Stantec

TRAVERS SOLAR
ALBERTA, CANADA

A Solar Farm's Calculated Best Outcome

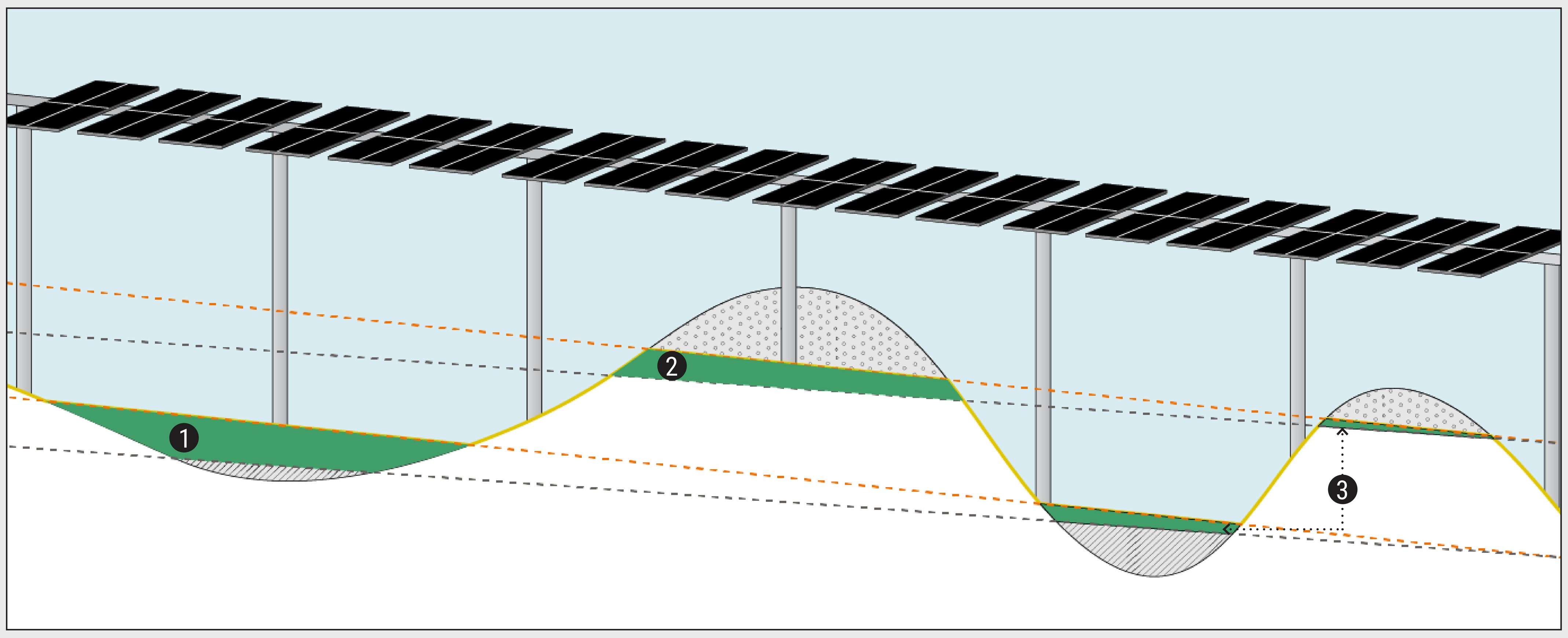
Current methods of resolving necessary earthworks on solar farms are established with little to no adaptation from the existing ground conditions due to its complexity and variability. Trackers have needed to evolve into terrain following options to account for the impacts that earthworks can have on time, cost, efficiency, complexity and environment. What if we could not only drastically reduce the necessary earthworks but in doing so account for every vertical variation at every pile and maintain the flexibility of changing the preset parameters quickly and efficiently.

Industry standard to date is to follow the existing ground at either end and carry out grading in a straight line fashion based off of those points as necessary. This is simple to follow while some modifications can be made either individually or systematically to be limited to certain parameters such as maximum north-facing slope of a tracker.

As we were beginning to develop something to automate the vertical layout similar to what some other tools are capable of doing now, we realized what is possible with the data and developed a far more in depth analysis at each tracker. We are accounting for all tolerances as a variable that remains within the users control throughout the entire layout. The difference can be seen in the results as **we account for more variables while reducing 30-50% earthworks, schedule, disturbance and potentially pile heights and concurrently maintain or increase production.**

In the sample site to the right we have a side by side comparison of an industry standard method vs our developed tool Stantec Beacon™ and as you can see in the savings in the center we are accounting for the largest factors that influence environmental impact and overall project finances when looking at the vertical layout. We have adapted this process for terrain following to account for all parameters.

Adjusting to Suit Site Conditions



EFFICIENCY: In marrying earthworks to the tracker requirements then improving overall design to suit the natural conditions, it's possible to make early decisions to improve the balance of required cut and fill. The result is minimized environmental impacts, compliance for vertical variations at every pile, and flexibility of dynamic inputs.

