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Meeting future infrastructure needs

A new National Infrastructure and Construction Pipeline was published at the end of 2017, which confirmed over £600Bn of private and public investment in UK infrastructure. Published by the government's Infrastructure and Projects Authority, it came hot on the heels of the Chancellor's Autumn Statement in which he promised investment into infrastructure and construction skills through a £23Bn National Productivity Investment Fund. Government investment is supporting some 40% of projects included in the pipeline, which is the largest and most comprehensive ever, with private finance making up more than half of the pipeline to 2020/21. The pipeline will help deliver important local projects across the country including transport, broadband, flood defence, and housing. Major infrastructure projects ongoing in the UK include: High Speed Rail 2, the Thames Tideway Tunnel, the rollout of smart meters, and the upgrading of the A14. Through the pipeline, UK infrastructure investment is set to reach a record high. The investment fund includes infrastructure investments of over £2.6Bn and over 720 projects

and programmes across transport, housing and digital to fire up the nation's infrastructure are featured within the pipeline. Chief Secretary to the Treasury David Gauke said: "This [pipeline] is clear proof that we are absolutely committed to ensure our infrastructure is fit for the future, which is at the heart of our ambitious plans to close the UK's productivity gap and build a fair economy for everyone. "It builds on our strong record of delivering the modern infrastructure this country needs for the twenty-first century." Investing in better infrastructure is at the heart of the government's plans for the country, and it goes without saying that the largest infrastructure project in the country – if not Europe – is HS2. In this UK Construction Media Special, we speak exclusively to Kate Hall, Design Director for HS2, page 14, about the ambitious project, what it takes to future-proof such a visionary design, the emerging technologies that are being used and developed alongside the project, and how the 'Year of Engineering' is inspiring HS2's 'Year of Design'.

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Funding boost for Solihull's HS2 Interchange





Plans to create a sustainable urban quarter around the HS2 Interchange Station in Solihull have been given a £9.8M funding boost. The Urban Growth Company (UGC) has worked with Solihull Council to secure a devolution deal cash from the West Midlands Combined Authority (WMCA) to change the designs of the site. The principles of designing new infrastructure and transport connections were also agreed, with a final deal to be signed in March. UGC

and Solihull Council are now working with HS2 Ltd to explore how the design process will be managed to support the vision for the new Interchange Station site over the next two years. This paves the way for significant development at the site near the NEC and Birmingham Airport. Changes to the plans include the creation of a plaza and public transport interchange to create a "sense of arrival" at the HS2 station. Surface car parks could be replaced

with multi-storey facilities to free up land, while pedestrian links would also be improved. The plans will better connect the HS2 Interchange to local services such as the Metro and could also open up the wider Arden Cross site for further development. Full details of the scheme were unveiled at property expo MIPIM 2018 in Cannes on 13 March 2018.



HS2 designs for Colne Valley viaduct

Colne Valley Viaduct is a vital connection amongst the HS2 plans and will have a significant impact on the surrounding area. It is therefore important to HS2 Ltd to discuss with the community how it can be aesthetically designed into the landscape.

The concept was developed by independent specialists Knight Architects, working with Atkins, in consultation with the Colne Valley Regional Park Panel, and the HS2 Independent Design Panel, consisting of architects, designers and experts in sustainability. The viaduct concepts explore a range of options and ideas for this technically demanding civil engineering project. It has been quite a demanding job to ensure the viaduct will be a sensitive and aesthetically pleasing addition to the Colne Valley, whilst addressing the technical requirements of the project. The area of the Colne Valley through which HS2's route passes features a series of woods and lakes that developed when farming and quarrying ended, and sits alongside the Chiltern railway. As with all infrastructure works along the HS2 corridor, the design has had to meet 14 key criteria, which

