

# SURVEYOR

California

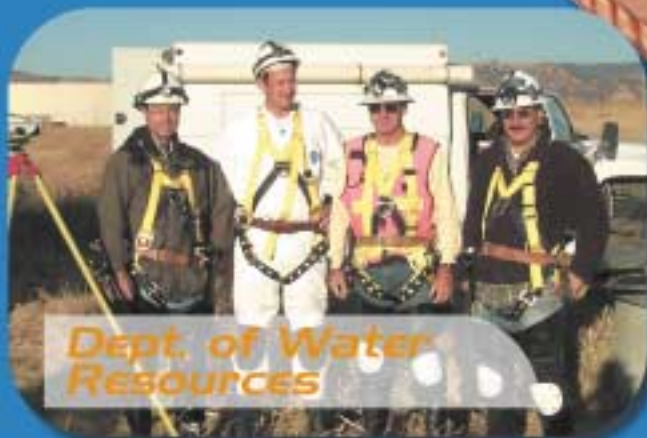
Spring 2008 Issue #154

**Surveyors in State Service**

starting on page 10

**CONFERENCE 2008 HIGHLIGHTS**

on page 34



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# Surveyor California

The quarterly publication of the California Land Surveyors Association, Inc. and is published as a service to the land surveying profession of California. It is mailed to all Licensed Land Surveyors in the State of California as well as to all members of the California Land Surveyors Association, Inc. The California Surveyor is an open forum for all Surveyors, with an editorial policy predicated on the preamble to the Articles of Incorporation of the California Land Surveyors Association, Inc. and its stated aims and objectives, which read:

“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 protection 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 Land Surveyors and their work.”

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### DEADLINE DATES

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

*Opinions expressed by the editor or individual writers are not necessarily endorsed by the California Land Surveyors Association Officers or its Board of Directors. Original articles may be reprinted with due credit given to the source and written notification to the California Land Surveyors Association, unless otherwise noted.*

# Inside This Issue:

## Features:

### SURVEYORS IN STATE SERVICE

#### California State Lands Commission

By: Steve Lehman, PLS, and Mike Bell, PLS ..... 10

#### California State Parks

By: David B. Karoly, PLS ..... 14

#### Department of Water Resources

By: Scott Martin, PLS ..... 18

#### California Department of Transportation

By: Kevin Akin, PLS, et al ..... 24

#### People in Caltrans

By: Kevin Akin, PLS, et al ..... 28

#### CLSA Honors Volunteers ..... 32

#### CLSA Conference Wrap-Up

By: Phil Bray, PLS, Carl C.de Baca, PLS, and Brian Smith, PLS .. 34

#### Scholarship Awards ..... 38

#### TECH TIPS: GPS Network Analysis and Adjustments

By: Michael McGee, PLS ..... 42

#### SMA Expert Q&A

By: Mike Durkee, ESQ ..... 44

#### Recruitment Success Story

By: Robert McMillan, PLS ..... 46

#### NSPS Area 9 Report

By: Carl C.deBaca, PLS, NSPS Area 9 Director ..... 48

#### Risk Management for Land Surveyors

By: Richard Hertzberg, CPCU, ARM ..... 52

## Department:

From the Editor .....	6
Presidents Message .....	8
Crossword Puzzle .....	50
Index to Advertisers .....	47
Welcome New Members .....	49
Call For Articles .....	54
Publication Order Form .....	55
Sustaining Members .....	56
Membership Application .....	58



# From the Editor

By: John P. Wilusz, PLS, PE - Editor

Our theme this issue of the *California Surveyor* is Surveyors in State Service. We asked Scott Martin of the Department of Water Resources, Kevin Akin of Caltrans, Dave Karoly of California State Parks, and Steve Lehman and Mike Bell of the California State Lands Commission, to tell us about their work as professional land surveyors with the State of California. We also asked them about research opportunities for those conducting surveys adjacent to lands under the jurisdiction of their departments. As you will see when you read their articles, they gave us all that and much more.



Photo by: Auburn Photography

State surveyors play an integral role in the planning, designing, building and maintaining of California's civil infrastructure. Aqueducts, pipelines, dams, highways, freeways and inter-city railways, our writers tell us how they apply both emerging and conventional technologies to keep the water flowing and people moving throughout the state. But that's not all they do. Surveyors in state service are also active in the protection, restoration, and enhancement of California's immense biological diversity, as well as the preservation of our colorful history and diverse cultural heritage. They are among those charged with managing and protecting irreplaceable natural and cultural resources on public lands within the state, as well as safeguarding the public's rights to accessing those

lands. Taken together, these articles provide an illustrated narrative of some of the many ways by which professional land surveying practice benefits the people of 21st century California.

And here's a bit of serendipity. By their well-crafted essays our state service writers also provided us with one of the most compelling recruitment tools since CLSA's DVD *Choose Your Path, Make Your Mark*. If you're looking for an easy way to promote our profession to potential future surveyors, pass along this issue of the magazine. Our writers' enthusiasm for their important and engaging work is infectious. Their writing captures the challenge, sense of purpose, and variety of activity that attracted many of us into the profession in the first place.

## 2008 ACSM Excellence in Journalism Award

**Exciting news!** The American Congress on Surveying and Mapping (ACSM) recently awarded the *California Surveyor* the 2008 Excellence in Journalism Award. It takes many hands to produce our quarterly publication, and I'm proud and pleased that mine are among them. Thanks to our columnists and contributing writers for providing award-winning content. Thanks to our administrative staff at CLSA Central Office, and Crissy Willson in particular, for unsurpassed (and cheerful) technical support. Thanks to Dave Ryan for his editorial eye and reliable judgment, and thanks to Media 94 for superlative graphic artistry and layout. And of course, we thank all who read, enjoy and appreciate the *California Surveyor*. Keep those cards and letters coming. ❖

*John Wilusz, PLS, PE, is a Water Resources Engineer in the Delta-Suisun Marsh Office of the California Department of Water Resources.*

## Photo of the Year



Tidelands Survey, Morro Bay, CA - Photo submitted by Robert J. Reese, PLS  
To submit an entry for Photo of the Year, please email a high resolution photo to [clsa@californiasurveyors.org](mailto:clsa@californiasurveyors.org)

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## President's Message



Since this is my first attempt at this, I have been sitting here for a while trying to figure out what I am going to say. As I sat, my mind wandered back to that day a couple years ago, when Bob Hart called me on the phone and ask me if I would accept the nomination for CLSA Treasurer. I was somewhat taken back but also honored by that request. After a little soul searching and discussion with trusted friends, I accepted the challenge. I am honored to be the CLSA President. For anyone interested in my background, I wrote an article for the CLSA News in 2005, Issue # 75, in which I tried to give the pertinent facts about my background, how I came to be a professional Land Surveyor, and what I thought was important to the Profession at the time. This article can be viewed at [www.californiasurveyors.org](http://www.californiasurveyors.org).

To date, this journey has been very gratifying and educational. This past year, serving as the CLSA President-Elect, I have had the pleasure of visiting eighteen of the association's twenty-two chapters. During these visits, I had the privilege of meeting and talking with over four hundred meeting attendees. I discussed many specific items and asked for "favor," "not favor" or "undecided" votes on several specific questions. For this article I decided to talk about some of the results of these discussions. When I list numbers of people you will notice that they will not add up to the same number nor to 400 because these numbers only show those people that actually voted.

### The first three questions that I asked were:

1. Do you favor a four-year degree requirement for licensure?  
The results were: favor 31, not favor 222, undecided 46.
2. Do you favor a two-year degree requirement for licensure?  
The results were: favor 141, not favor 90, undecided 81.
3. Do you favor professional development requirements to maintain your license?  
The results were: favor 310, not favor 22, undecided 10.

I was particularly pleased to see the results for question #3. For those in attendance, there should not have been any doubt that I whole-heartedly agree with the over 90% that favored this. I am certain that this requirement would be in the best interest of the public and the profession. Since the current political climate does not lend itself to this requirement, CLSA is going to be resurrecting its "Voluntary Professional Development" program to assist and encourage professional development. There will be a few changes to bring it closer to the NCEES Model along with a new certificate and a logo for use by participants. We hope to have this operational by December of 2008. I encourage everyone to participate in this program.

Another item of discussion was how the local agencies insure that building setbacks are being adhered to. The differences in requirements between the different local areas are substantial. They range from absolutely none to a requirement that a land surveyor stamp and sign a certificate stating that all setback distances were correct and the property corner monuments were in place prior to any concrete being poured. I found this quite interesting. It points towards a possible need to implement some sort of universal minimum state standards to help protect the public.

Another interesting topic was the definition of the word "establish" in 8762(b) (4). In November of 2006 I wrote a letter to the Board of Registration asking for clarification of this area of the PLS Act. I and two other surveyors in our office signed the letter. I have always interpreted this section as saying that if you determine the position of any property line and show it, mark it in any way, or reference it, and that line does not show on a recorded map, you must file a Record of Survey showing these lines. The Board's response was very quick and it confirmed my interpretation of most of this section. I believe that there is definitely a need for further clarification when it comes to Lot Line Adjustments but I will leave that to your interpretation of the Board's letter. I had not intended to make an issue out of this but after showing the information to a few people, it became evident that the profession was very interested in this. So I distributed it to all the chapters that I visited and in fact, it is available on the CLSA forum at [www.californiasurveyors.org](http://www.californiasurveyors.org) if you go back a bit. It was very gratifying to hear that the overwhelming majority agreed with the Board's explanation and in fact I had several people tell me that, as a result of this, they were taking a closer look at what they were doing and changing their policies somewhat. These comments were particularly gratifying to me in that it showed that the effort was working in a positive way. Nearly every chapter indicated that there were some people in their chapter area that seemed to ignore the rules. This is a very good reason why every chapter should have a Professional Practices Committee (PPC). Many times a PPC can work towards educating someone and take care of these violations without any involvement by the Board. This is not only good for the profession it is very beneficial to the public. It is crucial that we all operate under the rules and regulations of the Board of Registration. When we do not, it only confuses the public and drags down the profession.

During my visits to the chapters, I promoted many different things with two being worthy of comment here. The first is the need for recruitment. This is crucial to the continuing viability of

*Continued on next page*



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the land surveying profession. Past President Robert Reese was instrumental in getting this started and we must work to continue this effort. We are currently losing land surveyors faster than we are gaining new ones. With the pre-82 RCE's nearing retirement age, we must not only replace the practicing land surveyors that we are losing each year but also part of the pre-82 RCE's. CLSA has put a tremendous effort into this area with the production of the Path Mark Video and the compiling and distribution of Land Surveying Career Path folders. We are also making contacts with high schools and giving presentations in those schools that have invited us to do so. Those people involved in these endeavors are to be commended for their dedication to the profession. It was reassuring to hear all the support for this program along with the many different efforts that are going on across the state. I encourage every land surveyor to participate. This is literally the one area where we cannot fail!

The second item is the need for increased public awareness and understanding of the land surveying profession. We need to develop a program or programs to make the public more aware of the services that we provide and the importance of those services. Land surveying has always been a profession that was somewhat shrouded in mystery. While most children know something about what doctors and lawyers do, very few know what professional land surveyors do. We need to work towards changing this. There was also overwhelming support for this at the majority of chapters that I visited. CLSA has always viewed this as important and, beginning in 2008, I hope to develop some specific ideas and plans regarding how to implement this program.

In closing I will say these last eight months spent visiting chapters have been gratifying to me. I have been left with the very distinct impression that the profession is in good hands. There are literally hundreds of professional land surveyors around the state who are working diligently for the betterment of the profession. I want to tell them that their efforts are not going unnoticed and that I applaud them for those efforts. I also want to challenge those individuals who are not members of CLSA to join with us in this endeavor. I urge you to be willing to give something back to your profession to improve it for those that follow us.

Sincerely,  
James M. Herrick, PLS 5616  
2008 CLSA State President

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# The California State Lands Commission



The California State Lands Commission (CSLC) was created by the California Legislature in 1938 as the successor agency to the Office of the State Surveyor General. The CSLC is charged with managing and protecting the important natural and cultural resources on certain public lands within the state, as well as the public's rights to access these lands. The Commission is supported by a staff of more than 200, including specialists in mineral resources, land management, land surveying, structural engineering, natural sciences, safety management, marine terminal operations and oil spill prevention.

## Sovereign and School Lands

The public lands under the Commission's jurisdiction are of two distinct types—"Sovereign" and "School" lands. Sovereign lands passed to California upon statehood in 1850. Sovereign lands encompass approximately four million acres and include the beds of California's naturally navigable rivers, lakes and streams, as well as the state's tide and submerged lands along the state's more than 1,100 miles of coastline, extending from the shoreline out to three nautical miles offshore. In short, the CSLC's jurisdiction extends to more than 120 rivers and sloughs, 40 lakes, and the state's coastal waters. The state received no grants, patents or maps describing or locating these lands. Rather, these lands are "incidents of sovereignty" whose boundaries are determined by land surveyors in the CSLC Boundary Unit through surveys, research, and analysis of current and historical boundary data.



School lands are what remain of the nearly 5.5 million acres throughout the state originally granted to California by the Congress in 1853 to benefit public education. The state retains surface and mineral ownership of approximately 471,000 acres of these school lands and retains the mineral rights to an additional 790,000 acres. Unlike sovereign lands, school lands are based on the Public Land Survey System and are handled by Boundary Unit surveyors in accordance with standard practice for PLSS work.

*Continued on next page*



## The CSLC Boundary Unit

CSLC's Boundary Unit is composed of staff members at various levels of the Boundary Determination Officer (BDO) series, ranging from entry-level technicians to licensed land surveyors in the Associate and Senior BDO positions. The duties of Boundary staff include: preparing maps and land descriptions; investigating tidal, lake, and river characteristics; negotiating boundary agreements with owners of lands adjacent to state-owned land; consulting with and advising the Attorney General's Office on matters concerning state interests in lands involved in litigation; and appearing as expert witnesses in litigation involving lands under the jurisdiction of the CSLC.

For relatively straightforward projects, such as strip descriptions for river pipeline crossings, Boundary staff may review and approve survey documents provided to CSLC by other surveyors. For other projects—especially those requiring in-depth historical and legal research of water boundary issues—Boundary staff will prepare the required documents to support CSLC leases, boundary agreements, title settlements or litigation.

Several years ago, a well-known surveyor advised the attendees of a water boundary seminar that, if ever faced with a water boundary survey, they should simply turn and run! While that comment was made in jest, it is true that sovereign water boundaries offer CSLC Boundary staff challenges not usually found in other surveys.

