

# PUBLIC LAND SURVEY SYSTEM IN GOOGLE EARTH

By Thomas G. Davis<sup>1</sup>, PhD, PE, PLS

## INTRODUCTION

PLSGE (<http://www.metzgerwillard.us/plss/>) is a web-based service for visualizing the Public Land Survey System (PLSS) in Google Earth. The principal component of PLSGE is a Google Earth implementation of the Bureau of Land Management (BLM) GeoCommunicator map service (BLM 2011c). It retrieves multiresolution images of the BLM PLSS.

Coverage includes Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Mexico, North Dakota, Ohio, Oklahoma, Oregon, South Dakota, Utah, Washington, Wisconsin, and Wyoming.

PLSGE also includes an implementation of the GeoCommunicator Identify service and a facility to draw approximate PLSS boundaries with links to BLM land records (BLM 2011b).

## OVERLAYS

### Refresh Mode

The *Refresh Mode* buttons provide a mechanism to control the *Overlays* network links. When *Refresh Mode* is *Manual*, the contents of the network links are effectively frozen, allowing the user to pan and zoom without prompting a refresh. This is particularly useful for inspecting overlays or gaining an overview of network link contents. To display an overlay:

1. Position the area of interest (AOI) in the viewer.
2. Check the radio button beside the *Townships*, *Meridians*, or *Special Surveys* network link. Use the *Townships* overlay to find townships and sections. Use the *Special Surveys* overlay to find other divisions.
3. On subsequent uses, reposition the AOI and ensure that the network link is checked and selected. When *Refresh Mode* is *Automatic*, overlays are refreshed two seconds after camera movement stops. When *Refresh Mode* is *Manual*, choose *Refresh* from the *Edit* menu, or right-click and select *Refresh* in the context menu.

The *Manual* and *Automatic* network links may be used to stop and start refreshes for the *Overlays* network links. The default refresh mode is *Automatic*. To stop refreshes, check *Manual*; to restart refreshes, check *Automatic*.

---

<sup>1</sup> Metzger + Willard, Inc., 8600 Hidden River Parkway, Suite 550, Tampa, FL 33637.  
E-mail: [tdavis@metzgerwillard.com](mailto:tdavis@metzgerwillard.com)

## Townships

The *Townships* overlay (Fig. 1) provides the following layers from the PLSS web map service (WMS):

Minor Subdivision	Sections - Alternate Source
Special Surveys	Sections
Quarter-Quarters - Alternate Source	Townships - Alternate Source
Quarter-Quarters	Townships

This overlay displays multiresolution images of the PLSS from the BLM, U.S. Forest Service, and other sources. Click on the *Availability* folder name to test the map service.

The map service will not return an image for the *Townships* overlay if the target resolution is greater than 1 millidegree per pixel. Service parameters are adjusted to allow township displays at target resolutions up to 2 millidegrees per pixel with a corresponding decrease in label size. Zoom in to display sections, aliquots, and lots where available.

Protracted townships west of the antimeridian are provided by the Alaska Spatial Data Management System (BLM Alaska 2011).

## Meridians

The *Meridians* overlay provides the following layers from the Land Survey Information System (LSIS) WMS:

meridians	meridian_lines	meridian_line_labels
states	base_lines	base_line_labels
meridian_labels		

This overlay displays low-resolution images of state and meridian boundaries. Because these boundaries were created independently for high-altitude viewing, they will not coincide, nor will they encompass all PLSS divisions.

## Special Surveys

The *Special Surveys* overlay provides the following layers from the LSIS WMS:

all_ladesc	detail_first_labels
twp_labels	detail_twp
detail_alt_first	detail_ladesc
detail_alt_first_labels	detail_ladesc_labels
detail_alt_twp	detail_ladesc_special
detail_alt_ladesc	detail_ladesc_special_labels
detail_alt_ladesc_labels	detail_ladesc_minor_sub
detail_alt_ladesc_labels_survey_type	detail_ladesc_minor_sub_labels
detail_first	

This overlay displays detailed, multiresolution images of the PLSS with all available divisions and labels.

