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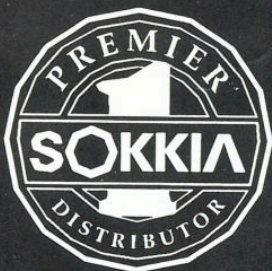
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VOLUME 5 NO. 2

JUNE 1993



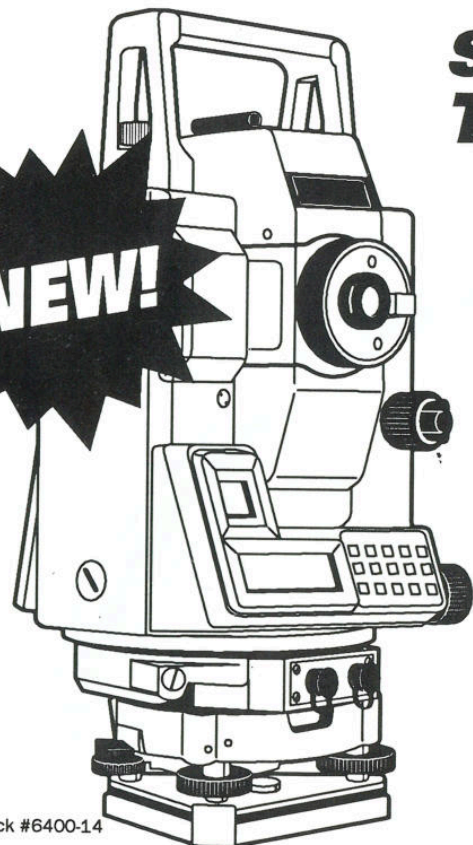


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_____ Special Member, student, annual dues \$15. (Pursuing a post secondary academic course of study, and currently enrolled.)

_____ Sustaining Member, annual dues \$100. (Persons, institutions or corporations desiring to assist PLSW financially.)

I AGREE TO OBSERVE THE CONSTITUTION AND BY-LAWS OF THE PROFESSIONAL LAND SURVEYORS OF WYOMING AND THE CHAPTER TO WHICH I WILL BELONG AND TO SUPPORT SAID ORGANIZATIONS IN THEIR ENDEAVORS.

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NOTE: All portions of the state have chapters. Chapter dues or assessments may vary in amount. Applications are considered by the Board of Directors at quarterly meetings. Send completed application to PLSW, c/o R.L. Hudson, Sec./Treas., P.O. Box 784, Thermopolis, Wyoming 82443.



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Positive News on the NGS State Geodetic Advisors Program

By Nancy Parke, ACSM

The Clinton Administration budget for fiscal year 1994 went to Capitol Hill last week. The National Oceanic and Atmospheric Administration (NOAA) held a budget briefing for interested parties on April 8. Dr. Stanley Wilson, Assistant Administrator, National Ocean Service (NOS) informed me of the briefing. He was there providing responses to audience questions concerning the NOS budget.

The positive news is the NOS budget contains an increase of \$2.5 million for the geodesy line item. It appears that our grassroots efforts last Fall and our recent NGS Forum in New Orleans were effective. The NOAA budget summary for NOS noted the following: "An increase of \$2.5 million is proposed in this sub-activity [Mapping, Charting, and Geodesy] for maintaining critical operations in the Geodesy Program. The proposed increase is for traditional geodetic activities, including the National Geodetic Reference System, at on-going levels."

Following the meeting, I questioned Stan Wilson on the increase and whether it was intended for the State Geodetic Advisors Program. He indicated that the State Geodetic Advisors Program should be in good shape for fiscal 1994, barring any changes as its goes through the congressional appropriations process.

There are still congressional hurdles to go through, however, this year it would have been almost impossible to add money to the budget. We are in a much better position with the funding included in the Administration proposal.

On a related topic, Dr. Wilson is in the process of organizing four separate groups to provide input on the NOS Budget Initiative for 1995. He has asked Nick Bodnar, ACSM President-elect to chair the private sector group. Wilson requested Coast & Geodetic Survey to recommend individuals to serve on the private sector group. They prepared a list for Wilson that includes individuals in leadership positions in ACSM/ASPRS, MAPPS, state and local groups. Wilson plans to review the list given him last week and make final decisions soon. I will keep you informed of further progress.

"Hard times – having to do without some of the things our parents never dreamed of having."

"Lack of Liaison"

I am a surveyor of line
The job to find corners is mine
What puzzles me most
Is more than one post
Where one would have served just as fine.

Northwest Corner of Wyoming To Be Reestablished

The northwest corner of Wyoming is being targeted by Paul Scherbel, Professional Land Surveyor of Marbleton-Big Piney, as this summers "Hands Across the Border" Project. This is a project of the Surveyors of the 6th P.M. organization.

The corner is located approximately 25 miles north of West Yellowstone, Montana, and is about two miles from Highway 191, being about a 1,600 feet climb.

Paul has received support from the National Park Service, U.S. Forest Service, Bureau of Land Management, and locals; including Rich Greenwood, who has consented to be point man for this worthy undertaking.

All those interested in assisting in this expedition should contact Paul Scherbel at Box 4296, Big Piney-Marbleton, Wyoming 83113, or call him at 276-3347, so the Park Rangers can arrange for parking along the highway.

The date has been set for August 28, 1993. This visit will include reconnaissance to recover the Corner and the marking of a trail into the area. Subsequent to this trip will be the assessment of the work to be done to preserve the corner and any accouterments that should be planned for installation during 1994.

Those interested should meet at Benchmark 6978 along Highway 191 about 9:00 a.m. near the confluence of Terminal Monument Creek, Snowslide Creek, and the Galatin River.

BRING A LUNCH!

Design Fees Stagnate

Not only has the recession held design fees at the levels seen three years ago, but designers are continuing to experience an inability to gain more favorable contract terms. So says the "1993 PSMJ Design Services Fee Survey" conducted by the *Professional Services Management Journal* (PSMJ), *A/E Marketing Journal* (AEMJ) and *Project Management* (PM).

According to PSMJ and AEMJ Publisher Frank Stasiowski, "Many clients have come to expect lower fees for projects, and firms have not been able to achieve more favorable contract terms in the face of tough economic conditions over the past two years."

"The market for design services has been split into two broad types of projects," said Bill Fanning, PSMJ's director of research. "In markets where fee cutting predominates, the scope of services is being cut. In markets where fee cutting is not as predominant, firms are providing more services for the same fees."

The survey indicates median billing rates of \$100 per hour for principals and \$75 for project managers.

Ten percent remains the median markup for subconsultants and reimbursable expenses, although the typical design firm is only able to get markups into 60 percent of its contracts.

Other key findings:

- While 74 percent of the participating firms bill interest on late payments, only 33 percent of those charges are actually collected.
- Fifty-two percent of the participating firms have contracts covered by limitation of liability clauses. These clauses typically cover 42 percent of their fee volume.
- The median firm reports 70 percent of their work comes from repeat clients.
- Ninety-two percent of the firms indicate fee competition

Editorial Potpourri

• **NEW MEMBER OF PLSW** - At the last Board of Director's meeting membership application of Stanton G. Taggart of Evanston and the special membership application of Edward M. Reading of Jackson were approved. Welcome and congratulations.

• **PLSW MEMBERSHIP** - Every man owes something to the profession that supports him. If you are not a member of PLSW, join now. We need your support. An application is included in this issue. If you are a member, recruit a new member.

• **SUPPORT OUR ADVERTISERS** - Advertisers help make this publication possible. Please support them.

