Oregon Department of Transportation

Oregon Geospatial Summit 2017

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Conceptual RTK GPS Network

ORGN Overview

A Cooperative Network getting data from many sources

- 100 stations total
- 38 station are ODOT Owned and Operated
- 62 Stations from partners
  - Plate Boundary Observatory (PBO)
  - Washington State Reference Network (WSRN)
  - Counties
  - Cities
  - Private Business

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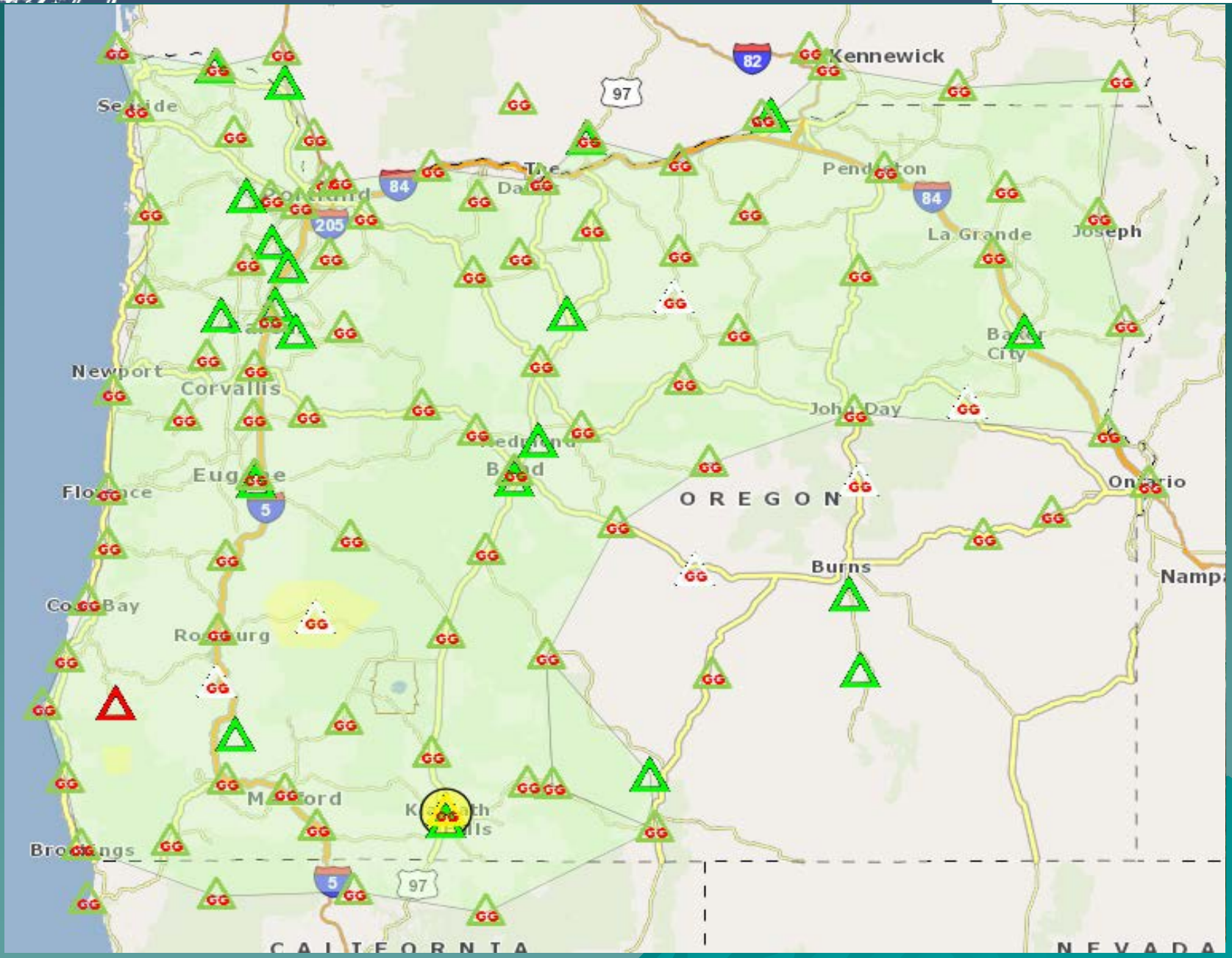
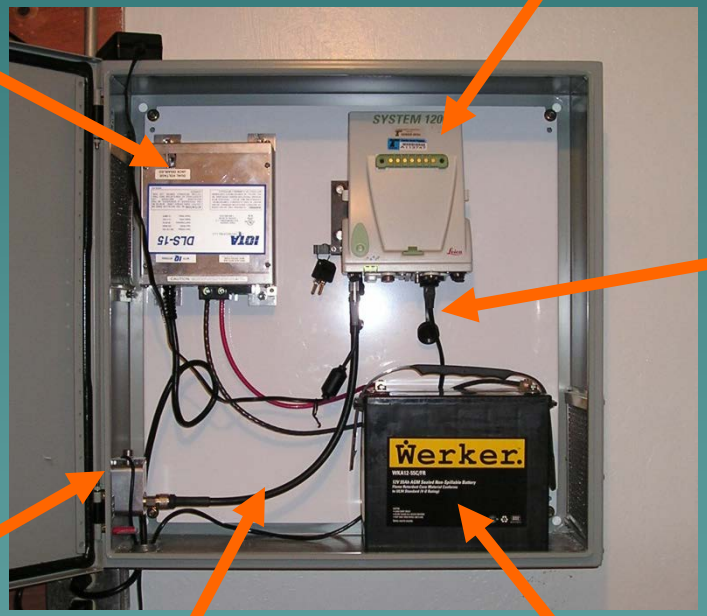


