going through a "circular recession," with bad news in newspapers and on television scaring employers, resulting in fear of unemployment being transmitted down the corporate ladder. This, in turn, contributes to the crisis in consumer confidence by workers who postpone all but essential purchases, contributing to the continuing recession.

I want to buy a new car, but until recently I put it out of my mind saying that as our business improves a new car will be one of my top priorities.

It's important to remember that real estate is a multifaceted industry, not just residential and commercial, not just people who pound nails into wood. Real estate includes people who manufacture carpeting, make water heaters, mix concrete, cut timber. It includes truck drivers and railroad employees who deliver these products and all the people who sell these products.

People don't see the real upturn in real estate until they see construction, but all work begins with the land surveyor. These surveys are necessary to the initial planning and entitlement, which our firm also provides.

As Los Angeles Mayor Tom Bradley pointed out recently, the city needs to get back to its "centers concept" — including nodes of intense development connected by mass transit. The "centers concept" was developed under the administration of a former city planning director, Calvin Hamilton, after many years of studies and dozens of public hearings. It was well received by the public.

Unfortunately, nobody has had the courage to fully implement this "centers concept." Every time somebody tries to put the "centers concept" into practice with large multifamily projects and big office centers, the politicians back down at the whim of a few homeowners (NIMBYS). Our firm represents a developer who is trying to get city approval for a high rise building on Wilshire Boulevard. After a lengthy environmental review process, the project finally had its first public hearing. At that hearing more than 30 angry neighbors, and the local council member opposed to the project due to its height, density, and traffic generation. The developer has proposed a comprehensive traffic mitigation program, and will be required to pay over $2 million in traffic mitigation fees. If the city denies the right to build a high rise building along Wilshire Boulevard — our most heavily-developed urban corridor with excellent buy service — then where can we build a high rise building in the City of Los Angeles?

The "centers concept" owes a lot to the type of transit system which existed when our company was formed 80 years ago. In 1911, the entire Southern California area was linked by what eventually became more than 1,000 miles of interurban trolleys, connecting the business and residential centers that were being developed.

My grandfather founded the company in a barn next to USC where he was a professor of engineering. My father took over in the booming 1950s when housing was very affordable and, since 1976 when he retired, my brother Lloyd and I have headed C.W. Cook Co., Inc. Over the past 80 years, our company has seen diverse economic conditions including depressions, recessions, and stagnation. We had just moved to our office at Melrose and La Cienega in 1926, when three years later the Great Depression dealt the building industry and the rest of the economy a severe shock.

Some observers call what we're going through a "circular recession," with bad news in newspapers and on television scaring employers, resulting in fear of unemployment being transmitted down the corporate ladder.

In promotional photographs of our workers in the early days, about 10 people at our company wore boots to every one wearing dress shoes. They were field workers, staking out lots.

Today it's just the opposite: Of our 26 employees, two are in the field. The rest are in the office. This change in our company is a parable for our overregulated industry.

I'm in favor of protecting the environment, but we've gone beyond the protection of the environment, to a point where the cost of regulation has made housing far too expensive in California.

Housing in the affordable range is in big demand in Los Angeles and, surprisingly enough, it is obtainable. Developers don't have to go to the fringes of the Los Angeles metropolitan area to build affordable for-sale housing.

We did the subdivision for Kaufman and Broad, a detached condominium development on 2,000 to 2,500 square foot lots in the San Fernando Valley. We used the condominium approach because zoning codes wouldn't allow K&B to construct traditional single family houses on lots that small. Through creative planning, we created about 280 single-family detached houses that sold for just over $100,000. The development provides for-sale housing for first-time buyers — the key element in keeping productive younger people from fleeing L.A.

In the existing home market, there are a lot of $80,000 – $100,000 condominiums in the San Gabriel and San Fernando Valley. Developers realize that not everyone can afford to live at the beach or on the west side of Los Angeles.

The sticking point in the recovery from the real estate recession continues to be construction financing. Aside from that major problem, the outlook for real estate is good. Commercial real estate land values are down 25% to 50% from the peak years of the late 1980s. This makes it a good time to buy and sell land and improved real estate.

For a number of reasons, I'm confident that real estate will rebound from the current recession. Real estate is one of the main industries of Southern California, along with defense manufacturing and entertainment.

Due to the spill-over effect, if real estate represents 25% of the economic pie in Southern California, it affects more than 25% of the economy: If construction workers are out of work, they won't buy cars or other goods and services. The slowdown in real estate affects retail sales, and many other economic aspects in our community.

The demographics in Los Angeles, especially the increase in the Asian and Hispanic population and our own booming birth rate, are good for the long-term outlook in construction. These new residents all need housing and jobs. And (unlike commercial and retail) housing is not over-built in Southern California. We will increase the supply to meet the demand.

I am so optimistic that I plan to visit automobile showrooms this week to look at some new cars. ⊕

Standards . . . .

CONTINUED FROM PAGE 22

Another, and considered the best, approach is to perform a comparison between the corrected observed data and the adjusted value. There are several items to review, but most important are the magnitude of the residuals. Besides being small quantities, the residuals should not exceed the survey precision or accuracy. The ratio of precision should not exceed the entire survey's ratio of precision. It has been found that the ratios of the precision have been found to be good sources for indicating a survey's goodness, but may not identify the defective element.

SURVEY MONUMENTATION

In many survey projects it is impossible for the survey instrumentation to be placed directly over a boundary monument. Therefore, survey "ties" are observed (also called azimuth-distance ties) from the survey control point. The measurement for these ties must be performed to the *same precision and accuracy* as employed in the remainder of the survey. If a survey monument is set from a survey control point, then after the monument has been set a complete set of regular observations are executed in order to have an independent determination of the boundary point's location with respect to the remainder of the local survey.

NAVSTAR GLOBAL POSITIONING SYSTEM SURVEYS

Since the early 1960s, the earth satellites' broadcast signals (optical and radio) have been monitored. Through the use of special broadcast satellite signals and compatible receivers and sophisticated computer processing, determination of geographic positions to submeter accuracies are possible. The original satellite constellation was developed solely for military purposes. In the 1970s and early 1980s , a new satellite constellation was developed to provide improved geographical positioning and navigation for military systems. The result is the NAVSTAR Global Positioning System (GPS). Through efforts of the private sector, surveyors have developed receivers and computer software to determine geographical positions. The procedure is to place one receiver at a known survey station and with one or more additional receivers simultaneously observe the same set of satellites at other points. These observations are reduced, the three-dimensional vectors between the receivers are computed. There are two approaches to this procedure which are usually employed. One procedure is called "relative positioning from a single master station." The second approach is to start from a master station and proceed in the classical leap-frog traverse manner. This procedure is called "relative positioning by a GPS traverse." Both procedures are acceptable for Class C and D surveys, and should provide identical positional data.

The results in GPS positions are latitude and longitude, and height. The bearings and distances between the points are not directly measured, but are calculated by the geodetic inverse procedure. The reobservations and the "diagonal observations" required in Table 2 were developed to insure that no untoward events have occurred, which would degrade the results. It is hoped that once the Federal Geodetic Control Committee publishes GPS guidelines, GPS surveys could be considered for the Class A and B surveys.

CONCLUSION

The specifications presented in Table 2 are not intended to restrict the practice of land surveying. The intent is to state minimally acceptable standards, which through experience, have been known to produce sufficiently precise *and* accurate results. No special equipment need be acquired to execute these land surveys. Every type of instrument identified in Table 2 is commonly manufactured item which can be maintained easily. The land surveyor will find the technical literature adequate and simple procedures to test survey field equipment to insure everything is properly functioning. The guidelines represent good technical practice which would indicate to the nonsurveyor that the quantitative information satisfies a minimum, but acceptable, standard.

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How a Surveyor Can Become Involved in GIS and LIS Projects

By James E. Kovas, R.L.S., P.E.

INTRODUCTION

Surveyors may be aware of the sweeping changes taking place in local government record systems. These changes involved how municipal and state agencies and private corporations store, retrieve, and analyze land parcel, planimetric, and utility data. Surveyors may not know how they can become involved in a GIS/LIS project taking place in their city, township, or county. This article reviews several ways that surveyors can provide valuable expertise in building a GIS/LIS which will benefit the citizens of their community far into the next century.

WHAT IS GIS? WHAT IS A LIS?

Perhaps the first thing that needs to be discussed is the definitions of a GIS and LIS and related terms. This is a brief treatment of a complex subject. Surveyors are encouraged to read other sources such as the ACSM publication, *Geographic and Land Information Systems for Practicing Surveyors: A Compendium*, edited by Harlan J. Onsrud.

Terms Used

Geographic Information Systems (GIS) — (1) A computerized system of hardware, software and procedures capable of capturing, managing, manipulating, analyzing, modeling, and displaying spatially referenced data. (2) A database management system that relates location to assets, events, or facilities.

