COMPANY
iNFRANEA

LOCATION
Antwerp, Belgium

SOFTWARE
Autodesk® AutoCAD®
Autodesk® AutoCAD® Civil 3D®
Autodesk® Revit® products
Autodesk® Navisworks® Manage
Autodesk® BIM 360™ Glue®

Making room for rivers

iNFRANEA uses BIM to model, coordinate, and plan a river-widening project on the River Waal Nijmegen

There are so many moving parts on a project like this. When will the dredging ship arrive? Where will the 5 million cubic meters of earth it will dredge go? How does that affect existing bridges, new bridges, and temporary structures? Those are just a few questions. Navisworks provides a way to keep track of activities in a 3D environment whilst also coordinating efforts across disciplines.

— Johan Kuppens
President
iNFRANEA

Visualisation of the project Room for the river Waal Nijmegen. Image courtesy of the municipality of Nijmegen.

Introduction

Climate change is expected to increase the risk of floods. So what can countries crossed by multiple flood-prone rivers do about it? The people of the Netherlands have launched a massive flood prevention initiative designed to improve environmental conditions in more than 30 of the country's locations. These measures along the rivers IJssel, Rijn, Lek, Nederrijn and Waal together make up the programme Room for the River. Room for the river Waal Nijmegen is one of these measures. The widening of the River Waal where it passes through the municipality of Nijmegen is one of the most ambitious undertakings in the programme. The river Waal bends sharply near Nijmegen and moreover, it narrows itself in the form of a bottleneck. That the river may flood at high water as a result became clearly evident in 1993 and 1995. Adequate measures are necessary in order to protect the inhabitants of the city against the strength of the water.

The project involves moving an existing dike 350 meters inland, and dredging an ancillary channel, creating a new island in the river. This will create an island in the Waal, and a unique urban river park in the heart of Nijmegen with room for living, recreational activities, culture, water and nature. The solution is far-reaching, yet sustainable. The municipality of Nijmegen is proud that it has formulated a plan that accounts for safety and that will strengthen the spatial quality of the environment. Along with the widening and the mix-use park, the project requires the construction of three bridges.

As multiple firms combine their expertise to engineer the design/build project, the lead contactors wanted proactive—and constant—coordination across the team. They turned to iNFRANEA, an infrastructure-focused firm with deep expertise in Building Information Modelling (BIM), for help.

"BIM lets you use intelligent, 3D models to engineer and understand projects," says Johan Kuppens, president and founder of iNFRANEA. "A model-based process opens the door to more visual and intuitive project coordination, but you still need a way to bring multiple models together. Autodesk® Navisworks® Manage provides the aggregated model we need to keep the large project team moving in the same direction."

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Creating a single model from ten different disciplines

The challenge

More than 10 different engineering disciplines contribute to the River Waal project. Their designs cover every aspect—from the permanent changes to the river and new bridges, to the temporary structures that allow the work to proceed. In fact, managing the overlapping temporary and permanent aspects of the project has proved to be one of the most difficult coordination challenges of the project.

"Even on a modest project with a little dredging and some minor changes to an existing bridge, you rely heavily on temporary structures," says Jaap de Boer of iNFRANEA, who serves as BIM manager on the River Waal project. "These temporary features allow work to proceed and reduce the impact of construction on people's lives. A project of the scale of the River Waal widening requires substantial temporary work, and it all has to be constructed and removed in ways that don't hinder the overall project. A structure that's essential today may need to be moved in six months, so we're coordinating a very dynamic environment that accounts for both the engineering models and time."

The solution

iNFRANEA decided to coordinate the project using a single model aggregated from all the models provided by the organisations working on the project. Importantly, this single model needed to be able to account for time as well as structure and location. iNFRANEA chose Autodesk Navisworks Manage software to help coordinate the BIM process on the River Waal project. That's because Navisworks not only aggregates models and helps identify conflicts, it also helps to plan projects by linking models to construction schedules.

iNFRANEA also decided to make BIM coordination available in the field with support from Autodesk® BIM 360™ Glue® web service. The cloud-based service gives team members almost anywhere, anytime access to project models on Apple® iPad® mobile devices.

"There are so many moving parts on a project like this," says Kuppens. "When will the dredging ship arrive? Where will the 5 million cubic meters of earth it will dredge go? How does that affect existing bridges, new bridges, and temporary structures? Those are just a few questions. Navisworks provides a way to help keep track of activities in a 3D environment whilst also coordinating efforts across disciplines."

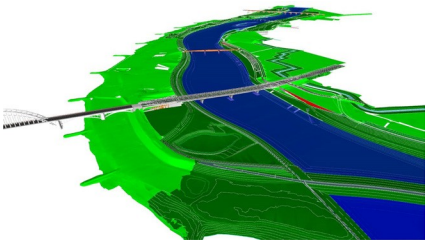
"Being able to view and interact with the model on mobile devices has the potential to transform the way people communicate on projects," says de Boer. "You can access so much information right in the field with BIM 360 Glue. As construction progresses, we expect more team members to take advantage of mobile access to information."