Site Criteria Standards

- +/- 70 Km Station Spacing
- Satellite visibility: clear view of sky
- No electromagnetic interference
- Pre-installation data quality sets: 3 days of GPS data
- Continuous power w/ backup
- Internet connectivity
- Vandal resistant locations
- Year round ease of access

Typical ORGN GPS Sensor Cabinet



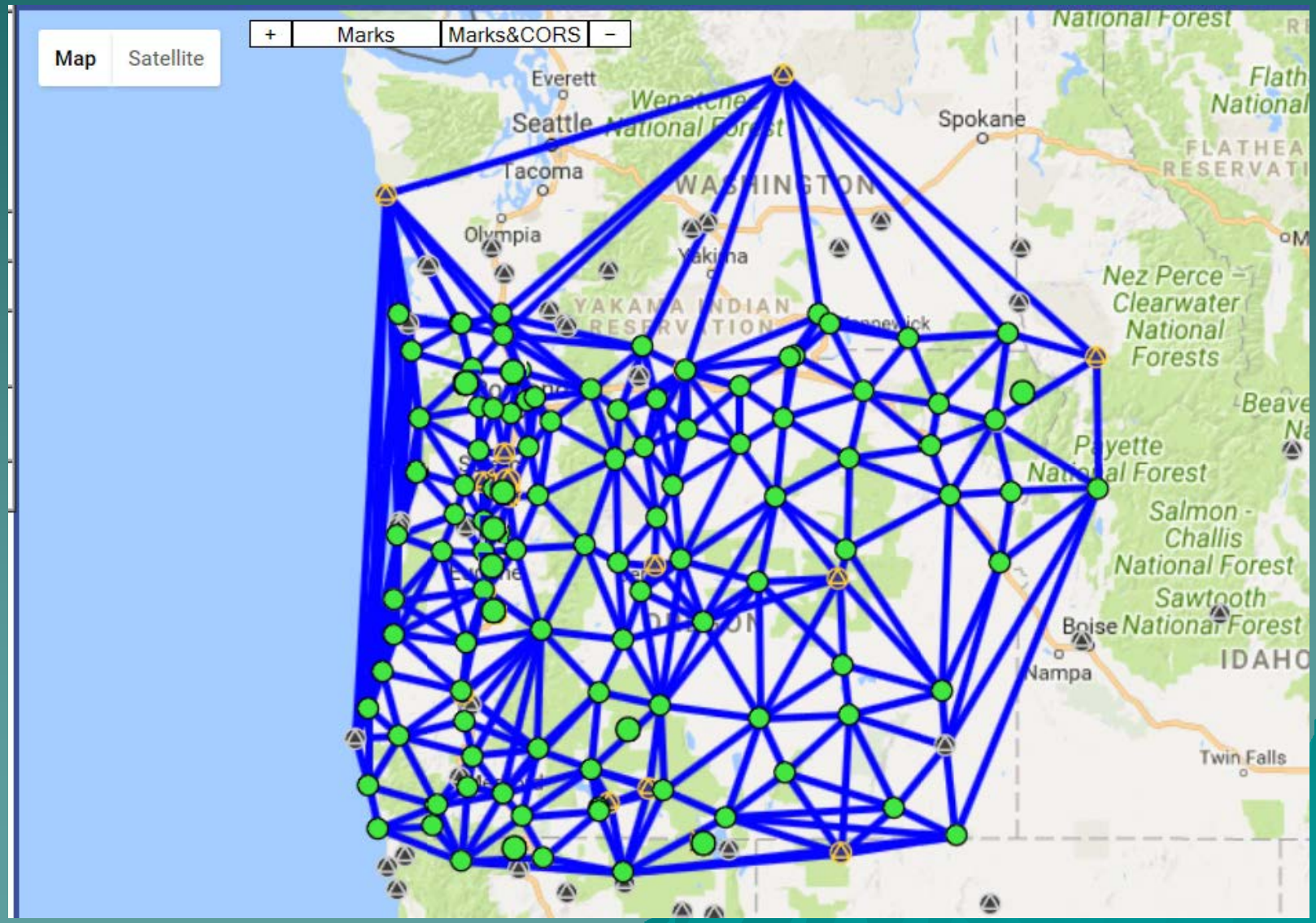
ORGN Position Accuracy

Installation

- Pre-testing Data Quality at Sites
- Extreme Care in Installation
- Sturdy Antenna Mounts

- Carefully Calculated Positions
- Constant Monitoring of Antenna Positions
- Precise Ephemeris used for Correctors

NGS – Opus Projects



Benefits of a Reference Station Network

- Eliminate the need for local base stations
- Only A GNSS rover receivers are needed (no need to purchase a base)
- No surveyor required to “watch” the base station
- Consistent known datum and coordinate system.

Non-Survey Uses

- Machine Control for Construction
- Asset Management
- GIS and Natural Resource Mapping
- Critical Structure Monitoring
- Precision Agriculture
- Intelligent Transportation
- … and More

Data from the ORGN

- Real-time Correctors
- RINEX
  - Links to partners RINEX data
- Station Coordinates: NAD83 (2011) Epoch 2010.00

To Get Real-Time data

An ORGN Rover Account

- Apply for a rover account on-line @ **http://www.theorgn.net**
  - One account per device
- Receive a username and Password and support documents
- **No Charge** at this time
- Internet connection
- NTRIP capable receiver

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The ORGN is Fully Functional

About

- About Us
- Contact Us
- Products and Services

Status

- Alerts and Advisories
- Completed Alerts
- Status Map

Stations

- Oregon Stations - Web Pages
- All States - Stations List
- Online Toolkit

Data

- About RINEX Data
- RINEX Data Files
- Account Requests

Coordinates & links to Station pages Partners RINEX data and Site Logs

August 10, 2017						
Oregon Real-Time GPS Network: NAD 83 (2011) epoch 2010.00 Coordinates						