• **OLD GROUCH SPEAKS** - The Old Grouch was overheard saying the following: "Every survey should be done so that the next S.O.B. must go through hell to prove you wrong." Think about it.

• **LOCAL PLSW NEWS** - Send us a summary of your chapters activities for publication. The deadline for the next issue of *Lines and Points* will be 30 SEP 1993.

• **1993 PLSW BOARD MEETINGS** - The 1993 meeting of the Board of Directors will be as follows:

18 SEP 93	Jackson
4 DEC 93	Rocks Springs

All members are welcome. Plan to attend. Your input is needed.

• **STATE REGISTRATION BOARD** - The next meeting of the State Registration Board will be June 18, 1993 in Sundance, Wyoming.

• **LINES AND POINTS FAX** - The *Lines and Points* fax number is 307-235-5604.

• **NORTHWEST CORNER REVISITED** - Wyoming surveyors plan to visit the northwest corner of the state located in Yellowstone National Park in August of 1993. The corner was last recovered in 1958. All are welcome. For more information contact Paul Scherbel 307-276-3347. (See Article Page 18)

• **MAP DIGITIZATION** - The City of Douglas is negotiating a \$3,300 contract with CYTEC, a California firm, to digitize city maps. Can your firm do this work? We thought Douglas had more maps!

• **WES CONVENTION 1994** - Preliminary arrangements are being made for Dennis Moulard to present an 8 hour seminar on "Corner Evidence Analysis" and a 4 hour presentation on "Ethics for Professional Surveyors." Arrange your schedule now to attend. More information later. Convention to be held in Riverton February 1994.

Front Cover Artwork
By Ray Blaha – Casper

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PLSW (Professional Land Surveyors of Wyoming) is a state-wide organization of Registered Land Surveyors licensed to practice in the Equality State of Wyoming. PLSW is dedicated to improving the technical, legal, and business aspects of surveying in the State of Wyoming. PLSW is affiliated with the American Congress on Surveying and Mapping and the Western Federation of Professional Land Surveyors.

Editorial Staff: John Hibsman, Steve Strang, Don Davis.

Lines and Points subscription \$50/year

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Board of Directors' Meeting Summary

The spring meeting of the Board of Directors was held in Casper on Saturday, May 1st, 1993. The meeting was hosted by the South Central Chapter and took place in the Teton Room of the Casper Hilton Inn.

Arrangements for the meeting facilities, and the pre-meeting luncheon, were made by Don Davis, secretary treasurer of the hosting chapter.

President Bob St. Claire called the meeting to order at 12:56 P.M. All members of the board were present with the exception of the past president. The Central Chapter is currently without a director since Chris Hamilton was elected vice president at the annual state meeting.

A total of twelve members were present including three members of the hosting South Central Chapter.

Minutes of the two board meetings and the annual state meeting, held in Laramie during the first week of February and previously sent to board members, were discussed and approved by formal vote.

Rick Hudson presented the treasurer's report which consisted of the statement from Hilltop National Bank, itemized expenses and the balance sheet, all dated 20 April, 1993. The report was accepted by formal vote.

The National Society of Professional Surveyors report, prepared by Governor Becky Braman was read by Southeast Chapter Director Pete Hutchison. The report concerned the NSPS Board of Governors meeting on February 14th in New Orleans. A general discussion followed the report and centered around several topics mentioned therein, particular attention being given to the "unlawful" establishment of minimum fees by professionals.

Delegate Scott Pierson presented an oral report concerning the Western Federation of Professional Surveyors conference held at South Lake Tahoe last month. He indicated that a written report will be available later. Scott mentioned various items including continuing education, group insurance, the scholarship fund auction and a new certification program for technicians at New Mexico State. He concluded by stating that approximately 15 PLSW members were in attendance at the conference.

Committee reports were presented as follows: Education, Herb Stoughton; Membership, Rick Hudson; Certified Land Corner Recordation, Paul Blough; Legislative, Bob St. Claire, Herb Stoughton and Pete Hutchison; Newsletter "Lines & Points", John Hibsman and Don Davis; and Public Relations and Publications, Andy Shauers and Pete Hutchison.

Following a short break the meeting centered around old business. The first item was a report by chairman Pete Hutchison of the Save Our Surveyors "SOS" Honorarium Committee. His written report concerned categories, filing and submission dates, composition of the judging panel and an additional stock purchase. Following a general discussion the motion to accept the recommendations of the committee was carried. A final report will be presented at the September board meeting in Jackson.

President St. Claire reported on his attendance at the State Board of Registration for Professional Engineers and Professional Land Surveyors meeting held in March at Cheyenne. He read a letter from that board which indicated the



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"take-home" test will remain as a part of the state specific portion of the examination.

A general discussion concerning the Nomination and Elections Committee resulted in agreement that President St. Claire will appoint at least two members to this committee, possibly the teller and the past president.

The "Rich and Don Committee", being Rich Greenwood and Don Davis, indicated that our PLSW Handbook is being scanned by a firm in California, at no cost to us, and will be in "Word Perfect" format.

The final item of old business was the presentation of the banners to PLSW, and the Northwest, Northeast, South Central and Southeast Chapters by Rick Hudson. The banners were made by Western Flag and Banner of Billings and personally delivered to Thermopolis the day before this meeting.

New business began with the approval of applications for membership from Stanton Taggart and Edward Reading and a matter regarding dues payment by an employer which will be handled by Bob St. Claire.

Herb Stoughton and Bob reported on the purchase of a file, containing approximately 3,000 General Land Office plats at a very reasonable price. This file belongs to PLSW and Herb is currently taking inventory of the contents. Copies of the plats will be available to members - contact your director for details.

Herb also presented and discussed a draft policy statement concerning control surveys for utilities location. He asked for input from members during the summer and that the board decide the matter at the September meeting. See Position Statement on page 14

Bob asked for additional questionnaires and stated that a report will appear in the upcoming "Lines & Points". A general discussion, concerning the 1994 annual state meeting to be in

Continued on page 6



PLSW – Board of
Directors' Meeting
September 18, 1993
Jackson

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Engineer Awarded \$1.8 Million in Lawsuit

ALBUQUERQUE - A former highway department engineer awarded \$1.8 million in a discrimination lawsuit says she hopes the jury's verdict is a step toward equality in the workplace, although she isn't anticipating rapid changes in the New Mexico State Highway and Transportation Department.

"When the cover-up goes to the highest level of the department and throughout all levels of management. No, I don't believe that kind of unethical conduct is going to change because of the outcome of a lawsuit," she explained.

The federal court jury of five women and three men returned the verdict, finding Barbara Bovee, P.E., had been discriminated against by supervisors because of her sex and had been retaliated against after her complaints.

The verdict came in February after more than two days of deliberation and two weeks of trial before U.S. District Judge C. LeRoy Hansen in Albuquerque.

"It's unfortunate someone has to go through this process," Bovee said. "It would have been nicer to have a dignified workplace for all women — and hopefully, this is a step toward attaining that end."

"I did have a good working relationship with a majority of the people that I worked with," said Bovee, who stayed with the department for 12 years. "I knew the atmosphere [in the highway department] was discriminatory very early on, but I tried to deal with it. I just tried to do my job. It was very difficult. A contractor would come in and here I was, the authority figure, trying to talk to him — hold him to contract compliance — and I'm standing in front of a picture of a naked woman."

The jury found that Bovee's former supervisor, William Moore, P.E., and now retired district engineer Don Atp, P.E., had discriminated against her on the basis of her sex.

They awarded \$225,000 in compensatory damages and \$180,000 in punitive damages from each of them.