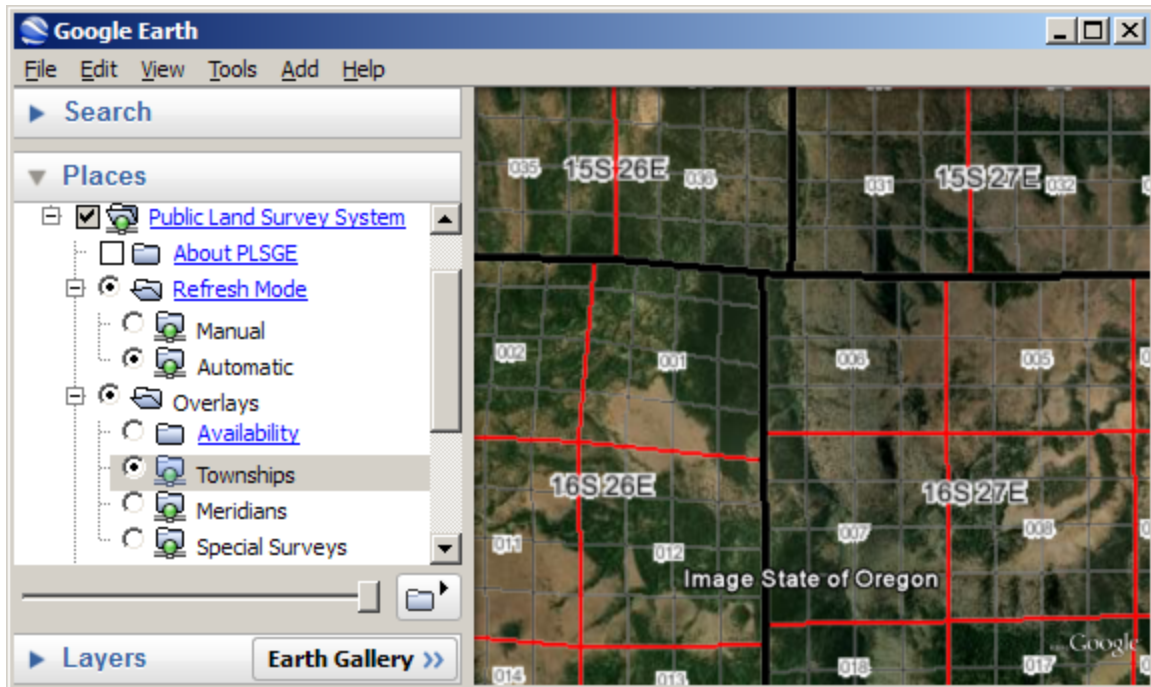


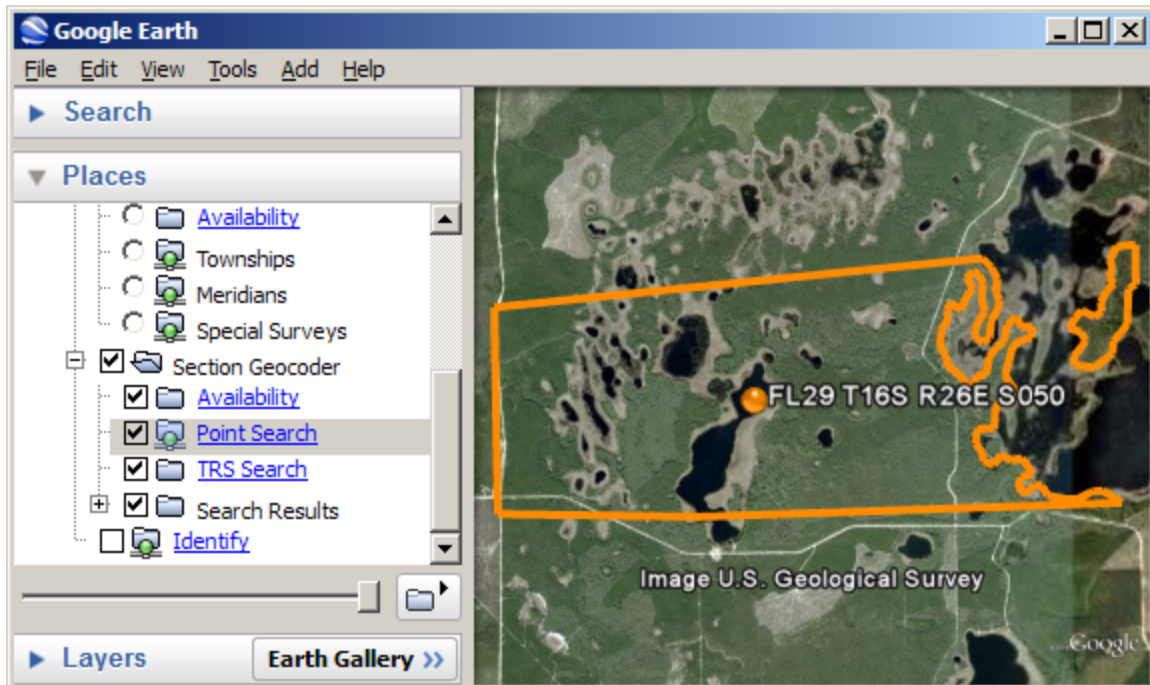
Figure 1. Townships Overlay

## SECTION GEOCODER

### Point Search

The *Point Search* network link (Fig. 2) is a Google Earth implementation of the GeoCommunicator Derive LD and Find LD data services (BLM 2011c). This feature should be used in conjunction with the *Townships* overlay to ensure that the point of interest (POI) is contained within a section boundary. Click on the *Availability* folder name to test the Find LD data service.

1. Position the POI in the center of the view. One way to do this is to double-click an unmarked location. To precisely position the POI in the center of the view, add a placemark at the desired location; then edit the properties of that placemark and reset the view.
2. Check the box beside the *Point Search* network link. The section boundary that contains the POI will be added to the *Search Results* folder. A successful point search will also update initial values in the *TRS Search* form.
3. On subsequent uses, reposition the POI and ensure that the network link is checked and selected. Then choose *Refresh* from the *Edit* menu, or right-click and select *Refresh* in the context menu.



**Figure 2.** Section Geocoder

### TRS Search

The *TRS Search* application is a Google Earth implementation of the GeoCommunicator Find LD data service. This feature should be used in conjunction with the *Townships* or *Special Surveys* overlay to ensure that the requested township, section, or subsection (Table 1) exists. Use the *Townships* overlay to find townships and sections. Use the *Special Surveys* overlay to find other divisions.