Station ID	Ref ID	Location	Latitude	Longitude	Ellipsoid Height (meters) @ ARP	Site Logs
ANAT	201	Anatone, WA	46 07 58.29503	-117 08 07.48104	1087.765	ANAT
ARLN	202	Arlington	45 42 29.52532	-120 10 59.71154	120.812	ARLN
ASHL	203	Ashland	42 10 50.47299	-122 40 12.55241	609.147	ASHL
BEND	205	Bend, City of	44 03 25.75727	-121 18 54.61222	1096.257	BEND
BLY1	204	Bly	42 24 24.62755	-121 02 56.57650	1313.889	BLY1
BNDM	278	Bend (ODOT Maintenance)	44 05 21.80729	-121 18 27.07883	1070.737	BNDM
CABL	206	Cape Blanco	42 50 09.94322	-124 33 47.98644	38.291	CABL
CATH	207	Cathlamet, WA	46 11 50.27547	-123 22 02.11302	56.670	CATH
CHEM	208	Chemult	43 13 27.68494	-121 47 08.94043	1440.413	CHEM
COBO	209	Beaverton, City of	45 29 08.88914	-122 47 50.56291	47.25	COBO
COND	210	Condon	45 14 16.44868	-120 10 52.90279	865.844	COND
CROK	211	Castle Rock, WA	46 16 28.54446	-122 54 45.09357	1.470	CROK
CTPT	212	Central Point	42 22 36.08473	-122 53 38.19500	370.975	CTPT
DCSO	213	Roseburg (Douglas County)	43 12 39.61798	-123 20 29.39045	137.174	DCSO
ELG2	341	Elgin	45 33 53.49145	-117 55 42.27526	816.489	ELG2
ENTR	214	Enterprise	45 25 52.50655	-117 17 17.03741	1127.055	ENTR
FWBD	215	Farewell Bend POE	44 17 30.78145	-117 13 17.85372	631.934	FWBD
GOBS	200	Goldendale, WA	45 50 19.73131	-120 48 52.77605	621.955	GOBS
GOLY	218	Goldendale, WA	45 49 43.29747	-120 48 08.78726	500.605	GOLY
GRAS	219	Grass Valley (BLM)	45 21 51.87542	-120 47 14.62113	677.871	GRAS
GTPS	220	Grants Pass	42 26 04.16523	-123 17 50.51054	279.017	GTPS
HALF	221	Halfway	44 52 20.58922	-117 05 59.32893	783.937	HALF
HRPR	242	Harper School	43 51 57.12128	-117 36 28.54808	761.430	HRPR
JUNT	226	Juntura	43 44 37.73932	-118 04 42.47825	891.128	JUNT
JIME	223	Hillsboro (Washington County)	45 31 23.21435	-122 59 25.84156	53.404	JIME
KENI	224	Kennewick, WA	46 11 52.36515	-119 09 31.01667	146.534	KENI
KFRC	225	Klamath Falls/ Rhine Cross	42 13 27.00263	-121 47 01.91272	1240.594	KFRC
LAPN		New antenna April 26,2016	Leica AR20 LEIM			LAPN
LAPN	230	La Pine (Deschutes County)	43 39 52.55204	-121 30 21.55207	1279.374	LAPN

