# Solar properties

Sun path is important for the data calculation process. Solar radiation depends on site location (Site reference) and time.  The general solar energy of a site can be shown as rose diagram (Solar rose diagram), as described in this section.

## 1 Solar rose diagram creation

A solar rose is a diagram that shows day-long light levels given various solar panel angles and orientations on the map.  PvDesktop will create a shapefile that looks like a circle around the reference point.  The user can use this chart to understand the dominant direction magnitude of the sun during daytime hours at the site.  The step to create the solar rose diagram are:

1. Click Solar properties button
2. Select plotting scale (default is 1)
3. Click the button  to create the table and diagram

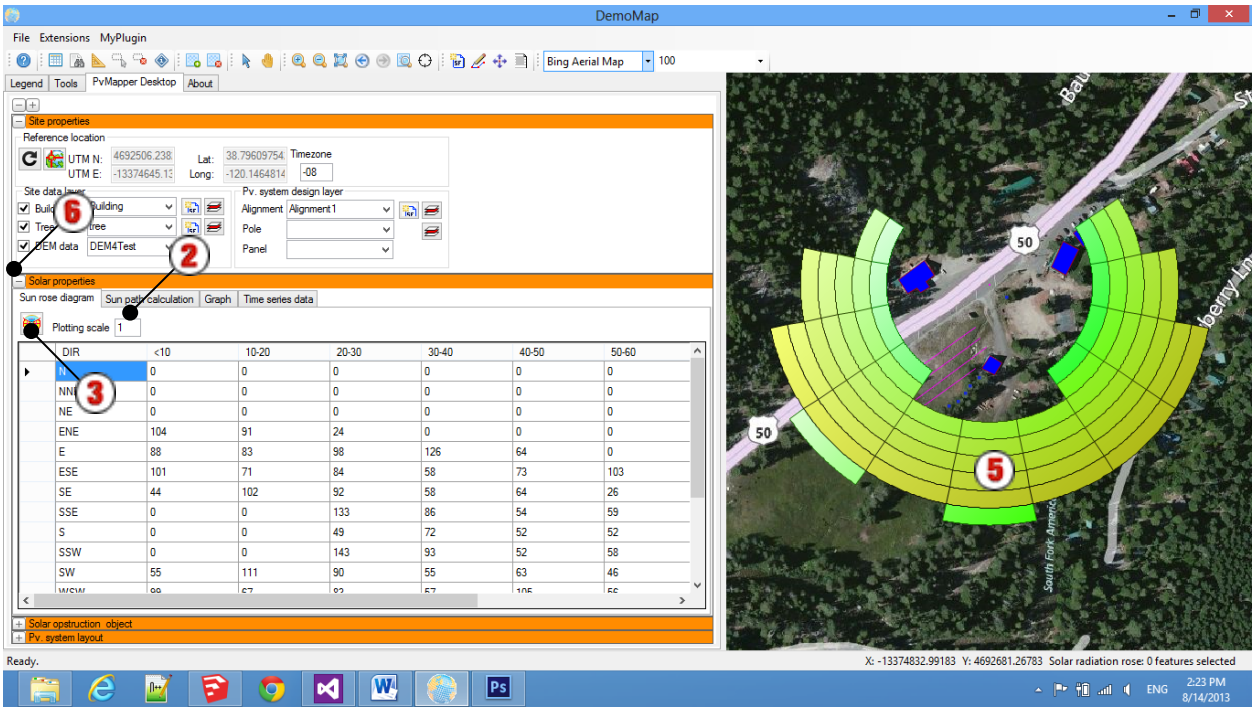
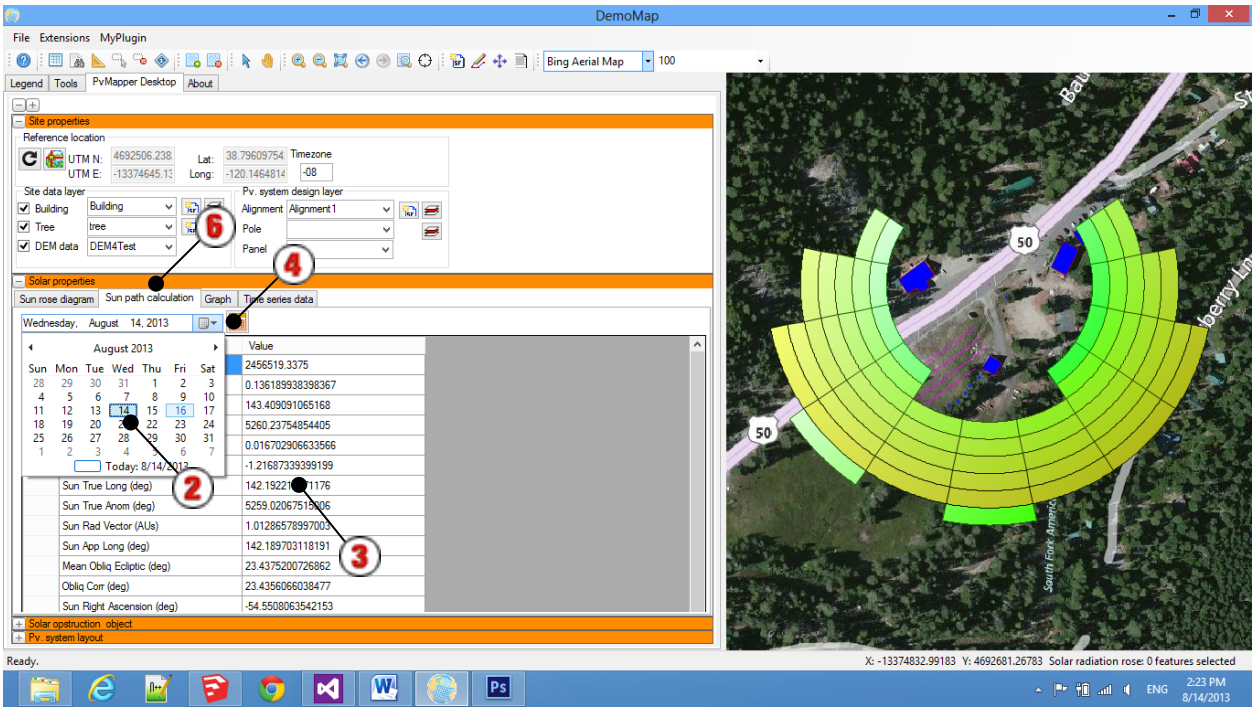