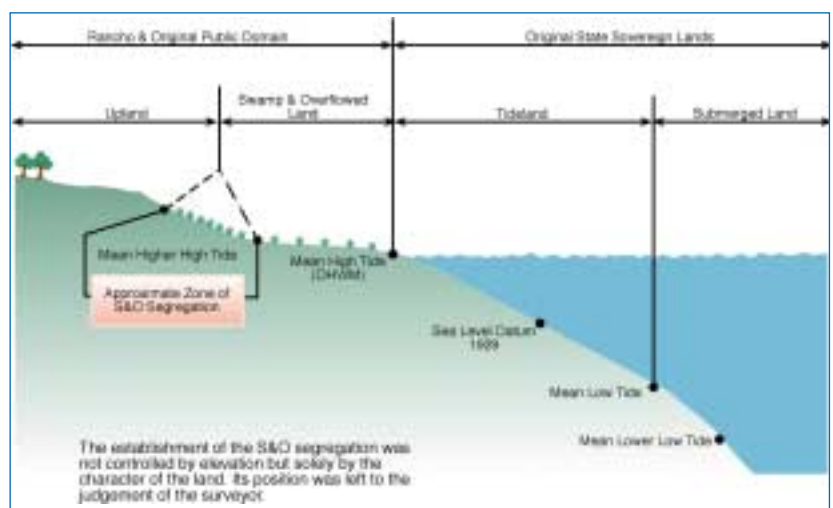
## Ambulatory Boundaries Present Challenges

One of the more obvious challenges of water boundary surveying is the fact that water boundaries are ambulatory—that is, they move. Seasonal and long-term movement of water boundaries, particularly in dynamic regimes such as the open coast, can complicate upland projects. A survey to locate the current mean high tide line may be inappropriate to define the legal boundary, which may require a determination of the historical location of the water boundary. The potential impact of artificial influences such as jetties, groins, or levees must be considered in determining historical water boundary location. An example of how man-made groin structures can influence the coastline is shown in the accompanying figure. Note the build-up of sand on the up coast side. In this case the artificially accreted land would be considered state-owned land.

Inland rivers and lakes present their own challenges to Boundary staff. For example, Swamp and Overflowed Lands (S&O) throughout California were surveyed and sold by the state in the late 19th and early 20th centuries. Swamplands are lands requiring drainage to make them fit for cultivation; overflowed lands are subject to periodic overflow and flooding and they require levees to protect them from water



and to make them tillable. Under the Act of September 28, 1850, Congress granted to each state of the Union, the swamp and overflowed lands within their respective borders. This act is known as the Arkansas Act. Legal title did not pass to the state until the lands were identified by a General Land Office survey, at which time a list of the approved lands was prepared and listed to the state. Upon state approval, the Governor would request a patent be issued to the state from the Federal Government.



Land types and water boundaries

Continued on next page





California State Lands Staff

Another type of land sold by the state was tidelands. The State Legislature authorized the sale of tidelands in 1861 and these sales continued through 1909. Tidelands are defined as lands covered and uncovered by the flow and ebb of the tides, or lands situated between the ordinary high-water and ordinary low-water marks of tidal waters. The state's title to these lands is derived by virtue of her sovereignty as previously described. There are no documents, lists or patents conveying tidelands from the Federal Government to the state. The various laws governing these conveyances are notorious for their creation of overlapping and confusing processes and requirements. Scrutiny of the legislation under which S&O surveys and tideland surveys were conducted is critical to properly analyzing their effect on boundary location. The accompanying figure Land Types and Water Boundaries shows the relationship of these lands.

Occasionally, water boundary complexities can ensnare even those surveyors who do not intend to engage in water boundary work. Consider a situation where a navigable river was diverted 150 years ago by mining or some other activity, so that the historical bed no longer carried any water. Because of the general rule that the public cannot be deprived of title to its lands by the actions of others (diversion of the river's flow), that wide swale running through a client's present-day orchard might still belong to the state as sovereign land!

### Records Research


CSLC's Boundary Unit is available to assist surveyors conducting surveys adjacent to state sovereign lands. Boundary staff can research historical records and discuss strategies for properly depicting state-owned lands. Also available from CSLC are S&O surveys, tideland surveys, and Board of Tide Land Commission (BTLC) maps. Copies of these documents are typically filed in county records, where they may be more easily accessible to the local surveyor, but CSLC staff will be happy to provide copies on request. To contact CSLC's Boundary Unit in Sacramento, call 916-574-1900. Due to reduced staffing levels and budget constraints there is currently a significant backlog of work, so please allow time for staff to respond to your request.❖



Staking mean high tide line

**Steve Lehman, PLS**, is a Senior Boundary Determination Officer (Supervisory), and **Mike Bell, PLS** is a Senior Boundary Determination Officer (Specialist), both with the California State Lands Commission in Sacramento.





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By: David B. Karoly, PLS



Access can be a challenge when off the beaten path

# California State Parks



California State Parks (a.k.a. State of California, Department of Parks & Recreation) is one of the largest landowners in the state with an estimated 1.5 million acres in 278 Park units. State Parks land surveyors are responsible for over 2,100 miles of boundaries, which range from modern subdivision lot lines to 19th century rancho grant lines that haven't been retraced since they were first surveyed. We have boundaries in every type of terrain and climate found in California.

## State Parks History and Mission Statement

California State Parks was founded in 1864, but the first state park, Big Basin Redwoods, wasn't created until 1902. That's because prior to 1902 the Parks Department mainly operated National Parks in California. The current in-house Survey Unit was established in 1946; surveys prior to 1946 were carried out either by private contract or the National Park Service, which performed surveys as part of their program to assist in improving California's state parks. The Survey Unit had 24 personnel at its height in the 1960s. This number slowly declined from the 1970s, with successive budget cuts, to the current staffing as described below. Land ownership mapping was performed by a separate unit until 1992, when that task was combined into the current Surveys and Ownership Section.

*The Mission of California State Parks is as follows: To provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation.*

California State Parks land surveyors serve that mission by helping to preserve and protect State Parks resources by surveying boundaries and maintaining records of real property ownership.

## Surveys Section Staff

The Surveys and Ownership Section, Acquisition and Real Property Services Division, represents the entire in-house surveying capability of California State Parks. Based in Sacramento, we have three full-time Professional Land Surveyors, one Land Surveyor in Training, one part-time Professional Land Surveyor, one Senior Delineator (state-speak for draftsman) and one Civil Engineering Associate in our section.

Our staff is lead by Paul Carlson, PLS. Paul came from the Department of Water Resources in 2002 after being employed in field surveys for 28 years. Your author, Dave Karoly, PLS, is in charge of field boundary surveys. Dave came to the surveys section in 2003 after first working in construction management at California State Parks. Prior to that Dave worked for the City of West Sacramento, Engineering Division, and before that for a small Sacramento-based civil engineering firm. Neal Jones, PLS, is responsible for legal description review for acquisitions,



In a redwood forest this line point fell on top of a stump

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as well as a wide range of real property management survey issues. We recruited Neal from Caltrans where he worked for Preliminary Investigations. Prior to Caltrans, Neal was a survey manager for CH2M Hill, and he also worked for the US Soil Conservation Service.

Nick Labedzki, B.Sc., LSIT, is our field assistant but he's also assigned a variety of office work. We recruited Nick from Caltrans and prior to that he worked for a private sector engineering firm. Nick generally runs the electronic gear while out in the field, allowing the party chief to be free to occupy the proverbial "higher intellectual plane." Nick also is well-versed in AutoCAD and Autodesk products so he fits our field and office work style very well. Bruno Rens is a mining engineer by training and has worked on engineering and mine surveys in Central America and New Mexico. Here at State Parks, Bruno helps the survey crew in the field. We've tried to make Bruno our designated poison oak, blackberry and yellow jacket person but he has balked at that assignment. Other than his lack of cooperation in the poison oak, blackberry and yellow jacket areas, Bruno will do just about anything from carrying equipment, chopping line and helping to set points. We also use Bruno in the office to do research and various map drafting tasks.

### Mapping Staff

Jerry Klopotek, PLS, is responsible for maintaining our Land Ownership Record Maps (more about these to follow). We are in the process of converting paper maps to electronic form and many of the paper maps are outdated or are less accurate, temporary maps. Checking these maps involves many hours of deed and map research and interpretation. Marsha Evanikoff is the main force behind our electronic mapping project. Marsha has been with our section since 1979 and has worked in all aspects of land surveying, including drafting (much of it topographic surveying drafted in the field), operating the instrument, and researching and interpreting deeds.

About five years ago Marsha took on the task of converting our paper and mylar ownership maps to electronic form. At that point she had extensive hand drafting experience but almost no experience with computer-automated drafting (CAD). Fortunately, her years of experience with computer-based coordinate geometry (COGO) programs, along with an intimate knowledge of survey drafting, smoothed the way into CAD. The department also hired a GIS consultant to assist in preparing the mapping for GIS and to provide AutoCAD training.

*Continued on next page*

## California State Parks



Above: GPS is great, but whale watching is better with a telescope

research documents such as existing paper maps, deeds, and whatever pertinent data we have in our files. Often we have to obtain additional research documents from the County Recorder and/or County Surveyor. The paper map is usually scanned but we build the new map using COGO and plotting existing information as much as possible. When we have ties to the National Spatial Reference System (whether NAD27 or NAD83) we also use that information to position the map with reference to the horizontal datum. If there is no accurate information available to georeference the map, we may use topographic features together with USGS quad maps or aerial photos to position the map. No two maps are alike so there is no single cookbook process that can be followed. Every tool and process has its place according to the application. We have a workflow plan which provides a general framework to be followed but analysis and decision making by skilled personnel is critical.

After the map is drawn as accurately as possible, given the information available, it is converted for use in our GIS. Tabular information is entered into the database by staff. We have a consultant who uses AutoCAD Map to generate an ESRI shape file, which is then imported into the GIS (ArcMap, version 9.2). The mapping and appurtenant data can then be accessed by personnel throughout the department. A typical application might be to query a land parcel for ownership information, grantor name, and deed book and page.

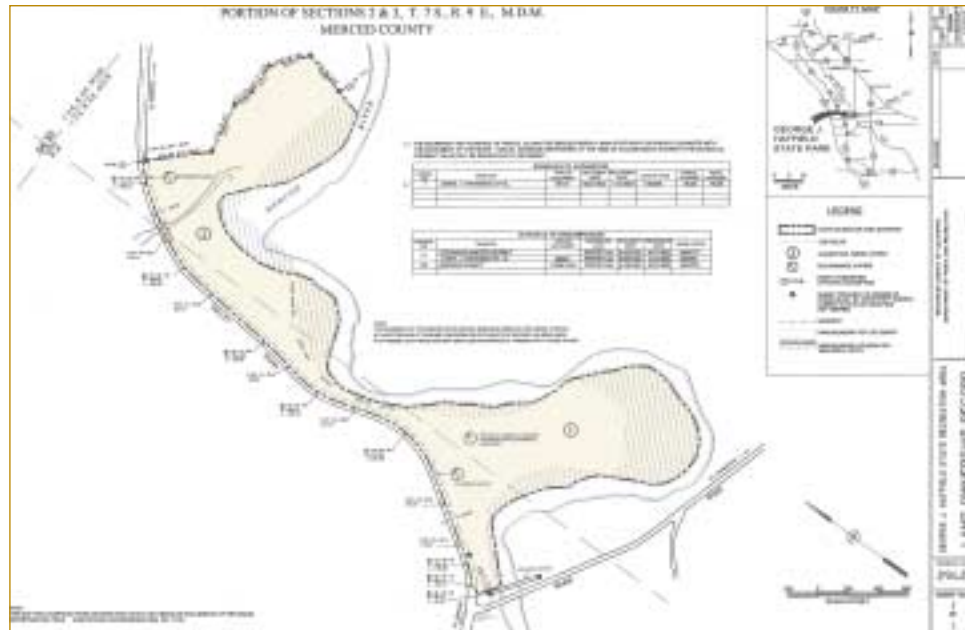
### Survey Records Research

Our extensive filing system of maps and files is probably one of the best-kept secrets in California surveying. Any California surveyor working adjacent to or near a state park

would be wise contact us to see what we have. One source of often-helpful information is our correspondence files, which reach back to the Unit's creation in 1946. Correspondence files are maintained for each Park unit. Not surprisingly, the amount of work done in any given park over the years will determine how thick that file will be. Every park has at least one folder with correspondence in chronological order from the park's creation to the present time. These files are useful for many things, such as tracking obscure land title data. For example, one might find court judgments in correspondence folders that uncover the results of long-forgotten boundary disputes.

Of course we also have drawers full of maps. Our collection includes copies not only of record maps, such as

*Continued on next page*



### Survey Records - Land Ownership Record Maps

A Land Ownership Record Map is a map which graphically depicts parcels we own, disposals (parcels that have been granted out), encumbrances (such as easements held by others) and appurtenances (such as easements which benefit State Parks). These maps are a compilation of the best information available without conducting extensive field surveys. Each map has a Schedule of Acquisition, a Schedule of Appurtenances and a Schedule of Encumbrances, all of which list useful information such as grantor names, deed book and page, and so forth. These maps are a valuable reference tool, but may or may not be complete for any given state park.

To convert Land Ownership Record Maps to electronic media is a complex process. It starts with gathering all the



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records of survey, but also non-record maps and related documents created both in-house and by outside entities. In-house documents include Plats of Field Notes (survey control maps), topographic surveys, boundary surveys and much more. In timber country, maps created by outside entities include surveys done by logging companies. Some of these maps date back to the early years of the 20th century. Since logging company maps were generally not recorded, they can be difficult to find elsewhere. We also

have loose-leaf field notes dating back to 1946. These mostly contain unreduced field measurements and bench circuit notes, but sometimes useful information can be found in them as well. These notes are bound into books and filed by Park unit. Typically, after the notes were calculated into coordinates, traverse sheets were bound into books and stored in the correspondence files. To search our records, call or email us and we will see what we can do.

**Sacramento Chapter, California Land Surveyors Association**

State Parks staff have long been active in the Sacramento Chapter, CLSA. Author Dave Karoly served as Chapter Secretary in 2004 and Chapter President in 2005. Paul Carlson served two years as Chapter Treasurer, plus five years as Chapter State Board Representative. This year Paul passed the Treasurer position to Nick Labeledzki. Neal Jones is now serving on the Chapter Professional Practices Committee. ❖

*Dave Karoly, PLS, is a Transportation Surveyor Party Chief with California State Parks in Sacramento. He can be reached by telephone at (916) 445-9104 or by email at [dkaroly@parks.ca.gov](mailto:dkaroly@parks.ca.gov)*

*More information about California State Parks may be found on the web at: <http://www.parks.ca.gov>.*



# California Department of Water Resources



The mission statement of the California Department of Water Resources (DWR) is rather brief, only 28 words total: *To manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.*

However, the responsibilities and efforts associated with successfully carrying out this mission are enormous and dynamic. Building, operating, and maintaining the California State Water Project (SWP) to deliver water to some 25 million Californians for domestic and agricultural uses, while protecting, restoring, and enhancing the natural environment, is a monumental task in itself. Add to that the role of being the keepers of approximately 1600 miles of federal project levees protecting tens of thousands of lives, and billions of dollars of property, from potentially disastrous flooding and you have never-ending jobs for some 3000 employees.

