COMPANY

Atkins

LOCATION

U.K.

SOFTWARE

AutoCAD® Civil 3D®
HoleBASE SI Extension for AutoCAD® Civil 3D®
HoleBASE SI

Combining geological modelling and BIM for infrastructure

HoleBASE SI and AutoCAD Civil 3D help Atkins design a new tunnel under London's River Thames

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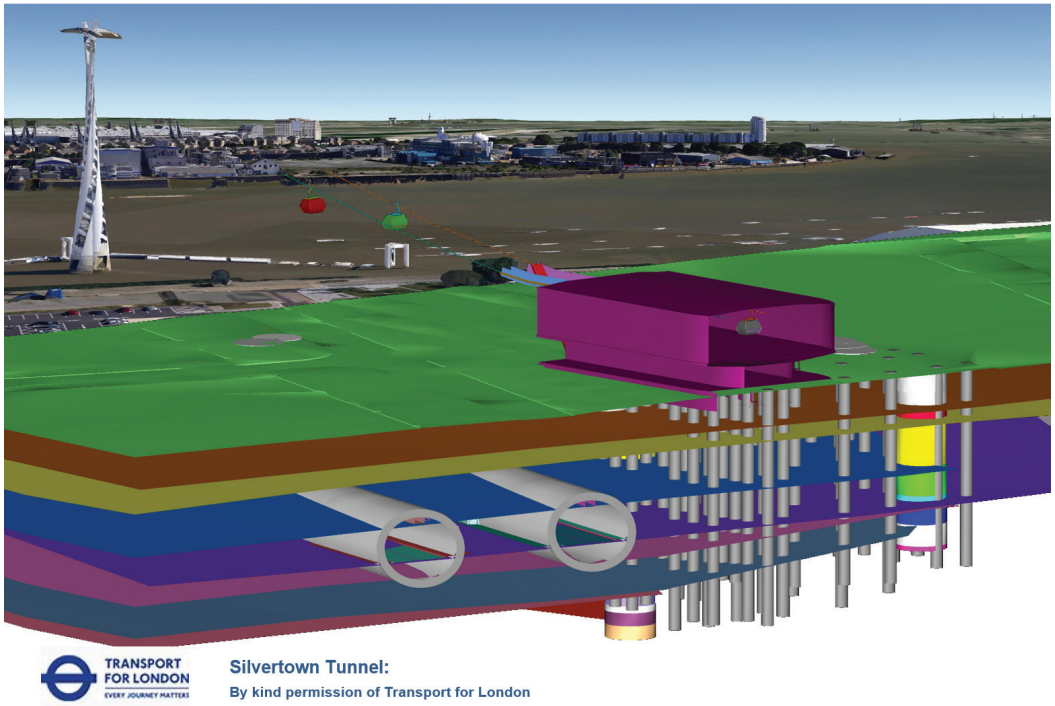
—Simon Miles
Principal Geotechnical Engineer
Atkins



Images courtesy of Atkins and Transport for London.

The project

Transport for London (TfL)—the statutory authority responsible for most aspects of Greater London's transport system—is planning a new road tunnel under the River Thames in East London. The proposed Silvertown Tunnel between Silvertown and North Greenwich will ease the strain on the nearby Blackwall Tunnel and other existing crossings. Engineering and design consultancy Atkins developed the project's reference design.

The challenge

The south portal of the tunnel route is the site of a demolished gas works. The soil in that area is contaminated and there are still remnants of the underground foundations of the plant. On the south and north banks, the proposed tunnel location comes close to the pylon foundations of the Emirates Air Line cable car. Additionally, the north bank tunnel portal is in the area of the now-filled western entrance to the Royal Victoria Dock and some demolished warehouses. Like the gas works on the south bank, there are still underground remnants of these features.

"The tunnel on both sides of the river will need to thread through heavily industrialized areas of London, with a myriad of existing soil types, roads, foundations, and other subsurface structures, as well as subsurface remnants of demolished structures," explains Simon Miles, a principal geotechnical engineer with Atkins. "To reduce the overall project cost and risk, we needed ways to better see and understand subsurface soil conditions in the context of existing built conditions, and calculate earthwork quantities and areas that will be impacted by construction." The increased costs of treating contaminated materials makes accurate volume calculations vital for assessing cost implications.

