Frequently Asked Questions – Trimble Quantm Alignment Planning Solutions

What is the Trimble Quantm Professional Service?

How is the Trimble Quantm system purchased?
Can I access the Trimble Quantm system on a $/run basis?
Where has the Trimble Quantm system been applied?
Can Trimble provide references from Quantm system users?
How can I work out if Trimble Quantm system is suitable for my project?
Can the system be applied to mine infrastructure?
Has the system been applied in USA?
Has the system been applied in Europe?

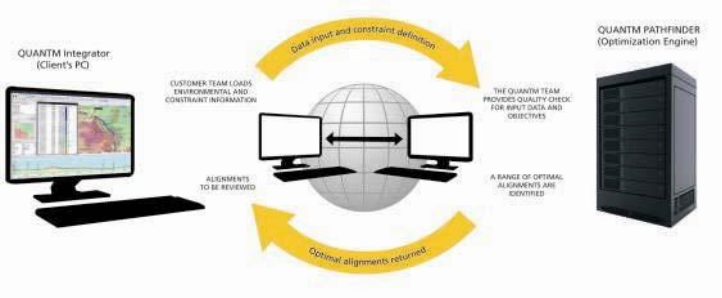
What is Trimble Quantm Desktop?

Are there different configurations of the Quantm Desktop software?
When would I want to use Quantm Desktop versus the service?
Does the length of the project influence which product I should buy?
How long does it take to process and return alignments with Quantm Desktop?
Is there training available for Quantm Desktop?
How does Trimble provide support for users of Quantm Desktop?

What are the benefits of using Quantm?

How can the system reduce the capital cost of alignments by so much?
How are these benefits achieved?
How does the system deal with environmental constraints?
How can the system be of benefit in narrow corridors?
How accurate are the quantities and costs generated in the system?
How much and what quality of data do I need to use the system?

What is the Trimble Quantm Professional Service?



The Trimble Quantm Alignment Planning system is a unique route optimization technology using a service business model that delivers a very high return on investment.

Planners use the Quantm Desktop (front end) software that allows them to input data, define project scenarios and review alignments on their standard personal computers. The planner's data inputs are delivered to the Trimble processing center, either directly or via the Internet. The optimization is carried out on Quantm Pathfinder, (back end) an advanced, secure IT platform with the results being returned to the client for review.

The Quantm system has been applied to both road and railway alignment selection. It has been successfully used on both very short projects (<1mile/2km) and on very long high speed rail and freight rail projects of over 1000 miles (1600km). The system is routinely used by state planning organizations on 3-20 mile (approx 5-40km) projects.

How is the Trimble Quantm system purchased?

Access to the Trimble Quantm technology is available in three forms:

1. as a software product that runs on a user's PC/laptop for road/rail projects of up to 50km in length (Desktop50), or

2. as a software product that runs on a company Server for road/rail projects of up to 250km in length (Enterprise250), or

3. as a professional service delivered using Trimble's data processing centers and supported by Trimble's technical specialists on alignment optimization and selection. The Quantm system is contracted on a per project basis for projects ranging from two miles to 1000 miles (3km – 1600km)

Can I access the Trimble Quantm system on a $/run basis?

The Trimble experience on road and rail projects globally is that the best results are achieved by planners who operate the system without concern for the marginal cost of each run.

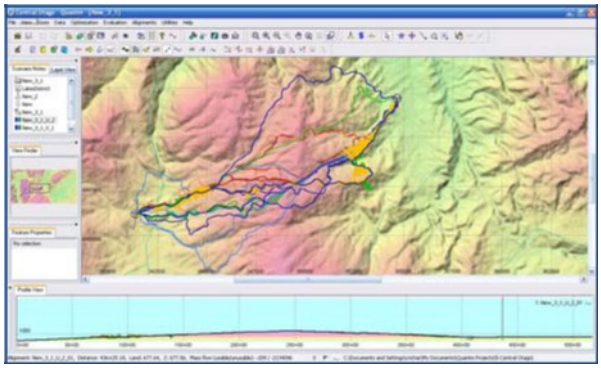
We therefore provide access to the system on a per project basis if you opt for the professional service. This allows the planner to run as many optimizations as required to investigate the (alignment and cost) impact of adding constraints, consider extra land-cost associated with acquisition, run sensitivity analysis to consider marginal cost of changes to grade and radii, and add new constraints as they arise through the EIS process or community consultation. Similarly, if you opt for Desktop50 or Enterprise250

Where has the Trimble Quantm system been applied?

The Quantm system has been applied to both road and railway alignment selection. It has been successfully used on both very short projects (<1mile/2km) and on very long high speed rail and freight rail projects of over 1000 miles (1600km). The system is routinely used by state planning organizations on 3–20-mile (approx 5-40km) projects.

The system has been applied on hundreds of road and rail projects globally and has been widely adopted in Australia and New Zealand, South Africa, Malaysia, Norway, Sweden India and on more than 50 US projects. The Quantm system has furthermore

The Quantm System has furthermore been applied on many projects in various countries including Canada, Mexico, Brazil, France, Spain, Italy, Portugal, China, Indonesia, Saudi Arabia, Liberia, Guinea and Cameroon.