Land Information Systems (LIS) — A GIS which also deals with property and cadastral applications.

Locations — In the context of a GIS/LIS they are positions in space that have sets of spatial data related to them. These sets of spatial data can be location identifiers such as street addresses and highway names or specific location identifiers such as coordinates. Maps are typically used to relate the location identifiers to a common reference system.

Attributes — These are alphanumeric data that describe the characteristics of entities. For example, a bridge structure may have the following attributes: Bridge No. 52; suspensions type; span equals 184 feet, etc.

Conversion — In the context of GIS/LIS, conversion involves the effort needed to take existing documents such as plats, as-built drawings, tax rolls, inspection files, precinct records, and other records and create digital files for use on a computer system.

General Discussion

Geographic Information Systems (GIS) and Land Information Systems (LIS) are databases management systems that relate location to assets or facilities. A GIS is more of a generic system than an LIS in that it usually deals with all aspects of an organization's assets, events, and facilities — from police and fire calls to sewers and appraisal mapping. A LIS includes property and cadastral aspects, such as appraisal mapping and zoning. Both are **information systems** that must be built to satisfy the data and accuracy requirements of the most demanding user involved in the project. And the systems must be **maintained** to remain useful after initial conversion is accomplished. If the database is allowed to become outdated, the LIS becomes ineffective.

HOW IS A GIS/LIS USED?

A GIS/LIS can be used in innumerable ways to manage, analyze, and model spatially-referenced data in providing services solving problems and planning growth in public and private sector environments. Maybe a few examples will help illustrate the applications of this database management technology to everyday situations in government and industry.

HOW TO PARTICIPATE IN GIS/LIS

Creating and implementing a GIS/LIS is a task that will take a great deal of time, effort and money over several years. The amount of planning and cooperation needed often prompts governmental organizations to rely on outside consultants in many ways.

Professional surveyors have much to contribute to the planning and implementation of a GIS/LIS in regards to cadastral and control procedures. Surveyors who have followed the spread of GIS/LIS in our country and are interested in its implementation in their community should look for ways to become involved. The local government official may be more receptive to your help than you expect.

Nearly all activities of local governments are concerned with the locations of an object or activity within their boundaries. The only profession that is generally recognized as being experts in determining location is the land surveying profession.

Ways in which a surveyor may participate in a GIS/LIS include: (1) serving on a GIS/LIS committee or task force formed by city, township or county government; (2) monumentation and GPS surveys; (3) cadastral analysis; (4) field data collection for input to land base; and (5) maintenance of land base data.

These are discussed in more detail below:

1) Serving on *GIS/LIS Committee* or Task Force. Most GIS/LIS projects start with a committee formed by the political organization or agency taking the lead in the development of the GIS/LIS. The knowledge of GIS/LIS which the governmental members bring to the committee varies from substantial to almost none. The committee is a learning experience for most of the members. A surveyor could provide valuable insight into such matters as the condition of the General Land Office section corners, the methods of dealing with overlap and gap situations between parcels, and the control network accuracy needed. Every GIS/LIS needs a sound foundation of accurate ground control upon which to base the graphical and textual elements. While this is obvious to surveyors, many members of a GIS/LIS committee may need to be convinced of this. A surveyor is also an excellent source of information on researching local source documents, how they are filed, and how they can be utilized. At the same time the surveyor could learn more about the relationships between the graphic data and the textual information which will be associated with it as well as the cost considerations of various options for data conversion.

The surveyor can explain that the purpose of the control network is to provide a coordinate framework. All Public Land Survey Systems (PLSS) corners in the project area should be remonumented and tied to the control network. This will provide new (and consistent) bearings and distances between the PLSS corners. The deed descriptions should then be entered into the system thus creating a new and accurate tax map. It is the entering of the deed descriptions, based on the State Plane Coordinates of the PLSS corners, that will reveal the gaps and overlaps along property boundaries. This process must be controlled by a surveyor knowledgeable in writing and descriptions.

2) Monumentation and GPS Surveys. Once the GIS/LIS project is started, surveyors are often involved with preparation of the control layout, field reconnaissance and monumentation. The ground control is often laid out to serve the dual purpose of photo control — for photogrammetry and as permanent control for ground surveys. This requires setting the monuments in "invisible pairs" to provide azimuth control.

After the control network is monumented, surveyors perform GPS satellite surveys and any necessary traversing and leveling to acquire horizontal and vertical positions of the monuments. Control networks for GIS/LIS Projects should be "bluebooked" by surveyors for inclusion into the National Geodetic Reference System. The GIS committee of MSRLS has recommended that all municipal LIS control networks be "bluebooked" to provide quality control, consistency, and precision.

3) Cadastral Analysis. During the course of building a GIS/LIS a huge amount of information in the form of plats, tax records, as-builts, and other paper records must be converted into digital form for use by the system. A large number of boundary overlaps and gaps will be revealed along the boundaries. One of the prime considerations of those responsible for any LIS project is how to handle these situations. Every gap or overlap is a special situation that must be dealt with effectively in the conversion process. The goal for most GIS/LIS projects is a map that is as correct as possible given the available information and budget constraints.

Surveyors may also be involved in the research and gathering of source documents at government offices. A surveyor who is familiar with the filing system can obtain the documents more quickly and efficiently than most people.

Some surveyors may become involved with the COGO input of subdivisions and plats or the entering of legal descriptions. A surveyor's experience and knowledge of boundary situations will provide insights that find solutions to problems encountered.

4) Field Data Collection for Input to a GIS. Low-altitude aerial photography and digital photogrammetry can produce excellent results in accuracy and total percentage of structures and utilities mapped. However, photogrammetry will never pick up one hundred of these features. There will always be some percentage of manholes, water valves, and other structures that will be missed. This could be caused by the altitude of the photography or because the colorations of the structure makes it blend in with the ground cover. Painting or flagging the structures with symbols visible from the aerial photography will greatly increase the percentage of capture, but a certain percentage will still be missed.

On many GIS projects, the client wants full and complete location and attribute information on each utility and structure. A surveyor could be contracted to perform services such as the following:

a) Locations of utility structures may be acquired by total service stations with the data being downloaded directly into the GIS system. The structure data will have already been layered coded in the field to facilitate processing.

b) Locations of utility structures and other features may be acquired by GPS methods. Walk-about kinematic would work well on open sites. This data would also be coded in the field for downloading to a GIS.

c) Attribute information such as manhole condition, construction material, etc., could be obtained using handheld computers. Many brands of handheld computers are available which have utility inspection and inventory programs already available. Hansen, CMT, Husky, and DADS are examples of field data collection computers being used.

d) A few organizations building a GIS/LIS decide that their database should also contain the locations of all **sub-surface** utilities (in most cases, this is only required by military bases and large industrial complexes). To perform this work surveyors need tools such as cable locators for metal pipes and cables and Ground Penetrating Radar equipment for non-metallic pipes and structures. The locations of these subsurface utilities are marked on the surface of the ground and then tied into the project control network by total station or other means.

5) Maintenance of Land Base. A GIS/LIS must be kept up to date if it is to remain useful to the organization using it. For example, new streets and utility structures must be added to the database as they are constructed. In many cases, this is done by requiring engineers and surveyors who design improvements to submit a digital copy of the plans or plat to the governmental agency responsible for keeping the database current. Some cities, townships and counties are writing that require the new developments be tied into the control network for the GIS/LIS.

Inspection and inventory data must be updated periodically for bridges, manholes, water systems, etc.

CONCLUSION

With the increase of GIS/LIS projects in our state and across the country, there is an ever-increasing need for surveyors to become involved. Surveyors bring expertise that no one else has to these projects, especially relating to cadastral and control network questions. If you hear of a GIS/LIS project happening in your community, offer to serve on planning committees or at least monitor the situation through your elected official. There is a great deal of work, both voluntary and contract, to be done in the decade ahead. Your communities' GIS/LIS will be a more versatile and effective tool because of your involvement.

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Sleepy Hollow Record of Survey

By Bruce F. Hunsaker, P.L.S.

SLEEPY HOLLOW, California — the name itself evokes mystery and intrigue. Lying along Highway 142 as it winds through Carbon Canyon in the Chino Hills area of San Bernardino County, this small town was once the hideout of bandits and gangsters evading the jurisdiction of law enforcement officials from adjoining Los Angeles and Orange Counties. The boundary survey we would perform in this area also had its mysterious aspects — classes could be taught and textbooks written on what we had to do to complete this survey.

This project first came to Hunsaker & Associates Riverside/San Bernardino, Inc., a surveying, land planning, and civil engineering firm, in May 1989 as an ALTA (American Land Title Association) survey. The client, a local developer, needed the ALTA survey to meet a condition of escrow when the site was purchased.