1. Optionally, use the *Point Search* network link to preset initial values to the section level.
2. Click on the *TRS Search* folder name to open a form (Fig. 3) with input fields for state, meridian, township, range, section, and subsection.
  - Mouse-over input fields for brief instructions.
  - An aliquot number is a series of digits that represents a quartered subdivision with 1 = NE, 2 = SE, 3 = SW, and 4 = NW, e.g. 23 = SESW, 411 = NWNENE, etc. Subdivision to the 1/4-1/4-1/4-1/4 (2.5-ac) level is supported where available (Fig. 4).
  - Subsection numbers may include an optional suffix preceded by a dash, e.g. MT20 T4N R7W S031 Mineral Survey 8154-02.
  - See Appendix for search form examples.
3. Press the *Search* button on the input form to add the requested parcel to the *Search Results* folder.

Find LD does not currently support suffixes with letters, e.g. WY06 T55N R100W S032 Lot 64T-B.

All geocoder results include information balloons with links to BLM land records and source data from Derive LD and/or Find LD.

Table 1. Supported Subsections (BLM 2011a)		
Survey Type	Division Name	Example
A	Aliquot	NV21 T20S R60E S009 SWNE
B	Aliquot, Residual	OR33 T35S R7E S036 SWSW-02
G	Land Grant	OR33 T1N R13E S009 G1
H	Homestead Entry	MT20 T26N R34W S020 H211
J	Small Holding Claim	NM23 T3S R1E S030 J2889
L	Lot	OR33 T36S R8E S006 L5
M	Mineral Survey	MT20 T4N R7W S031 M8154-02
N	Townsite	OR33 T1N R13E S009 N14
O	Aliquot, Fractional	AZ14 T9S R20E S002 NWNE
Q	Donation Land Claim	OR33 T1N R13E S004 Q40
T	Tract	MT20 T15N R27W S020 T37
U	Unsurveyed, Protracted	MT20 T15N R27W S020 U47
W	Water	CA21 T29N R3W S014 W
X	Exchange	MT20 T26N R34W S017 X1263D
Z	Unsurveyed, Unprotracted	NM23 T14N R23E S001 Z

