Exploratory PDF

Earthwork optimization software.

Softree Optimal

The easiest way to reduce your corridor earthwork costs.

Introducing mathematical optimization for geometric design. You'll love it. And so will your budget.

Softree Optimal is the easiest way to reduce your earthwork costs.

It solves the complex 3D problem of minimizing excavation, embankment and haulage, while meeting your design constraints and standards. Softree Optimal will calculate the lowest cost vertical alignment. Every time.

Compatible with most CAD software, Softree Optimal can add speed and power to your next design project.

Experience the future of geometric road design, contact Softree for a custom, free demonstration with your own data.

Click the links to explore the PDF:

- Technology Overview
- Case Study: MPE Engineering
- Case Study: Franklin County
- Video: 5 minute optimization using Civil 3D
- Project Suitability / Guidelines

What to do next:

- Download a Free Evaluation Copy
- Schedule a Custom Demonstration

Softree

Engineering an Easier Way

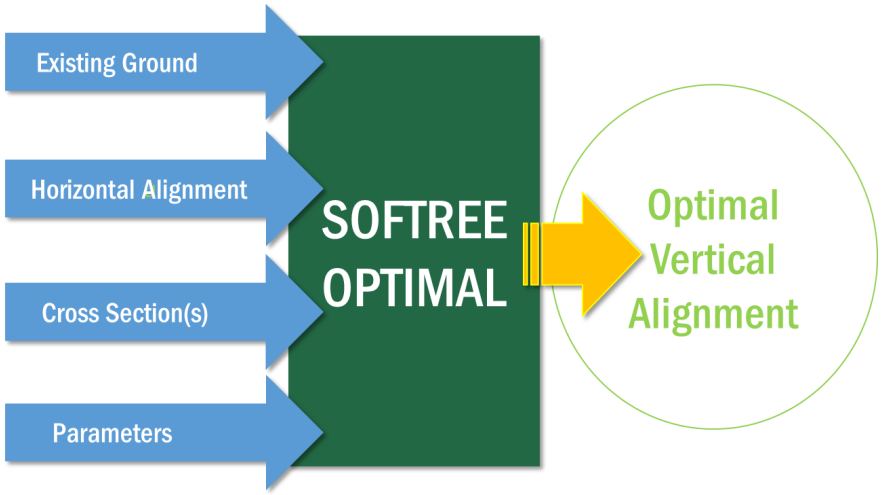
Technology Overview

Softree Optimal

OPTIMIZE YOUR GEOMETRIC DESIGN TO REDUCE EARTHWORK

Minimize earthwork costs for roads, highways, and other corridor projects. Optimize designs from RoadEng, Civil 3D, or other design software. Get the lowest cost vertical alignment.

Using a patented technology developed in collaboration with the University of British Columbia, Softree Optimal determines the true lowest cost solution using detail cross section quantities.



Softree Optimal can be used for preliminary design to quickly evaluate corridor options and confirm cost & feasibility. It can be used during design finalization to perfect your vertical alignment with a final optimization, run design checks and get construction quantities.

"Softree Optimal has become an integral part of our engineering design software. With it we are able to test multiple vertical alignments in very short time spans, allowing us to test alignments that we would usually not have the option for due to time constraints.

It has (on average) reduced our estimated cost for construction of subgrade by 15%-20%.

Its ability to take into account the varying aspects of road construction and materials is unparalleled. We would recommend it to anyone looking for an easy to use, quick and accurate road design software."

Tyler Dychko,
Transportation Engineer

Key Benefits

☑ REDUCE ENGINEERING TIME

The iterative process involved in balancing a road by hand is very time-consuming. Softree Optimal mathematically optimizes this process and achieves an optimal solution, often in a matter of minutes.

Reduced design time ultimately means reduced design cost, but it also means engineers can spend more time adding value to other aspects of their designs.

☑ REDUCE EARTHWORK COSTS

A truly optimal solution gives the lowest-cost alignment possible, based on the constraints you have entered. Most clients see savings of 10-30% on subgrade costs.

Small changes in vertical alignment can make a big impact on earthwork cost. The ability to evaluate multiple design options quickly allows engineers to come up with the best possible design.

Softree Optimal

ADVANTAGE OVER MANUAL DESIGN METHODS

MANUAL DESIGN IS APPROXIMATE

The current procedure for determining the vertical alignment is largely based on trial and error. The alignment is iteratively adjusted while the engineer looks for the lowest cost solution meeting the design criteria. This iterative process continues until the designer is satisfied. The problem is, this solution is approximate. As shown below, small changes in the alignment result in significant cost differences.

