

Volume 25: Issue 3
July, 2014



LINES & POINTS

www.plsw.org



THE EQUALITY STATE SURVEYOR
PROFESSIONAL LAND SURVEYORS OF WYOMING



HIXON
Mfg. & Supply Co.

www.hixonmfg.com

SALES - SERVICE - RENTAL

TWO CONVENIENT RETAIL LOCATIONS
SURVEY, CONSTRUCTION, AND ENGINEERING
INSTRUMENTS AND SUPPLIES

LARGEST GNSS RTK REFERENCE
NETWORK IN COLORADO AND WYOMING

LOCAL SUPPORT, TRAINING, AND SERVICE

24/7 WEB STORE - www.hixonmfg.com

MS50 MultiStation – The **new** **dimension** in measuring technology

You only get a moment to make the right decision. So ultimate performance and absolute reliability are critical. This requires not only intuition, but also intelligent technology you can rely on. For the first time, the Leica Nova MS50 combines every significant measuring technology in one device and opens the doors to a fascinating new dimension of the geospatial world. All functions, including precision 3D scanning, extensive and precise total station capabilities, digital imagery and GNSS connectivity are now brought together in the Leica Nova MultiStation. A revolutionary solution with advanced measuring technology that provides unchallenged accuracy and quality, yet is easy to use for an unprecedented range of applications.

The capabilities of the Leica Nova MultiStation are truly comprehensive and second to none.



**INTEGRATED SCANNING
OF EVERY DETAIL**

The Leica Nova MS50 integrates 3D point cloud measurements into a regular survey workflow. This lets you collect and visualise your topographic survey data together with detailed high-precision scans. Save time by checking your data for integrity and relevance and avoid costly reworking or returns to the field. Benefit from better decisions with richer and more detailed data.



**PROVEN TECHNOLOGY
FOR UNMATCHED VERSATILITY**

The Leica Nova MS50 provides proven total station functionality with superior sensor integration for highest precision, performance and full automation of measurement procedures. Together with the benefits of GNSS connectivity, the Leica Nova MS50 offers complete versatility by delivering reliable results wherever and whenever you need them.



**IMAGE ASSISTANCE
FOR EVERY SITUATION**

The Leica Nova MS50 features an overview camera and a telescope camera with 30x magnification and autofocus. State-of-the-art image processing technology delivers live fluid video streaming of highest image quality. The imaging capabilities of the Leica Nova MS50 open up new opportunities of operating the MultiStation in an almost infinite range of applications.



Leica
Geosystems



FORT COLLINS

1001 SMITHFIELD DR
FORT COLLINS, CO 80524
970.482.0111 800.762.5252

www.hixonmfg.com



DENVER

8775 E ORCHARD RD, #807
GREENWOOD VILLAGE, CO 80111
303.694.0012 800.475.3422





PRESIDENT ● Carl Carmichael, PLS

PRESIDENT ELECT ● Sonja "Suzie" Sparks, PLS

SECRETARY/TREASURER ● Marlowe Scherbel, PLS



● Cotton Jones, PLS
Area Governor



● Paul Reid, PLS
Wyoming Delegate

PUBLICATIONS COMMITTEE

Committee Chair ● Larry Perry, PLS
arpentator@yahoo.com

Editor in Chief ● Michael Flaim, PLS
mike.flaim@bresnan.net

Treasurer ● John "Jack" Studley, PLS
jklz0318@gmail.com

Circulation ● Joel Ebner, PLS
joel_ebner@blm.gov

Advertising ● Pete Hutchison, PLS
peteh@bresnan.net

Copy Editor ● Herbert W. Stoughton, PhD, PLS, CP
hws.geod.engr@bresnan.net

Editor at Large ● Steven "Dennis" Dawson, PLS
dennieamdbarb@aol.com

Website ● Sonja "Suzie" Sparks, PLS
s75sparks@blm.gov



On The Cover

ENCAMPMENT AERIAL
TRAMWAY 2014
PHOTO BY
ANITA MORRIS, PLS

CONTENTS

Page 3 ● PRESIDENT'S MESSAGE
AND ANNOUNCEMENTS

Page 6 ● BOD MEETING SUMMARY

Page 7 ● DIGITAL WHAT?
By: Angie Rudolph

Page 10 ● CEDARHOLM RECEIVES
HISTORICAL RESEARCH GRANT
By: Herbert Stoughton

Page 11 ● THE AERIAL TRAMWAY OF
ENCAMPMENT
By: Anita Morris & Martin Pedersen

Page 21 ● YOU NEVER KNOW WHAT YOU
MIGHT FIND!
By: Joel Ebner

2014 PLSW SUSTAINING MEMBERS

- John Baffert - Surv-KAP, LLC
- Troy Langston - Monsen Engineering
- Richard Monsen - Monsen Engineering
- Bryan Baker - Frontier Precision Inc.
- Chris Farnsworth - RDO Integrated Controls
- Kelly Goff - Underground Consulting Solutions

Advertising Information

Digital-ready, full-color advertising with payment should be mailed to Lines & Points, P.O. Box 8, Cheyenne, WY 82003.

Advertising rates are as follows:	Year	Issue
Full Page	\$810	\$210
Half Page	\$540	\$140
Quarter Page	\$310	\$80
Business Card	\$160	\$40
Employment	Free	Free

Special Rates apply for PLSW Chapters and cover placements.

For more information please contact Pete Hutchison or Jack Studley.

PLSW (Professional Land Surveyors of Wyoming) is a statewide organization of Land Surveyors registered 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 National Society of Professional Surveyors (NSPS) and the Western Federation of Professional Land Surveyors (WestFed).

Lines and Points is published by the Professional Land Surveyors of Wyoming. Lines and Points is not copyrighted and permission is hereby granted to reprint articles with appropriate credit. The Professional Land Surveyors of Wyoming assume no responsibility for statements made or opinions expressed in this publication. The articles and opinions as put forth in this journal are not necessarily those of PLSW or the Editorial staff of this journal.

PRESIDENT'S MESSAGE



Hello again, fellow PLSW members and affiliates,

The storms of winter have finally passed, and summer is in full swing here in Sheridan. The busy season is upon us, and I hope you all are staying real busy and making hay while the sunshines. Here at WYDOT lots of things are happening, and I am taking advantage of the warm weather to catch up with stuff that was impossible when the ground was frozen. Those old stones are tough to find under the snow.

Once again, I must make my pitch to you all to try and establish a relationship with your local school districts, and give some time and energy to encouraging students to think about surveying as a career. To date, though, the silence has been deafening. I know everybody is preoccupied with work, but maybe you can find a few minutes to do something along those lines. I have approached the local school administrators here in Sheridan, and have had some success in getting them on board to try and help that happen. I still hope some of you will give this a shot as well. Please contact me if you do try some outreach, and we can compare notes.

There is always something to learn from each of our combined experiences. I hope that you all can see some of the potential benefits of this kind of outreach.

So, enough of that, I'll get off my soapbox and plow on ahead. I hope all of you are seeing the benefits of becoming part of the NSPS organization, and that you are taking advantage of that membership. NSPS has a great website, and it is real fun to visit it and explore some of what is available there. I think this was a great decision on the part of PLSW and that it will pay dividends for us all.

Personally, it is an honor to be able to serve this outstanding organization, and I see nothing but good things coming our collective ways. Chapter meetings are probably on hold for the summer, but be sure you do all you can to support your respective chapters, they deserve your attention. Thanks in advance for all you do!

I hope you can all enjoy the good weather, stay busy, make lots of money, and don't forget to get out there and fish!

Respectfully,

Carl R. Carmichael, President

Professional Land Surveyors of Wyoming

ANNOUNCEMENTS

CONGRATULATIONS!

The members of the Professional Land Surveyors of Wyoming would like to recognize the achievement of the following new Wyoming registrants.

Gary D. Anderson,
Devils Tower, WY, LS 14175

Bradley Danielson,
Gillette, WY, LS 14406

Jacob I. Dunham,
Sheridan, WY, LS 14407

Christopher A. Glantz,
Albany, OR, LS 14408



PLSW FIELD BOOKS AVAILABLE

Embossed with the PLSW logo on the cover
Only \$10.00 each
Available in Orange or Yellow

PLSW, SE Chapter % Larry T. Perry L.S.
1127 Terry Ranch Road
CHEYENNE, WYOMING 82007

From The *Pinedale Roundup*

KENNY NAMED BIG PINEY'S TRIG STAR



Russell Kenny won the 2013-14 Trig Star competition at Big Piney High School. The contest, sponsored by Surveyor Scherbel, LTD, is put on in schools across the nation to find students who demonstrate strong skills in the practical application of trigonometry. The contest helps to promote careers in surveying and mapping and is sponsored in part by the National Society of Professional Surveyors, along with local firms. Kenney got a perfect score on this year's test.

