

National Highways Introduces Digital Twin Technology to Transform Engineering Information Management, Delivering U.K. Strategic Network Projects

Piloting the iTwin Platform and ProjectWise on A303 Stonehenge Tunnel Project Drives Efficiencies and Environmental Sustainability at the World Heritage Site

- *A303 Stonehenge tunnel is part of the National Highways complex infrastructure program to improve network connectivity in the United Kingdom.*
- *These complex infrastructure projects generate and require massive piles of data that have not been well federated and managed.*
- *National Highways leveraged digital twins for better data federation, streamlining roadway design and construction management to preserve the area around the Stonehenge World Heritage Site.*
- *Their success was predicated on the development of a digital engineering information management solution using the iTwin Platform and ProjectWise.*

Reuniting a Cultural Landscape

The A303 Stonehenge tunnel scheme is part of National Highways' (NH) strategic road network improvements and complex infrastructure projects to enhance connectivity throughout the United Kingdom. Providing a critical link between the South East and South West of the country, the existing corridor is congested, impeding economic growth and impacting the visual landscape and visitor experience of the World Heritage Site. Committed to preserving pre-historic Stonehenge while offering tourists a more open, exploratory visit, NH is constructing a new dual carriageway and an underground tunnel closely following the existing A303 route. The upgraded scheme will connect the two habitats on either side of the site, reuniting the entire cultural landscape while reducing congestion, ensuring reliable journey times, and meeting future traffic demands. The changes will also introduce significant environmental benefits, creating new chalk grassland and enhancing biodiversity across the area.

Information Rich, Data Accessibility Poor

As part of NH's complex infrastructure program, all phases of the Stonehenge scheme planning, design, construction, and operations presented massive amounts of data, which needed to be organized, stored, and readily accessible to project teams and stakeholders. Like many organizations, NH is information rich with siloed data that lacks connection and full potential for added value and insight, resulting in inefficiencies and costly rework. "By not maintaining a full fidelity copy of engineering design data with ontology intact, [we] had no way of repurposing design data and frequently incurred substantial costs each year recollecting data on existing assets to support updates to or new schemes of work," stated Andrew Smith, digital engineering lead at National Highways.

NH wanted to understand how the exchange of design data could be improved, digitized, expedited, and enhanced to provide higher levels of accessibility, security of digital assets, and cost-saving benefits. Their previous data management processes relied on paying third parties within their supply

chain to store data on their behalf, costing thousands of pounds a year. This situation was further complicated by having information delivered in PDF format, making data review and interrogation difficult, as well as requiring installation of additional viewing software on local PCs. LiDAR and drone survey data and photogrammetry were often not delivered or just stored in mass storage locations with no associated metadata. “We needed to develop a digital engineering information management solution that would maintain data fidelity and relationships of delivered information,” said Smith.