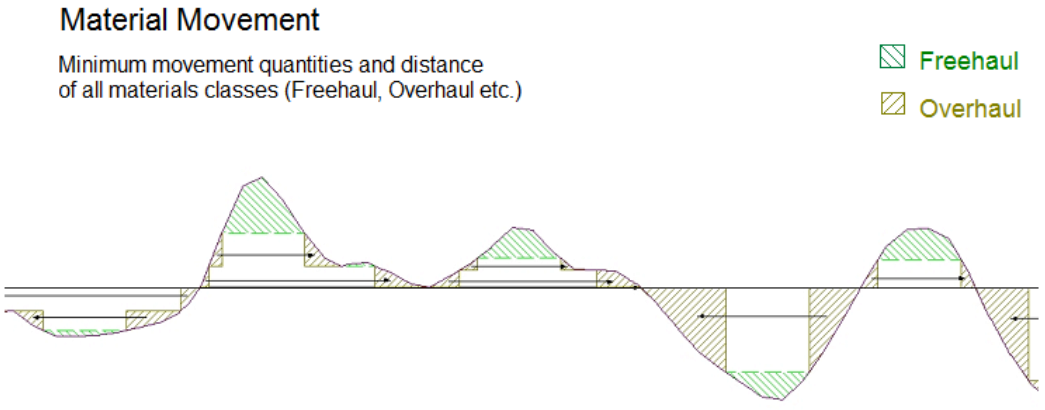
Small vertical alignment changes can result in huge cost savings

MANUAL DESIGN SIMPLIFIES MATERIAL MOVEMENT

Movement of material is a significant expense in road construction. In manual design, it is common to categorize materials into movement classes (Freehaul, Haul and Overhaul etc.) and minimize movement using a mass haul diagram. This procedure is largely qualitative and does not accurately account for individual material movements.

While finding the best solution, *Softree Optimal* considers the most efficient material movement in each of these categories based on hauling and loading costs. It also considers the movement of material downhill and location and cost of waste pits. Consideration for all these factors using conventional design methods is very difficult. As a result material movement is approximated or even overlooked.

Calculate optimal haulage while you design



5-minute Demonstration (via YouTube)

Optimize Civil 3D Corridor Designs

Watch a 5 minute demonstration on how Softree Optimal works with a Civil 3D Corridor project:

Softree Optimal for Civil 3D is a powerful tool that gives AutoDesk Civil 3D users the ability to minimize earth-work costs for road and corridor designs created in the Civil 3D environment. It also helps to reduce iteration within Civil 3D.

Softree Optimal for Civil 3D provides users with quantitative costing data to back design decisions. It can help to determine if a project is feasible and within budget before getting to detailed design.

Deliver the best, lowest cost design. Every time.

Case Study: MPE Engineering

Preliminary Design Time Reduced by 80%

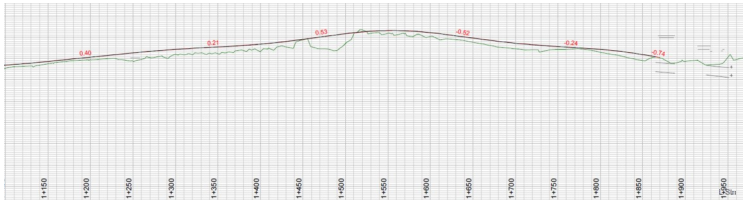
Softree Optimal

MPE Engineering Moves Project Ahead for City of Lethbridge

LOCATION: **City of Lethbridge, AB**

SOFTWARE: **Softree Optimal RoadEng®**
Civil 3D®
AutoCAD®

PROJECT: **43rd Street Paving**



STRICT BUDGET & TIME LIMITATIONS

The project objective was to grade, base, and pave an existing gravel road: 0.8km on the south end and 2.2km on the north end.

The south end had very strict budget limitations. We also had to work with a very limited right-of-way and tight geometric confinement. On top of that, there was political pressure to rush the construction schedule.

"REDUCED OUR PRELIMINARY DESIGN TIME BY ABOUT 80%"

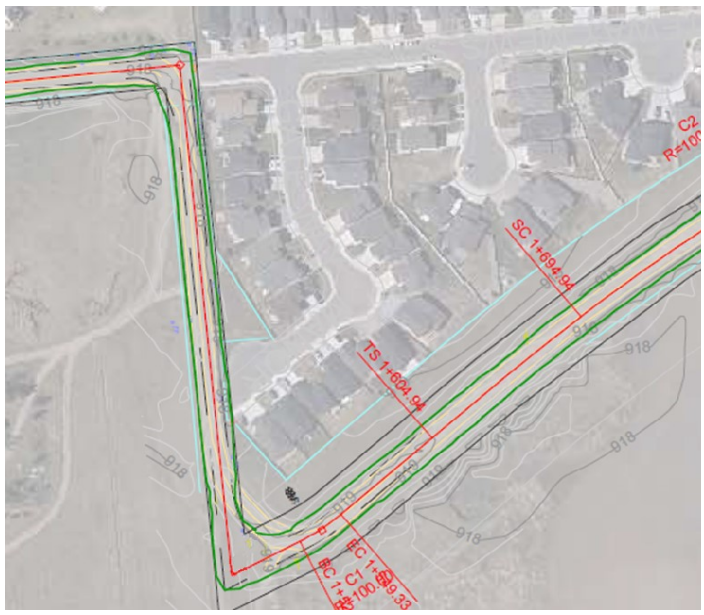
By using Softree Optimal, we were able to get the project designed on a very short timeline. I would estimate Softree Optimal probably reduced our preliminary design time by about 80% versus manually inputting and revising it.

