Oregon Real-Time GPS Network
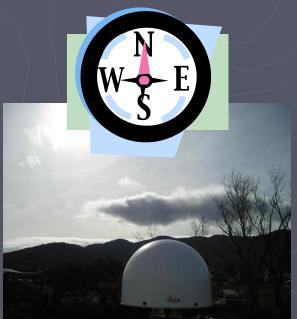
Oregon GPS Users Group
Civil GPS Service Interface Committee
Bend, OR
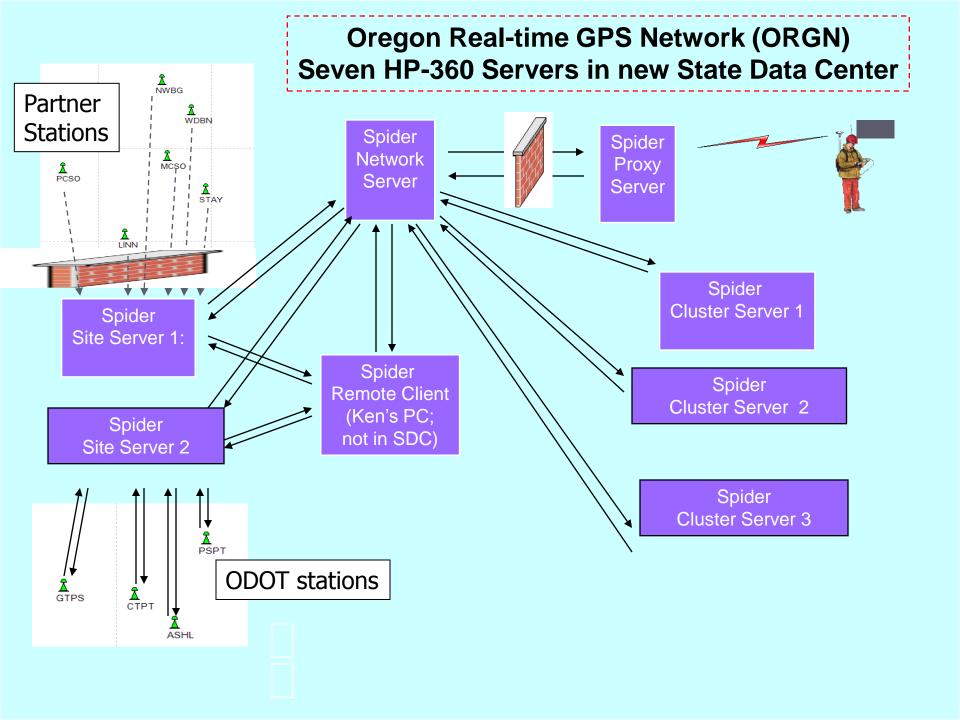

Ken Bays, PLS
ODOT Geometronics Unit
15 June 2007
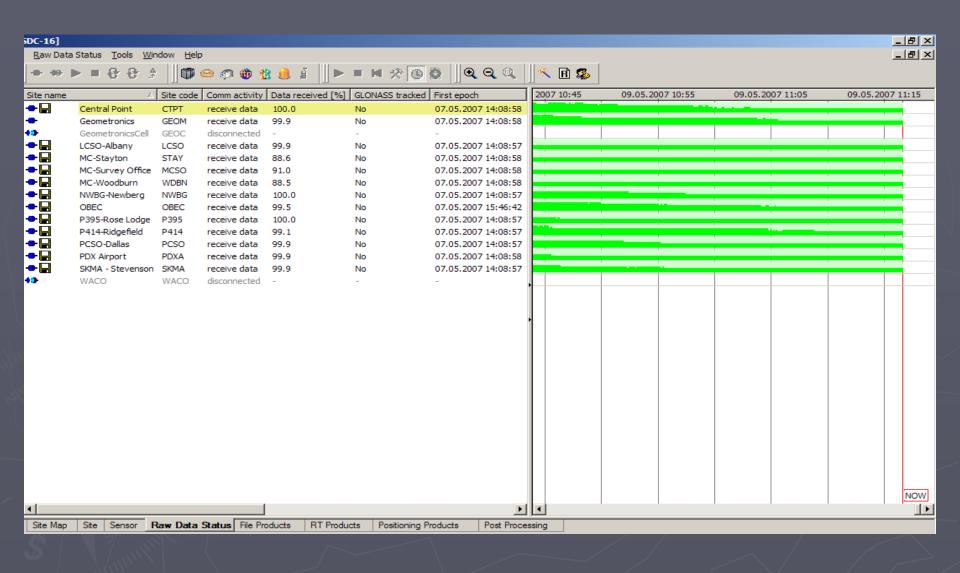
**Oregon Real-time GPS Network (ORGN)
Seven HP-360 Servers in new State Data Center**