In support of a large percentage of DWR programs, a relatively small number of land surveyors play a very significant role. DWR currently employs 14 licensed land surveyors, nearly 20 LSIT certificate holders and perhaps a dozen more technical staff, including photogrammetrists, who capably service most of the surveying and mapping

needs within DWR. Occasionally contractors are brought aboard to service special needs, like construction support, or to serve as an extension of DWR staff when demand exceeds in-house resources.

## The Geodetic Branch, Precise Surveys, and Planning

Most of the surveying and mapping operations at DWR are performed by employees of the Geodetic Branch, which is part of the Division of Engineering. The Geodetic Branch is comprised of three primary functional sections: Cadastral Surveys and Land Records, Mapping and Photogrammetry, and Field Surveys. All of these sections are based in or near DWR headquarters located in the Resources Building, 1416 9th Street, in Sacramento.

Another smaller section, the Precise Surveys Unit of the Division of Operation and Maintenance, has staff located at two Field Division locations: San Luis Field Division in Gustine and San Joaquin Field Division in Bakersfield. A single licensed surveyor leads a small group in the Division of Planning and Local Assistance's Northern District Office located in Red Bluff. While each of these offices service specific programmatic and geographically based needs for DWR, each has been known to rely on the assistance of the others to bring in specialized expertise or to combine forces to tackle large surveying projects.

## Height Modernization

In 2002, DWR made a commitment to begin the process of converting all DWR owned and operated water surface elevation gauging stations in the California Delta from the National Geodetic Vertical Datum of 1929 (NGVD 29) to the North American Vertical Datum of 1988 (NAVD 88). A geodetic network referenced to NAVD 88 was established and surveyed in the Delta in 1997 through an effort led by the National Geodetic Survey (NGS) with DWR as a major partner. It was decided that a complete re-survey would be done of this network in 2002, with the addition of the Suisun Marsh region, and differential leveling would be incorporated into the project to update the reference bench marks adjacent to some 60 gauging stations to NAVD 88 orthometric heights.

*Continued on page 20*



### **Aqueduct surveying**

*A DWR crew ( Tim Johnston and Abraham Magdaleno in boat, Robert Jones as safety spotter) from the Geodetic Branch performs bathymetric surveying in the California Aqueduct to measure silt and debris deposits. Staff from the Southern Field Division standby to move the boat around structures and put it in and take it out daily.*

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## California Department of Water Resources



**GPS Unit at Check 63.** The Precise Surveys Unit performs a static survey along the East Branch of the California Aqueduct at a check structure. Benchmarks are located at all major structures and facilities along the State Water Project.



**San Joaquin River bathymetry.** Tim Johnston and Greg Sanfilippo of the Geodetic Branch collect bathymetry data to augment photogrammetric mapping for the San Joaquin River Restoration Program.

The gauging stations are used to monitor water surface elevations in the system and are relied upon heavily during high water events and other normal water delivery operations. DWR had sufficient resources to undertake this project alone this time, except for the invaluable guidance from the NGS Geodetic Advisor to California, Ms. Marti Ikehara. With Marti's dedicated assistance and mentoring, DWR staff performed all of the station reconnaissance, new mark setting, field observation planning, observation execution, and data post processing in adherence with NOS NGS-58 guidelines and Blue Booking procedures. DWR staff also performed the approximately 70 miles of second-order leveling needed to transfer elevations from geodetic network stations to staff gauge reference bench marks.

The results of this Height Modernization survey, consisting of approximately 125 stations, were published by NGS with an epoch date of 2002.86. An epoch date represents the date, in year and decimal equivalent of month, when the stations that are constraints for the network were observed. On October 1, 2004, at the beginning of the water year in California, DWR officially converted all of its staff gauges in the region to the NAVD 88 datum, providing conversion factors from the historical NGVD 29 referenced data sets for each station to all data users through its California Data Exchange website located at: <http://cdec.water.ca.gov/>

### Partnering with Local and Federal Agencies

In 2008, DWR will lead the effort, through funding and partnering with local and Federal agencies, primarily the U.S. Bureau of Reclamation, to plan, develop, install, survey, and publish another major NAVD 88 Height Modernization network in California. This network will cover most of the Sacramento Valley floor and extend from Sacramento to Shasta Lake. The network will consist of approximately 335 stations, with an average spacing of 7 kilometers, and encompass more than 5000 square miles.

This massive project arose out of the need to develop a cohesive reference frame in this region to be used as one of several tools to monitor ground surface elevations as demands for groundwater continue to increase, which could cause subsidence. The network will also prove useful to other programs within DWR such as floodplain mapping, high water mark surveying during flood or near flood events, conversion of all DWR gauging stations in the region to the NAVD 88 datum, and bathymetric surveying efforts of major rivers and tributaries in the region.

The network will include, in entirety, two existing smaller regional networks; the Yolo County network and the Glenn County network. Close to 100 stations from the Caltrans Northern Region Height Modernization survey performed in 2004 will also be included. The results of this survey will be submitted to and published by the NGS for use by the entire surveying, engineering, and scientific communities. Current NGS data sheets can be accessed at: <http://www.ngs.noaa.gov/>. Resurveys of this network will probably be performed in 3 to 5 years, possibly on a regional basis, depending on the availability of resources when the time comes.

Continued on page 22

# EFFICIENCY BEYOND MEASURE



[ DEEDS ]

[ ASSESSOR MAPS ]

[ PARCEL MAPS ]

[ SUBDIVISION MAPS ]

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## California Department of Water Resources



**Precise Surveys Team in climbing gear.** Precise Surveys team members (L to R) Joe Mello, Charles Mussett, Forrest Smith, and James Santos in hazmat suits and climbing gear prepare to survey inside the North Bay Aqueduct.



**Pillar at Perris Reservoir.** Control pillar overlooking Perris Dam in Southern California. Pillars of this type are installed in arrays around SWP dams for use in monitoring dam deformation.



**Precise leveling.** Running first-order levels to the reference "rock mark" at Edmonston Pumping Plant are James Harlan (level) and Charles Mussett (rod).

### Boundary and Right of Way Surveys

Height Modernization work isn't the only kind of surveying DWR surveyors do. Staff from the Geodetic Branch do all boundary surveying and analysis required for the acquisition of land rights, both fee and easement, for the State Water Project and Central Valley Flood Protection Board (formerly entitled Reclamation Board). This could range from acquiring a small easement parcel from a single landowner for a levee repair project, to obtaining all permanent and temporary property rights needed to construct the 125 mile-long Coastal Aqueduct Phase II pipeline in the 1990's. Future expansions and extensions of State Water Project and flood protection facilities will require ongoing property rights acquisition work for decades to come.

### Photogrammetry

With a full service Photogrammetry Section, all engineering mapping is done internally, from flight planning to delivery of the final products to the design teams. Recent examples of DWR projects for which design mapping was done by this section include: East Branch Extension Phase II, a 6 mile long pipeline, reservoir, and pumping plant project in the Yucaipa area, South Bay Aqueduct rehabilitation and expansion in the Livermore area, and mapping for approximately 120 miles of the California Aqueduct for the East Branch Enlargement is currently underway. The DWR photogrammetry staff also provides services to other state agencies, such as the Department of Parks and Recreation and the Department of Forestry and Fire Protection.

Many other aerial imagery based products are also developed by DWR's photogrammetry staff, such as ortho-rectified, full color mosaics used for project planning and public presentation purposes. The Mapping and Photogrammetry Section houses a substantial film archive dating back 50 years or more. A Geographic Information System (GIS) is currently being developed to facilitate research of this film and mapping archive. Through the use of a high-end film scanner, historical imagery can be digitized from film upon request. DWR does make this imagery library available to the public and other government agencies. However, there is a fee to recover significant staff and other costs, including any materials. For more information on this aerial imagery and mapping library please call (916) 653-2698.

### Land Records

The Cadastral Surveys and Land Records Section maintains an inventory of all maps and deeds for any and all land rights obtained for State Water Project (SWP) and Central Valley Flood Protection Board purposes. Most of the mapping is based on the California Coordinate System and often contains information on monuments recovered at the time of the survey. These records are also available for research by interested parties. If significant DWR staff time is required to assist with this research, cost recovery is required. For more information regarding these records, please call (916) 653-4744.

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## Field Surveys

The Field Surveys Section is continually perpetuating and densifying horizontal and vertical control throughout the State for internal use. Field staff regularly performs a wide variety of surveys including boundary, bathymetric surveys of rivers, lakes, and the California Aqueduct, topographic surveys for design and construction purposes, setting and surveying of ground control for aerial mapping missions, and as-built surveys of facilities. In virtually all cases, projects are based upon the California State Plane Coordinate System of 1983 and NAVD 88. This section maintains a database of DWR horizontal and vertical control, as well as a list of project specific survey requests completed in the past 30 years. An extensive archive of survey records covering past work is also maintained by this section. For more information on this resource, or if you find a DWR stamped survey monument about which you want information, please call (916) 324-4834.

## State Water Project

The primary mission of the previously mentioned Precise Surveys Unit is to maintain a comprehensive and coordinated surveillance program of SWP facilities. This program is designed to detect and facilitate the correction of potentially hazardous and damaging conditions in the early stages to prevent serious interruption of water delivery capabilities. The major surveillance component involves a continuing survey program to monitor structural and ground movements of SWP facilities and the surrounding environment. This includes a regiment of periodic observations at all SWP dams. In addition, more extensive high-order vertical and horizontal control networks are also maintained at each dam. This program provides a basis for monitoring movements associated with reservoir loading, special geologic problems, and provides firm controls for embankment surveys in critical areas.

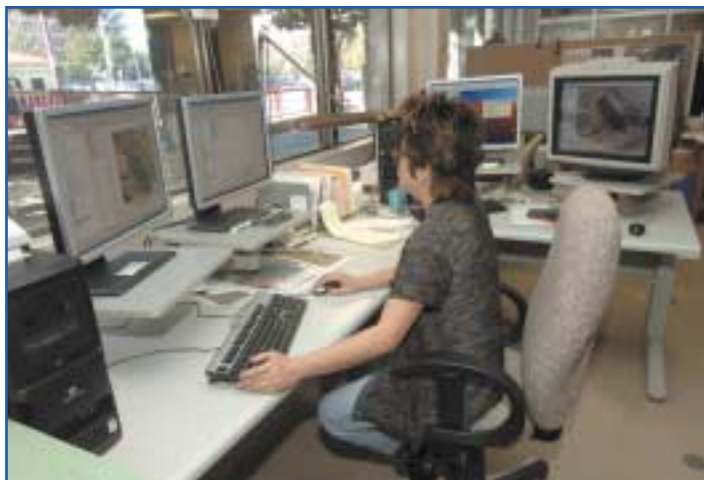
The Precise Survey Unit also provides precise leveling for monitoring of subsidence and differential settlement along extended reaches of the California Aqueduct from the California Delta to Perris Dam in Southern California. As a result of the perpetual leveling campaign, this unit houses a substantial amount of historical bench mark information covering the past several decades along SWP facilities. The South Bay, North Bay, and Coastal Aqueducts are also monitored by this unit.

It is of interest to note that most of the California Aqueduct that runs through the San Joaquin Valley is built in a region known to have experienced substantial subsidence due to groundwater extraction and other factors related to the geological composition in this region. The leveling program along the aqueduct in this area has measured cumulative subsidence approaching 30 feet near the town of Huron, California since the aqueduct was built in the early 1960's. Such significant vertical movement has impacted the operations of the SWP, imposed stress on structures in the region, and significantly altered flood inun-

ation patterns. The Precise Surveys Unit also provides critical emergency response for any infrastructure problems along the SWP in the southern California region as well as providing right-of-way and construction related support services as needed. An impressive fact is that all of this work is performed by a total staff of five surveyors. For more information on the Precise Surveys records, please call (661) 858-5524.

## Small Staff, Big Mission

Land Surveyors at DWR aren't nearly as visible or numerous as their counterparts at Caltrans, but they are out there, often working in remote locations in and around natural and manmade waterways and flood control infrastructure throughout the State. Although they are few, like the number of words in DWR's mission statement, they are critical members of a talented and dedicated team serving the water resource related needs of the people of the State of California. ❖



DWR Photogrammetrist, Gwynne Kimura-Fong, processes GIS files while a photogrammetry workstation runs in the background.



**Scott Martin, PLS** is chief of the Geodetic Branch for the Division of Engineering, California Department of Water Resources where he manages approximately 35 employees. Prior to joining DWR, Scott worked in the private sector for engineering consulting firms in the Sacramento, Eureka, and Mother Lode areas. He has been a member of the Coordinating Council of the California

Spatial Reference Center since 2001 and has served as a member of the California Professional Land Surveyor examination grading team.

Contributions from:

**Forrest Smith, PLS**, Chief, Precise Surveys Unit  
California Department of Water Resources





By: Kevin Akin, PLS, et al.



# Caltrans

The California Department of Transportation (Caltrans) is a large state department with over 22,000 employees. Caltrans manages more than 15,000 miles of California's highways and freeways, provides inter-city rail services, permits more than 400 public-use airports and special-use hospital heliports, and works with local agencies. Caltrans carries out its mission of improving mobility across California with six primary programs: Aeronautics, Highway Transportation, Mass Transportation, Transportation Planning, Administration and the Equipment Service Center. Caltrans maintains twelve district offices around the state and a headquarters in Sacramento.

Surveyors make up a small portion of this total and can be hard to find in the organization. This article is intended to help the survey community know what functions surveyors perform for Caltrans, where they are located, how to contact them, and what information is available.



Near Devils Slide just south of San Francisco

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### A Skilled Workforce

Caltrans Surveys, including Right of Way Engineering and Photogrammetry, consists of a skilled workforce of approximately 720 persons, including 320 licensed land surveyors, 260 Land Surveyor in Training (LSIT), 100 technicians and 40 drafting, administrative staff, and clerical professionals. As a result of changes to the California Business and Professions Code that prohibited civil engineers registered after 1982 from performing land surveying activities, Caltrans adopted a Land Surveyor series in 1988. Prior to that time, there were limited career advancement opportunities for licensed land surveyors in Caltrans. In 2000, a Transportation Surveyor deep class series was implemented, paralleling the civil engineering pay scales and career ladder.

Consultant firms under contract to the Department accomplished approximately 13% of Caltrans surveying workload over the last fiscal year. Consultants are important partners, providing professional services that give Caltrans the flexibility to manage workload and staffing imbalances by quickly bringing additional resources on-line. Firms interested in providing professional consultant services to Caltrans should monitor the Caltrans website for Architectural and Engineering contract information at the following link: <http://www.caltrans-opac.ca.gov/aeinfo.htm>.

### A Typical Project

A typical Caltrans project begins with a survey request to locate existing utilities, roadway, structure, and terrain

features. Existing survey control is researched and new project control points are established along the corridor as needed. Monument locations are placed in safe areas removed from traffic. State plane coordinates are established from Continuously Operating Reference Stations (CORS) and High Precision Geodetic Network (HPGN) monuments using GPS observations.