(Reprint from May 9, 2014 *Pinedale Roundup*)

FREE MONEY AVAILABLE!!!

APPLY NOW FOR A PLSW SCHOLARSHIP

If you are attending college with the intent of pursuing a career in Land Surveying in Wyoming, we want to give you money!

A Scholarship Application is available on our website

<http://www.plsw.org>



2014 PLSW TECH SESSION

CASPER'S BEST WESTERN - RAMKOTA INN

6TH AND 7TH OF NOVEMBER

GUEST SPEAKER: **MR. DENNIS MOULAND, PLS**

SUBJECT YET TO BE DETERMINED.



SURVEYORS RENDEZVOUS

Please join us 'way down south' in historic Mobile, on Alabama's Gulf coast this September 17 to 20 --- for Surveyors Historical Society's 18th annual RENDEZVOUS. Since 1997 these educational, affordable, fun gatherings have become the best national surveyors events of the entire calendar year.

Classroom sessions will be hosted aboard battleship USS Alabama (BB-60) - a marvel of World War II American might - now a National Historic Landmark. Commissioned in 1942, Alabama fought in the Atlantic, above the Arctic Circle, off the coast of Norway, throughout the Mediterranean, and finished the war in the far Pacific. Today she's berthed at Mobile Bay. Talks will be held in her Officer's Wardroom, and we'll dine for lunch in the shadow of her after-turrets, on the fantail.

We'll also visit the battlefield of Fort Blakely.

There, in one of the last major engagements of the Civil War (some historians say the last,) 16,000 union troops fought 4,000 rebels on the same day that Robert E. Lee laid down his sword at Appomattox.

But the highlight of Rendezvous '14 will be Ellicott's Spanish Florida Line . . .

In the years 1798 to 1800, Andrew Ellicott and a crew of roughly 40, in one of the most epic surveys ever conducted, laid out and monumented the southern border of our fledgling United States - more than 400 miles in length. Today their line still forms five state boundaries - Louisiana, Mississippi, Alabama, Georgia and Florida. But in those early days it was the international 'frontier'

between the United States and Spanish Florida. Ellicott marked the line with earthen mounds --- faint traces of which can still be found, more than two centuries later --- if one knows where to search.

SHS has 'followed the footsteps' of many famed surveyors. Now, from Mobile Bay, we'll do so again. On Saturday September 20, Rendezvous attendees who are "hiking-inclined" will fan out across miles of Ellicott's historic line, armed with plots and coordinates, to search for remnants of those 215-year old, weather-beaten original mounds. Most have never been recovered.

Also on our Rendezvous program are a traditional Southern Fish Fry lunch, a genuine Mardi Gras Banquet, a historic Southern Style Breakfast, tours of the Mobile-Tensaw Delta Swamp, a Swap-Meet of antique survey items, and a Dedication Ceremony of

Surveyors Historical Society *RENDEZVOUS '14*

ON THE ELLICOTT LINE

*Meet Me
in
Mobile*

Admiral Semmes Hotel

September 17-20, 2014

USS Alabama & Battleship Park

Five Rivers Delta Resource Center

Featuring Andrew Ellicott's survey of the 31st Parallel, the "Line of Demarcation" between the United States and Spain, as specified in the 1796 Treaty of San Lorenzo

a permanent SHS marker at 'Ellicott's Stone' on the famous Spanish Florida Line. Please join us.

Everyone is welcome and urged to attend. Space is limited this year, so early sign-up is strongly recommended. SHS membership is not required. Interested non-members may join the society at a substantial discount and receive our member rates for everything.

Certificates for educational credits will be awarded. You are invited. We encourage everyone to come 'Rendezvous' at historic Mobile Bay this September.

With highest professional regards,
Surveyors Historical Society

PLSW BOARD OF DIRECTORS MEETING SUMMARY

The PLSW Board of Directors met via conference call on 5 May 2014.

The 6 Feb., 2014 meeting minutes were approved.

PRESIDENT'S REPORT: Carl Carmichael repeated his agenda to encourage PLSW membership to get involved in introducing the youth of Wyoming to the world of surveying. He hopes that the membership can find ways to share our profession with young people. Carl also reported that he had drafted a letter in response to the news that there was going to be a Joint Judiciary Interim Committee meeting on May 12-13 in Rawlins to consider legislation regarding trespassing to collect data. He was very concerned that language in the proposed bill (SF0085) would adversely affect the land surveying profession. He asked for feedback on the draft letter and guidance on whom to send it to.

PRESIDENT ELECT'S REPORT: Suzy Sparks reiterated the importance of the PLSW getting involved in the discussion on the proposed trespass bill. She reported that Don Schramm was following the legislation very closely and was planning to attend the meeting in Rawlins.

SECRETARY'S REPORT: Marlowe Scherbel presented a report on the active membership role: Life: 2; Honorary: 6; Member: 174; Associate: 72; Special: 6; Student: 2; Sustaining: 7; Total: 269. Marlowe will send a list of members that are in arrears to each chapter.

TREASURER'S REPORT:

Bank Account Balances as of 31 March 2014:

Checking Account:	\$ 17,034.61
Money Market account:	\$ 6,894.44
Investments:	\$ 136,688.10
Total Cash	\$ 160,562.15

COMMITTEE REPORTS:

Education Committee: PLSW Tech Session to be held on 6 & 7 November 2014 at the Ramkota in Casper.

DELEGATE REPORTS: None

OLD BUSINESS:

- a) Members name on website – Will be optional.
- b) Corner Records – County Clerk
Questionnaire will be sent out again to each chapter in an attempt to get feedback on what each county is currently doing.
- c) Compilation of acceptable map sizes – no report
- d) Publication of Dr. Herb Stoughton writings: Karl Scherbel is working with Herb and will follow-up.

NEW BUSINESS:

- a) Presentation of Honorary Membership to John Steil at the 2015 Annual meeting was approved.
- b) Ron Gossard new membership was approved.
- c) TWIST – Todd Hickman from Sundance High School was approved for a \$1000 grant to attend the TWIST workshop.
- d) Wyoming State Bar Correspondence – Carl Carmichael reported that the rules governing the Wyoming State Bar had been approved and an exception had been included for acts performed by licensed Wyoming Professional Engineers and Land Surveyors.

ANNOUNCEMENT: Next BOD meeting will be a teleconference meeting at 8:00 am, 30 August 2014.

***** GENERAL MESSAGE TO ALL GPS USERS *****

The Air Force has released notice of GPS CNAV activation beginning 28 April, 2014.

The purpose of this notification is to inform users of an upcoming event related to the GPS satellite constellation. Air Force Space Command will be implementing CNAV messages on the GPS L2C and L5 signals beginning J118/1430z with updates from the control segment approximately twice per week. The message populated signal content will include Broadcast Message Types (MT) 10, 11, 12, 30, and 33. There are no planned GPS satellite outages or degradations for this activity. L2C and L5 CNAV messages should be transparent to GPS receivers that do not process L2C or L5 CNAV messages. These populated signals are intended to facilitate user familiarization and development of compatible user equipment.

NOTE: Until further notice, the L2C and L5 signals are considered pre-operational. A pre-operational signal means the availability and other characteristics of the broadcast signal may not comply with all requirements of the relevant Interface Specifications and should be employed at the users' own risk. Therefore these signals should not be used for safety-of-life or other critical purposes. Any military or civil users who encounter user equipment problems following message population of the L2C and L5 signals should contact the applicable POCs identified below as soon as possible. Aviation users should file reports consistent with FAA-approved procedures.

Rick Hamilton
CGSIC Executive Secretariat
GPS Information Analysis Team Lead
USCG Navigation Center
703-313-5930

DIGITAL WHAT?

by Angie Rudolph

With the advent of the digital era comes a lot of great technological enhancements but with that comes change, and often times with change comes resistance. Rather than resist the digital revolution of the surveying profession maybe embracing it is the way to go, because like it or not it's here to stay. Just think how far the surveying profession has come since the days when the PLSS was first surveyed in 1785 with chains and links, to today where there are robotic total stations and GPS. The following is an example of moving the surveying profession into the future in a different way - to the web.