Partner Stations

NWBG
WDBN
PCSO
MCSO
STAY
LINN

Spider Network Server

Spider Proxy Server

Spider Cluster Server 1

Spider Site Server 1:

Spider Remote Client (Ken's PC; not in SDC)

Spider Cluster Server 2

Spider Site Server 2

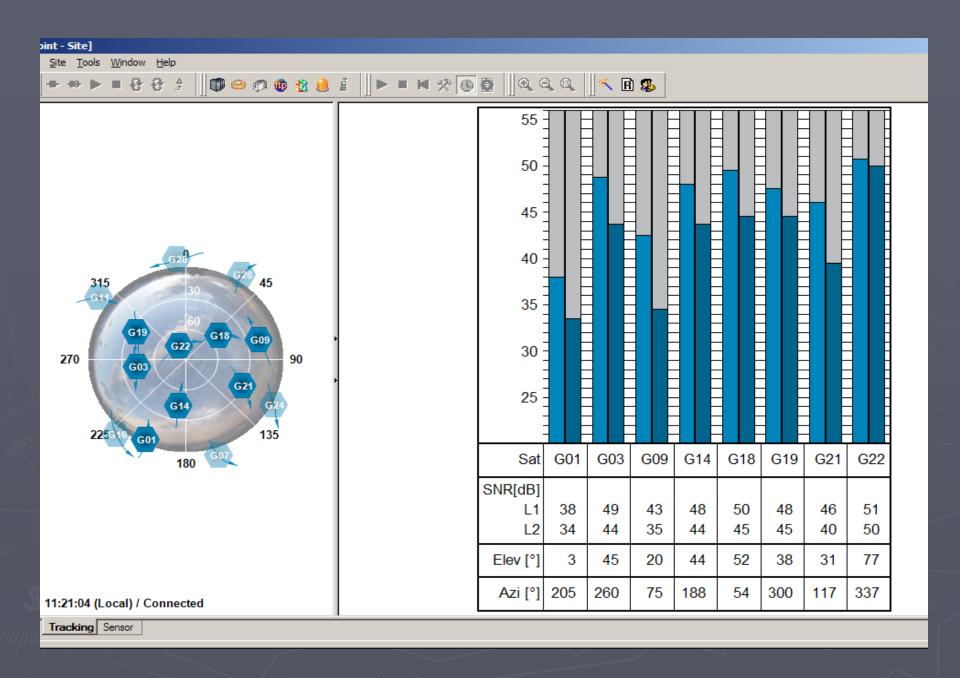Spider Cluster Server 3

ODOT stations

PSPT
GTPS
CTPT
ASHL

ORGN Users

▶ Administrator

▶ Partners

▶ Subscribers

▶ Major Cooperators

Administrator

- ▶ Oregon Department of Transportation
- ▶ Geometronics Unit
- ▶ Program Management: Ron Singh
- ▶ Technical Administration: Ken Bays

Administrator Responsibilities

► Network quality control

► Network software operation

► Network software maintenance and upgrades

► Network listserv and maintenance

► User support

Partners

► Partners will provide sites, GPS equipment, and other infrastructure to the network.

- Government agencies
  - ► Inter-Governmental Agreements
- Private entities
  - ► Public-Private Partnerships

Some, but not all, of our Interested Partners

OBEC Consulting Engineers	Yamhill County
Polk County	City of Salem
Deschutes County	Clackamas County
EWEB	Marion County OR
City of Beaverton	Jackson County
City of Newberg	Lane County
Washington County	Tualatin Valley Water District
City of Springfield	Port of Portland
Curry County	Oregon State University
Washington DOT	City of Wilsonville
City of Bend	Clatsop County
Linn County	Douglas County
David Evans & Associates	Portland Water Bureau
Lincoln County	Benton County
Multnomah County	Oregon Parks and Recreation Department