were set by HS2 in consultation with the HS2 Independent Design Panel. These include: whether the design fits the landscape, maintains views and landscape, and 'flow' is well proportioned and elegant. Chair of the Colne Valley Regional Park Panel, Jim Barclay, said: "The construction of the Colne Valley HS2 viaduct will have a significant impact on the Colne Valley area. The Colne Valley Panel, which is drawn from local stakeholders, is very pleased to have been consulted and, through a series of workshops, Panel Members have been able to understand the design principles for the viaduct. The Colne Valley Regional Park Panel looks forward to further engagement with HS2 and Align over the actual viaduct design. As well as the viaduct itself, the concept document also explores innovative ideas for additional elements such as transparent noise-reduction barriers with vertical lines which are visible to bats and wildfowl to reduce possible impacts, whilst creating a slimmer side profile of the viaduct. Sadie Morgan, Chair of the Independent Design Panel, said: "We are delighted that this imaginative and carefully considered concept has

been published, and can form the basis for wider discussions with the communities around the Colne Valley and all those who value and use the spaces and amenities within it.

"The Independent Design Panel will continue to work hard to ensure that the viaduct's final design respects its location and communities, whilst being a shining example of great design that Britain can be proud of." HS2 Programme Director, Mike Hickson, said: "The Colne Valley viaduct will be one of the longest viaducts in the UK, and one of HS2's best-known structures. We are pleased and grateful for the work done by Knight Architects, the Colne Valley Regional Park Panel and the HS2 Independent Design Panel to produce this potential scheme design. We have every confidence that our contractor, Align, will continue this collaborative approach and engagement, as they now develop their own scheme and then detailed design of this significant structure." Construction partner Align will be responsible for developing the final design and constructing the viaduct according to technical specifications and within an agreed budget.

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HS2 funding to deliver woodland hub

A community development near Aylesbury will be enhanced thanks to government funding, HS2 Minister, Nusrat Ghani has announced. The development at Wendover Woods will see the creation of a recreational facility, including an adventure trail, café and parking for 600 visitors, thanks to a £450,000 government grant. Minister Ghani visited the site to see plans for the £4.45M redevelopment, one of the largest areas of publicly accessible open spaces in the region. The £450,000 grant is the largest funding award given to any single project so far from a £40M HS2 Phase One Community and Environment Fund (CEF) and Business and Local Economy Fund (BLEF). Minister Ghani said: "HS2 will be the backbone of our national rail network – supporting growth and regeneration

and helping us build a Britain fit for the future. Whilst we know there will be disruption as we deliver one of Europe's biggest infrastructure projects, we are absolutely committed to minimising the effects of building the new railway. "It is great to see so many exciting local projects, such as the Wendover Woods recreational development project, benefit from this fund, helping even more people access and enjoy our beautiful countryside. Funding such as CEF and BLEF will help to ensure that the legacy of HS2 is shared by everyone for generations to come." The grant is part of a £45M fund, established to support a wide range of projects along the HS2 route, ranging from community centres to nature conservation, while measures to drive jobs and local economies will also be supported.

The first round of grants offered some £245,000 of monies to fund the renovation of Steeple Claydon Methodist Church in Buckinghamshire, to help a pre-school in Northamptonshire build its first playground, and to support schemes in Camden to engage residents in environmental and health issues. Joanne Mason from the Forestry Commission said: "Wendover Woods is a hugely popular recreation resource for families living across the Chilterns and further afield. This grant from the HS2 CEF fund will enable much needed new toilets, seating and expanded café facilities to be established, ensuring that the forest can continue to be enjoyed by future generations."

HS2 Ltd appoints Andrew McNaughton to new strategic role

Early 2018 saw Professor Andrew McNaughton transition from Technical Director at HS2 Ltd, into a new role as Strategic Technical Adviser. Professor McNaughton will provide the High Speed Two (HS2) Executive and Board with guidance relating to technical matters, while advising the Department of Transport and other government bodies on issues of transport. Crucially, Andrew will also continue to fulfill his role as an expert witness for HS2 and retain his position as Chairman of the World High Speed Rail Committee. Andrew was HS2 Ltd's first official

employee. He joined the company as Chief Engineer in 2009 and has guided it from concept to reality in the years since. Professor McNaughton had this to say: "After leading the design and authorisation phases of HS2 for the last nine years, I am stepping back from a full-time executive leadership function to this more strategic role which, I am delighted to say, will continue my strong link with HS2 whilst also giving me more freedom to advise the government here, and others elsewhere, on both high speed railway development and wider transport issues."



