

Oregon Solar Highways

Oregon Innovative Partnerships Program

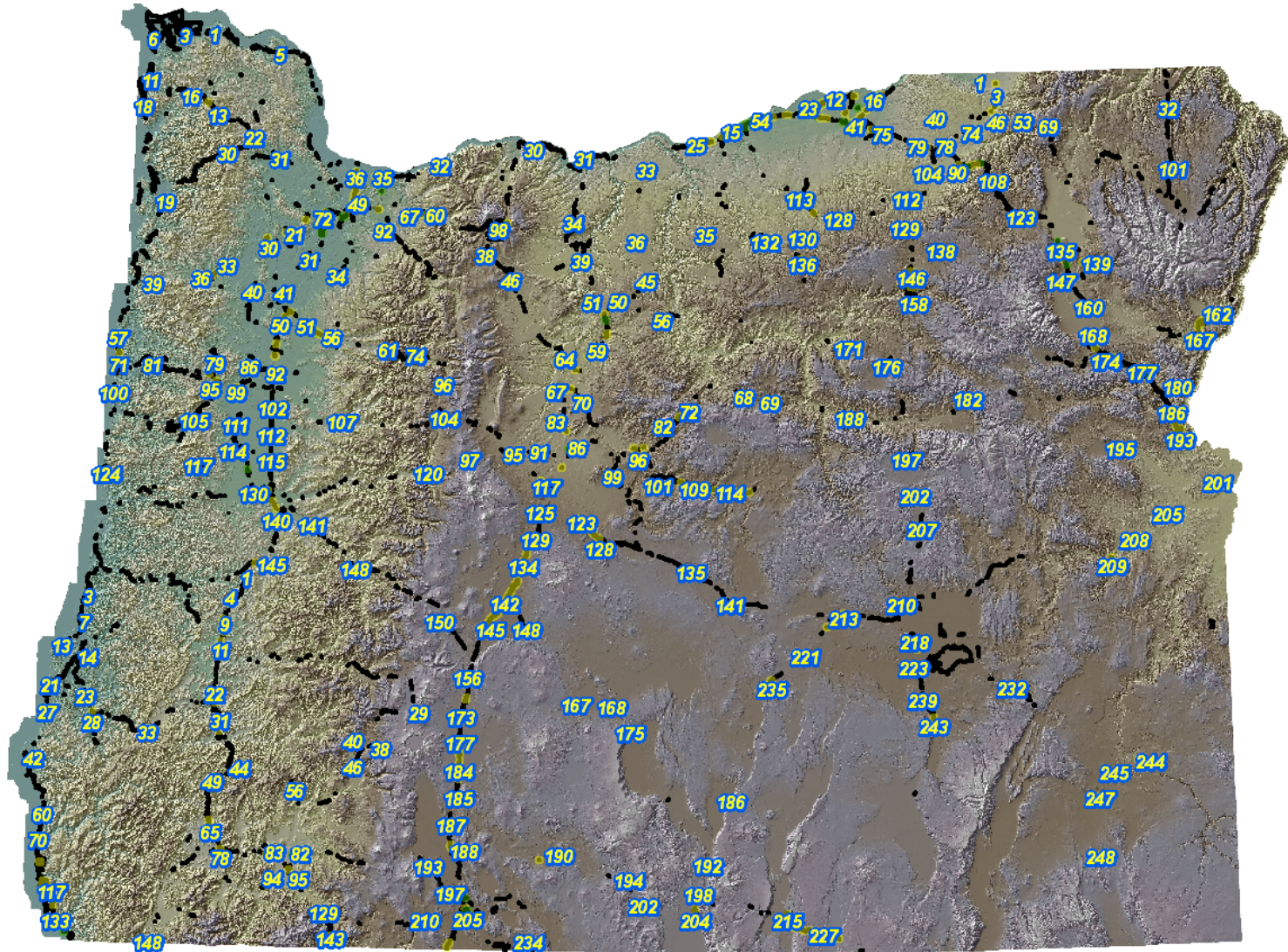


Solar Highway Program Origin



Solar Site Project

Find potential solar sites
Estimate energy potential



The process

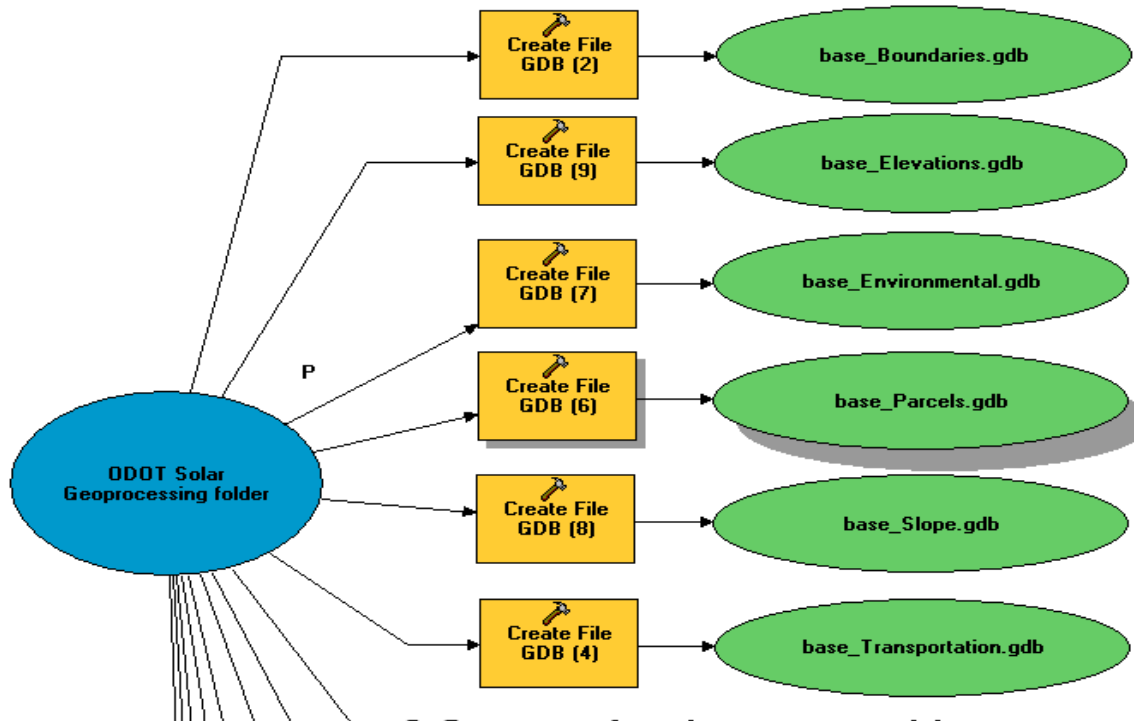
ODOT defined solar site requirements

Alsea Geospatial built the tools to find sites

This model creates the geodatabases and folders where output will be stored.

1 Storage for data imported from ODOT and other sources.

Minor processing may be done on it during import step, for example reprojection.