As you all know, land surveyors are required by Wyoming state statute to file corner records as described below:

Sec. 33-29-142 Completion of "corner file"

A surveyor shall complete, sign and file with the county clerk where the corner is situated, a written record of corner establishment or restoration to be known as a "corner file" for every public land survey corner and accessory to such corner which is established, reestablished, monumented, remonumented, restored, rehabilitated, perpetuated or used as control in any survey by such surveyor, and within ninety (90) days thereafter, unless the corner and its accessories are substantially as described in an existing corner record filed in accordance with the provisions of (this act).

Traditionally a surveyor has to drive to the courthouse and dig through books to see if a corner record had been previously filed. Sounds easy enough, but what about corner records that aren't indexed correctly, or meander corners, or all of the other time consuming corner records to track down. What if we were to employ technology to help us gather this information in a more intuitive and efficient way? The majority of counties in Wyoming have a web mapping application of some sort with varying levels of public information available from basic ownership to land records, taxes, building permits, and more. So if we leverage this existing technology and display the corner records on the web mapping application, we then have access to scanned corner records right at our finger tips. The idea being that when you click a section corner and a corner record has been filed there will be a link to the recorded document(s). Then instantly the problem of tricky corners and corners that are cross indexed incorrectly goes away, plus you get the history of the corner immediately.

State of Wyoming Corner Record


(In compliance with the CORNER PERPETUATION AND FILING ACT, Wyoming Statutes, 1977 Section 36-11-101, et. sec. and the Rules and Regulations of the Board of Professional Engineers and Professional Land Surveyors)

Reverse side of this form may be used if more space is needed.

Record of original survey and citation of source of historical information (if corner is lost or obliterated). Description of corner monumentation evidence found and/or monument and accessories established to perpetuate the location of this corner. Sketch of relative location of monument, accessories, and reference points with course and distance to adjacent corner(s) (if determined in this survey). Method and rationale for re-establishment of lost or obliterated corner.

FOUND Stone monument 11"x8"x6" above ground.
Steel post 1" North.
2 notch on South face.

Monument location

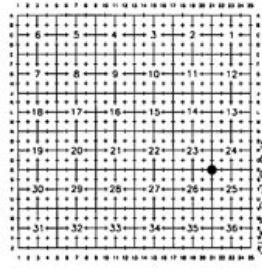


Monument Inscription

STONE
2 notch on South face.

Date of Field Work: 12/09/08 Office Reference: 5027

Cross Index Plat



Firm/Agency, Address
D.R. GRIFIN & ASSOCIATES, INC.
SUITE 202
1414 E. K STREET
ROCK SPRINGS, WYOMING 82902
Telephone Number: 362-5028

This corner record was prepared by me or under my direction and supervision.
SEAL & SIGNATURE

270878

STATE OF WYOMING
Office of Clerk and Recorder
County of Sublette

"This corner record" was filed at 10:24 AM on the 14 day of December, 2008 and was noted on the cross-index plat.

Mary L. Luskard Deputy Clerk

County Clerk

Corner Name: Southeast Section Corner Section 23, T 27 N, R 109 W, 6th P.M.
County: Sublette Wyoming

Cross-Index No: 8-21

In 2013, the Professional Land Surveyors of Wyoming agreed they would tackle digital corner record projects. There were no instructions and no guidelines; each chapter was to come up with a solution to get this data out there. The West Central Chapter started working on this in Spring 2014. The following is an outline of their workflow, and includes some questions you need to ask of your particular chapter in the process. There really is no right or wrong way of doing this project, these are just suggestions.

Three things are required to begin this project. A digital copy of the corner records, State Plane coordinates for the **general** location of the corner, and access to an online mapping system.

1. Scanned documents
2. State Plane coordinates - general, not meant to be a precise location
3. Online mapping system

All of these items fall into more than one jurisdiction, so the first battle is defining the role each party will fulfill. While the list is short, each component poses many questions you need to ask yourselves.

DOCUMENTS

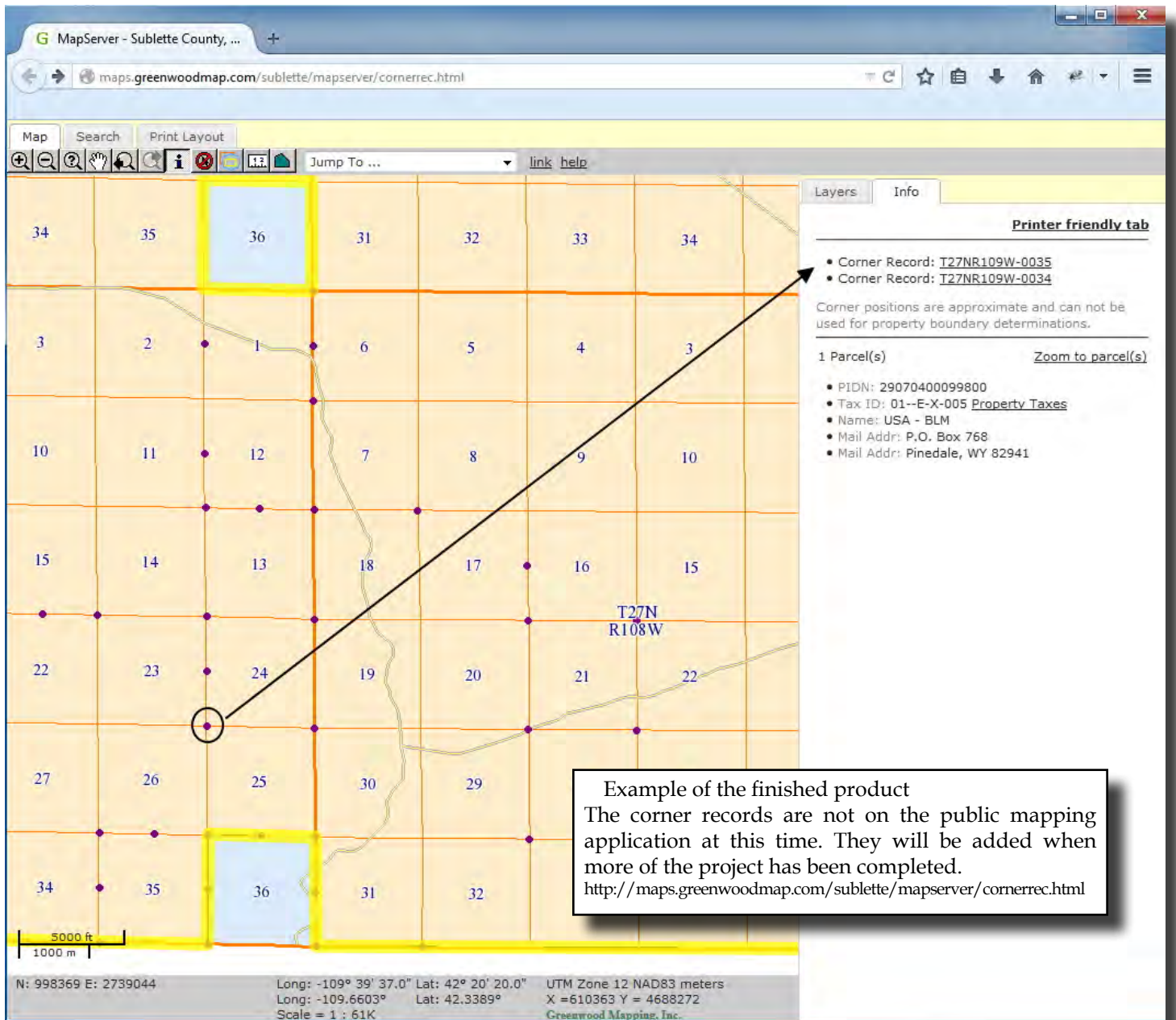
- What does the clerk have already scanned – do they even have digital documents?
- If not, who is going to scan these records, you could hire it out or do it yourselves. If you hire it out, who is going to pay for it?
- If you do it yourselves, do you have access to a two-sided scanner?
- Naming convention? Use the instrument number? Does it matter?
- Do you want to have all the corner records for a corner in one file or do you want to have separate documents for each corner record?

• What about multi-page documents – where a corner record has more than one page?