We were given a preliminary title report and a tentative tract map (a map indicating existing conditions and the improvement of a proposed subdivision that is not necessarily based on a detailed survey) from which to prepare our proposal. The title report covered a much smaller area than the map. In addition, the map had an inadequate legal description — it simply called out the areas being subdivided to the nearest ¼ section instead of giving a correct legal description of the entire boundary. The boundary drawn on the map was apparently compiled from assessors' plats or some other means. However, our client assured us that the boundary on the map was correct and we were awarded the contract to perform the ALTA survey and, subsequently, a record of survey of the same site. Whereas the ALTA survey would indicate any physical encumbrances on the site, the record of survey would show survey work performed that is not subdividing the land. The record of survey, required by California law, was also requested by the County of San Bernardino to resolve any boundary problems prior to subdividing the land.

Our first task was to inform the title company of the inadequacy of the legal description. Shortly thereafter, seven separate title reports arrived. The preliminary title report had described only one of seven contiguous parcels on the site. We would now be surveying seven boundaries instead of one, and 35 points, indicated by the descriptions in the title reports, instead of the ten points shown on the map. The survey would extend far outside the project boundary to affect four townships within two counties.

The site itself covers 546 acres of some of the roughest topography in the state. Traversing the survey area are three parallel canyons running northeast to southwest. The adjoining hillsides of these canyons are covered with such trees as coast live oak, native black walnut, and sycamore. Soquel Canyon, the most densely vegetated of the three, is also covered with coastal sage and expansive vines of poison oak. The vegetation here and in portions of the adjoining canyons was over six feet high and so dense that there was little if any visibility. Nothing short of a fire could have helped in locating the old stones and wood posts found within this unyielding terrain. Coincidentally, within a week after the survey was completed and the last monument set, a great fire (caused by arson) charred the entire site.

Other than Highway 142, which is a two-lane road in this area, there are few paved roads and most of the dirt roads we traveled on were in poor condition. Without four-wheel-drive vehicles, many areas would have been accessible only by horseback or on foot. In addition, this region is the home of coyotes, mountain lions, rattlesnakes, racoons, skunks, and a wide variety of insects; longhorn steer also graze here. Though the flora, fauna, and topography of the area would create problems during routine surveys, these problems pale in comparison to the ones we would encounter in trying to locate the boundaries of the site.

As we began our research, we found an Orange County record of survey that showed a township corner in the middle of the site out of position — it had been incorrectly established nearly 380 feet westerly of its true location. The Orange County surveyor had resolved this problem on the record of survey that was recorded in both San Bernardino and Orange Counties in 1979. Few, if any, maps of record were found northwesterly or southeasterly of that township corner. Fortunately, five of the seven parcels lie southwesterly of the township corner and were mapped after the problem was rectified. However, the other two parcels created more than enough difficulties to make up for this slight advantage. (Most of these problems would not be found until the ALTA survey was complete and our record of survey began.)

Coincidentally, within a week after the survey was completed and the last monument set, a great fire (caused by arson) charred the entire site.

In preparing the ALTA survey plat, it became apparent that something was awry along the west line of the southeast ¼ of section 36. This line was bearing nearly six degrees northwesterly rather than being relatively close to due north, which is the norm. Through diligent research we discovered that a 1926 judicial decree established the east line of a piece of property in the north ½ of the southwest ¼. This east line, which was the west line of the north ½ of the southeast ¼, did not meet the west line of the south ½ of the southeast ¼, established in 1921, by 378.50 feet. Usually they

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would be a common line.

The San Bernardino/Orange County line also posed a problem. The distance from corner number 8 to corner number 9 is over 22,000 feet long and crosses over some rugged topography. Five boundary corners intersect this line. Conventional survey methods would have required weeks to survey it. Fortunately, Hunsaker & Associates Riverside/San Bernardino, Inc. was experienced in the use of Global Positioning System (GPS) surveying technology. Prior to this project, one of our company's more noteworthy GPS jobs involved establishing control using GPS procedures throughout Clark County, Nevada, to develop a geographic information system for the county. By using GPS, we were able to survey this segment of the county line in one 45-minute session. Additional GPS surveys saved weeks, even months, of time over conventional methods of locating and controlling much of the project boundary. The navigation display unit we utilized with our Trimble single-frequency 4000SL GPS receivers allowed us to establish control near all the points we would need to locate but had not already found.

The ALTA survey began May 8, 1989, and after spending more than 160 office hours as well as over 800 field hours, the survey was completed and the plat prepared in accordance with the minimum standard detail requirements for a Class C ALTA Land Title Survey. This portion of the project was not without its physical hardships. A multitude of minor injuries were received cutting through the brush and many surveyors lost several workdays due to poison oak dermatitis. In addition, many sleepless nights were spent preparing the project documentation within such a tight time frame. The plat was presented to the client and title company for review on June 6, 1989.

At this point we felt that the hard part was over and all we needed to do was prepare the record of survey and submit it to Larry Cotton, P.L.S., the San Bernardino County surveyor, for the required plan check. We were confident that all the monuments we had shown and accepted were the actual corners. Most of them consisted of San Bernardino County Surveyor (SBCS) brass caps stamped as section corners. On August 22, 1989, when we received our first plan check comments, the horror, mystery, and intrigue began.

PIECES OF THE PUZZLE

A note from the San Bernardino County surveyor's office told us about Henry Soaper, PLS, a surveyor who had submitted preliminary notes on a boundary survey in this same area but had never filed a record of survey. His client had him stop work on the project, and Soaper could not afford to finish the job himself. He had uncovered original stones in this area that would supersede many of the SBCS brass caps we had accepted. While out in the field with Soaper, the county surveyor who accompanied him had begun accepting Soaper's points. Unfortunately, no other survey work had occurred in the area until we arrived. We were directed by the county surveyor's office to contact Soaper. Having been unable to reach him during our initial attempts, we returned to the county surveyor's office and began reviewing Soaper's notes. The majority of his work involved Township 2 South, Range 8 West; however, the problems he had begun to uncover spread well into Township 3 South, Range 8 West.

Soaper's extensive investigation enabled him to uncover a substantial number of original corners. His research took him back to the 1906 San Francisco earthquake, which had destroyed the district land office where most of the U.S. Public Land Survey notes on the area were filed. Before the replacement notes from Washington, D.C. arrived, other surveyors had set monuments without realizing that original corners existed; this sometimes resulted in double, triple, and quadruple sets of corners. Soaper went to the National Archives and Record Service, General Services Administration in Washington, D.C., to examine the notes on file there since they would provide the best determination of where the original corners should be. This information, along with the testimony of some very old residents, helped him find numerous original corners.

While reviewing Soaper's notes, we also began countless hours of deciphering U.S. Public Land Survey notes dating back to the 1850s. These were the only notes of record concerning some of the corners we were looking for — no one had returned to some of these points since the original corners had been set. We would need to establish the north, south, and east lines of section 6, Township 3 South, Range 8 West to establish our easterly project boundary. We obtained copies of the notes (some handwritten, some typed) and any available plats from the Bureau of Land Management (BLM) office in Riverside and from the San Bernardino County surveyor's office.

Through our research we learned that Henry Hancock was the first surveyor to work in the area, from 1853 through 1865, although he never completed section 6. He did establish the northwest corner (the township corner), the west ¼ corner, the southwest corner, the southeast corner, and the east ¼ corner. In 1872, Ebenezer Hadley, who had worked as a compass man for Hancock, set the northeast corner and the north ¼ corner. In 1896, John Rice had apparently completed the survey of section 6 by setting the south ¼ corner, resetting the east ¼ corner, and establishing closing corners at northeast and southwest corners. (We later proved Rice's survey to be inaccurate.) Our only other source of information was a sketchy plat prepared by a San Bernardino County surveyor around the 1920s. This plat shows what is now the northerly boundary of Chino Hills State Park, which falls within the northern portions of section 7.

Soaper had found the stone set by Hadley for the north ¼ corner of section 5, more than 125 feet from the SBCS corner. He had also located the stone set for the closing corner to sections 5 and 6 by Rice, as well as the stone set for the northeast corner of section 6 by Hadley lying some 95 and 18 feet easterly, respectively, of the SBCS corner.