Go To Bend

Station - BNDM

Looking North

Looking South

Looking West

Looking East

Station Information

Site ID:	BNDM
Location:	Bend
PID:	205

Position

Antenna Ref Point:	NAD83 (2011) epoch 2010.00
Latitude:	44° 05' 21.80729"N
Longitude:	121° 18' 27.07883"W
Ellip. Hgt.:	1070.737m

Tracking GPS and GLONASS

Location Address:	63055 N Highway 97 Bend OR, 97703
Organization:	Oregon Department of Transportation

Equipment Specifications

Manufacturer:	Leica Geosystems / Septentrio
Receiver Model:	Septentrio PolaRx5
Antenna:	Leica AR20 (LEIAR20 LEIM)
Elevation Mask:	0 Degrees

File Logging

File Type:	RINEX
Logging Interval:	5 Seconds
Operation Time:	24x7 log files
Rollover:	Hourly

Important Links

- Site Log:
- RINEX Data:
- Alerts/Advisories:
- Superseded coordinates NAD83 (CORS96) epoch 2002:

Index of ftp://ftp.odot.state.or.us/ORGN/RINEX/

Up to higher level directory

Name	Size	Last Modified	
1_hr_0.1_sec		9/3/2014	2:00:00 PM
1_hr_1_sec		7/15/2014	10:59:00 AM
12_Hr_1_Sec		2/3/2014	8:36:00 AM
12_hr_half_sec		8/7/2014	5:03:00 PM
24_hr_1_sec		3/11/2014	5:12:00 PM
24_Hr_5Sec		5/5/2014	3:30:00 PM
ARLN		5/6/2014	11:15:00 AM
ASHL		5/6/2014	11:15:00 AM
BLY1		5/6/2014	11:16:00 AM
CHEM		5/6/2014	11:16:00 AM
COBO		5/6/2014	11:16:00 AM
COND		5/6/2014	11:16:00 AM
CTPT		5/6/2014	11:17:00 AM
ELGN		5/6/2014	11:17:00 AM

Datum Realization

CURRENT DATUM REALIZATION

NAD 83 (2011) epoch 2010.00 Coordinate List

SUPERSEDED DATUM REALIZATION

NAD 83 (CORS 96) epoch 2002.00 Coordinate List

The Oregon DOT Geometronics Unit intends to keep the Oregon Real-time GPS Network (ORGN) aligned to the National Geodetic Survey (NGS) National Spatial Reference System (NSRS) to help surveying, mapping, and other professionals determine positional coordinates that are compatible with coordinates derived by others. This use of a common coordinate base allows project coordinates to be exchanged freely and ensures projects match up on the ground, thus saving time, money, and possibly costly mistakes by geospatial professionals.