• What format do you save them in? Tiff vs PDF
The West Central Chapter decided to start in Sublette County because Surveyor Scherbel, Ltd generously scanned all recorded corner records. They scanned 18,259 images and organized them into 120 Township and Range folders. This organizational method helps prevent errors in gathering the State Plane coordinates by staying in one township and range at a time without jumping around.

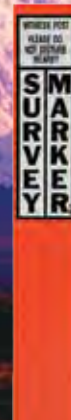
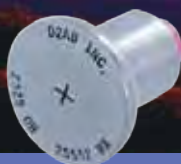
They were scanned as TIFFs and are batch converted to PDF for web presentation. The PDF format accommodates corner records with more than one page, however, they did decide to have a separate document for each record because it

(CONTINUED ON PAGE 19)



Responsible Chapter	First Call Date	Last Call Date	Publication Date
Upper Platte Chapter	THANK YOU!!	(SEE "THE AERIAL TRAMWAY OF ENCAMPMENT" IN THIS ISSUE)	
Southwest Chapter	September 1	September 15	October 1, 2014
Northeast Chapter	December 1	December 15, 2014	January 1, 2015
Northwest Chapter	March 1	March 15	April 1, 2015
West Chapter	June 1	June 15	July 1, 2015
Central Chapter	September 1	September 15	October 1, 2015
South Central Chapter	December 1	December 15, 2015	January 1, 2016
Southeast Chapter	March 1	March 15	April 1, 2016

- SURVEY MARKERS & MONUMENTS
- CONCRETE MARKERS & DRILL BITS
- SURVEY NAILS & WASHERS
- REFLECTIVE TARGETS & PRISMS
- FLAGGING & WITNESS POSTS



Berntsen



REQUEST A CATALOG
877.686.8561



FIND US ONLINE
www.berntsen.com

MARKING THE INFRASTRUCTURE OF THE WORLD™ | WWW.BERNTSEN.COM



A compilation of parts of the
WYOMING STATUTES

and other items of interest to
PROFESSIONAL LAND SURVEYORS

Order from **SURVEYOR SCHERBEL, LTD.**

Box 96, Big Piney – Marbleton, Wyoming 83113

\$60.00 postpaid



MANUFACTURER CUSTOM

SURVEY STAKES, LATH, & BRASS CAPS

FLAGGING - PIN FLAGS - FLUORESCENT PAINT

ROB SHOOK

P.O. Box 51227

Casper, WY 82605-1227

307-234-9856

COMPLETE FIELD SUPPLIES SINCE 1969

TODD CEDARHOLM, PLS, RECEIVES HISTORICAL RESEARCH GRANT

The Wyoming State Historical Society recently announced the 2014 Lola Homsher research grants. Tamsen Hert, chairman of the committee reviewing applications for the Lola Homsher grants recently announced that Todd Cedarholm (PLS No. 6447) of Jackson, a PLSW member received a grant of \$950.00 for "Documentation of the Original USGS Surveys of Grand Teton National Park and the Teton Forest Reserve." The announcement was published in the June 2014 issue of Wyoming History News.

Mr. Cedarholm's application for the grant indicates in depth research on the early cartographic efforts performed to produce the early topographic maps of the area. The geodetic control necessary for the effort was initiated in northern Wyoming near Sheridan and Ranchester with a geodetic based line near the latter town and an astronomic station for latitude and longitude. It must be remembered that the first transcontinental arc of triangulation traverses Utah -Colorado -Kansas, and that there were no northern networks into Wyoming until the twentieth century. Therefore, a "local" USGS astro station provided the horizontal datum. The triangulation extended westward and terminated with a verification baseline in Jackson Hole. The network crossed the Bighorns and Absorkas mountain ranges and through Yellowstone.

In his application, Cedarholm presented a detailed discussion of his previous research into various archives, and identified primary sources (persons and facilities) where original documents, diaries, cartographic products, and photographs might be located. He identified individuals who led mapping expeditions in the region prior to the



Todd photographing one of the reference markers to the 1896 USGS Teton South Base

USGS efforts (Capt. Raynolds, 1860; Hayden, 1872, 1878 1879; Gillette, 1891; and Bannon, 1897 -1899). Cedarholm's identification of primary record sources indicates the primary sources of historical data needed to prepare this report.

Personal experience by this writer in preparing similar projects indicates that Cedarholm has an excellent opportunity of researching and writing an invaluable contribution to the fields of cartography, surveying, mapping, and Wyoming history.

Good luck with your project!

Author: Herbert W. Stoughton, Ph.D., P.E., P.L.S., C.P.



THE AERIAL TRAMWAY OF ENCAMPMENT

By, ANITA MORRIS & MARTIN PEDERSEN

Probably the biggest surveying and engineering project ever done in Encampment, Wyoming began in January 1902 with the building of the world's longest continuous aerial tramway. It was built to haul copper ore 16 miles from the Ferris-Haggarty copper mine across the Continental Divide to the Boston-Wyoming smelter in Encampment.

The reason behind building the tramway was, of course, economic. Before the tramway, the ore was hauled from the mine by horse drawn teams which had great difficulty in the winter months.

Shipping cost was \$10 per ton. Shipping cost was \$5.00 per ton on the tramway, and much more ore could be shipped. In fact, the smelter had to be enlarged to handle the increased volumes.

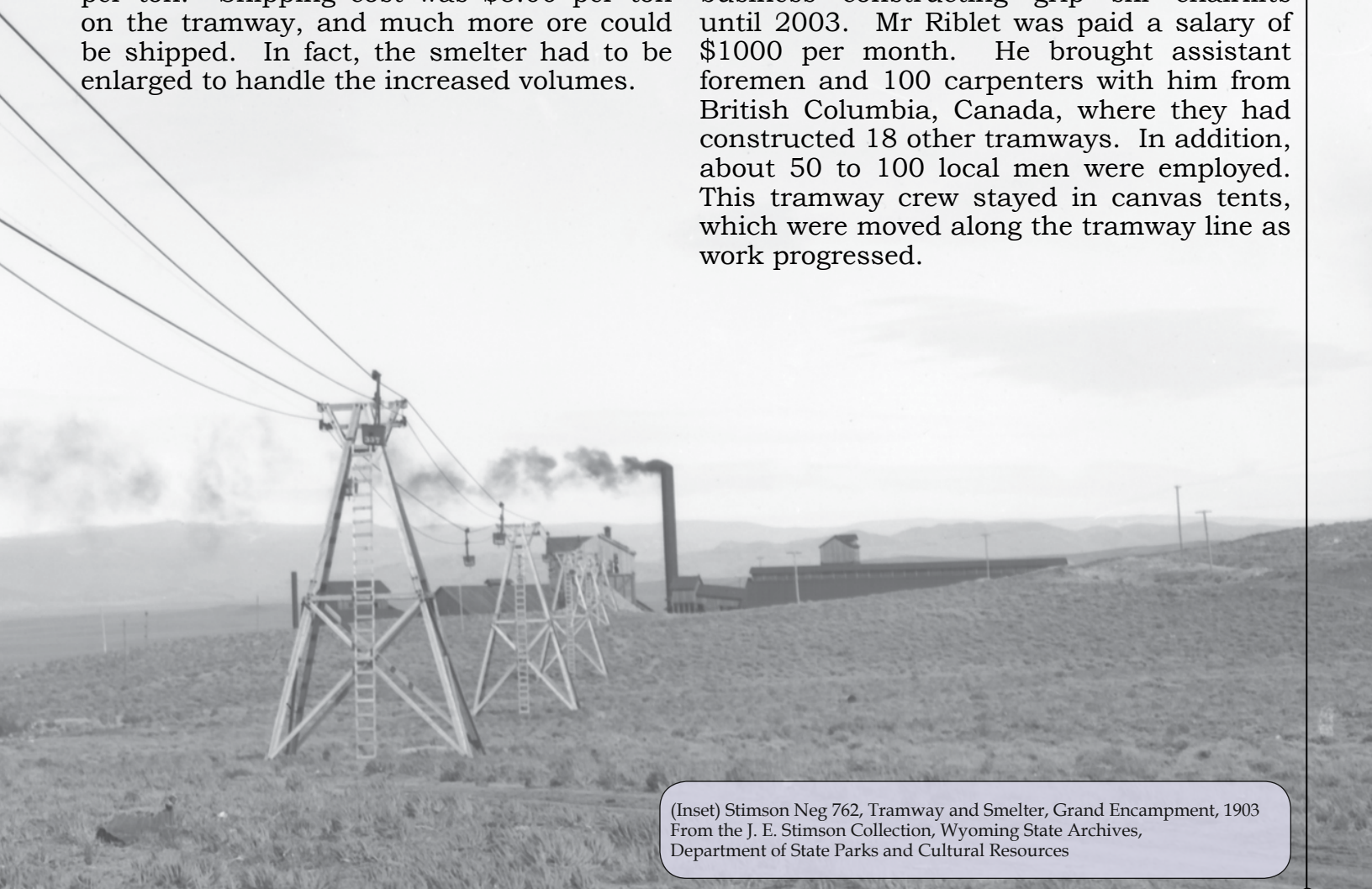
"All through the woods are strange looking fellows with instruments aiming here and there and putting up little stakes with nails in the tops. They behave very curiously, but my neighbors assure me that they are wise men employed by the Tramway Company to find trails through the mountains, and that they mean no harm."