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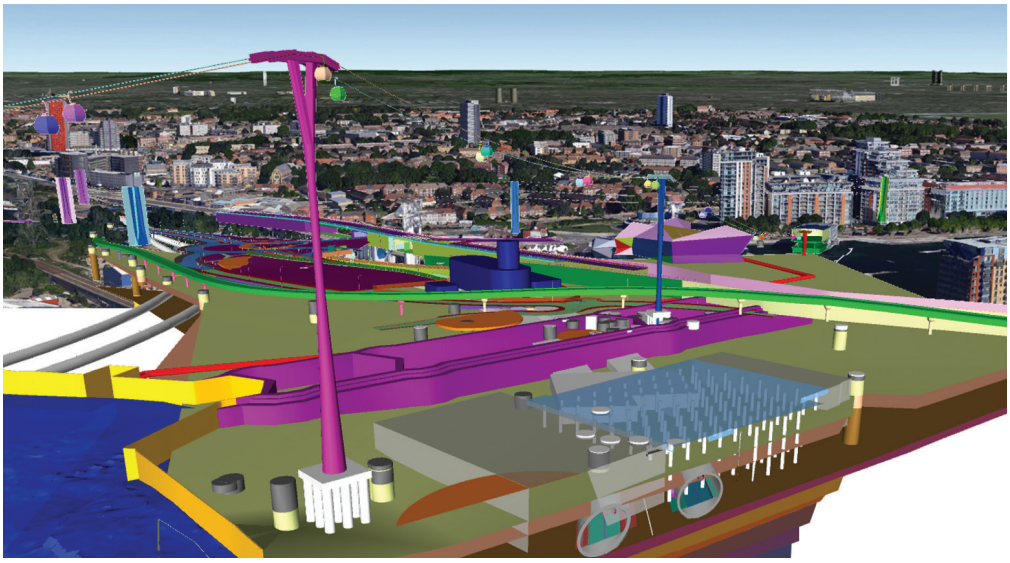

The solution

For many years, Atkins has been using AutoCAD® Civil 3D® from Autodesk for civil engineering design and documentation, and HoleBASE SI from Keynetix for geotechnical knowledge management. For its preliminary design of the Silvertown Tunnel, the firm used the HoleBASE SI Extension for AutoCAD Civil 3D to quickly visualize geotechnical data in the model-based, multidisciplinary Civil 3D environment.

"With the HoleBASE SI Extension for Civil 3D, we could quickly combine, organize, and manage geology data, and then see that data in the context of existing and proposed above and below-ground structures," says Jerome Chamfray, an Atkins BIM Manager. "This helped us visually understand and evaluate the design alignment, pinpoint potential construction obstructions, and determine what new site investigations were needed." Moreover, Atkins used Civil 3D to automatically generate earthworks quantities for project costing and risk assessment.

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>
> —**Jerome Chamfray**
> BIM Manager
> Atkins

Geological modelling

Atkins planned its ground investigation by importing historical data (from previous Atkins projects in the same area and British Geological Survey data) into HoleBASE SI to determine requirements for new borehole data. "By reusing this historical data in HoleBASE SI, we significantly reduced the amount of exploratory holes that were required on-site, which translated into reduced project time and cost for our client," says Miles. After completing the on-site ground investigation, the data was merged with the historical information in HoleBASE SI for engineering interpretation and stratum identification.

In parallel, the firm used Civil 3D to create an existing conditions model of the project area (both above and below the surface) based on a variety of data sources such as TfL's as-built data for the cable car foundations, and historical data for the demolished gas works foundations, warehouses, and piers and foundations of the old dock entrance. Next, Atkins added the proposed tunnel alignment and other proposed structures relating to the tunnel.

The firm then used the HoleBASE SI Extension for Civil 3D to automatically layer the geotechnical data into the Civil 3D model. This enabled Atkins engineers to visualize the geotechnical data in relation to the existing site and proposed design. "Having a live link between the HoleBASE SI database and Civil 3D dramatically improved our design process," says Chamfray. "Whenever the HoleBASE SI database was updated, those changes were automatically reflected in the Civil 3D model and we didn't have to waste time recreating or manually synchronizing the geotechnical data in Civil 3D, which gave us more time to refine and improve our design."

Atkins also used Civil 3D to extract volumes for the different materials that will be excavated. "We were able to identify areas that will require specific treatment on-site during excavations, such as the treatment of hazardous material for example," says Miles. "This gave us a clearer picture as to what material could be reused for construction and helped us refine our cost estimate."

Production of geological sections and other inter-disciplinary checks were also facilitated by having all the information in a common data environment. "The Civil 3D model helped us maximize efficiency and increase our level of design confidence," says Miles. "This 3D design environment allowed us to visualize the subsurface conditions in a new way—giving us a better understanding of the site for more informed decision-making."

For example, the original design for the road as it entered one of the portals placed the road's ground slab below the local water table level, which would have led to a continuous flow of ground water into the tunnel. "With the ground slab and the geological model in the same 3D environment, we could easily see and quickly make the necessary design changes," says Miles. Atkins also used the Civil 3D project model in Autodesk® Navisworks® for client and partner design reviews and walkthroughs, and in Autodesk® 3ds Max® to create high-end project renderings for TfL's public outreach efforts.

The result

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For more information, visit **www.autodesk.com/civil3D** and **www.keynetix.com/holebase/civil3d**

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