O.C.R.S. History/Timeline

Mar. 2008 - Presentation to ODOT

July 2008 - Presentation to OGUG

Nov. 2008 - ODOT/OGUG Workshop

Jan. 2009 - Presentation to PLSO

Apr. 2009 - Created Technical Development Team

July 2009 - Developed Test Projections

Jan. 2010 - Developed 20 Projections

Jan. 2010 - Presentation to PLSO

April 2010 - Roll out and OGUG Workshop

June 2011 -SB877 passed revising ORS 93 & 209

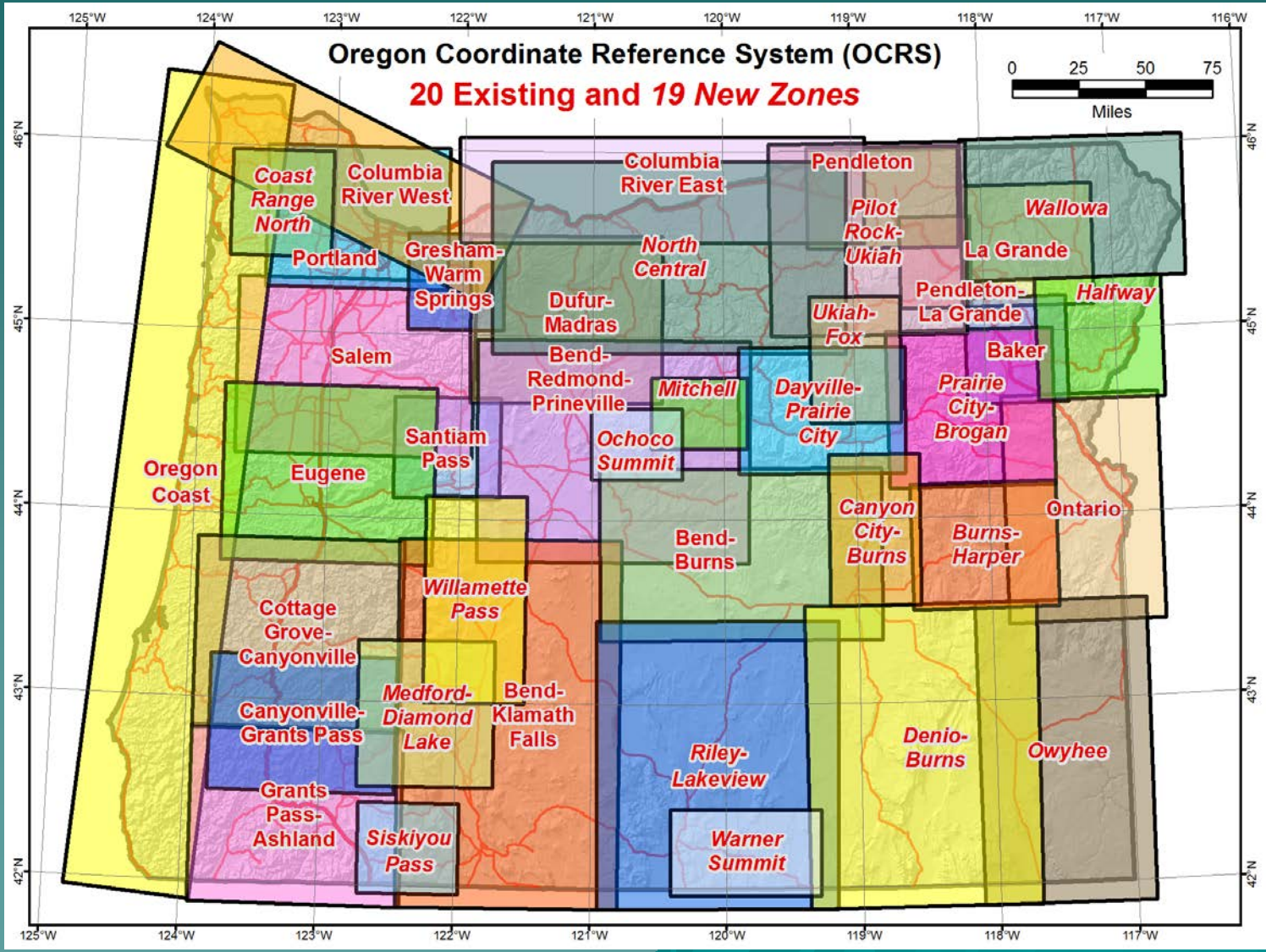
Dec 2011 -OTC approves OCRS OARs; OAR filed with Secretary of State