Mark Thurston, Chief Executive of HS2 Ltd, added: "Andrew was not only our first employee, but has also been an inspiration to many of those who have joined since. He has been critical in establishing the project and in recruiting the highly talented team that will carry his and many others' work through to fruition. We will continue to lean heavily on his expertise, at the same time as benefiting from the perspective Andrew gains from his work with other organisations."



Midlands is 'heart of HS2'

During a visit to Birmingham, HS2 Minister, Nusrat Ghani has reaffirmed the Midlands as the heart of HS2. The Minister has met with apprentices and businesses across the Midlands to see first-hand how they are already benefiting from the jobs, skills and opportunities being delivered by HS2. The visit included discussions with businesses at the Birmingham Chambers of Commerce, where the Minister talked about the vital role HS2 will play in achieving the potential of the Midlands Engine, supporting 100,000 new jobs, bringing major cities, skilled workers and businesses closer together, and increasing productivity. Following this, the Minister met with the next generation of skilled apprentices being created by Britain's new railway, visiting the National College for High Speed Rail, where she met with some of the 2,000 apprentices being created by HS2, and learnt how they are gaining the specialist qualifications required to build HS2 and lead the way on future rail infrastructure projects. A further visit to Rolls Royce's Apprentice Academy in Derby saw her discussing how HS2 will bring businesses, skilled workers and major cities closer together, and the support they all can give during government's Year of Engineering campaign. The Year of Engineering campaign is designed to help find the 186,000

engineers needed every year until 2024, who will fill all the engineering roles required by the UK. The Minister encouraged the apprentices to be role models and help provide one million schoolchildren with an inspiring experience of engineering. Minister Ghani said: "HS2 is not only the future of our rail network, delivering faster journeys for more passengers and improving connections between some of our country's biggest cities, but is essential for driving forward economic growth and developing the next generation of engineers. "Birmingham is at the heart of HS2 and is already seizing the opportunities that it has to offer. Through the National College for High Speed Rail we are training the engineers of tomorrow, empowering students with the skills and experience needed to gain brilliant careers and drive forward future innovation. "I also enjoyed meeting with a diverse range of businesses to discuss their vision and how HS2 can help unlock the extraordinary economic potential of the Midlands engine, driving forward jobs, productivity and growth." HS2 will not only lead in the regeneration of Britain's railways, but also in regenerating town centres and communities that the railway will run through. Ms Ghani visited Curzon Street station, where she was joined by West Midlands Mayor Andy

Street to discuss the regeneration of the area. Regenerating the area around HS2 in Birmingham has the potential to create around 14,000 new jobs and unlock 600,000 square metres of new development space across Eastside and Digbeth. Closed in 1966, Curzon Street will reopen as a new iconic station and Birmingham's largest building, with seven platforms providing HS2 services initially to London in 2026 and then to the north west, north east and Scotland as the full HS2 network is delivered. Patrick Twist, Chair of the Greater Birmingham and Solihull Business Transport Group, said: "The roundtable was the perfect opportunity for the Minister to hear the thoughts of local businesses on how the HS2 project will raise productivity levels across the region, improve connectivity with other parts of the country and play a huge role in rebalancing the economy – a key tenet of the government's Industrial Strategy. "As someone who grew up in Birmingham, I'm sure the Minister was delighted to witness first-hand the renaissance the city has undergone over the last decade and how key infrastructure projects such as HS2 will continue to shape this narrative for years to come."