Table 1 Solar distribution table

| | Sun time (hour) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| DIRECTION | >10 deg. | 20 deg. | 30 deg. | 40 deg. | 50 50 deg. | 60 deg | 70 deg. | >80 deg. | Total |
| N | - | - | - | - | - | - | - | - | - |
| NNE | - | - | - | - | - | - | - | - | - |
| NE | - | - | - | - | - | - | - | - | - |
| ENE | 139 | 37 | 37 | - | - | - | - | - | 213 |
| E | 63 | 91 | 100 | 75 | 75 | - | - | - | 404 |
| ESE | 143 | 92 | 59 | 76 | 63 | 87 | - | - | 520 |
| SE | 29 | 134 | 92 | 63 | 53 | 74 | 81 | - | 526 |
| SSE | - | - | 104 | 90 | 50 | 48 | 83 | 40 | 415 |
| S | - | - | 128 | 63 | 52 | 19 | - | - | 262 |
| SSW | - | - | 107 | 90 | 56 | 44 | 84 | 39 | 420 |
| SW | 45 | 133 | 87 | 62 | 53 | 72 | 80 | - | 532 |
| WSW | 114 | 94 | 58 | 81 | 62 | 85 | - | - | 494 |
| W | 65 | 97 | 105 | 67 | 66 | - | - | - | 400 |
| WNW | 136 | 19 | 27 | - | - | - | - | - | 182 |
| NW | - | - | - | - | - | - | - | - | - |
| NNW | - | - | - | - | - | - | - | - | - |
| Sum | 734 | 697 | 904 | 667 | 530 | 429 | 328 | 79 | 4,368 |

The user can compute the sun path parameter on selected day by doing the following:

1. Click the sun path tab
2. Select a day from the calendar
3. PvDesktop will display the sun path parameters
4. Then click  to see the sun properties graph and yearly calculation

