

SURVEYOR

California

Summer 2010

Issue #162



*Retracing the Sonoma County –
Napa County Boundary*

***The Monument Preservation
Fund Puts Surveyors To Work***

*Article by Paul M. Brown, PLS-
page 16*



***The Summer of Living
Dangerously (But Safely)***

*Article by Carl C. de Baca, PLS
page 26*

***The Land Surveyor and
the Preliminary Report***

Article by Joe Kooyers, PLS, page 10

Local presence ■ **National** reach ■ **Global** resources

Leica Geosystems announces the opening of the first Solution Centers in the West!

Our state-of-the-art factory retail facilities offer superior service and products at the most competitive prices.



Leica Geosystems Solutions Centers Offer:

- Competitive Pricing
- Knowledgeable & professional staff
- Largest service department in the US
- Repair of any make & model of instrument
- An extensive inventory of rental equipment
- Local product training & seminars

**We Will Match Any
Competitor's Price
on field supplies!**



**Visit our
California
locations:**

2942 Century Place
Costa Mesa, CA 92626
800-938-0606

1447 Rollins Road
Burlingame, CA 94010
650-348-7247

Leica
Geosystems
Solutions Center



LEWIS & LEWIS ENTERPRISES

1600 CALLENS ROAD
P. O. BOX 1328 - VENTURA, CA 93002-1328
TELEPHONE (805) 644-7405



Toll Free
(800) 235-3377
sales@lewis-lewis.net

Web Site
www.lewis-lewis.net



QUALITY

Products - Service - Support
Financing



Robotic Total Stations



New
"GLS-1000"
Scanner

- Complete Line of Topcon Total Stations, Robotic and GPS systems.
- PLUS Topcon Transits, Levels, Lasers and accessories.
- NEW, DEMO & USED

www.lewis-lewis.net
Check It Out !!!

BUILD A PACKAGE

Buy a Total Station
and we will Discount
The Accessories....
(Data Collector, Tripods,
Prisms, Poles, etc.)
You decide what you need.



Total Stations

- WAREHOUSE CLEARANCE
- Specials NEW & USED Promotions
- Rental & Financing Options
- Complete Pricing Information
- Competitive Prices with Quality Service

GRS-1



Automatic
Levels

Transits

Lasers and
accessories

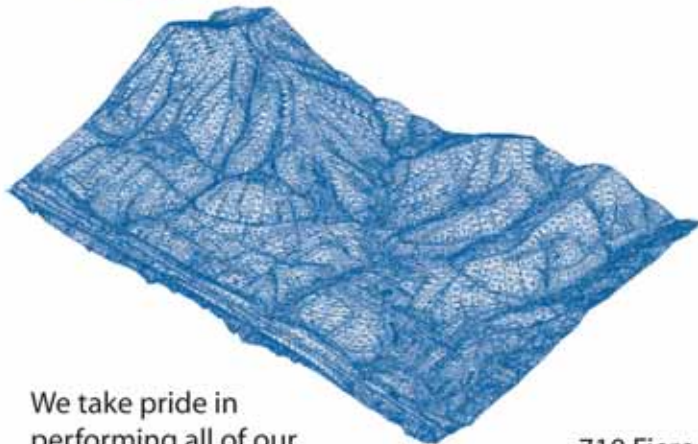


GR-3



Central Coast Aerial Mapping, Inc.

a.k.a. C&C Aerial Mapping Services
Since 1976



We take pride in
performing all of our
mapping in house.

Photogrammetric Mapping
AutoCAD/Microstation Formats
Seamless Color Digital Orthophotos
Digital Terrain Models (DTM)
Photogrammetric Scanning
SMBE/SWBE Certified

710 Fiero Ln. #24
San Luis Obispo, CA 93401
P(805) 543-4307 F(805) 543-7257
mail@aerial-maps.com * www.aerial-maps.com



ASPRS Certified

GET SPECIAL DISCOUNTS at Office DEPOT with your CLSA Membership

The program includes:

- Savings of up to 70%
on commonly used items
- FREE next-business-day delivery
- Thousands of products in stock
- Unparalleled expertise
- Ultimate shopping convenience
by phone, fax or online
- The latest in office technology
- Office Supplies, Furniture
and More!

**OFFICE DEPOT
IS YOUR
ONE STOP SHOP!**

**CALL CLSA
at 707-578-6016
FOR MORE INFO**

**Office
DEPOT** *Taking Care of Business*

2010 Board of Directors

CLSA Officers 2010

Aaron R. Smith, President
William R. Hofferber, President-Elect
Frank R. Lehmann, Secretary
Thomas A. Taylor, Treasurer
Matthew J. Vernon, Immediate Past President
Dorothy Calegari, Executive Director

Chapter Representatives

BAKERSFIELD CHAPTER

Rolland VanDeValk

CASCADE CHAPTER

Jeff S. Steffan • Leslie J. Gross

CENTRAL COAST CHAPTER

James Randal Ellison • Ian E. McClain

CENTRAL VALLEY CHAPTER

Michael D. Jones • Keith W. Spencer

CHANNEL ISLANDS CHAPTER

Debora L. Naves • Lawrence Paul Cook

DESERT CHAPTER

Douglas E. Redlin

EAST BAY CHAPTER

Harold B. Davis • Janine L. Hampton • Steven J. Martin

GOLD COUNTRY CHAPTER

Marc R. Van Zuuk

HUMBOLDT CHAPTER

Pete Jackson

LAKE/MENDOCINO CHAPTER

Michael Gilmore

LOS ANGELES CHAPTER

Stephen M. Hughey • Jay K. Seymour • Diane W. Wells

MARIN CHAPTER

Lionel K. Vincent

MONTEREY BAY CHAPTER

Christopher Bateman

MOTHER LODGE CHAPTER

John P. Gnipp

NORTHERN COUNTIES CHAPTER

Roger Keith Hanlin

ORANGE COUNTY CHAPTER

Anthony Charles Cuomo • David W. Hill
Michael Simon • Jerry L. Uselton • David E. Woolley

RIVERSIDE/SAN BERNARDINO CHAPTER

James A. Drenon • Delia K. Smith • William T. Smith

SACRAMENTO CHAPTER

Robert M. McMillan • William E. Telling

SAN DIEGO CHAPTER

David W. Ambler • Sean C. Englert • Anne Louise Hoppe • Gary L. Hus
Andrew G. Karydes • Donald D. Woolley

SAN JOAQUIN VALLEY CHAPTER

Ted J. Kerber

SANTA CLARA/SAN MATEO CHAPTER

Paul W. Lamoreaux • Keith L. Nofield

SONOMA COUNTY CHAPTER

Howard W. Brunner • Mike Jones

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."

PERSONNEL

OWNER

California Land Surveyors Association, Inc.

CENTRAL OFFICE

526 So. E Street
Santa Rosa, CA 95404

E-Mail address: clsa@californiasurveyors.org
CLSA Homepage: www.californiasurveyors.org

EDITOR

John P. Wilusz, PLS, PE

ASSISTANT EDITORS

Paul Brown, PLS – Jill Van Houten, PLS

CONTRIBUTING WRITERS

Levi Cox, PLS
Michael P. Durkee, Esq.
Richard R. Hertzberg, CPUC, ARM
Ian Wilson, PLS
David E. Woolley, PLS

DESIGN AND PRODUCTION

Tony Monaco

ADVERTISING

Commercial advertising is accepted by The California Surveyor. Advertising rates and information can be obtained by contacting
CLSA 526 So. E Street, Santa Rosa, CA 95404,
Tel. (707) 578-6016 - Fax (707) 578-4406. Circulation: 4,800.

EDITORIAL MATERIAL

All articles reports, letters, and contributions are accepted and will be considered for publication regardless of the author's affiliation with the California Land Surveyors Association, Inc. Contributions should be emailed to clsa@californiasurveyors.org. We can accept WordPerfect or Microsoft Word files. We can accept ASCII text files or word processor files from the following programs: WordPerfect or Microsoft Word.

EDITOR'S ADDRESS

John P. Wilusz, PLS, PE
E-mail: johnwilusz@gmail.com

DEADLINE DATES

Spring February 10 Summer May 10
Fall August 10 Winter November 10

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:

- The Land Surveyor and the Preliminary Report**
By: Joe Kooyers, PLS10
- NSPS Area 9 Director's Report**
By: Carl C.de Baca, PLS 12
- Retracing the Sonoma County – Napa County Boundary**
By: Paul M. Brown, PLS16
- The Summer of Living Dangerously (But Safely)**
By: Carl C.de Baca, PLS26
- Thinking Outside the Box**
By: Robert M. McMillan, PLS 34
- Real Risk Management Can Be Surreal**
By: Richard Hertzberg, CPCU, ARM 35
- The Coast Mappers, by Taylor Morrison Book Review**
By: Timothy R. Case, PLS 36
- SMA Expert Q&A**
By: Michael P. Durkee, Esq. 38

Department:

- From the Editor- NSPS award, Nepal 6
- President's Message 8
- Kids Korner 9
- Letters to the Editor 9
- The More Things Change 25
- TechTips 32
- Index of Advertisers 39
- Welcome New CLSA Members 39
- Crossword Puzzle 40
- Sustaining Members 42

On The Cover:

Kris Vonderscheer – **Surveying at Sunset**
submitted by Mike Jones, PLS

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

John Wilusz, PLS, PE, works in the Delta Levees Program at the California Department of Water Resources in Sacramento, CA



John Wilusz in Kathmandu, Nepal.

Excellence in Journalism

On April 25th the National Society of Professional Surveyors (NSPS) presented the *California Surveyor* with the award “Excellence in Journalism – Best Printed Professional Publication.” The news arrived as Issue #161 went to press so I didn’t get a chance to mention it in my editorial, but we ran a photograph of the award on page 43. If you missed it go back and have a look. Thanks again to our prize-winning team, starting with Crissy Willson, office manager extraordinaire. Thanks to Tony Monaco for graphic design that puts us miles ahead of the competition. And thanks to our contributing writers who continue to submit content that is educational, interesting, and relevant to professional practice for California’s Surveyors.

Kathmandu, Nepal



The all-seeing eyes of the Buddha.

April was an exciting month all the way around for me. I spent the first half of the month in England and the second half in Kathmandu, the capital city of Nepal. Nepal is sometimes called the top of world because it is home to Mount Everest and the Himalayas. I had originally planned to do some trekking in the mountains, but by the time I arrived in country I was already worn out from trekking the streets of London. On top of that, I was still recovering from the flu-like side effects of a typhoid vaccination. So I adjusted my sights and set out to explore the *cultural* geography of Nepal instead. According to Wikipedia Kathmandu’s population is about 950,000 and its elevation is 1,400 meters. It is situated in the Kathmandu Valley and surrounded by sister cities that, though they date back to antiquity, have in modern times merged into the greater metropolitan area. One such community is Swayambhu, also known as the Monkey Temple.

Swayambhu

The dominant religions in Nepal are Hinduism and Buddhism and they seem to coexist peacefully. In fact they are represented side by side in the religious iconography at Swayambhu, an extravagant temple com-

plex on the west side of the city. Swayambhu is also called the Monkey Temple and sure enough there are monkeys roaming freely there. This took some getting used to. The last time I was that close to a monkey was at the zoo and there was a fence between us. According to the Lonely Planet the earliest confirmed activity on the site was in AD 460; it has been a spiritual center for a very long time. Legend has it that the Kathmandu Valley was once a lake and the hill now topped by the Monkey Temple rose spontaneously above the waters. From that event came the name Swayambhu, which means “self-arisen.” Geologists agree that the valley was formerly under water. Surveyors, I was about to discover, confirmed the part about the self-arising.



Niraj Manandhar at Swayambhu Temple.

While strolling through the plaza, enjoying the shrines and statues and the incense in the air, I came upon a familiar sight: a yellow tripod with a GPS antenna on top. Surveyors at work! The funny thing is this: I was hoping to meet a surveyor on my trip but didn’t expect it would be so easy. Nor did I expect to find one at a temple. I walked over and introduced myself to the boss. Niraj Manandhar is a Chief Survey Officer with the Geodetic Survey Branch of the Government of Nepal, Ministry of Land Management. He told me that he and his crews were making GPS observations as part of an on-going crustal dynamics study. It turns out that Nepal is still growing, and I mean that literally. The self-arising Swayambhu is still rising at the rate of about 2 cm per year. Even though he was busy at work, my new friend took the time to chat with me and answer my questions.

Continued on next page

Geodetic Survey Branch

Niraj invited me to visit him at his office and I took him up on it. We met several days later on the campus of the Survey Department in downtown Kathmandu. I wanted to learn about surveying in Nepal. I thought others might like to know too so I kept notes. The Survey Department is part of the Ministry of Land Management. It includes geodetic, topographic, and cadastral branches. The Geodetic Survey Branch (GSB), the branch Niraj works in, is responsible for providing geodetic control for cadastral mapping and infrastructure development. It also performs deformation studies like the one at Swayambhu. It is planning more of the same throughout the country if it can find the resources. GSB surveyors hope to someday build a network of continuously operating reference stations across Nepal. The objective is to collect data and observe the rate of change of ground movement. Nepal, like California, is seismically active. These studies may ultimately help to predict earthquakes. Unlike California, Nepal is poor and lacks the resources to do the work. Besides funding they need training and equipment. In short, they need a benefactor in the international community who appreciates what this project could contribute to global science.

Another ambitious project the GSB is working on is improving Nepal's geoid model. In 2009 the government entered into an agreement with the Danish Technological University of Denmark to work jointly on a nationwide airborne gravity survey. There have been many set backs along the way, not the least of which is getting permission to fly along the international boundaries with China (Tibet) and India. If all goes well they will begin the flights in 2010. Niraj hopes to use the project for his Ph.D. His education already includes a Master of Engineering from the School of Geomatics Engineering, University of New South Wales, Australia. The topic of his master's thesis is geoid studies for Nepal.

Nepalese Journal on Geoinformatics

The Survey Department publishes a journal - *Nepalese Journal on Geoinformatics*. It is written in English and the current issue contains interesting articles on topics you'll recognize: geoid modeling, GIS, cadastral mapping, surveying education, and professional licensing. One article recounts the proud history of our profession, beginning with the code of Hammurabi and continuing through the surveying careers of George Washington and Abraham Lincoln. Can you believe it? They know about Washington and Lincoln in Nepal. We have more in common than I thought. If you think I'm making this up you can read it for yourself at the Survey Department's website: <http://www.dos.gov.np/nepalese-journal8.php>.

Institute of Chartered Surveyors

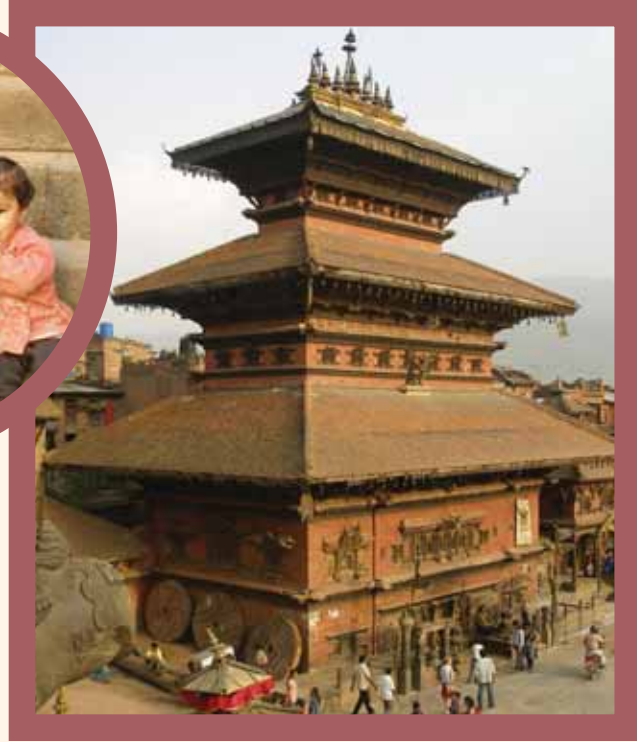
I was surprised to learn that Nepal has no licensing requirements for land surveyors. However, that may soon change. In 2008 Niraj and others from the Survey Department formed the Institute of Chartered Surveyors. The Institute is a professional association that advocates for land surveyors. Among other things, it promotes the idea that surveyors should be licensed and it proposes a definition of professional practice. It is the definition of professional practice that is creating some difficulties. The membership would like to include land valuation as a regulated activity for surveyors. The problem is that land valuation currently belongs to the civil engineers and the engineers don't want to give it up. Imagine that – a turf war between land surveyors and civil engineers. Membership in the Institute is voluntary, but the requirements to become a *chartered* member are rigorous. One must have 10 years of qualifying experience, be a

graduate of a surveying curriculum (or equivalent), and pass an examination. These are also the requirements the Institute is recommending for licensure as well, when that day comes. Today there are only 27 chartered surveyors in Nepal and Niraj Manandhar is one of them.

Before I left he asked if we have a similar professional association in California. I assured him we do. "The Institute of Chartered Surveyors is very new," he said, "and we would like to build relationships with similar institutions in the international community. We would be happy to share information with CLSA, about our activities and projects, and maybe we could cooperate in one way or another in the future."

One of the great pleasures of traveling is meeting people from different cultures and finding common ground. Beautiful views are nice too, and it would have been great to see the Himalayas, if only from a distance (heavy smog squashed my plans for that). But sometimes peak experiences have nothing to do mountains. If you're a traveler too you know exactly what I mean. ■

You can read my interview with Niraj Manandhar at <http://www.amerisurv.com/content/view/7575/1/>



Hindu temple in Bhaktapur, Kathmandu Valley.



Flowers used for devotional purposes.



President's Message

Our profession has been evolving for hundreds of years, and the technology and tools we use today have taken on the look of an exponential curve. Surveyors in our legacy, 300-years ago, were using the compass and chain. Two hundred years later we were using a transit to measure our angles and still a chain for our distances. Then for the next forty years we migrated to a theodolite and electronic distance measurer. That's when technology really started to take off and we moved into total stations and now we have GPS that can measure tolerances down to less than an inch, and LiDAR that can get incredible results....What's Next? These remarks aren't intended to be accurate, in which we have migrated with our technology, but remind us that we are evolving more and more rapidly with our technology.

We have the capabilities of generating millions of bites of data for a project; we can measure tolerances to hundredths and report facts that were probably far reaching from just 30 years ago. We have grown from 5-person crews schlepping equipment through the mountains, to a 1-person crew with a 4-wheel drive truck, and an ATV equipped with a GPS receiver, attached to it, loaded in the back of the truck. We're making measurements in a day, when it used to take a week or longer, and the accuracy, precision and redundancy is unbelievable.

With all this technology, and the capabilities to measure and sort data, let's not lose sight of the need to service our clients and protect the public. All of these scenarios and pieces of equipment I just mentioned are nothing more than a new tool in our toolbox. In our daily activities we must remain cognizant of the fact that we are *Professionals*, and we should go about our work each and every day remembering that. We have a duty to our client and our employers, whether you work in the private industry or the public. Whether you are working on acquisitions for a new roadway, a section breakdown for a rancher, or a development in town, keep in mind that we play a critical role in how our communities are shaped. We need to plan for the future and leave a legacy that our children and grandchildren can be proud of, not a community in turmoil.