Jurors also found that Atp, Moore, and department legal counsel Henry Rothschild had violated Bovee's First Amendment rights by retaliating against her when she spoke out about posters and pinups of nude women, and about a hostile environment for women at the New Mexico State Highway and Transportation Department.

The jury awarded Bovee \$150,000 in compensatory damages and \$180,000 in punitive damages from each of the three.

The state, which will be responsible for paying the judgment, will appeal the award.

Bovee, the only woman project manager in the department, says she didn't begin to fight back against the discriminatory environment until she started working on a committee whose mission was to determine why there were so few women in the management levels of the department. The committee's conclusion was that the working environment was the cause, she said. "That's when I finally decided I had an obligation to act," she said.

Because of her involvement on the committee, other women in the department began contacting Bovee with their complaints. Bovee claims she began being harassed by management after she started representing another department employee, Carla Maestas, in a sexual harassment complaint.

Bovee testified that she had sought changes through both internal grievances and committees. When that didn't work, she

went to the Federal Highway Administration, the Equal Employment Opportunity Commission, and Rep. Steve Schiff, R-N.M.

"The Federal Highway Administration was aware of my situation," she said. "They read my internal investigation where I had complained internally about the retaliation I was experiencing, and they agreed that I was being retaliated against. But they couldn't force the state to do anything. There was not an adequate avenue to control the state's conduct."

Finally, in 1990, Bovee and two other women filed a federal civil rights lawsuit.

Bovee said conditions had become so unbearable at the department she was forced to quit her \$46,000-a-year job earlier this year.

Bovee, who says she realizes her crusade for justice may have labeled her as 'tainted' within the engineering profession, claims she can still maintain her positive outlook despite everything that has transpired. "All I was trying to do was have a dignified work environment for women," she said. "I think men and women should be able to work together and draw from each other professionally in a positive manner."

The other plaintiffs, highway department employees Carla Maestas and Nancy Pins, settled their cases with the state earlier.

A related, non-jury trial is scheduled to begin before Judge Hansen. Eric Sirotlin, Bovee's attorney, said it is part of Bovee's lawsuit alleging a pattern and practice of discrimination against women by the highway department.

"From the writing of a Practical Land Surveyor who gave the working years of his life to a profession he served."

*"Now I lay them down to rest
My transit, tape and orange vest
My shovel's dull
My pick is broke
My chaining pins are just a joke
My plumb-bob string is full of knots
My notebook's full of jumbled jots*

*No more to look for corners rare
The Highway took them
I know not where
No more to solve the Lawyers' deed
Much of which was sour seed
No more to run with ratty-race
Set by Ed-u-cations pace
No more with clients will I plea
Who think that surveys should be free*

*Yes, it was tough
As you can see
But never dull – Don't you agree?"*

Metric Facts: Linear Acceleration

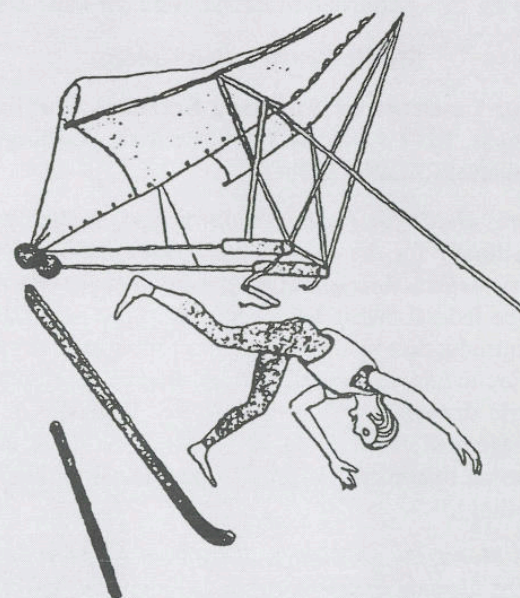
how long will it take to get up speed? The opposite of linear acceleration is, of course, a reduction in speed. In metric, both are expressed in meters/second/second (m/s^2).

Acceleration is easily understood if it is thought of as the rate of change of velocity. When a body is accelerating, it is adding units of velocity each second.

The most commonly observed display of linear acceleration is that of a falling object which accelerates due to the force of gravity. The international standard acceleration of gravity (as defined by the 1901 General Conference on Weights and Measures) is $9.806 m/s^2$, which in customary units is $32.17 ft/sec^2$, so the conversion factor is 3.281.

Problem A machine part goes from a standstill to 50 ft/sec in 3 seconds. What is its average acceleration expressed in metric units?

Solution: $50 ft/sec \times 1/3s \times m/3.281 ft = 5.08 m/s^2$



Metric Publications

American Congress on Surveying and Mapping (5410 Grosvenor Lane, Suite 100, Bethesda, MD 20814; phone 301-493-0200):

- *Metric Practice Guide for Surveying and Mapping*. 11 pp. 1978. \$10.00.

American Association of State and Highway Transportation Officials (444 N. Capital St., N.W., Suite 225, Washington DC 20001; phone 202-624-5800):

- *Guide to Metric Conversion*. Available in mid-May 1993.
- *Standard Specifications for Transportation Materials*. Two-volume set. includes dual units. \$115.00

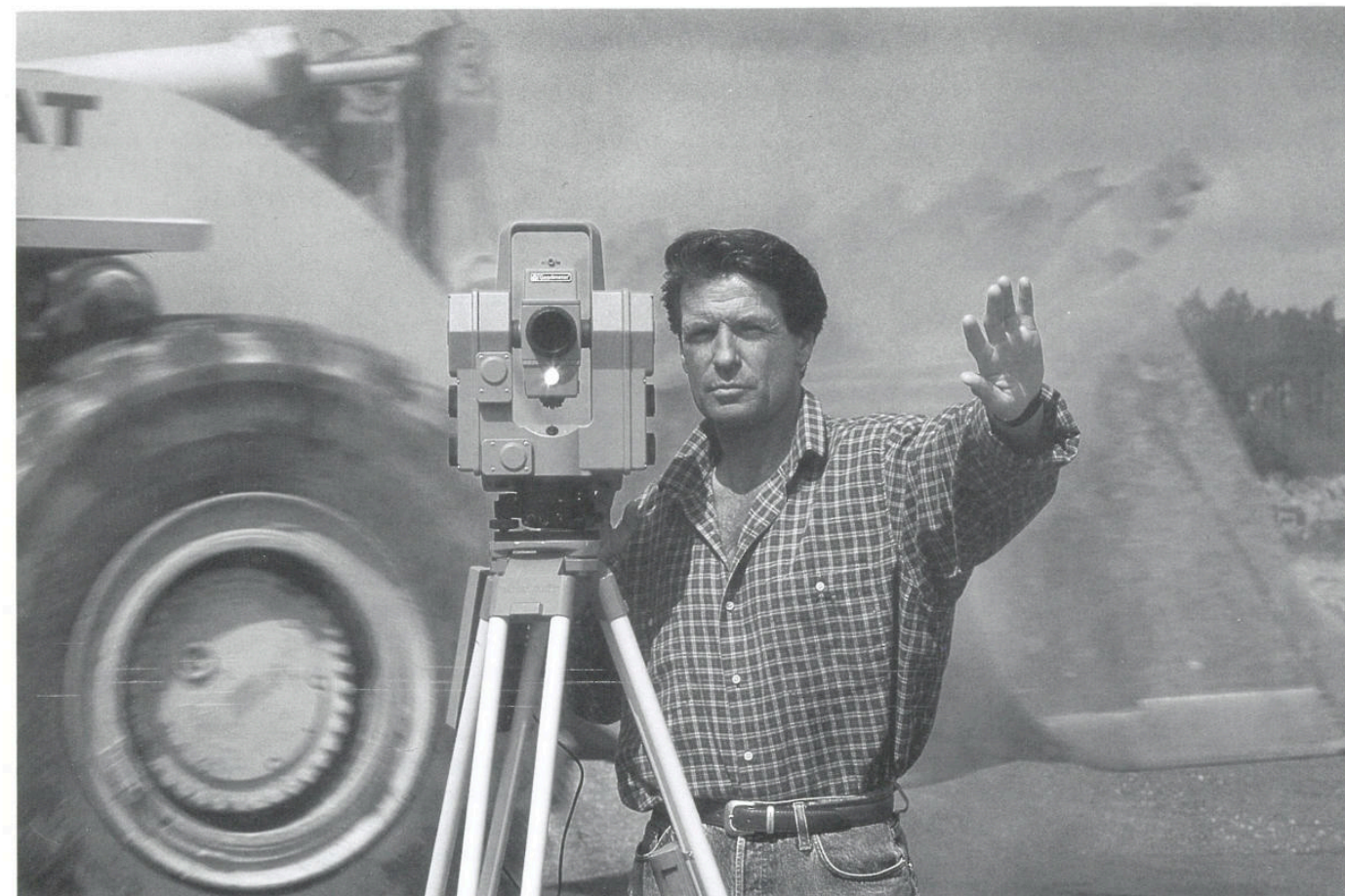
Northeast Corner of Wyoming Remonumentation