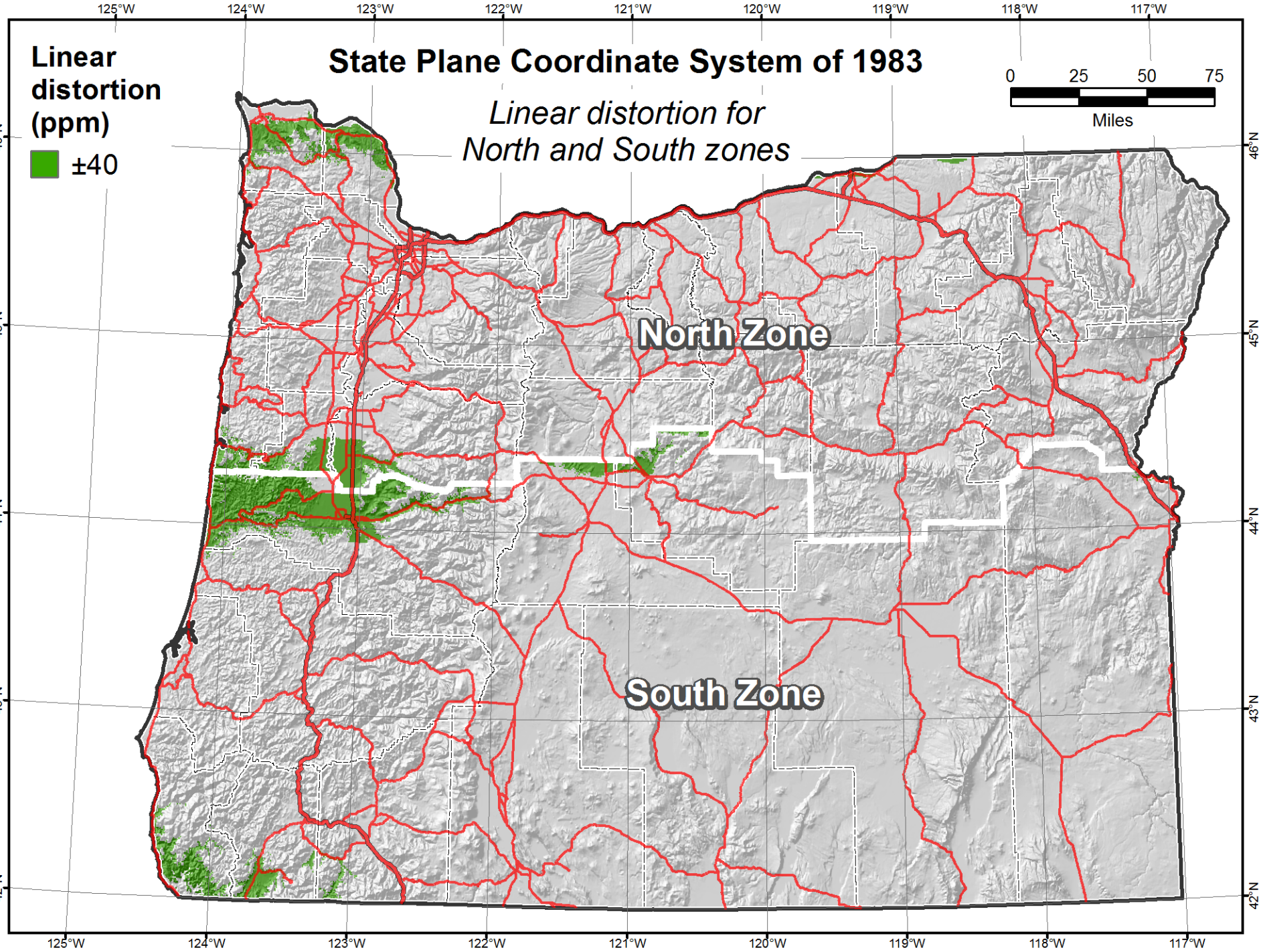
Jan. 2012 - New OAR becomes effective

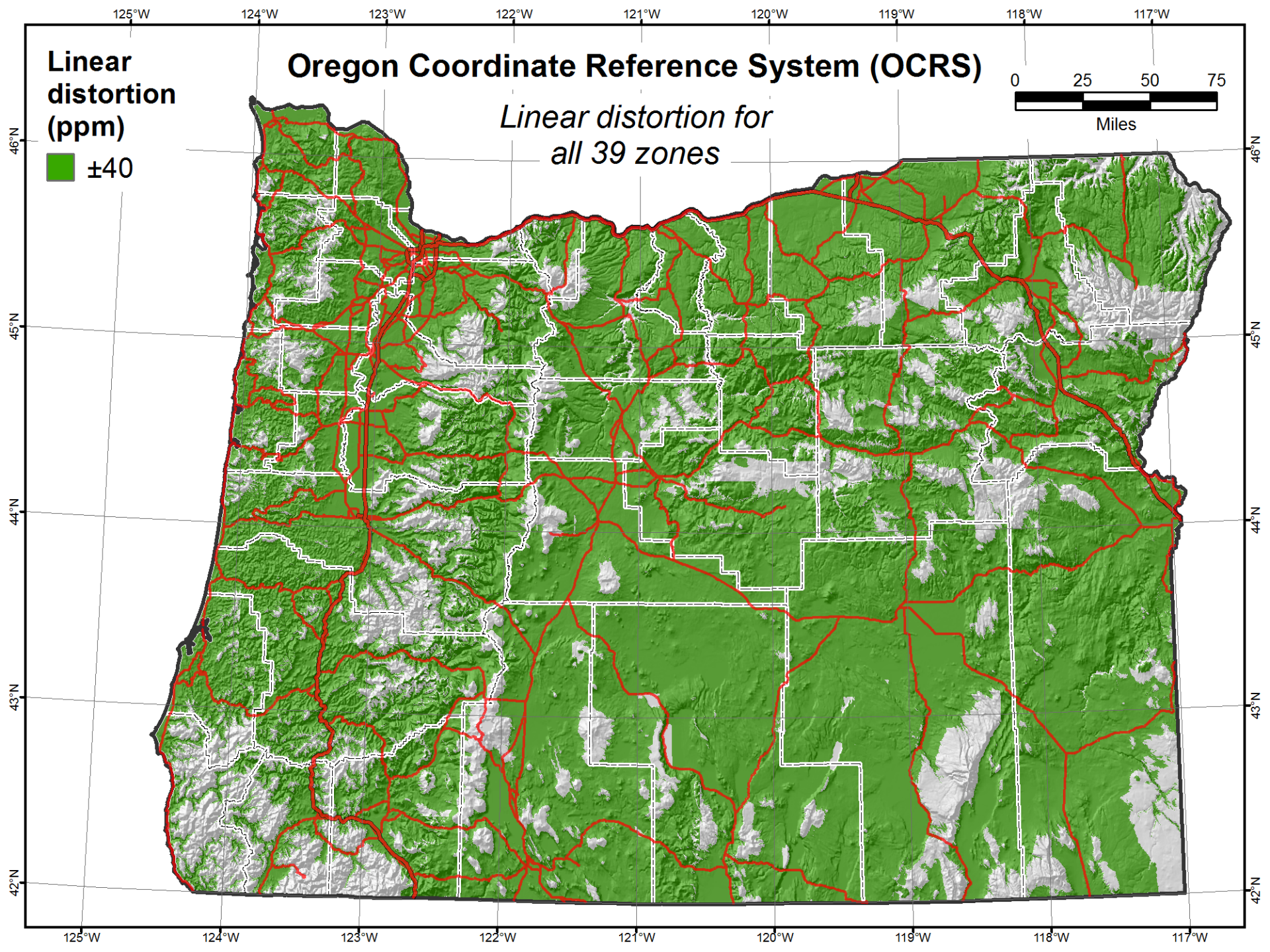
2015-2016 -19 additional OCRS zones designed to extend OCRS coverage

Dec 2016 -OTC approves the 19 additional zones.

http://www.oregon.gov/ODOT/ETA/Pages/OCRS.aspx




State Plane Coordinate System of 1983
Linear distortion for North and South zones
Linear distortion (ppm)
±40
0 25 50 75
Miles
North Zone
South Zone
125°W
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
46°N
45°N
44°N
43°N
42°N


Oregon Coordinate Reference System (OCRS)
Linear distortion for all 39 zones
Linear distortion (ppm)
±40
0 25 50 75
Miles
125°W
124°W
123°W
122°W
121°W
120°W
119°W
118°W
117°W
46°N
45°N
44°N
43°N
42°N

Engineering Automation

Oregon Coordinate Reference System

TOOLS AND RESOURCES

Manuals

SURVEYING

Geodetic Control and Benchmark Retrieval

Right of Way Engineering

Mobile LiDAR

Oregon Coordinate Reference System

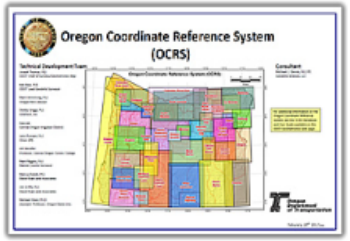
ENGINEERING TECHNOLOGY

3D Design

e-Construction

Automated Machine Guidance

The Oregon Coordinate Reference System is based on a group of low distortion map projection coordinate systems.



Low distortion projections are based on true conformal map projections designed to cover significant portions of urban and rural areas of the state.

Low Distortion

The term low distortion refers to both the horizontal distortion from presenting a curved surface on a plane and the vertical distortion because these projections are also scaled to a regional height representative of the area to be covered.

The advantages of a low distortion projection are:

- Grid coordinate zone distances closely match the same distance measured on the ground.
- Limited distortion and reduced convergence angle.
- Easy to transform between other coordinate zone systems.
- Maintains a relationship to the National Spatial Reference System.
- Can cover entire cities and counties making them GIS-friendly.

For more information please click on the topic bars below.