The public has a right to rely on our work and the results of our survey, so make sure you perform the necessary checks and balances, and be aware that the general public, for the most part, does not know or understand what we do. Take time to educate your clients, and the public while performing the survey. If you survey a fence that is not on the title line, discuss it with the client and neighbor(s), just don't map it and walk away, leaving the problem in the hands of those who are unsure what to do next.

While collecting the topographic measurements for a new highway, bridge, or other improvement, understand the end result so you can be of greatest value to the team. Provide input and suggestions on alternative solutions, be the eyes and ears on the ground for the project engineer, or the lead consultant. Remember, our survey is the base foundation and the success of the project is dependant on your survey.

Together we can build a profession that is bigger and stronger, and gain the respect of those who are unaware of what we provide to our communities. We should choose to be problem solvers for our clients and project leaders and give them the knowledge and feedback needed to make the right decisions, so let's do so.

I give you my thoughts because in today's tough economic climate, decision-makers are looking for those who can provide value and be a benefit to the project. No one wants to hear the news of a problem, whether it is a vertical issue on the construction of Highway 101, a boundary problem from poorly written deeds, or new regulations that might put a halt on the development. However, those are all real issues we face each day with each project, but the true professional will come to the table with solutions and ideas to keep the project on track. Let's try to keep an open mind and think outside the box, you never know what you might stumble across. No one can ever know everything, but collectively we can combine our skills and expertise and solve just about anything. Try and keep an open mind and listen, you never know what you might learn.

As I leave you with this message, remember that your toolbox can be filled with some of the newest and coolest tools, but if you forget the one tool that can solve the problems and save your client and their dreams, your tools may be for not. As you learn how to solve problems, take the time to pass that knowledge on and educate someone else, and in the meantime, don't be afraid to ask for help. The mind is a wonderful thing, keep exercising it, and don't be afraid to use it, especially when you've been invited to the table. ■



Letters to the Editor



Dear John,
As usual - another great issue of the California Surveyor, save, that damned Danskin article! And your cover shot looks like a pro, John!

Rick Marshall of the County Surveyor's Office was kind enough to write 'n correct me . . . that Napa County is processing Certificates of Compliance. We had a nice telephone chat and Rick set me straight. So . . . my apologies for misinforming my surveyor cousins about Napa County Certificates of Compliance. They're ready willing and able to process 'em.

Take care 'n keep up the good work!
Respectfully yours,
Phil Danskin

Do you have a picture of a "junior surveyor" in your family that you would like to share? Send it in and we will put it in the Kids Korner.



Kate Klima of Klima Land Surveys doesn't need a blankie or a pacifier ... just the Cal Surveyor. Submitted by her dad, Kris Klima, PLS.

Your deadlines are our deadlines



Custom orders your way ... when you need them.

When your name is on it, our name is behind it.

Berntsen delivers.

The professional's choice in survey products • www.berntsen.com • 877.686.8561



The Land Surveyor and the Preliminary Report

Joe Kooyers, PLS, is a 23-year consultant to California counties and cities for boundary determination and mapping standards, and he is a participating Subject Matter Expert with BPELS and NCEES. He wishes to thank Tom Votel, Senior Title Officer with Chicago Title Co. and Vince Sincek, Attorney, PLS, RCE with Epsten, Grinnell & Howell for their contributions to the article. All work in San Diego County.

- What is the purpose of the Preliminary Report as it relates to the boundary of a parcel?
- Do the Professional Land Surveyor and the title company share a common purpose?
- Is the Preliminary Report's legal description a trustworthy resource upon which a land surveyor should place the reliability of a boundary determination?

THE PRELIMINARY REPORT

The Preliminary Report, sometimes referred to as a Preliminary Title Report or "PR", is part of an insurance product. The Preliminary Report expresses what the title company will insure: that a parcel is marketable; that the title has continuous evidence of ownership; and that the property is free from defects, liens, claims, encumbrances and exclusions to the title insurance except as to those items that are listed as exceptions. The title insurance policy will guarantee the ownership and marketability of the parcel as described as of the effective date. After the Preliminary Report is examined by all parties, and after possible further negotiations, an insurance policy is prepared, a premium paid, and the policy issued. If defects of title are subsequently discovered that are not shown as of the policy date, the title company will pay all costs within the terms of the title insurance policy.

For the purposes of this article we will focus on the legal description in the Preliminary Report. The legal description is based on a chain of title which is a written history of the public records documenting conveyances from the original vesting grant or patent. Based on the chain of title, the title company will define the boundary of the parcel in the legal description. The title company will list those rights of others and encumbrances within the defined limits of the parcel that it wishes to exclude from insurance coverage. Additionally, the title company may list some of the rights in favor of the parcel to be insured within the property of others.

ENTER THE LAND SURVEYOR

One way for a title company to limit risk of non-public or unrecorded rights is to include an ALTA/ACSM field survey as a basis of the policy. A field survey may show evidence of the rights of others not noted in the public record. The title company then identifies those risks and notes them in the Preliminary Report. When a survey is not made, the Preliminary Report will reflect the survey exclusion. Without a survey, the location of the boundary will not be guaranteed. With a survey the boundary will be guaranteed only according to the terms of the insurance policy.

Yet, the question remains: Does it matter to the Professional Land Surveyor if the boundary as described in the legal description is guaranteed by the title company?

RESEARCH AND PRIMARY EVIDENCE

The land surveyor also begins with document research. As provided in the California Board of Professional Engineers and Land Surveyors, ("BPELS" or the "Board") Rule No. 425(e)(8), qualifying training for the prospective land surveyor may include the research of public and private records to obtain survey and title data. The research and the analysis of the written documents, vesting deeds of the client and the descriptions of the adjoining properties can reveal sequential conveyances, senior rights, and gaps and overlaps.

The land surveyor generally reviews the same documents as the title company and looks for evidence of title, the property location, the shape of the parcel, and evidence of monumentation. The continuity of the wording of the legal descriptions is important for the land surveyor to research since changes of meaning or calls may be introduced in subsequent deeds. The quality and completeness of the land surveyor's research will directly affect the quality and correctness of the decisions made in the boundary determination process.

THE CAVEAT

Although the title company may have done extensive research to determine continuity of title and may have prepared a Preliminary Report with a legal description for the insurance policy, any use of that legal description by the land surveyor would be the use of secondary evidence. The Preliminary Report legal description is very useful and helpful. In many instances the Preliminary Report legal description notes all the relevant vesting deeds and exceptions. The Preliminary Report and legal description are supported with copies of the original documents. But, to accept the Preliminary Report legal description at face value is to accept expertise of uncertain diligence or knowledge. The Preliminary Report legal description is an aid to understanding but should not be regarded as infallible.

THE SIGNIFICANT DIFFERENCE

The qualifying training provided in the Board Rule 425(e)(9) also may include the prospective land surveyor performing boundary analysis and determination using record descriptions, survey and title data. Regarding the report that follows research, it will be noted that the title company follows its research with a Preliminary Report, while the land surveyor follows the research with a map. The land surveyor follows research and boundary determination with a visual report, a map. Subdivision Map Act, section 66441 states that the land surveyor, or the civil engineer who is authorized to practice land surveying, is responsible for the survey and the preparation of the final map. The map will reflect the thoroughness of the research and the quality of the informed

Continued on next page



ALLEN PRECISION EQUIPMENT

NEW NIKON NIVO Compact and Accurate

MAIN FEATURES

- Survey Pro software on-board optional
- Windows CE touch-screen
- High quality Nikon optics
- Fast, accurate EDM
- Prism and reflectorless measurements
- Easy-to-use 2nd face keypad
- Hot swappable batteries
- Compact, rugged, and lightweight (only 8.6 pounds)
- Cable-free Bluetooth®
- Optional laser plummet
- Available in 2", 3" and 5" models to meet specific accuracy needs.



Item No.	Description
103680	5/8 x 11 Wood Fiberglass Tripod w/ Quick Clamp 60-WDF20
106101	67-4209TMA APE 8" PP W/Adj Tip Compression Lock
103305	63-2010M Single Tilt Prism w/Metal Yoke

Make it a Package for an additional

\$199⁰⁰

CALL FOR QUOTE



1-800-241-6223 • www.allenprecision.com

Continued from previous page

decision-making for the boundary determination. As noted in the National Society of Professional Surveyors, Model Standards for Property Surveys, Section 5(h), the map should include...."sufficient data to indicate the theory of location applied in formulating the opinions as to the probable location of the boundaries and corners of the property."

PROFESSIONAL STANDARD OF CARE

The land surveyor locates the boundary according to written documents. The legality of the documents is determined by attorneys, including those of the title company, and ultimately by the courts. The land surveyor does not guarantee the location, but rather the land surveyor is held to a professional standard of care. Referencing the Professional Code of Conduct as stated in the Board Rule No. 476 (c).(7) a land surveyor shall only express professional opinions that have a basis in fact or experience or accepted land surveying principles. Land surveyors are required to use the same care that is ordinarily exercised in like cases by competent, knowledgeable land surveyors and consistent with the Board Rule No. 476.

Local support and professional advice can be found through in the California Land Surveyors Association ("CLSA") Professional Practices Committees. The CLSA San Diego Chapter bylaws state that its Joint Professional Practices Committee has been formed, in part, to "encourage a high ethical standard of practice in the land surveying profession [and to] encourage com-

pliance with the PLSA and other applicable laws." For instance, the committee can provide an open, local forum to test whether one's interpretation of a grant deed is based on solid evidence or whether it is tainted by advocacy for the client.

CONCLUSION - THE NECESSITY OF PRIMARY EVIDENCE

Land surveyors construe documents for original intent. Primary evidence takes precedence over secondary evidence. To the land surveyor, the original vesting deed and resultant chain of title take precedence over the summary report of the title company. In a highly technical profession which advances on the remarkable ingenuity applied to earth science, geometry and spatial recognition, the profession is sometimes hesitant in assigning importance to those land surveyor functions which can be performed by candlelight. Diligent research, the accumulation of boundary determination knowledge and the application of accepted principles are ready and timeless tools to be used and respected. ■

Further Reading:

Robillard, Wilson and Brown, *Evidence and Procedures for Boundary Location*, Fifth Edition, Wiley & Sons, 2006 Chapter 14; Williams, Mitchell G., editor, *Land Surveys, A Guide for Lawyers and Other Professionals*, Second Edition, ABA Publishing, 1999, Chapters 13, 14, 17, and 18; Woolley, David E., "The Professional Practices Committee Surveyor's Friend or Foe?" *California Surveyor*, Summer, 2009, Issue 159



By: Carl C. de Baca, PLS

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

National Society of Professional Surveyors Area 9 Director's Report

During the last week in April the NSPS, ACSM and the other member organizations¹ (MOs) of the ACSM met at the Phoenix Convention Center in down town Phoenix, Arizona. It is not possible to attend every meeting that goes on at the annual ACSM / NSPS conference. I think however that if you consider this report in conjunction with that of your governor, a fairly complete picture can be stitched together. Over the course of five days, the officers, directors, governors and committee people that run the NSPS and ACSM have dozens of different meetings completely separate from the workshops and seminars that typically draw surveyors and vendors from across the nation. (Sad to say it is not generally feasible to take in any of these great classes and workshops while serving as a director or governor.)

The NSPS holds meetings of most of its committees including: Membership, Public Relations, Mines and Minerals, Standards, Private Practice, Youth Outreach, Education, TrigStar, the Certified Survey Technician and the Hydrographer Certification Boards. The governors also caucus semi-formally in their respective geographic areas, so the western governors meet in the Western State Governors' Council, the southern governors meet in the Area 3-4 Governors' meeting and the rest meet in the Great Lakes Council of Governors. Alongside the NSPS meetings, the ACSM holds meetings of the Joint Government Affairs committee, the ALTA committee, the FIG Delegation, the Awards committee, the Publications committee and a few others. There are also a day-long NSPS Board of Governors (BOG) meeting, a day-long Board of Directors meeting and a final-day meeting of the ACSM congress.

I said all that to give a flavor of what goes on at one of these soirees, and also as a way to reinforce something that I have mentioned before: the NSPS does a lot of heavy lifting on items that affect every US surveyor, whether they are a member or not. This is not particularly well publicized but true nonetheless. As noted above, no one can possibly take in all these meetings so you try to attend the ones of obvious importance and stick your head in the door of as many as you can after that. I apologize in advance for the length of this report. Several items of significance came up during the course of the conference and I will do my best to explain them to you. If after reading this you still have questions or need further information on anything I touched upon, feel free to contact me – my email address is alidade.nv@sbcglobal.net.

Membership Committee / Public Relations Committee

The NSPS faces declining membership this year. This is not surprising given the fragile state of the economy. The number is still robust and we still have national credibility and a strong voice when meeting with federal agencies, Congress and other professional organizations. But we could do better. The membership has been declining for the last couple of years. Thus the Membership / Public Relations meeting spent several hours discussing various strategies to increase membership. Finding a way to foster closer relations with the state societies and developing the kind of benefits that would allow us to entice and capture their members seems to be one strategy that we

would all like to explore. The relationship between NSPS and ACSM was also discussed at length and this topic is of such significance that I will discuss it at length later in this report.

Western States Governors' Council

The WSGC, chaired by the Washington governor, Bill Glassey, is relatively new. It only became a formal group five years ago and was chaired first by Chuck Paddock of Arizona and then Matt Vernon of California. This is a good group and a great place to sound out ideas and thoughts before taking them on to the Board of Governors meeting. It is important to discuss what's going on in your state with the other states around you to see if they have similar issues and perhaps solutions you may not have considered. As with all of the meetings, this one is open to anyone and we had as many guests as members of the council. At this meeting we talked about each state's economic condition, got an update on the Railroad Documentation legislation and discussed the NSPS / ACSM identity issue. Vernon discussed CLSA's Safety Tailgate manual, its development and it was suggested that he introduce it at the Board of Governors meeting.

Mines and Minerals Committee

Area 9 has some mining going on – maybe not much in Hawaii but a little in California and a whole bunch in Nevada. (Did I mention that northern Nevada is the third largest gold producing region in the world?) This is a committee in which I have a personal interest and which has vexed me for some time with its apparent lack of motivation. To be fair, it has been a committee of two for quite a while and has received no interest or input from NSPS. Its mission has withered to the point where it serves only as a liaison to the international mine surveying community. I hope to inject new life into the committee and at this meeting we discussed producing materials and workshops of interest to US mine surveyors as well as finding a way to track down these folks and persuade them to join NSPS and participate.

Student Competition

Every year NSPS hosts a student competition. Teams of surveying students from various universities compete in a format that requires a paper, a poster and a field competition. This year the topic was forensic surveying and the field competition was a one-hour presentation to an audience and a panel of judges, of which I was one. Seven schools competed this year and I congratulate each one for their outstanding efforts. However, I continue to be puzzled why no schools from Area 9 competed – there are at least three with baccalaureate degrees in surveying. Where are you guys? Are you chicken?

Big Issue No. 1

NSPS faces many issues right now, but none as critical as that of identity. Last year we voted to have the ACSM commission a marketing firm to study the ACSM and the member organizations. The report delivered a message that a few people had been thinking for quite a while. The structure of the ACSM as an umbrella, under which

Continued on next page



CLOSE HAS ITS CONSEQUENCES. Even when something is slightly off it can have a big impact, especially with property data. Make sure you get the exact data you need with ParcelQuest. It's the only data company dedicated solely to California property. ParcelQuest, precise data for precise people.



PARCELQUEST

WWW.PARCELQUEST.COM

Continued from previous page

the MO's such as NSPS reside, is confusing, misleading and inefficient. We suffer from an identity crisis. Take Lobby Day for example: The event is organized and managed by the Joint Government Affairs committee, an ACSM committee that is chaired by an NSPS member. Thus ACSM schedules appointments and provides information to Congress, while NSPS members actually attend the appointments – confusing indeed. Apparently many people even within the geospatial community are unsure of who does what with respect to NSPS and ACSM.

The marketing report suggests that we should reorganize so that there is only one national society. The member organizations should be working groups within the single organization, such as the hydrographers group within the NSPS. Too, there are layers of overhead, if you will, that can be eliminated in such a restructuring. At the present time, NSPS members make up some 85 percent of the total ACSM membership. Dues to run ACSM are assessed to the MOs proportionately based on membership so we provide 85 percent of the funding for ACSM. Yet the congress is made up of 2 delegates from each MO so at the present time we have 2 out of 8 delegates or 25 percent of the vote. We pay for bank accounts and audits for NSPS and 85 percent of the cost for bank accounts and audits for ACSM, etc. Some costs could be eliminated with the suggested restructuring. CaGIS, one of the four MOs, voted to withdraw last year and at the end of this year they are out. The proportionate costs to fund ACSM from NSPS will rise accordingly. At that time we will be paying 93 percent of ACSM funding and will have 33 percent of the vote at the congress.

The NSPS core officers group mulled this report over during the last few months and came to the conclusion that we should follow the suggestion of the report. The most expedient way to accomplish this is for NSPS to withdraw from ACSM and become a stand-alone organization at long last. An obvious and unfortunate side effect of this would be the death of ACSM, since its funding source would be gone. We could offer to take the other two remaining MOs on as working groups within NSPS and we could absorb the central office too. This would make for a leaner and less confusing organization. A motion to withdraw from ACSM and use the two-year withdrawal period to study how best to restructure was subsequently developed and brought forward at the BOG meeting.

Big Issue No. 2

As previously discussed, our membership is declining. The economic times have conspired to make many surveyors choose between their state society membership and their NSPS membership. With the headaches that face surveyors today, membership and participation in our organization is more important than ever, yet fewer surveyors see it that way every year.

The aforementioned marketing study also suggested that the national society should be unified as possible with the state societies. There are approximately 60,000 professional surveyors in the U.S. The state societies combined have about 35,000 members. If we could capture that membership then our clout with federal agencies, other

Continued on next page

professional organizations and Congress would increase significantly. The problem lies in that the state societies are independent, well run and as concerned about maintaining their membership as we are about ours. The bigger states offer benefits that are the equal of the ones that NSPS offers and the smaller ones are concerned that our dues are too high. If we suggested a combined dues structure that allowed members of one to be members of both, the fear is that the cost would price some people out of joining or rejoining. Newly installed NSPS president Wayne Harrison created an ad hoc committee comprised of 4 area directors, including myself, plus the state executives from 3 state societies to explore what we could do to develop closer relations and hopefully share membership. Everything is on the table, dues included.

Board of Governors (BOG) Meeting

This meeting was dominated by the withdrawal issue. The motion to withdraw was made and passed on a very close vote, 26 to 21 with 2 abstentions. The reason for the close vote had more to do with the method of delivery rather than the message itself. This suggestion to withdraw was delivered to the ears of the directors and governors alike in the first day's meetings. It was the first time many of them had heard it. The typical reaction was strong and negative at first, but as the idea had a chance to sink in, opposition generally faded. Unfortunately for all involved, the well was poisoned to a certain degree by introducing the concept to the governors at large while at the same time coordinating with one governor to bring forth the motion to withdraw. This gave many of the governors the impression of a conspiracy.