Grant Jones, *Grand Encampment Herald*

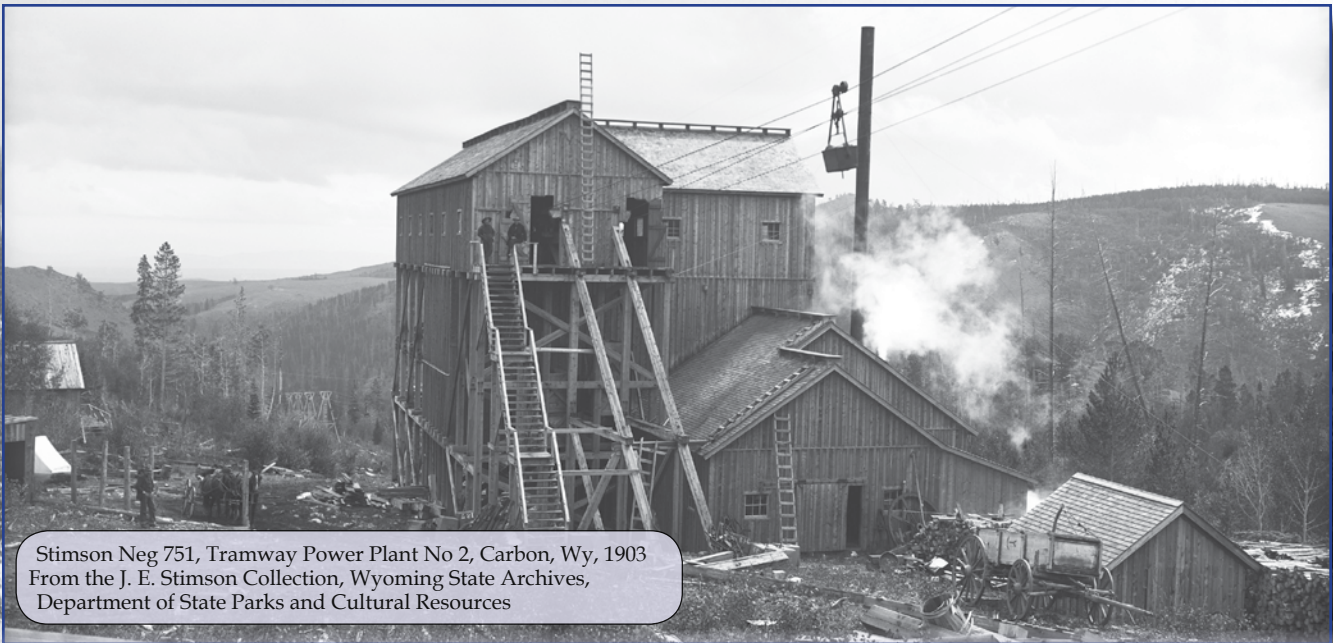
Ferris-Haggarty Copper Mining Company ordered the construction and the contract was let in January 1902. The contract specified that the tramway must be in operation by October 1, 1902. The cost of the tramway was estimated to be \$300,000. The man in charge of construction was B.C. Riblet. He

had a degree in civil engineering and had worked as a surveyor for the Northern Pacific Railway. He was a "noted aerial tramway engineer" from Spokane, Washington, and established the Riblet Tramway

Company in 1896. His company stayed in business constructing grip ski chairlifts until 2003. Mr Riblet was paid a salary of \$1000 per month. He brought assistant foremen and 100 carpenters with him from British Columbia, Canada, where they had constructed 18 other tramways. In addition, about 50 to 100 local men were employed. This tramway crew stayed in canvas tents, which were moved along the tramway line as work progressed.



(Inset) Stimson Neg 762, Tramway and Smelter, Grand Encampment, 1903
From the J. E. Stimson Collection, Wyoming State Archives,
Department of State Parks and Cultural Resources



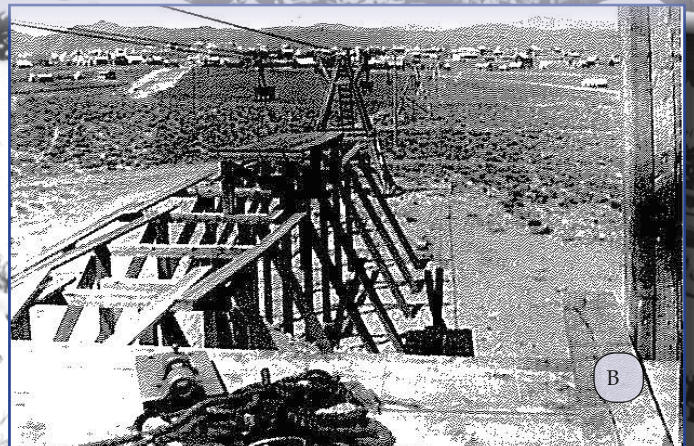
Stimson Neg 751, Tramway Power Plant No 2, Carbon, Wy, 1903
From the J. E. Stimson Collection, Wyoming State Archives,
Department of State Parks and Cultural Resources

In the Grand Encampment Herald of June 25, 1902 reporter Grant Jones is quoted as saying "All through the woods are strange looking fellows with instruments aiming here and there and putting up little stakes with nails in the tops. They behave very curiously, but my neighbors assure me that they are wise men employed by the Tramway Company to find trails through the mountains, and that they mean no harm."

The tramway right-of-way was cut 100 feet wide, much through heavy and downed timber and deep snow. Twenty miles of haul road was built in conjunction with the tramway, along the tramway route to haul timber and equipment. This road, known locally as the Encampment Boulevard, was described as "wide, level, with a good grade and properly drained and bridged." It was carefully laid out and was far superior to the



A



B



C



D

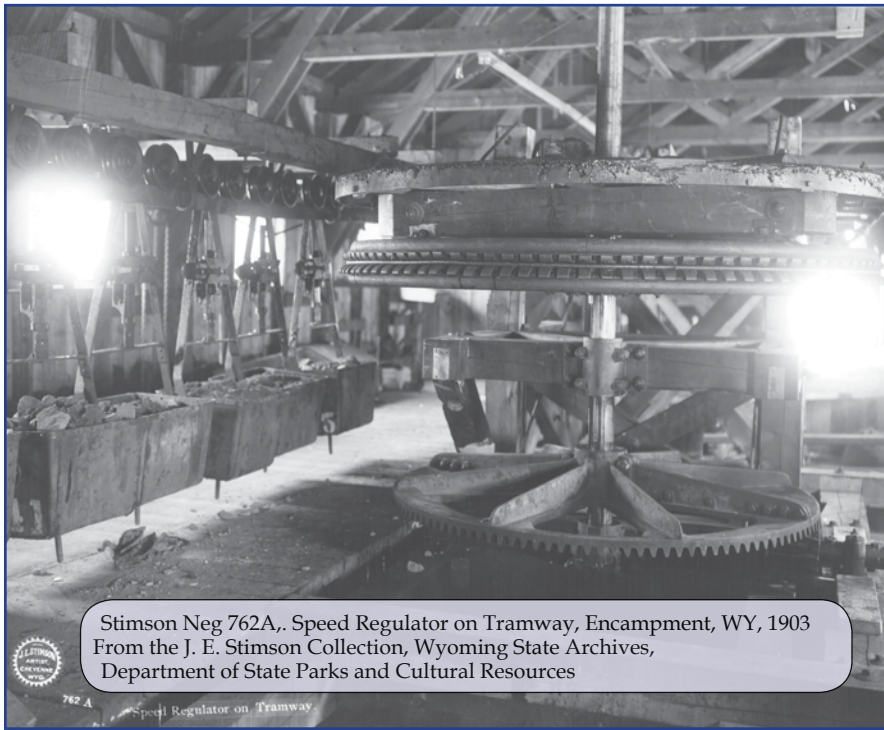
average mountain road. When the road was finished, people found it amazing that they could get to Cow Creek in only 2½ hours.