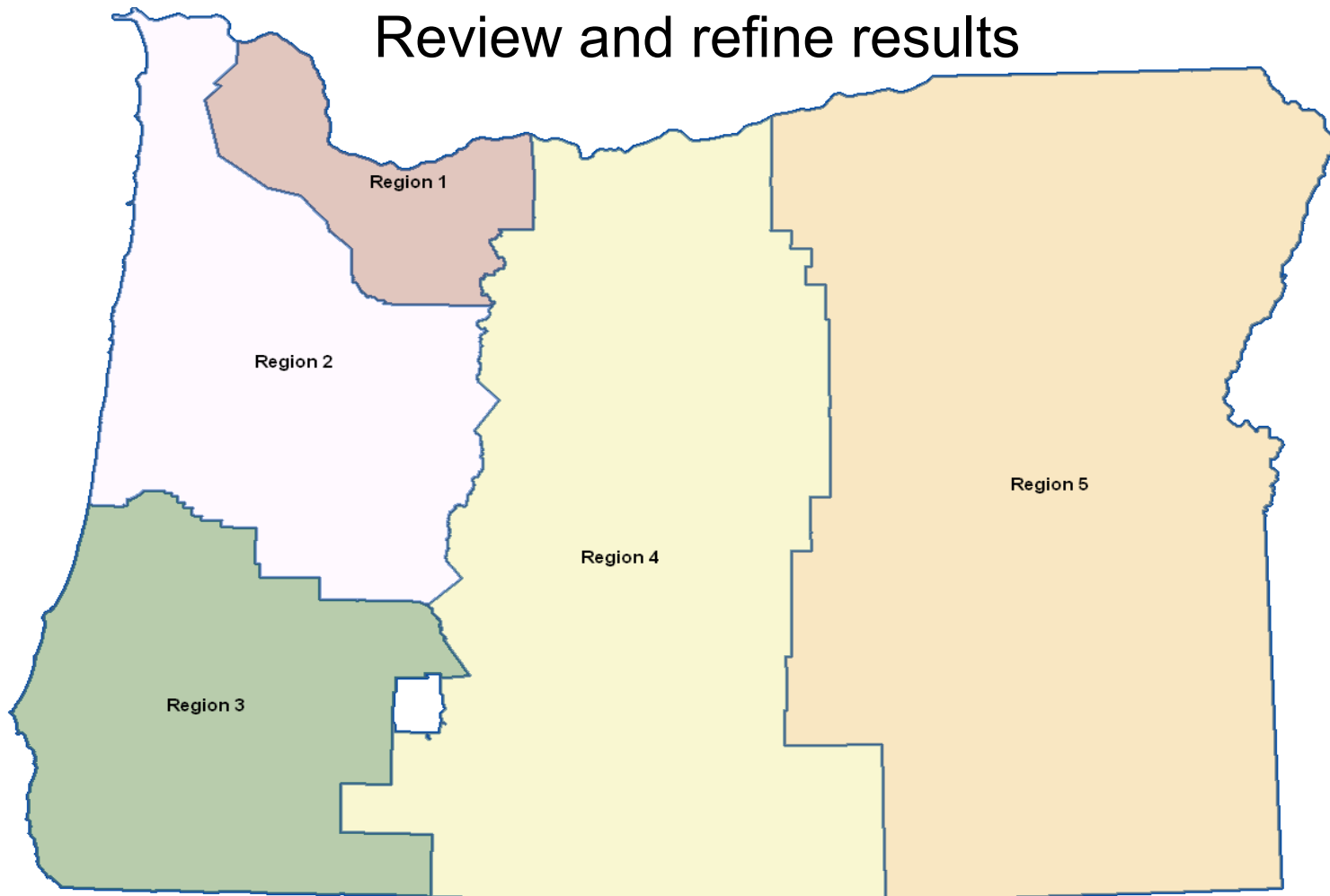


Project Steps

Collect data

Generate potential sites

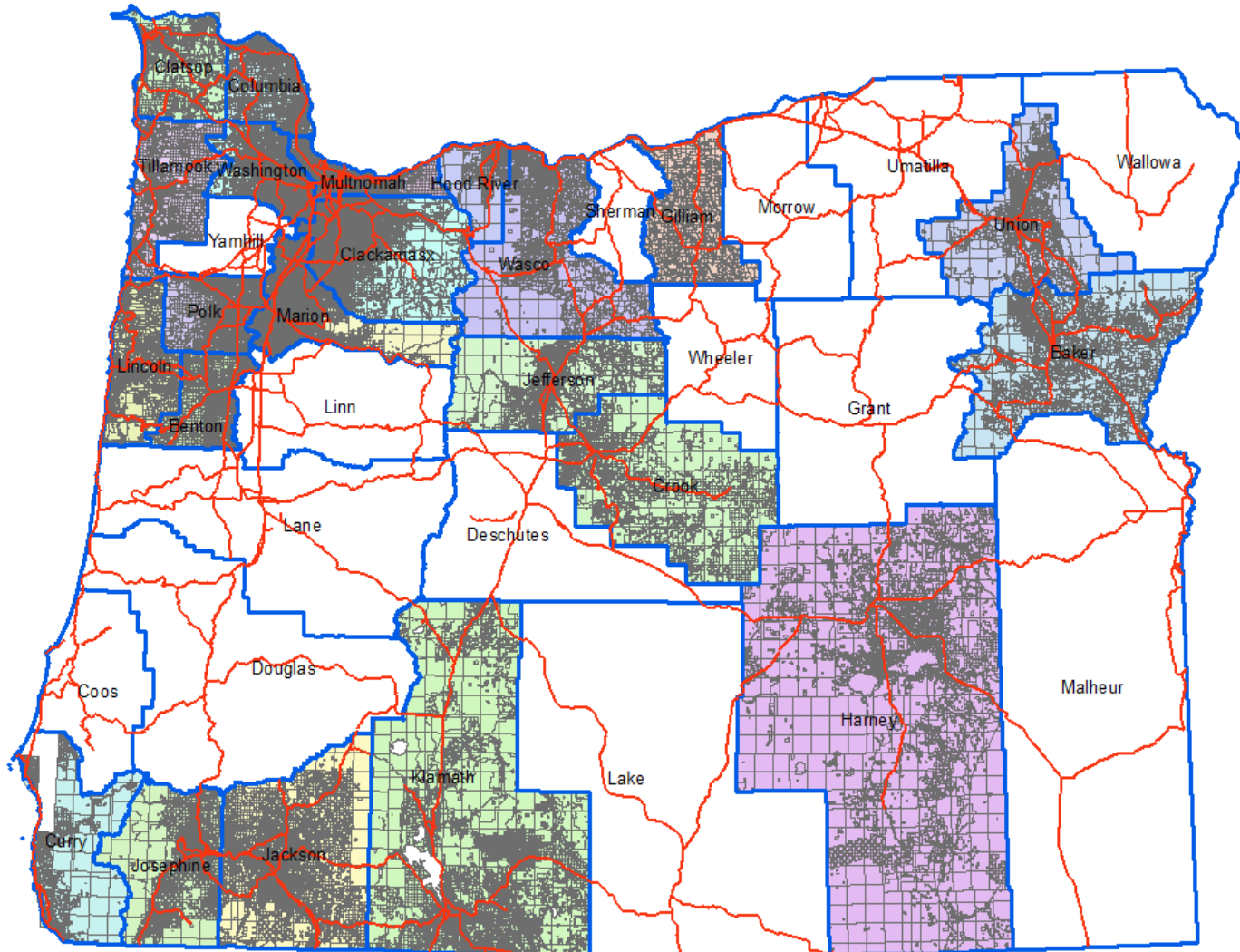
Review and refine results



Collecting the data

ODOT provided roughly half.