Can Trimble provide references from users?

Yes. Please contact Trimble for more information.

How can I work out if Trimble Quantm system is suitable for my project?

You can contact your local Trimble dealer in your area to learn how the system can be of benefit.

Can the system be applied to mine infrastructure?

Yes. Trimble Quantm system has been successfully applied to mine access and mine to port rail projects in Australia and globally, assisting planners to find routes through complex community and landowner issues and delivering substantial savings. The Trimble Quantm system is an ideal application in the development of scoping studies, pre-feasibility and definitive feasibility studies.

Has the system been applied in USA?

Yes. The Trimble Quantm system has been applied on numerous projects in 18 states in USA.

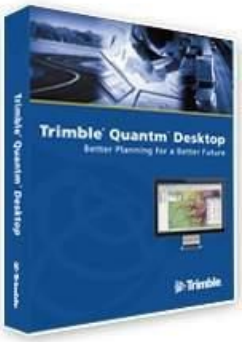
The system has already been applied on two stages of the California High Speed Rail project and is currently being used on a major highway feasibility/alignment selection study.

The California High Speed Rail Authority has documented that the study team used the Quantm system to meet all of the defined environmental and community constraints while delivering potential alignment construction cost savings.

Has the system been applied in Europe?

Yes. The system has been applied by RAVE on multiple high speed rail projects in Portugal, High Speed Rail studies in Russia, a 24 mile (40km) PACA TGV high speed rail study by Scetauroute (a subsidiary of Groupe Egis), a 14km highway project by Spanish engineering consultants Intecsa Inarsa and for scoping studies for highway and rail planning in a number of Eastern European countries. There are also multiple projects in Scandinavia that have benefited from the Quantm alignment planning software. Planners on these projects were able to deliver considerable savings, despite the tight constraints created by environmental, urban and social issues.

What is Trimble Quantm Desktop?



Trimble Quantm Desktop software offers many of the same benefits of the Quantm Professional Service but running on the local PC of the planning engineer or consultant.

To obtain the maximum value out of the desktop software, Quantm Desktop should be applied by skilled planners and engineers who are experienced and understand the processes involved in road infrastructure planning. Many issues associated with planning are subjective and the interpretation of these issues into constraints for the system is a key function of the planners and engineers.

Are there different configurations of the Quantm Desktop software?

No. Quantm Desktop is currently available as a Desktop50.

The Quantm Desktop50 can be applied at every step of the planning process from initial scoping through feasibility and value engineering. Desktop50 performs corridor identification, and full horizontal and vertical alignment optimization. It considers environmental, social, geological, engineering, and construction constraints to provide and optimal alignment for detailed design. Quantm Desktop50 is available for project study areas of 50km x 50km.

When compared to results using traditional planning methods, Quantm Desktop50 can provide 5-15% reduction in project planning time and cost for road projects.

When would I want to use Quantm Desktop versus the service?

Trimble recommends using the service for road projects over 50km, for all railway projects, or when you want to draw on the expertise of the Trimble Planning Solutions technical experts to assist you with a project of any size.

For local and regional road projects in study areas of less than 50 x 50 km that you want to manage independently, use Quantm Desktop50. Users can deploy Quantm Desktop50 for multiple planning projects at a small scale, vertical optimizations of existing alignments, local re-alignment projects or even for planning haul roads in mines or on larger projects. The Quantm Desktop50 solution is upgradeable to the Quantm Enterprise system if required for specific complex or large planning projects.

For additional information on when to use Quantm Desktop or Quantm Enterprise System, please discuss with your local Trimble dealer

Does the length of the project influence which product I should buy?

Yes. Trimble Quantm Desktop50 has a maximum study area model size of $50km^2$

How long does it take to process and return alignments with Quantm Desktop?

The processing times for the return of alignments is dependent on the complexity of the terrain and the complexity of the GIS and constraint data associated with the project. On typical rolling terrain with constraint and GIS information, twenty -five alignments will typically be returned within an hour for an unseeded or free to roam optimization.

Is there training available for Quantm Desktop?

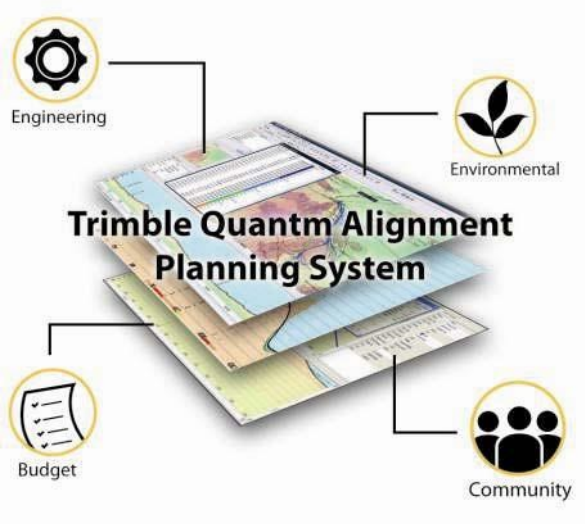
Training for Quantm Desktop is available directly from your dealer or through the Trimble Knowledge Network online training system.