Additionally, he found the stone set by Hadley for the east ¼ corner of section 36, Township 2 South, Range 9 West, more than 365 feet easterly of the SBCS corner. Soaper had also located the stone set by Hadley for the north ¼ corner of section 6 — the San Bernardino County surveyor had not set a corner in this area. Most of these corner monuments consisted of either 18-inch by 12-inch by six-inch granite or sandstone rocks or four-inch by four-inch live oak posts in rock mounds. Some of the monuments were found at the surface and some just beneath it. Soaper had replaced nearly every stone he lo-

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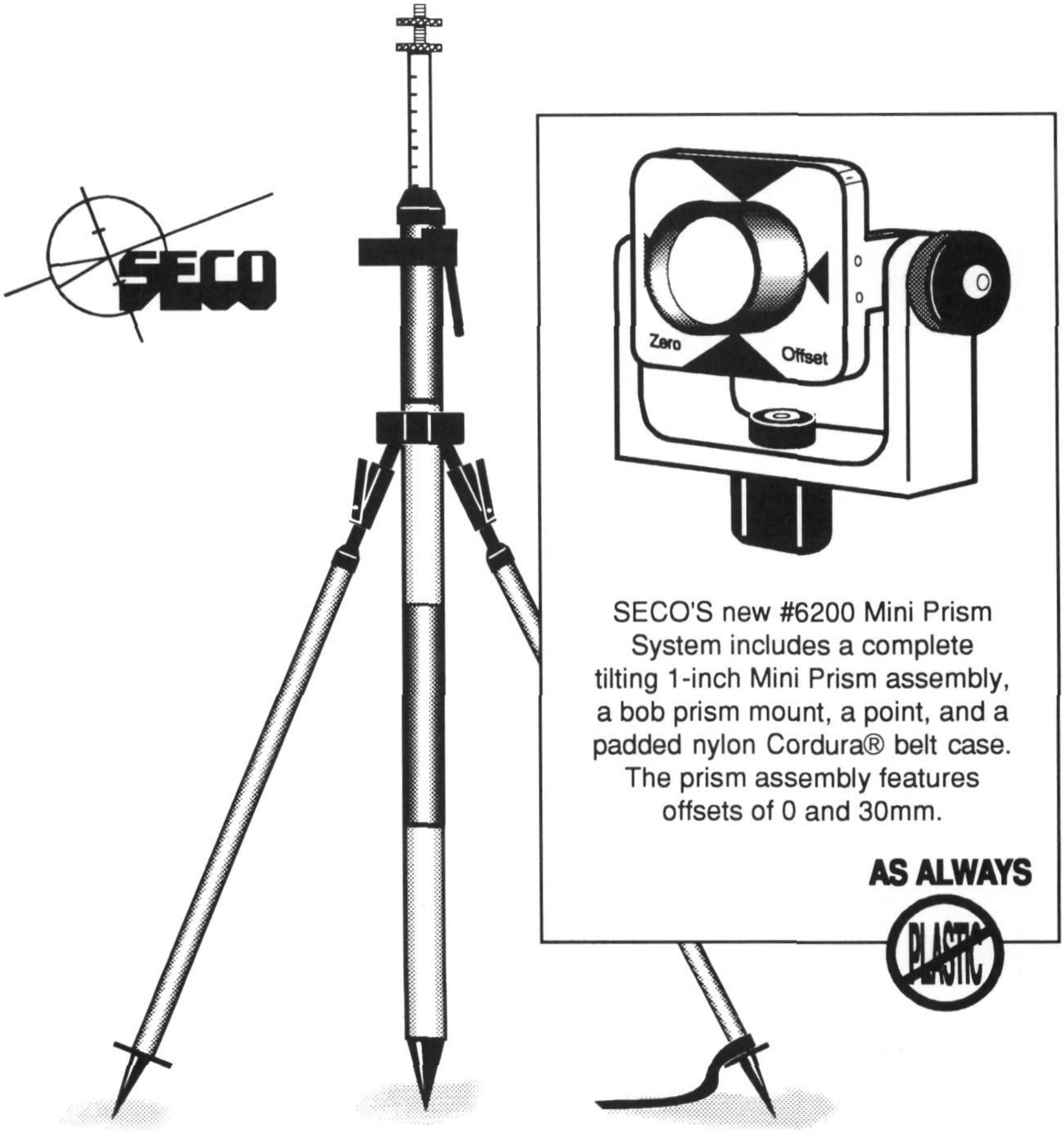

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cated with a two-inch iron pipe and brass cap. However, the Soaper notes that the San Bernardino County surveyor had did not give us enough information to find these pipes.

When we finally got hold of Soaper, he told us a lengthy and captivating tale of his efforts in retracing the north line of Township 3 South, Range 8 West. He told of notes of other surveyors that were mysteriously absent from the rest of their files, problems he had found with the government notes, and what he had learned about the government surveyors themselves. He then elaborated on his own notes and showed us what corners he had found and how we could locate those corners. His efforts had not, however, extended south into section 6.

PUTTING THE PIECES TOGETHER

After meeting with Soaper, we had little difficulty in locating his corners. Because of the terrain, which would force us to hike to reach these corners, an enormous amount of additional control would be required. Once again we decided to turn to GPS for the answer. If we had not used GPS technology, surveying these points would have required days of control work with our total station, hiking in and out of canyons to get from known control stations to the points in question. Also, because the line of site for conventional equipment was so dense with brush it was easier to clear a vertical line of sight for the GPS equipment than a horizontal line of sight for the total station. However, before this GPS survey began, we decided to search for, or at least establish control for, the remaining corners we would need to locate. The majority of our time on this project was spent searching for these points rather than determining positions for them.

Over the next month, Ray Sepulveda, survey party chief, and myself, and occasionally a couple other surveyors, cut though the brush searching for the corners. Often our only clues to their location were the infrequent topo calls in the original surveyor's field notes. We had established a control network with GPS to use for locating points conventionally. Most of the time we would hike from a point we found, and using a hip chain and pocket transit, search for the next point. Sometimes we would turn an angle and shoot a distance from a control point using our Geodimeter 440 total station, and be close enough to look for that particular monument. Once we found a point, in some instances it proved efficient to tie it into the network conventionally. Otherwise we tied the point in with our GPS receivers.

We started our month-long search by looking for the southwest corner of section 6. We knew that the Orange County surveyor had found the burnt remains of the post set by Rice for the closing corner at this point. We also knew it to be approximately 330 feet south of the southwest corner of section 6 that the Orange County surveyor had set and we had already located. We spent 1½ days cutting through a dense jungle of poison oak and sagebrush and, with an abundance of luck, stumbled across the remains of the post just inches above the surface.

Next we set out after the south ¼ corner of section 6. Rice's notes showed this to be a blazed oak tree with a bearing tree nearby. Several days scouring the hillsides of Soquel Canyon provided no trace of either tree. Dejectedly, we pressed on to continue our search at the southeast corner of section 6.

During the course of our ALTA survey we had accepted a one-inch iron pipe with no tag at the intersection of fence lines for the corner. This had appeared on the sketchy San Bernardino County surveyor plat. By this time we had become extremely skeptical of nearly every monument we found, so we began combing the brush for signs of old stones or posts that Hancock or Rice may have set. Some 160 feet south of this pipe we found a post in a mound of stones amid the brush. It fit Rice's terrain calls, but his notes said he had recut notches in the stone Hancock had set. We therefore proceeded north from the one-inch iron pipe along the fence line for nearly 170 feet and found a flared-out 1½-inch iron pipe, which fit Hancock's terrain calls. The distance from the one-inch iron pipe to this pipe matched the distance shown on the old county surveyor plat between the section corner and a point on the north line of the state park. We accepted the one-inch iron pipe as a point on the state park boundary, we accepted the post in the mound of stones as a replacement of what Rice had accepted as the southeast corner, and we accepted the flared-out 1½-inch iron pipe as a replacement of Hancock's stone — the true southeast corner of section 6.

In an effort to support our acceptance of these monuments, we attempted to locate the east ¼ corner section 6, the south ¼ corner of section 5, and eventually had surveyed all of section 7 as well.

We found no trace of any monumentation at the south ¼ corner of section 5, or for that matter, the southeast corner of section 5. At the east ¼ corner of section 6 we found a post in a mound of stones, very similar to what we had found at the southeast corner of section 6. Our survey showed this post to be nearly on line with what we had accepted as Rice's corners to the north and south. Thus, we accepted the post as a replacement of Rice's ¼ corner.

With the exception of not finding a trace of the east ¼ corner, our survey of section 7 progressed smoothly. We found additional reference information through the Orange County surveyor's office and the monumentation was easily visible. However, locating the west ¼ corner of this section proved interesting. All of the information referred to a pyramidal sandstone that should be at this corner, yet we could not find anything resembling it. Fortunately, the Orange County surveyor's office had a state plane coordinate on the stone. After transforming it into our coordinate network, we found the stone buried under three feet of dirt that had been piled up from a firebreak on the ridgeline near this corner.

We were finally ready to begin our GPS survey. Unfortunately, it was now February 1990 and the satellite visibility window was in the middle of the night. This was also one of the few wet periods of the year, and it had just rained. If that was not enough, several of the points we were about to survey fell within the confines of a weapons testing facility, Aerojet Ordnance, that requires special permission to enter. Gene Baguley, facilities manager at the plant, granted us access, though he did have some concerns about how we would be able to survey at night. He also warned us about how treacherous the winding dirt roads in and out of the canyons are, especially when wet. From 11 P.M. to 3:10 A.M., four of us surveyed nine points within four square miles during three (35-minute, 40-minute, and 45-minute) sessions.