Contact the Geometronics Unit

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Resources and Related Content

The ORGN
Geodetic Control and Benchmarks

OREGON DEPARTMENT OF TRANSPORTATION

Highway Division
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NGS Northwest Region
Geodetic Advisor

Ken Bays, PLS
Lead Geodetic Surveyor
Geometronics Unit

Michael L. Dennis, RLS, PE
Geodetic Analysis, LLC

2017 Edition

Oregon Coordinate Reference System

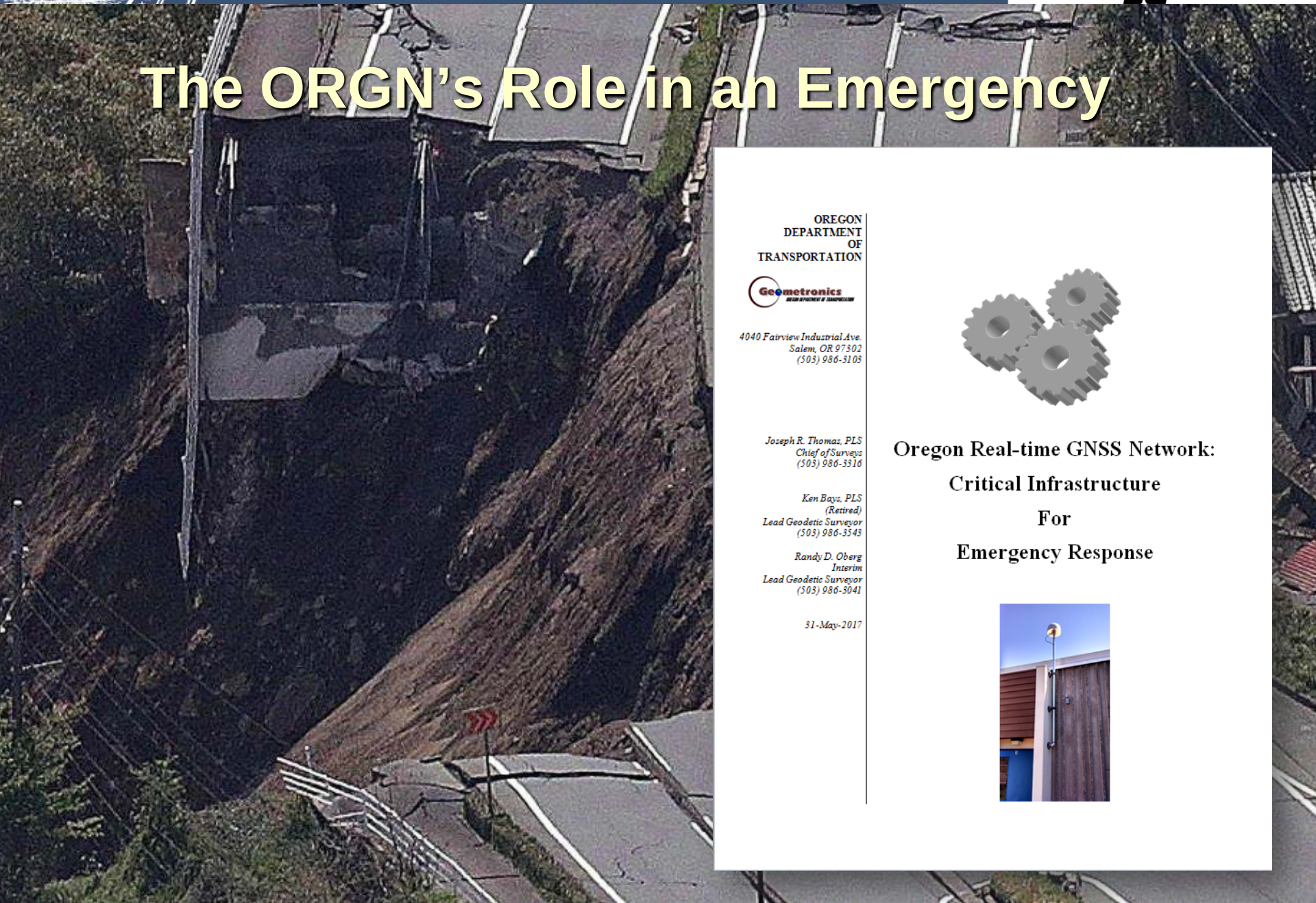
Handbook and Map Set

Version 3.01 2-28-2017

Lead Author – Mark L. Armstrong

CONTAINS 39 OCRS ZONE MAPS

The ORGN's Role in an Emergency



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31-May-2017

Oregon Real-time GNSS Network:

Critical Infrastructure

For

Emergency Response

The Virtual Highway Corridor

Questions?

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