How does Trimble provide support for users of Quantm Desktop?

Support for Quantm Desktop is provided through your local Trimble dealer for Quantm Desktop.

What are the benefits of using Quantm?

Planners consistently achieve substantial alignment construction cost savings, as well as reducing the planning cycle time, enhancing collaboration and improving the consultative process associated with environmental analysis and community opinion. Using either the Trimble Quantm system or Quantm Desktop, planners
have the ability to demonstrate that all
possible alternatives have been considered.



The cost of not using Quantm technology can be extensive delays to a project, dissatisfied community, litigation, or the project even being postponed or canceled because the projected cost of construction means that the project is no longer deemed economically viable.

How can the system reduce the capital cost of alignments by so much?

The system has demonstrated that the earthworks and structures, such as bridges, tunnels and retaining walls are very sensitive to small changes in an alignment. Even moving an alignment only vertically, or within very narrow corridors can make a major difference in costs. The advanced complex algorithm

performs a true tri-dimensional optimization by applying millions of permutations and combinations and thus achieving a reduction in the overall capital cost of an alignment.

This sensitivity, coupled with the complexity of projects where many variables have to be considered simultaneously, results in the manual process being highly unlikely to find the optimal solution. These variables include: terrain; geometric standards; avoid zones to address social and environmental concerns (sometimes conflicting); additional cost zones; geological data; existing features (road, rail, river, pipelines, etc); and unit costs.

How are these benefits achieved?

The Quantm system has been independently assessed by government agencies, public and private companies and consulting engineers throughout the world and their studies document the benefits achieved by their planning organizations when using the Quantm system as a tool to aid in the decision making process. Agencies, companies and consulting engineers who have experienced the benefits of the Quantm system repeatedly use the system as a standard part of their planning process.

The planning process is becoming increasingly complex with alignments being influenced by terrain, design standards, environmental analysis, public consultation, community influence, cultural heritage, crossing rules for existing features, geology, noise mitigation and unit costs. The conventional approach, while supported by CAD (design) or GIS (Geographic Information Systems), is fundamentally a manual process that relies on the planner being able to balance all of these issues in locating an alignment.

The Quantm system investigates millions of alternatives, driven by and based on the input of the planners and engineers. It then compiles and summarizes the results, enabling planners and engineers to concentrate their time and skills on the analysis and decision making.

How does the system deal with environmental constraints?

In addition to being able to define special treatment zones that protect areas of cultural heritage or environmental sensitivity, the system allows planners to integrate the input from the various workgroups involved in the environmental analysis and provides a detailed audit of the process taken to arrive at a preferred alignment(s).

This ability to prioritize environmental and community constraints and document the steps to objectively determine the solution that best balances economic, social and environmental issues is unique to the Quantm system.

The speed of the system allows the avoid/mitigate constraints to be defined iteratively, enabling planners to prioritize no-go zones and determine the alignment implications of each addition, and at what point the design standards of the project may be compromised by the constraints created by these zones.

The system also allows planners to carry out comprehensive sensitivity analysis to determine the effect of changes to grade, radii, creation of new zones or earthworks limits to determine the balance between construction cost and operating cost, with the associated environmental and operational impacts.

How can the system be of benefit in narrow corridors?

The challenge for many infrastructure projects is meeting all of the constraints defined by the environment, urban development and community issues while achieving required design standards. Trimble has consistently demonstrated improved alignments, meeting defined constraints, improving quality and cutting costs in these conditions.

Even when the system has been restricted to a vertical optimization (where the horizontal alignment is fixed) significant savings have been achieved.

How accurate are the quantities and costs generated in the system?

There are many factors that affect the final quantities and costs on a project, such as the quality of the underlying terrain model, soil and geological information, workflow constraints on the project during construction, and the level of detail provided in the planning phase compared to the detailed design phase.

The system provides the ability to assess alternatives based on the quantities and the relative cost differences. The absolute accuracy of those costs compared to the final construction costs depends on the quality and level of detail in the input data.

How much and what quality of data do I need to use the system?

The minimum data to begin is a preliminary digital elevation model, such as those available from various sources on the Internet, together with initial design constraints and cost information.

As the project progresses, the level of detailed input depends on the planners and engineers. It can be supplemented with additional and more accurate data, gathered as the project proceeds from scoping through to the detailed feasibility study and design.

As an example, the project may start with 100m regular grid terrain data, a single default geology and only major features. As the study area is narrowed to a preferred alignment, this may be supplemented with 10m regular grid terrain data or very accurate Airborne Laser Survey (ALS) data and geology data that defines multiple zones and strata, each with their own batter, bench (shoulder) requirement for construction and unit cost for extraction. This results in better alignments and more informed decisions at all stages of the project.

While it has been consistently proven that the system will allow project planners to deliver better outcomes for any given data set, it should be noted that the quality/accuracy of the output from the system is directly related to the quality of data input.