After a few more days of conventional surveying to tie in the remaining points that were not surveyed with GPS equipment, the field work, other than final monumentation, was complete. With this information in hand, we could now feel confident in our final resolution for the south and east lines of section 6. Rice had apparently accepted an incorrect stone at the southeast corner of section 6, thus creating a parallel line some 330 feet southerly of the true south line of section 6. The fact that he accepted an incorrect stone at the southeast corner also gave us cause to ignore his survey of the east line, which meant that we treated the establishment of the south ¼ corner as if it had never been set. We therefore held the replacements of Hancock's monuments at the southeast and southwest corners as well as the replacement of Hadley's monument at the northeast corner. We then established the south ¼ corner, in accordance with BLM's *Manual of Instructions for the Survey of the Public Lands of the United States (1973)*, 40 chains along the south line from the southeast corner.

The next challenge before us was to establish several boundary lines by deed interpretation. Portions of the boundary had been created by deed — no monuments were ever set at the boundary corners these deeds created and no maps had been filed. Along the northerly project boundary, this involved determining which monuments had been the accepted corners at the time the deeds were written. Within section 6, where we were establishing a portion of our easterly project boundary, this involved searching through more than a century of poorly written deeds to ascertain senior rights. We had to use the deed calls between existing corners referred to in the deed to establish positions we could monument. The final monuments were set by conventional methods off the GPS-established control. Two-inch iron pipes in three-foot lengths were driven flush with the ground with stamped brass tags set in concrete in the top of the pipes. Some of the iron pipes, generally section and ¼ section corners, had two-inch stamped brass caps set in concrete in the top of the pipes. It took a three-person crew two weeks to set 23 monuments. These tasks being accomplished, the survey was complete.

Over a year had passed since our first glimpse of this site. We had spent more than 1200 office hours and nearly 2000 field hours on this project, as well as countless hours of concentration in trying to resolve this dilemma. This survey could not have been finished without the cooperation of the San Bernardino County surveyor. Cotton is one of the few people around with firsthand knowledge of the site. This knowledge proved to be invaluable throughout the course of our survey.

The record of survey is now recorded in both San Bernardino and Orange Counties. All our work is finished and the files are put away, but the mystery and intrigue of this challenging project will linger.

Bruce F. Hunsaker, P.L.S., is vice president of Hunsaker & Associates Riverside/San Bernardino, Inc., San Bernardino, California, a company his uncle, Richard Hunsaker, founded. His responsibilities include heading the Surveying and Mapping Department and serving as the chief financial officer for the company. He has worked there for more than 14 years. Hunsaker is a member of the American Congress on Surveying and Mapping, the California Land Surveyors Association, and the California Council of Civil Engineers and Land Surveyors.

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Attorney General's Opinion on Condominium Plans

Opinion No: 90-102 - October 25, 1990
Requested By: Anaheim City Prosecutor
Opinion By: John K. Van De Kamp, Attorney General
Rodney O. Lilyquist, Deputy

THE HONORABLE JACK L. WHITE, ANAHEIM CITY PROSECUTOR, has requested an opinion on the following questions:

1. Would creation by condominium plan of a three-dimensional division of airspace which is then severed from any ownership interest in the underlying earth violate the provisions of Government Code section 66426 in the absence of a tentative and final map?

2. Would a condominium project consisting of five or more divisions of airspace within a previously created three-dimensional air cube constituted a subdivision under the terms of Government Code section 66426 for which a tentative and final map would be required even though such divisions of airspace are not coupled with any ownership interest in the earth underlying the airspace?

CONCLUSIONS

1. Creation by condominium plan of a three-dimensional division of airspace which is then severed from any ownership interest in the underlying earth would violate the provisions of Government Code section 66426 in the absence of a tentative and final map.

2. A condominium project consisting of five or more divisions of airspace within a previously created three-dimensional air cube would constitute a subdivision under the terms of Government Code section 66426 for which a tentative and final map would be required even though such division of airspace are not coupled with any ownership interest in the earth underlying the airspace.

ANALYSIS

The two questions presented for resolution concern the creation of a "dirtless" condominium project as may be authorized and regulated under two different statutory schemes: the Davis-Stirling Common Interest Development Act (Civ. Code, §§ 1350-1373; "Development Act") and the Subdivision Map Act (Gov. Code §§ 66410-66499.37; "Map Act").

A "dirtless" condominium project is one in which each owner receives title to his or her individual unit plus an undivided interest in the building in which his or her unit is located. The undivided interest in the building is usually equal for all unit owners or based upon the square footage of each unit relative to the square footage of all units. Ownership of the building does not include the earth beneath it. All of the "dirt" is conveyed to the homeowners' association established for the project concurrently with the conveyance of title to the purchases of the first unit. Membership in the homeowners' association is incidental to unit ownership and cannot be separated from it.

The advantages of developing a condominium project that is "dirtless" primarily relate to the requirements imposed by the Department of Real Estate under the Subdivided Lands Law (Bus. & Prof. Code, §§ 11000-11200) and imposed by financial institutions with respect to construction loans for larger phased projects. This form of real estate ownership provides flexibility in meeting these governmental and financial requirements when developing projections that may take years and numerous stages to complete.

We are informed that condominium project developers in Northern California have used this concept of real estate ownership in their developments over the past several years. Southern California developers, however have not done so due to uncertainties in the treatment of this nontraditional form of real estate ownership[1] by two separate statutory schemes with their apparent differences in goals and requirements[2].

1. Creation by Condominium Plan

The first question to be resolved is whether the creation of a three-dimensional division of airspace if filing a condominium plan would violate the provision of Government Code Section 66426 in the absences of a tentative and final map. We conclude that it would.

The question posed concerns the relationship between the provisions of the Development Act and the Map Act. A condominium plan is filed under the authority of the Development Act, which Government Code section 66426 is one of the provisions of the Map Act requiring the recording of a tentative and final map.

Civil Code section 1351, subdivision (e) defines a "condominium plan" as follows:

> *" 'Condominium plan' means a plan consisting of (1) a description or survey map of a condominium project, which shall refer to or show monumentation on the ground, (2) a three-dimensional description of a condominium project, one or more dimensions of which may extend for an indefinite distance upwards or downwards, in sufficient detail to identify the common areas and each separate interest. . . ."*

Government Code section 66426, on the other hand, provides:

> *"A tentative and final map shall be required for all subdivisions creating five or more parcels, five or more condominiums as defined in Section 783 of the Civil Code. . . ."*

Section 783 of the Civil Code defines a "condominium" as follows:

> *"A condominium is an estate in real property described in subdivision (f) of Section 1351. A condominium may, with respect to the duration of its enjoyment, be either (1) an estate of inheritance or perpetual estate, (2) an estate for life, (3) an estate for*

years, such as a leasehold or a subleasehold, or (4) any combination of the foregoing."

Civil Code section 1351, subdivision (f) in turn provides:

"A 'condominium project' means a development consisting of condominiums. A condominium consists of an undivided interest in common in a portion of real property coupled with a separate interest in space called a unit, ***the boundaries of which are described on a recorded final map, parcel map, or condominium plan*** *in sufficient detail to locate all boundaries thereof. The area within these boundaries may be filled with air, earth, or water, or any combination thereof, and need not be physically attached to land except by easements for access and, if necessary, support. The description of the unit may refer to (1)* ***boundaries described in the recorded final map, parcel map, or condominium plan,*** *(2) physical boundaries. either in existence, or to be constructed, such as walls, floors, and ceiling of a structure or any portion thereof, (3) an entire structure containing one or more units, or (4) any combination thereof. The portion or portions of the real property, except for the separate interests, or may include a particular three-dimensional portion thereof,* ***the boundaries of which are described on a recorded final map, parcel map, or condominium plan.*** *The area within these boundaries may be filled with air, earth, or water, or any combination thereof, and need not be physically attached to land except by easements for access and, if necessary, support. An individual condominium within a condominium project may include, in addition, a separate interest in other portions of the real property."* [Emphases added.]

The Development Act thus contemplates that the boundaries of the interests in a condominium project may be described on a condominium plan filed pursuant to its provision. This would seemingly be as an alternative to describing the boundaries on a recorded final map or parcel map as authorized by the Map Act. Does this mean that no subdivision map need be filed at all?

The Development Act contains various safeguards for condominium owners, including provision for the enforcement of covenants and restrictions as equitable servitude (Civ. Code, §1354), ingress, egress, and support easements (Civil Code, § 1361) ownership of the common areas (Civ. Code, § 1362), and the creation of a community association (Civ Code, §1363). It does not purport to affect or interfere with the requirements of the Map Act. Indeed, Civil Code section 1352 states:

"This title applies and a common interest development is created whenever a separate interest coupled with an interest in the common area or membership in the association is, or has been, conveyed. provided, all of the following are recorded:

"(a) A declaration.