AGI collected the rest.



Identifying potential sites

Determine ownership

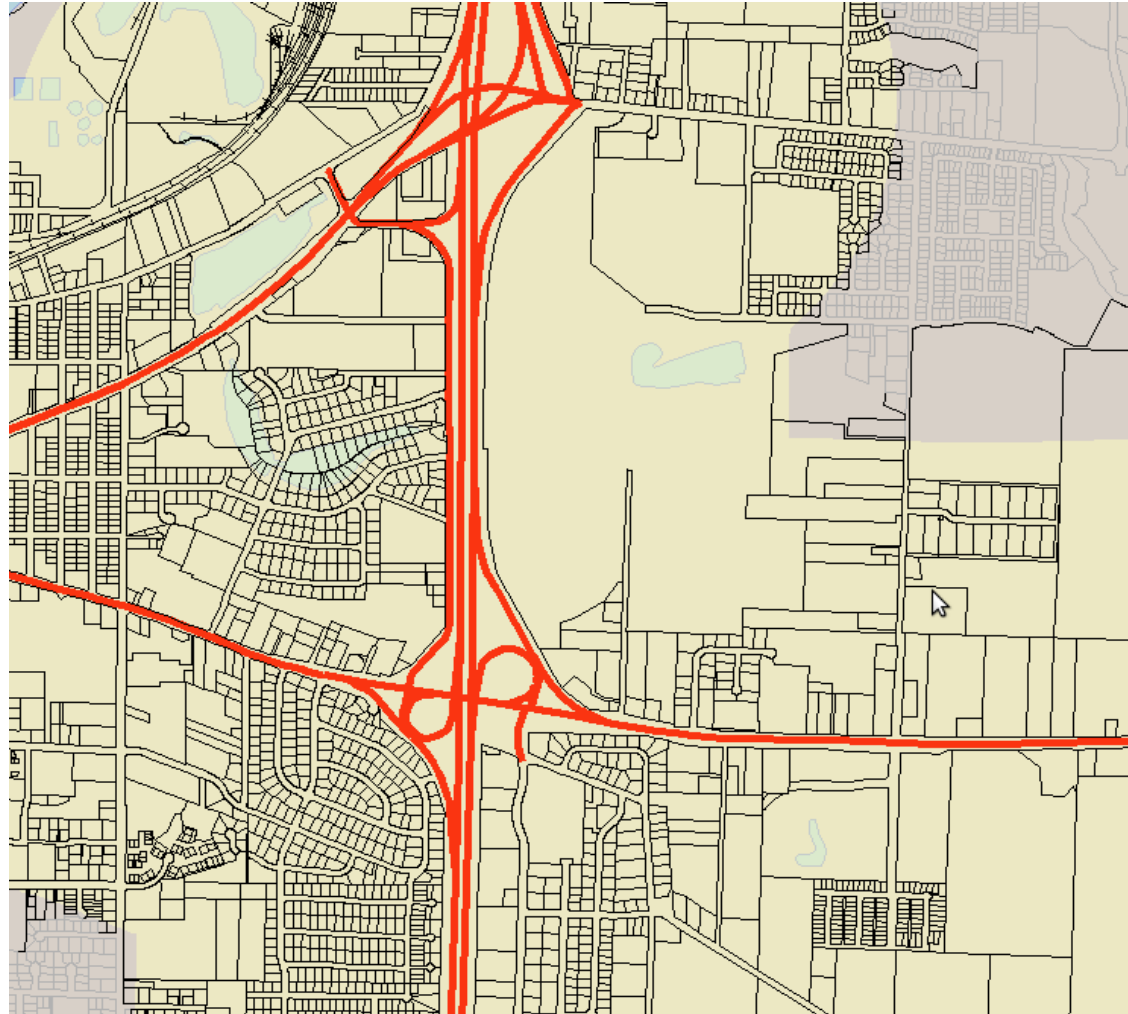
Apply selection criteria

Add attribute values to sites



Ownership

Disregard areas more than 1/2 mile from highways



Ownership

Find ODOT owned parcels

The screenshot shows a GIS application window titled "Identify". The "Identify from:" dropdown is set to "Parcels_ODOT_NONTL_RGN2". The "Identify from:" list shows "Parcels_ODOT_NONTL_RGN2" and "11503W09A 01403". The "Location:" field displays "648,646.242 1,060,560.720 Feet". The "Identified 1 feature" section shows a table of attributes:

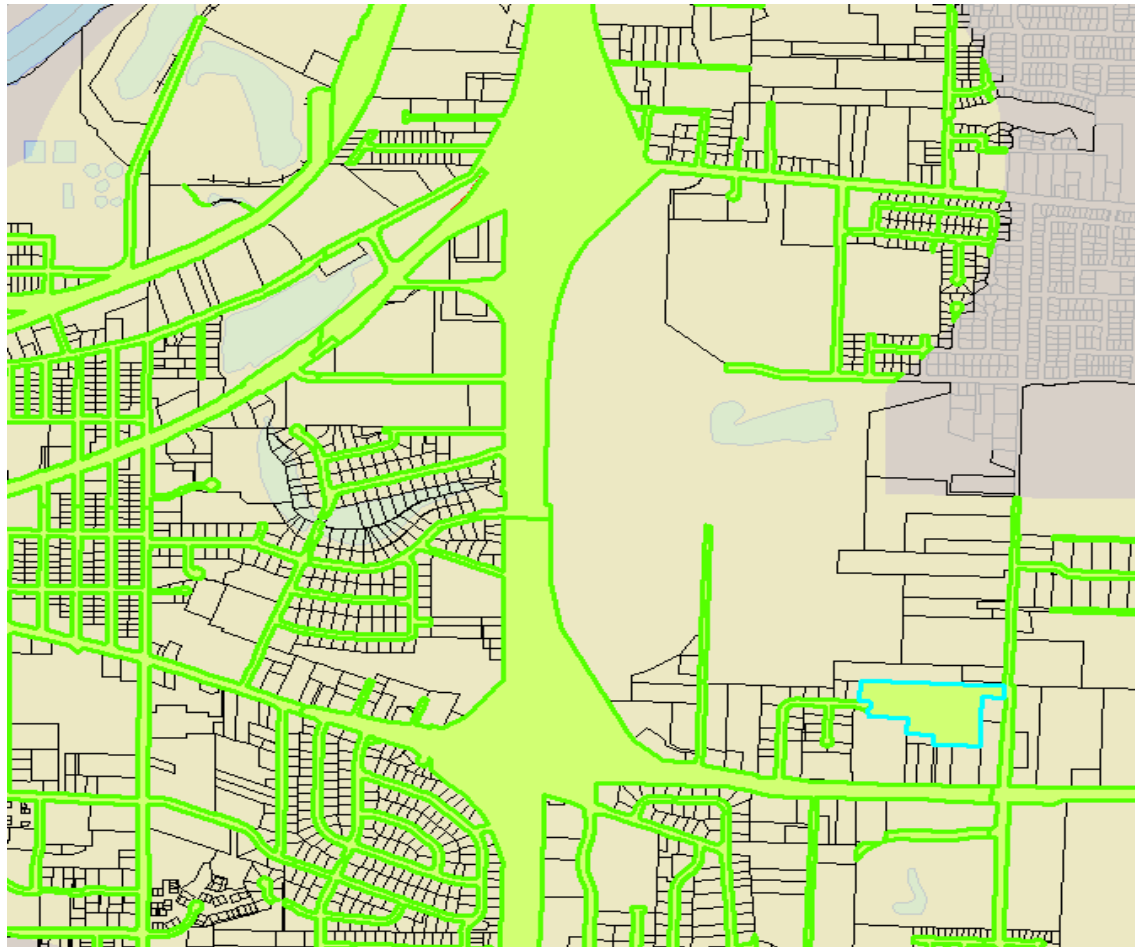
Field	Value
TLID	11503W09A 01403
Taxlot	01403
RegionCode	2
CountyCode	22
OwnerCode	2
TypeCode	0
RowCode	0
NearHighway	1
Owner1	OREGON STATE OF DOT
Owner2	
Agent	C/O HWY DIV R/W SEC FILE 6006-004.C
MailAddr	417 TRANSPORTATION BLDG