Elevations are established from NGS benchmarks. Crews then use GPS, total stations, and/or the Vangarde 505 pavement elevation surveying system to produce topographic, photogrammetric control, and right of way surveys. Digital terrain models and CADD files are created from the photogrammetric and conventional survey data. These files are delivered to highway designers and Right of Way Engineers (RWE). CAiCE (Autodesk, San Rafael, Ca.) is Caltrans' Cogo/DTM/roadway design software. Microstation (Bentley, Exton, Pa.) is the CADD program and is used to produce survey, photogrammetry, and right of way maps in a DGN format.

### Right of Way Engineering

Highway designers provide Right of Way Engineers (the Caltrans name for boundary surveyors, dating back to the days when the work was performed by engineering staff) with the limits of new property required for a project. RWE researches internal and public records to determine the boundaries of parcels affected by the new project. RWE then

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Aerial view of eastern span of the Oakland San Francisco Bay Bridge, Courtesy of Department of Transportation. Photograph by Bill Hall



Eastern span of the Oakland San Francisco Bay Bridge, Courtesy of Department of Transportation. Photograph by John Huseby.

requests survey field staff to locate existing boundary monuments for the project and for monument preservation. Armed with this information, RWE develops “acquisition maps” that show the property locations, parcels for acquisition, and remainders and excess. RWE also prepares descriptions for the parcels to be acquired. Right of Way agents use the mapping and descriptions to acquire the property.

New right of way boundaries are monumented near the end of construction. Corner Records and Record of Survey maps are completed and submitted to the local County Surveyor. The California Business and Professions Code Section 8774 (c) states that: “When required for a property survey, monuments within a freeway right-of-way shall be referenced to usable points outside the access control line by the agency having jurisdiction over the freeway when requested in writing by the registered civil engineer or licensed land surveyor who is to perform the property survey.” This is the process for private surveyors to use when tying to inaccessible monuments within a Caltrans right of way.

Right of Way Engineering is also responsible for the disposal of property no longer required by the department. This includes excess land (mapping and description provided by RWE), sales and relinquishment, and vacation. The California Transportation Commission (CTC) handles relinquishments (turning over control of property to counties and cities) and vacation (vacating the public’s right) through resolution. Resolutions, with descriptions, by the CTC are filed in the county of jurisdiction. Mapping is generally filed in the State Highway Map book located, by statute, in the county recorder’s office of the county of jurisdiction.

### Right of Way Records

Right of Way Engineering also maintains records. The Streets and Highways Code 128 states: “The department shall maintain, in each district office, a file of its final construction plans and right-of-way record maps for all completed state highway projects located within the district.” Staff can be contacted for monument ties and right of way

record maps. See the district contact list cited below for the individual districts. This information is available to the public during normal business hours.

RWE and Survey office staff prepare records of survey showing final monumentation and disposition of property owned by the state. These are filed in the county of jurisdiction.

### Design and Construction Surveys

Highway designers provide Surveys with design information in paper, Microstation, and CAiCE formats for pre-construction quality assurance, review, and construction staking note preparation. During construction the earthwork staking, finished grade, utility, and structure staking is done using total stations, GPS, and differential levels. Increasingly contractors are using automated machine guidance equipment and procedures are being developed and implemented to facilitate the use of this technology.

### Resource Materials

The District Surveys offices manage the field and office surveying operations and are the primary contact for obtaining available survey maps and documents. A map, with district homepage links and locations can be found at:[http://www.dot.gov/hq/row/landsurveys/documents/Internet\\_State\\_map\\_10\\_06.pdf](http://www.dot.gov/hq/row/landsurveys/documents/Internet_State_map_10_06.pdf)

For survey information and Caltrans’ Right of Ways maps: [http://www.dot.ca.gov/hq/row/landsurveys/documents/Contact\\_list\\_RWE.pdf](http://www.dot.ca.gov/hq/row/landsurveys/documents/Contact_list_RWE.pdf)

The Office of Land Surveys (OLS- formerly known as Geometronics) in Sacramento provides functional management for Caltrans’ Surveys and Right of Way Engineering activities. <http://www.dot.ca.gov/hq/land-surveys/>.

The Surveys Manual is produced and edited by OLS and establishes uniform survey policies and procedures within Caltrans. There are 14 chapters to the Surveys Manual: [http://www.dot.ca.gov/hq/row/landsurveys/SurveysManual/Manual\\_TOC.html](http://www.dot.ca.gov/hq/row/landsurveys/SurveysManual/Manual_TOC.html)

*Continued on next page*



The Office of Photogrammetry in Sacramento provides aerial photography, aerial mapping, orthophotography, and photogrammetric digital terrain data for the Departments use: <http://www.dot.ca.gov/hq/esc/photogrammetry/index.html>

The Office of Photogrammetry contracts with aerial mapping firms for all its aerial photogrammetry needs. Caltrans survey crews set the photo targets and coordinate them. The aerotriangulation is done in house. Consultants contract to do most of the map compilation. Photogrammetric mapping standards and Microstation resource files can be accessed at:

<http://www.dot.ca.gov/hq/esc/photogrammetry/resources.html>

Caltrans archives the negatives of uncontrolled and mapping photography. Existing inventory indexes can be examined visually and prints ordered from firms that are contracted to do the reproductions. The local district Photogrammetry Coordinator can be contacted for prints of aerial photography. In Sacramento, the Office of Photogrammetry also provides that service. For further information, the photogrammetry coordinators contact list can be found at: <http://www.dot.ca.gov/hq/esc/photogrammetry/contacts.html>

For structure site information, Preliminary Investigations (PI), located in Sacramento and Irvine, goes to every site where a bridge is going to be built or modified to gather the most recent site data for Structure Design. The PI webpage is located at: <http://www.dot.ca.gov/hq/esc/pi/>

## Geodetic Surveys

Caltrans surveyors recognize the accuracy limitation of NAD 27 control. They worked closely with NGS and others to establish and densify the High Precision Geodetic Network (HPGN), NAD 83 1991.35 epoch. The Department contracts with the National Geodetic Survey (NGS) to provide a Geodetic State Advisor, Marti Ikehara: <http://www.geodesy.noaa.gov/ADVISORS/California.shtml>.

Caltrans participates in the implementation of the National Height Modernization program in California. In partnership with the NGS, the California Spatial Reference Center (CSRC), local agencies, private surveyors and engineers, and the earthquake and geophysical community.

## Challenges

As with many other institutions, the aging of the baby-boomer generation is affecting Caltrans. Of the licensed land surveyors, LSITs, and technicians within Caltrans Surveys, over 200 have surpassed the age of 55 and an addition 150 are between the ages of 50 and 55. Approximately 50% of the current Caltrans Surveys workforce will likely be retiring within the next 15 years, creating succession planning and training challenges to overcome.

The large volume of traffic on California can make surveying alongside the highway hazardous. Chapter two of the survey manual is devoted to making the work environment safer. One surveyor who was killed on the job was Callie Joe Buser. He was struck by an impaired driver in 1992 while painting photo targets on the Antelope Valley Freeway. A scholarship fund in his name was created and to date Caltrans surveyors, in partnership with the California Transportation Foundation <http://www.transportationfoundation.org/>, have donated approximately \$60,000 in scholarships to surveying students.

## Community Outreach

Caltrans surveyors participate in outreach programs, CLSA, and BPELS. TrigStar is an annual high school mathematics competition sponsored to promote trigonometry and to acquaint students with surveying. Adopt a School is a long-term recruitment effort designed to expose middle and high school students to careers in transportation. Department engineers and surveyors give classroom presentation, tours, participate in high school career fairs, and volunteer for job shadowing. Caltrans surveyors recruit at colleges and conventions around the country. Caltrans liaisons work with CLSA and BPELS to promote surveying and provide input. ❖

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*Both this article and the accompanying People in Caltrans were written by **Kevin Akin, PLS**, with assistance from other Caltrans surveyors. Kevin is a Senior Transportation Surveyor in the Office of Land Surveys and has been employed by Caltrans since 1992. He received a B.S. in Surveying from Oregon Institute of Technology in 1980. Before coming to Caltrans Kevin previously worked for the Bureau of Land Management and several private firms.*





# People in Caltrans

Surveyors in Caltrans come from many different backgrounds, have different levels of education and experience, and do a wide variety of tasks. There is no one-career path that surveyors follow and there is no typical Caltrans surveyor. There are many different jobs within Caltrans Surveys to specialize in and to grow as a professional. Here are a few profiles of people who work in Caltrans, descriptions of what they do, and some of their day-to-day challenges.

**Carol (CJ) Vandegrift, LS 5788**, is a Senior Transportation Surveyor in District 4 (San Francisco Bay Area). She supervises field crews working out of the Richmond Field Office and is the district's survey equipment coordinator. Crews from this office are working on the new Bay Bridge and the highways in the upper San Francisco Bay vicinity.

CJ began her surveying career at Oregon Institute of Technology where she earned a Bachelor of Science degree in Surveying. Before coming to Caltrans in 1991, she worked for the Bureau of Land Management and private firms. She passed the California LS exam in 1987.

CJ's position is the link between the requestor and the field crews. Construction, Right of Way, and Design request surveying products that often must be interpreted for intent. Her biggest challenge is staying focused despite constant change and keeping a sense of humor about it all. Projects on different datums, funding issues, scope change, technological change, and "politics" all contribute to her day-to-day challenges.

When asked how to prepare for a position like hers in Caltrans, CJ responds that much of her job is not about surveying. Her job requires people skills such as knowing how to listen and communicate. She says: "It's all about communication and communication is imperfect". CJ says: "At times I feel like a cross between a parent and a circus master". Her varied experience has helped her to know that perfection does not exist. Learn from your experiences and keep doing the best you can do.



**Jackie Thomas** is a Transportation Engineering Technician working in the Richmond Field Office in District 4. She orders survey supplies, monitors inventory, and arranges equipment repair for all survey crews in the District. In addition, she has other general office and reporting duties for the field office.

Jackie started as a typist for Caltrans in 1973. Further education allowed her to advance into other positions. She has worked as delineator, on a survey field crew, in a material testing lab, and her present position.

It was Jackie's artistic abilities that got her into engineering and surveying. She became a delineator and saw how her hobby of drawing could be applied to mapping. She fondly remembers adding illustrations to bike path and horse trail designs. She then realized how art and engineering could come together. She later used her artistic ability and mapping experience while keeping field notes on a survey crew. She took classes, at Laney College in Oakland, on math, computers, and surveying to prepare for her other positions.

Jackie's biggest challenge is to keep the 15 District field crews supplied with survey supplies and equipment. She continually updates her spreadsheets and databases to stay on top of usage.

She says when she first started, surveying was a man's job and she was not always welcome. Jackie feels that women are more accepted now, but good leadership does make a difference in the workplace.



*Continued on page 30*

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**Russell Smith** is a Photogrammetrist II working in the Sacramento Office of Photogrammetry. Russ reviews the flight plan, what actually occurred during the flight and marks the photo targets and the pass points on the diapositives and prints. He then reads the coordinate values and adjusts all the pass points and photo targets to the control values. If there are any problems with the control, he communicates with the survey crews to resolve the problems. Currently adding pass points to the diapositives is a manual process using a Wild PUG 5 to place a mark on the diapositive emulsion. Coordinates positions on all the points are produced with an analytical stereo plotter. He says the next aerotriangulation process will be a completely digital softcopy system that uses scanned images and the manual process will be obsolete.

Russ obtained his LSIT in 1991 while still a student at California State Fresno and graduated with a BS in surveying in 1992. He began as an engineering student at CSUF and switched to surveying. He liked the visual nature of photogrammetry and how the industry applied new technology. After graduation, he worked for firms in Utah and Colorado. Russ gained valuable experience working in the private sector on a wide variety of projects. He mapped a golf course in Hawaii for a video game, cellular sites in Germany, and was on a team that mapped the entire state of Florida.

He has been employed in the Office of Photogrammetry for nine years. Russ is currently getting some survey field experience in District 10 (Stockton) and plans on taking the LS exam in the future. Caltrans aerotriangulation projects can be found anywhere in the state and vary from a few models to several hundred. He says his biggest challenge is resolving problems with control.

Russ says that photogrammetry is a changing profession and that computer literacy and education is a must. To understand how the data is being manipulated the photogrammetrist must be educated on the equipment/program and in the basics of photogrammetry and surveying.

**Carlos Camarillo, LS 6593**, is one of two Supervising Transportation Surveyors in District 8 (Riverside and San Bernardino Counties). He is in charge of a group that includes field crews, right of way engineering, utility location, GIS, photogrammetry, and A&E consultants.



As a manager, Carlos describes himself more as a facilitator between his staff, upper management, and other public agencies. He has responsibility and accountability for planning, organizing, budgeting, reviewing and directing the work of his 40 +/- staff and ensuring that they have the resources needed to accomplish the work tasked to them. He works with other internal managers, and interfaces with local transportation agencies in issues relating to land surveying matters. His typical day is spent monitoring projects, identifying and facilitating solutions to problems that could cause project delays, and working to help improve surveying processes. His internal customers are the Divisions of Right of Way, Construction, Maintenance, Environmental, Design, and others.

As a civil engineering student at the University of Arizona, Carlos' first introduction to land surveying was a surveying class that both intrigued and left him with a desire to pursue further surveying experiences. A summer job in 1980, surveying at a copper mine, turned into a two and a half year stint. While working for the mining company, he helped survey streets at the nearby company town, retraced mining claims, staked haul roads, rail spurs, and performed topographic surveys for quantities. The crew chief let him operate one of the first total stations (an HP 3820). This exposure to new technology is one of the things he likes about surveying. He kept working as a surveyor and never made it back to college to finish his degree. He has been employed in Surveys at Caltrans since 1983.

*Continued on next page*

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Carlos feels that his biggest challenges in his current position are keeping his staff engaged in the improvement of work processes and effectively communicating with technical and non-technical people on survey related issues. Surveyors are generally task oriented, but more than just good technical skills are required in his present position. Good verbal and written communication skills are essential. A good survey foundation helps him to understand problems and possible solutions. One of the things he reminds college students is to pursue their education, because, in today's work environment, it is a fundamental element in the development of long-term career goals. His advice to new surveyors is to develop a strong surveying background, embrace change, cultivate good work habits based on strong ethical values, acquire good communication skills, and learn to be a good facilitator.

**Brian Fox** is a Transportation Surveyor working on a North Region field crew based in Marysville. As a crewmember, Brian collects data with GPS receivers, total stations, and levels. After collection he assists with processing field data in Trimble Geomatics Office (Trimble Navigation, Sunnyvale, CA.) and Starnet (Starplus Software, Oakland, CA.) for import into CAiCE. This data is delivered to the Marysville surveys office for additional checks and merging with previous field efforts.