Matt Vernon, the California governor, reacting to the fact that a motion was made without the governors really having a chance to think about it and without giving the state time to consider the proposal, made a competing motion to postpone withdrawing until the fall meeting to give the states a chance to study the idea. In a painful example of the way that parliamentary procedure can be manipulated to produce something quite different from the original motion, an amendment was suggested, debated and subsequently passed that added language to Vernon's motion calling for the withdrawal while the state study the issue concurrently. This modified motion passed 36 to 5 with 5 abstentions (somebody left the room after the 1st motion), giving the directors something to chew on the next day: two similar motions pointing out the need for debate at the Board of Directors meeting.

On a more pleasant note, the ad hoc governors committee on Machine Guidance was reconstituted with a new chair and they are still charged with developing an NSPS position on the surveyor's role in the machine guidance process. This will doubtless lead to discussion with engineers and contractors groups and, hopefully, vendors with the goal of carving out a position that all can agree on.

Board of Directors Meeting

As with the governors meeting the previous day, this too was dominated by the withdrawal issue. The audience included a large number of governors sticking around another day to see how their will would be interpreted. The BOG's first motion was considered, including the uncomfortably close vote that passed it. This motion was recognized as being inferior to their second motion in terms of wording and it was summarily voted down. The second motion, being the modified Vernon motion was lengthily debated and passed 11 to 5. We have two years to work out the details on withdrawal and on the new

Area 9 Director's Report

structure and this is critical: *if at any time the circumstances change or if a workable restructure eludes us we can terminate the withdrawal and remain as we are.*

Other Important Issues

The Railroad Monumentation committee is still trying to get legislation introduced. The reception in Congress is encouraging and it is a matter of timing more than anything else.

- The legislative earmark for TrigStar was rejected. TrigStar is of course sufficiently funded currently. The hope was to secure funding for an aggressive expansion. Congress's taste for earmarks has markedly declined in the last couple years. We will keep trying.
- The Board of Directors voted to grant up to \$20,000 toward creation of a monument that tells the correct story of the establishment of the 'Four Corners' monument common to Utah, Colorado, Arizona and New Mexico. This is greeted warmly by the Navajo upon whose land the four corners monument lies and who are getting tired of debunking the recently reported myth that the original corner was set in correctly and is off by 2.5 miles. This is a good public relations move for the surveying profession.
- NSPS has completed a Crisis Management Manual and it will soon be available to the members.
- The ALTA committee is working toward another periodic update of the ACSM / ALTA standards
- Lobby Day will be handled at congressional home offices in the states in August this year in a partnership between NSPS and the state societies. This could be the biggest one ever!
- The Governors and Directors voted to invite the Cayman Islands surveyors' organization to join NSPS.
- This year's fall meeting is in Orlando in conjunction with the ASPRS and AutoCarto conferences.
- Next year's conference will be in San Diego in July in conjunction with ESRI's Survey Summit.

- Respectfully submitted for consideration by all in Area 9. ■

ⁱ The four member organizations of the ACSM are the NSPS, the American Association of Geodetic Surveying (AAGS), the Cartography and Geographic Information Society (CaGIS), and the Geographic and Land information Society (GLIS).



NSPS



The shortest distance between two points
is not a trip back to the tripod.

TRIMBLE S8 TOTAL STATION



"Back and forth." Easily two of the most hated words for any surveyor. Except perhaps, "again".

Trimble® VISION™ technology brings new levels of productivity to the Trimble S8 Total Station by dramatically reducing trips back to the tripod. Now you can see everything the instrument sees from your controller.

Why walk back? With the longer range EDM you can stay put and use your controller to aim, acquire, and capture measurements to reflectorless surfaces – at more than twice the distance you're used to.

The Trimble S8 also gives you live video streaming with surveyed data on the screen to confirm your task list. With photo documentation, you have visual verification for all data before leaving the site. Eliminating an even costlier form of back and forth.

Trimble VISION is the latest in a long line of innovations designed to make surveying more productive, in the field, in the office, and wherever the next opportunity takes you.



© 2010, Trimble Navigation Limited. All rights reserved. Trimble and the Globe & Triangle logo is a trademark of Trimble Navigation Limited, registered in the United States and in other countries. Trimble Access is a trademark of Trimble Navigation Limited. All other trademarks are the property of their respective owners. SUR-1185

Trimble 2010
DIMENSIONS

**FOR MORE INFORMATION
CALL YOUR
TRIMBLE DEALER**

Allen Instrument
Anaheim, CA
714-238-3434

California Survey and Drafting
Sacramento, CA
916-344-0232



Licensed in 1982, **Paul M. Brown** founded Adobe Associates, Inc., a Land Surveying/Civil Engineering company in Santa Rosa, CA. When not surveying you will usually find him serving as a per diem Hospice Chaplain, tracking down family genealogy, or digging into local history and trying to piece together one story or another.

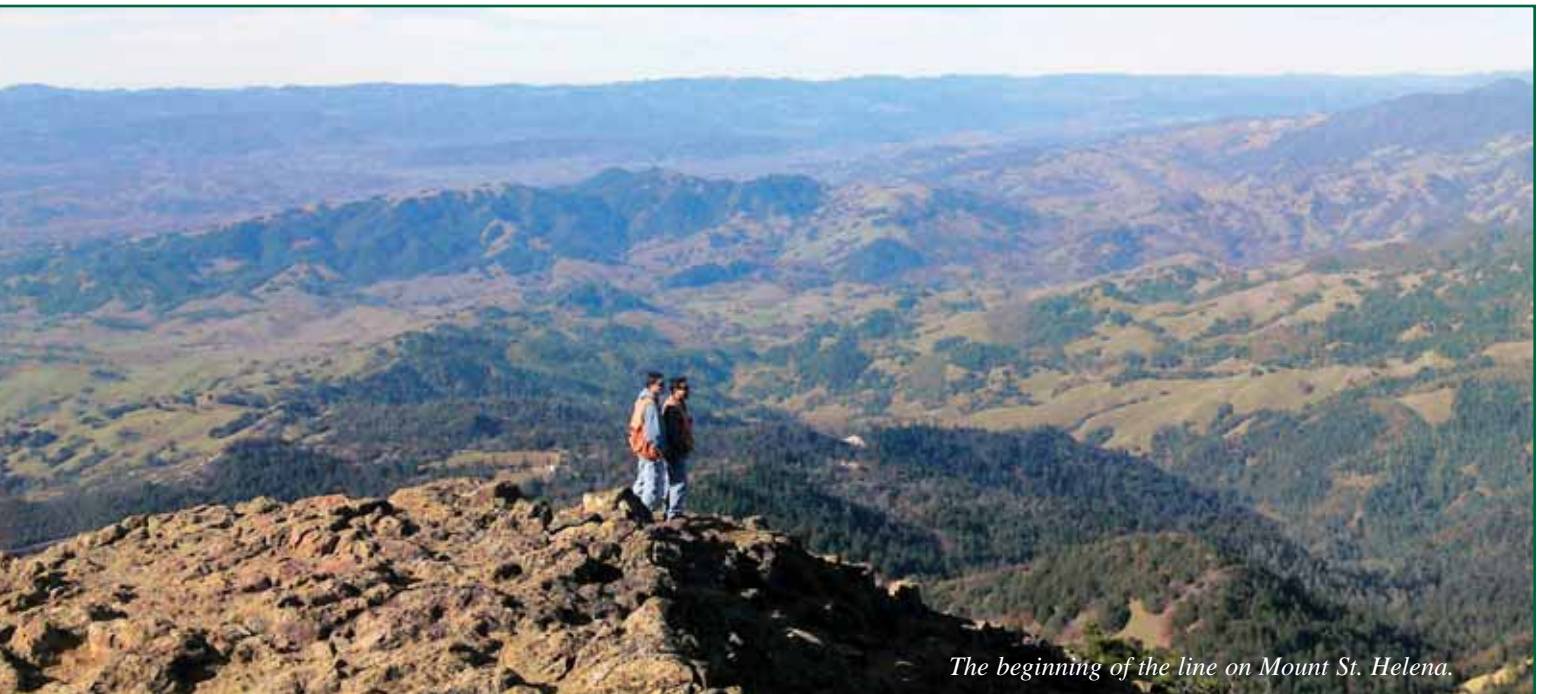
Retracing the Sonoma County – Napa County Boundary

The Monument Preservation Fund Puts Surveyors To Work

J.T. KINGSBURY 1877 HISTORIC LINE RE-TRACEMENT

As time goes on evidence of historic surveyed lines can become clouded, lost, obliterated, destroyed. That is a fact with which the survey community is intimately familiar, whether we work in the public or private sectors. In Sonoma and Napa counties one such line is the common

From copies of the field notes for this line, on file in the office of the Sonoma County Recorder and the State Lands Commission, we know, J. T. Kingsbury, Deputy Surveyor under direction of the California State Surveyor General, William Minis, began his survey of the Sonoma/Napa



The beginning of the line on Mount St. Helena.

boundary between them. Those of us in the private sector have long known that surveying boundaries adjacent to the county line can be difficult and expensive due to the lack of sufficient evidence. Original monumentation dates back to 1877 and was sparsely set, generally a mile apart, in often fairly rugged terrain.

county line at the summit of Mount St. Helena and set iron stakes 3 feet long, 3 inches wide and 3/4 inches thick, with an “S” cut with a cold chisel on one side and an “N” on the other side. Where available he also blazed trees with three notches cut across the blaze. 52 iron stakes were set along the 52 miles of his survey, generally one per mile. His beginning

Continued on next page

iron stake was set at the summit of the mountain, 107 feet southeast of the US Coast Survey Signal Station set the previous year (1876) as a fine drill hole and cross, cut on top of a 1/2 inch copper bolt cemented in bedrock and projecting 1/4 inch. This station was last recovered in 2003, as described, and is designated as National Geodetic Survey PID (point identification number) JT2703.

Some of the original 52 monuments set by J. T. Kingsbury in 1877 have been destroyed by construction of fire trails and other activities along the ridge. A few of these monuments have been found intact, some found destroyed and their positions re-established (not always clear how) and appear on recorded maps of individual boundary surveys. However the distance between original monuments still remaining has rendered their re-construction more expensive than most property owners have been willing to take on. In at least one location a boundary line agreement between vineyard owners on both sides of the line was entered into due to the “excessive” cost of locating the line, “until such time as a more definitive survey could be undertaken”.

For many years, it has been the desire of the Sonoma County Surveyor’s office to re-construct this historic line. In order to do this, it would be necessary to locate original monuments and any other evidence of the original survey (where still existing), re-construct evidence where missing, re-run the approximately 52 mile line, and provide additional new monumentation. This would perpetuate the original survey for use by the private surveying community, for current and future surveying along the dividing ridge, as well as providing accurate controls for use up and down the Sonoma and Napa Valleys. A survey of this magnitude would be difficult to fund, require extensive research, and certainly be beyond the scope of most private firms, at least without substantial public funding. Some initial investigation was begun by county staff some years ago and it was thought the County of Sonoma would undertake the endeavor, but funding, personnel and other priorities kept the survey from moving forward.

So the challenge of financing a re-establishment survey of the entire historic line was going to be difficult, but that issue would need to be addressed, if the survey was ever going to be undertaken. As it turns out such a source already existed.

The Sonoma County Board of Supervisors established the “SURVEY MONUMENT PRESERVATION FUND” in fiscal year 1990-1991, by ordinance No. 4182, in conformance with Section 27585 of the Government Code. Government Code Section 27584 states “The board may establish a survey monument preservation fund to pay the necessary expenses incurred or authorized by the county surveyor in any retracement or remonument survey of major historical land division lines upon which later surveys are based, such as, but not limited to, government section lines, rancho lines, grant lines, rancho section lines, acreage subdivision lot lines, and subdivision boundary lines within such county. The county surveyor may authorize a city engineer to perform such surveys within subject city or may contract with any surveyor in private practice to perform such surveys.”

As an aid to the use of this fund, the Sonoma County Chapter of the California Land Surveyor’s Association established a “MONUMENT PRESERVATION FUND COMMITTEE” to work with the County Surveyor, in an advisory capacity. Through the activities of this committee and the County Surveyor, a formal process was established for application by private survey firms, for the funding of “appropriate” projects, to preserve monuments and lines of significant public value. In normal practice, local surveyors aren’t usually looking to create work, but are busy serving existing clients. As a result, the fund has not often been used.

So, in order to move the discussion of reconstructing this historic line forward, in early 2009 application was made by Adobe Associates, Inc., through Paul M. Brown, PLS, principal, for the gathering of background research and documentation, and preparation of a “draft” proposal for the retracement of the 1877 J.T. Kingsbury survey of the Sonoma/Napa county line. The contract for this application was signed in early April 2009 and in late April 2009 the “PROPOSAL FOR SONOMA/NAPA COUNTY LINE RE-TRACEMENT SURVEY” was delivered to Gary O’Connor, Sonoma County Surveyor for review. The report called for establishment of a control network of monuments along the length of the dividing ridge, followed by re-construction of the surveyed line with appropriate mapping and reports being filed in both counties. Recommended specifications for a GPS control network were included. Integral to the proposal was utilizing multiple private survey firms for prosecuting the work, with suggestions as to how many firms might be coordinated in undertaking the effort. Considerable time savings would be gained by using multiple firms, and coordination of these firms, while potentially difficult, was not considered insurmountable. Each section of work would be set up to be run as independently as possible to ease the coordination challenges. As independent as surveyors usually are, a common purpose was thought to trump that bent. At least that was the hope. What a novel idea: many different firms working on the same project, coordinated by the County Surveyor.

Following review and approval of the draft project report by the Sonoma County Surveyor and the CLSA Monument Preservation Fund Committee, the County Surveyor obtained the support for the project and its’ funding by the Board of Supervisors of Sonoma County and the rest of the pertinent county staff. Once that was in place, the county surveyor called for submission of STATEMENTS OF QUALIFICATIONS from any private survey firms in Sonoma County (including a few from Napa County known to have surveyed along the ridge) interested in participating in the project. Firms from outside the area would not be considered. County funds should stay in the county. Napa County, without a monument preservation fund, was unable to assist in funding of the project but the Napa County Surveyor’s office agreed to waive fees for processing of required “Records of Survey”, as that county’s participation (as it happens, not a small amount).



Anita Moreno of Adobe Associates, Inc., near the middle of Kingsbury’s line.

Retracing the Sonoma County – Napa County Boundary

So, for those of you readers with a penchant for history and “evidence” let me fill in some of the background for this particular project, following which I will return to this story.

History of the Boundary

On January 4, 1850, the California constitutional committee recommended the formation of 18 counties. The current number of counties was achieved over time by subdivision of many of the larger counties into smaller ones. The last county to have been established is Imperial County in 1907. Napa County is one of the original counties, created in 1850 with parts of the county’s territory, together with parts of Mendocino County, being given to create Lake County in 1861.

The State Surveyor General was a Constitutional officer elected by the voters of the state. As outlined in the California Constitution of 1849 the duties of the Surveyor General included:

“He shall make an accurate and complete survey by astronomic observations and linear surveys, of the boundaries of the State; He shall make an accurate map of the State; He shall survey and, when necessary, designate by plainly visible marks, or monuments, and shall describe on the map of the State, the boundaries of the several Counties; The Surveyor General shall be chief engineer and commissioner of internal improvements; He shall deliver to the Governor annually his report.” The office of Surveyor General was eliminated by Chapter 516, Statutes of 1929, with the duties being transferred to the Division of State Lands in the newly created Department of Finance. In 1938, all responsibilities of the former office of the Surveyor General, and which from 1929 to 1938 were held by the Department of Finance, were transferred to a new independent agency – the California State Lands Commission.

As the state legislature was given the responsibility to establish the counties, the following contain the pertinent portions of the legislative descriptions of the counties of Napa and Sonoma:

NAPA COUNTY: According to the California Statutes (23128) *“The boundaries of Napa County are as follows: Beginning at the southwestern corner, at a point in Huichica Creek where the said creek empties into San Pablo Bay, thence east to the mountains dividing Napa Valley from Suisun Valley, forming the southeastern corner;.....thence southwesterly along the southern line of Lake to its intersection with the eastern line of Sonoma; thence southeasterly on said line of Sonoma to the western branch of the headwaters of Huichica Creek; thence westerly to the main ridge that divides the Huichica Valley from the Sonoma Valley; thence southerly along the said dividing ridge to the tule bordering on San Pablo Bay; thence southerly to the center of the Huichica Creek; thence down said creek to its mouth, the place of beginning.”*

SONOMA COUNTY: According to the California Statutes (23149) *“The boundaries of Sonoma County are as follows: Commencing at a point in the Pacific Ocean, three miles due west of a point in the center of the channel at the mouth of the Gualala River, thence due east three miles to said point in the center of the channel at the mouth of said Gualala River;.....thence southerly along the Mayacamas Mountains, and on the western lines of Lake and Napa, to the westerly branch of headwaters of Huichica Creek; thence westerly on the line of Napa to the top of the main ridge that divides the Huichica Valley from the Sonoma Valley; thence southerly along the said dividing ridge to the tule bordering on San Pablo Bay; thence southerly to the center of Huichica Creek; thence down said creek to its mouth, which is the southwest corner of Napa;”*

On December 23, 1861 H.A. Higley, Surveyor General submitted his annual report to John G. Downey, Governor which included the following entry:

“At the request of the Board of Supervisors of Napa and Sonoma Counties, I last summer established the boundary line between the two

counties; and also a portion of the line between Napa and Solano. As usual, I found difficulty in executing the work, arising from the ambiguity and careless wording of the statutes defining boundaries. These statutes should be revised. The expenses of survey were born by the counties.”

In the files at the office of the Sonoma County Recorder I found the following letter:

*“To the Hon.
The Board of Supervisors of Sonoma County*

I have the honor to transmit herewith a map and field notes of a survey of the boundary line between Napa and Sonoma Counties. The survey was made in strict conformity to the Statute. I found that the ridge dividing Clear Lake and Russian River Valleys was at the nearest point about six miles from the Fitch Ranch. I suppose from what Mr. Nathan Coombs told me and my own observations that the ridge intended by Napa as the boundary is the spur dividing the Fitch Ranch from the small valley at the head of which lives Mr. William McDonald. But the law expressly says that the line shall follow the ridge dividing Clear Lake from Russian River Valleys to a point on the top of said ridge one mile east of Fitch Ranch, not one mile from the ranch. I followed down the ridge until I was one mile east of the NE corner of the grant, which was the nearest point in the eastern boundary. I there established the NW corner of Napa County, and ran the line to the head of Huichica Creek. I have been very careful in laying down upon the map, all the ridges, spurs, creeks, etc. so that a perfect idea of the topography of the county can be gained. I will take occasion to say here that the work took twice the time contemplated. It was certainly the roughest and most difficult survey I have ever undertaken. I was present with Col. Norris on the work nearly all the time. The cost of the work was much greater than he anticipated. He asks through me that the Board make an allowance of \$300 more than the stipulated price. I think he is justly entitled to this. The number of miles run was more than 100. The line from the NW corner of Napa to the head of Huichica Creek is 47 miles. This had to be connected back. Lines had to be run to fix the position of the Fitch Ranch, the Head of Huichica and the US Township lines were carried up to the corner in order to make calculations for the bearing of the line. At the prices paid by the US for township lines, the work would amount to \$1,500, and to about the same by the fees allowed County Surveyors.