Finding ODOT Ownership

```
1 # Format: OWNER1 OWNER2 AGENT MAILADDR
2 test_list = [
3 # Ann - Malheur
4 (2, 'OREGON, DEPT OF TRANSPORTATION', '', '', ''),
5 (1, "OREGON, DEPT OF STATE LANDS", '', '', ''),
6 (1, "OREGON, DEPT FISH & WILDLIFE", '', '', ''),
7 (1, "OREGON, DEPT OF CORRECTIONS", '', '', ''),
8 (1, "OREGON, DEPT OF AGRICULTURE", '', '', ''),
9
10 # From Colleen
11 (2, 'DEPARTMENT OF TRANSPORTATION', 'RIGHT OF WAY SECTION', '', '355 CAPITOL ST
12 (2, 'DEPARTMENT OF TRANSPORTATION', '', '', '355 CAPITOL ST NE #RM 420'),
13 (2, 'DEPT OF TRANS PARKS & REC', '', '', '1255 PEARL ST'),
14 (2, 'DEPT OF TRANSP PARKS & REC', '', '', '1255 PEARL ST'),
15 (2, 'DEPT OF TRANSPORTATION', '', 'PARKS & REC DIV #54647', '525 TRADE ST NE'),
16 (2, 'DEPT OF TRANSPORTATION', '', '', '355 CAPITOL ST NE RM 420'),
17 (2, 'DEPT OF TRANSPORTATION', '', '', '555 13TH ST NE #SUITE 3'),
18 (2, 'DEPT OF TRANSPORTATION', '', '', ''),
19 (2, 'Dept of Transportation', '', '', ''),
20 (2, 'DEPT OF TRANSPORTATION', '', '', ''),
21 (2, 'ODOT - RAIL DIVISION', '', '', '650 HAWTHORNE AVE SE #STE 220'),
22 (2, 'ODOT DISTRICT 2B', '', '', ''),
23 (2, 'OR DEPT OF TRANSPORTATION', '', '', ''),
24 (2, 'OR DOT HWY DIV', '', '', '6000 SWRAAB RD'),
25 (2, 'OR DOT HWY DIV', '', '', 'ROOM 417 TRANSPORTATION BLDG'),
26 (2, 'OR HIGHWAY COMMISSON', '', '', '109 TRANSPORTATION BLDG').
```

