Faster & Lower Cost for County Road Design
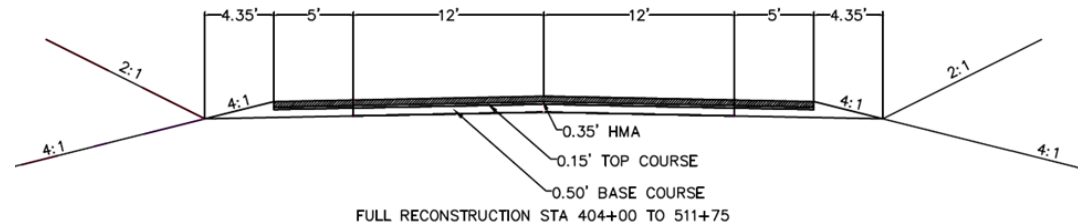
Franklin County uses *Softree Optimal* to significantly reduce design time

COMPANY:

Franklin County

LOCATION: Franklin County, WA

SOFTWARE: Softree Optimal
RoadEng®
Civil 3D®

0.35' HMA
0.15' TOP COURSE
0.50' BASE COURSE
FULL RECONSTRUCTION STA 404+00 TO 511+75

ABOUT OPTIMAL

Softree Optimal is the result of 4 years of mathematics research, conducted in conjunction with Softree Technical Systems and UBC. It uses the *average end area* technique to calculate volumes. By iterating an algorithm many, many times, the program is eventually able to zone in on the lowest-cost solution.

Future Plans for *Softree Optimal* include incorporation of this technology into other design platforms such as Autodesk's Civil3D®, 12d®, and Bentley® road design products.

Cost Comparison:
Engineer–led vs *Softree Optimal* Design

COSTS	ENGINEER	OPTIMAL	REDUCTION
Cut	$352,410	$274,710	22.0%
Fill	$122,020	$ 94,320	22.7%
Haul	$ 47,220	$ 31,000	34.3%
TOTAL	**$521,660**	**$400,040**	**23.3%**

RoadEng is a registered trademark of Softree Technical Systems. Civil3D is a registered trade mark of Autodesk. 12d is a registered trademark of 12d Solutions Pty Ltd. Bentley is a registered trademark of Bentley Systems, Inc.

FOCUSING ON VERTICAL REALIGNMENT

Franklin County in Washington, USA was 30% into the design stage of a new road design which would accommodate a higher speed. The project was to create a new vertical alignment for two miles of a two lane road to allow a new design speed of 55mph (90km/h). The existing road was basically straight, and the horizontal alignment of the road was to remain unchanged. The vertical realignment was the main focus.

We used RoadEng® to copy the existing design from Civil3D®. We then discussed the unit costs, parameters, and constraints specific to their project, and entered this data into Softree Optimal.

The values for other constraints were also entered into Softree Optimal, such as the parameters for K—the value used for the curvature of a road. Grade was also constrained to be less than 10% for this project, and the end points of the road were made to match both the grade and elevation of the existing road.

"IT TOOK ABOUT 2 HOURS"

Once all of this data was entered into the program, we ran the optimization and produced a result in 22 seconds (this was with only a medium-high quality 2012 ASUS G55V laptop, not a super-computer). We optimized a few more times using slight variations of data. In total, it took about 2 hours to come up with an overall optimal solution.

"THE COST DIFFERENCE WAS QUITE SIGNIFICANT"

The result was that the alignment design generated by Softree Optimal was, at a glance, very close to the design done by the county engineer; however, the cost difference was quite significant. Estimated total costs with Softree Optimal were a 23% lower. The volume of earth excavated and filled was also significantly reduced, reducing not only the cost, but also the environmental impact of the project.

QUICK COMPARISON

In the end, the we chose to reduce the design speed. This decision, however, was made quicker and easier by the fact that the optimization program was able to take the two design speeds as inputs. In 20 seconds, a comparison between the two road designs was available.

It is no surprise that the road with the slower segment would be cheaper, but using Softree Optimal, we were able to see, along with the Franklin County engineer, exactly how much cheaper.

A hand design done by the same engineer at different times will not be reproducible, and the output from two different engineers will vary even more, whereas two alignments done by Softree Optimal software use the same parameters, and thus are completely reproducible and comparable.