The preliminary survey for the tramway showed a distance of sixteen miles in mountainous country. It was the intention of the contractors to build the tram in four sections, each four miles in length, and so constructed that the sections would work independently of each other and at the same time in conjunction. This was made possible by automatic switches at each terminal so that the cars would switch automatically from one section to the other without delay.

The first step was to prepare the right-of-way, which meant the cutting of trees and the removal of any obstructions. Timbers were cut, sawed, and hauled to town. The sawmill moved along the line as towers were built. Cutting timber began in February. The snow was 5 feet deep on the level and horses could not get in. They used "block and fall" in order to get the logs onto the road. Teams brought in several thousand feet each day.

(Opp. Page) A. Sub Neg 18914, Tramway from Ferris Haggerty Mine
From the Department of State Parks and Cultural Resources
B., C., & D. From the Pedersen/Morris collection of post cards.

(Inset) Stimson Neg 753. Rudefeha Mine, Carbon Co., Wyo, 1903
From the J. E. Stimson Collection, Wyoming State Archives,
Department of State Parks and Cultural Resources



Stimson Neg 762A., Speed Regulator on Tramway, Encampment, WY, 1903
From the J. E. Stimson Collection, Wyoming State Archives,
Department of State Parks and Cultural Resources

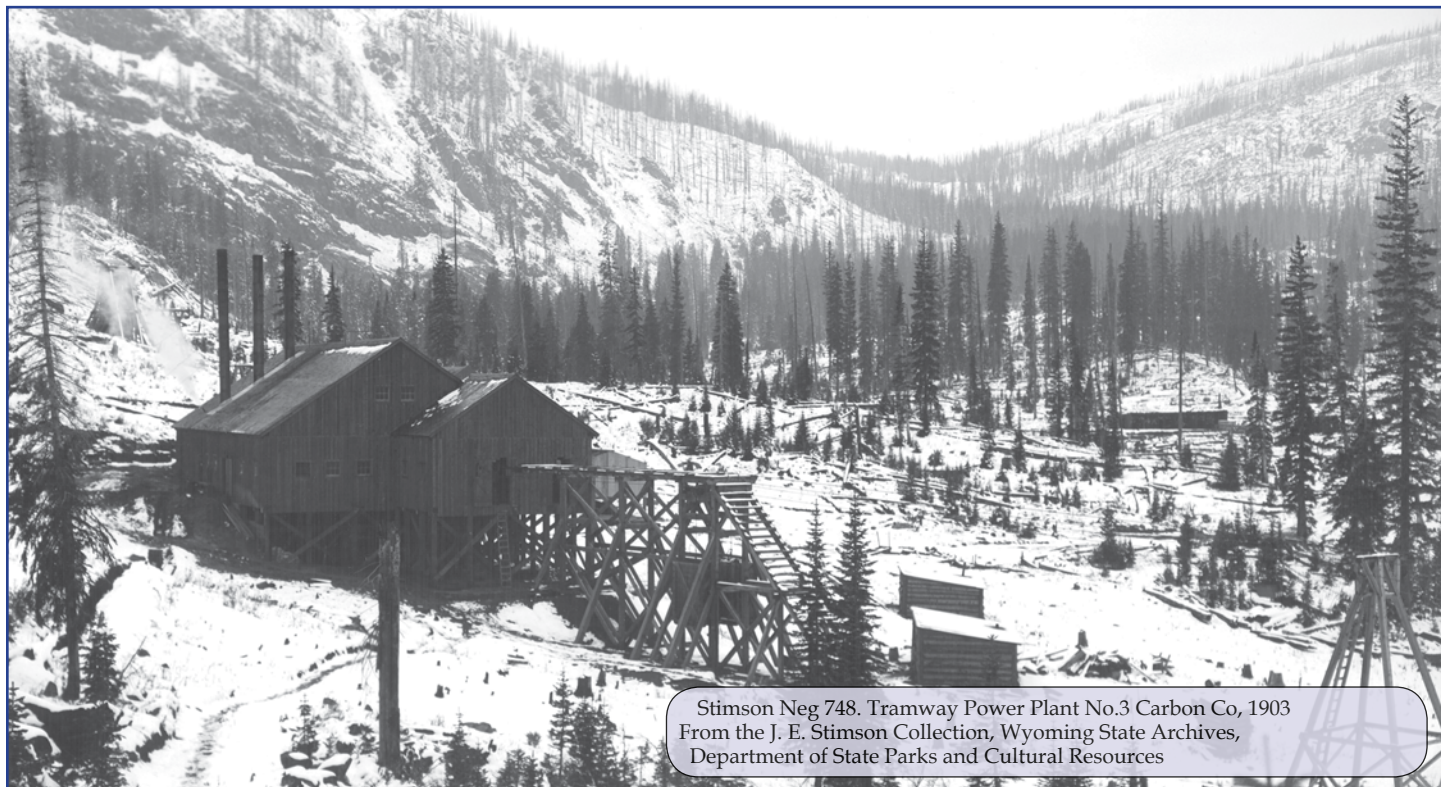
right side, which bore the weight of the loaded cars, was $1\frac{1}{4}$ inches in diameter, while the return cable on the left was only $\frac{7}{8}$ inch in diameter. It was downhill from the mine to Encampment, so the force of gravity furnished the power to run the cars. In addition, a 250 horsepower stationery engine and boiler was installed in Encampment to be used in case of emergencies. Electricity was generated and wired to the emergency points. The terminals consisted of large drums or pulleys set in a half circle, about which the cars ran while switching from one section to the other. One million feet of lumber and 64 miles of steel rope cable were required. There

Building the towers was the second step. They consisted of heavy timbers anchored by heavy bolts in rock foundations. The height of the towers and the distance between them depended on the topography. In open ground, the distance between towers was about 1,000 feet, with the span much less in the hills. The cars traversed the tram on either side; the down cars traversed on the right and the up cars on the left. The moving cable was continuous, carrying the loaded cars to the smelter on one side and the empty cars to the mine on the other. The track cable on the

were 370 towers mostly built of wood but a few of steel. They were anchored by iron bolts in rock foundations. The highest tower was 69 feet at an elevation of 9,992.7 feet. The highest tower elevation was 10,690 feet on Bridger Peak. The longest span between towers was 2,200 feet at Cow Creek Canyon. The number 3 station, built on the south side of Cow Creek, was at the top of a 700 foot wall of rock, subject to snow slides, and was 2,200 feet from the next tower that could be placed to support the steel cables. Other long spans were 2,000 feet and 1,200 feet. The highest



Photo by Anita Morris

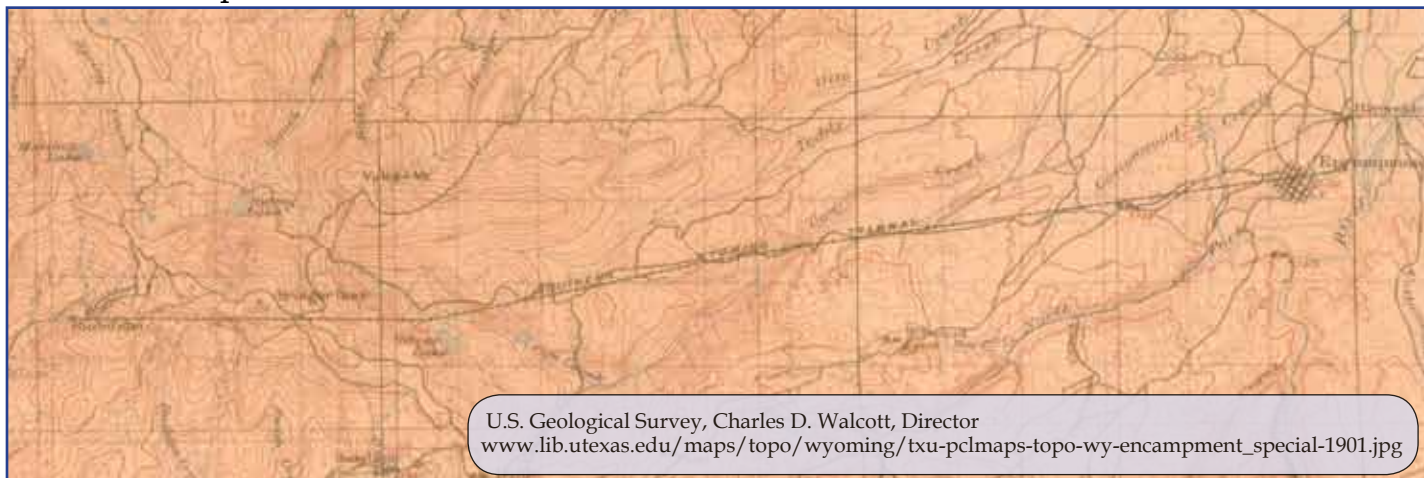


Stimson Neg 748. Tramway Power Plant No.3 Carbon Co, 1903
From the J. E. Stimson Collection, Wyoming State Archives,
Department of State Parks and Cultural Resources