Subscribers

► Anyone who is not a partner wanting access to the RTK corrector data that is delivered via cell modem

► Must have ORGN rover account set up
  ▪ No cost for beta mode rover accounts in 2007

► May pay a subscription fee starting in 2008

► Fee will be minimum – Cost recovery for maintenance/upgrades of network

Major Cooperators: Other Networks

► UNAVCO Plate Boundary Observatory
► Washington State Reference Network
  ▪ Exchange raw data streams across the Columbia River.
► California and Idaho as our network develops

OREGON

Business   Education   Human Services   Natural Resources   Public Safety   Recreation   Transportation

Oregon Department of Transportation - Geometronics

Oregon Department of Transportation

Departments | Divisions

No Alerts or Advisories at this time.

Oregon Real Time GPS Network

www.theorgn.net

OVERVIEW

The Oregon DOT Geometronics Unit is developing a state Global Positioning System (GPS) reference station network. We are partnering with state and local governments, federal agencies, and educational institutions to develop the network.

The ODOT Geometronics Unit is responsible for enhancing and maintaining the vertical and horizontal geodetic control infrastructure across the state of Oregon. The establishment and operation of this permanent GPS CORS network in Oregon will help us accomplish our mission.

This GPS network will consist of GPS Continuously Operating Reference Stations (CORS) that will provide real-time kinematic (RTK) correctors via cellular phone and radio networks. GPS users that are properly equipped to take advantage of these correctors can survey in the field to the one centimeter accuracy level in real time.

SCOPE OF NETWORK

ODOT initially plans to establish three sub-networks of GPS reference stations in Oregon during the 05-07 biennium. Each sub-network will consist of four to five stations spaced at approximately 70 km.

The northwest Oregon sub-network will extend from I-5 to the coast and from the Columbia river to the southern Willamette Valley. It will provide vital geodetic control to ODOT Region One and its partners to support the Interstate 5 Columbia River Crossing bridge project.

The southern Oregon sub-network will be in the vicinity of Jackson County and the Deschutes sub-network will be in the vicinity of Deschutes County. We expect to expand the network to include a major

ORGN Map

Legend:
- ▲ (dark green) Active ORGN Station
- ▲ (red) ORGN Station Disabled
- ▲ (cyan) Existing Partner Station: Data Stream to ORGN Required
- ▲ (yellow) Planned Location: Site Identified for Installation
- △ (white) Planned Location: No Site Identified

Revised: 11 April 2007

Oregon Real-time GPS Network Current Station Status

Legend

Active ORGN Station	
ORGN Station Disabled	
Existing Partner Station: Data Stream to ORGN Required	
Planned Location: Site Identified for Installation	
Planned Location: No Site Identified	

Station ID	Spider Reference No.	Location	Partner	Site Possibilities	Latitude	Longitude
		Chemult				
		Chiloquin				
		Coos Bay		BLM North Bend		
		Corvallis	OSU	PBO site at OSU		
		Detroit		ODOT Radio Site (Halls Ridge)		
		Diamond Lake				
		Elkton Jct 38/138				
		Enterprise				
LPSB		Eugene	Lane County		44 03 04	123 05 24
OBEC		Eugene	OBEC		44 03 04	123 05 24
LFLO		Florence	Lane County		43 59 00	124 06 28
Pxxx		Gold Beach/Rogue 2	PBO			
		Govt Camp				
GTPS	2	Grants Pass	ODOT		42 26 04	123 17 51
		Gresham				
HLSY		Halsey	Linn County		44 22 39	123 06 32
		Heppner		ODOT		
		Heppner Jct				
		Hermiston				
WACO		Hillsboro	Washington County		45 31 23	122 59 26
P022		I84:Exit 269	PBO			
		Klamath Falls		NDGPS,PBO, Private		
		La Pine	Deschutes County			
LCSO	8	Linn County Surveyors Office	Linn County		44 38 03	123 06 24
MCSO	3	Marion County Surveyors Office	Marion County		44 58 26	122 57 21
		Moro				
P412		Mulino	PBO/Port of Portland			
NWBG	9	Newberg	City of Newberg		45 18 00	122 58 32
		NW Yamhill County				