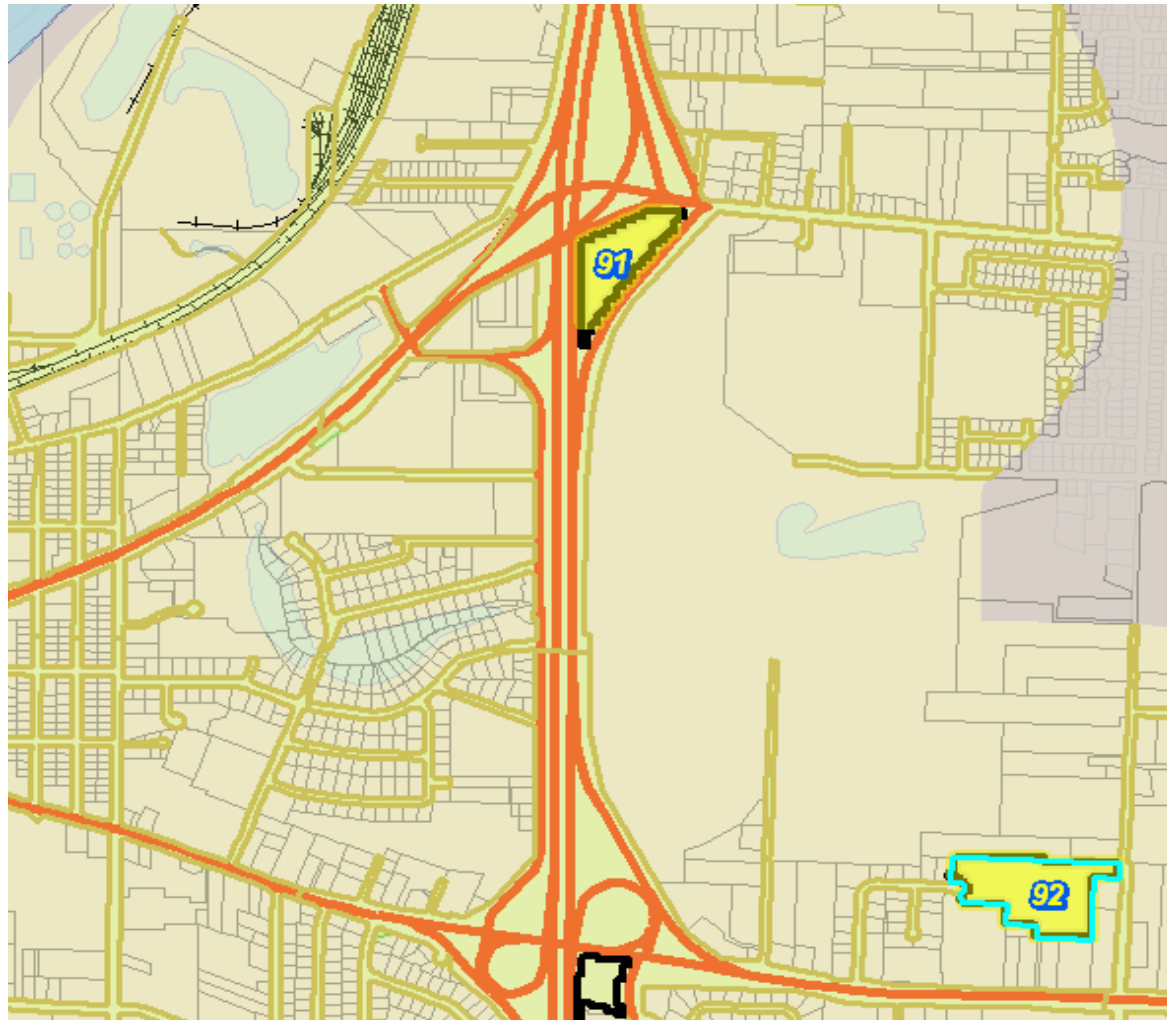

Ownership

Find ROW that *might be* owned by ODOT



Ownership

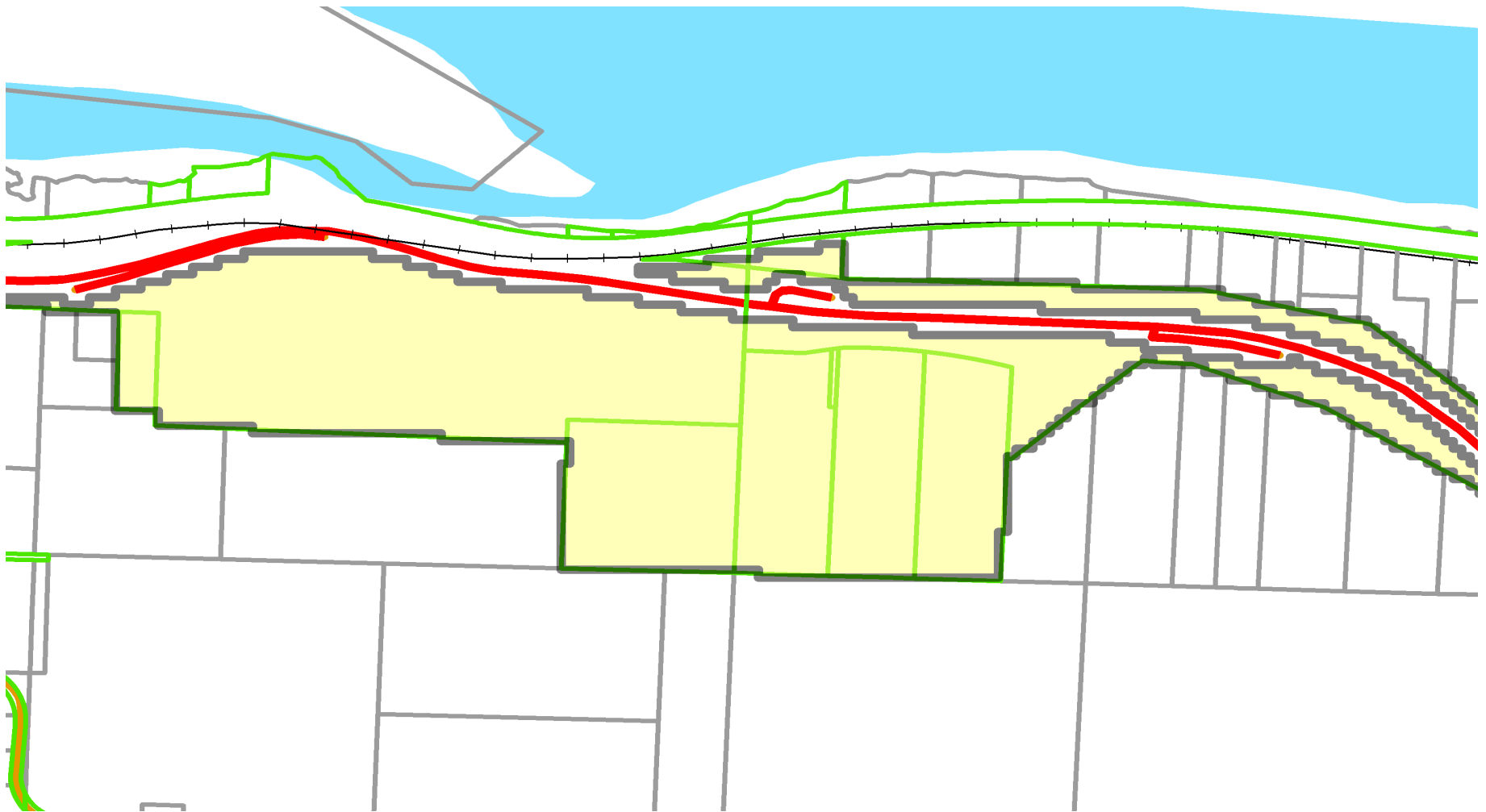
After removing roads...



Merge

Merge adjacent polygons

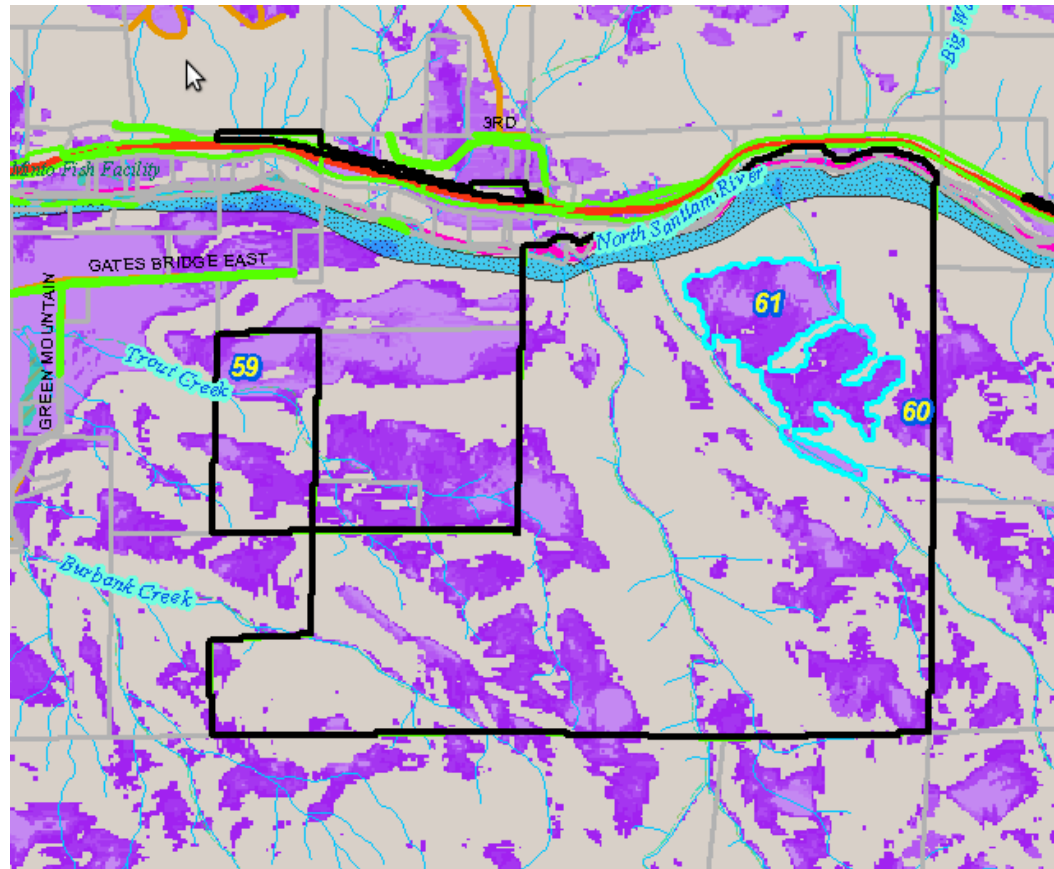
Disregard any site < 5 acres



Site Criteria

Evaluate physical attributes

Remove sites < 5 acres



Add attributes

What is each site near? What are the stats?