An effort is underway to remonument the corner common to South Dakota and Wyoming, on the Montana State Boundary. The corner site was visited last November by surveyors from the Bureau of Land Management and the Professional Land Surveyors of Wyoming. Field retracements and site construction are scheduled for the summer of 1993. A dedication ceremony is planned for summer of 1994. Be a part of this important project. Contact Jim Claflin (307) 686-6750 for further details

\$8.5 Billion In Metric Construction

Here are the January 1993 totals, by agency, for federal metric projects in the planning, design, and construction stages:

	\$ Million
Army Corps of Engineers (domestic and overseas).....	653
Bureau of Land Management	under 1
Bureau of Reclamation (domestic only)	260
Department of Agriculture.....	under 1
Department of Energy (Super Collider only)	6000
General Services Administration	1281
NASA.....	17
NAVFAC (overseas)	65
National Institute of Standards and Technology	110
National Park Service	1
Office of the Secretary of Defense.....	1
Public Health Service.....	1
Smithsonian Institution	103
Air Force	5



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P.L.S.W. Central Chapter

Minutes of the meeting of May 11, 1993

1. The meeting was called to order by President-for-Life Rich Greenwood at 7:40 pm.
2. The minutes of the February 4 meeting were discussed and approved.
3. The treasurer's report showed a balance of \$408.
4. Committee reports:
 - a) Field notes and maps of the U.S.B.P.R. withdrawal area are being recorded at the Fremont County Courthouse. Copies are available now for inspection or perusal at the offices of Inberg Miller in Riverton. It was agreed that the B.L.M. had been extremely cooperative in this effort and they should be appropriately thanked for their help in hopefully resolving what had the potential to be a serious problem for surveyors in the area.
 - b) A 1993 membership list was presented and is available for anyone who might wish one. Interested persons should contact Rich Greenwood or Mike Quinn for a copy.
 - c) A search/recovery effort will be made for the northwest corner of the state (Wyoming). Interested persons should contact Mr. Greenwood or Paul Scherbel. August 28 has been chosen as the date.
 - d) Chapter dues were discussed. It was agreed to leave them as is for the time being.
5. Director's report:

Chris supplied a report of items discussed at the Board of Director's meetings. He recommended that the chapter elect a director as we are nominally being shorted one vote at the state level. Inasmuch as the Chapter President has the authority to appoint a director failing the election of one, it

- was agreed that willing/interested persons should contact Mr. Greenwood. Ideally, Chris Hamilton will inform the Chapter members if an issue of practical and compelling interest is to be discussed.
- Chris included with his report two handouts; one from Pete Hutchinson regarding the SOS honorarium, a financial award for excellence in the preparation of Land Corner Certificates. Two awards will be available this year. The second handout was a memorandum prepared by Herb Stoughton discussing and recommending a Policy Statement on Control Surveys for Utilities. Copies of both of these reports are available from Mike Quinn.
- 6) There was some discussion of a problem (surveying) of Mr. Greenwoods' with respect to the changing location of Land Boundaries involving a river channel.
 - 7) Scott Scherbel presented a retracement survey he performed in Kelly, Wyoming. There was some interesting history involved and notable current ramifications as a result of his conclusions.

This was the first effort at the chapter level to provide a participatory program aimed at continuing education, and was informative and enlightening for those who attended.
 - 8) The next meeting of the Chapter will be in Jackson following the PLSW Board of Director's meeting on September 11. The venue will most likely be the Nelson Engineering Offices at 430 South Cache.
 - 9) The meeting was adjourned at 10:30 p.m.

Signed and dated this 12th day of May, 1993.
Michael Quinn, Secretary, Central Chapter

Directors' Meeting Summary...Continued

Riverton, followed in which it was decided to contact Dennis Mouland concerning his presentation of a seminar on the topics of ethics and corner evidence.

Copies of the handout from NSPS, concerning changes to the Minimum Standards for Property Boundary Surveys, were distributed for review by members at chapter level. This matter was from Becky Braman, our NSPS governor.

Herb, as chairman of the Standards, Ethics and Professional Practice Committee, led a discussion concerning alteration of CAD drawings by other design professionals and asked members of the board to solicit examples from chapter members and send this information to him.

Jeff Lewis stated that his Northeast Chapter, in cooperation with the Gillette field office of the Bureau of Land Management, is involved in a remonumentation project of the northeast corner of Wyoming. He also asked for, and received, permission to use the PLSW logo for the project as well as for scholarship notebooks.

A general discussion concerning the Route Surveying teleconferencing course by Rod Skaggs at the University of Wyoming resulted in the decision to prepare resolutions and letters to the UW board of trustees, president and dean of the College of Engineering.

The meeting was adjourned at 5:05 P.M.
Dated this 10th day of May, 1993.

News From The Professional Land Surveyors of Wyoming, Northeast Chapter

The Northern Wyoming Community College, Sheridan Campus and Gillette Campus will be offering the following courses during the fall semester of 1993.

Boundary Surveying	ENTK 1990 01
Survey Law	ENTK 1990 02
Surveying I	ENTK 2070 01
Surveying I Lab	ENTK 2070 L1
Computer Aided Drafting I	ENTK 2500 02

In conjunction with these courses the college is offering an Associates of Science degree in Surveying Technology. For more information contact the Northern Wyoming Community College in Gillette at 307-686-0254 or Donald Oakley, PLSW Survey Curriculum Chairman at 307-687-0600.

Please advise all interested students that the PLSW, Northeast Chapter has available two \$250 scholarships for persons interested in enrolling in this degree program and pursuing a career in Land Surveying.

Metric Resources

Metric conversion is largely a paper-and software-change. Codes, standards, handbooks, manufacturers' literature, advertising, and software are being prepared in metric. Here are some of the most requested metric resources.