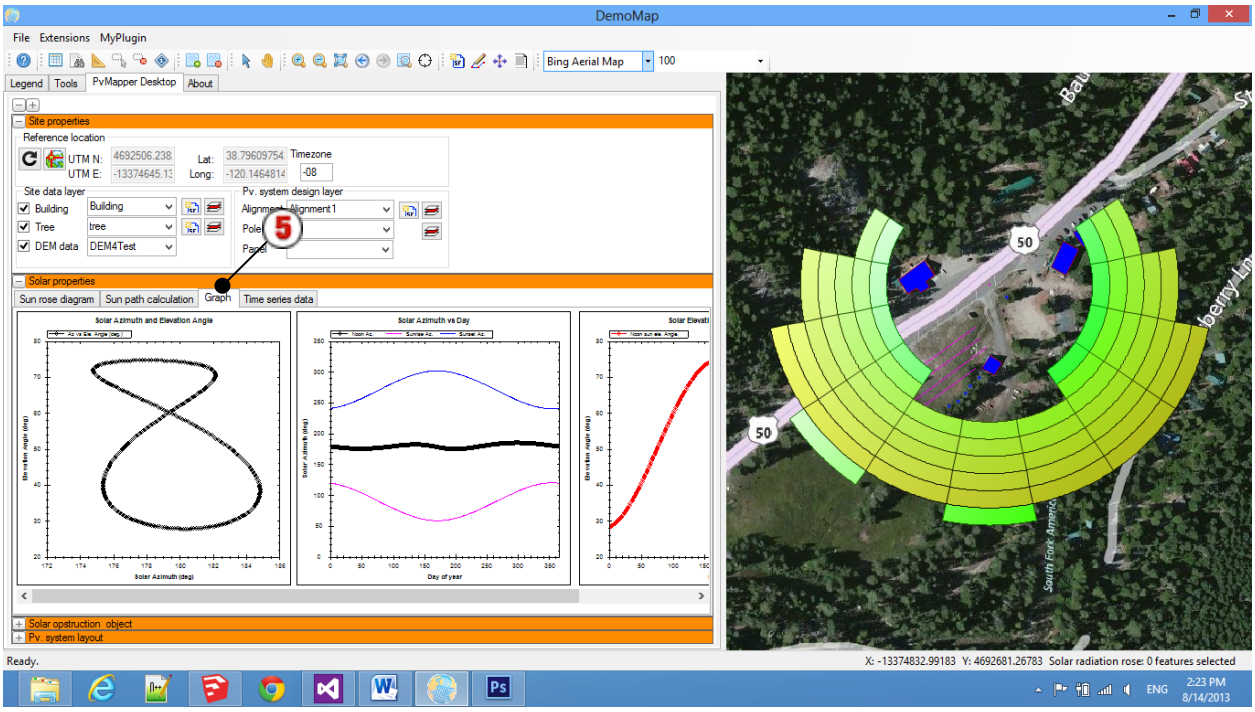


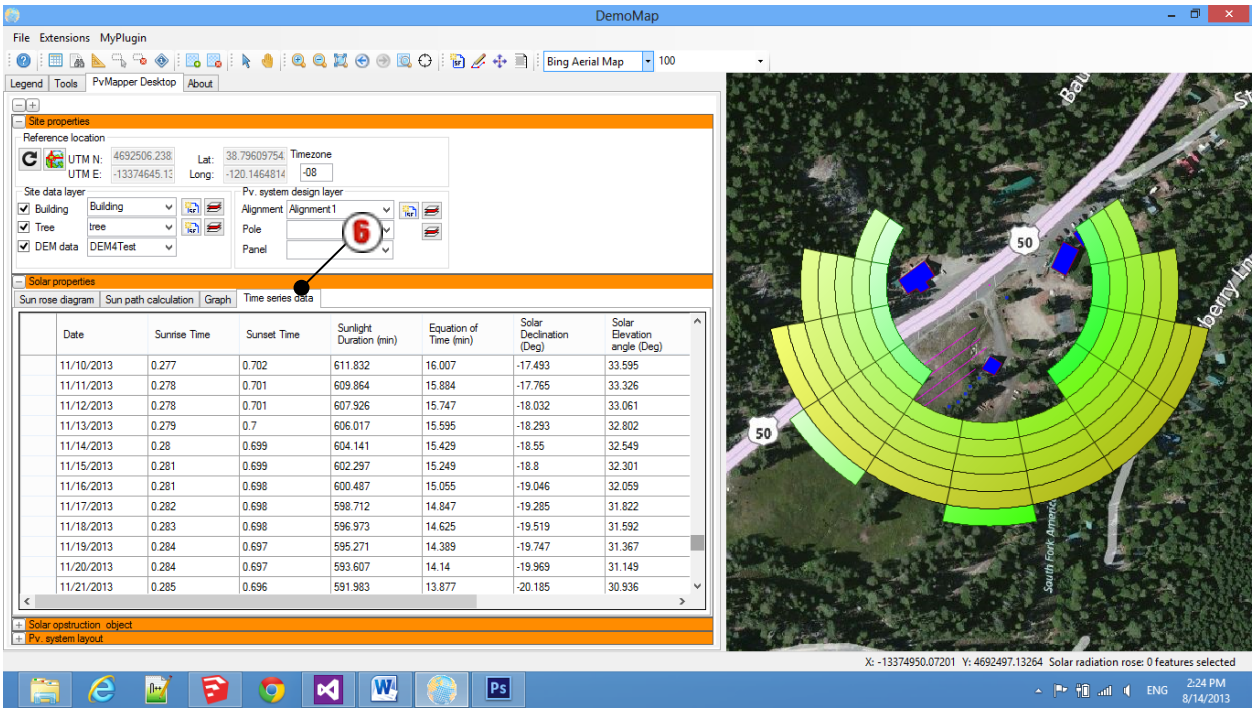

5. Click the graph tab to display the sun properties graph
6. Click the time series tab for yearly detail

Table xx Sun path parameter table

Thursday . July 18, 2013

| Parameter | Value |
|---|---|
| Julian Day | 2,456,491.713 |
| Julian Century | 0.135 |
| Geom Mean Long Sun (deg) | 116.181 |
| Geom Mean Anom Sun (deg) | 5,233.010 |
| Eccent Earth Orbit | 0.017 |
| Sun Eq of Ctr | -0.422 |
| Sun True Long (deg) | 115.758 |
| Sun True Anom (deg) | 5,232.588 |
| Sun Rad Vector (AUs) | 1.016 |
| Sun App Long (deg) | 115.756 |
| Mean Obliq Ecliptic (deg) | 23.438 |
| Obliq Corr (deg) | 23.436 |
| Sun Right Ascension (deg) | -27.738 |
| Sun Declination (deg) | 20.990 |
| var y | 0.043 |
| Equation of Time (minutes) | -6.234 |
| Hour Angle of Sunrise (deg) | 110.782 |
| Solar Noon (LST) | 1.107 |
| Sunrise Time (LST) | 0.799 |
| Sunset Time (LST) | 1.415 |
| Sunlight Duration (minutes) | 886.255 |
| True Solar Time (min) | 571.655 |
| Hour Angle (deg) | -37.086 |
| Solar Zenith Angle (deg) | 37.165 |
| Solar Elevation Angle (deg) | 52.835 |
| Approx Atmospheric Refraction (deg) | 0.012 |