KEY:
- Industry Standard Grading Limit
- Stantec Beacon™ Tool Grading Limit
- Proposed Ground Level (after grading)

- Cut
- Fill
- Efficiency

1. Increased fill to balance the excess cut
2. Reduced cut to balance the earthworks
3. Balanced earthworks: no imported or exported material

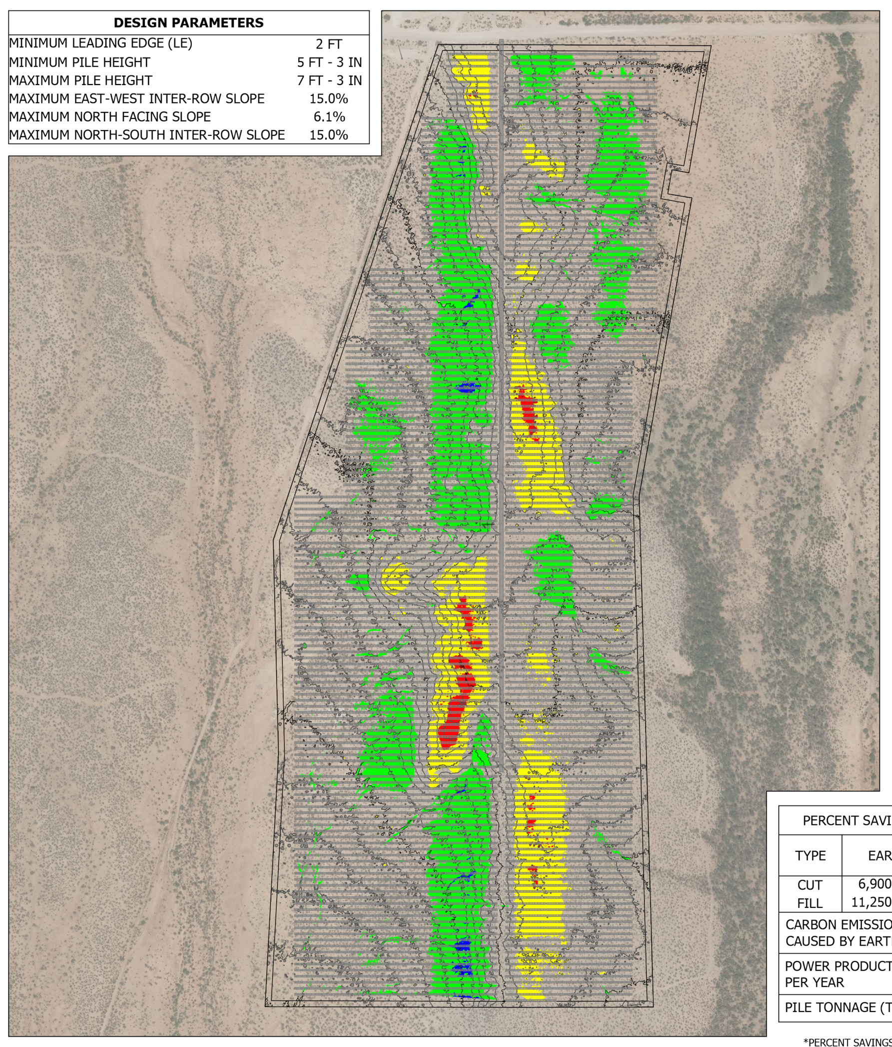
STUDY SHOWS UP TO 50% REDUCTION OF EARTHWORKS WHILE POTENTIALLY IMPROVING PRODUCTION AND REDUCING PILE REVEAL. FULL CONTROL AND QUICK ITTERATIONS TO ENSURE THE BEST SITE SUITED DESIGN

On a recent solar project (>400MW AC), Stantec employed the Beacon Tool which resulted in an estimated 50% reduction of earthworks compared to a conventionally graded solar facility. Earthwork reductions were approximately 850,000 cubic yards.

On another recent project (800MW AC), utilizing Beacon resulted in the reduction of earthworks by approximately 50%, reduction in disturbed area by approximately 43%, same pile reveal average and increased production compared to a conventional method of vertical layout.

INDUSTRY STANDARD

DESIGN PARAMETERS	
MINIMUM LEADING EDGE (LE)	2 FT
MINIMUM PILE HEIGHT	5 FT - 3 IN
MAXIMUM PILE HEIGHT	7 FT - 3 IN
MAXIMUM EAST-WEST INTER-ROW SLOPE	15.0%
MAXIMUM NORTH FACING SLOPE	6.1%
MAXIMUM NORTH-SOUTH INTER-ROW SLOPE	15.0%



PILE REVEAL	
TOTAL PILES	7,124
PILE SIZE (DIA. IN)	4
PILE THICKNESS (IN)	0.25
EMBEDMENT DEPTH (FT)	8.50
AVERAGE REVEAL (FT)	6.52