Metric Construction Guides

National Institute of Building Sciences (Publications Department, 1201 L St., N.W., Suite 400, Washington DC 20005; phone 202-289-7800):

- *Metric Guide for Federal Construction*. Written by NIBS specifically for the construction industry and reviewed by metric experts throughout the country. Includes background on the federal metric laws; facts on metric in construction; an introduction to metric units; a primer on metric usage for architects, engineers, and the trades; requirements for metric drawings and specifications; guidance on metric management and training; and a list of current metric construction references. 34 pp. \$15.00 (including shipping and handling).
- *GSA Metric Design Guide*. Interim design guide developed by the General Services Administration (GSA) for use by federal project managers and their A/Es. Contains practical architectural, civil, structural, mechanical, and electrical design information; a list of available "hard" metric products; sample drawings; and related reference information. 77 pp. \$8.00; \$5.00 if ordered with the above *Metric Guide for Federal Construction*.

General Metric Information

American National Metric Council (Washington, DC; phone 410-727-0882 for publications):

- *ANMC Metric Editorial Guide*. \$5.00; bulk discounts available.

- *SI Metric Training Guide*. \$5.00.
- *Metricalization and the Consumer*. \$5.00.
- *Metricalization for the Manager*. \$15.00.

Society of Automotive Engineers (400 Commonwealth Dr., Warrendale, PA 15096-001; phone 412-776-4841):

- *Metric (SI) in Everyday Science and Engineering*. A well written, concise, and very practical guide to understanding metric in depth. By Stan Jakuba. 1993. \$26.00.

U.S. Metric Association (10245 Andasol Ave., Northridge, CA 91325; phone 818-363-5606):

- *Style Guide to the Use of the Metric System*. \$3.00; bulk discounts available.
- *SI Metric Style Guide for Written and Computer Usage*. \$2.00; bulk discounts available.
- *Freeman Training/Education Metric Materials List*. \$38.00.
- *Metric Vendor List*. \$28.00.

Blackhawk Metric Supply Inc. (Box 543, South Beloit, IL 61080; phone 815-389-2850):

- *Metric poster*. Attractive four-color chart that shows common metric units and their logical relationship. \$8 each; discounts for bulk orders.

Reprinted from "Metric In Construction"

\$9 BILLION

This is the current amount of federal construction in the planning, design, and construction stages.



Governors' Meeting...Continued

them on to the chapters.

NSPS has established a Safety Committee which will be working on developing standards, literature, and training for safe surveying. Since by its nature, surveying often can involve exposing ourselves and our employees to hazards such as traffic, enclosed spaces and chemicals, safety practices are of major importance to us.

An item which PLSW should keep strongly in mind is the current sensitivity of prosecutors to anti-trust violations. A chapter of the professional land surveyors association in Arkansas and its members were prosecuted by the federal government. The case was settled out of court with the members, the chapter and the state association paying damages. In Florida, the attorney general's office is investigating the state surveyors association and the surveyors of the state for anti-trust violations. This investigation resulted after the state newsletter published several articles about the need for higher prices and chapters held discussions about the advantage of minimum fee structures. Obviously, PLSW needs to be very sensitive about not discussing fees or pricing either in publications or at chapter meetings or at "informal meetings" before or after chapter meetings. (The discussion which led to the prosecution in Arkansas was held in a bar after the chapter meeting.) Whether or not the federal and state governments are justified in attacking so-called anti-trust problems so aggressively, the fact remains that this is a current danger for state professional organization. PLSW may also wish to review its unincorporated chapter structure since liability for any chapter wrongdoing passes on to members.

NSPS is planning a social (and working) get-together at the site of the founding of ACSM - Camp Marston at Brown's Bay on Rainy Lake in Minnesota. Available is a brochure outlining the weekend, which will include cleaning up the camp with the help of the National Park Service, as well as fishing, camping and boating.

The next conventions for NSPS/ACSM will be held in Minneapolis, Minnesota, during October 31-November 4, 1993, and at Reno, Nevada, during April 23-28, 1994. Minneapolis is the GIS/LIS convention, while Reno is the ASPRS/ACSM convention.

Position Statement on Utility Surveys

The Wyoming surveyors execute surveys to provide surveys and maps for various utilities - highways, streets, roads, and alleys; electrical, telephone, telegraph, and cable television lines; sanitary, industrial wastes, and storm sewers; aqueducts and canals; water distribution systems; irrigation systems; and oil/gas/slurry pipelines.

The policy concerns executing basic (fundamental) geodetic control surveys which are required for mapping and real property surveys, engineering design, construction stakeout, and as-built mapping. The contents of the document do not make "geodetic engineers" or "geodesists" of the professional land surveyor, but do define prudent control surveying which will minimize incompatibilities between various surveys and mappings.

A policy statement should be a statement of fundamental philosophy for executing the control survey correctly. It does not attempt to mandate a specific procedure, instrumentation, or technology, but indicates that what is considered acceptable criteria, standards, and procedures. A similar statement was adopted by ACSM in 1980, and legal scrutiny has failed to indicate that the statement is derogatory to general surveying practice and could be cited as restrictive. Furthermore, the statement is not era dependent.

It is recommended that the PLSW Board of Directors approve the policy statement and authorize publication in *Lines And Points*. Furthermore, the Board of Directors stipulate that the period of comment should be from the date of publication through 1 December 1993. Lastly, the Board of Directors instruct the PLSW Secretary to place on the agenda of the 1994 PLSW Annual Meeting an action item for the PLSW membership to consider adoption of this policy statement.

Copies of this draft position statement and comments should be addressed to your Chapter Director for evaluation at September's Board of Directors' Meeting.

P.L.S.W. Central Chapter

Minutes February 4, 1993

Laramie, Wyoming

1. Minutes of the December 1992 conference call meeting were reviewed, discussed and approved.
2. Chapter Officers were elected:
Chapter Director - Chris Hamilton
President - Rich Greenwood
Vice President - Brad Shaw
Secretary/Treasurer - Mike Quinn
3. Gary reported on the progress of the U.S.B.R. Withdrawal Area Committee; The field notes and maps are being archived by the B.L.M. in Cheyenne and will also be recorded at the Fremont County Courthouse. John Lee has been very cooperative. Chris pointed out that the new Clinton Administration is putting more money into the BLM and that this might be a good time to get them to fix some problem areas.
4. Gannett Peak still needs to be finished up. We can tie off the points near Pinedale and Dubois, or if we can get dual frequency receivers, we could go back to the summit and use a high order point in Yellowstone. I will check with Dan and Roger at Equinox and report at the next meeting.
5. A committee was formed to explore the possibility of remonumenting the Initial Point of the Wind River Meridian. Bruce Hughes and Howard Johnson are the co-chairs.
6. Scott Scherbel will give a one hour talk on his retracement survey in the Town of Kelly at our next chapter meeting. The area has some interesting problems that most of the Teton County surveyors have dealt with (or avoided).
7. The next meeting is to be at the Dubois Town Hall on Tuesday, May 11, 1993 at 7:30 pm. Please mark your calendars, we will not mail out another notice before then.
8. Meeting adjourned.

J. H. 'Carp' Carpenter

Mr. Carpenter died May 13, 1993, at the Wyoming Medical Center following a long illness. He was born May 24, 1913, in Protection, Kansas, the son of Ralph and Zella (Bradley) Carpenter. He moved to Winfield, Kansas at an early age, and, after the death of his father, he moved to Manhattan, Kansas. During his teen years, he moved to Encampment and then went to work for the Bureau of Reclamation at Seminole following high school.

On July 7, 1940, he married Ruby Beebe at Arkansas City, Kansas. The couple made their home at Seminole.

During World War II, Mr. Carpenter served with the SeaBees in the Pacific Theater of Operations. He then returned to Casper and continued working with BuRec.