Real-time coordination

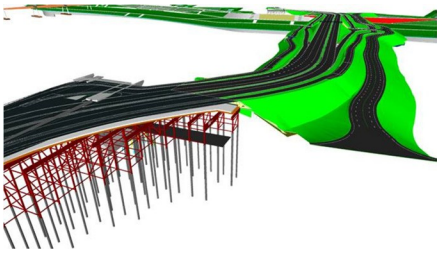
In advance of the weekly design coordination meetings, iNFRANEA aggregates project models from more than 10 different disciplines into the single model maintained in Navisworks. Many of the engineering and design firms involved in the project base their BIM design on Autodesk® Revit® software products and Autodesk® AutoCAD® Civil 3D® software. Others use software from another provider. Navisworks works with all files types in use on the project. After bringing the latest models together, iNFRANEA identifies clashes, and helps the team to constantly monitor potential interface risks in this complex project.

> We go through the model systematically. When there are clashes, we discuss who will address the issue… Sometimes there are no clashes at all because the whole team is more aware of the details of what others are doing. So, regular coordination in Navisworks helps us to spot and prevent problems.
>
> **— Jaap de Boer**
> BIM Manager
> iNFRANEA

Visualisation of completed project. Image courtesy of the municipality of Nijmegen.



Centralise and help identify clashes through 3D-designs in Navisworks. Image courtesy of iNFRANEA.



3D and 4D interface management for all temporary works. Image courtesy of iNFRANEA.

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BIM coordination helps resolve more than 15 major interface conflicts on the project

"We go through the model systematically," says de Boer. "When there are virtual clashes, we discuss who will address the issue. Everyone agrees, and we move on to the next issue, if there is one. Sometimes there are no clashes at all because the whole team is more aware of the details of what others are doing. So, regular coordination in Navisworks helps us to spot and prevent problems."

Avoiding the bombs

With the permanent structures and alterations to the river located in the most favorable places, the temporary structures and staging areas must fit around them. iNFRANEA is using a BIM-based process to plan movements of the ever-changing temporary structures required on the project. There's also a dangerous—and hidden—existing condition that the team must avoid. The River Waal at Nijmegen was the site of a major battle in World War II, and there are unexploded bombs underground in areas near the project. The Navisworks model includes a map of the bomb locations, which helps the team plan when and where to put temporary elements—safely.

"We joke that we have the BIM model and the bomb model," says Kuppens. "Actually, the locations of the bombs are mapped in the single integrated model. No one wants to clash with a bomb. A clash between a pipe and a retaining wall may add time or costs to a project, and Navisworks is definitely helping us avoid those kinds of problems. But helping to keep people safe is an even more important use of the model."

The result

Since taking charge of BIM coordination on the River Waal project, iNFRANEA has kept track of clashes, and the results have been eye-opening. "We've spotted numerous minor clashes, and for each, there are savings in cost and time," says Kuppens. "The big benefit from Navisworks has been in the area of what I would call major interface conflicts. We've found and resolved more than 15 so far. That's the essence of our service, eliminating 'failure costs' well before cost increases or delays surface, at a later stage. And so far, our BIM-process has delivered error-free construction data. Proactive, model-based coordination helps prevent them from occurring in the first place."

To learn more about BIM for Civil Infrastructure, visit, www.autodesk.com/ids. To learn more about BIM 360, visit, www.autodesk.com/bim360.

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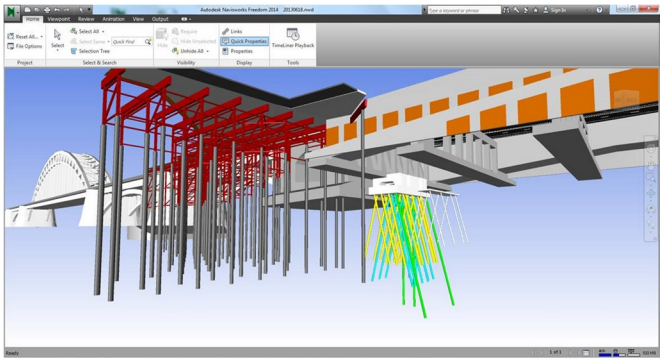
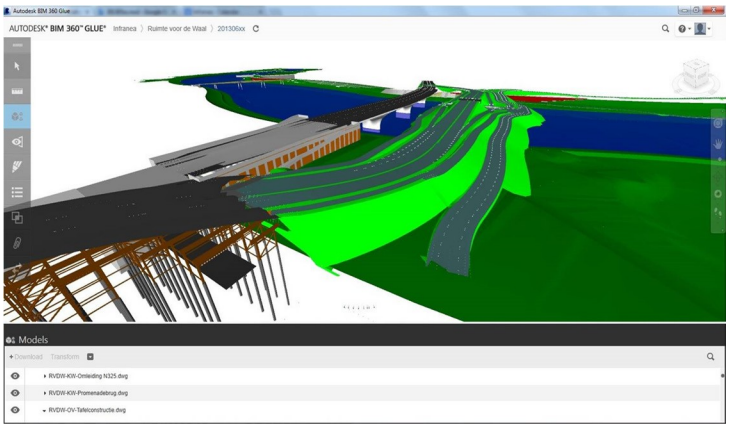


3D clash controls for new and existing foundations. Image courtesy of iNFRANEA.



Sharing the BIM model via Autodesk BIM 360 Glue. Image courtesy of INFRANEA.

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