Lendlease lands HS2 Euston role

HS2 has confirmed Lendlease will be responsible for constructing the line's gateway to London through its Euston development. Lendlease has been appointed as Master Development Partner (MDP) by the Secretary of State for Transport and Network Rail. The company behind the 2012 Athletes' Village and the new International Quarter, gateway to the Queen Elizabeth Olympic Park, will lead the planning and development of Euston. Lendlease will work with GLA and London Borough of Camden to develop a 54-hectare masterplan, which is expected to unlock up to 1,700 new homes and 19,000 jobs around the wider station site with sustainable mixed-use developments, once station construction is complete. Welcoming the appointment, HS2 Minister, Nusrat Ghani said: "Confirming Lendlease as our intended major partner is an exciting and important moment as we drive forward the regeneration of Euston. We are setting out a strong vision for creating new homes and jobs, stimulating economic growth and building a modern development that will match the ambition and scale of HS2. "Crucially, as we build Britain's future railway we will ensure that communities are at the heart of our plans and share the transformative economic benefits on offer." HS2 Chief Executive, Mark Thurston, said: "The arrival of HS2 gives us a unique opportunity to transform the wider Euston station site, opening up the station to the surrounding community with new streets and public realm as well as opportunities to unlock thousands of new jobs and homes, anchored around a common masterplan vision. "It was great to see such a strong competition and I'm pleased to welcome Lendlease to the team. Their experience of delivering some of the world's most challenging transport and development projects will be vital as we move forward with this exciting new

phase in the story of Euston station." David Biggs, Managing Director Network Rail Property, said: "Network Rail has a successful history of creating great places and we're excited to use this expertise to work with stakeholders, landowners, and our new development partner to establish a visionary masterplan for Euston. "Like our award-winning work at nearby King's Cross, which attracted £2.2Bn of private investment including new offices, jobs and homes, we will work to transform Euston station to meet modern needs and act as a catalyst for wider regeneration. With this transformation and the arrival of HS2, Euston station quarter will become a new thriving London destination which meets the needs of passengers and local communities." Lendlease is already working on a masterplan for International Quarter London, at the gateway to the Queen Elizabeth Olympic Park. Development of land there is intended to create some 25,000 jobs centred around some of the best transport connections anywhere in the country. Like Euston, the development of the Olympic Park shows how infrastructure investment can help areas live up to their full potential, delivering new jobs, homes, shops and leisure opportunities. In the six years since the Games, the area has been transformed, with new neighbourhoods created and work ongoing to integrate the new development into the surrounding community with new streets, public spaces and leisure facilities. Lendlease worked with a broad consultant team including Prior and Partners, Grimshaw, Arup, BIG, AHMM, Haworth Tomkins, Asif Khan and AECOM. Dan Labbad, Lendlease Chief Executive Officer International Operations, said: "We are proud and excited to be selected as preferred bidder to deliver the Euston OSD in partnership with HS2, Network Rail, London Borough of

Camden, GLA and wider stakeholders. "We believe this is a fantastic project in a key area of London which will provide opportunity for all and act as a catalyst for wider UK growth." The appointment of Lendlease as MDP allows for a coordinated approach with Network Rail, and a unified approach to long-term development, which could unlock up to 4.84M sq ft of development space. Jules Pipe, London's Deputy Mayor for Planning, Regeneration and Skills, said: "Euston has the potential to be much more than just a transport hub, and we look forward to working with Lendlease to make it into a real public space, which benefits local people, drives business growth, and unlocks some much-needed housing. "As one of our capital's main stations, it must seamlessly connect HS2, national rail, the Tube and, in the future, Crossrail 2." The new HS2 station will be designed with input from local communities, using best practice principles from stations around the world, and guidelines and specifications endorsed by an independent panel of leading architects and designers. The project will include a new interchange with the London Underground, combining Euston and Euston Square for the first time and including provision for a future connection to a potential Crossrail 2. HS2 Ltd has announced a shortlist of bidders in the running to build the station, and appointed Engineers Ove Arup & Partners, working with Grimshaw Architects, to take forward the design. The main construction phase is due to begin in 2019 with the first HS2 services arriving in 2026.