In 1952, he began working with Worthington, Lenhart and later became a partner. The company became known as



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A Message From Robert L. St. Claire, President

Twenty three people responded to the questionnaire. Although this only represents approximately 21% of our membership, the responses are very interesting. For sake of simplicity I lumped a few of the responses into general categories. For example if a person would make a very specific response about the State Board of Registration, I put it under State Board Liaison instead of creating a new category. This was done only a few times and I tried not to influence the results. I want to thank all the members who responded to the questionnaire. We as a Board can now address the issues that you rated as most important.

PLSW QUESTIONNAIRE RESULTS

- 1.) What are the most important issues that need to be worked on by the PLSW Board of Directors? For example: handbook, dues, State Board liaison, legislation, national issues, Etc. Please list your priorities in order of importance.
 - A.) State Board Liaison - 70%
 - B.) Handbook - 57%
 - C.) Legislation - 57%
 - D.) Continuing education - 30%
 - E.) Ethics - 22%
 - F.) Professional image - 13%
 - G.) Dues - 9%
 - H.) 4% or less - National issues, Liaison with State agencies, Legal descriptions & easements need to be signed by PLS, PLSW annual meeting to long, PLSW scholarship and membership recruitment.
- 2.) Do you think we need a professionally presented seminar at our annual meeting or do you think we have enough talent within the organization to present a successful program ourselves?
 - A.) Professional seminar & local talent 61%
 - B.) Professional seminar only 26%
 - C.) Local talent only 13%
- 3.) Would you be willing to pay if a professional seminar was presented? If yes, how much more?
 - A.) 96% said they would pay and 4% said they would not.
 - B.) Of the respondents that said yes.
 - 1.) 62% gave a dollar amount. This ranged from a low of \$5 to a high of \$200. The average was \$70.
 - 2.) 18% said it depends on the seminar.
 - 3.) 08% said it should be subsidized by PLSW State Funds.
 - 4.) 04% said yes but gave no amount.
 - 5.) 04% said they would pay more if awarded CEU's.
 - 6.) 04% said they would pay a reasonable amount.

If no, would you teach a course?

 - A.) The one person who said no, said that he would teach a course.
 - B.) Six other respondents volunteered to teach courses.
- 4.) Would you be willing to help with the PLSW Handbook? If yes, which section?
 - A.) Yes - 78%
 - B.) No - 09%
 - C.) No answer - 13%

Several respondents volunteered to help with the Handbook. I will be contacting these individuals in the next month or so. There were some who said they would help

but did not put their name on the questionnaire. If you are not contacted and do want to help us out, please contact me or any of the PLSW Board members.

- 5.) Would you be willing to serve on a committee or help PLSW in any other way?
 - A.) Yes - 61%
 - B.) No - 09%
 - C.) No answer - 30%

We had several respondents who volunteered to be on a PLSW committee. I will be contacting these individuals in the next month or so. There were some who said they would be on a committee but did not put their name on the questionnaire. If you are not contacted and do want to help us out, please contact me or any of the PLSW Board members.
- 6.) Any other comments or suggestions.
 - A.) "We need the record of survey legislation."
 - B.) "All ROW's, easements & descriptions should be signed by a PLS."
 - C.) "PLSW can support its own annual meeting instead of an add on to the WACES meeting."
 - D.) "We pay our dues and see very little in return."
 - E.) "Lower the dues or distribute for projects."
 - F.) "It is time to consider having our own PLSW convention, like the States around us."
 - G.) "We need to work to obtain qualified and responsible members on the State Board of Registration."
 - H.) "The PLSW business meetings last too long and accomplish too little."
 - I.) "Establish a clear path for those seeking registration to follow."

The number one issue was the State Board of Registration. Liaison with the Board, membership of the Board and enforcement of the new rules and regulations, particularly the new education and licensing issues are all important to the respondents. If you lump continuing education in this category, it is by far the main issue. Since the membership considers this as one of our more important issues, I will attend the June 18th Board meeting in Sundance. Please contact me if you have a specific issue that you want me to present to the Board at any of their future meetings.

The PLSW Board agreed to have Mr. Dennis Mouland of Cadastral Consultants present an eight hour seminar on corner evidence analysis and a four hour seminar on ethics. These seminars will be presented all day Wednesday and on Thursday morning, February 4th and 5th, 1994. We are presenting it before the convention starts so we won't conflict with the WES programs. PDH's and/or CEU's will be provided for those who need them. We will have additional speakers on Friday and Saturday during the WES convention.

The PLSW Board has not decided what we will charge for these seminars but it probably will be a nominal fee with PLSW making up any difference. Since we will decide these matters at the September 18th meeting in Jackson, contact your chapter director if you have an opinion. We will send out notices announcing the schedule and fees.

We still need volunteers to help us with the Handbook. Our Handbook Guidelines Committee is now having the current

Wyoming High Accuracy Reference Network...Continued from page 12

5. **GPS Relative Surveying Techniques**
 - A. Methods
 - B. Project Planning
 - C. Field Execution

PROJECT PLANNING AND NETWORK ADJUSTMENTS

1. **Basic Geodesy**
 - A. Geodetic Coordinate Systems
 - B. Ellipsoid/Geoid Relationship
 - C. Horizontal & Vertical Datums
 - D. Comparison NAD 27/NAD 83
 - E. Plane Coordinate Systems
2. **Project Planning**
 - A. Define the Survey
 - B. Collect Source Material
 - C. Coordination
 - D. Submission to NGS
3. **Standards & Specifications**
 - A. Intended Survey Accuracy
 - B. Project Review
 - C. "Fixed" Coordinates
 - D. Datum Definition
4. **Network Analysis**
 - A. Adjustment Analysis
 - B. Readjustments
 - C. NGS Adjustment Procedures
5. **High Accuracy Reference Networks**
 - A. HARN Definition
 - B. HARN Adjustment
 - C. Regional Readjustment
 - D. Coordinate Transformations

NSPS Board of Governors' Meeting

February 14, 1993

New Orleans, Louisiana

by *Becky Braman*

The American Congress of Surveying and Mapping/National Society of Professional Land Surveyors semi-annual meetings and convention were held February 14-19, 1993, in New Orleans. The convention was held in one of the most beautiful cities in America at the beginning of the exciting Mardi Gras celebration. The NSPS members enjoyed the outstanding cuisine and hospitality of New Orleans including Mardi Gras Krewe parades.

The National Society of Professional Land Surveyors Board of Governors met on February 14, 1993, at the Hyatt-Regency in New Orleans, Louisiana. Complete minutes of the meeting are available by contacting me. This report consists of the items considered to be of most importance to Professional Land Surveyors of Wyoming.

The Surveyor's Creed and Canons has been prepared and adopted by NSPS/ACSM. It is available on vellum or as a brass plaque from ACSM at a cost of \$10 for the vellum or \$30 for the plaque.

A committee of NSPS/ACSM chaired by Wendy Lathrop has worked out an agreement with the Federal Emergency Management Agency (FEMA) to allow corrections to be submitted for minor changes to Federal Insurance Rate Maps (FIRMS.) "Lines and Points" has received this committee report and form for publication. The form will work for corrections to spelling, corporate boundaries and such minor changes but NOT changes to the flood plain which will still follow the previous (more complicated) procedures.

Another committee of NSPS, chaired by Al Frieze, is working on the updating of minimum standards for property boundary surveys. ACSM adopted minimum standards in 1979 which are still in effect. Available are copies of this committee's request for input from each surveyor, including the 1979 standards, the standards as adopted by the National Council of Examiners in Engineering and Surveying and the 1992 ALTA/ACSM Land Title Survey standards. Please send comments to me or directly to Al Frieze by August 2, 1993. Please also note that NCEES has adopted property survey standards and has sent them on to the State Board of Registration.