Brian passed the LSIT in 2004 and is studying for the 2008 LS. He is spending his free time studying and "hitting the books".

Brian came to Surveys from Maintenance where he was a structural steel painter in the Bay Area (District 4). He saw an announcement that volunteers were needed to work on construction projects. He volunteered and credits his high school math classes and military training as reasons he was chosen. Brian became a Transportation Engineering Technician on a crew surveying for the new Bay Bridge. There were many opportunities to operate the equipment and he worked hard to learn surveying. Caltrans in-house training has also added to Brian's surveying knowledge.

A typical field season in the North Region is broken up into winter and summer months. Mapping surveys are done in the winter and Brian works on construction staking projects in the summer. The construction season has been busy and there has been lots of work. Brian says that one of the biggest challenges is to maintain cohesion and communication between all the people involved on large project.

Brian feels that a surveyor must know many aspects of construction and design to produce surveys that the requestor needs. His goals are to obtain that knowledge, get licensed, and to become a successful party chief. ❖



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# CLSA Honors Volunteers



*Robert J. Reese, PLS, Member of the Year with James M. Herrick, PLS, CLSA President*



*Chad Dickey, Los Angeles Chapter Treasurer with James M. Herrick, PLS, CLSA President*



*Paul Cuomo, PLS with Steve Shambeck, PLS, CLSA Past President*

## Member of the Year

CLSA Member of the Year is awarded to someone who is considered to be the person that has best supported and promoted the objectives of CLSA and who has contributed the most to CLSA activities. This year's recipient, Robert J. Reese, PLS, has gone above and beyond the call of duty. He has dedicated his time, energy and talents to CLSA and the profession for many years. Chances are you have met him because he has attended a meeting of every CLSA Chapter. If you haven't met Robert, you have probably read one of the many informative articles he has contributed to the California Surveyor magazine. Or, perhaps you have worked with him on one of the many committees he has chaired over the past years including the Advanced Technologies Committee, Nominating Committee, Past President's Advisory Council and the Professional Practices Committee. Robert is a past president of CLSA. During his presidency he was instrumental in the development of CLSA's recruitment DVD and remains a driving force and champion of the CLSA Student Outreach Program. Thank you Robert for your dedication to CLSA and the land surveying profession.

## Chapter of the Year

The Chapter of the Year Award is presented to the CLSA chapter that best demonstrates overall excellence and has best supported and promoted the mission and objectives of CLSA. This year's Chapter of the Year award was presented to the Los Angeles Chapter. The Los Angeles Chapter made great strides in 2007 including an overwhelming increase in membership. This is, in part, due to the development of an LS Review Course. In addition to the review course, the chapter has launched a new website and newsletter helping to keep members up-to-date on chapter activities. Congratulations Los Angeles Chapter and keep up the good work!

## Distinguished Service Award

**The Distinguished Service Award is CLSA's highest service recognition.** As such, the recipient must demonstrate exemplary service to the profession extending beyond the chapter/local level for an extended period of time. This year's recipient, Paul Cuomo, has contributed greatly to the survey profession in many ways. He has served as CLSA President as well as President of the Orange County Chapter.

Paul was licensed in 1973 and began teaching survey classes at Santa Ana Jr. College. He has been a mentor to many in the profession who have taken his classes at SAC and Santiago Canyon College plus his review courses. Paul has allowed more than a few to re-take his review course without paying a second or third time. Paul is the current Chairman of the California Foundation for Land Surveying Education. Some of his accomplishments to date include:

- **Initiated the 4-year Surveying Option program at Cal-Poly Pomona.**
- **Supported Cal-Poly Pomona's successful effort to obtain ABET Accreditation**
- **Provided \$100,000 in scholarships for both Cal-Poly and CSU Fresno surveying students.**
- **Provided \$50,000 in equipment donations for the Surveying Programs at Fresno, Cal-Poly, Santiago Canyon Community College and San Jacinto Community College.**
- **CFLSE's Board has also served as the Surveying Advisory Committee for Santiago Canyon Community College.**

Paul recently also contributed to CLSA Exam Guide by providing a chapter on Legal Descriptions and has headed the Orange County Chapter's "L.S. Exam Test Taking Techniques" given in 2005 and 2006. For over thirty years Paul has been helping and mentoring young surveyors and even a few older ones, and he still is doing it with his seminars from California to Washington to Iowa. ❖





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**HOLY COW!** The CLSA Conference 2008 in Reno, Nevada was a resounding success! Held at the Silver Legacy Resort and Casino in downtown Reno, the conference was well attended, with surveyors shrugging and laughing at a spring snowstorm that snarled traffic on Interstate 80 and delayed flights into Truckee Meadows. Total attendance for the event was in the neighborhood of 500 surveyors, spouses, vendors and students, including nine former CLSA presidents.

On Saturday, the day before the conference opening, Gary Kent, nationally known surveyor and chairman of the NSPS committee responsible for updating the ALTA/ACSM standards, presented an all-day workshop on easements and rights-of-way. That evening the CLSA Scholarship Foundation hosted a bowling tournament across the street at the National Bowling Stadium. This was a lot of fun and the next time the conference is held in Reno, you must be sure to get in on this exciting event!

The opening ceremonies kicked off on Sunday afternoon. President Jim Herrick and Education Foundation chairman Steve Martin introduced this year's big scholarship winners and gave out two important awards: the Distinguished Service award went to Paul Cuomo and the Member of the Year award went to Robert Reese. Both of these gentlemen have worked hard on behalf of the organization for many years and the awards were well deserved indeed. One other award was announced by President Herrick, and this one carries national recognition. Our own California Surveyor magazine was recently cited for Excellence in Journalism by the American Congress on Surveying and Mapping (ACSM) and an award will be presented to editor John Wilusz at the March 2008 ACSM conference in Spokane, Washington. Congratulations John on setting such a high standard!

The keynote address was delivered to a very full room by none other than Marc Cheves, editor of The American Surveyor magazine. In a speech filled with both energy and humor, Marc touched on many things relevant to today's surveyor, including the fact that a shortage of land surveyors in Louisiana drove the land development community to clamor for the relaxing of licensure requirements. He noted that in Florida a similar shortage created a movement to allow civil engineers to practice surveying. Marc also talked about the ubiquity of GPS and commented on the fact that even now there are unpredictable times when the satellite constellation is insufficient for surveying.

As usual, a wide variety of workshops and talks were available throughout. On Sunday, Tim Redd of Silicon Valley Land Surveying outlined the process of terrestrial laser scanning, or High Definition Surveying as it is popularly called. Jill Johnson from Leica gave a comprehensive overview of RTN networks, while Mike Durkee, an attorney whose name is familiar to our readers, held a discussion on the Subdivision Map Act.

Monday's offerings included a four-part all day course entitled Pins, Cushions and the Law presented by national speaker and surveyor John Stock. Stock questioned many of our notions on how to approach boundary work, how to deal with the other surveyor, and what to do about multiple monuments. He touched on other topics as well. For example, he had us look around the room and notice the collective age of the group. We are not a youthful bunch! The time to entice young people into our aging workforce is now.

Also on Monday Bruce Joffe discussed the responsibilities of GIS professionals and Ron Scherler summarized the BLM's Certified Federal Surveyor program. Matt Eklund of Sukut Construction, Inc, described in great detail how his company has successfully implemented GPS machine guidance equipment and what that has meant to the workflow of large projects, as well as how this has changed (and diminished) the role of the surveyor. He noted that more and more construction firms are adopting these methods and made some suggestions as to where surveying fits in, and where it doesn't, in this brave new world. We'll be hearing a lot more about this in the coming years, mark my words. The Monday luncheon featured Patrick Lee as Thomas Jefferson and was both moving and informative. Lee slips into and stays in the role so effortlessly that it feels like you are actually seeing and hearing our most forward thinking president. The last two hundred years just melted away.

A friendly and enthusiastic group of vendors populated the exhibitor's hall. You could find information on insurance, photogrammetry, drafting supplies, monuments, numerous brands of survey instruments and software, truck boxes and every kind of survey tool. CSU Fresno, the Mt. Diablo Historical Society, the California Spatial Reference Center and the National Society of Professional Surveyors, among others, had booths in the hall.

*Continued on next page*

The annual scholarship auction, once again anchored by Lightning Williams, was huge fun and raised a heap of cash that CLSA will distribute in the form of scholarships in the coming year. Barbara Herrick donated another beautiful quilt with a surveying theme. Lightning drove the bidding up to a frenzy and the quilt brought in a thousand dollars. Rumor has it that this is the last quilt that she will be making and what a way to go out. Thanks Barbara, for all your hard work and artistry! The silent auction contained many items that surveyors could not live without, that is, except for those surveyors who donated them in the first place. There were old books, old instruments, wine, pictures, pocketknives and various gift certificates. A lot of folks went home with good deals, or at least good junk. We certainly did. This makes you wonder why no one has ever tried to open a survey thrift store. Anyway, the two auctions brought in over 15,800 dollars and that is outstanding!

On Tuesday Jim Pilarski made a presentation on preparing legal descriptions, and he included a terrific handout with his discussion. David Paul Johnson, always a crowd favorite, talked about the surprising results of some experiments he made using long distance RTK GPS. This led him to question some general understandings of the limitations of RTK. Jim Pilarski also presented a talk on ALTA surveys and our legislative advocate, Ralph Simoni of California Legislative Advocates, gave a very informative talk on politics and legislation in California. Steve Parrish and Skip Robinson co-presented a very interesting cadastral boundary dispute in extreme southern California involving questionable corner identification, a series of BLM resurveys, and a lawsuit against the federal government from an angry landowner.

The BPELS Panel Discussion on Tuesday afternoon revealed that one of the problems surveyors are getting into these days involves the abuse of right-of-entry privileges. Here are some tips: whenever practical, alert landowners before entering their property, keep a copy of the right-of-entry statute in your truck, and don't get carried away with the orange paint! Right-of-entry cards and survey notification door hangers are available at nominal cost from CLSA Central Office. In fact, staple a business card to a door hanger and you've got free (almost) advertising.

On Wednesday, Mike Weaver discussed the future of NGS and Marti Ikehara spoke on the NGS's national readjustment and height modernization. John Briscoe, famous land attorney, author and friend of CLSA, gave a great talk touching on evidence, privilege and concepts of the legal system that surveyors should be familiar with. John's knowledge and experience is so broad and deep that he takes all the mystery, and much of the fear, out of the courtroom aspects of surveying.

The closing ceremonies marked the end of another successful, fun, and expertly run CLSA annual conference. It's such a pleasure to meet old friends, make new ones, and socialize with those who speak our common surveying language. ❖

Conference Highlights on next page



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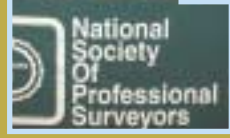
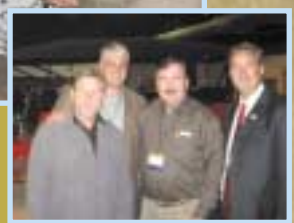
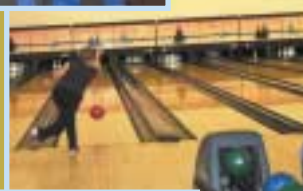
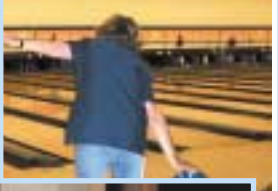
# CLSA CONFERENCE 2008 Highlights



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# Congratulations Scholarship Award Winners!

**Bill Young Memorial, Riverside/San Bernardino Chapter (\$2000)**

Jason Wolf, California State Polytechnic University Pomona

**Bud Uzes Memorial Scholarship (\$1500)**

Dennis Drew, California State University Fresno

**Central Valley Chapter Scholarship (\$1000)**

Alex Calder, California State University Fresno

**Channel Islands Chapter Scholarship (\$625)**

David Biswanger, California State University Fresno

**Channel Islands Chapter Scholarship (\$625)**

Marisol Serrano, California State University Fresno

**Cliff Lewis Memorial Scholarship, Central Coast Chapter (\$1000)**

Amy Galvan, California State University Fresno

**CLSA A.E. "Ed" Griffin Memorial (\$1500)**

Charles Miller, California State University Fresno

**CLSA Dick Hogan Memorial (\$1500)**

Christopher Vang, California State University Fresno

**CLSA Education Foundation Roy Minnick Memorial Scholarship, (\$1500)**

Paul Fridley, California State University Fresno

**CLSA Education Foundation Scholarships (\$750)**

Joseph Waltz, College of the Canyons

**CLSA Education Foundation Scholarships (\$750)**

Thomas Marsh, California State University Fresno

**CLSA Education Foundation Scholarships (\$750)**

Khae Saetern, California State University Fresno

**CLSA Education Foundation Scholarships (\$750)**

Sherrie Vaughn, Santa Rosa Junior College

**CLSA Education Foundation Scholarships (\$750)**

Brian Frame, Evergreen Valley College

**CLSA Education Foundation Scholarships (\$750)**

TiliAnne Tanner, Santa Rosa Junior College

**CLSA James E. Adams Memorial (\$1500)**

Pa Vang, California State University Fresno

**CLSA Presidents Scholarship (\$1000)**

Fredrick Gregory, California State University Fresno

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*Continued on next page*

## Congratulations Scholarship Award Winners!

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**Orange County Chapter Past Presidents Scholarship (\$875)**

Tyler Overmire, California State Polytechnic University Pomona

**Orange County Chapter Past Presidents Scholarship (\$875)**

Mario Flores, California State Polytechnic University Pomona

**Riverside/San Bernardino Chapter Scholarships (\$1000)**

Keith Ream, California State University Fresno

**Roy Minnick Memorial Scholarship, Northern Counties Chapter (\$1750)**

Travis Bohan, California State University Fresno

**Stanley R. Smith Memorial Scholarship, Monterey Bay Chapter (\$750)**

David Biswanger, California State University Fresno

**Tim Adams Memorial Scholarship, Riverside/San Bernardino Chapter (\$1000)**

Brandon Barnett, California State Polytechnic University Pomona

**Vance F. Breshears Scholarship, San Diego Chapter (\$1000)**

Joaquin DePaz, California State University Fresno

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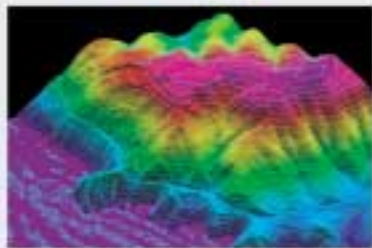
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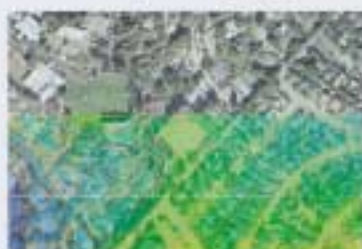
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## Thank You Letters From our Scholarship Award Recipient

To CLSA Education Foundation:

*I'd like to thank you for your sponsoring me with a scholarship. I truly can't begin to convey my appreciation for your support. As a student it is often difficult to provide for yourself especially in a demanding discipline like Engineering. At an upper-class level of study, classes can be very time consuming, often leaving little or no time to hold a job. In my studies I've made it a priority to put school above all else so that I can maximize my efforts. It is my belief that this will allow me to be well equipped to enter the professional community.*

*As an Eagle Scout, I've been taught to hold leadership with high regard. I believe that CLSA is one of, if not the leading organizations in promoting the profession and providing incentives for students to pursue a career in geomatics. I hope that someday I will be able to live up to the high standards set forth by professional organizations like CLSA. I look forward to interacting with CLSA in the future to help further the profession.*

*Sincerely,  
Travis Bohan*

Dear CLSA:

*My name is Joseph Waltz, and I am the recipient of a \$750.00 scholarship from the education foundation. I received the check yesterday, and wanted to thank you. This scholarship money will help me continue my education at College of the Canyons, and assist me with future education. I look forward to a long and prosperous career as a Land Surveyor, and your help has shown me that the community of professional Land Surveyors supports me in this goal.*

*Sincerely,  
Joseph Waltz*

Dear Members of CLSA:

*When I am asked about my future career and describe the profession, I always specifically distinguish the overwhelming amount of financial support that companies and organizations give to Geomatics Engineering students at Fresno State. The importance of attaining summer work experience in a surveying environment is well known, and unfortunately, most companies that offer summer internships do not supply housing. Scholarships are what make it possible for students like myself to be able to afford a place to live while gaining experience over the summer. It is with great honor that I thank you for scholarship of one thousand dollars and the opportunity to gain further understanding of my major and future profession.*

*Sincerely,  
Keith Ream*

Dear CLSA:

*This is a letter of appreciation for your recent contributions to the CSU, Fresno 47th Annual Geomatics Engineering Conference and also for your scholarship donation. Thank you very much for the CLSA Education Foundation award. I came to the CSU, Fresno Geomatics Engineering Department as a post baccalaureate student intending to focus on Photogrammetry and GIS. However, through events like conferences, classes at CSU, Fresno and having met so many outstanding individuals such as yourself in the field of land surveying, I am motivated and compelled to pursue a licensure in land surveying in addition to my original goals. Last year's conference and this year's conference provided the opportunity to network with committed individuals and to learn about others' accomplishments in the field of Geomatics Engineering. Donations of scholarships open doors for students, not only for the necessity of financing books and*

*tuition, but also they open doors to attend national conferences such as CLSA, ACSM, and ASPRS. Your support provides a view of the profession at large, and your support gives me faith and hope and inspires me to do the best. I believe I can speak for my fellow students and say you have inspired us to be proud of our Geomatics profession and we are grateful for your support and generosity.*

*Sincerely,*

*Khae Saetern*

To CLSA Education Foundation:

*Thank you for the Roy Minnick Memorial Scholarship that you presented to me at the 47th Annual CSU, Fresno Geomatics Engineering Conference. It is an honor to be chosen for such a distinguished award. I want to assure you that your contribution has gone to an excellent cause, for I will be using the money entirely on educational needs and expenses. Thank you for the opportunity to focus my time on my educational goals rather than working forty hours a week. Your support of not only myself, but the entire CSU, Fresno Geomatics Program is greatly appreciated.*

*Sincerely,  
Paul Fridley*

Dear CLSA:

*Thank you for your recognition and generosity in awarding me a \$500.00 scholarship. I would also like to express my gratitude for inviting my guest and I to such a nice dinner meeting. More than anything else, thank you for assisting me in my journey into a profession I hold dear. I am proud to associate myself with such a wonderful group of professionals. Your generous award has brought me even closer to another one of my goals of teaching at the community college level. I look forward to the day that my journey is complete and someone asks me the question "what do you do for a living?" I will look at them and proudly say, "I'm a Surveyor."*

*Thanks again for your generosity.*

*Sincerely,  
Jennifer Horton*

*CLSA Education Foundation  
P.O. Box 9098  
Santa Rosa, CA 95405-9990*

*Recently, at the CLSA Conference in Reno, I received a scholarship from your organization. The scholarship was in memory of Mr. "Ed" Griffin. It is an honor to receive a scholarship in memory of an individual such as Mr. Griffin who understands and values a formal education in Land Surveying. Your donation has helped me to relax concerning my finances, and enabled me to focus on the classes I am taking this semester. Thank you very much for your financial support. Seeing organizations such as yours support the education of future professional land surveyors through your auctions and other efforts has helped confirm to me that I chose the correct industry to become involved in. After seeing inspiring scholarship donations such as yours, I look forward to one day returning the favor and helping future students with their financial needs.*

*Thank you very much for your generosity.  
Sincerely,  
Chase Miller*

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# GPS Network Analysis and Adjustments

We present here an outline for GPS adjustment procedures to test whether we as a profession are following similar thought processes and a guide for those that haven't made up their minds yet.

Network analysis and adjustments can be defined generally as the process of validating the integrity of the measurements and constraining the measurements to known horizontal and vertical coordinates. This process is applicable to radial networks as well as complex interconnected arrays. The adjustments, horizontal and vertical, technically should be handled as separate processes when determining horizontal positions or orthometric heights (elevations). If both are required for a project then the process occurs in the following steps.

**Step 1: Validate the internal consistency of the measurements and remove bad data.**

**Step 2: Fix a single position (Latitude, Longitude, Ellipsoid Height on a known valid control point) and analyze closures on other known points**

**Step 3: Fix all acceptable control points to develop horizontal coordinates on all points in the survey.**

**Step 4: Fix a single height to develop heights and analyze closures on other known heights.**

**Step 5: Fix all acceptable heights to develop vertical coordinates on all points in the survey.**

Step one is a minimally constrained adjustment used to validate the integrity and accuracy of the measured stand-alone vectors (baselines). Step two follows after removing unacceptable measurements. Step two is a minimally constrained adjustment fixing a known latitude, longitude and ellipsoid height (GPS coordinates) for the purpose of comparing the computed versus record positions (closures) at other known points. Step three is the constrained adjustment which fixes all the points determined to be acceptable in Step two and is used to develop adjusted three dimensional GPS coordinates. These adjusted coordinates (latitude, longitude and ellipsoid height) are the basis for applying a projection (i.e. State Plane or local) and computing grid coordinates.





If orthometric heights (elevations) are necessary then technically the adjustments should be processed separately and be free in the horizontal dimension. Step four fixes a single point for horizontal and a single point at a known orthometric height for the purpose of comparing the computed versus record heights (closures) at other known points. Step five fixes acceptable points in a vertically constrained adjustment to develop orthometric heights on all points in the network. The best results will be obtained if an NAVD88 height is used and includes a geoid model (i.e. Geoid03). Fixing an NAVD88 height and applying the geoid model results in pseudo-ellipsoid heights (pseudo meaning "as if") that may vary about 10 centimeters from the actual ellipsoid heights determined in Steps two and three. The resulting orthometric heights will only be as good as the geoid model and the measured ellipsoid height differences. The absolute accuracy can be better than 3 centimeters and the relative accuracy could approach 1 centimeter over a local area if diligent procedures are followed. There are some variations of these adjustments where tilts or rotations in the surfaces are solved to improve the overall fit with existing local control point positions and heights and will be discussed in a separate article.

A thread title "GPS Network Analysis and Adjustments" is available on the CLSA Forum for comments and questions. The Advanced Technologies Committee welcomes the opportunity for exchange. ❖

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# Q&A SMA Expert



## Question:

***I understand some counties refuse to recognize any properly filed and recorded subdivision maps if they pre-date 1929. I currently am working with a map that was properly recorded in 1914. Are the parcels shown on that map legal parcels today?***

## Answer:

Excellent question! In the author’s opinion, yes. A bit of background may be helpful. First, we know that the California Supreme Court has determined that subdivision maps properly recorded prior to 1893 did not themselves create legal parcels. Second, we know that most if not all jurisdictions recognize maps properly recorded after 1929. So, it is this period between 1893 and 1929 that is now drawing the attention of land use practitioners.

Prior to 1893, subdivision maps were recorded, but they were merely lot “descriptors,” not lot “creators.” Under the pre-1893 law, a lot depicted on the face of a subdivision map did not become a legal lot until it was actually conveyed by a deed. Those who give the year 1929 creation importance argue that conveyance is required in order to create a legal parcel for all maps properly recorded between 1893 and 1929. However, in the view of the authors, as of 1893, the Map Act did much more – a recorded subdivision map changed from being a short form lot descriptor to a full-fledged lot creator.

### ***The Post-1893 Concept of Lot Creation by Map Recordation***

Under the modern Subdivision Map Act, the post-1893 concept of lot creation by map recordation is reflected in Government Code section 66412.7. Section 66412.7 provides that a lot is created or “established” on the date that the map showing the lot is recorded with the County recorder. Those who give importance to the year 1929 give weight to the modern language of the Map Act and its use of the terms “parcel map” and “final map” as the only maps that when recorded create the lots shown. The term “final map” was first used by the Map Act in 1929. But California courts and the state Attorney General have concluded that other recordable maps from the early 1900s, often called “plats” or just “maps,” likewise created lots upon their recordation. The key to the lawfulness of the post-1893 lots is the recordation of the map, not the name given to the recordable map. As Shakespeare’s Juliet said, “What’s in a name? That which we call a rose by any other word would smell as sweet.” See also Civ. Code § 3528 (“The law respects form less than substance.”). The “name” of the recordable map is form, the fact that the map is properly recorded after 1893 and depicts lots on its face is substance.

### ***Map Act Grandfathering Provisions***

Beginning in 1907 and continuing until the present day, the Map Act has always “grandfathered” older subdivisions (and the lots they created) that were properly recorded under the law in place on the date of the map’s recordation. Through these grandfathering provisions, the Map Act recognizes the continuing validity of legal parcels created by properly recorded subdivision maps after 1893. With respect to subdivision maps recorded prior to 1929, the 1937 Map Act confirmed the validity of “any parcel or parcels of a subdivision of land (1) a map of which was recorded or filed prior to August 14, 1929, or in compliance with the provisions of Chapter 837, Statutes of 1929. . . .” (Emphasis added.)

Today, the Map Act expressly provides that the modern rules of the Map Act “do not apply to any parcel or lots of a subdivision . . . sold . . . in compliance with or exempt from any law (including a local ordinance), regulating the design and improvement of subdivisions in effect at the time the subdivision was established.” Gov. Code § 66499.30(d). (Emphasis added.) Those who give importance to the year 1929 argue that the Map Act did not regulate the design and improvement of subdivisions prior to 1929. However, beginning in 1893, the Map Act required recorded maps to describe all land intended for avenues, streets, lanes, alleys, courts, commons, or other public uses and all lots intended for sale, either by number or letter, and their precise length and width, and that all land proposed for dedication as a public highway be shown. These requirements clearly are design and improvement requirements

The 1929 proponents also contend that under the Map Act, an antiquated subdivision is not established unless the subdivision map received local agency approval, and that local agencies did not obtain authority to approve subdivision maps until 1929. As stated above, Map Act section 66499.30(d) exempts from the modern subdivision rules “any parcel or lots of a subdivision . . . sold . . . in compliance with or exempt from any law (including a local ordinance), regulating the design and improvement of subdivisions in effect at the time the subdivision was established.” Map Act section 66412.7 defines the term “established” for purposes of Section 66499.30(d) and, according to the 1929 proponents requires local agency approval for a subdivision to be established.

However, Section 66412.7 does not provide that local agency approval of a subdivision map is required for a subdivision to be considered established. Section 66412.7 is comprised of two parts. The first part states the simple rule that a subdivision is established when the subdivision map is properly recorded. No local agency approval is required. Local agency approval applies only to the second part of Section 66412.7, which sets forth a narrow exception to the first part.

*Continued on next page*

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Moreover, in many cases, local agencies in fact approved subdivision maps prior to 1929, although the 1929 proponents do not consider these approvals to be the type of approvals contemplated by Section 66412.7.

**Grandfathering Under Modern-Day Map Act Section 66451.10**

Finally, modern-day Map Act section 66451.10 is another grandfathering provision. Section 66451.10 provides that:

... two or more contiguous lots or units of land which have been *created under* the provisions of this division, or *any prior law regulating the division of land*, or a local ordinance enacted pursuant thereto, or which were not subject to those provisions at the time of their creation, shall not be deemed merged by virtue of the fact that the contiguous lots or units are held by the same owner, and no further proceeding under the provisions of this division or a local ordinance enacted pursuant thereto shall be required for the purpose of sale, lease, or financing of the contiguous lots or units, or any of them. (Emphasis added.)

This section's key phrase is "created under ... any prior law regulating the division of land." The *only* requirement is that the prior law regulated the "division of land." No reasonable person

could dispute that beginning in 1893, the map statutes regulated the division of land.

**Conclusion - The Big Picture**

Certain land use practitioners fear that the recognition of lots created by subdivision maps recorded between 1893 and 1928 will lead to rampant unregulated development. However, such fears are unfounded. The reality is that local governments have numerous tools (beyond the Map Act) to regulate the development of property, regardless of whether or not older maps created legal lots. The allowed uses of, and ability to place development on, lots is controlled by local general plans, specific plans, zoning codes, and other local regulations. Cities and counties should be relying on these planning tools, rather than misinterpretations of the Subdivision Map Act, to effectuate their policy goals.

**About the Author**

**Michael Patrick Durkee**, a partner in the Walnut Creek office of Allen Matkins, represents developers, public agencies and interest groups in all aspects of land use law. Mike is the principal author of *Map Act Navigator* (1997-2008), and co-author of *Ballot Box Navigator* (Solano Press 2003), and *Land-Use Initiatives and Referenda in California* (Solano Press 1990, 1991). 415.273.7455 mdurkee@allenmatkins.com

"Mike wishes to thank Tom Tunny, Senior Counsel at Allen Matkins, for his assistance in writing this article."

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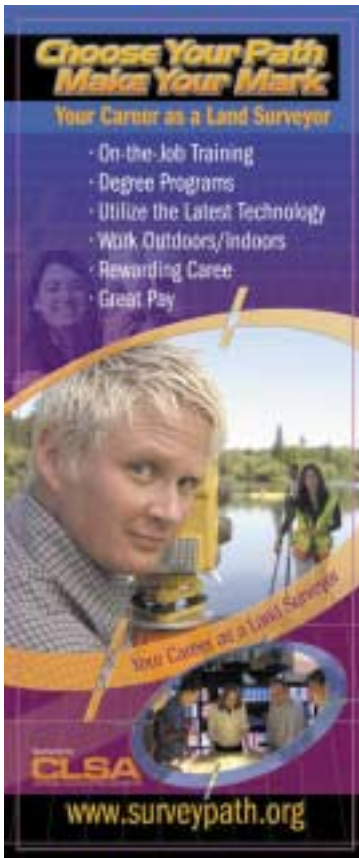
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## Recruitment Success Story

So there I was... at the Northern California Construction Careers Awareness Day (CCCAD) - an event that promotes awareness of the opportunities in the construction trades available to young people. The morning was set up for High School students; the afternoon was a "helmets to hardhats" session introducing members of our armed forces to construction careers after completion of their military service.