*Respectfully,
H.A. Higley,
Surveyor General”*

Given the statements in that letter, I was not surprised to find the following entry in the “Biennial Report of William Minis, Surveyor General dated August 1, 1877, to William Irwin, Governor:

“On the fourteenth of February, eighteen hundred and seventy-seven, at the request of the Board of Supervisors of Sonoma County, Captain John F. Kingsbury was appointed to run the line between the Counties of Sonoma and Napa. The map and field notes of this survey were filed in this office on July tenth, eighteen hundred and seventy-seven, and the survey was approved August thirteenth, eighteen hundred and seventy-seven.” (Note the absence of reference to the Board of Supervisors of Napa County.)

In reviewing records at the research desk of the Sonoma County Library I discovered the following articles from the SONOMA DEMOCRAT that helped fill in some valuable information. I have listed them by issue date of the paper:

Continued on page 20

ENGINEERING SUPPLY COMPANY

THE LEADER IN PRECISION POSITIONING SYSTEMS SINCE 1985

Two Full Service Locations
To Serve You! 800-788-3307

Concord, California
5700 Imhoff Dr., Suite J

W. Sacramento, California
1030 Riverside Pkwy., Suite 150

 **TOPCON** Sales - Service - Training - Rentals



There's No Limit To Your Productivity!

With Quality Topcon Products And World Class Customer Service!

Imaging and Scanning
Solutions



RTK and Network
GPS Solutions

 **TOPCON**
GPS PRODUCTS



Advanced Robotic
Systems



Factory Trained and Certified Sales, Service and Training!

Call Toll Free: 1-800-788-3307
www.escsurvey.com

September 12, 1861:

“Surveyor General Higley and Col. Norris with company, passed through town on yesterday, on their way to Knight’s Valley where they will commence the work of establishing the boundary line between Napa and Sonoma counties; Napa having surveyed the line from the Bay up to Knight’s Valley. This is an important matter for both Napa and Sonoma as it will determine the location of the Quicksilver region and also the celebrated Geyser Springs.”

February 19, 1876:

“On motion of Mr. Beacon the Clerk was directed to apply to the Surveyor General of the State for a survey of the county line between Napa and Sonoma counties.”

October 27, 1877:

“It is gratifying to be able to state that the vexed question of boundary between this County and Napa, is at last settled in accordance with the survey recently made by Capt. Kingsbury, under the direction of Surveyor General Minis, and that there is to be no more contests about the matter. In the Napa Reporter of last week, we find the following item, which shows that the Napa people have concluded to abandon the proposed proceedings to set aside the survey: “Our readers will remember the announcement made some months since that a new survey of the boundary line between Napa and Sonoma counties was being made under direction of the Supervisors of the latter county. At the time we gave little attention to the matter, thinking that the approved survey of Ralph Norris, made twenty years ago, would hold under the Code. It seems that we were mistaken. Surveyor General Minis has recently approved the new survey, which the lawyers say concludes the whole matter in favor of Sonoma and against Napa.”

March 6, 1880:

“On motion of Supervisor Crane it was,

Resolved, that the Board of Supervisors of Sonoma County, having in strict compliance with the law of the State of California in such cases made and provided, finally determined the boundary line between the counties of Sonoma and Napa, which said line was for many years unmarked and undetermined, to the inconvenience of all the residents near said line, and to the officers of both said counties in levying and soliciting taxes for State and county purposes, and having at large expense caused said line to be surveyed and marked with plain and lasting monuments, by a deputy surveyor appointed by the Surveyor General of the State of California, as required by law. Therefore, the said Board of Supervisors of Sonoma County respectfully but earnestly protest against re-opening the question of the boundary line between Sonoma and Napa counties, the same having been finally settled as required by law and as above set forth, and it is further, Resolved that a copy of these resolutions be forwarded to each of the members of the Legislature for Sonoma county.”

January 8, 1881:

“Our esteemed contemporary, the Napa Register, thus gracefully surrenders: “In the matter of A. Borel vs. A.G. Boggs, ex-Tax Collector of Napa County, the Supreme Court has affirmed the judgment of the lower Court in favor of the plaintiff. This decision virtually settles the question of the disputed boundary of Sonoma and Napa counties in the favor of the former. Borel, the plaintiff in the case, owns a large amount of real estate in the disputed territory and it will be remembered by our readers was assessed in both counties. Last year he paid his tax into the treasury of Sonoma County, and the property was advertised in Napa county as delinquent and offered for sale on a certain day, when to prevent the land from being sold, Mr. Borel paid the tax and costs, at the same time filing a written protest. He afterwards commenced suit in the Superior Court of Napa County to recover the tax, and got a judgment. The defendant appealed to the Supreme Court, where the judgment of the lower court

was sustained. The decision will cost Napa County something like \$4,000, besides taking from her the disputed territory. Napa County’s share of the expense of the survey made by Kingsbury, which gave the territory to Sonoma County, and which survey was approved by the Surveyor General, amounts to \$1,800. The Board of Supervisors of Sonoma County have heretofore endeavored to make Napa County pay the amount, but our Board of Supervisors declined to recognize the survey, and refused to pay anything for it, but now, of course Sonoma will compel the payment. Besides this a number of property holders within the disputed territory have been paying taxes in both counties for the last four years, and as a matter of course they are entitled to the amounts that they paid in, together with interest thereon. However, we doubt not all will be glad that the matter has been settled.”

From the Law Library in Sonoma County I retrieved the following decision in the court case referenced to in the preceding articles:

“In the suit cited here regarding the location of the county line, it was argued by counsel for the defendant, the Legislature alone can establish county boundaries; the act under which the surveyor-general acted is unconstitutional, if it be so construed as to hold that the action of the surveyor-general was conclusive.

The Supreme Court of California
56 Cal. 648; 1880 Cal. LEXUS 476
No. 7519
PEOPLE ex rel. BORRELL v. A.G. BOGGS

The question in this case is as to the conclusiveness of the survey of the boundary line between Sonoma and Napa Counties, as approved by the surveyor-general of the State. The Court below held that it was conclusive, and refused to hear evidence to contradict the survey.

Section 3972 of the Political Code reads: “All surveys finally approved under the provisions of this chapter are conclusive ascertainment of lines and corners included therein.” Either the above section is unconstitutional, or the survey is conclusive. It is claimed that the section is unconstitutional, in that it attempts to confer on the surveyor-general judicial functions. We do not think that the functions exercised by him are judicial in their character, he is not, under that section, to decide what is the law. The Legislature had already, in regard to the boundary between the two counties, fixed the law; viz., that the summit of the dividing ridge should be the dividing line. We think it was competent for the Legislature to direct its officer to go upon the ground and run his lines along that ridge; and in doing so, he was acting more in a ministerial capacity; and we think that it was competent for the Legislature to declare that the line so run, that is, the location of the boundary line upon the ground, should be thereby defined and fixed.”

Local Firms Selected for Resurvey

From the response to the request for “Statements of Qualifications”, eighteen firms were selected as qualified for the project and were called to a meeting in September 2009, to map out a process for implementation of the proposed project. It was the intent of the county surveyor that each qualified firm would have a piece of the work. From that meeting, four firms were selected at random for the establishment of the control network – Adobe Associates, Inc, Santa Rosa; Crabtree Land Surveying, Healdsburg; Michael Ford, Inc, Kenwood; and F3 & Associates, Petaluma. These firms would establish the GPS control network (project Phase II), and the other fourteen firms would each have a portion of the retracement survey (project Phase III). With numerous jokes about herding cats on a mountain, the project was underway.

The four Phase II firms met through October to work out an equitable breakdown of the 52 miles into four sections, review the draft GPS

Continued on next page

Retracing the Sonoma County – Napa County Boundary

Continued from previous page

specifications, and agree to a final plan for the control portion of the survey. Two of the firms retained outside consultants to provide additional GPS expertise for their firm, which greatly aided the creation of the final specifications. At the initial meeting of these firms, with two representatives from each, and following a discussion of the draft project proposal, it was agreed to form a smaller GPS committee to go over the specifications for the control work. Following agreement that our contractual work had begun and the time included in each firm's contract, the GPS committee was formed with a representative from each firm. The specifications were worked over, massaged and finally agreed to by the committee made up of: Leonard "Gabe" Gabrielson, PLS for Adobe Associates, Inc.; Mike McGee, PLS for Crabtree Land Surveying; Reg Parks, LSIT for Michael Ford, Inc.; and Fred Feikert, PLS for F3 & Associates, with Gabe acting as scrivener for the committee.

The GROUP OF FOUR was encouraged to consider using some students from Santa Rosa Junior College in their project work, if it seemed appropriate. And so a number of students from Jerry Miller's Surveying Technology program at Santa Rosa Junior College were invited to participate in the project by two of the firms as a means of providing an enlarged view of the profession. Beau Immel, David Slatter, Greg Pfeiffer, Tiffany Tatum, and Eli French, all JC students, worked on Sections II & III. By the time the control project was concluded there were some excited students on campus, with an elevated status as "paid surveyors".

By the end of December 2010 the control monuments were set and the GPS field work complete. The final adjustments were completed in January and in February/March the Records of Survey were in process for County Surveyor reviews in both counties and subsequent recording. It had been recommended and agreed by both counties to record the maps in consecutive order from Section 1 on the north to Section 4 on the south. A common coordinate system for control of the total line was now in place.



In Sugar Loaf Ridge State Park looking south along the dividing ridge.

Following agreement of a process for prosecution of the field work for each section, coordination between sections and project deliverables, each firm prepared their contract proposal for submission to the Sonoma County Surveyor's office for approval. Each section of the work was intended to be set up for completion in as independent a manner as possible, each section running its own adjustments, with a final total network adjustment to be run as a check and to provide final coordinate values for use in each firm's mapping. It was agreed to have Mike McGee run the final adjustment, with each of the other firms taking their own shot at running a total network adjustment and comparing results. For those of you most fascinated with the details, and hoping not to turn away those who are not, I have included the project specifications at the end of this discussion.

The County Surveyor decided to use project control monuments specific to this project, both for control monuments as well as the final line retracement monuments and accessories. In November, 2009 the County Surveyor ordered the control monuments with approval of each firm's monument designation, and delivered them to the four firms:



Special Monument caps for the retracement survey.

Contract proposals were developed following the guidelines established for use of the Fund, and delivered for review and approval by the County Surveyor. For this project a separate committee of private survey practitioners from Sonoma County, (not included in this project), acting as advisors, was convened by the County Surveyor to review these contracts. With some minor requested revisions, the contracts were agreed to and the work authorized.



...and down to San Pablo Bay.

Suggested breakdown of the county line into fourteen sections as equitably as could be, were supplied to the County Surveyor by the initial Phase II firms. I conclude this article with the following comments by participants:

MIKE FORD, PLS, "This project, so far, is an example of how a large surveying project can be accomplished effectively and efficiently with the collaboration of surveying companies that regularly compete with one another. The Sonoma County's Surveyor's Office, namely Gary O'Connor, deserves much of the credit for successfully negotiating the bureaucratic hurdles and providing the leadership to bring this project to fruition. Credit should also be given to the four firms that were chosen to perform the initial reconnaissance and set the horizontal control network. Through their cooperative efforts the Control Phase came off without a hitch. The old saying that "if you take all the land surveyors in California and lay them end to end they would all point in different directions" didn't hold for this group. I was suitably impressed with the willingness of all to collaborate, compromise and share their individual knowledge and skills to produce a single control network that the "Kingsbury Line Retracement Survey" will reference. Kudo's to Adobe Associates, Inc., Crabtree Land Surveying, F3 & Associates and Michael Ford, Inc. Land Surveying."

Continued on next page

Retracing the Sonoma County – Napa County Boundary

JIM CRABTREE, PLS, “For me, this project has been as much about the people involved as the survey itself.

I had not had the pleasure of meeting Fred Feickert until our first control group committee meeting. The other surveyors on the project, although known to me before, have become more like friends and co-workers as we resolved the coordination and technical issues as a group. We worked with my good friend Michael McGee, who assisted us with the GPS specs and adjustments. I was also able to include my son who was on winter break from the Geomatics program at OIT.

Surprising to me, the landowners whose cooperation was very much needed, were particularly helpful. There was the winery owner who still had a positive attitude, despite having spent years and lots and lots of money dealing with dual County jurisdictions and not knowing just exactly where the County line is (and still not have the winery built). There were some owners I never met face to face. One property owner turned out to be my dentist and he gave me the phone number for his neighbor, an absentee owner. These don't seem like big deals, but when

you have a small window to complete several days' field work, it's critical to have the access figured out.

I do regret that I didn't make more of an effort to include the SRJC students in our fieldwork. My only other regret is that I didn't prepare for doing a little recreational corner searching on my own. Some of our points should be close to Kingsburg monuments.

As much as I enjoyed the people contacts, it didn't hurt that on one day the view from Mt. St. Helena included Point Reyes, the Farallon Islands, San Francisco and Oakland, Mt. Diablo, the Sierras and Mt. Shasta and, of course, most of the Kingsbury Line. On another day, when the weather was a light rain in Knights Valley it was a cold, foggy, windy, horizontal blast at the top. The vertical difference from Highway 128 to the top of the mountain less than 5 miles away is 3600 feet.”

On February 24, 2010, the other fourteen firms were called to a meeting to match firms with each of the fourteen sections. As of this writing, proposals/contracts for each of these sections are underway. ■

Sonoma - Napa County Line Survey 2009 GPS Network Control Survey Procedures and Specifications

By: Michael McGee, PLS

OVERVIEW: The Phase II survey for the GPS Control Network covers a linear north-south path of about 40 miles. The Primary Network has been partitioned into four areas or Sections (four companies) of approximately 10 miles in length. Each Section will be a sub-network within itself. The lengths and boundaries between the Sections have been determined by the Sub-Committee (made up of the four companies) performing the GPS Control Network with the intent of equitably distributing the work. It is expected that that each company will perform the survey of their assigned Section on their own schedule. The survey plan for developing a network for each section is discussed hereafter. The primary control and constraints for the network will be three CGPS (Continuous GPS) stations published by the California Spatial Reference Center (CSRC) with NGS sanctioned NAD83, 2007.00 Epoch positions listed below. The CGPS stations, similar to the NGS CORS, are published on the CSRC web site () for California. The Sections, CGPS stations and HPGN stations are shown on a map at the end of this document.

Station	Latitude	Longitude	EH(m)	Vel. N	Vel. E	Vel. U
P200	38 14 23.377664	-122 27 6.072673	-24.5667	0.0166	-0.0195	0.0000
P201	38 33 35.286081	-122 39 30.309085	349.8624	0.0029	-0.0105	-0.0126
P202	38 25 24.875220	-122 29 45.545574	584.6136	0.0026	-0.0129	-0.0136

SECTIONS: The Sections are numbered sequentially from north to south as Section One, Section Two, Section Three, and Section Four. These Section numbers will be referenced in all communications. New control points will be established about every 2 to 3 miles in each Section. Points in each Section will be assigned point numbers for identification within a range as listed below. For HPGN station identifications, use their NGS PID.

Section	Point Range
One	101-199
Two	201-299
Three	301-399
Four	401-499

The nearest control point to the boundary between adjacent Sections will be selected for a Tap Point. The Tap Points will be included in the GPS survey networks of adjacent Sections and are intended to provide a common connection between the sub-networks. Each company will set and survey the Tap point on the south side of their Section and include the Tap Point on the north side in their survey. Note, there are no Tap Points on the north side of Section One and the south side of Section Four.

Companies performing surveys in adjacent Sections will necessarily need to coordinate their efforts in regard to Tap Points.

HPGN: In addition, to confirm and report on the network compatibility of in-the-ground HPGN monuments, the following will be included in each Section's survey. The HPGN points were assigned based on their proximity to each Section; however, the Committee has the option to change these assignments.

Section	HPGN NGS PID's
One	JT9630, JT2703
Two	JT9631
Three	JT9565, JT9626
Four	JT9621

SURVEY PLAN: The procedure for performing the field survey follows: A base station receiver is set up on a control point having a clear horizon above 15 degrees. The preference is for a location approximately 1/4 - 1/3 the length of the Section from one end (this is intended to create long and short vectors to each point). One or more roving receivers, oper-

Continued on next page

ating independently of each other will occupy the new points, the Tap Points and the HPGN points for 30 minutes in a sequence that optimizes production and all roving receivers complete their point assignments at nearly the same time. The base receiver is then moved to a point located approximately 1/4 - 1/3 the length of the Section from the other end of the Section, and all points are occupied a second time (this includes the previous base station). The intent is that every point is measured with an independent short and long vector and the maximum length is limited to about seven miles except for vectors connecting the base stations to the CGPS stations.

PROCESSING: In the post-processing, vectors (baselines) will be computed from each base to two CGPS stations using a minimum of two hours of observations. A primary network of six vectors will be created connecting the two Base Stations and the two CGPS stations with a closure on the second CGPS station. The vectors will be processed in each Section from CGPS station P202 to the Base Station points and then to P200 or P201 as listed below.

Section CGPS in Network

- One** P202 – P201
- Two** P202 – P201
- Three** P202 – P200
- Four** P202 – P200

Two vectors are processed between the Base Station points. Vectors will then be processed from each base station to the other points occupied

in the survey resulting in two independent vectors to each point. In the network adjustment, the result is an over determined system in which the position of the base stations are very well known. The residuals at the secondary points (new points, Tap Points, HPGN) resulting from the two independent vectors are indicative of the accuracy of each point and are expected to be less than 2 centimeters with un-obstructed observations.

ADJUSTMENT: A minimally constrained network adjustment will be processed by constraining to CGPS station P202. The vector residuals, differences at the other CGPS station and HPGN stations will be listed and forwarded along with an exported ascii file of the final vectors to the County Surveyor for QAQC analysis. The County Surveyor will review the results for all companies, compare the Tap Point positions derived from adjacent Section surveys, and determine if the adjustment is acceptable. Once all four surveys are accepted the vector files will be combined in a single network adjustment constrained to the three CGPS stations resulting in latitude, longitude and ellipsoid heights, and grid coordinates that will satisfy the Public Resources Code for filing in a Record of Survey(s). Note, station velocities may be a consideration in designing the final adjustment constraints.

BOUNDARY CONTROL SURVEY: Suggest the 14 firms be assigned point number ranges from north to south beginning with area one 1001-1499, area two 1501-1999, area three 2001-2499 etc. Suggest a minimum of three primary GPS control points be included in conventional traverses along the ridges unless a company establishes secondary GPS control. Adjustment methods and reporting for conventional measurements need to be addressed to assure uniformity across the project.

Continued on next page



- Aerial Imagery
- Orthophotography
- Plan/Topo Mapping
- LiDAR
- In-house Photogrammetry
- GIS Services
- Historic Archives

Serving California and beyond the West Coast for 60 years...

