

COMPANY

Multiconsult

LOCATION

Fet, Norway

SOFTWARE

Autodesk® InfraWorks™

Bringing transportation plans to life

Multiconsult AS uses InfraWorks for early planning and visualization of transportation and infrastructure projects

With minimal effort, InfraWorks helps us create models that simulate our transportation and infrastructure design concepts within the surrounding environment and present the results to our clients and other project stakeholders in the form of high-quality project renderings and animations.

—Philip Hon

Road Designer/BIM Coordinator
Multiconsult AS



View of a Single Tower Cable-Stayed Bridge from 1 of 12 proposed road corridors.

Project summary

The Norwegian Public Roads Administration (NPRA) has begun a road improvement project for Regional Road 22 (rv.22), an important transportation route running through the municipality of Fet, approximately 30 kilometers east of Oslo. The road is being expanded to four lanes to relieve congestion, increase capacity, and improve emergency operations. Additionally, a new bridge over the nearby Glomma River will improve waterborne traffic on the river.

Multiconsult AS, one of the leading firms of consulting engineers and designers in Norway and Scandinavia, was tasked with the development of early stage designs and simulations for the project. For almost 100 years, Multiconsult has played a key role in developing some of Norway's most important projects. The firm has been using Autodesk Building Information Modeling (BIM) solutions such as AutoCAD® Civil 3D® and Autodesk Revit® software products for over a decade to help improve project design and documentation. In 2011, Multiconsult also implemented Autodesk® InfraWorks™ software to develop and visualize conceptual designs.

The challenge

"The project involves more than just expanding an existing roadway," explains Multiconsult project leader Birger Opgard. "Our study included the investigation of new routes for sections of the road, as well as various alternative locations for a new river crossing. In addition, one of NPRA's requirements was a presentation of the preliminary design options in the form of 3D project visualizations."

The solution

Multiconsult used InfraWorks to quickly and cost effectively create and present multiple preliminary design alternatives—visualized in the context of the existing environment—using a single model. "In Norway, there is increasing client expectation and demand for the use of 3D models," says Philip Hon, a road designer and BIM coordinator for Multiconsult. "With minimal effort, InfraWorks helps us create models that simulate our transportation and infrastructure design concepts within the surrounding environment and present the results to our clients and other project stakeholders in the form of high-quality project renderings and animations."

Aggregate a single data-rich model fast

Develop preliminary design alternatives and visualizations in the context of existing environments more quickly and cost effectively

Get the detail right

Multiconsult's traditional method for creating project simulations of conceptual transportation or infrastructure projects was to use 3D modeling software products that are normally used for detailed design. Individual components of the project—such as roads, bridges, and tunnels, as well as the existing environment—would be modeled using a range of software applications, and then these individual design elements were imported into a 3D architectural visualization tool used widely within Multiconsult. "The time and effort to generate visualizations increased exponentially as the project area and complexity increased. In addition, any changes to the design had to be made in the original models and the visualizations recreated," says Hon. "But for preliminary design, this high level of detail is not necessary and, in fact, becomes burdensome during early planning efforts."

InfraWorks enabled Multiconsult to create a large model of the surrounding environment from existing 2D CAD, 3D model, GIS, and raster data; and then develop and evaluate its conceptual design alternatives in that single model. The team started with digital terrain models of the project area, encompassing approximately 30 square kilometers. Over this terrain, they merged and draped 2D and 3D data representing existing water bodies, bridges, railways, roads, roadway junctions and interchanges, and buildings. "The GIS data included the building footprint and height, and the client required that existing buildings in our concept model be shown with their actual heights," says Hon. "So to make the model more realistic-looking, we even used features within InfraWorks to define random roof patterns and building facades."

Once the base model of the existing environment was complete, Multiconsult imported some early stage design elements developed in other software applications, such as models for the new Glomma River bridge and 3D road alignments from a software application commonly used in Norway for road design. With the road alignments in place, the designers used drag and drop features of InfraWorks to assign road types (such as a divided highway versus a local road) to the imported road alignments. The team also used drag and drop styles for existing tunnels and bridges, saving days of work by not having to model tunnel portals and bridges.

"With InfraWorks, there was no need to bog down the model with detailed road features such as shoulders or slopes to the existing terrain," says Hon. "The model only contained stylized versions of road types, which are more than sufficient for a preliminary design." The team also used InfraWorks to sketch new conceptual design elements directly within the software (such as adding landscape features) or edit existing features ('demolishing' buildings in the path of the new road for example). In addition, Multiconsult added hyperlinks to the InfraWorks model, associating road corridors in the model to profile drawings of the roads and terrain—enabling them to quickly open source data in their client meetings.

The resulting model included preliminary design alternatives for the road alignments, bridges, tunnels, and interchanges. "In this single InfraWorks model, we developed 17 possible road alternatives and eight different designs for the new bridge across the river," says Hon. "Despite the large amount of data, we could navigate smoothly through the model during our design efforts and during presentations to our client."

Design changes were accomplished in two ways: by directly adjusting design elements within the InfraWorks model, or—when appropriate—updating the source data (such as the road alignments) and then simply refreshing that data source in InfraWorks to update the model. "By linking the data source to the model, any changes we made to the original data sources could be automatically reflected," says Hon.



Another view of Cable-Stayed Bridge.



View of a Twin Tower Cable-Stayed Bridge.

Communicate visually

During meetings with NPRA and affected communities, the InfraWorks model enabled these stakeholders to virtually experience Multiconsult's design plans. "With InfraWorks, we could convey our design proposals for the road corridors using visual methods and show them how different design alternatives would look in the surrounding environment," explains Multiconsult traffic planner Jan Orsteen. "For example, in the model we could virtually navigate to the river crossing and let everyone see how the different options for the bridge would look from various angles and locations. Or we could zoom into an area that has chronic traffic jams and show the client our different ideas for reducing congestion."

Multiconsult also used the InfraWorks model to produce high-resolution still images and animations that were presented during meetings with the client and project stakeholders. These project visualizations have since been used on NPRA's website as well as the websites of affected municipalities and counties to help explain the design proposals to the public.



Proposed upgrade of existing traffic light regulated intersection

In contrast to studying plans on 2D drawings and maps, the 3D project visualizations gave us a much better idea of how the various road corridors will affect the landscape. We have received a lot of positive feedback on the project simulations and there is no doubt that the InfraWorks software raised the quality of the feasibility study and increased interest in our road planning effort.

— **Edgar Sande**
Project Manager

Develop and communicate the best design alternatives to exceed your client's expectations

The result

Multiconsult's design efforts on the Fet roadway project resulted in a wide range of possible road alternatives and designs for the new bridge, and construction for the initial phases of the project began in May 2013. "InfraWorks helped our designers simulate the environment and present our design alternatives within the context of the surrounding environment," says Hon. "As a result, we succeeded in delivering a project that met our client's requirements within the time and cost limits."

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"Finally we have a tool that helps our team quickly develop many different preliminary design alternatives and helps our clients make important decisions early in the planning stages of the project," says Opgard. "By not having to spend countless hours using 2D tools to generate our design, we have more time to develop many more planning alternatives. And we can develop those alternatives based on existing data sources and evaluate them against the backdrop of the existing environment."

"InfraWorks enabled us to create high quality conceptual models and visualizations with a minimum of effort," says Hon. "The software also improved communications with our client—helping them to better understand the plans we were developing and make decisions faster."

For more information, visit
www.autodesk.com/BIM



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—Birger Opgard
Project Leader
Multiconsult AS



Close-up view of bridge design.