After meeting and greeting about 1,200 high school students, telling them about this cool profession called Land Surveying, I was ready for some people with a slightly longer attention span... Along came a young Airman. He was on terminal leave from the USAF. He had been a specialist working with satellites. His dad was with him, and had already introduced him to the operators and grade checkers at the Operating Engineers, Local 3 booth. The father was a union laborer for one of the big construction firms, and although he had provided well for his family, he wanted better for his son.

They stopped at the Caltrans booth, and asked questions about Land Surveying as a profession. I showed him a total station, and demonstrated some of the capabilities. We talked for a half an hour or so, about all the different career paths that are available to a person interested in land surveying. We discussed the Union apprenticeship program, educational opportunities, internships, opportunities at Caltrans after passing the LSIT exam, and the role of professional societies such as CLSA in establishing working relationships and maintaining high professional standards.

The more we talked about all the aspects of land surveying, the more interested the Airman became in choosing his path, and making his mark. I invited him to the Chapter meeting, which was only a couple days away. He arrived early to the meeting, right at the start of the pre-meeting stage. We talked more about different areas of the state, and projects we had worked on. He took it all in stride, and I introduced him in the meeting as an aspiring land surveyor looking for an entry-level position with a local firm. At the end of the meeting, he was busy talking with several managers of local firms. I told him to call or e-mail me if there was anything I could do for him.


That was the last I saw of the Airman, until last month at the International Sportsman's Expo (ISE show) at Cal Expo. I was walking around, trying to decide what to spend money on next, and I recognized a familiar face across the exhibit hall. I couldn't recall the Airman's name, but I remembered the events listed above, and asked him what he was doing? He proudly said that he had been accepted into Local 3, was attending the Union surveying classes, and happily working for a large firm here in the area. I'd call that a recruiting success story... What can you do to create one of your own? ❖

---

**Rob McMillan, PLS**, is Chief of Survey Standards, Division of Right of Way and Land Surveys, California Department of Transportation.

## Index To Advertisers

Allen Instruments & Supplies	33
Allen Precision Equipment	15
Berntsen International, Inc	47
California Surveying & Drafting	60
Cartwright Aerial Surveys	25
CD Data	45
Data Tree	21
HJW Geospatial	39
Holman's, Inc.	49
Latitude Business Software	53
Leica Geosystems	13, 43
Lewis & Lewis	19
Office Depot (Member Benefit)	4
RBF Consulting	47
Reese Water & Land Surveying	35
Rick Engineering	17
Santiago Canyon College	9
Silver Shields System	3
Sokkia	41
Software By D'Zign	31
Surveyors Service Company (SERVCO)	2, 59
Surv-Kap	35
TopCon	7
Trimble	29
Tri State Surveying, Ltd	33
Vista International	9



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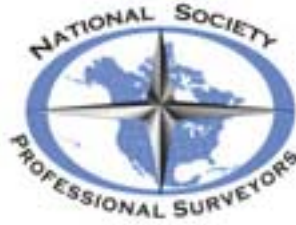
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By: Carl C. de Baca, PLS



## National Society of Professional Surveyors NSPS Area 9 Director's Report

Greetings to all land surveyors in NSPS Area 9 (California, Nevada, Hawaii, and Guam). As your new director, installed at the March 2008 ACSM/LSAW conference in Spokane, Washington, I would like to share a few thoughts and observations with you regarding the National Society of Professional Surveyors. Although many of the issues affecting our profession are covered at the state level, there are good reasons to consider membership in NSPS as well. For example:

1. NSPS is responsible for the technical portions on the ACSM/ALTA standards. The Standards committee has developed, and is continuously refining, the model minimum technical standards for surveys (not just ALTA surveys). They are also charged with preparing specifications for photogrammetric control surveys and the model accuracy standards for construction surveys.
2. An NSPS committee is involved with the BLM on efforts to generate a new Manual for the Survey of Public Lands. This new manual is expected to be completed and published jointly with ACSM in May of 2009.
3. The NSPS Legislative Liaison committee battles via our lobbyist to make sure that on government contracts design professionals, including surveyors, are consistently selected based on qualifications rather than cost. If your firm encounters a federal RFP whose selection is cost-based, you can contact the ACSM Joint Government Affairs Committee and they will work to have the offending RFP rescinded and re-issued. They have a very high batting average in this regard.
4. NSPS is part of a coalition fighting to preserve the budgets for both the NGS and the USGS. The NSPS also helps develop standards for FEMA flood certification surveys.
5. The NSPS Private Practice committee is developing a list of skill sets that survey firms would like to see in graduates of two and four year survey college programs. They are also contemplating a national cohesive policy with respect to the surveying aspects of machine guidance.

6. NSPS is working on introducing legislation to ensure that before a railroad removes a track and abandons the right-of-way, sufficient monumentation shall be in place and/or a map shall be filed that will provide for accurate right-of-way retracement.

7. You might be accustomed to thinking of TrigStar as a state or local program, but it is administered nationally by NSPS. NSPS is working with the U.S. Congress to secure significant funding which would allow for an impressive expansion of the program.

There are numerous other NSPS committees working on a host of issues that affect the land surveying profession, from educating the public about what we do to assisting states where the practice of land surveying is under assault. Take the case of Alabama. Rural Surveyor legislation was recently introduced to loosen licensing requirements, ostensibly to solve the problem of a shortage of surveyors in sparsely populated areas. At the request of the Alabama Society of Professional Land Surveyors, NSPS offered guidance and letters of support in an effort to derail the legislation.

The function of the NSPS is not to replace state professional societies, but to work with them to edify and unify the profession throughout the nation. If the issues mentioned above interest or concern you, then please consider joining the National Society of Professional Surveyors and getting involved.

More information on the National Society of Professional Surveyors can be found on the internet at: [www.npsmo.org](http://www.npsmo.org) You can contact the NSPS Area 9 Director at: [alidade.nv@sbcglobal.net](mailto:alidade.nv@sbcglobal.net) and the NSPS California Governor at: [mvernon@rbf.com](mailto:mvernon@rbf.com)

---

*Carl C. de Baca, PLS, is the owner of Alidade, Inc., Elko, Nevada, is a past editor of the California Surveyor, and is the current NSPS Area 9 Director.*

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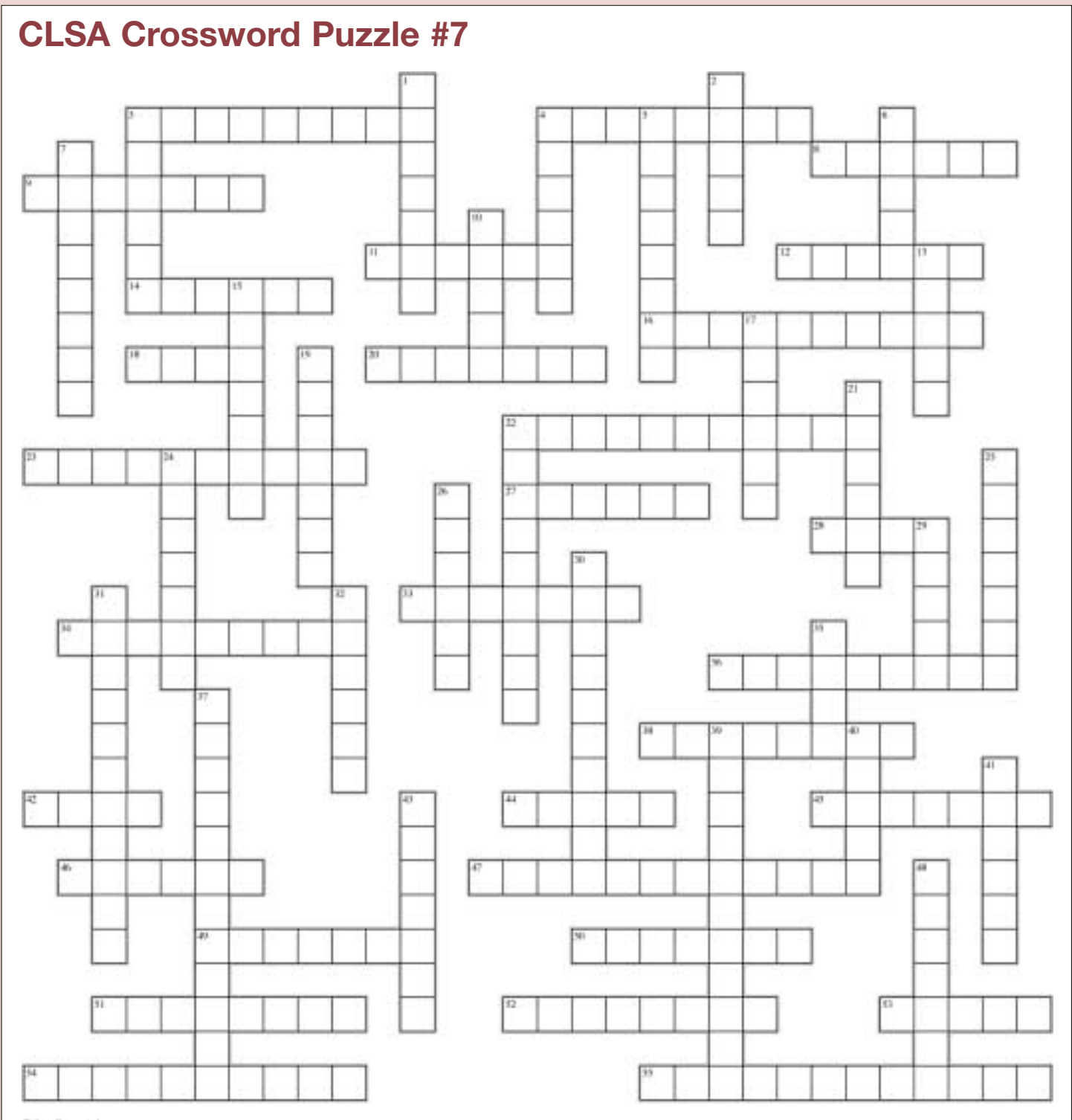




# Crossword Puzzle

By: Ian Wilson, PLS

## CLSA Crossword Puzzle #7



**Ian Wilson, PLS** is the president of Ian Wilson Land Surveying, Inc., in Temecula, CA. His practice specializes exclusively in boundary and topo surveys. He has worked in both private and public sectors for small firms in California and Caltrans, respectively. As well as being a licensed land surveyor, he and his wife, Laura, are newly certified SCUBA divers. They are looking forward to "getting wet" on future trips along coastal California and around the world.

## Across

3. WATER STORAGE DEPRESSION
4. DISPLACEMENT
8. TAKE A DRAFTING POWDER
9. DISTANCE TO THE RIGHT OR LEFT BUT NOT POLITICAL
11. LONGTERM SURFACE OSCILLATION
12. SHORT PERPENDICULAR
14. POLES IN A FURLONG
16. ROMAN SURVEYOR
18. PLACE DATA ON A MAP
20. GROUP OF PILES OR CSONKA
22. AGREEMENT
23. LINE ON A COMPASS - USUALLY RED
27. SIX FEET
28. WRITTEN CONVEYANCE DOCUMENT
33. RAILROAD SPIRAL TYPE
34. DIFFERENCE IN LONGITUDES
36. MEASURER UNDER PRESSURE
38. TALENTLESS STAR MEASURE
42. CLAIM AGAINST LAND
44. RELATIVE SIZE
45. TYPE OF POINT
46. ONE OF TWO EQUINOXES
47. DEVIATION FROM CENTER
49. 10k METERS
50. CORRECT MARQUIS
51. AN INTEREST IN LAND
52. ESTATE OF "CLASSY HEIRS"
53. SOUND ECHOS, O'REILLY
54. FREE AND CLEAR OF LIENS, CLOUDS, ETC.
55. TAKING PRIVATE PROPERTY FOR PUBLIC USE

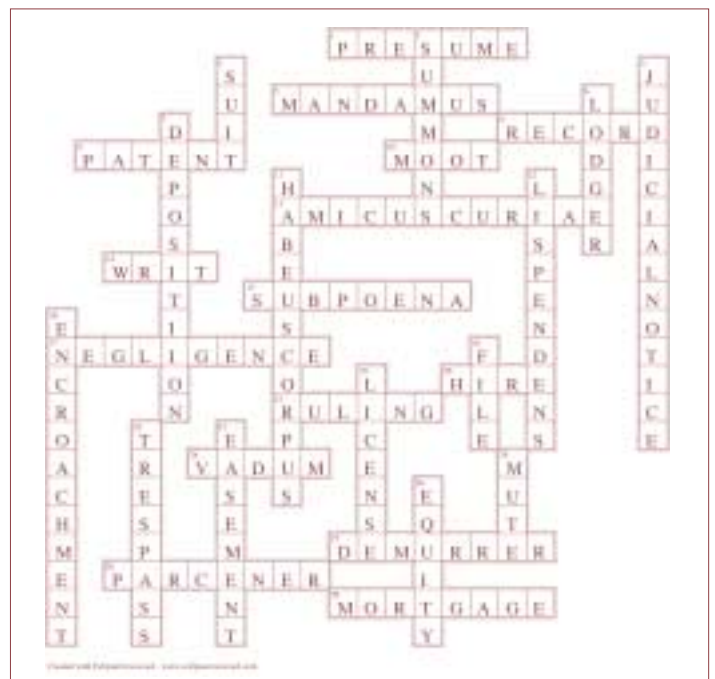
## Down

1. BUYER
2. TITLE DEFECT
3. LITTLE PEOPLE'S SUNLIGHT BENDER
4. ALLUVIAL DEPOSIT
5. THE OTHER EQUINOX
6. 19TH CENTURY FRENCH NOVELIST
7. CHARTOGRAPHIC REPRESENTATION, NOT TERRY
10. PERPENDICULAR SLOPE

13. SMALL ISLAND IN A RIVER
15. CROSSHAIRS
17. TRUE MEANING
19. MISTAKE OR BUST
21. VARIATION IN SURFACE
22. WATER BARRIER
24. REVERSION OF LANDS
25. SOAKS UP INK
26. RIGHT TO LEAVE
29. BLOW INK ON A MAP BUT DON'T ENLIST
30. MOVE BACKWARDS
31. VERIFICATION SURVEY
32. DISK USED TO MEASURE WATER CLARITY
35. TRIANGULAR OVERLAP THAT CREATED THE INTERNET
37. UNLAWFUL INTRUSION
39. DIFERENCE IN NORTH OR A POLITE TURNDOWN
40. LEVEL BUT NOT LANE
41. INVENTOR OF DEMAND VALVE FOR SCUBA
43. MIRROR
48. BEND

## Key to CLSA puzzle #6

(Surveyor Issue # 153)



If you have an idea for a puzzle theme or a clue you would like to include in an upcoming puzzle, email to [clsa@californiasurveyors.org](mailto:clsa@californiasurveyors.org)





## RISK MANAGEMENT FOR LAND SURVEYORS

### Now What Do They Want? Public Agency Insurance Requirements

You are an ambitious surveyor and you want to expand your work with public agencies in your state, county or city. You answer an RFP (Request for Proposals), for a specific job or to be selected as an on-call surveyor, and you get back a long list of proposal requirements and questions asking about your firm's qualifications and projects. A detailed list of insurance requirements is also included. It looks like you have some of the insurance they ask for but you're not sure if you have all the insurance requested.