2001 Broadway, 3rd Floor Oakland, CA 94612 (510) 834-2001 p (510) 834-2101 f



GPS Methodology and Requirements

- 1 Broadcast Ephemeris is acceptable, however, the Rapid Ephemeris is available the next day with the CGPS rinex data and is preferred.
- 2 Rinex Data for the CGPS stations is available the next day (downloading, antenna assignments and processing instructions can be made available)
- 3 Satellite observations will be collected at 10 degrees and processed at 15 degrees unless dictated otherwise by processing results.
- 4 Minimum occupations shall be two times on all points under different satellite constellations.
- 5 Maximum PDOP is 5 for a minimum of 5 satellites clear of obstructions
- 6 Minimum satellites to be observed simultaneously at base and rover is 5 satellites that are clear of obstructions. This will require pre-planning with obstruction diagram and satellite availability software.
- 7 Minimum time of observation is 30 minutes for rovers and 2 hours for vectors connecting base stations to CGPS stations.
- 8 Epoch interval for data sampling shall be 15 seconds. 5 second is acceptable but does not contribute to the solutions since CGPS and CORS generally run at 15 or 30 second epochs.
- 9 Repeat station observations must be a minimum of one hour apart in time.
- 10 Antenna measurements shall be recorded in feet and meters at the beginning and end of each occupation when using a tripod setup. Fixed height poles (four legged) are recommended.
- 11 Tripod/Tribrach and Fixed Height Poles will be calibrated with a total station and be within 1 millimeter of plumb. A report on the calibration will be included in the survey report.
- 12 NGS antenna models (available on the NGS web site) will be used in post processing.
- 13 Obstruction Diagrams will be prepared for all points and used to pre-plan the best times for occupying a particular point. The best time is dictated by having five satellites clear of obstructions (not attenuated by foliage) with as PDOP of 5 or less.
- 14 Base Stations must have a clear horizon above 15 degrees and not have any nearby objects (minimum of 20 feet) or reflective surfaces that may be a source of multipath.
- 15 Occupation Logs will be kept for each receiver session (occupation). The information will include the operator, company, receiver make/model, antenna make/model, setup configuration (tripod or fixed height pole), start, stop times, antenna height in meters and feet, station description, to reach instructions, obstruction diagram, and weather conditions and will note any significant events affecting the data collection. A standardized log form using a form approved by the County Surveyor will be provided. Obtain photos of each point visited including a close up and distant picture. Clearly mark each point with their ID.
- 16 Survey Report will be prepared addressing the purpose, plan and execution of the field survey; datum and epoch; references used to realize the datum; minimally constrained and constrained adjustment results including closures on known points and vector residuals; equipment and operators; accuracy; accuracy; recommendations (examples available)
- 17 Accuracy will be 1:50,000 or better on closures between CGPS stations (expect 1:100,000)
- 18 Residuals allowed in north and east component not to exceed 1 centimeter, and 2 centimeters in height.
- 19 Processing Logs will be kept for data management, processing and adjustments. Observation data will be delivered to the County in a format consistent with the following example: C:\Kingsbury\Section One\Rinex\120109\BaseStation # (or) \Rover #

Prepared by Michael McGee, PLS3945 -Revised October 19, 2009 ■

Map of Kingsbury Boundary
GPS Control Network
Section Limits (green), CGPS Stations (purple),
and HPGN Stations (yellow)



The More Things Change...

David E. Woolley, PLS, is the CLSA Orange County Chapter Legislative Chairman, Chapter Representative, State PPC Member, and owner of D. Woolley & Associates, Tustin, CA

Quotes from the near and distant past that prove the point: The more things change, the more they remain the same.

The following excerpt is from *The Judicial Functions of Surveyors*, presented to the Michigan Association of Surveyors and Civil Engineers in 1881, by Chief Justice Thomas M. Cooley of the Michigan Supreme Court.

"...there is no particular time that shall be required to conclude private owners, where it appears that they have accepted a particular line independently as their boundary, and all concerned have cultivated and claimed up to it. Public policy requires that such lines be not lightly disturbed, or disturbed at all after the lapse of any considerable time. The litigant, therefore, who in such a case pins his faith on the surveyor is likely to suffer for his reliance, and the surveyor himself to be mortified by a result that seems to impeach his judgment.

Of course, nothing in what has been said can require a surveyor to conceal his own judgment, or to report the facts one way when he believes them to be another. He has no right to mislead, and he may rightfully express his opinion that an original monument was at one place, when at the same time he is satisfied acquiescence has fixed the rights of parties as if it were at another. But he would do mischief if he were to attempt to "establish" monuments which he knew would tend to disturb settled rights; the farthest he has a right to go, as an officer of the law, is to express his opinion where the monument should be, at the same time that he imparts the information to those who employ him and who might otherwise be misled, that the same authority that makes him an officer and entrusts him to make surveys, also allows parties to settle their own boundary lines, and considers acquiescence in a particular line or monument, for any considerable period, as strong if not conclusive evidence of such settlement. The peace of the community absolutely requires this rule".

Commentary by David E. Woolley, PLS

This context of this passage refers to the establishment or re-establishment of monuments at their original location. In the event the original monument location is undeterminable, the surveyor can allow the parties to settle their own boundary lines. That is not to say a surveyor can or should make a legal determination, such as acquiescence. The surveyor must recognize and document the elements of legal boundary doctrines i.e. acquiescence, prescription, agreement etc. Woe to he who incorporates any one of these doctrines without having considered all other evidence and makes a legal determination without having organized the proper title and/or conveyance (re-conveyance) documents. The surveyor must be educated and aware of the nuances of written title and property rights. The complete surveyor will document the facts related to legal boundary doctrines and assist the parties in reconciling the discrepancy between the written conveyances with the location on the ground. Anything less is likely to be negligence.

Consider the following hypothetical example of negligent practice: A surveyor rotates a Computer Aided Drafting (CAD) model of a record map or metes and bounds description to two found monuments. Other found monuments are then called out of position from their "record" location. Or worse yet, they are shown as being in the record position when the contrary is true or were not searched for at all. No reputable textbook, written standard or case law prescribes this method of boundary "establishment". In California, rotating record figures violates California Code of Civil Procedure § 2077 because it places lesser "record" elements over actual physical monuments. Any opinions (maps, plats, exhibits) derived from these procedures are likely to be in error, thus putting the boundary where it does not belong. ■



Santiago Canyon College
SURVEY/MAPPING SCIENCES PROGRAM

Preparing for California LSIT or LS exams? Need to upgrade your skills? New surveyor? We offer:

- Affordable classes with certified instructors
- Survey/mapping certificate and degree programs
- Computer labs equipped with GPS, ESRI-GIS, and AutoDesk software
- Total Stations and GPS for field exercises
- Evening classes in City of Orange
- Career training for new surveyors

For more information call (714) 628-4883 or visit www.sccollege.edu/survey

 **Santiago Canyon College**
8045 East Chapman Avenue
Orange, CA 92869

By: *Carl C. de Baca, PLS*

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



The Summer of Living Dangerously (But Safely)

Thoughts on the concept of safety in the field.

Last summer my 19-year-old son, Conor, erstwhile college student (but mostly aspiring college baseball pitcher), came home needing a summer job. I gave him one and it turned out to be an interesting summer indeed. Buried in the following passages is a list of reasons why my wife is angry with me and why my other two sons may not end up getting all that much exposure to our exciting and soul-satisfying profession.

A few years back I heard the distant rumble of the impending collapse of the housing market and decided it was time to flee the Sacramento area and my position as survey manager for a multi-discipline firm. I had been primarily doing boundary surveys and supervising subdivision mapping for the previous fifteen years. The once red hot land development segment seemed to be cooling down rapidly and for some time I had been keeping my eye on my old home town in Northern Nevada, an area that ranks fourth in the world for gold production and produces significant amounts of other minerals, and precious and non-precious metals as well. As the long-depressed price of gold started to climb in 2004-2005 I made the decision to go home and hang my shingle, offering surveying services to the mining community at large.

Four years on it has turned out to be a very good move for me and I do not regret it in the least but I must say that there were necessarily some profound changes in my day to day work routine, the most significant of which is that I spend probably 85% of my time in the field now and have been reintroduced in a major way to the concept of workplace safety. It seems funny using the term 'workplace' because in the course of a week, my workplace can be the muddy surface of a tails dam, the precipitous top of a mine high wall, the Jon-boat in which I perform somewhat primitive hydrographic surveys of tails facilities and the mountains and deserts of the Great Basin. For me there is much to enjoy about my new professional focus. However, there are many dangers concomitant with this line of work. I have gotten used to most of these dangers and I don't much worry about them while going about my day but the key is to stay alert all the time. I focus on maintaining a rigorous safety regimen that can minimize these dangers.

Mining is a dangerous business whether below ground or on the surface. A typical open pit gold mine has enormous machinery both stationary and mobile; steep and sometimes unstable slopes; explosives and explosions; poisonous, caustic and flammable liquids and gasses; and seemingly limitless opportunities to get hurt or killed. Over the last hundred and fifty years, many hundreds of miners have lost their lives in gruesome accidents throughout the country and the Mine Safety and Health Administration (MSHA) was created and still exists to prevent these accidents. MSHA requires that all new miners take a 24-hour introductory course in mine safety before going to work at a mine. This requirement also applies to contractors and consultants, such as me. MSHA also requires an annual 8 hour refresher course be taken so as to reinforce the importance of mine workplace safety. In addition to these safety courses, each mine also requires that site-specific safety training be administered to all miners at each mine and every task such as operating heavy equipment or working in the mill, requires specific task training as well. Each of these comes with a special U.S. Government Printing Office form called the 5000-23 that must be filled out and signed by both the trainer and the trainee and which must be renewed annually. The miner must keep these on his person at all times when on site. I have projects at several different mines which means I keep a binder of 5000-23's in the truck and I must make sure not to let any of them expire. No one should ever operate equipment or work in hazardous places unless they have been properly trained. That alone eliminates many opportunities for accidents.

After Conor completed his MSHA new miner training this June, I took him to his first mine: Newmont Mining Corporation's Phoenix Mine located near Battle Mountain, Nevada. This mine has a sterling safety record and the people who work there are very focused on keeping it that way. As soon as you cross through the gates you must remember to turn on your headlights, turn on your strobe light, put up your fluorescent flag mast and most importantly to switch over to left-hand traffic. (This is routine at all surface mining operations due to the visual limitations of the large haul trucks.) At the

Continued on next page



pudding below for quite some time. The water in the pool area is drawn out through a decant structure and pumped back to the mill for re-use.

The project I am embarking on this summer is an “upstream raise” which means that we are placing fill material out over the tails and building upwards from there. Before the contractor can do that, the toe of the fill must be slope-staked, which in turn means that someone has to tread on the tails surface, the one that I just told you is a lot like pudding. Who gets to go out on tails you ask? Hello Conor, I guess it sucks to be the new guy...

There was a little over 8000 feet of the toe to be staked. That is some 80 stakes falling roughly 50 feet out from the existing edge where the mud is over 20 feet deep. Conor was equipped with a safety harness attached to a length of mountaineering rope and anchored to yours truly situated

on the existing dam crest. He walked on two pieces of plywood, cut into 2' x 3' planks with a piece of rope attached to the front to use as a leash. It was a bit like walking on snowshoes although in practice the rope was used to fling each plank ahead as he stepped from one to the other. This made for an awkward and slow gait so the task was a multi-day endeavor. Conor also carried the GPS gear, in this case a Trimble 4700 and Zephyr antenna in a backpack, which was the perfect tool for the job, although the backpack necessitated modifying the safety harness so that it could be worn backwards with the rope attachment on the chest instead of on the back. We attached the data collector to his vest with heavy duty Velcro so that when he was ambulating, he would have his hands free. A hammer was not necessary since he could push the lath into the tails surface without much resistance. I carried the lath bag and tossed each one to him as we found the catch point because there were only so many things he could manage and also we were afraid that the plywood shoes would not support any more weight. We carried on this process for four days without a single incident and were frequently observed by the mine's safety coordinator. It was amusing to listen over the radio to the comments by the other contractors, who apparently thought we were crazy.

The second week of Conor's stint as a surveyor saw us slope-staking the downstream side of the dam for the raise to the next stage. Both the upstream and downstream crests of the dam have 5-foot high safety berms so as to prevent the haul trucks delivering the fill from driving off the edges of the dam. As the fill goes up, so do the berms. As we proceeded with finding the catch points, the stakes were consistently falling near the top of the downstream berm. It was a hot July day and some ominous clouds were passing by to the south. It was a typical summer thundershower, a cold air front moving over the top of the 100-degree desert air and causing little rain squalls along the way. There were some lightning bolts striking the ground some four or five miles away and we took a break while the storm blew through. Once it had passed us to the east, I climbed up the berm and began staking again



Phoenix mine, the first thing you encounter after passing through the gate is an intersection with a major haul road where you must come to a stop and make sure that the way is clear. Using that road on occasion are Caterpillar 785 haul trucks, a moderately sized-behemoth that can carry 150 tons of material and is big enough to crush a passenger vehicle flat without the operator even realizing that he hit something. They look like a 3 story building going by and judging their speed is difficult because of the size. After encountering a 785 on its way to somewhere, we turned on the haul road, which is some 90 feet wide and bracketed by 6 foot high berms, (rule of thumb – berm height must be at least half the tire diameter of the largest vehicle expected to travel the road – a 785 tire is roughly 10 feet in diameter), on our way to the tails dam. The tails dam at the Phoenix mine is a work in progress and as the mine grows, so must the capacity of the tails impoundment. Currently on stage 3 of a 7-stage project, the dam is already over a hundred feet high and hundred feet wide across the top. My job this summer is to perform staking and quality assurance surveying while we raise the dam 20 feet. Tails dams are designed to fill up with solids and once mine life is over, the dam gradually hardens into a mountain of solidified slurry, which is then capped and re-vegetated. The bottom of such an impoundment, which is lined with an 80-mil thick high-density polyethylene (HDPE) liner, is tilted towards a pool area and the slurry is released through spigots at the uphill side. The cyanide-laced water runs out toward the pool while the slurry material, the remains of the milling process, dries in place. 'Dries' is a relative term because this quicksand-like material tends to form a thin crust while remaining the consistency of

Continued on next page

when the PDL antenna started making a loud buzzing sound and the hair on my arms and neck started standing up. I quickly jumped down and put the equipment on the ground. I was sure that lightning was going to strike but thankfully it didn't. I used the opportunity to explain to Conor what to do in the event of such an emergency. First grab the mine radio and call for radio silence and ask for the mine foreman, then state "man down" and give the location as concisely as possible. The mine procedure in such an event is that all equipment and vehicles throughout the mine are immediately stopped and radio silence is held until instructed otherwise. Each mine has an ambulance and a crew of EMT's called "first responders" and they are dispatched to the scene and usually can arrive within minutes. Lightning strikes often cause burns and can sometimes cause the victim's heart to stop so CPR training is useful. (I am trained in the procedure and update my training annually, Conor is not yet trained). All in all it was a close call and a 'teachable moment' but with no ill effects. Surveying when lightning strikes are possible is a needless risk but one easily overlooked.

The following week I took the boy, by now an old hand at mine surveying, to Newmont's LoneTree mine, which is now closed and undergoing reclamation. One state-mandated closure requirement is to monitor the tails surface to see how the material is solidifying or consolidating, as the process is called. All of the surface water on these tails has long since soaked in or evaporated. Last winter I set 15 monuments in the 200-acre tails impoundment. These monuments (except for one) are 10 foot long pieces of angle iron with a reflective prism on the top and a cross bar welded 4 feet below the top. They are driven in until the cross bar rests on the surface and the prisms are pointed toward a permanent control station on a hill next to the dam. One monument differed from the above specifications because it was placed in the area where the pool used to be and the mud there was still quite soft. This particular spot required a 20 foot section of angle iron plus a rubber mat and piece of plywood for the cross bar to rest upon. Setting that monument was where I originally developed the previously described plywood snowshoe technique although I must point out that once such a plank becomes slick with mud, it is easy to fall off and become mired up to your waist in the tails. Not that I would know that first hand...

So it is time for the quarterly observation of the tails monuments at LoneTree. I set up my total station on the permanent control point above the dam. It is an iron pipe in concrete with a bolt on the top on which to thread the total station, thereby removing instrument height from any subsidence calculations. The pipe, an old mine survey control point, was originally set by someone much taller than me so last winter to make it easier to use, I stacked some large rocks around the pipe to stand on. I was standing on said rocks when Conor pointed out a 3-inch long scorpion crawling out of the rocks next to my



The Summer of Living Dangerously (But Safely)

boot. A sting from such a creature could in a worst-case be fatal, but even the best case scenario would still be pretty crappy. We coaxed our little friend, who was the largest scorpion I've ever seen in this part of the country, into a split-open water bottle and duct taped it shut. The scorpion lived all summer in a terrarium in our kitchen. I called him "Rudy", after Rudolf Schenker, the guitarist for 80's rock band The Scorpions. Rudy loved big crickets and grasshoppers and really did glow in the dark when lit with a black light. Alas, we set him free he is now back slinking with his carapace clad compadres. Poisonous creatures abound in the Great Basin and avoidance is the best way to deal with them (rather than making them a house guest). By the way, the monument with the 20-foot section of angle iron has since sunk out of site, plywood, rubber mat and all. I'd have to say that consolidation is not yet complete.

Next up for the young surveyor was a series of aerial photo control projects. On days when we were not surveying at the Phoenix tails dam, we had to set 83 flight crosses at 6 different mine sites and associated exploration areas throughout Northern Nevada. Given the terrain, the use of ATV's was not only warranted, it was critical. ATV use is one the things where specific task training is required, and so I task-trained perennial good sport Conor. Commencing this type of operation means outfitting each ATV to carry: flight crosses – each leg pre-assembled as a twenty foot section stapled to a piece of lath at each end and rolled up, 60d nails and shiners to secure the 20 foot flight crosses against the almost constant desert winds, a hammer, the GPS equipment, (again the trusty backpack clad Trimble 4700), a rod and bipod, a handlebar mounted handheld GPS device for navigating to the pre-computed lats and longs, and most important since it is the desert in summer, bottles of water.

The first project required carrying the GPS base station equipment as well as the other gear to a control point on the top of a mountain. The trail up was an old drill road, overgrown with brush and with notorious switchbacks from the valley floor, which was situated at around 5000 feet above sea level, to a saddle near the top at an elevation of over 8500 feet. Loaded down with gear and climbing such a steep grade in July, both four wheelers battled overheating problems the whole way. This project was relatively uneventful although I confess it is best not to look over the downhill side of that road while riding on it. Regardless of the summer heat, I insist on proper safety gear including steel-toed boots and helmets. Too many ATV fatalities involve rollovers by people not wearing helmets.

The next site was mostly in an arid valley in an area bracketed by the Union Pacific Railroad main line and the always-on-it's-last-legs Humboldt River. (The Donner party thought the waters of the Humboldt to be almost undrinkable, even for the

Continued on next page

The Subdivision Map Act: A One-Day Seminar in Several California Locations!