First BREEAM infrastructure certificate awarded to HS2

A BREEAM Infrastructure (pilot) Scheme Certificate has been awarded to HS2 in recognition of its hugely ambitious sustainability strategy. The landmark assessment – a first for UK infrastructure – helps demonstrate HS2 Ltd's commitment to environmental protection and the economic and social impacts associated with development. Considerations include working with communities, being a good neighbour, prioritising safety and wellbeing, and building sustainable economic benefit for Great Britain – better skills and career opportunities for the next generation. "We are very pleased to receive this BREEAM Infrastructure certificate," said

Peter Miller, Environment Director for HS2. "Our goal with HS2 is to design and build the most sustainable high-speed railway of its kind in the world, working in partnership with our supply chain and local communities to leave a positive legacy for future infrastructure projects both in the UK and beyond. This certificate is a testament to our sustainability commitments and to the lasting benefits of the HS2 project." BREEAM Infrastructure forms part of the international BREEAM family of sustainability standards for buildings and infrastructure. Later this year the best in BREEAM Infrastructure, together with sustainable infrastructure

initiative, CEEQUAL – will be brought together to provide an international scheme for the future, titled CEEQUAL (2018). The CEEQUAL (2018) development process will include feedback and learning from BREEAM Infrastructure's HS2 implementation. Chris Broadbent, Director of Infrastructure at BRE, added: "From 2014, HS2 was the first project to engage with BRE in the development of BREEAM Infrastructure, working with us to pioneer a new approach to a sustainability strategy which applies right across the entire HS2 project. This is a first for the UK and it will set the standards for future infrastructure projects around the world."

HS2 announces design partners for brand new stations

HS2 Ltd has revealed which architects and engineers will transform London Euston and build new stations at Birmingham, Solihull and Old Oak Common. The contract appointments will help refine and develop detailed plans for the four HS2 stations in anticipation of their 2026 opening. The new hires are as follows:

- Birmingham Curzon Street – WSP UK Limited and Grimshaw Architects LLP
- Birmingham Interchange – Ove Arup & Partners International Limited, Arup Associates and Wilkinson Eyre Architects Limited
- Old Oak Common – WSP UK Limited and Wilkinson Eyre Architects Limited
- London Euston – Ove Arup & Partners International Limited and Grimshaw Architects LLP

Collectively, these are the minds behind Gateshead Millennium Bridge, the Eden Project in Cornwall, Biljmer Arena station in the Netherlands, and the new concourse at London's King's Cross station, to name but a few tent-pole projects.

London and Birmingham are already anticipating the arrival of HS2, which is due to unlock opportunities for 30,000 new homes and 130,000 jobs as part of wider development around the four stations.

"HS2 is a modern railway fit for Britain's future, improving vital links between some of our country's biggest cities, driving forward growth and significantly improving services for passengers with thousands more seats on faster trains," said HS2 Minister Nusrat Ghani.

"Appointing these leading creative firms ensures that passengers on our world-class railway will experience modern and accessible stations. I am confident that these firms will deliver these projects at value for money, with designs that are both innovative and in keeping with their surroundings." Mark Thurston, Chief Executive of HS2 Ltd, added: "Our new stations in London and Birmingham will be at the heart of the first phase of the project, increasing capacity, improving journeys and helping to unlock opportunities for tens of thousands of new jobs and homes around what will be four new landmark buildings. "That's why I'm delighted to welcome these talented designers to the team, and we look forward to working with them to

create station designs which showcase world-class architecture, ease of use and value for money that our passengers and communities expect and deserve." Meanwhile, HS2 Ltd has also confirmed that the following bidders have been invited to tender for the London station construction contracts:

London Euston:
Costain Limited/Skanska Construction UK Limited
Mace Limited/Dragados S.A.
Bechtel Limited
BAM Nuttall Limited/Ferrovial Agroman (UK) Limited
Canary Wharf Contractors Limited/
MTR Corporation (UK) Limited/Laing O'Rourke Construction Limited

Old Oak Common:
Balfour Beatty Group Ltd/
VINCI Construction UK Ltd/
VINCI Construction Grands Projects SAS/SYSTRA Ltd
Mace Limited/Dragados S.A.
Bechtel Limited
BAM Nuttall Limited/Ferrovial Agroman (UK) Limited

The construction partner contracts will be awarded this autumn.