#### Minimum limits of insurance are basic and attainable.

1. General Liability including operations, products and completed operations: \$1,000,000 per occurrence for bodily injury, personal injury and property damage; \$2,000,000 aggregate.
2. Automobile Liability: \$1,000,000 each accident; \$1,000,000 uninsured motorist.
3. Workers' Compensation (necessary only if party has employees): \$1,000,000 each accident for bodily injury or disease.
4. Errors and Omissions Liability (Professional Liability): 1,000,000 per occurrence; \$2,000,000 aggregate.

#### Other Insurance Provisions get a little tricky, but can be done.

Each general liability and automobile liability insurance policy shall be endorsed with the following specific language:

1. The Public agency, its elected and appointed officers, employees, agents and contractors are to be covered as additional insureds with respect to liability arising out of work performed by or on behalf of the Surveyor.
2. For any claims related to this Agreement, Surveyor's insurance coverage shall be considered primary insurance and shall act for each insured and additional insured as though a separate policy had been written for each.
3. The insurer waives all rights of subrogation against the Public agency.
4. Each insurance policy required by this agreement shall not be cancelled, except after 30 days prior written notice has been given to the Public agency.
5. The Surveyor shall, prior to commencement of work deliver certificates of insurance to the Public agency reflecting the required insurance coverage.

#### Acceptability of Insurers, Insurance and Indemnification

1. Insurance is to be placed with insurers acceptable to the Public agency's Risk Manager and with companies having current A.M. Best ratings of at least A VII.
2. While occurrence policies are preferable, if policies are written on a claims made basis, the certificate must clearly state so and provide a retroactive date that coincides with or precedes the Surveyors start of work.

3. All policies shall be maintained with insurers authorized to do business in the State of California and shall be issued under forms of policies satisfactory to the Public agency.
4. To the fullest extent permitted by law, Surveyor shall indemnify, defend and hold harmless the Public agency, its officers, employees and agents (collectively the "Indemnified Parties") from and against all claims, damages, losses and expenses, including but not limited to reasonable attorneys' fees, that arise out of, pertain to or relate to the negligence, recklessness or willful misconduct of the Surveyor or its employees in the performance of this Agreement. This indemnity shall apply to all claims and liability regardless of whether any insurance policies are applicable. The policy limits do not act as a limitation upon the amount of indemnification to be provided by the Surveyor.
5. Notwithstanding the foregoing, nothing herein shall be construed to require the Surveyor to indemnify the Indemnified Parties from any claim arising from the sole or active negligence or willful misconduct of the Indemnified Parties.

#### What's it all mean?

While most of these requirements seem straightforward and achievable, remember they may have been written with a general contractor or a major sub contractor in mind, so be ready to negotiate for lower limits and less coverage. If you explain your work situation well you may find the insurance overseer will accept your requested changes.

You may not need the high limits for your auto because you're not on-site very long and you may not need worker's comp coverage because you are an owner without employees. If the Public agency asks to be named as an additional insured on your professional liability policy tell them that doesn't make sense because if they make a claim for negligent professional services they would be suing themselves for the alleged error or omission.

#### Don't worry, get the job

Your broker and insurance company should be able to provide the additional insured, waiver of subrogation, primary insurance and cancellation provisions requested. Remember what you give up takes away from your coverage in the event of a loss but that you have to do it to get the job. You should always have your insurance with an A rated company. You'll find general liability policies are on an occurrence (when the loss happened) basis while professional liability policies are on a claims-made (when the loss is reported) basis. If you don't understand the insurance requests and coverage requirements be sure to ask your broker or go back to the Public agency for clarification.

It may cost a little more to get the required insurance and provisions, but after a cost/benefit analysis, you may find it worth the extra cost to get the job you want. ♦



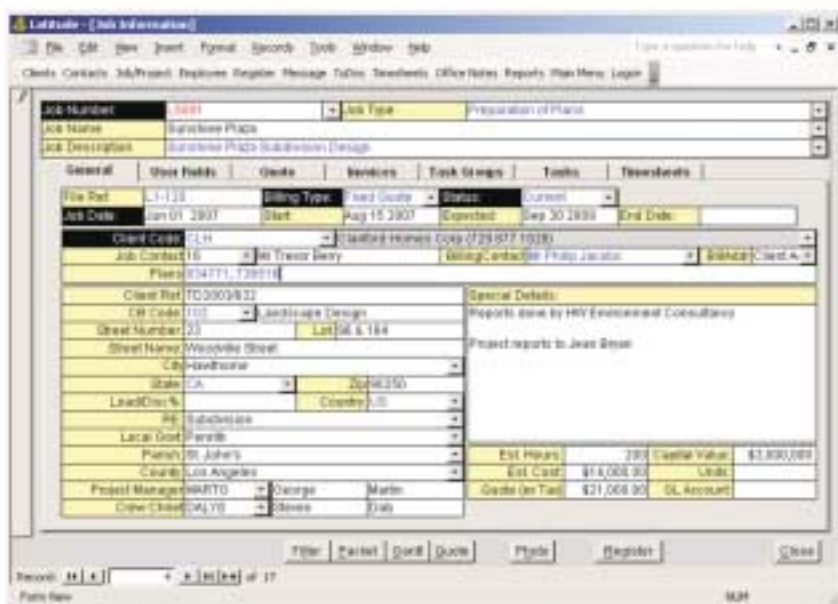
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Latitude Job/Project screen

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**Ian McLachlan - Barwon Water**

Latitude support is always quick and ready to fulfil any request for changes, something we don't get from other software vendors.  
**Andrew Edwards - McKinlay Morgan & Associates**

Latitude has increased our bottom line, and for time billing I have not seen anything better.  
**John Henley - Civil Surveys & Design**

Latitude minimizes administrative overhead in a small firm.  
**Terry Cromer - Terry Cromer Surveying**

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**Kevin Dodd - Earl James & Associates**

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**Grant Phillips - Charles O'Neill**

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## CALL FOR ARTICLES

Do you have a topic you would like to share with the land surveying profession? Or, are you involved in a project that would be of interest to our readers? Then please accept our invitation to have your article printed in the *California Surveyor* magazine.

## ABOUT THE MAGAZINE

*The California Surveyor* is a quarterly magazine written and edited specifically for land surveying professionals. Quarterly, it provides in-depth articles on issues affecting the profession as well as current events, and general interest articles. Our readers are members and non-members of CLSA. They are Land Surveyors in private practice and public employees, Land-Surveyors-in-Training, employees of title companies and other related industry professionals.

## FINDING THE MINDSET

Personal experience is probably your best source of article ideas. As a Land Surveyor, you have encountered problems, made mistakes and found solutions that can be shared with your colleagues. Have you worked on a unique project you would like to share with the profession? Do you have a fresh approach to an old problem or a cost-effective solution to a new one? Examine back issues of *The California Surveyor* to get a feel for the kinds of articles that are published and the way they are written. Visit the California Surveyor page on the CLSA website at [www.californiasurveyors.org/files/calsurv.html](http://www.californiasurveyors.org/files/calsurv.html). Before you write the article, feel free to write or call the editor to discuss your ideas.

## EVALUATION & ACCEPTANCE

All articles submitted will be reviewed by the editor. We may accept your article outright, accept it for a staff rewrite, or accept it contingent on your revision. Your writing style is your own, and we make every attempt to preserve it as we prepare your article for publication. But we will try to make the copy as substantive and clear as possible. If your article is substantially revised, we will email you the edited version, and you will have approximately one week to review it and make any additional changes.

## ARTICLE SUBMISSION

Generally, articles should be between 500 and 4,800 words. Articles must be submitted digitally. Pictures must be sent as individual files at least 300 dpi. Please include a head-and-shoulders photo and a brief bio of author. **Articles cannot promote a product, service, or company.**

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## TOPIC IDEAS

### Project Narratives

Personal accounts of interesting land surveying/geomatics projects including the people, equipment and field procedures involved, together with tips for success that may benefit other surveyors.

### CLSA

Reports from committees and local chapters regarding Trigstar and the Boy Scout Merit Badge, joint activities with ACSM and NSPS, and service work (such as baselines and PLS examination review classes).

### Education

Reports from land surveying/geomatics curriculums in California including school location, program administrator, classes and degrees offered, status of enrollment, and job placement of graduates.

### Boundary Resolution and Mapping

Research opportunities available at public agencies, certifications and ALTA surveys, gaps and overlaps, easements, using survey narratives and notes on record maps, and applying PLSS methods.

### GPS and Geodetic Surveying

Using emerging technologies, fundamentals of datums for practical applications, defining geoids and ellipsoids, finding geodetic data on the web, interpreting published data sheets, and project planning.

### GIS

The surveyor's roles and responsibilities regarding GIS, the acquisition, use and dissemination of geographic information, and opportunities for networking with the GIS community.

### Photogrammetry and Remote Sensing

Principles, practical applications and limitations, descriptions of equipment and procedures, evaluating data quality, finding sources for existing coverage, and graphic examples of mapping products.

### Business Management

Strategies for diversifying a private practice, identifying nontraditional opportunities, suggestions for crafting contract language that satisfies clients, minimizes surprises, and limits liability.

## Article Submission Deadlines:

February 1st ♦ May 1st  
 August 1st ♦ November 1st

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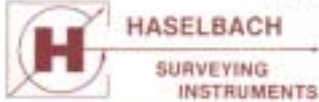
















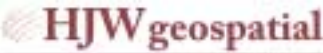

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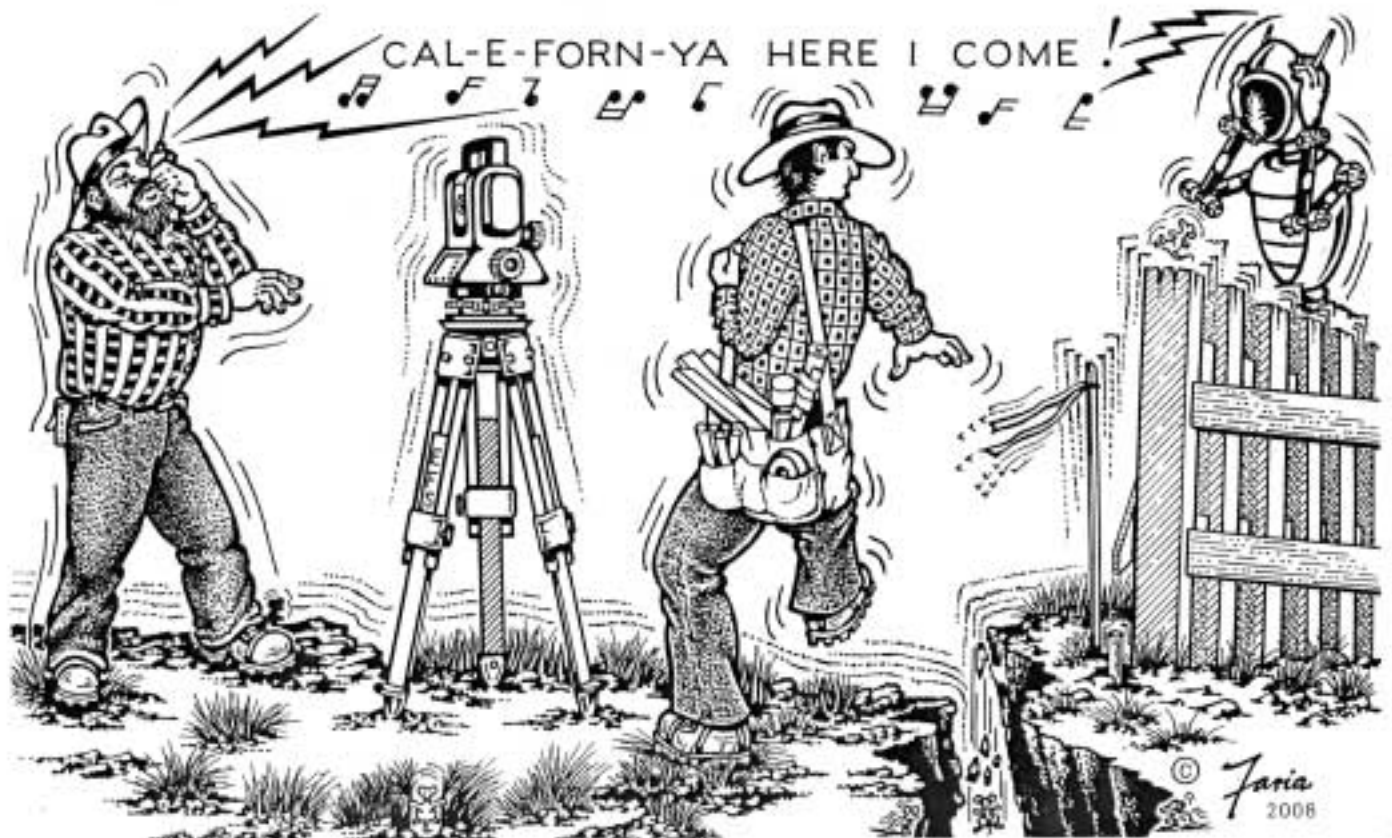
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# Here's Some Important Information About CLSA

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 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 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.

## Educational 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. Professional liability insurance programs are available to members.

### JOIN CLSA TODAY!

- **CORPORATE MEMBER** \*\$159.00 + Entrance Fee. Shall have a valid CA Professional Land Surveyor or Photogrammetric license.
- **CE CORPORATE MEMBER** \*\$159.00 + Entrance Fee. Any California registered Civil Engineer who is authorized to practice land surveying pursuant to Article 3, Section 8731 of the PLS Act and must be actively practicing land surveying and show sufficient proof thereof. CE Corporate membership must be approved by the Board of Directors.
- **AFFILIATE MEMBER** \*\$79.50 + Entrance Fee. Any person who, in their profession or vocation, relies upon the fundamentals of land surveying.
- **ASSOCIATE MEMBER GRADE** \*\$79.50 + Entrance Fee. Any person who holds a valid certificate as a Land Surveyor-in-Training.
- **OUT-OF-STATE CORPORATE MEMBER GRADE** \*\$79.50 + Entrance Fee. Any person who resides in a state other than CA, who is a member of the other state's Association, and meets the requirements of Corporate Member.
- **STUDENT MEMBER GRADE** \*\$15.90. A student in a college or university actively pursuing a surveying education.
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