"(b) A condominium plan, if any exists.

"(c) A final map or parcel map, if [the Map Act] requires the recording of either a final map or parcel map for the common interest development."

In contrast to the purposes of the Development Act, the Map Act establishes general criteria for land development planning in communities throughout the state. Cities and counties are given authority under this legislation to regulate the design and improvement of divisions of land in their areas through a process of approving subdivision maps required to be filed by each subdivider. (Gov. Code, § 66411; *Santa Monica Pines, Ltd. v. Rent Control Board* (1984) 35 Cal.3d 858, 869; *Soderling v. City of Santa Monica* (1983) 142 Cal. App.3d 501, 506-508; *South Central Coast Regional Com. v. Charles A. Pratt Construction Co.* (1982) 128 Ca.App.3d 830, 844-845.)

The basic definition of "subdivision" for purposes of the Map Act is contained in Government Code section 66424, which states:

" 'Subdivision' means the division, by any subdivider, of any unit of units of improved or unimproved land, or any portion thereof, shown on the latest equalized county assessment roll as a unit or as contiguous units, for the purpose of sale, lease or financing, whether immediate of future except for leases of agricultural land for agricultural purposes. Property shall be considered as contiguous units, even if it is separated by roads, streets, utility easement or railroad right-or-way. ***'Subdivision' includes a condominium project, as defined in Section 1350 of the Civil Code.*** *. . ."* [Emphasis added.] [4]

Government Code section 66427 additionally provides:

"A map of a condominium project, a community apartment project, or of the conversion of five or more existing dwelling units to a stock cooperative project need not show the buildings or the manner in which the buildings or the airspace above the property shown on the map are to be divided, nor shall the governing body have the right to refuse approval of a parcel, tentative or final map of such a project on account of design or location of buildings on the property shown on the map not violative of local ordinances or on account of the manner in which airspace is to be divided in conveying the condominium. Fees and lot design requirements shall be computed and imposed with respect to such maps on the basis of parcels or lots of the surface of the land shown thereon as included in the project. Nothing herein shall be deemed to limit the power of the legislative body to regulate the design or location of buildings in such a project by or pursuant to local ordinances."

Although "[a] map of a condominium project . . . need not show the buildings or the manner in which the buildings or the airspace above the property shown on the map are to be divided" (Gov. Code, §66427), the design and improvement of a condominium project are subject to the control of the city or county under provisions of the Map Act. (See *Griffin Development Co. v. City of Oxnard* (1985) 39 Cal.3d 256, 262; *Soderling v. City of Santa Monica, supra,* 142 Ca.App.3d 501, 506-508; 65 Ops. Cal.Atty.Gen. 101, 102-103 (1982) Government Code section 66411 states in part:

"Regulation and control of the design and improvement of subdivisions are vested in the legislative bodies of local agencies. ***Each local agency shall, by ordinance, regulate and control the initial***

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> ***design and improvement of common interest developments as defined in Section 1351 of the Civil Code.*** . . ." [Emphasis added.]

The Map Act and Development Act may be seen as consistent and in agreement with each other. They regulate different aspects of condominium developments, and in so doing, each refers to the other. "Statutes in pari materia should be construed together" (*Long Beach Police Officers Assn. v. City of Long Beach* (1988) 46 Cal.3d 1379, 1387), "even when interpreting provisions in different codes" (*Material & Construction Teamsters' Union v. Farrell* (1986) 41 Cal.3d 651, 665), "[If] possible, the codes are to be read together and blended into each other as though there was but a single statute [citations] . . ." (*Lara v. Board of Supervisors* (1976) 59 Cal. App.3d 399, 408-409). The boundaries of the ownership interest in a condominium project may properly be shown on a condominium plan rather than on a parcel or tentative and final map, but a subdivision map must necessarily be approved and recorded as directed by the Map Act.

Having established that the Development Act and Map Act operate together for purposes of creating a condominium project, we are left with the issue of whether a "dirtless" condominium project requires a different analysis or treatment. Under the two statutory schemes, a "condominium project" is "a development consisting of condominiums" each of which "is an estate in real property" comprised of (1) "an undivided interest in common in a portion of real property" and (2) "a separate interest in space called a unit." In addition, a condominium may include (3) "a separate interest in portions of the real property." (Civ. Code, §§783, 1351; Gov. Code, §§66424, 66426.)

In a dirtless condominium project, the requirement of "a separate interest in space called a unit" is clearly satisfied. Each unit owner is deeded a separate "space" as in any other condominium project. It is the requirement of "an undivided interest in common in a portion of real property" that may arguably distinguish a dirtless condominium project from other condominium projects under the two legislative acts. The owners have an undivided interest in common in their building, but the building has been severed in ownership interest from the underlying earth, and the latter has been conveyed to a homeowners' association. May a building separated in ownership interest from the underlying earth constitute "real property"?

To answer this questions, we look to the Legislature's treatment and use of the term "real property." Civil Code section 658 states that "real property" includes "land," and "land" is defined in Civil Code section 659 as follows:

> *"Land is the material of the earth, whatever may be the ingredients of which it is composed, whether soil, rock, or other substance, and includes free or occupied space for an indefinite distance upwards as well as downwards, subject to limitations upon the use of airspace imposed, and rights in the use of airspace granted, by law."*

The statutory definition of the term "land" was amended in 1963 (Stats. 1963, c. 860 §2) by deleting the word "solid" and adding the last phrase beginning with the words "and includes."[5] Significantly for our purposes, the 1963 amendment was part of the same legislation that defined the term "condominium" for the first time in a California statue. We thus believe that these definitions of "land" and "real property" contained in the Civil Code may be applied in the context of condominium projects as specifically contemplated by the Legislature in the Development Act and Map Act.

With such harmonizing of the statutes, we conclude that an undivided interest in common in a condominium building that has been severed in ownership interest from the underlying earth would constitute "land" and "real property" under the Legislature's definition of those terms. Hence a dirtless condominium project may be treated the same as other condominium projects for purposes of the Development Act and Map Act.

In summary, a three dimensional division of airspace may <u>in part</u> be created by the filing of a condominium plan under the authorizing provisions of the Development Act. (See Civ. Code § 1351.) This statutory scheme, however, does not take place of or supersede the Map Act. Rather, it recognizes that subdivision maps must also be recorded if the Map Act so requires. (Civ.Code, §1352.) The two statutory schemes have different requirements based upon their different goals and purposes. Although condominium project subdivision maps need not show the buildings or manner in which the buildings or airspace are to be divided (Gov. Code, §66427), local governments are directed to regulate the in initial design and improvement of condominium projects through their ordinances implementing the Map Act (Gov. Code, §66411). The joint operation of the Development Act and Map Act are as applicable to dirtless condominium projects.

In answer to the first question, therefore, we conclude that creation by condominium plan of a three-dimensional division of airspace which is then severed from any ownership interest in the underlying earth would violate the provisions of Government Code section 66426 in the absence of a tentative and final map.

2. Map Act Enforcement

The second question deals with a three-dimensional air cube that has previously been created pursuant to the provisions of the Map Act. Would a condominium project consisting of five or more divisions of airspace within a previously created three-dimensional air cube constitute a subdivision under the terms of Government Code section 66426 for which a tentative and final map would be required even though such divisions of airspace are not coupled with any ownership interest in the earth underlying the airspace?

As explained in answer to the first question, Government Code section 66426 requires a tentative and final map "for all subdivisions creating . . . five or more condominiums as defined in Section 783 of the Civil Code." The latter Civil Code provision refers in turn to Civil Code section 1351, subdivision (f), declaring that "[a] condominium consists of an undivided interest in common in a portion of real property coupled with a separate interest in space called a unit." An undivided interest in common in a building that has been severed in ownership interest from the underlying earth would constitute "land" as defined by the Legislature in Civil Code section 659.

While a tentative and final map would be required, the maps "need not

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show the buildings or the manner in which the buildings or the airspace above the property shown on the map are to be divided." (Gov. Code, §66427.) The ordinances of the local government would required examination to determine the type of documents needed by the local government for it to review and approve the initial design and improvement of the condominium project. (Gov. Code, §§66412, 66434.2)

The background material furnished with respect to the second questions focuses upon projects built in phases, where separate buildings are constructed over a number of years. How are the Map Act requirements to be interpreted with respect to phased developments in which air cubes have previously been created in compliance with the Map Act?