cable span was 250 feet above ground at Henning's Gulch. There were 840 buckets, each independently suspended on sheaves, metal arms, and cable. Each bucket carried 700 pounds. The maximum capacity of the tram, one-half of the buckets loaded, was 948 tons per day. There were three steam power stations, 4 miles apart. These stations operated as brakes on the gravity system. It moved about 4-6 miles per hour. There were 16 tension stations, 4 of them double. The buckets were attached to the tension cable by buttons, placed 200 feet apart. There was an automated system for loading and for dumping the ore in bins at the smelter. The empty buckets were used as a general freighting business to haul supplies, workers, and tourists up to the mines.

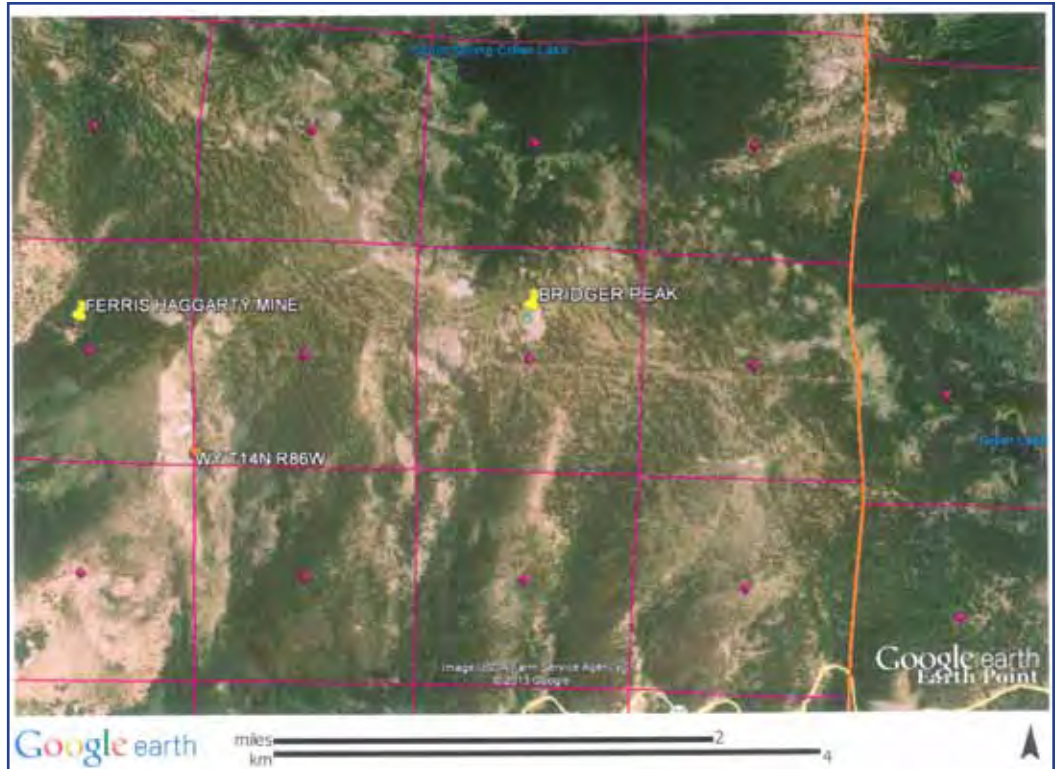
Material came by train to Walcott, and then had to be freighted 45 miles to Encampment and up the mountain. The amount of freight which was shipped from Walcott was almost 1,500,000 pounds, and the freight charges were about \$39,000. One of the most difficult tasks was handling the 5 spools of cable. Each spool weighed seven tons and contained 32,700 feet of cable. Three new wagons were bought that could carry 15 tons each using a team of 14 horses. All available teams in camp were secured, but still more were needed for the great amount of hauling. The Ferris-Haggarty mine even quit hauling ore so their teams could be used.

The contract was let in January, 1902. By the end of February, 1902, two towers



U.S. Geological Survey, Charles D. Walcott, Director
www.lib.utexas.edu/maps/topo/wyoming/txu-pclmaps-topo-wy-encampment_special-1901.jpg

closest to the smelter had been finished. In the first week of March, there was a labor strike of about a dozen employees who wanted to be paid \$3.00 per 10 hour day instead of \$2.50. Basically, there was not much support for the cause, and those employees were fired. By March 14, 1902, thirty towers had been built, extending over two miles out from the smelter. By April 4th, four miles had been completed. By April 11th, the first 4 miles of track cable was stretched upon the towers and the second transfer station was begun. By May 9th, almost nine miles were completed.



By May 16th, the route for the tramway from the second transfer station to the mine was definitely located. The cables had been strung on the first half of the tram. In June, work was slowed by a forest fire and an infestation of bears at the second man camp. By July 18th, towers had been built for 13 miles out to Bridger Peak, and two tension stations of the fourth section had been erected. Boilers had been installed in the second station. The third station, finished Aug 1st, was the most important one. It had a masonry foundation and was located just beyond Cow Creek. It had a 65 horsepower boiler and a 25 horsepower boiler. The tramway angled at this station and then ran on a direct line south of Bridger Peak to the Ferris-Haggarty mine. By August 29th, the first two sections were fully completed and running. In early September, there was a delay of a small

consignment of appliances which delayed completion. Superintendent Riblet was discharged along with a large number of the workers who were all going to Washington to start another tramway job. The upper terminal at the mine was almost complete. The tramway was finished September 10th, ahead of schedule. The first ore was shipped over the tramway June 9th, 1903 with a huge celebration in Encampment as the first loaded bucket arrived.

When the tramway was finished, A.L. Cox, President of the Continental Mining Company was quoted as saying "This is the biggest transformation ever taken place in twelve months. The entire tramway is built so substantially and so well that it is there for business and nothing else. It has been a phenomenal undertaking in every sense."

SPECIAL THANKS TO THE LATE MARTIN PEDERSEN FOR ALL HIS RESEARCH AT THE ENCAMPMENT MUSEUM.

INFORMATION CAME FROM SEVERAL ISSUES OF THE GRAND ENCAMPMENT HERALD NEWSPAPER FOUND AT THE GRAND ENCAMPMENT MUSEUM, AND FROM THE SARATOGA SUN

1. DIMENSIONS OF LONGEST TRAMWAY IN THE WORLD, COMPILED BY DICK PERUE FROM JUNE 18, 1903 "SARATOGA SUN", AN ENGINEER'S REPORT AT THE AMERICAN HERITAGE CENTER, UNIVERSITY OF WYOMING, LARAMIE, WYOMING AND THE MARTIN/PERUE FILES.

2. THE SARATOGA SUN, MARCH 5, 2014, REPRINT OF STORY FROM THE MARCH 7, 1902 GRAND ENCAMPMENT HERALD

3. GRAND ENCAMPMENT HERALD; ISSUES JANUARY 24, 1902, FEBRUARY 28, 1902, MARCH 7, 1902, MARCH 14, 1902, APRIL 4, 1902, APRIL 11, 1902, MAY 2, 1902, MAY 16, 1902, MAY 30, 1902, JUNE 6, 1902, JUNE 13, 1902, JUNE 20, 1902, JUNE 25, 1902, JULY 4, 1902, JULY 11, 1902, JULY 18, 1902, AUGUST 1, 1902, AUGUST 8, 1902, AUGUST 15, 1902, AUGUST 22, 1902, AUGUST 29, 1902, SEPTEMBER 5, 1902, OCTOBER 10, 1902, OCTOBER 17, 1902, JUNE 12, 1903.