Lafayette
Marina
San Luis Obispo
Bakersfield
Rancho Cucamonga
San Diego

Allen Matkins
in association with
LandUseNavigators.com

COST: \$195

Group discounts available

TIME:

Registration:

8:30 am

Class:

9:00 am - 4:30 pm

Includes the 2010 edition of the Map Act Navigator (a \$49.95 value)



WHAT IS COVERED?

This seminar provides guidelines for effective use of the Subdivision Map Act. The instructors will discuss the responsibilities and powers of local agencies under the Act, as well as particular issues regarding when the Act applies.

SEMINAR HIGHLIGHTS:

- Discussion of legislative and judicial changes in 2009
- Relationship of Map Act to other planning, zoning and development laws, and to CEQA
- When the Map Act applies (and when not)
- What kind of Map (Tentative/Final or Parcel Map) to use
- Certificates of Compliance
- Lot Line Adjustments
- Exemptions and exceptions under the Map Act
- Life of Tentative Map
- Vested Rights (including Vesting Maps, Development Agreements and Common Law Vesting)
- Exactions/Dedications/Fees
- Creative mapping approaches

WHO SHOULD ATTEND?

This seminar is designed for planners, surveyors, engineers, developers, builders, attorneys, project managers, architects, planning commissioners, council and board members, property managers, public works and utilities directors, zoning board members, and all others involved with the land use process.

This course qualifies for 6 hours of California MCLE credit.

FACULTY



Michael P. Durkee



David H. Blackwell

Register for a seminar: by phone 415-273-0310 online at LandUseNavigators.com or register and pay at the door

2011 Classes Coming Soon!
Look for our upcoming ad.

Upcoming Classes

RANCHO CUCAMONGA

Sept. 23

Rancho Cucamonga
Community Center
Lion's Park Building
9191 Baseline Road
Rancho Cucamonga, CA 91730

SAN DIEGO

Oct. 28

San Diego Concourse
Copper Room
202 C. Street
San Diego, CA 92101

Continued from previous page

oxen.) The lands in this area were originally part of the checkerboard land system of alternating public and private sections of land and now are subject to ranching and mining interests. The low lands near the river are a sort of swamp of salt grass and willows and semi-wild cattle and contains the thickest clouds of mosquitoes found anywhere south of Alaska. Even 40% deet bug repellent is only good for about a half hour. Mosquitoes in Nevada have been found to carry a variety of diseases including encephalitis and bird flu. It is important to refresh the repellent application often. The other side of this site is adjacent to the railroad tracks, which have been there since the 1870's. The track is upraised about 10' on fill material and is the only high spot in the valley. Sagebrush and bitterbrush have grown thick along both toes of the embankment and crossing the tracks on foot is made difficult by the density of this brush - brush that seems to attract many small species of birds and rodents and their number one predator, the rattlesnake, or more specifically the Western Diamondback rattlesnake. Western diamondbacks are responsible for most snakebite fatalities in the United States. This heavy bodied, large and easily provoked species is easily recognized by its grayish tan background color, dark diamond pattern and of course, the rattle. Diamondback venom is not necessarily fatal, but a bite from a large snake can deliver a

massive dose and if you are hours away from a medical facility, things might not go so well.

After arriving at the site and unloading the ATV's from the trailer, we split up and worked independently due to the number of flight crosses to be set. I chose the mosquito zone and let Conor take the uplands near the railroad. After loading up all the gear, he went south and I went north. I had set a couple crosses and was working on a third when my cell phone rang. Thankfully this was in one of the few parts of the desert with cell service. Conor, breathlessly babbled into the phone that he had speared a rattlesnake with his survey rod and then he said, "Uh, oh, it's not dead yet... I'll call you back!" and the phone went dead. A couple minutes later he called back, still breathless and told me, "It's dead now!" and hung up again. I called him back a few minutes later and he explained that he had stepped over the brush on the side of the railroad fill and almost stepped on the snake. Spearing it was primarily a defensive reaction. He also noted that he had seen a couple more rattlers while walking out to set one of the crosses. He sounded kind of jumpy, although heaven knows why.

I figured I'd better ride over and check on him since he sounded equal parts elated and scared on the phone. After a

Continued on next page



The Summer of Living Dangerously (But Safely)

requires someone to drive the boat while I collect data, someone like Conor. The only real hazards are launching the boat from the HDPE-lined embankment and getting in and out of the boat. Typical desert winds can add a bit of chop to the water and you breathe a certain amount of acrid cyanide mist but it's not any worse than the air in some of the cities I have been in. Conor became quite adept at trolling for topo in the course of surveying two of the larger tails ponds.

And so at the end of summer, the boy went back to school. He survived all of the hazards to which I had subjected him and actually seemed to like the whole experience.

hard 40 minute ride I found his ATV parked on the dusty dirt road next to the tracks. He was off setting a cross. In the carry basket on the back of the ATV was a headless rattlesnake body, 46" long and with 13 buttons on his rattle. Alive, it would have been over four feet long. The carcass had several puncture wounds and I'm guessing that adrenaline took over when Conor started spearing. At home that night, he skinned the snake and pinned the skin to a board to dry. The skin, with rattles intact, rode in the back window of his car for a few days and is now in a frame on the wall of his apartment.

One of the tasks that I have to do annually at a couple of the mines is to survey the tails, both above the water line and below so as to determine the amount of material placed there since the previous year. The portion in the water requires primitive hydrographic techniques. I have a small flat-bottomed boat that I have outfitted with a rod, clamped upright to the side. A GPS antenna sits atop the rod and the transponder for a depth sounder is affixed to the bottom. I sail around the low-level cyanide solution collecting data, which is post-processed, into a topographic map of the mud surface. This

Whether he ends up hearing the call to become a surveyor or not probably depends more on whether his wicked slider continues to develop, but at least he has seen some of the more interesting things that we surveyors do. Someday NSPS hopes to produce a surveying safety video, an effort that I wholeheartedly support. I hope that along with the obvious discussion of traffic, high-rise and electrical safety, that all of the hazards discussed above are mentioned, along with dangerous falls; exposure to poisonous minerals such as realgar (high arsenic content) and sulfides that in contact with rain or snow generate plumes and rivulets of sulfuric acid; ticks; poison oak and ivy; poisonous spiders; killer bees; sun burns; dehydration; heatstroke; drowning; frostbite; tunnel cave-ins; radioactivity; alligators; mountain lions and bears. Should I mention angry landowners with guns?

Not every surveyor will work in an environment where he or she can encounter such potential dangers, but rest assured, if there is a hazard somewhere, a surveyor is working alongside it, (and safely, I hope). Whether working or just going about your day, remember that safety is an attitude. ■

Note: the author's company, Alidade, Inc. received an Excellence in Safety award from Newmont Mining Corporation for 2008, having compiled over 3000 man-hours on various Newmont properties without any accidents.



ADVANCED

Sokkia's GRX1 GNSS Receiver Ultimate in Versatility

Sokkia's GRX1 brings a new level of versatility and flexibility into precision applications. The GRX1 fully integrates GPS+GLONASS receiver and antenna, digital UHF modem, GSM/GPRS module and *Bluetooth*® module into a compact and rugged body. Whether it's used for RTK base or rover, network rover or static receiver, the GRX1 provides unmatched usability and convenience that increases efficiency on every job site.

www.sokkia.com
800.4.SOKKIA

SOKKIA

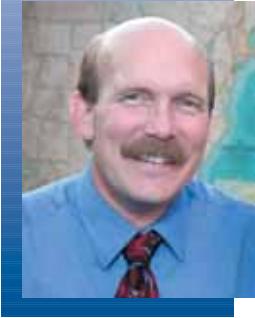
Precision & Reliability

The Bluetooth® word mark and logos are registered trademarks of Bluetooth SIG, Inc.



Limited Time GRX1 Trade-In Offer!

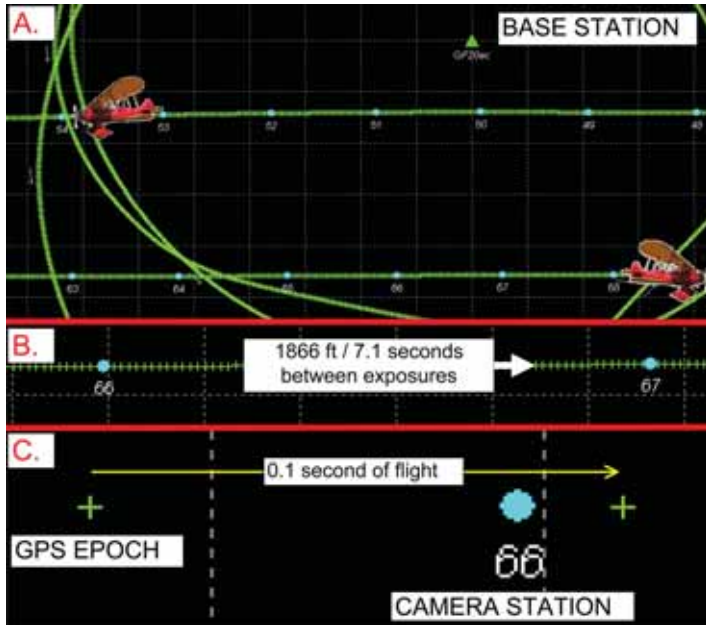
Contact your local Sokkia Dealer or visit www.sokkia.com for more information.



Airborne GPS: Camera Position Interpolation

This article is the first in a series designed to educate the reader about airborne GPS; the mechanics, applications and associated errors. Airborne GPS is used to establish a set of virtual control points which define the position of an aerial camera or other sensor used to measure geospatial data. The accuracy of these control points in the

During the flight, GPS observations, known as epochs, are taken at a fixed interval that is typically one second or less. Figure 1 illustrates the basic concepts of an airborne GPS flight. Figure 1(A) provides an overview; the green pluses are the epochs and the blue dots are the positions of the camera. A base station is occupied by a receiver, which is continuously collecting data during the entire flight. Figure 1(B) zooms in on two of the camera stations and the GPS epochs measured between these exposures. Figure 1C illustrates the camera exposure relative to the straddling epochs. As discussed above, the position of this sensor is determined through interpolation based on time and the three-dimensional positions of the GPS epochs.



Test Data

This discussion analyzes sensor position error due to turbulence and interpolation distance. The data from two flights flown under different conditions is used to perform this anecdotal accuracy analysis. The first set was flown with a photo scale of 1"=520 ft. as a block of photography on an extremely calm day. The second set flown at a scale of 1"=820 ft. was acquired with a single strip on a blustery day and a different pilot. The scale of the photography is immaterial yet the atmospheric conditions contribute significantly to apparent inaccuracies. The analysis is simplified by removing sensor position interpolation from the equation. Half-second readings are used to simulate the firing of the camera shutter. These GPS epochs measured at the half second are compared to the same position determined by an average of the readings at the whole second. This distance traveled between epochs depends on the sampling rate and the speed of the aircraft which is noted in Table 1. This table also contains information which will serve as the basis for the conclusions drawn from this study.

Analysis

Does interpolation distance affect position accuracies? The position of the sensor is determined through interpolation between epochs. This distance depends on the speed of the aircraft. Inter-epoch travel distances for these two flights was 260 ft. and 230 ft. per second thus approximately 25 feet in 1/10 of a second. The calm day Beechcraft flight revealed 1 second versus 0.1 second

Continued on next page

sky can significantly contribute to the accuracy of the collected data. This article provides an overview of the airborne GPS process and discusses the methods used to determine sensor position and the effect aircraft movement has on the accuracy of these positions.

Airborne GPS Overview

The position of the camera determined by traditional photogrammetric mathematics is solved by resection from control points on the ground. This photo controlling process can also be achieved when the position of the camera and just a few points on the ground are known. Airborne GPS is an application of real-time kinematic (RTK) surveying used to determine the position of a sensor during flight through interpolation between straddling epochs.

interpolation errors which maximized around 0.1 foot and produced a statistically-expected standard deviation of one third of that. The blustery-day Cessna flight produced results, which were nearly three times worse than the

Photo Scale	1"=520 ft.			1"=820 ft.		
Speed	156 knots (263 ft./sec)			135 knots (228 ft./sec)		
Aircraft	Beechcraft Bonanza			Cessna 206		
Measured 0.1 sec Epochs vs. Interpolated from 1.0 sec Epochs						
	X	Y	Z	X	Y	Z
Min	-0.03	-0.07	-0.09	-0.22	-0.30	-0.35
Max	0.04	0.08	0.11	0.17	0.34	0.17
StDev	0.02	0.03	0.04	0.09	0.13	0.09
GrafNavSD	0.02	0.02	0.07	0.06	0.11	0.16
Movement in 100 ft. of flight						
Horizontal	0.044			0.126		
Vertical	0.044			0.206		

Table 1. Test Data Results

Beechcraft flight. GrafNav is the airborne GPS software package used to calculate the epoch positions and associated precisions. It can be seen that these statistically produced precisions of the epoch positions are consistent with those determined anecdotally from actual flight data. So how much is the aircraft moving "off course" during flight? A travel vector was calculated for each one-second segment along the trajectory then scaled to 100 feet of travel for both flights. The standard deviations of the delta hori-

zontal and delta vertical components for this vector are shown in Table 1. Inspection of these values shows how they numerically reflect the turbulence for each flight.

Conclusions

Interpolated sensor positions determined between GPS epochs will improve if collected over shorter time intervals. The differences realized on calm days may be insignificant. On the other hand, accuracies can be greatly improved on blustery days. Obviously, atmospheric conditions may render the day unacceptable for flight regardless of collection rate. The amount of air turbulence was analyzed through the travel vector where "turbulence factors" were determined. Perhaps these TFs should be determined for every flight.

Future Studies

Sensor position interpolation is only one of the many components of airborne GPS where inaccuracies may be realized and need to be addressed. Proper timing of shutter release, base station distribution, antenna-camera vector survey, drift parameters, IMU integration, and aerotriangulation are just some of the aspects of airborne GPS where both random and systematic errors can occur.

Acknowledgments

Data sets from projects performed by Towill, Inc. and Rick Engineering Company were used for this study. Skyview Aerial Photo, Inc. flew both of the airborne GPS flights. ■




**TRI STATE
PHOTOGRAMMETRY**

Land Information Solutions

Tri State Photogrammetry

Northwest Region Office
1925 E. Prater Way
Sparks, Nevada 89434
(775) 358-9491
Fax: (775) 358-3664

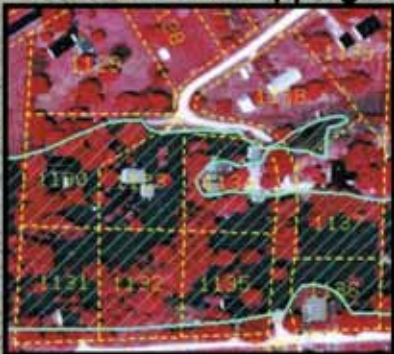
Southwest Region Office
3471 W. Oquendo Rd., Ste. 102
Las Vegas, Nevada 89118
(702) 222-0986
Fax: (702) 895-9652



Topographic & Planimetric Mapping For Design Engineering




Digital Orthophotography & Cadastral Mapping



GPS/RTK Surveys

Image Matched DTM/DEM & Contouring



1-800-411-3752
www.TriStateLtd.com



By: Robert M. McMillan, PLS

Rob McMillan is Chief of Survey Standards, Division of Right of Way and Land Surveys, California Department of Transportation. He is also Chapter Representative for the CLSA Sacramento Chapter.

Thinking Outside the Box

Look at the picture to the right. Can you figure out what it represents? It's thinking outside the box! To some it may be an over-used term, a trite catch phrase, or as shown here, a little idea-inspiring thingy for your desk, but in these tough economic times, we Land Surveyors need to do a little more "Thinking Outside the Box." What am I talking about? We often restrict our activities to control, boundary, topographic mapping, and construction staking. We are holding ourselves back! We need to use our imagination, talent, and technology to garner recognition and additional opportunities for ourselves and our profession, with clients and the public in general.



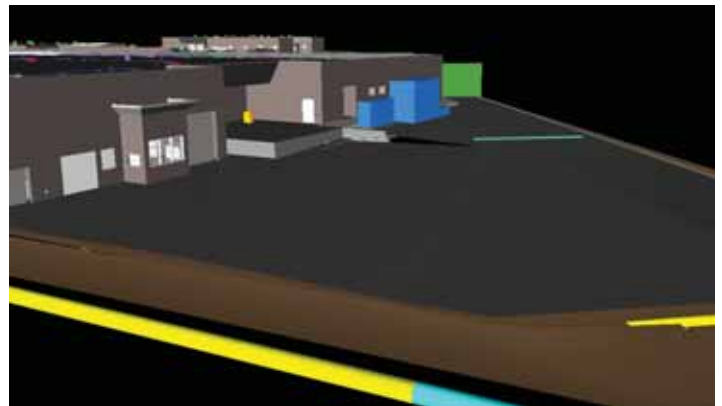
toring the clearance to the bridges. The GGB clearance gave a good indication that the cranes would clear the SF-OBB, but rising tides could cause complications. Murtha's measurements provided the assurance that the cargo would pass safely below the structure.

Some of our colleagues have been thinking outside the box: CHP and Caltrans used 3D laser scanners to document the scene of the 2007 MacArthur Maze meltdown. Tom Holemberg, PLS and Michael Farrauto, PLS of Andregg Geomatics, Inc. (Auburn, CA) used both total stations and laser scanners on that same project to ensure that the steel bridge girders manufactured by a sub-contractor would fit perfectly into place, allowing contractor C. C. Myers, Inc. to complete the project well ahead of schedule, and thus collect the early completion bonus. This was not only a win for the contractor, but early reconstruction of the critical interchange was essential for the Bay area commuters.

Tom Cade, PLS and staff from R.E.Y. Engineers, Inc. (Folsom, CA) participated in the C. C. Myers, Inc./Mammoet 2009 Labor Day weekend mega-move of the detour section of the East span of the San Francisco-Oakland Bay Bridge (SF-OBB). Using 8 total stations at once, they performed real-time monitoring of the deflection and alignment of the nearly 300' X 100' bridge section as it was being jacked into place.

Dave Murtha, PLS and his Port of Oakland (Oakland, CA) staff measured the height of the SF-OBB soffit using total station and GPS technology in preparation for the March 2010 arrival of three giant container cranes on a cargo ship for the Port of Oakland. The SF-OBB, with the soffit several meters closer to the water than the Golden Gate Bridge (GGB), was the critical clearance structure. As the cargo ship approached the GGB, Murtha used both conventional RTK and network RTK techniques to provide redundant real-time measurement of the cranes and moni-

Ron Moreno, PE, PLS from RBF Consulting recently utilized BIM procedures including 3D Scanning on the County of San Bernardino Juvenile Detention Center to model the proposed roadway access points, existing utilities, run clash detections and coordinate the survey and civil portion of



BIM. The project went through the typical submittal process however a portion of the deliverable will be the digital model for use in the Public Works department for the GIS department, Facilities Maintenance Department, and the Engineering Department.

These are just a few examples of innovative efforts by our colleagues. These successful efforts were not only a solution to an existing problem, but investments in the future, expanding capabilities, expectations and customer bases. At the very least, they showcased the expertise and ingenuity of the land surveyors involved in the projects.