Sheet1 / Sheet2 / Sheet3

Ready

OREGON

Oregon Department Of Transportation - GPS Network

Oregon Department of Transportation

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Station – Grants Pass

Go to Print Friendly Page

ODOT Maintenance Yard

Looking North

Looking South

Looking West

Looking East

Station Information

Site Name:	Grants Pass
Site ID:	GTPS
PID:	

Position at Antenna Reference Point: NAD_83 (CORS96) (Epoch 2002.0)

Latitude:	42 26 04.16245 North
Longitude:	123 17 50.50982 West
Ellip. Hgt.:	279.026 m
Location:	
Organization:	Oregon Department of Transportation

Receiver Specifications

Manufacturer:	Leica Geosystems	Receiver Model:	GRX1200 Pro
Antenna:	Leica AT504 dual-frequency choke-ring L1/L2 antenna		
Elevation Mask:	0 Degrees		
Operation Time:	24x7 log files	Logging Interval:	5 Seconds

Important Links

NGS Coordinate Reports

Site Log

RINEX DATA

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ORGN Rover Account Requests

Overview

The Oregon Real-time GPS Network (ORGN) is producing real-time correctors of various types and in various formats as described on the Products and Services page. These correctors are streamed from an ORGN server to the internet to users with valid Rover Accounts.

During a beta test period until the end of the 2007 calendar year, Oregon DOT is authorizing Rover Accounts for ORGN at no direct charge to the user. During this data test period, use of the ORGN and its products will be at the users own risk. It is the responsibility of the user to verify the accuracy of surveys they perform using the ORGN and its products.

During this beta test period, Oregon DOT will evaluate ongoing maintenance and upgrade costs for the GPS Network. In 2008 and after, Oregon DOT may charge reasonable subscription fees for rover accounts based upon cost recovery of the maintenance and upgrade for the ORGN; however, rover accounts for partners will continue to be provided at no charge.

Disclaimer of Liability and Reliability

In preparation of this RTCM broadcast service, ODOT has endeavored to offer current, correct, and clearly expressed information. Nevertheless, errors may occur. ODOT expressly disclaims any liability, of any kind, or for any reason, that might arise out of any use of the RTCM information broadcast provided by this service or any other product or service of the ORGN. In particular, but without limiting its disclaimer, ODOT disclaims any responsibility for typographical errors or inaccuracies of the information provided or contained within the broadcast message. ODOT makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy, or timeliness of the information and data provided by this service.
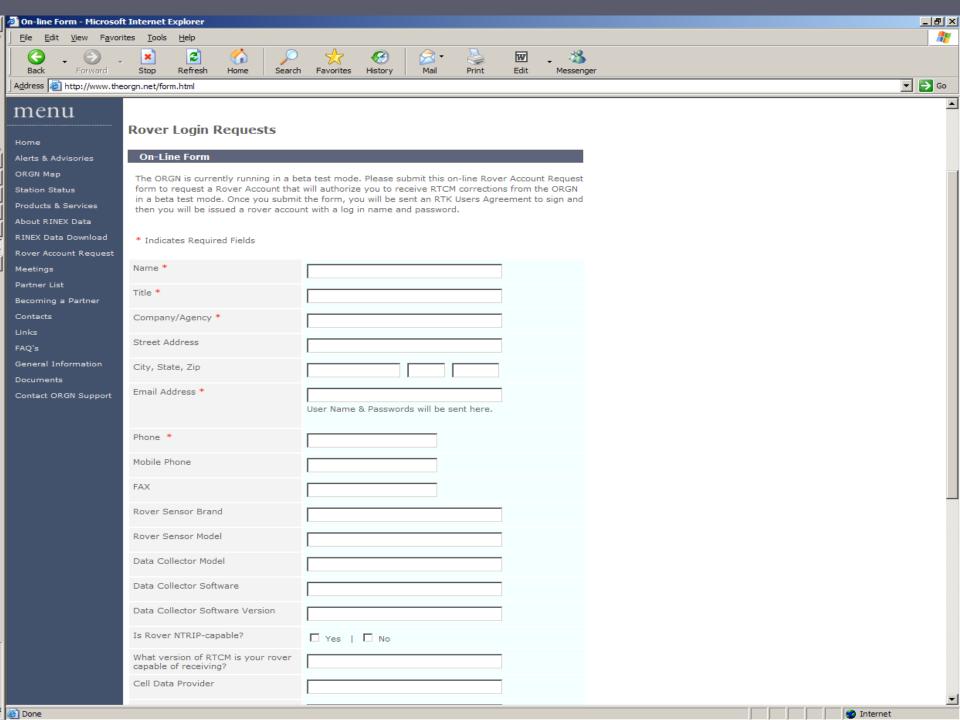
ODOT makes no representations or warranties of any kind regarding this service that may serve as the basis for holding ODOT liable, under any circumstances, for any consequence of the use of this information contained in the RTCM Broadcast message. ODOT makes no representations or warranties regarding the condition or functionality of this broadcast service, its suitability for use, or that this Broadcast Service will be uninterrupted or error-free.