Identify

Identify from: Potential Sites - REVIEWED

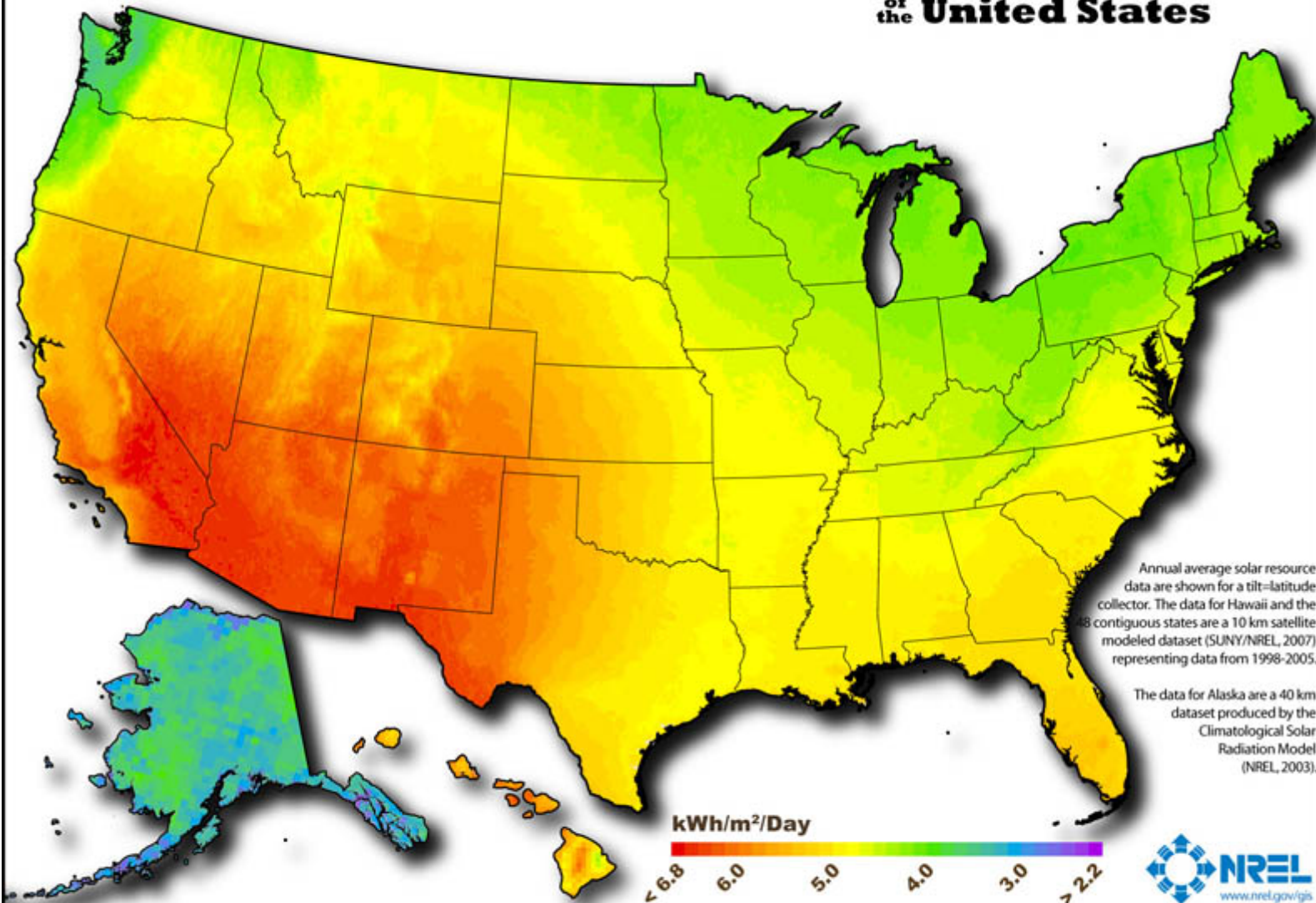
Potential Sites

64

Location: 919,306.576 1,324,777.013 Feet

Field	Value
OBJECTID	63
Shape	Polygon
ReviewStatus	Maybe
NumComments	1
RegionCode	1
ID	64
SizeAcres	7
powerLIST	Portland General Electric
ugbLIST	<null>
densityMEAN	306
slopeMIN	8
slopeMAX	20
slopeMEDIAN	20
scenicbywayLIST	Mount Hood
scenicbywayNEAREST	53
highwayLIST	MT. HOOD
highwayNEAREST	41
stip2010COUNT	1
stip2010LIST	153
stip2010NEAREST	41
stip2008COUNT	2