First of all, we believe that it would be insufficient to file a subdivision map indicating only that it is for "condominium purposes" without any indication of the number of divisions that ultimately are to be created in the project. The Map Act contemplates that the actual number of division will be indicated so that the appropriate map (parcel or tentative and final map) will be prepared and recorded. (Gov. Code, §§ 66426, 66428.) The statutory requirements differ for these maps (Gov. Code §§ 66425-66450), and the local government must be given an opportunity to perform its statutory duty to approve the entire project. It would be a violation of the Map Act to file a parcel map "for condominium purposes" and then attempt to create a condominium project of 20 units without appropriate government review and approval of all the divisions to be created.

Likewise it would violate the Map Act to file a tentative and final map for 20 units and them attempt to develop a project for 40 units. The local government cannot effectively control the design and improvement (Gov. Code, §66411) of a 40-unit condominium project if it is presented with a map for a 20-unit project.

In a phased condominium project to be developed over a period of years, the ultimate number of units be constructed may not be known at the initial planning stage. Circumstances may change, and the building of additional units may be considered. In order for the local government to regulate the initial design and improvement of the entire project, additional maps would be required to correspond with proposed additional divisions, even though the maps themselves "need not show the buildings or the manner in which the buildings or the airspace above the property shown on the map are to be divided." (Gov. Code, §66427) Even though a three-dimensional air cube is legally created, compliance with the Map Act will be necessary for any divisions within the air cube not previously approved.

To interpret in isolation the "need not" language of Government Code section 66427 would violate the principle that "statutory sections relating to the same subject must be harmonized, both internally and with each other, to the extent possible." (*Dyna-Med, Inc. v. Fair Employment & Housing Com.* (1987) 43 Cal.3d 1379, 1387) Moreover, major purposes of the Map Act are "to coordinate planning with the community pattern laid out by local authorities, and to assure proper improvements are made so the area does not become an undue burden on the taxpayer." *(Benny v. City of Alameda* (1980)105 Cal App.3d 1006, 1011.) The provisions of the Map Act are to be broadly interpreted so as to prevent circumvention of its goals and purposes. *(John Taft Corp. v. Advisory Agency* (1984) 161 Cal. App.3d 749, 755; *Bright v. Board of supervisors* (1977) 66 CAL.App.3d 191, 195; *Hersch v Mountain View* (1976) 64 cal. App.3d 425, 432-433; *Pratt v. Adams* (1964) 229 Cal. App.2d 602, 605-606)5 A construction of the Map Act's requirements, particularly those of Government Code sections 66411 and 66426 , other than as we have concluded would thwart the purposes of orderly community development.

In answer to the second question, therefore, we conclude that a condominium project consisting of five or more divisions of airspace within a previously created three-dimensional air cube would constitute a subdivision under the terms of Government Code section 66426 for which a tentative and final map would be required even though such divisions of airspace are not coupled with any ownership interest in the earth underlying the airspace.

FOOTNOTES

1. In 65 Ops. Cal. Atty.Gen101, 103 (1982), we noted that in a condominium project, "the ownership; of stacked cubes of space is a decided departure from the usual maxim of cujus est solum, ejus est usque ad coelum et ad inferos [to whomsoever the soil belongs, he owns also to the sky and to the depths]."

2. The applicability of other statutory schemes, such as the Subdivided Lands Law, is beyond the scope of this opinion.

3. Ordinarily a parcel map would be required for subdivisions creating four or fewer condominiums, while a tentative and a final map would be required for the creation of five or more condominiums. (Gov Code, §§ 66426, 66428.)

4. "Section 1350 of the Civil Code" formerly contained the Legislature's definition of a condominium project, but in 1985 the Legislature moved the definition to Civil Code section 1351. (Stats. 1985, ch. 874, §§13-14). We may deem the reference in Governmnet Code section 66424 to the former statute as being to the present Civl Code provision. (See *Puckett v. Johns-Mansville Corp.* (1985) 169 Cal.App.3d 1006, 1009; *People v. Oliver* (1985) 168 Cal.App.3d 920,926; *Valley Electric Co. v. Slagle* (1956) 142 Cal.App2d §1, 83-84) Government Code section 9604 embodies this principle of statutory construction as follows:

"When the provisions of one statute are carried into another statutue under circumstances in which they are required to be construed as restatements and continuations and not as new enactments, any reference made by any statute, charter or ordinance to such provisions shall, unless a contrary intent appears, be deemed a reference to the restatements and continuations."

5. Prior to 1963, Civil Code section 659 provided:

"Land is the solid material of the earth, whatever may be the ingredients of which it is copmposed whether solid rock, or other substance."

6. In *Freedland v. Greco* (1955) 45 Cal.2d462, 468, the Supreme Court reaffirmed:

"That construction of a statute should be avoided which affords an opportunity to evade the act, and that construction is favored which would defeat subterfeges, expediences, or evasions employed to continue the mischief sought to be remedied by the statute, or to defeat compliance with its terms or any attempt to accomplish by indirection what the statute forbids. ⊕

California Surveyors Help Define GIS/LIS

By Joseph W. Betit, P.L.S.

AS IT DEVELOPS, GIS/LIS technology will affect all strata of society. It has the potential to restructure societal interactions across large geographic regions containing many vested interests and diverse opinions. But the complexities of today's social and economic issues will require a forum that can encompass them all simultaneously.

The federal government is steadily moving towards establishing an LIS, as outlined in the November 1989 draft of *A Study of Land Information* published by the Department of Interior. To avoid federally mandated programs that may not suit the needs of individual states, the California Land Surveyors Association (CLSA) felt that it was imperative that a mechanism be established in state law that would define GIS and LIS fundamentals, and that would allow city and county governments, as well as private firms, to set their own standards and specifications based on local needs and financial resources.

In February of 1988, the Legislative Committee of the association began looking at the issues associated with the surveying impact of the rapid proliferation of computer-based mapping and information systems. CLSA recognized that the traditional delivery of map and boundary products on paper and mylar media would rapidly be supplanted by electronic (computerized) media. Accordingly, it was suggested that, upon completion of the study, appropriate legislation be introduced to address the surveying profession's concerns, and to also translate the surveyors' current role and responsibilities into the new computerized systems.

Research revealed that the GIS system administrators had little background or understanding of the legal arena in which surveyors operate. Yet these administrators are able to disseminate information with little, if any, responsibility for the accuracy of the data. Another problem the committee identified was that the typical graphics or plotter output from a GIS system is so attractive that a layman might assume it to be as accurate as it is good looking. That leads to the "Garbage In, Gospel Out" syndrome. However, John Q. Public operates on the once-burned, twice shy approach. It would be a tragedy if the public lost confidence in spatial data systems because of bad computer-generated data.

Considerable research and legislative groundwork was accomplished between October 1988 and December 1989. The proposed legislation, Assembly Bill 3590 (see box), was introduced into the California Legislature in January 1990 by Rep. Sam Farr, of Monterey. This bill represented input and suggestions from many sources within and outside the CLSA.

As part of a cooperative legislative effort, the California Council of Civil Engineers and Land Surveyors accepted the separate task of sponsoring the addition to the Land Surveyors and Civil Engineers Acts of electronic media as an acceptable form of product delivery. This bill, Assembly Bill 3395, was passed after many changes, and went into effect January 1, 1991.

Assembly Bill 3590 also underwent numerous changes. Opposition to the bill finally necessitated a compromise bill that created a Task Force to study GIS/LIS issues. The task force compromise was designed to bring together city, county, state, federal, and private sector in a joint, one-year study, while simultaneously balancing the influence of the legislature and governor over the direction of the task force. The result would be a recommendation from the task force as to legislation. Task Force Bill AB 3590 passed both houses of the legislature but was vetoed by Governor George Deukmajian.

The bill was reintroduced, unchanged, in 1991 by Rep. Farr as AB 429. It again passed in both houses, but the new governor, Pete Wilson, threatened a veto. Considerable negotiation between the legislature and the governor resulted in a new version that was subsequently signed. The bill is now scheduled to take effect in January 1992.

The task force bill was considerably different from the last version of the legislation we originally proposed. A large number of suggested changes never made it to print during the shift. Surveyors will work to bring those critical elements to the attention of task force members.

The original proposal consisted of two parts: an addition to the scope of practice to be made to the Practice Acts of the Land Surveyors, and addition of a new section to the Public Resources Code of California (Section 8900) that would define GIS and LIS.

It avoided state-mandated uniform data standards and specification in order to avoid state-mandated costs (reimbursable by the state according to California law) and also to avoid the imposition of unsuitable or unachievable standards on local governments of varying capabilities and wealth. Although each LIS member might not be able to initially share data easily, this would eventually be offset by the requirements of the new Section 8904 of the Public Resource Code, which required systems to include information related to the source of data, identification of submitter of data, estimated or known accuracy and standard error of dataset, and the requirements that data be on the California Coordinate System. This would have allowed the eventual sharing of data sets as the technology matured.