If misleading, inaccurate or otherwise inappropriate information is discovered ODOT asks that it be brought to ODOT's attention so that efforts may be made to fix or remove it.

On-line Rover Account Request Form

Please submit the on-line Rover Account Request form to request a Rover Account that will authorize you to receive RTCM corrections from the ORGN. Once you submit the form, you will be sent an RTK Users Agreement to sign so you can be issued a rover account with a log in name and password.

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Rover Login Requests

On-Line Form

The ORGN is currently running in a beta test mode. Please submit this on-line Rover Account Request form to request a Rover Account that will authorize you to receive RTCM corrections from the ORGN in a beta test mode. Once you submit the form, you will be sent an RTK Users Agreement to sign and then you will be issued a rover account with a log in name and password.

* Indicates Required Fields

Name *	
Title *	
Company/Agency *	
Street Address	
City, State, Zip	
Email Address *	
	User Name & Passwords will be sent here.
Phone *	
Mobile Phone	
FAX	
Rover Sensor Brand	
Rover Sensor Model	
Data Collector Model	
Data Collector Software	
Data Collector Software Version	
Is Rover NTRIP-capable?	☐ Yes	☐ No
What version of RTCM is your rover capable of receiving?	
Cell Data Provider	

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ORGN real-time correctors: support all makes of GPS rovers

Products & Services

Real-time GPS Correctors

Oregon Real-time GPS Network (ORGN) partners and subscribers with valid ORGN Rover Accounts have access to Real Time Kinematic (RTK) correctors computed by Leica Spider software. These correctors are served over the internet and accessed by the user via a cell modem connected to a GPS rover in the field.

ORGN Spider provides both Network and Single Reference Station survey accuracy (dual-frequency) correctors. In addition, single frequency Differential GPS correctors are provided to users of resource/mapping accuracy GPS receivers

Network RTK Corrections:

A network-based RTK corrector is based on using several reference stations at once. A network-based corrector resolves distance dependent errors including ionospheric, tropospheric, and emphemeris errors better than a corrector based upon a single reference station, thereby allowing the rover user to travel farther from the reference stations than would be possible when using a single reference station.

A user must be within the confines of the network for a network-based corrector to be effective.

ORGN provides a network corrector called MAX, in RTCM version 3.0 format, to rovers that are RTCM 3.0-capable. The MAX network correctors take full advantage of the additional network messages available in RTCM 3.0.

For older rovers that are not version RTCM 3.0-capable, a network corrector called i-MAX is provided using RTCM 2.3 format.

For a rover to use either the MAX or i-MAX network corrector, it must be configured by the user to send the rover position back to the ORGN processing center using the NMEA GGA format. In other words, the rover must be set to "send GGA".

Single Reference Station RTK Corrections:

If the user is working outside the confines of the RTK network, they will not be able to use a network-based correction effectively; however, rover users will still be able to receive a corrector based upon a single reference station (same distance dependent errors apply as when using a single base RTK from a temporary base station). The user of a single base station solution will not be able to work as far from the reference station as when using a network-based MAX or i-MAX solution; however, the user will still realize considerable cost savings by not having to buy a base station receiver and set it up and monitor it everyday of a project. In addition, common error sources associated with the use of a portable base station, including incorrect input of base coordinates, base antenna not plumbed correctly over station mark, and incorrect height of base antenna, are avoided by the use of a permanent ORGN reference station.

ORGN provides "nearest site" RTK correctors in RTCM 2.3 format.

For a rover to use the "nearest site" RTK correctors, it must be configured by the user to send the rover position back to the ORGN processing center using the NMEA GGA format. In other words, the rover must be set to "send GGA".