Photovoltaic Solar Resource of the United States

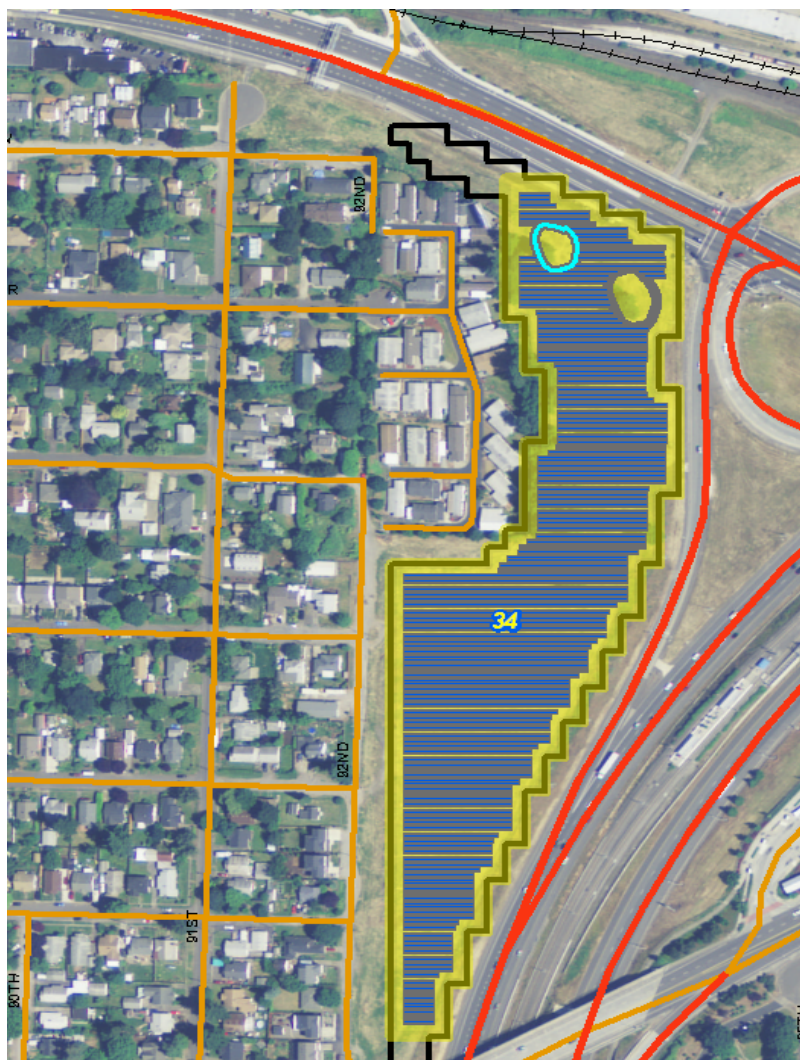


Author : Billy Roberts - October 20, 2008

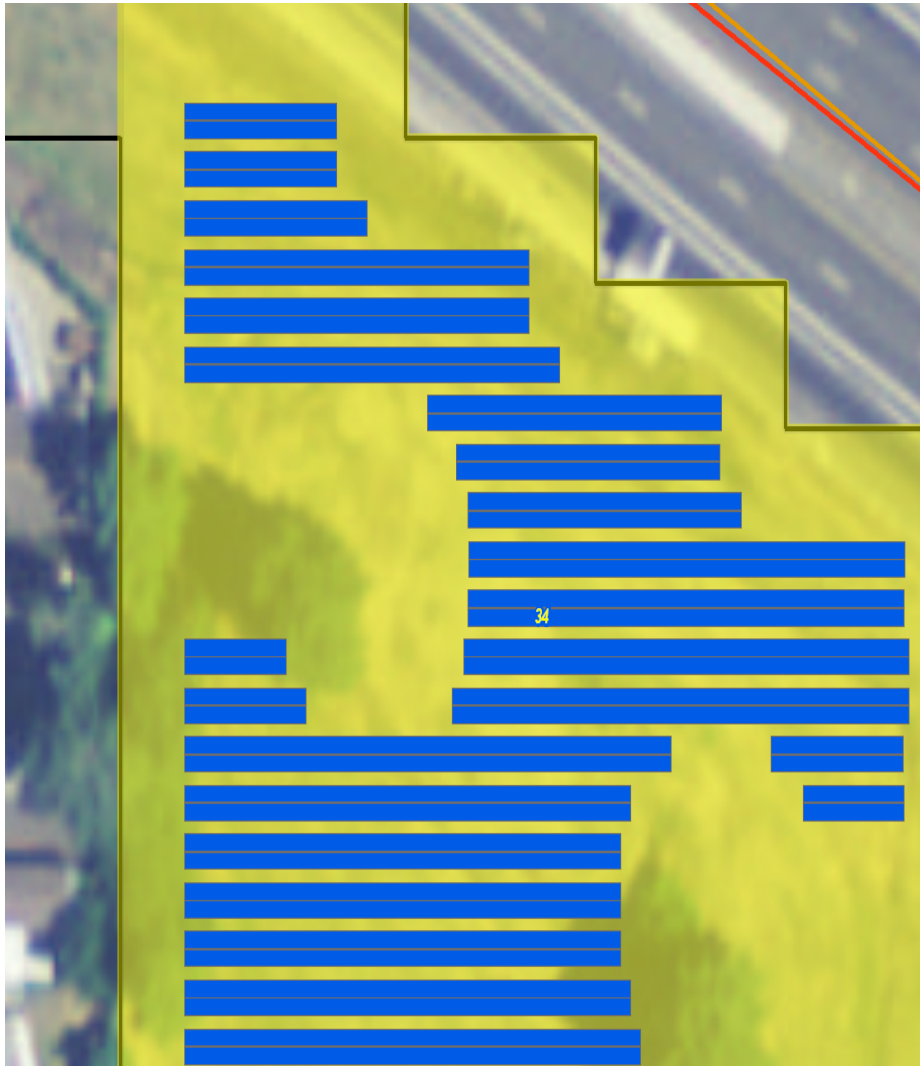
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.



Solar Power Estimate



Solar Power Estimate



Site Location:

Cell ID: 0185333
State*: Oregon
Latitude*: 44.488
Longitude*: -123.065

PV System Specifications:

DC Rating (kW):

DC to AC Derate Factor:

Array Type:

Fixed Tilt or 1-Axis Tracking System:

Array Tilt (degrees): (Default = Latitude)

Array Azimuth (degrees): (Default = True South) [What's this?](#)

Energy Data:

Cost of Electricity (cents/kWh):

(Type comments here to appear on printout; maximum 1 row of 90 characters.)

Station Identification

Cell ID:	0185333
State:	Oregon
Latitude:	44.5 ° N
Longitude:	123.1 ° W

PV System Specifications

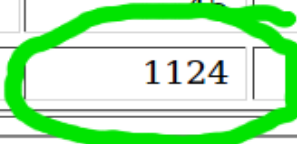
DC Rating:	1.00 kW
DC to AC Derate Factor:	0.770
AC Rating:	0.77 kW
Array Type:	Fixed Tilt
Array Tilt:	44.5 °
Array Azimuth:	180.0 °

Energy Specifications

Cost of Electricity:	7.6 ¢/kWh
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Results

Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
1	2.29	51	3.88
2	3.39	70	5.32
3	4.15	94	7.15
4	4.86	106	8.06
5	5.09	113	8.59
6	5.49	115	8.74
7	6.02	129	9.81
8	6.18	134	10.19
9	5.80	122	9.28
10	4.37	96	7.30
11	2.31	49	3.73
12	2.05	45	3.42
Year	4.34	1124	85.46



Estimate Solar Kilowatts

The screenshot shows a software window titled "Identify" with a purple header bar. Below the header, there is a dropdown menu labeled "Identify from:" containing "Solar_Arrays_Statewide_Aug3". To the left is a tree view showing a folder "Solar_Arrays_Statewide_Au" with a sub-item "1 - 34". To the right of the tree is a "Location:" field with the coordinates "783,025.630 1,396,049.458 Feet". Below these is a table with two columns: "Field" and "Value". The table contains the following data:

Field	Value
OBJECTID	83
Shape	Polygon
Shape_Length	107767.56168
Shape_Area	205702.039043
RegionCode	1
ID	34
Panels	7535
Kilowatts	1884
POINT_X	-123.103193
POINT_Y	45.212666
CELL_ID	186332
SolarKW	2017764
SolarMW	2017.764
RegionAndID	1 - 34

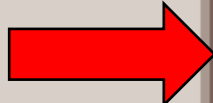
At the bottom of the window, a status bar indicates "Identified 1 feature".

Identify from: Potential Sites - REVIEWED

Potential Sites - REVIEWED
34

Location: 782,969.156 1,396,034.056 Feet

Field	Value
OBJECTID	33
Shape	Polygon
ReviewStatus	Maybe
NumComments	3
RegionCode	1
ID	34
SizeAcres	9
powerLIST	PacificCorp
ugbLIST	Metro
densityMEAN	1370
slopeMIN	6
slopeMAX	20
slopeMEDIAN	20
scenicbywayLIST	<null>
scenicbywayNEAREST	<null>
highwayLIST	EAST PORTLAND FREEWAY,CASCADE HWY NOR
highwayNEAREST	39
stip2010COUNT	<null>
stip2010LIST	<null>
stip2010NEAREST	<null>
stip2008COUNT	<null>
stip2008LIST	<null>
stip2008NEAREST	<null>
crithablineCOUNT	<null>
wpCOUNT	<null>
hazCOUNT	<null>
solar_MIN	1
solar_MAX	1
solar_MEDIAN	1
countyLIST	Multnomah
senateLIST	23
houseLIST	45
rowCOUNT_	1
rowLIST	34969
RegionAndID	1 - 34
Shape_Length	4395.199475
Shape_Area	400212.5273
SolarMW	2017.764