RDO Integrated Controls

BLOWOUT SALE

GIS | GPS | Laser | Machine Control | Mobile Mapping | Supplies | Survey | UAV



ES Total Station

Designed from the ground up to deliver the very latest technological advantages, all in a small, sleek design

- Ultra-powerful, advanced EDM
- Easy access USB 2.0 memory
- Advanced angle encoder system
- Rugged, waterproof design

ES-103 3" List: \$10,290 / **Sale Price: \$8,500**

ES-105 5" List: \$9,365 / **Sale Price: \$7,500**

Contact us today to get these great savings and find out more about all of the services we provide!



RDO Integrated Controls
Chris Farnsworth
307-277-4925
cfarnsworth@rdoic.com



RDO Integrated Controls
Chris Vaughn
406-794-2135
cvaughn@rdoic.com



OS Total Station

Professional grade compact design total station

- Fast and powerful EDM
- Advanced angle accuracy
- MAGNET Field on-board
- Advanced security and maintenance with TSShield™

List: \$13,290 / **Sale Price: \$9,999**

BILLINGS
5221 Midland Road
Billings, MT 59101
1-800-234-5420

BOZEMAN
257 Laura Louise Lane
Bozeman, MT 59715
1-800-927-3001

RAPID CITY
1540 Deadwood Ave.
Rapid City, SD 57702
1-800-658-4590

Call for GREAT pricing on all your survey needs including Robotic Total Stations!

ARIZONA • CALIFORNIA • HAWAII • MINNESOTA • MONTANA • NORTH DAKOTA • SOUTH DAKOTA • WYOMING

Toll Free 877-90 RDOIC

www.rdoic.com
www.rdomarketplace.com

TOPCON



Contract Holder
Contract GS07F0R76A

(CONTINUED FROM PAGE 8)

is easier to maintain long-term. The scans were not renamed because as long as the coordinate is associated with the filename there was no need to rename it. As a side note, going forward they are being named with the instrument number, but again it doesn't matter.

COORDINATES

- Who is going to determine the geographic location of the corner record?
- What software are you going to use to obtain the State Plane coordinate? AutoCad, GIS?
- How are you going to deliver the information? CSV or Shapefile
- How are you going to deal with pin cushion? Where there are many points (corner records filed) coincident.
- How is this data going to be updated as time goes on?

The West Central Chapter decided to have land surveyors determine the State Plane coordinates for the corner records. They divided up the work by township and range and asked local surveying firms to take on some of the work. It was decided that it wasn't critical what software they used to get the coordinate only that the file produced (CSV or shapefile) contained the State

Plane coordinate with the filename associated. Because each point is only a general location and not the true position they decided it was beneficial to have several coincident points, this allows the user to access multiple recorded documents with one click. As they finish this stage they give the raw data (CSV of shapefile) to the county GIS staff to assimilate into one file to be used on the county web mapping system. The GIS staff will maintain the data as new corner records are filed.

GETTING IT ONLINE

- Does the county you are working on have an existing online mapping system that they maintain? (i.e., not a mapping system at the state level)
- Is the county willing to put this data on their web mapping system?
- How are the scanned documents going to get online?
- Where are the scanned documents going to be hosted?

Sublette County already has their documents online using Greenwood Mapping, Inc. as their hosting company, so this step was not difficult. But if you are working in a county that does not have a digital solution for recorded documents then this step will obviously pose more challenges. It's important to work with



■ Digital Aerial Photography ■ LIDAR
■ Topographic Mapping ■ Orthorectified Imagery



40 West Oakland Avenue, Salt Lake City, UT 84115 • PHONE: 801-487-3273 • FAX: 801-487-3313

the Clerk and GIS staff to determine what is available. If the county you're working on does not have an online mapping system, you could scan the recorded documents and gathering the coordinates in the event that someday the county will have an online mapping system.

A couple take aways, if your organization is interested in getting more experience with GIS, then this is a perfect project to do just that. And you don't need expensive software either. QGIS is an open source GIS software package that can be used freely, or you can use your existing surveying software. Either way, it's a great way to spend some time looking at corner records and is an excellent opportunity for developing your staff's skills in the off season. Make it a learning experience.

Some of the details outlined in this particular process are specific to the technological logistics at Sublette County. It's important to not get too caught up in the technology and keep the end goal in sight, because obviously, this is a momentous project that will take years to complete.

(Angie Rudolph is a GIS professional with over a decade of experience. She has been working in land records and GIS since 2006 with Greenwood Mapping, Inc.)

ATTENTION!

SAFETY MANUAL FOR SURVEYORS



NOW AVAILABLE FROM THE SW CHAPTER
OF PROFESSIONAL LAND SURVEYORS OF
WYOMING

COMPREHENSIVE, AFFORDABLE, ADAPTABLE!

Special Offer - Only \$50 + \$2 SHIPPING!

CD CONTAINS ENTIRE 206 PAGE MANUAL IN BOTH
"WORD" AND ADOBE ".pdf" FORMATS THAT CAN BE
EDITED AND ADAPTED FOR YOUR PARTICULAR USE

Contact Secretary/Treasurer: Olian T. Shockley
Olian_Shockley@msn.com or phone 307-875-0146

ON YOUR MARK, GET SET, SURVEY!

EASY ORDERING ONLINE!



SURV-KAP.com

SURVEY MARKERS, CAPS AND ACCESSORIES

800-445-5320



YOU NEVER KNOW WHAT YOU MIGHT FIND!

Ryan Lorenzen, BLM Cadastral Surveyor, was conducting a resurvey in T. 26 N., R. 6 E., on the Winnebago Indian Reservation in Northeastern Nebraska in June of 2013 when he uncovered the monument pictured. Following is Ryan's description of what he found:



The center W. 1/16 sec. cor. of sec. 34, monumented in 1915 by E. C. Simmons, Thurston County Surveyor, with a four legged cast iron chair base, 18 ins. diam., center post 6 ins. long, 1½ ins. diam., firmly set 24 ins. below the surface of the ground, with a threaded iron bolt, 27 ins. long, 5/8 in. diam., through the center post, with a paving brick, plainly mkd. ECS on N. face, and APR 22 1915 on S. face, and glass fragments alongside. This position is recorded in Surveyor's Record Book No. 2, p. 143, in the Thurston County Courthouse, and is accepted as a careful and faithful reestablishment of the original cor. position.

~ GRENVILLE DODGE AND PARTY AT THE GANGPLANK ~



A signed and numbered reprint of Dave Paulley's original oil painting of UP Rail Road's survey party finding a route over the Laramie Mountains after being forced there by an Indian war party.

FOR SALE BY THE PLSW SE CHAPTER

\$50.00 per print plus shipping
Contact: Dennis Dawson
307-421-9932
DennieandBarb@aol.com

TECHNOLOGY FOR INFORMATION AND MEASUREMENT



FRONTIER PRECISION, COMMITTED TO THE GEOSPATIAL COMMUNITY SINCE 1987.

- Market Focused Solutions
- Technical Expertise to Serve you Better
- Toll Free Technical Support Number
 - ➔ Colorado/Wyoming/Montana 888.960.7934
- Technical Survey Blog at www.fpisurvey.com
- Trimble Certified Training Classes
- 3 Regional Service Centers

Frontier Certified Service Center

Cheyenne, WY | Denver, CO

800.652.1522

www.FrontierPrecision.com



seco



LINES AND POINTS

P.O. BOX 8

CHEYENNE, WY 82003



Please Recycle

Digital Terrain Models

Digital Elevation Models

Orthometric Photos

Western
Research & Development, Ltd.



Topographic Mapping

3-D As-Builts

Contour Maps

State-of-the-art LiDAR & Digital Imaging

- **High Accuracy LiDAR**

Maximum rate of 200,000 KHz which translates to a point cloud as high as 150 points/m².

- **High Definition Digital Images**

Our Leica 39 megapixel RCD 105 Digital Camera produces images at two inches per pixel or higher.

- **Real-time Decision-making**

Our field & flight crews are staffed with Professional Engineers & Land Surveyors who truly understand data collection in real-time.

- **Reliable Topographic Mapping**

The helicopter flies at low altitudes and is capable of providing elevations at two-tenths of a foot or less.



Tel (307) 632-5656

5908 Yellowstone Rd, Cheyenne, WY

www.wrd-ltd.com