The standards for ALTA/ACSM Land Title Surveys have been adopted by ACSM and ALTA in 1992. A copy of these was included in the latest publication from ACSM.

The Bureau of Land Management reported that it is rewriting its Manual of Instructions for Surveys of the Public Lands of the United States. This project is just beginning and will take some time to complete.

Booklets explaining the certification program for surveying technicians, from the entry level through sub-professional level (rod-person through survey manager) are available from NSPS/ACSM. I have ordered them and will pass

Continued on page 14

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Wyoming High Accuracy Reference Network (HARN), Better Known as High Precision GPS Network

Information from NGS in Washington, D.C. indicates that they will be in Wyoming around August or September 1993 to start the GPS observations on the Wyoming High Accuracy Reference Network.

Preliminary reconnaissances of point locations has been done at Cheyenne, Wheatland, Glenrock, Casper, Midwest, Buffalo, Gillette, Guernsey, Torrington-Lingle, and Jackson. The preliminary reconnaissance should be done by the end of June 1993. Someone will be contacting the people who have shown interest in helping with the reconnaissances or people who have asked that specific points be used.

There has not been much of a response on the GPS questionnaire that was put in *Lines and Points* previously. We would like people to send them in so we can find out more about the GPS users in the state and what kind of training seminars are desired by those users.

The following is an outline for a possible GPS-GIS seminar that Wyoming Technology Transfer Center may sponsor this December if there is enough interest in it. If anyone is interested, write Barry Flom, Wyoming Technology Transfer Center, Box 3295 University Station, Laramie, 82071-3295. Please list the order of the subjects being presented from most interest in to least interest in.

DEVELOPING an accurate GIS/LIS

1. Geodesy in the Federal Government

- A. National Geodetic Survey
- B. U.S. Geological Survey
- C. Federal Geographic Data Committee
- D. Federal Geodetic Control Subcommittee

2. Geodesy Short Course

- A. Basic Concepts
- B. Ellipsoids
- C. Geoid
- D. Horizontal/Vertical Datums

3. National Geodetic Reference System

- A. Definition and Concepts
- B. History of NGRS
- C. National Spatial Reference Network
- D. High Accuracy Reference Network

4. Using the National Geodetic Reference System

- A. Extending Horizontal/Vertical Control
- B. Field Methods and Measurements
- C. Computations, Adjustments, Data Storage
- D. Planning a Geodetic Control Project

5. NGS Products and Services

- A. Types & Sources of Geodetic Data



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NAD 83 STATE PLANE COORDINATES AND DATUM TRANSFORMATION

1. Introduction & General

- A. Agency Introduction
- B. Products & Services of NGS

2. Geodetic Reference Systems

- A. Geodetic Coordinate Systems
- B. Horizontal & Vertical Datums
- C. Ellipsoid/Geoid Relationship

3. Plane Coordinate Systems

- A. Map Projection Overview
- B. Universal Transverse Mercator Grid
- C. State Plane Coordinate System
- D. State Legislation Status

4. Use of State Plane Coordinates

- A. Standards & Specifications
- B. Comparison NAD 27 vs. NAD 83
- C. Distance Reduction Factors
- D. Azimuth Determination
- E. NGS Horizontal Control Data
- F. NGS Software

5. NAD 27 to NAD 83 Datum Transformation

- A. Overview of Transformation Techniques
- B. NGS Software (NADCON/CORPSCON)
- C. High Accuracy Reference Systems (HARN)

SURVEYING APPLICATIONS OF THE GLOBAL POSITIONING CONCEPTS

1. GPS Positioning Concepts

2. GPS Operation

- A. System Segments
- B. System Status

3. Surveying Measurements Using GPS

- A. Principles & Concepts
- B. Observables
- C. Space & Terrestrial Coordinate Relationship
- D. Error Sources
- E. Methods

4. Reference Networks & Standards

A Message From The President...Continued
Handbook scanned. It is being scanned in California at no cost to us. When finished, it will be in a "Wordperfect" format.

The PLSW Board purchased approximately 3000 old General Land Office plats and a wooden map file. We think they pretty well cover the whole State including plats of the Wind River Indian Reservation, which I understand are hard to find. Herb Stoughton is currently taking inventory of the contents. If you are researching a project and need copies of the maps, please contact Herb. Copies will be available to all PLSW members at a nominal fee.

The next PLSW Board meeting is scheduled for September 18th in Jackson, I hope to see you there.

Bob

Letter To The Editor

Re: Delivering Electronic Drawing Files

It is becoming more and more common by clients to ask for an electronic drawing file along with paper copies to be read in the client's CAD program. After delivery we have no control over changes made by others that may be made to the drawing. Just recently I have seen topography, generated by our office, being used by several different subcontractors, i.e. architects and design engineers from other states, with our title block still intact along with design and development of the site with added statements by the architects and engineers. If that isn't enough to make your think about another career wait until irate contractors call telling you nothing fits and asking how you developed your topo?

In my brief sojourn to California a few years ago this was a common problem and the topic of discussion amongst surveyors. There are two ways to handle the problem and my suggestion is as follows. First, a letter of enclosure and statement for the drawing. (If enough people are interested then the P.L.S.W. Board of Directors could also take on the task to review and make a recommendation for a standard.)

(Letter of Enclosure)

Date:

To:

Re: Survey at

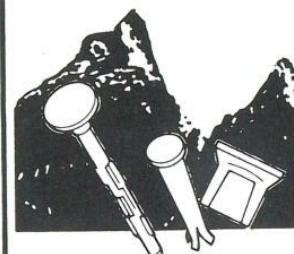
Dear

Enclosed you will find two signed and sealed paper copies of a 24" x 36" map representing the _____ survey at _____. The map along with this cover letter contains all pertinent data and constitutes a full report of the survey.

Also find a 3 1/2" disk containing a drawing file called XYZ.DWG. This drawing is an electronic copy of the above map with the surveyors statement changed to a qualifying disclaimer statement. This drawing in electronic form (on magnetic medium) is provided as a courtesy and the signed paper copies must be referred to for correct information. The signed and sealed paper maps constitute the actual and official delivery product of professional ser-

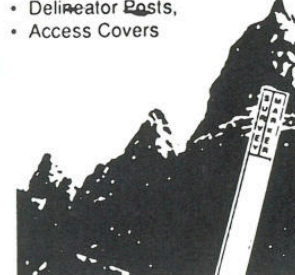
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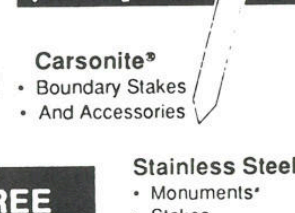
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Credit in the preparation of this letter goes to different publications by the California Land Surveyors Association. Also spe-

NSPS NOTICE OF AWARDS

The National Society of Professional Surveyors
sponsors four 1994 awards for excellence in the
surveying profession.

SURVEYING EXCELLENCE AWARD

Staff Liaison: Pat Canfield ■ ACSM/NSPS, 5410 Grosvenor Lane, Bethesda, MD 20814-2122

Presented to a person who performed outstanding service to the surveying profession, this award includes an engraved plaque and a \$500 honorarium contributed by POB Publishing Co., Canton, Michigan.

The person does not have to be a surveyor or a member of NSPS or ACSM, but candidates must be nominated for the award by an ACSM affiliate section or two NSPS members at large. If nominated by an ACSM section or affiliate, the nomination must be signed by two officers of the organization. If nominated by two NSPS members at large, the nomination must be signed by the sponsors and accompanied by four letters of recommendation.