Website for review

Layers

- Excluded Sites
- True
- Solar Arrays
- Potential Sites
- ODOT Ownership Areas
- Streets
- Imagery

Exclusion Tool

Add Exclusion Remove Exclusion

Pan Mode

Site Comment Tool

Select Region: Region 1

View Comments

ODOT Solar Potential Map

364 Feet

ReviewStatus	NumComments	Region	ID	SizeAcres	powerLIST
Yes	3	1	44	8	Portland General Electric
Yes	2	1	57	13	Portland General Electric
Yes	2	1	69	20	Portland General Electric
Yes	2	1	66	11	Portland General Electric

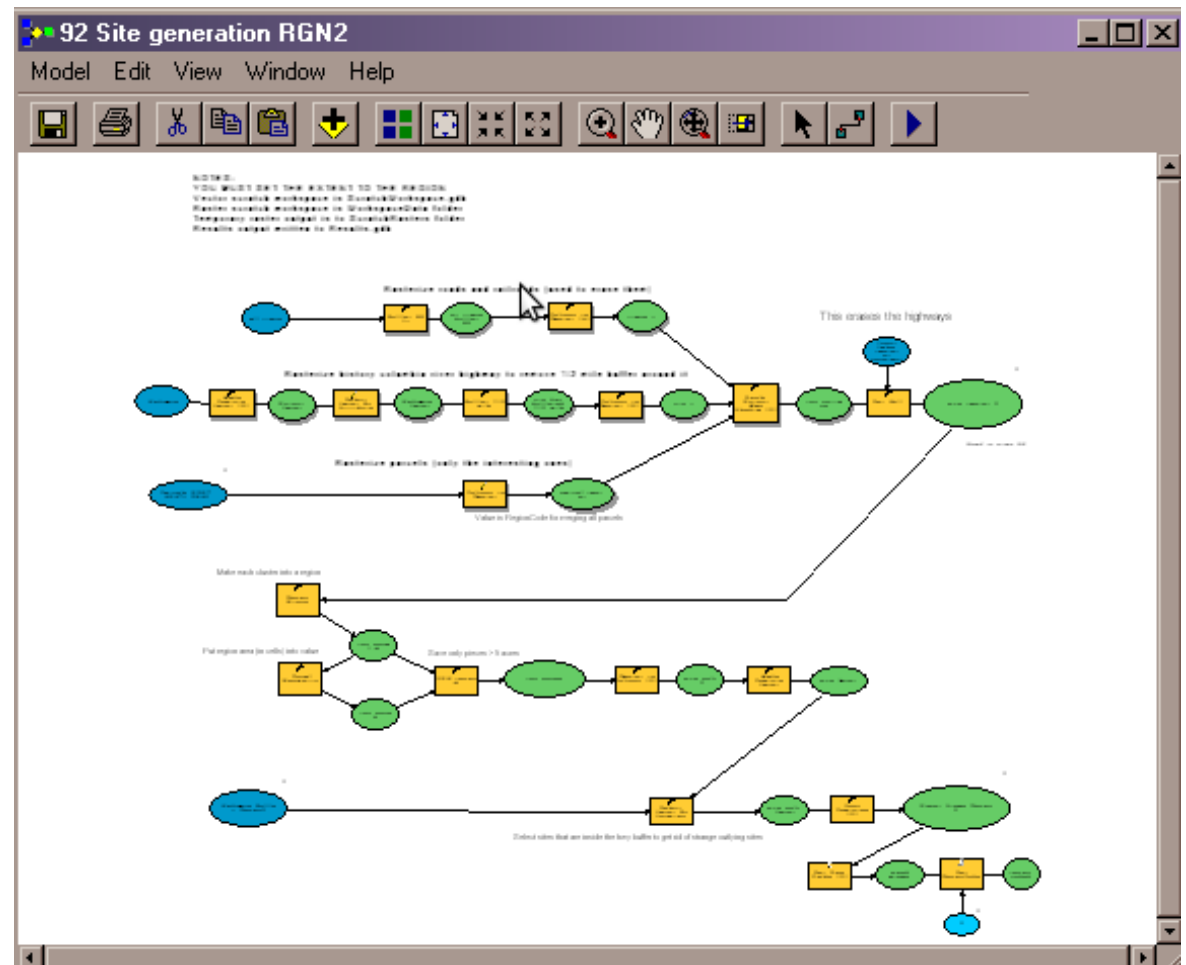
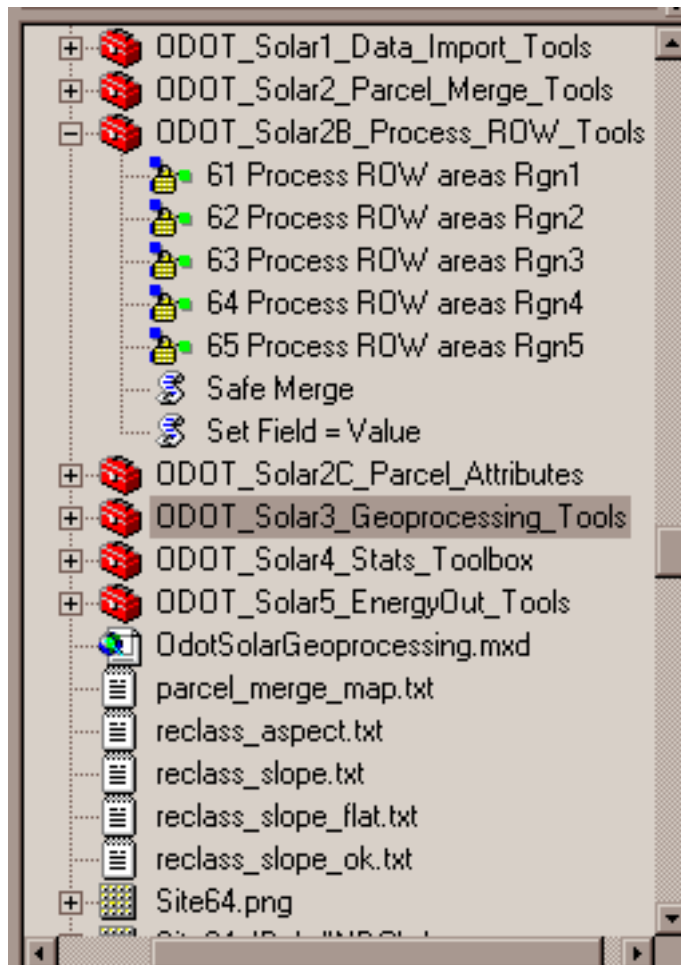
Record: << < 72 > >> Records (1 out of 90 Selected) Options... Commit

Models and Scripts

Seven ESRI Model Builder toolboxes

Each toolbox contains 5-15 models

Each toolbox has 5-10 python scripts



Results

ODOT is building 1.9M kwh Baldock rest area site.

Results from this project: 810 total, 344 “Maybe”, 57 “Yes”

57 sites graded as “Yes” would generate 449 million kwh

Nine times ODOT’s statewide requirement.



The people

ODOT Office of Innovative Partnerships

Lynn D. Averbeck, Project Director

Allison M. Hamilton

Alesea Geospatial, Inc

John Gabriel, project management

Brian Wilson, GIS programming and analysis

Ann Stewart, data management and GIS analysis

Lew Ladd, web site design