The reduction in design time is always a bonus, but on this job, it was the difference between meeting the deadline and budget, and building the road; or having the client shelf the project for another year.

A QUICK FEASIBILITY CHECK

Softree Optimal helped to fit the alignment into the limited right-of-way and quickly verified that we could meet the budget requirements.

It allowed us to almost instantly run a feasibility check between our horizontal constraints and our design criteria, and then in only a few hours, we had the most cost-effective design roughed out that also met our site-specific requirements.



The project was tendered, and the bids all came in under budget.

A SMOOTH WORKFLOW

Our workflow involves using RoadEng to model the site and create our first alignment, and then using Softree Optimal to pick the vertical alignment and highlight any opportunities to improve our initial alignment. Once finalized we export the design to our survey equipment, to the contractor for machine control, and to AutoCAD to create final drawings.

THE RESULTS

- 80% REDUCTION IN PRELIMINARY DESIGN TIME
- OVERCAME CHALLENGE OF LIMITED RIGHT-OF-WAY
- ALL BIDS CAME IN UNDER BUDGET
- DEVELOPED EFFICIENT WORKFLOW
- SAVED PROJECT FROM BEING SHELVED

Case Study: Franklin County

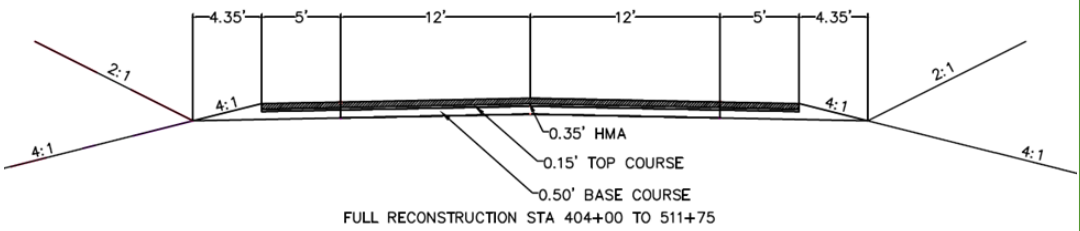
Faster & Lower Cost for County Road Design

Softree Optimal

Franklin County uses Optimal to significantly reduce design time

LOCATION: **Franklin County, WA**

SOFTWARE: **Softree Optimal RoadEng® Civil 3D®**



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 endpoints 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, 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.

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%**

Cost Comparison:
Engineer–led vs Softree Optimal Design

➲ Project Guidelines

Softree Optimal

Project Suitability

Indicators of a suitable test project for Softree Optimal are:

- Large cut/fill volumes.
- Unconstrained corridor (few vertical control points). *Examples: rural road, rail, or pipeline.*
- Steep or irregular topography.

General Requirements

- Less than 10 kilometers/6 miles in length. Longer lengths can be optimized in segments.
- Single alignment. Currently Softree Optimal cannot optimize multiple alignments at once. Intersections, interchanges or ramps are not included in the earthwork calculations, but can be set as control points.

Data Requirements

File	Accepted Formats
Original ground surface file	• LandXML, .dwg 3D faces, LiDAR (ASCII, .las)
Alignment files (horizontal and vertical)	• LandXML (for best results) • .dgn, .dwg, and .shp files (are acceptable, but do not provide as detailed results.)
Subgrade surface file *(if available)*	• LandXML
Cross section visual & list of corresponding station ranges	• .pdf

Design Controls, Costs,& Parameters

(These are not required, but are recommended for a complete demo.)

- List of constrained points. Provide station numbers, elevations and grades.
- Maximum/minimum values for: grades, curve lengths, k-value.
- Cut & fill cost of materials (per cubic yard), and any pit locations.
- Any additional constraints, such as the minimum height of fill.

Your data. 30-minute custom demo. See the savings for yourself.

➲ **File Uploads: www.support.softree.com/uploads**

➲ What to do next

Softree Optimal

Let us show you just how easy it is to reduce your earthwork costs on your next corridor project.

Talk to us about a free web demo.

Call us Toll Free at **1.866.519.6222** or email us at **sales@softree.com**

Your data. 30-minute custom demo.

See the savings for yourself.

www.softree.com/optimization

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