The first definition to be added to the Public Resources Code section 8900 (GIS) would have allowed the continued rapid evolution of technology without restrictions wherever property rights, accurate property

CONTINUED ON PAGE 41

THE LEGISLATION

Assembly Bill No. 429 (Chapter 782, Statutes of 1991)

An act to add and repeal Division 8.5 (commencing with Section 8900) of the Public Resources Code, relating to surveying, and declaring the urgency thereof, to take effect immediately.

(Approved by Governor October 9, 1991. Filed with Secretary of State October 10, 1991.)

LEGISLATIVE COUNSEL'S DIGEST

AB 429, Farr. Geographic and land information systems.

Existing law vests various agencies with authority to collect data and conduct mapping for various purposes. Existing law also establishes the California Coordinate System of 1927 and the California Coordinate System of 1983 for use in defining and stating positions and locations in surveying and mapping in California.

This bill would create a Geographic Information Task Force, to be convened by the Office of the Governor. The task force would be composed of 13 members, as specified.

The bill would require the task force to submit a report containing specified minimum recommendations to the Governor and the appropriate committees of the Legislature by October 1, 1992.

The bill would provide for the termination of the task force on December 1, 1992.

The bill would declare that it is to take effect immediately as an urgency stature, and would repeal its provisions as of January 1, 1993. *The people of the State of California do enact as follows:*

SECTION I. Division 8.5 (commencing with Section 8900) is added to the Public Resources Code, to read:

DIVISION 8.5. GEOGRAPHIC AND LAND INFORMATION SYSTEMS

8900. The legislature hereby finds and declares all of the following:

(a) Property management, planning, risk assessments, and environmental decision making at all levels of government and in the private sector rely heavily on geographic information and various mapping and surveying techniques.

(b) Many entities, both public and private, have similar needs and overlapping requirements for geographic information.

(c) Many local state, and federal government agencies and private companies in California are now using computers to manage geographic information.

(d) There are many issues associated with the development, use, maintenance, and exchange of and access to computer-based geographic information.

8901. (a) There is hereby created a Geographic Information Task Force that is to be convened by the Office of the Governor.

(b) The task force shall be composed of 13 members as-follows:

(1) Director, Stephen P. Teale Data Center.

(2) Five representatives from diverse state agencies, departments, or commissions, including, but not limited to, the Office of Planning and Research, having expertise and experience with geographic information systems, appointed by the Governor.

(3) Two representatives of countries having expertise and experience with geographic information systems, one of who shall be appointed by the Speaker of the Assembly and one by the Senate Committee on Rules, upon the recommendation of the County Supervisors Association of California,

(4) Two representatives of cities having expertise and experience with geographic information systems, one of whom shall be appointed by the Speaker of the Assembly and one by the Senate committee on Rules, upon the recommendation of the League of California Cities.

(5) Chief of the Mapping Division, United States Geological Survey.

A representative of the California Land Surveyors Association appointed by the Governor from five names recommended by the association.

A representative of the California Council of Civil Engineers and Land Surveyors appointed by the Governor from five names recommended by the council.

(c) Additionally, the California Director of the Bureau of Land Management, the Regional Director of the United States Forest Service, and the director of the Center for Ocean Analysis and Prediction of the National Oceanic and Atmospheric Administration shall serve as ex officio members of the task force.

(d) Staff support shall be provided to the task force by the Teale Data Center.

(e) The task force shall create and appoint members to technical advisory committees which shall assist the task force in developing its recommendations. The technical advisory committees shall include representatives of the public, private, and academic sectors and shall reflect varying responsibilities for the development and use of geographic and land information systems.

(f) The task force shall meet a minimum of four times prior to the submission of the report required pursuant to Section 8902. The task force shall terminate on December 1, 1992.

8902. The task force shall submit a report to the Governor and the appropriate committees of the Legislature by October 1, 1992. The report shall include, at a minimum, recommendations for the following:

(a) An organizational and institutional structure to foster the cost-effective development and exchange of geographic information.

(b) The roles and responsibilities of public agencies, private sector firms, and individuals involved in the development and use of geographic information.

(c) Procedures for ensuring accuracy and quality of geographic information.

(d) Procedures for data sharing.

(e) Mechanisms for funding the development of geographic information.

(f) Development of a definition of geographic information systems, land information systems, and other applicable systems and their potential uses.

(g) Procedures to ensure the integrity of data developed by those professionals subject to licensing or registration requirements.

(h) Specific steps, including legislation, necessary to accomplish the above.

8903. This division shall remain in effect only until January 1, 1993, and as of that date is repealed, unless a later enacted stature, which is enacted before January 1, 1993, deletes or extends that date.

SEC 2. This act is an urgency stature necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the Constitution and shall go into immediate effect. The facts constituting the necessity are:

Because of rapid development of geographic information systems by state agencies and the need to better manage them and achieve more consistency, it is necessary that this act take effect immediately. ⊕

California Surveyors . . . .

CONTINUED FROM PAGE 39

location and accurate location of physical improvements were not required to conform with state laws and licensing acts. This would have provided a safe arena for vendors, in that liability issues would be strictly between the vendors and clients.

The second definition (LIS) was intended to address the needs of professions licensed by the state. In particular, the issues of third-party liability, copyright of data, accountability, repeatability and responsibility are very important to the surveying profession and would have to be addressed in any digital mapping information system that attempted to provide the public with responsible information. The definition of a LIS should ideally be as minimal as possible in the early stages, in order to allow flexibility to respond to rapidly evolving technologies, yet accomplish the following minimum goals:

a) Each system sets forth and documents its own data standards and specifications, and places a surveyor in a position of responsibility for those elements that fall under the Land Surveyors Act.

b) Each system maintains accountability and liability for data. This includes maintaining an archive copy of the original data as submitted and a transaction log of any changes made by the system to the original submitted data.

Many California surveyors feel that mapping professionals have an obligation to work with government and private entities to ensure the best use of this extensive technology. Although the legislation as originally proposed did not become law, the task force will certainly hear from the surveying community as it conducts its deliberations. Given the vast potential for LIS/GIS, we can do no less. ⊕

OVERVIEW OF ORIGINAL LEGISLATION

The following is the last iteration of the initial version of AB 3590 before it changed form completely and became a GIS Task Force bill.

GIS/LIS LEGISLATION AB 3590 20 APRIL 1991

DIVISION 8.5. GEOGRAPHIC AND LAND INFORMATION SYSTEMS

8900. This division defines and distinguishes geographic information systems and land information systems. All geographic information systems and land information systems shall be identified as such so that the system user is aware of the nature of the system being used. The use of the term "State Plane Coordinates" refers only to the California Coordinate System of 1927 (NAD 27) and to the California Coordinate System of 1983 (NAD 83), as defined in Section 8801 (of the Public Resources Code). The use of the term "federal longitude and latitude datum" refers to those geodetic datums established and defined by the National Geodetic Survey.

8901. A geographic information system (GIS) is a computer based mapping and information system designed to collect, store, edit, display, and retrieve graphical and mathematical information from a spatial data base. The two main components of a GIS are locational or spatial information, and text or attribute information. Spatial data shall be linked through a common coordinate system that provides a standard geographic locator. Attribute data shall include some common identifier that relates to the spatial data.

8902. A land information system (LIS) is a geographic information system created, maintained, or operated by or for a public agency in which the focus of the spatial data base is primarily on land parcels and their associated records and land attributes. A land information system may include the boundaries or corners and locations of legal rights and other land use information as needed by a particular jurisdiction, including, but not limited to roads, hydrography and topographical features. The public agency operating the land information system shall develop a coordinating committee to establish reasonable accuracy standards and specifications for the system. The membership of the committee shall include persons authorized to practice those disciplines (land surveying, civil engineering, architecture, etc.) included in the system. To qualify as a "land information system," the database shall contain all of the following items:

(a) Geodetic control in the form of a common coordinate system based on the public lands survey system, the California State Coordinate Systems, or a federal longitude and latitude datum.

(b) Mathematical and graphical representation of the location of property boundaries or corners, including a unique identifier for land parcels.

(c) Land attributes, including legal rights, and land use information as needed by the particular jurisdiction.

8903. On and after January 1, 1995, a land information system shall be based on the California Coordinate System and the North American Vertical Datum of 1988 (NAD) for new surveys or mapping projects.

8904. Data submitted for inclusion in a land information system which is the result of functions that require licensing or registration shall be prepared by or under the direction of a person authorized to perform those functions under Sections 6731, 6731.1 and 8726 of the Business and Professions Code.

8905. When a state or local agency establishes a land information system the system shall contain the following capabilities for each data submission or data entry:

(a) Identification of the source and original intent of the data.

(b) An indication of the accuracy of the data.

(c) Date and time of input of the data and the original intent.

(d) Name, number, type, and expiration date of the licenseor registration of the professional in responsible charge of inputting the data.

(e) An audit trail and transaction log indicating the itemslisted above for each spatial data element and each attribute data element within the system and for each change or addition to the system.

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