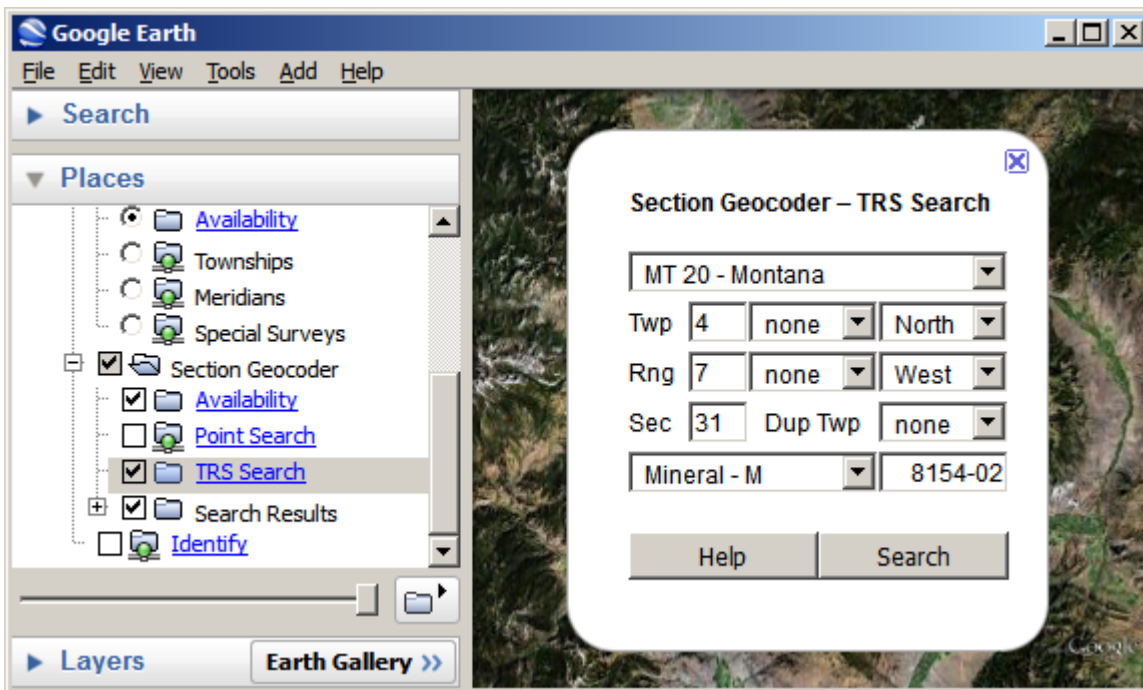


Figure 3. TRS Search Form

Some Find LD representations, e.g. FL29 T25S R16E, are missing one or more vertices resulting in missing and extraneous lines. Survey type E (Metes and Bounds, e.g. OR33 T1N R36E S034 E-01) is not supported by Find LD. Survey types K (Townsite Block, e.g. ID08 T4S R34E S035 K39), P (Parcel, e.g. AZ14 T14N R5E S002 P1), and Y (Townsite Outlot, e.g. CA21 T43N R9W S018 Y14) do not appear to be supported by either Derive LD or Find LD. Fractional townships, e.g. OR33 T35 1/2S R32 3/4E, and duplicate townships, e.g. OR33 T36S R7EA, are fully supported; and east tiers and north ranges are supported for townships in the Symmes Purchase, e.g. OH43 T3E R12N.

To save geocoder results from one Google Earth session to another, right-click on *Search Results* and select *Save to My Places*.