The California Surveyor, CLSA Chapter meetings, User Group meetings, workshops, other professional venues, and conferences are all opportunities for us to learn about what others are doing, and to share our experience.

What "Thinking Outside the Box" ideas will you share in 2010? ■



RISK MANAGEMENT FOR LAND SURVEYORS

Real Risk Management Can Be Surreal

So this year we are witnessing the failure of risk management and realize there are events that man, his science and his government cannot control. Recession, the business cycle, natural and man-made disasters are examples. Over the long haul, people are basically lucky because they usually don't have to deal with such things very often, especially all at once. But it can happen, it doesn't make sense and there are things that just can't be prevented.

See What's Wrong

We have bank failures, the housing crisis, foreclosures, phony collateral debt obligations, unemployment, world-wide recession, earthquakes, coal mine explosions and the giant Gulf oil spill. What's going wrong? Is it Armageddon? Will we all survive? Whose fault is it? On the internet there's a picture of a planet 3 times the size of earth being devoured by its sun. Wow! What can we do? The answer is; be ready.

Ask Questions

Go from the general to the specific. Ask questions like: what is the worst thing that could happen to me? And answer them.

- What would happen to me if my equipment was stolen and I couldn't afford to replace it
- What if my #1 client went out of business
- If most of my clients couldn't pay their bills
- The economic slow down hurt my best contractors, my home builders, the cities I do work for
- Or a trusted employee embezzled most of my funds and I couldn't pay bills or meet payroll?

And On and On

- If an earthquake destroyed my office and truck and equipment.
- A fire burned all my records
- I was sued for unspecified errors and omissions by three failing clients looking for a quick financial fix
- A flood, a fire, a sink hole, an oil spill wipe me out
- Perhaps a car accident, or a workers comp injury, cancer, or sexual harassment or a wrongful termination suit
- Or even a faulty survey?

Risk Management Can Still Help

Let's look at the risk management criteria and see where we are. Remember: Identify and Control, Avoid, Reduce, Transfer, Retain?

In a catastrophe there's a bit of the all criteria involved as one struggles to survive.

These huge losses can't be avoided but hopefully reduced and controlled, shared and insured and also retained. We all take risks in business and as the Peter Principle says: *Whatever can go wrong, will go wrong.* Failure of safety devices, back-ups, fail safes and monitoring equipment create the perfect storm. Safety reviews not done or ignored, financial audits overlooked, insurance not renewed, coverage ignored etc.

The Hyatt walkway failed due to inadequate bolts. The Gulf oil spill rampage continues because of a failed blowout protector and risky well sealing and gas leaks.

What Should You Do?

- Like a fire drill, be ready, know what to do
- Have experts ready to help you
- Select you team of helpers
- Insurance
- Legal
- Accounting
- Rebuilding
- Clean-up.

Accidents happen and often they are no one's fault. Just accept them and confidently move forward with your solid, pre-arranged plan to get back to where you were before your loss. ■





CLSA Book Review

THE COAST MAPPERS, BY TAYLOR MORRISON

While browsing in the children's section of her favorite book store in Port Townsend, Washington, my mother stumbled upon *The Coast Mappers*, by Taylor Morrison, a fascinating book describing the first mapping efforts of the Pacific Coast of the United States. She purchased the treasure and sent it off with a note: "Here's a book for learning what your daddy does - Surveying...Love, Grandpa and Grandma."

What a fun and unique book this is! Taylor Morrison relates the adventures of George Davidson, and others, of the U.S. Coast Survey (U.S.C.S.) as they mapped the Pacific Coast in the mid-nineteenth century. The book is copiously illustrated with detailed and colorful paintings on every page, and is written at a level that can be understood by children from about age 10 on up. Even younger kids will enjoy and learn from the pictures; this is truly an illustrated history.

The book begins by explaining why accurate maps of the coast were needed and gives a little historical background into the earliest efforts. Before the advent of lighthouses and nautical

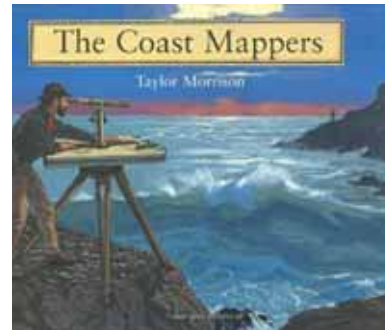


charts, ships often crashed with terrible consequences upon barely submerged rocks along the shore. The U.S. Coast Survey was created in 1807 to map all United States coast lines for the safety of mariners and the improvement of commerce. Following the Mexican-American War, the mapping focus was shifted from the Atlantic Ocean to the Pacific Ocean.

In May of 1850 George Davidson, James Lawson and John Rockwell of the U.S.C.S. left New York and began their journey to map the Pacific coast. Like many others bound for California, they traveled south by ship to Panama, crossed Central America in

By: Timothy R. Case, PLS

Timothy R. Case, PLS, MS is a Senior Land Surveyor and Associate at RBF Consulting in Sacramento, CA



canoes and on mules, and then traveled north by sea to the Golden Gate. One of the first of their many struggles involved finding lodging and transportation in California. Gold fever was at its peak and the surveyors had a tough time just finding a place to stay in the boomtown of San Francisco. It also took a while for them to find a ship to take them to their first mapping area, Point Conception, near Santa Barbara. Point Conception was chosen because old mariners, known as "coasties", said this was among the most dangerous places to sail. Accurate maps of the area would, hopefully, reduce the number of shipwrecks. The survey crew went on to map the position of Point Conception by celestial observations over a 60-day period. The book describes with simple language and beautiful artwork how surveyors use celestial bodies to determine locations on the earth's surface.

After his mapping work in California, Davidson and company moved on to map Cape Disappointment in the Oregon territories at the mouth of the Columbia River. Morrison's historically-accurate paintings show how surveyors used stadia and plane tables to draw maps with precision. The book also covers the efforts of Richard Cutts to survey 35 miles up the Columbia River using triangulation. As throughout, the colorful and detailed graphics clearly illustrate how these old-time surveyors did their work (in this case, a measured baseline and triangulation stations along the river).

After Oregon, Davidson went on to map Cape Flattery in northwest Washington. Here the author tells us about dangerous encounters with the Native-American Makah Tribe at Neah Bay, and Davidson's successful efforts to smooth things over. Public relations has been an important part of the surveyor's job for a long time. The book also describes the hydrographic mapping of the San Francisco Bay. There the surveyors used a sextant to measure a three-point resection to fixed points on the shore in conjunction with a lead and rope depth gage. The accompanying illustrations show us clearly how this method of surveying works.

Field work is only the first step in the mapping process. After the observations and sketches made by field crew, and the calculations and drafting of the office crew, engravers etched images of the final maps onto copper plates. These plates were then used to create crisp charts that could be read by mariners in low light and rough sea conditions. All of this is explained and illustrated by *The Coast Mappers* as well. The book finishes by briefly touching on the later years of George Davidson's life, including his tenure as professor of geography at the University of California at Berkeley. In December 1911, he passed away peacefully at the age of 86.

Continued on next page

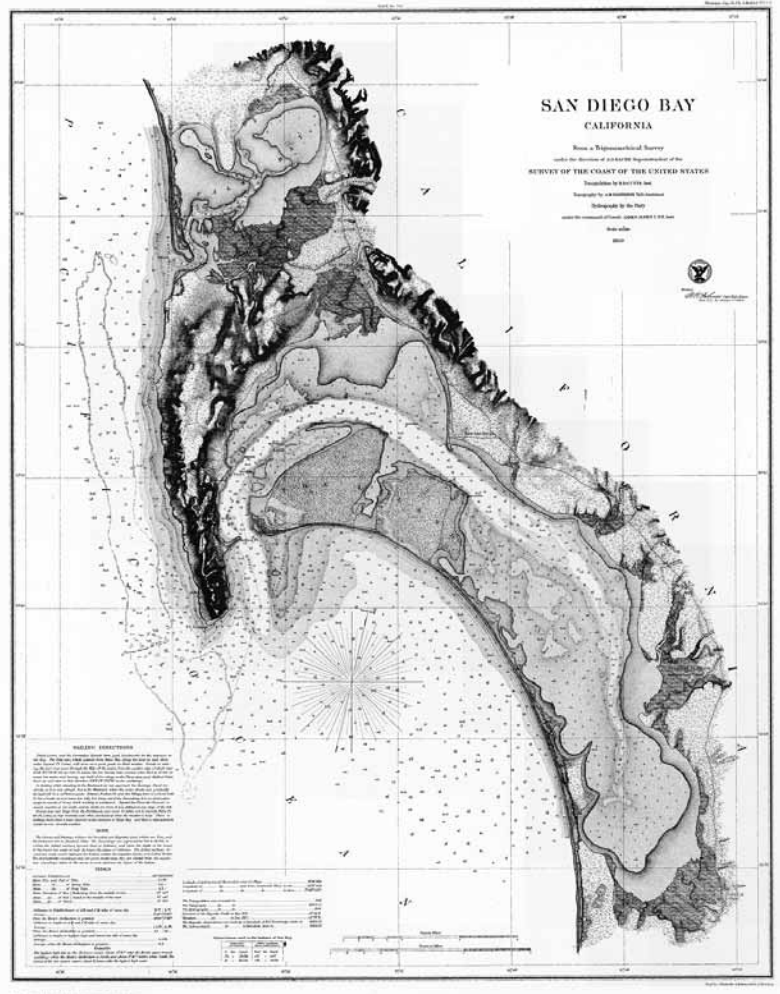
Continued from previous page

Because of his skill and personal sacrifice in mapping the Pacific coast, countless souls were spared the misery of shipwreck.

This book is excellent. It is well-researched and easy to understand. It is both a history lesson and an adventure story. My two young daughters have embraced *The Coast Mappers* and look forward to having me read it to them at every opportunity. They really enjoy it, not only because this is what "daddy" does but also because it is beautifully illustrated and fun to read. And this book is not just for kids. It tells a story that adults, even non-surveying adults, will find compelling. ■

Editor's Note: The historical maps are from the early days of the U.S. Coast Survey. They can be downloaded from the National Oceanic and Atmospheric Administration archives at: http://historicalcharts.noaa.gov/historicals/historical_zoom.asp

The image of the U.S. Coast Survey sounding party is from <http://www.history.noaa.gov/ships/fauntleroy.html>



Postcards

Here is a quiz on California geography submitted by Anne Hoppe, PLS

Photograph by Germar Bernhard

Can you guess where this picture was taken? Here is your clue: This is the highest peak above the largest glacier in the Sierra Nevada. See page 43 for the answer.





*Michael P. 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* (1997-2010), 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*

Q&A SMA Expert

Question

Given the recent legislative changes to the Subdivision Map Act concerning lot line adjustments (LLAs), are the local ordinances of cities and counties now required to: (1) characterize the approval of a lot line adjustment as a “discretionary approval” subject to CEQA?; and (2) must the local ordinance limit the property owner to four total lot line adjustments over the lifetime of its ownership of the property?

Answer

Excellent questions! In my view, (1) no, cities and counties are not required to characterize the approval of a LLA as a “discretionary” approval subject to CEQA; and (2) no, the local LLA ordinance need not limit an owner to four total LLAs over the lifetime of its ownership of the property.

Discussion

My analysis begins with a basic tenant of Land Use Law in California: cities and counties in California are not dependent on statute to give them the power to act. Instead, cities and counties have the inherent “police power” to regulate for the health, safety and general welfare of their communities, and can only have that police power curbed when its exercise conflicts with general law. (See, Calif. Const. Art XI, § 7.)

With respect to LLAs, some land use practitioners argue that cities and counties cannot take certain LLA actions unless the Subdivision Map Act expressly *allows* them. I disagree. The Subdivision Map Act does not “grant” or “empower” cities and counties in California to act – cities and counties already have that inherent police power to act. And, where the Map Act is silent, a city/county has the power to supplement its regulations as long as the provision at issue reasonably relates to the purposes of the Act. (*Soderling v. City of Santa Monica*, 142 Cal.App.3d 501 (1983).) In other words, the Map Act sets up certain express requirements regarding LLAs – which express requirements cities and counties cannot ignore or conflict with – leaving those matters not addressed by the Map Act to be addressed by local police power exercise through the local LLA ordinance.

That is exactly what many cities and counties in California have done with respect to LLAs. For example, in Napa County, the Director of Public Works is required to tentatively approve a LLA

application if it meets twelve identified standards. (Napa County Code § 17.46.040.C.) These 12 standards are very exacting, and are “objective” in character. Because of this, LLA applications that comply with these identified County standards “are deemed to conform to the county general plan, any applicable specific plan, and county zoning and building ordinances.” (*Id.*) Upon a determination of compliance, the LLA must be approved. Because the County lacks discretion to deny a complying application, the decision is “ministerial” in character. As readers may know, ministerial approvals are exempt from CEQA. (Pub. Res. Code § 21080(b)(1).)

The second question concerns the number of LLAs the Subdivision Map Act allows for a property owner and a particular property. Under Government Code section 66412(d), LLAs are exempt from the Map Act’s general requirement that property may not be subdivided without either a parcel map or a tentative and final map. Some land use practitioners argue that this exception for LLAs is limited to four total LLAs over the lifetime of a property owner’s ownership of the property. They argue that all serial LLAs of a single property owner on a single piece of property are to be accumulated over time. Once they reach five or more, they argue that the exception of Section 66412(d) no longer applies and that the property must do further adjustments through a map. I disagree.

There is nothing explicit in the Subdivision Map Act that prohibits multiple LLA applications and approvals over the life time of one’s property ownership. Such a prohibition would have been easy for legislators to draft but they have not. Nor has any court determined that such a prohibition exists. Adjusting existing lots (which arguably already went through a mapping process or were allowed with a process) has always been considered less important under the Map Act than “creating” new lots through maps.

Because the Map Act is silent with respect to how many times a property owner may invoke Section 66412(d) on the same piece of property, the police power of cities and counties, as we discussed above, can be used to fill this void. The decision as to whether a property owner may apply for an LLA with respect to a single plot of property for the first, second, third, or hundredth time has been left completely within the control, discretion, and administration of the local city/county.

As stated above, statutes curtail a city’s/county’s police power; they do not grant authority. Therefore, the local public agency is the appropriate entity to control this Section 66412(d) issue, unless and until the California Legislature explicitly addresses the application of CEQA to LLAs, and the number of LLA applications that a property owner may file. ■

Hydrographic Surveying Services

Hydrographic Surveying Services:

- single beam bathymetry
- sidescan imaging
- ROV underwater video imaging

featuring:

- Trimble™ TerraModel® software for benthic surface models & reservoir volumes
- HyPack® Max for hydro surveys
- Imagenex Win881 for sidescan imaging



For more information:

Tel/Fax: 805-543-5375 robert@reesesurveying.com
San Luis Obispo, CA

Geodetic & Land Surveying Services also available

Index To Advertisers

Allen Precision Equipment	11
Berntsen International, Inc	9
California Surveying & Drafting	44
CD Data - Parcel Quest	13
Central Coast Areal Mapping	3
Engineering Supply Company	19
HJW Geospatial	23
Leica Geosystems Solutions Center	2
Lewis & Lewis	3
Office Depot (Member Benefit)	4
Reese Water & Land Surveying	39
Santiago Canyon College	25
Sokkia	31
Subdivision Map Act Seminar	29
Trimble	15
Tri State Surveying, Ltd	33
Vista International	43

Welcome New CLSA Members

CORPORATE

Gerald L. Arana, Santa Cruz
Tony R. Battaglia, Petaluma
William Bridgnell, Oroville
Robert J. Brunel, Oakland
William D. Crume, Martinez
Paul C. Ehe, San Bernardino
Russell W. Forsberg, San Diego
Gary H. Hubbs, Woods Cross, UT
Brian D. Jones, Modesto
Steven M. Mendenhall, Roseville
Patrick R. Mercado, Mission Viejo
Alan Austin Nichols, La Verne
KC Offenberg, Santa Ana
Shawn D. Pettichord, Bakersfield
David C. Queyrel, Anaheim
Jay E. Remley, Cupertino
Jerry Lynn Wahl, Silver Springs, MD
Donald L. Whiteley, Santa Ana

AFFILIATE

Stuart G. Farley, Madera
William Kipp, Sun City
Paul Mabry, San Francisco
Ronald Oberlander, Livermore
Gary Smith, San Diego

ASSOCIATE

Robert Caughey, San Marcos
Frank Cellucci, Devon, PA
Mahmoud Khallil-Samani, San Diego
Anthony W. Maffia, Brentwood
Bryan J. Mundia, Orange
William Paul, Modesto
Karl Rettig, Glen Ellen
Nahid Safaie-Dey, Granada Hills
Chris Shepherd, Stockton
Stanislaw Ziolkowski, Fresno

STUDENT

Sarah Burgi, Bakersfield
Peter Maguire, Hollister

Postcards



Taken in Himeji, Hyogo Prefecture, in the Kansai region of Japan. The marker was set in the sidewalk at cross streets along the major thoroughfare of the city leading from the train station to the Himeji castle.

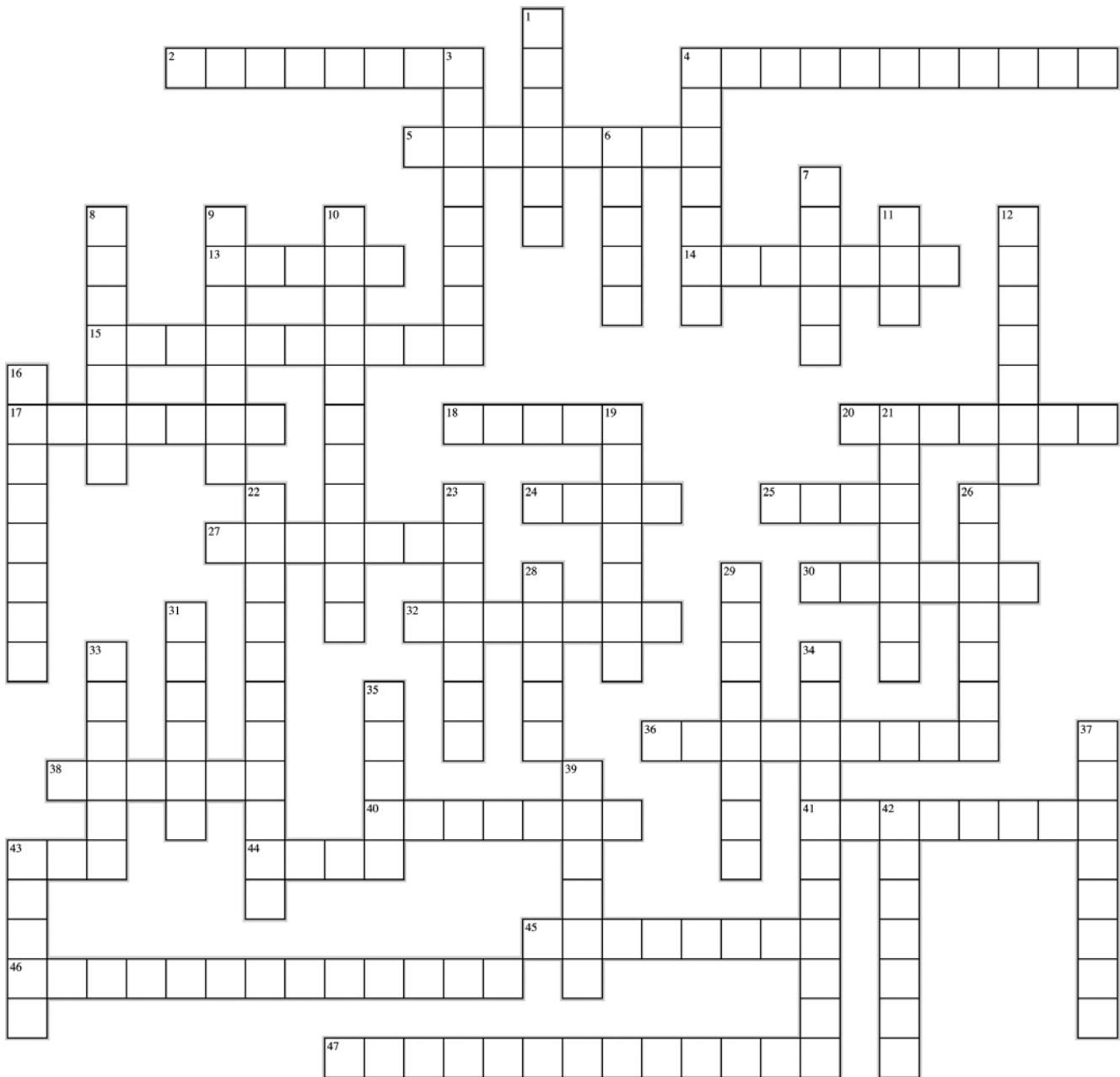
Submitted by Rolland Van De Valk, PLS
Photography by Dan Cronquist, PE.