Network correctors:
1. MAX (RTCM 3.O)
   (**M**aster-**A**u**x**ilary)
2. i-MAX (RTCM 2.3)

Single base correctors:
1. Nearest_site (RTCM 2.3)

ORGN RINEX data: provided at no direct cost to user

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About Rinex Data

General Information

Data Storage: One hour RINEX files collected at a 5 second epoch rate are available on-line for one month, after which they will be archived off-line. Archived RINEX files older than one month may be obtained by contacting ORGN Support.

If an ORGN partner is already providing RINEX files on-line for their site; i.e., the partner site is a National Geodetic Survey Coop CORS site, we will not duplicate those RINEX files on the ORGN website; however, we will provide a link to the partner's RINEX data by clicking on the station on our Station Status page or by clicking on a station on one of the clickable ORGN maps.

RINEX data will be made available at no charge from ORGN.

The nominal epoch rate for ORGN RINEX files if 5 seconds; however, users may request RINEX files with a faster epoch rate on a project-by-project basis, for example, an aerial photography project using airborne GPS control. Contact ORGN Support in advance of your project if you have such a need.

File Naming: The zipped RINEX files posted on the ORGN website contain both an observation RINEX file and a navigation RINEX file.

The file naming convention for the zipped file is: sssssdddh.rnx.zip, where "ssss" is used to identify the site name, "ddd" is the Julian day of the year, "h" is the hour identifier in UTC time (see chart below), "rnx" shows the type of files in the zipped file are RINEX, and "zip" is the type of compression used.

Do not be confused by the times listed on the left of the RINEX data page. They are the times that each file was posted onto the FTP server. The 8th character in the file name indicates the hour (UTC) that each hourly file was started, per the following chart:

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23

For example, pdxa041p.rnx.zip is a zipped one hour RINEX file from station PDXA which contains data starting at 15:00 UTC on Julian Day 041 (February 10).

Each zipped RINEX file contains both an observation file and a navigation file from the site and a similar naming convention is used for both unzipped files: sssssdddh.yyt where "ssss" is used to identify the site name, "ddd" is the Julian day of the year, "h" is the hour identifier in UTC (see chart above), "yy" is the year, "t" is the file type (o= observation, n=navigation). For example, pdxa041p.07o is the observation file and pdxa041p.07n is the navigation file zipped into the above zipped RINEX file pdxa041p.rnx.zip.
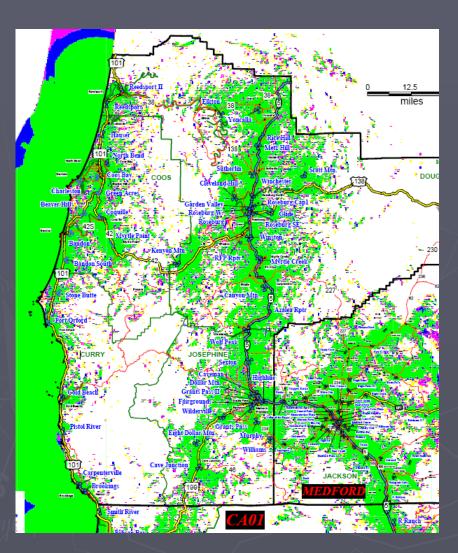
Resources

Station Status - Shows a full list of station related information, with links to individual station pages and to the RINEX data of ORGN partners.

RINEX Data Index - A direct link to the zipped downloadable ORGN RINEX files organized in folders according to the following hierarchy: site/year/month/day of month.

Corrector Delivery Methods

► Real-time Correctors

  ▪ Radio

  ▪ Internet

    ► Cell Modem

    ► WIFI (?)

► Post processing Correctors

  ▪ RINEX Data for Post Processing

    ► Available for ORGN website: www.theorgn.net

Cell phone signal types

- ► GSM
  - Cingular
  - Unicel
  - T-Mobile
- ► CDMA
  - Verizon
  - US Cellular
- ► Either type will work with ORGN
- ► Most important: data cellular coverage where you will be working.

Transformation/calibration sets

► ORGN will provide consistent NAD 83 (CORS 96)(Epoch 2002) coordinates.

► You will not necessarily fit the HARN in Oregon or your existing transformation/calibration sets.

► You must do a new transformation/calibration set on your project control while using ORGN.

http://www.donnellandallred.com/

Contact - ODOT Geometronics Unit

► ORGN Business Manager:
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