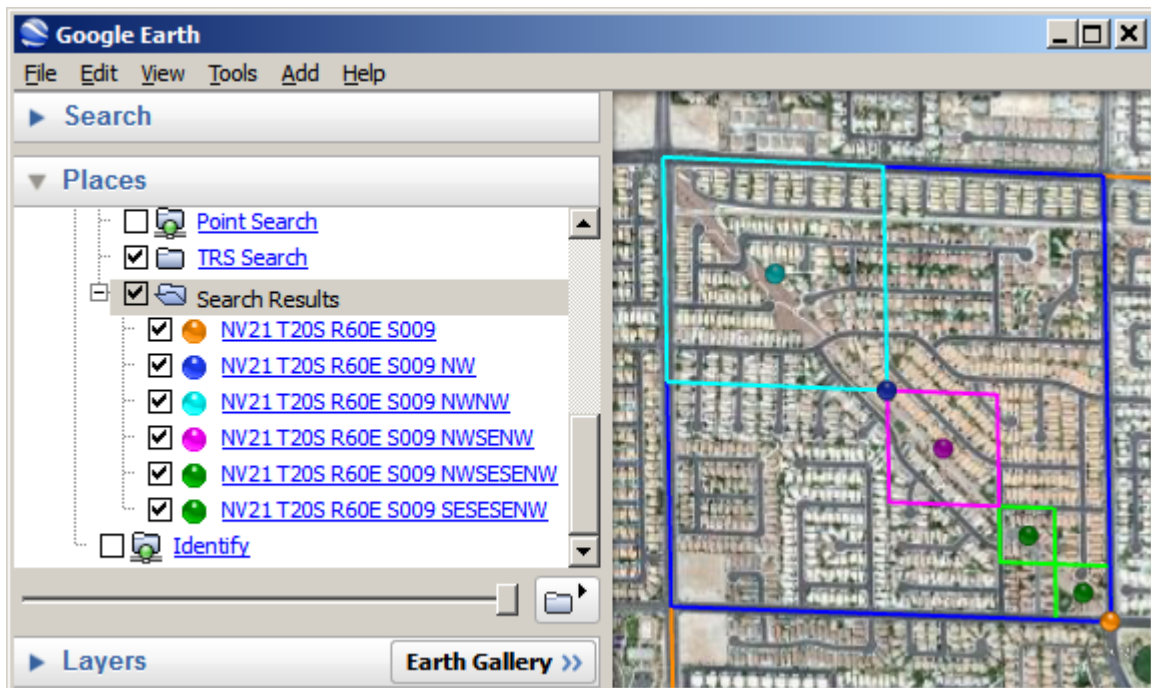


Figure 4. Aliquot Parts

## GEOCOMMUNICATOR IDENTIFY

To review PLSS boundaries identified by the LSIS in the current view:

1. Position the AOI in the viewer.
2. Check the box beside the *Identify* network link.
3. On subsequent uses, reposition the AOI and ensure that the network link is checked and selected. Then choose *Refresh* from the *Edit* menu, or right-click and select *Refresh* in the context menu.

Click on column headings to sort records (Fig. 5). GeoCommunicator map controls and search features do not work in Google Earth.



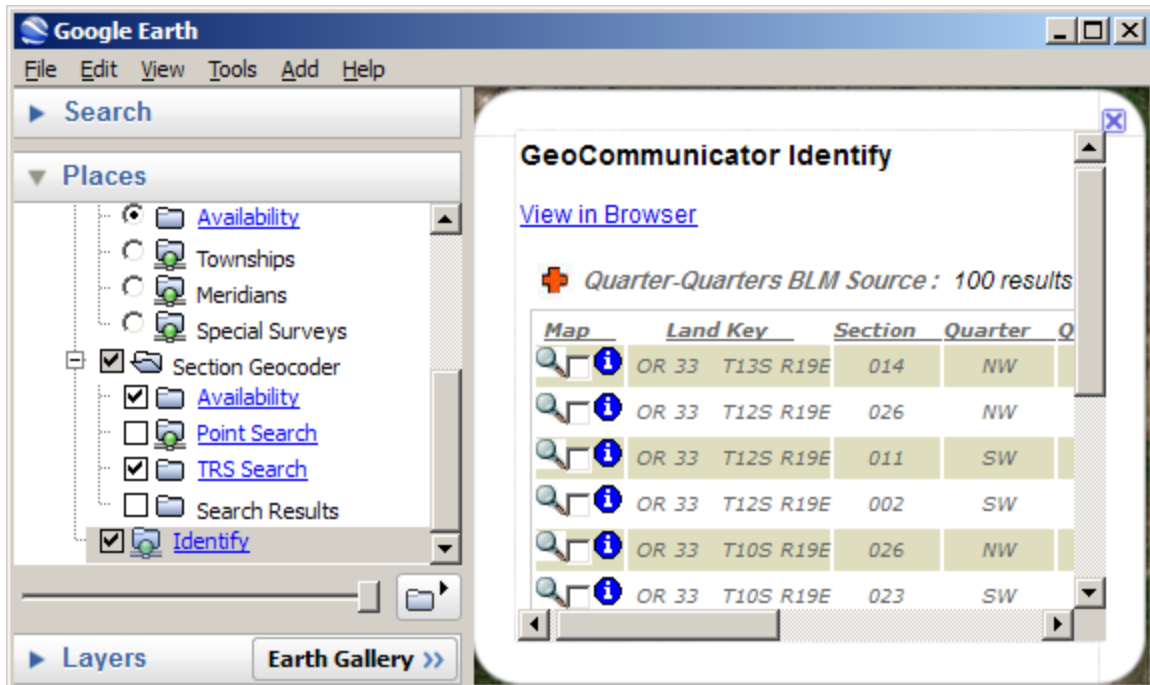


Figure 5. GeoCommunicator Identify

## CONCLUSION

PLSGE provides user-friendly, graphically oriented access to a wealth of publicly available geospatial information maintained by the BLM. Metzger + Willard, Inc. is pleased to make PLSGE freely available to anyone having Google Earth installed on a computer with an Internet connection.