Crossword Puzzle

By: Ian Wilson, PLS

CLSA Crossword Puzzle #15



Ian Wilson, PLS is the Director of Survey for Cardno WRG, Inc. in Roseville, CA. He started surveying in 1988 in Southern California and is now enjoying life in Northern California. Ian enjoys hearing from fellow members about the crossword puzzle and is always looking for clue ideas and input. He is licensed in California and Nevada and has specialized in boundary, topographic and Land Title surveys. His expert witness practice in boundary and easement issues is growing. Ian has been a member of CLSA since 1988.

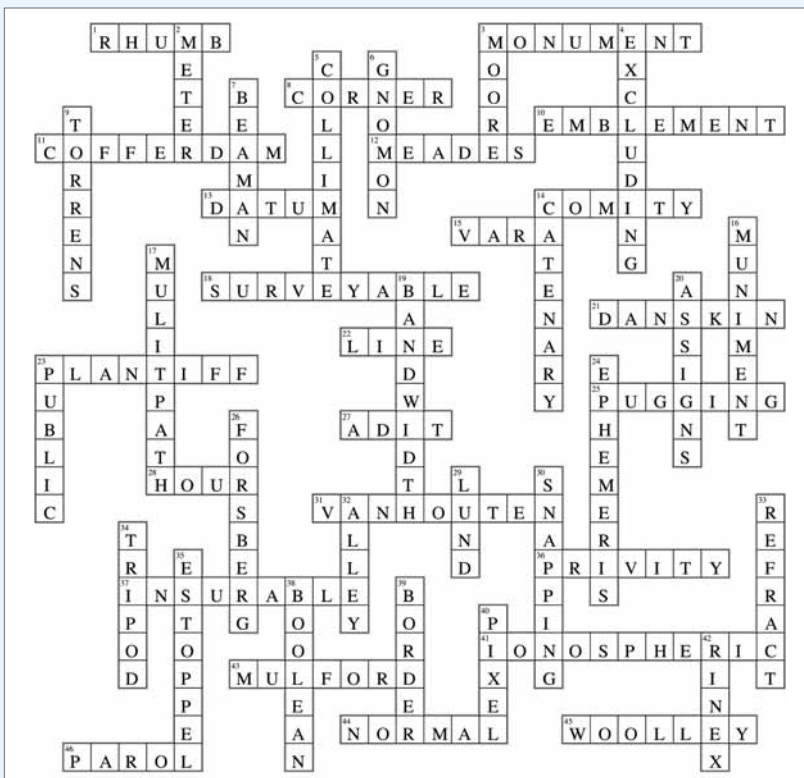
Across

2. CREEK IN NAPA COUNTY
4. CALIFORNIA SURVEYOR EDITORS BIRTH STATE
5. HEALDSBURG SURVEY FIRM
13. SANTA ROSA SURVEY FIRM
14. MOUNTED CONCENTRICALLY
15. FACTOR NECESSARY IN AIRBORNE GPS CONTROL DATA EVALUATION
17. QUICKSILVER
18. GPA DATA INTERVAL
20. FALL 2010 NSPS MEETING SITE
24. SLANG FOR COORDINATE GEOMETRY
25. 33.372 INCHES IN L.A.
27. RANK TYPE
30. CALIFORNIA GOVERNOR IN 1861
32. REVERSION OF PROPERTY TO THE STATE
36. DEPUTY SURVEYOR UNDER MINIS
38. CURRENT CALIFORNIA NSPS GOVERNOR
40. AREA 9 SPRING 2010 MEETING CITY
41. NAPA NEWSPAPER
43. UNIVERSITY WHERE COGO WAS FIRST DEVELOPED
44. SURVEYORS FLOWER?
45. SONOMA NEWSPAPER
46. ESTIMATION BETWEEN DATA POINTS
47. ESTIMATE OUTSIDE DATA POINTS

Down

1. SPANISH TOWN
3. NEW METHOD FOR PHOTOGRAMMETRIC GPS CONTROL
4. AREA 9 NSPS DIRECTOR
6. GPS DATA FILE FORMAT
7. STATE IN WHICH PLS 7507 WAS RECENTLY LICENSED
8. 2.471 ACRES
9. SWISS MATHEMATICIAN WHO LIKED CONES
10. TYPE OF REPORT USED IN GPS FIELD WORK
11. SPACE BETWEEN DESCRIPTIONS
12. TYPE OF DEED
16. LAST COUNTY CREATED IN CALIFORNIA
19. PUBLIC ROAD AND RIGHT-OF-WAY
21. CONSTRUCTED PUBLIC WAY
22. TITLE REPORT
23. NSPS WASHINGTON GOVERNOR
26. ACCESS CONTROLLED ROAD
28. HISTORY OF TITLE
29. DIRECTION TYPE
31. COMMON AIRCRAFT FOR PHOTOGRAMMETRY
33. WITNESS ALLOWED TO DRAW CONCLUSIONS
34. TYPE OF DIAGRAM USED IN GPS FIELD WORK
35. UNDERGROUND ORE EXCAVATION
37. CURRENT NSPS PRESIDENT
39. HEAD OF SANTA ROSA JC SURVEY PROGRAM
42. AIRBORNE GPS SOFTWARE PROGRAM PACKAGE
43. CALIFORNIA SURVEYOR GENERAL

Key to CLSA puzzle #14 (Surveyor Issue # 161)



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



Sustaining Members

Steve Dillon

ARROWHEAD MAPPING CO.
431 Mac Kay Drive
San Bernardino, CA 92408

Phone: 909-889-2420
Fax: 909-889-2664



Gencaga (Ali) Aliyazicioglu, CEO
Certified Photogrammetrist

e-mail: admi@admap.com • URL: <http://www.admap.com>
21062 Brookhurst St., Suite 101 • Huntington Beach, CA 92646
Tel: (714) 968-5459 • Fax: (714) 968-2429



HANS I. HASELBACH (Jr.)

HASELBACH
SURVEYING
INSTRUMENTS

SURVEYING & GPS SYSTEMS
INSTRUMENT SERVICE & REPAIR



(800) 462-8181
(850) 348-7247
1447 Rollins Road
Burlingame, CA 94010

SURV-KAP®



520-622-6011
1-800-445-5320
FAX: 520-792-2030
www.surv-kap.com

John G. Baffert
President

P.O. Box 27367 • Tucson, AZ 85726 • 3225 E. 47th Street • 85713

Sustaining Members



Trimble Navigation Limited
5475 Kellenburger Rd.
Dayton, OH 45424-1099

800.538.7800
937.233.8921
937.233.9441 fax



4155 Oasis Road • Redding CA • 96003
(800) 824-4744 or (530) 225-8155



LEJA SURVEYING CORP.

Land Surveying & Mapping • Court Diagrams
Legal Descriptions

Steve Leja
P.L.S. 5933

Telephone (909) 797-3043
Cell (909) 709-6861 • Fax (909) 797-3876
13642 Highland Oaks Dr. • Yucaipa, CA 92399

ENGINEERING SUPPLY COMPANY

THE LEADER IN PRECISION POSITIONING SYSTEMS SINCE 1989

Two Full Service Locations
To Serve You! 800-788-3307

Concord, California
5100 Inland Dr., Suite 7
W. Sacramento, California
1000 Rosewood Plaza, Suite 100



TOPCON Sales Service Training Rentals

There's No Limit To Your Productivity!
With Quality Topcon Products And World Class Customer Service!

ALLEN Instruments & Supplies

Bill Stull
Sales Manager
602.359.0359 Mobile

800.272.0180 • Fax 480.994.8337
7114 East Earl Drive
Scottsdale, AZ 85251



SALES • RENTALS • SERVICE • TRAINING



SACRAMENTO • LIVERMORE • FRESNO

800.243.1414 • www.csdsinc.com

TOPCON

Quality
Product - Service - Support



Lewis & Lewis

(800) 342-3607

Sales - Rental - Repair - Financing
www.lewis-lewis.net

VENTURA: 1600 Callens Rd. Ventura CA 93003 (805) 644-7403
FAX (805) 642-3970 Email: sales@lewis-lewis.net
SAN DIEGO: 540 S. Andreasen Dr., Suite A Escondido, CA 92029
(760) 747-8823 FAX (760) 480-5778 Email: jump@lewis-lewis.net



CARTWRIGHT
AERIAL SURVEYS, INC.

BILL CALMES
PRESIDENT

EXECUTIVE AIRPORT:
5979 FREEPORT BLVD.
SACRAMENTO, CA 95822

CALMES@CASMAR.COM
WWW.CASMAR.COM
(916) 421-3465
FAX (916) 422-9631



**Surveyors
Service Company**



Sales • Service • Rentals • Training
Serving California Surveyors Since 1926



Costa Mesa, CA
2942 Century Place
Costa Mesa, CA 92626
(800)938-0606
(714)546-0606

San Diego, CA
8898 Clairemont Mesa Blvd.
San Diego, CA 92123
(800)282-4454
(858)278-7762



P.O. Box 578

NUEVO, CA 92567

WWW.HESSSURVEY.COM

BRIAN T. HESS, PLS
PLS 8136

OFFICE 951-325-2200
FAX 951-639-9661

BRIAN@HESSSURVEY.COM



Dj Johansen
Business Development Manager

2001 Broadway Street, 3rd Floor
Oakland, CA 94612
Office 510-834-2001 x105
Fax 510-380-6332
Mobile 510-407-2283
Email dj@hjw.com
www.hjw.com



**VERTICAL MAPPING
RESOURCES, INC.**
An Employer of Labor Professionals
www.verticalmapping.com

San Diego, CA
4421A Avenida
Carmelita, CA 92118
Ph. 619(615) 1330
Fax: 619(414) 1201

Sacramento, CA
191 Blue Blinn Road, #110
Folsom, CA 95630
916(932)237 1486
Fax: 916(932) 1487



Mira Solutions, Inc.
Photogrammetric Services

Jan Gill
Accounts Manager

29300 Kohnstark Way, Unit 130
Union City, CA 94587
Tel: 510-487-9688
Fax: 510-477-9019
Cell: 510-543-6950
jan.gill@mira-solutions.com
www.mirasolutions.com

Southern California Survey
a california corporation
land · marine · aerial surveys

11655 Vaca Place
San Diego, CA 92124
fax 658.492-0950

John E. Hank, PLS
land_surveyor@usa.net

619.563.2888

Berntsen
Custom Identification Products

Tim Klaben
Marketing Manager

Berntsen International, Inc.
PO Box 8670
Madison, WI 53708-8670
www.berntsen.com
tklaben@berntsen.com

Tel. (608) 249-8549
Fax (608) 249-9794
Tel. (800) 356-7388
Fax (800) 249-9794

Marking the Infrastructure of the World.

Tt TETRA TECH

Susan R. Jackson
Business Development Director

3746 Mt. Diablo Boulevard, Suite 300, Lafayette, CA 94549-3681
Tel 925.283.3771 Cell 510.910.8669 Fax 925.283.0780
susan.jackson@tetratech.com www.tetratech.com

EngineerSupply.com

Your Resource for Engineering Tools and Supplies.

BluePrint Storage
Laser Measuring Devices
Measuring Wheels
Surveying Equipment
Calculators
Digitizers
Hand Trucks
Metal Locators



CALL TOLL-FREE 800-591-8907

Visit Us on the Web at www.EngineerSupply.com

**MOUNT DIABLO
SURVEYORS HISTORICAL SOCIETY**
A CALIFORNIA NON-PROFIT PUBLIC-BENEFIT CORPORATION (951101001)

Burt's Solar Compass



COLLECT, PRESERVE & DISPLAY
ARTIFACTS of the LAND
SURVEYING PROFESSION

5042 Amethyst Ct, San Jose, CA 95136

www.mdahs.org



Land Information Solutions

MITCHEL E. BARTORELLI
ASSOCIATE

(775) 358-9491

Digital Mapping
Aerial Photography
GIS Services
Digital Orthophotography
Volume Services
Global Positioning Services

1925 E. PRATER WAY
SPARKS, NV 89434-8938
Email: MBartorelli@TriStateLtd.com

www.TriStateLtd.com
FAX (775) 358-3664
(800) 411-3752

SUSTAINING MEMBERSHIP

Membership in the California Land Surveyors Association, Inc. as a Sustaining Member is open to any individual, company, or corporation who, by their interest in the land surveying profession, is desirous of supporting the purposes and objectives of this Association. For information regarding Sustaining Membership, contact:

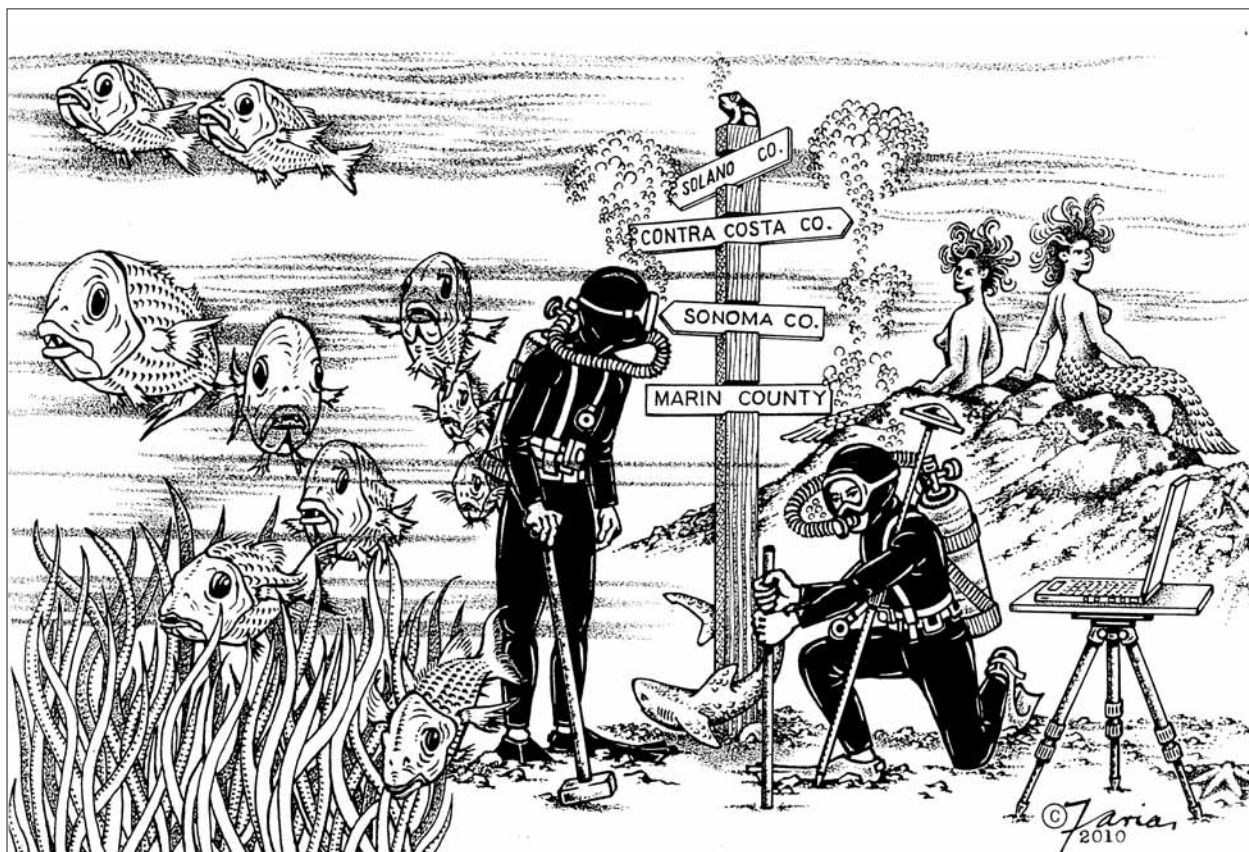
CLSA Central Office

526 So. E Street, Santa Rosa, CA 95404

Tel: (707) 578-6016 Fax: (707) 578-4406

Answer to Anne Hoppe's geography quiz:

North Palisade, 14,248 ft (4,342.8 m) NAVD 88, is the third highest mountain in the Sierra Nevada range of California. It is the highest peak of the Palisades group of peaks in the central part of the range. Source: *Wikipedia*



Is the struggling economy affecting your bottom line?

CSDS can help!

With a team of 7 experienced survey and mapping specialists, dedicated in-house technical support and a Virtual Survey Network that provides 93,000 square miles of coverage throughout California, we can develop creative solutions to grow your business and better serve your customers.

An Authorized Trimble Distributor, we offer the industry's most advanced tools, techniques and services that seamlessly integrate, enabling you to reach new levels of productivity and collaboration.

So if your firm is looking to work with more than a reseller, we urge you to call us. CSDS is a productivity partner. We'll analyze your needs, develop a customized technology solution and back it with knowledgeable salespeople, certified technicians and training and support personnel dedicated to helping you optimize your company's equipment investment.



800.243.1414 • www.csd sinc.com

Sacramento
4733 Auburn Boulevard

Dublin
6701 Sierra Court, Suite E

Fresno
4753 W Jennifer Avenue

Supporting productivity through innovative technology since 1986™

CALIFORNIA
SURVEYING  DRAFTING
S U P P L Y
SACRAMENTO • DUBLIN • FRESNO