Each nomination must include a narrative stating the reasons why the sponsors feel the nominee is deserving of this honor, specific accomplishments the nominee has made toward the profession and biographical data that can be used in the award presentation.

The staff liaison must be notified of any nomination by December 31, 1993.

MOST INTERESTING SURVEYING PROJECT OF THE YEAR AWARD

Staff Liaison: Pat Canfield ■ ACSM/NSPS, 5410 Grosvenor Lane, Bethesda, MD 20814-2122

This award consisting of a Pentax IQZoom 105 Super 35mm camera with case, a plaque, and 1000 reprints of the resulting published article contributed by Pentax Corporation, Englewood, Colorado, is presented to individuals, companies, governmental units, or state associations having knowledge of interesting projects and the ability to provide documentation of the project—technical information, releases, photographs, and a record of the personnel and equipment involved. The project need not have occurred in the last year.

Interested candidates should submit a project by December 31, 1993 to P.O.B., Attn: Most Interesting Surveying Project, 5820 Lilley Road, #5, Canton, MI 48187.

STUDENT PROJECT OF THE YEAR AWARD

Staff Liaison: Pat Canfield ■ ACSM/NSPS, 5410 Grosvenor Lane, Bethesda, MD 20814-2122

This award consists of a plaque and a \$150 honorarium, contributed by C&G Software Systems, Inc., Atlanta, Georgia, as well as paid travel and lodging expenses to the ACSM-ASPRS Spring Convention.

A submitted paper should describe a project in which the applicant was a participant and may involve a group of students and/or non-students. The paper must be written by one person only. Advice and constructive criticism from the applicants' instructor or supervisor is permissible and encouraged. The project need not have occurred within the preceding 12 months. All papers submitted will be considered for presentation and publication by ACSM. Specifications for the format of the manuscript can be acquired from the staff liaison.

Completed papers should be submitted to the staff liaison by December 31, 1993.

EXCELLENCE IN PROFESSIONAL JOURNALISM

Chairperson: Kenneth S. Curtis ■ 2204 Happy Hollow Road, West Lafayette, IN 47906

An engraved plaque is presented annually to the ACSM affiliate society whose newsletter was judged to have the highest quality during the previous year. In the past, judging was made by the editors or publications chairmen of the newsletters participating in the contest. Any editor wishing to participate should contact the chairman for information.

Geodetic Surveying

Herbert W. Stoughton

Geodetic surveying is the most accurate form of surveying measurements executed by the surveying profession. These surveys are used as the basis of state and national mapping programs and other projects requiring precise measurements over significant areas and distances.

Geodetic surveying was first developed to determine the size and shape of the earth. The knowledge is used to determine state and international political boundaries; the interrelationship of continental tectonic plates; worldwide navigation for airlines and merchant marine; guidance and navigation for space vehicles and space launches; and large mapping programs which must take into account the three-dimensional size and shape of the earth. The U.S. Coast and Geodetic Survey (Department of Commerce), U.S. Geological Survey (Department of the Interior) and the Defense Mapping Agency [formerly the Army Map Service] (Department of Defense) are the Federal agencies with the largest geodetic surveying programs. However, the International Boundary Commission (Department of State), National Institute for Science and Technology [formerly the National Bureau of Standards] (Department of Commerce), Bureau of Land Management (Department of the Interior) Corps of Engineers (Department of Defense), Bureau of Reclamation (Department of the Interior), and the U.S. Forest Service (Department of Agriculture) also employ geodetic surveyors to meet their programs and needs.

Until 1900, geodetic surveying specifically emphasized determining the size and shape of the earth, and supporting national mapping and nautical charting programs. The 1906 San Francisco earthquake changed the role of geodetic surveying. In order to determine the amount of movement along the San Andreas Fault, the U.S. Coast and Geodetic Survey resurvey their survey networks in an area about one hundred miles north and south of San Francisco. The networks had been originally surveyed and resurveyed between 1850 and 1905. Messrs. John F. Hayford and Albert L. Baldwin wrote a detailed report of their analysis of all the surveys. The researchers were not only able to quantify the movement along the fault in 1906, but were able to identify and quantify movements along the San Andreas Fault after others between 1850 and 1906. From 1907, geodetic surveying has been the mensuration tool to measure and monitor movements of the earth's crust.

Today, the U.S. Geological Survey and a university consortium located at the University of Colorado operate large geodetic survey programs, and study the movements of the earth's crust throughout the world. One program is the study of the caldera beneath Yellowstone National Park. A caldera is a place where magna from the earth's interior rises to near the earth's surface. In these areas hot springs, geysers, and other geothermal activity are prevalent. Blue Mountain Lake, New York, Mammoth Lakes, California, and the Yellowstone-Hegben Lake area currently are prominent areas of study in the United States. Geodetic surveyors repeatedly execute precise surveys for these studies. The results of each new survey are compared to the predecessor surveys. The differences between each epoch are analyzed to identify trends. If trends exist, then the researchers can postulate what is occurring. For over one decade, the U.S. Coast and Geodetic Survey and the University of Colorado

have surveyed the Yellowstone area. In order to have an unbiased reference, a survey station at F.E. Warren AFB, known as "GPS BASE" (about 500 mile distant from the survey) is used. This survey station was established by the Defense Mapping Agency.

By the late 1930's, geodetic surveying technology was able to measure the distance between two points one mile apart with an uncertainty (error) of about one inch! This capability indicated that geodetic surveying techniques could be employed for other projects. The engineering community required an ability to measure points on structures to monitor movements and structural integrity. The inspection and monitoring of dams, aqueducts, canals, levees, reservoirs, and large buildings rely heavily upon geodetic measurements. Besides monitoring these structures, engineers have gained invaluable insight into the actions and reactions of the structures to environmental factors. For instance, tall buildings "bend" in the wind and twist due to differential solar heating. The complex movements of concrete arch dams are due to a number of factors (temperature of the water and air, amount of impounded water, crustal loading, etc.).

With the launching of artificial satellites in 1958, geodetic surveying entered a new era. Utilizing 18th and 19th century physics theory, geodetic surveyors "observed" or "listened to" these satellites and developed systems to provide positions of points throughout the world. The results of these surveys include the most accurate determination of the size and shape of the earth (to about 15 feet for a radius of about 3,950 miles).

In the last 15 years, the use of artificial satellites and the new requirements stated by the engineering and scientific communities demanded more stringent accuracies. The geophysics community desire distances over widely spaced points on the earth be accurate to one inch in several hundred miles. These surveys are needed to monitor and study the movements of the earth's plates (continental drift) and the local tectonic and seismic actions, such as seen in the Yellowstone-Hegben Lake region. Some engineering projects now have geodetic survey accuracy requirements of 1/2 inch for distances of ten miles.

Less accurate geodetic surveying is used in regional mapping, engineering design and construction (highways, airports, railroads, water distribution systems, irrigation systems, sewerage systems, etc.) geographic information systems, etc.

In the Cheyenne area, lower accuracy geodetic surveys are executed by private land surveyors, the Wyoming Department of Transportation, Bureau of Land Management, and the U.S. Forest Service. The Geodetic Surveys Division, Geodesy and Geophysics Department; Aerospace Center, Defense Mapping Agency situated at Warren AFB near Cheyenne sends geodetic surveyors worldwide to execute surveys. Three state-of-the-art laboratories and a series of field survey test ranges are located at Warren to support the geodetic survey operations.

This was written for Surveyor's Week.

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