## Estimating Shading of a Rooftop/Pole Mount on the Future Site Instructions for Spreadsheet



$$a2 = Tan^{-1} \left[ Tan(a1) - \frac{P}{D} \right]$$

1. Place the Solar Pathfinder (SPF) on the ground in the location of the future PV panel. Using the grease pen supplied, trace around the shading objects directly onto the clear plastic angle estimator (also supplied with the SPF). The SPF clear angle estimator is write-on/wipe-off.



2. Type into the spreadsheet the expected height (to the bottom of the panels) that the PV panels will be mounted at in the yellow shaded box with the "P" (Panel Height) above it.

Distance from the pathfinder to the shading object.*		Ground-level angle measurement from Solar Pathfinder	Calculated angle at height "P"	Perceived Height* of Shading Object**
50		Angle 1	Angle 2	Н
	<u>.</u>	5	-31	4.4
	Enter	10	-28	8.8
Expected Height	Your	15	-23	13.4
of the Panels.	Here	20	-19	18.2
P (Panel Height)		25	-13	23.3
35.0	•	30	-7	28.9
		35	0	35.0
		_ 40 _	8	42.0
$\odot$		_ 45 _	17	50.0
		50	26	59.6
		55	36	71.4
		60	46	86.6
		65	55	107.2
		70	64	137.4
$a2 = Tan^{-1} \left[ Tan(a1) - \frac{P}{D} \right]$		75 80	72 79	186.6 283.6
		85	85	571.5

- 3. Measure the distance from the SPF to the shading object. Type this measurement into the spreadsheet in the blue shaded box with the "D" (distance) above it.
- 4. Use the clear angle estimator in the SPF at ground level to get the altitude (Angle 1) of the object shading the spot. [The altitude is the angle above the horizon shown as concentric circles on the angle estimator.] Find that angle measurement (Angle 1) in the red column. For this example, we will only work with the tree shown between 10-35 degrees West. Our example shows angle 1 (at the tip of the tree) to be 50 degrees (beside the <sup>Q</sup>). Your new angle (Angle 2) at the new height (P) will be in the green column to the right of your original, ground-level angle measurement (Angle 1). Our example shows angle 2 to be 26 degrees.
- 5. Plot the Angle 2 on the clear angle estimator at the corresponding azimuth. [The azimuth is the angle east or west of due south shown as rays from the center of the angle estimator.] NOTE: Any new Angle 2 measurements that are negative indicate that the object will then be below the new heights' horizon and will cause no shading. In our example, the tip of the tree stays at 23 degrees W. for the azimuth having a new angle of 26 degrees above the horizon shown with yellow line. At azimuth 15 degrees West, the angle 1 is 45 degrees, making angle 2

equal 17 degrees. At azimuth 30 degrees West, angle 1 is 40 degrees, making angle 2 equal 8 degrees.



- 6. You will need to repeat steps 3, 4, & 5 for each shading object (different shading objects will be located at different distances from the Pathfinder) in question.
- 7. Place the clear angle estimator with its new Angle 2 measurements for the given height (H) on top of you latitude-specific sunpath diagram to see if the shading estimated at the new height will intersect the sunpath.



In our example, the new proposed height's shading (marked in yellow) will barely touch the sunpath for December and January around 1:15pm at this latitude.