## ACKNOWLEDGMENTS

The author wishes to thank the following BLM employees for their help in implementing and testing PLSGE: Regina LeFort, Land Surveyor (retired); Ginny Pyles, Program Analyst (retired); Kathy Ferguson, User Support Specialist; Marilyn Doren, IT Specialist; and John Liddle, Canyon Software, LLC.

Special thanks are extended to John Reitsma, BLM GIS Coordinator, and Patrick Foppe, BLM IT Specialist.

## REFERENCES

- Bureau of Land Management (2011a). "Definitions for Survey Types."  
(<http://www.blm.gov/lr2000/codes/CodeSurveyTypes.pdf>)
- Bureau of Land Management (2011b). "General Land Office Records."  
(<http://www.glorerecords.blm.gov/>)
- Bureau of Land Management (2011c). "GeoCommunicator Map and Data Services."  
([http://www.blm.gov/nils/GeoComm/home\\_services.html](http://www.blm.gov/nils/GeoComm/home_services.html))
- Bureau of Land Management, Alaska (2011). "Spatial Data Management System."  
(<http://sdms.ak.blm.gov/sdms/index.html>)

**APPENDIX. TRS SEARCH FORM EXAMPLES**

<b>NV21 T20S R60E S009 SWNE</b>			<b>OR33 T35S R7E S036 SWSW-02</b>			<b>OR33 T36S R8E S006 L5</b>					
NV 21 - Mount Diablo			OR 33 - Willamette			OR 33 - Willamette					
Twp	20	none	South	Twp	35	none	South	Twp	36	none	South
Rng	60	none	East	Rng	7	none	East	Rng	8	none	East
Sec	9	Dup Twp	none	Sec	36	Dup Twp	none	Sec	6	Dup Twp	none
Aliquot - A,B,O			31	Aliquot - A,B,O			33-02	Lot - L			5

<b>OR33 T1N R13E S004 Q40</b>			<b>MT20 T26N R34W S017 X1263D</b>			<b>OR33 T1N R13E S009 G1</b>					
OR 33 - Willamette			MT 20 - Montana			OR 33 - Willamette					
Twp	1	none	North	Twp	26	none	North	Twp	1	none	North
Rng	13	none	East	Rng	34	none	West	Rng	13	none	East
Sec	4	Dup Twp	none	Sec	17	Dup Twp	none	Sec	9	Dup Twp	none
Donation - Q			40	Exchange - X			1263D	Grant - G			1

<b>NM23 T3S R1E S030 J2889</b>			<b>MT20 T26N R34W S020 H211</b>			<b>MT20 T4N R7W S031 M8154-02</b>					
NM 23 - New Mexico			MT 20 - Montana			MT 20 - Montana					
Twp	3	none	South	Twp	26	none	North	Twp	4	none	North
Rng	1	none	East	Rng	34	none	West	Rng	7	none	West
Sec	30	Dup Twp	none	Sec	20	Dup Twp	none	Sec	31	Dup Twp	none
Holding - J			2889	Homestead - H			211	Mineral - M			8154-02

<b>OR33 T1N R13E S009 N14</b>			<b>MT20 T15N R27W S020 T37</b>			<b>NM23 T14N R23E S001 Z</b>					
OR 33 - Willamette			MT 20 - Montana			NM 23 - New Mexico					
Twp	1	none	North	Twp	15	none	North	Twp	14	none	North
Rng	13	none	East	Rng	27	none	West	Rng	23	none	East
Sec	9	Dup Twp	none	Sec	20	Dup Twp	none	Sec	1	Dup Twp	none
Townsite - N			14	Tract - T			37	Unprotracted - Z			

<b>OR33 T35 1/2S R32 3/4E</b>			<b>OR33 T36S R7EA</b>			<b>CA21 T29N R3W S014 W</b>					
OR 33 - Willamette			OR 33 - Willamette			CA 21 - Mount Diablo					
Twp	35	1/2	South	Twp	36	none	South	Twp	29	none	North
Rng	32	3/4	East	Rng	7	none	East	Rng	3	none	West
Sec	0	Dup Twp	none	Sec	0	Dup Twp	A	Sec	14	Dup Twp	none
All				All				Water - W			