| Solar Elevation corrected for atm refraction (deg) | 52.847 |
| Solar Azimuth Angle (deg cw from N) | 111.260 |






| Date | Sunrise Time | Sunset Time | Sunlight Duration (min) | Equation of Time (min) | Solar Declination (Deg) | Solar Elevation angle (Deg) |
|---|---|---|---|---|---|---|
| 11/10/2013 | 0.277 | 0.702 | 611.832 | 16.007 | -17.493 | 33.595 |
| 11/11/2013 | 0.278 | 0.701 | 609.864 | 15.884 | -17.765 | 33.326 |
| 11/12/2013 | 0.278 | 0.701 | 607.926 | 15.747 | -18.032 | 33.061 |
| 11/13/2013 | 0.279 | 0.7 | 606.017 | 15.595 | -18.293 | 32.802 |
| 11/14/2013 | 0.28 | 0.699 | 604.141 | 15.429 | -18.55 | 32.549 |
| 11/15/2013 | 0.281 | 0.699 | 602.297 | 15.249 | -18.8 | 32.301 |
| 11/16/2013 | 0.281 | 0.698 | 600.487 | 15.055 | -19.046 | 32.059 |
| 11/17/2013 | 0.282 | 0.698 | 598.712 | 14.847 | -19.285 | 31.822 |
| 11/18/2013 | 0.283 | 0.698 | 596.973 | 14.625 | -19.519 | 31.592 |
| 11/19/2013 | 0.284 | 0.697 | 595.271 | 14.389 | -19.747 | 31.367 |
| 11/20/2013 | 0.284 | 0.697 | 593.607 | 14.14 | -19.969 | 31.149 |
| 11/21/2013 | 0.285 | 0.696 | 591.983 | 13.877 | -20.185 | 30.936 |

**TIP**

The user can save the created solar rose as shape file and add it to the Map project.