ESTIMATED EARTHWORK STATISTICS	
CUT	18,150CY
FILL	22,850CY
NET	4,700CY

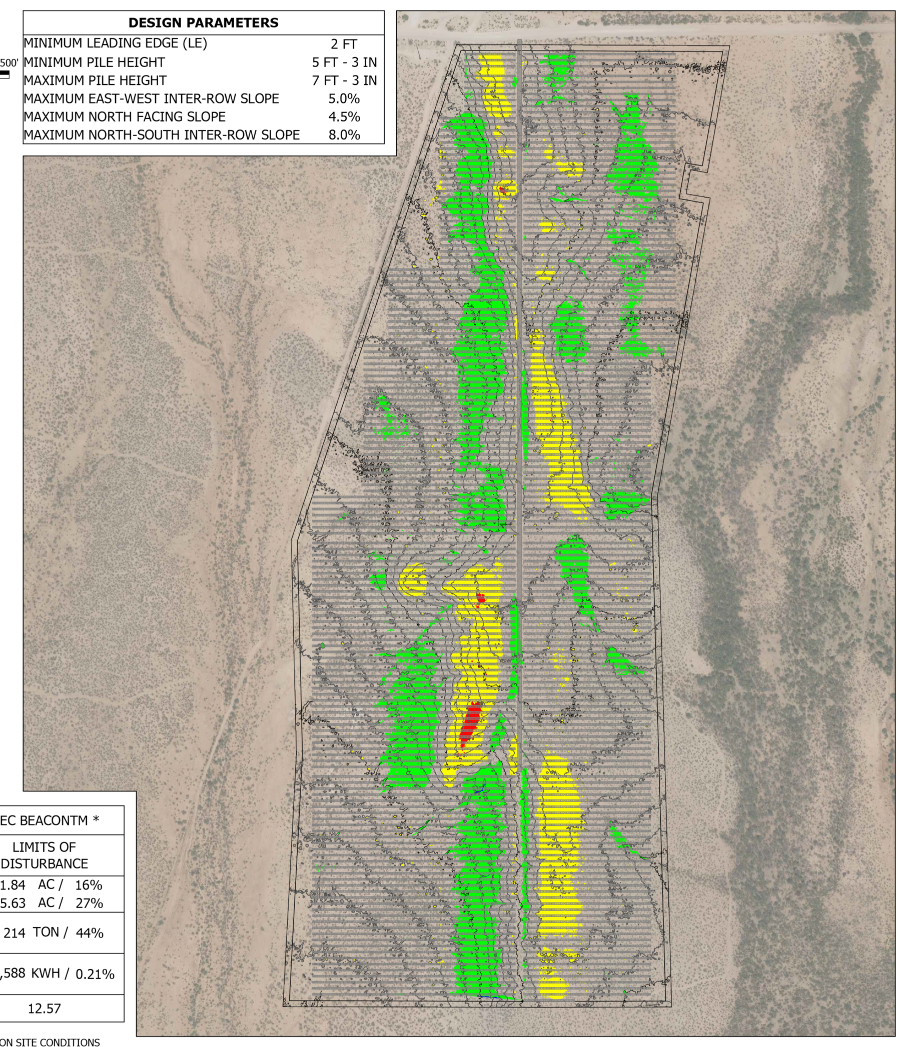
DEPTH RANGE (FT)	COLOR	AREA (AC)	VOLUME (CY)
-4.2 to -2.0	red	1.11	692
-2.0 to 0.0	yellow	10.75	17,434
0.0 to 2.0	green	20.77	22,722
2.0 to 2.9	blue	0.31	93

PERCENT SAVINGS USING STANTEC BEACONTM *		
TYPE	EARTHWORK	LIMITS OF DISTURBANCE
CUT	6,900 CY / 38%	1.84 AC / 16%
FILL	11,250 CY / 49%	5.63 AC / 27%
CARBON EMISSIONS CAUSED BY EARTHWORK		214 TON / 44%
POWER PRODUCTION PER YEAR		129,588 KWH / 0.21%
PILE TONNAGE (TON)		12.57

*PERCENT SAVINGS WILL VARY DEPENDING ON SITE CONDITIONS

STANTEC BEACON™

DESIGN PARAMETERS	
MINIMUM LEADING EDGE (LE)	2 FT
MINIMUM PILE HEIGHT	5 FT - 3 IN
MAXIMUM PILE HEIGHT	7 FT - 3 IN
MAXIMUM EAST-WEST INTER-ROW SLOPE	5.0%
MAXIMUM NORTH FACING SLOPE	4.5%
MAXIMUM NORTH-SOUTH INTER-ROW SLOPE	8.0%



PILE REVEAL	
TOTAL PILES	7,124
PILE SIZE (DIA. IN)	4
PILE THICKNESS (IN)	0.25
EMBEDMENT DEPTH (FT)	8.50
AVERAGE REVEAL (FT)	6.16

ESTIMATED EARTHWORK STATISTICS	
CUT	11,250CY
FILL	11,600CY
NET	350CY

DEPTH RANGE (FT)	COLOR	AREA (AC)	VOLUME (CY)
-3.8 to -2.0	red	0.27	179
-2.0 to 0.0	yellow	9.75	11,053
0.0 to 2.0	green	15.44	11,595
2.0 to 2.7	blue	0.01	3

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LEARN MORE ABOUT STANTEC BEACON