Leveraging iTwin and ProjectWise Provides Digital Framework

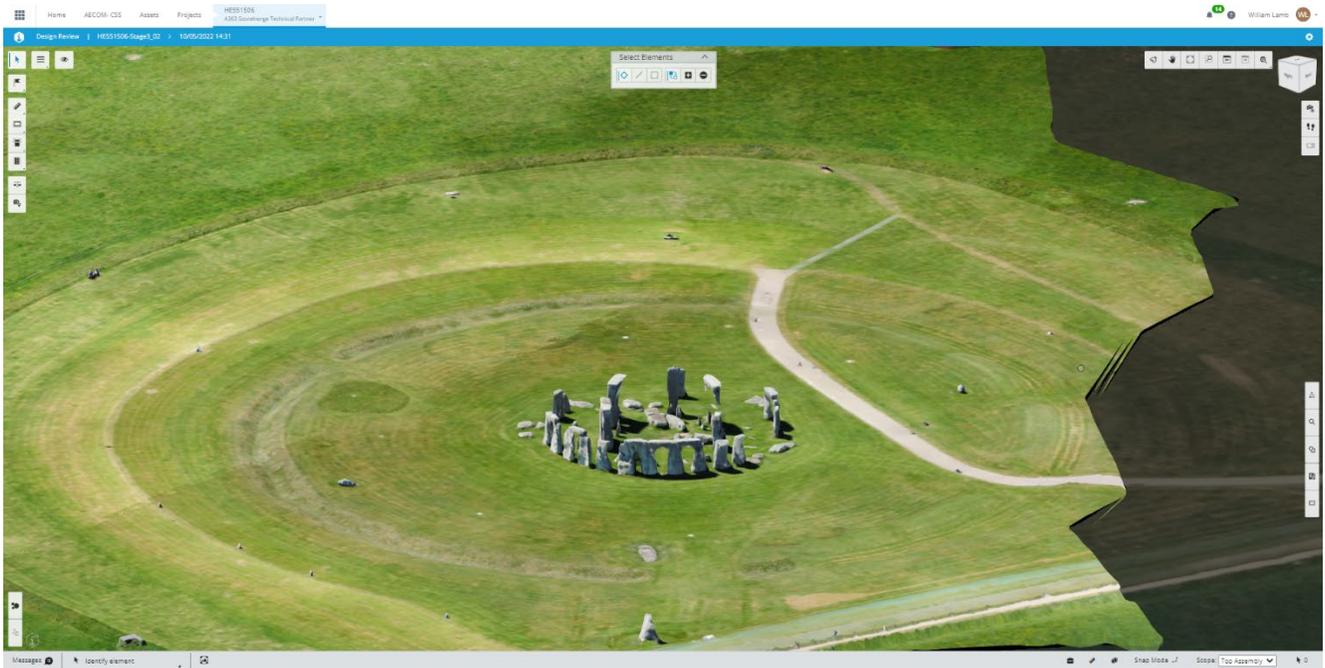
NH selected the Stonehenge project to evaluate their information strategy and improve their data architecture and intelligence. “In the absence of good quality asset design data or any mechanism for collaboration, we undertook a review of business requirements, supply chain processes, and available solutions in the marketplace,” stated Smith. After assessing different technology options, they decided to pilot ProjectWise and the iTwin Platform to exchange and manage project design data. The applications seemed to complement existing systems while also strengthening information management capabilities and developing digital maturity.

ProjectWise provided a master repository of engineering content and associated metadata in a web-based platform, streamlining collaboration and automating transmittals between internal project participants and external supply chain members—without the need to install additional software locally on devices. Working in a cloud-based environment using Bentley’s powerful and comprehensive software supported reality capture data sets in excess of 100 gigabytes, including approximately 13,000 aerial captured site photographs, which provided valuable insight to the World Heritage Site status of Stonehenge. Integrating iTwin enabled multisourced data to be aggregated, federated, and more accessible. NH used the Bentley-based solution to provide a digital framework, offering a single view of all types of information and establishing an intelligent, reusable data architecture that maps, defines, and relates datasets for better decision-making.

Digitization Drives Collaboration and Connectivity

“Enhanced digital maturity and collaboration has resulted from this initiative, both internally within project teams, and externally with our supply chain,” said Smith. The integrated ProjectWise and iTwin solution allows NH to use data created within the supply chain more proactively, allowing them to better understand the design process, costs, risks, and environmental impact. This insight resulted in more timely and better-informed decisions, supporting better outcomes for the built asset. Working in a connected, cloud-based platform where data is easily accessible and organized with its ontology and provenance saves considerable time, reduces resources, and facilitates data reuse during the construction phase.

Piloting the Bentley-based information management system on the A303 Stonehenge tunnel design improved data exchange efficiencies by 70% and data federation by 50% on the project. The digital twin technology is driving collaboration and connectivity within previous fragmented data management processes, as well as enhancing connectivity within the World Heritage Site, via the optimally designed roadway scheme that will accelerate journey times by 850%. “Already, the A303 ProjectWise and iTwin are exceeding initial business requirements and [we] are working closely with Bentley to look at a more sophisticated iTwin functionality to support [our digital journey],” said Smith.



[Image Link](#)

Image Caption: National Highways selected the Stonehenge project to evaluate their information strategy and improve their data architecture and intelligence. *Image courtesy of National Highways.*



[Image Link:](#)

Image Caption: The A303 Stonehenge tunnel scheme is part of National Highway's strategic road network improvements and complex infrastructure projects to enhance connectivity throughout the United Kingdom. *Image courtesy of National Highways.*

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