HS2 searches for contractors

HS2 Ltd is currently seeking rail systems track and mechanical & electrical contractors to deliver the track and overhead catenary system works and the tunnel and lineside mechanical & electrical and tunnel ventilation works between London and Birmingham (Phase One) and Birmingham to Crewe (Phase 2a). The contract package is worth some £1.55Bn, with the contractor for the track and overhead catenary system (OCS) package overseeing HS2's construction and its dynamic testing phase. It will link the whole system and trains before handing it over to the operator for the line's trial running phase. Aspects of the track and OCS contract include delivery of critical elements of the railway's infrastructure, covering its overhead catenary 'power' system from which high speed trains will draw down power, and 180 miles of track along which they will travel at speeds of up to 360kmph (225mph). The contract also incorporates construction work within stations and

in tunnels including the provision of engineering trains to link worksites along the route. It also covers design integration and co-ordination with other railway systems, civil engineering and station construction contractors. The second part of the pre-qualification questionnaire (PQQ) publication is for the circa £330M contract for the tunnel and lineside mechanical & electrical and tunnel ventilation works. It covers the design, installation, testing and commissioning of HS2 safety equipment including tunnel ventilation fans, lighting, handrails, fire safety equipment and tunnel alarm systems.

HS2 Ltd Chief Executive Mark Thurston said: "We're looking for the smartest, most cost-effective solutions that the industry has to offer through these contracts, which form part of the overall railway system for HS2. "These two essential contracts are fundamental to HS2 operating safely, reliably and efficiently for the millions of people who will use and come to depend on it. Once complete, HS2 will transform rail travel in the UK, providing extra capacity and improved connectivity between our major cities and act as a catalyst for growth across the UK."



Bidders for £2.75Bn HS2 trains



HS2 Ltd has revealed details of the companies competing to construct Britain's next generation of trains, giving a boost to high tech skills and expertise in the UK. The new state-of-the-art trains will travel at speeds of up to 225mph and carry tens of thousands of people every day across the new high speed network. The new trains will be designed to provide unparalleled levels of reliability, speed and comfort, as well as providing much-needed extra capacity between the UK's major cities. Shortlisted bidders invited to tender for the contracts are: Alstom Transport; Bombardier Transportation UK Ltd; Hitachi Rail Europe; Patentes Talgo S.L.U; and Siemens plc. The contracts comprise the design, build and maintenance of at least 54 trains due to

come into service from 2026. The first trains are expected to come off the production line in the early 2020s. The new trains will be required to meet HS2's design and performance needs and the highest standards internationally for passenger experience, noise reduction, and environmental sustainability, while maximising skills, employment and growth opportunities for the industry.

The announcement is the latest in a series of milestones achieved on the HS2 project. The National College for High Speed Rail has opened recently in Birmingham and Doncaster, aiming to boost Britain's skills and expertise in the high speed rail sector. HS2 is expected to create around 25,000 jobs and 2,000 apprenticeships both directly in construction and also across the UK-wide supply chain. Welcoming the shortlist, the then HS2 Minister, Paul Maynard, said: "Thousands of skilled British jobs and apprenticeships will be created by HS2, which gets a step closer as we reveal the companies shortlisted to build the high speed trains. "HS2 will see some of the world's fastest trains connecting our great cities across the north and Midlands,

creating an economy that works for everyone. But announcements like this show how the benefits of HS2 will resonate far beyond the opening of the new railway. HS2's legacy of jobs and skills is already being created." Chris Rayner, HS2 Ltd Managing Director - Railway Operations, said: "It's great to see such a strong line up of experienced high-tech manufacturing and design talent. Together with the successful bidder, HS2 will deliver some of the world's most advanced rolling stock, engineered to provide seamless, accessible, fast and reliable journeys. "Starting from 2026, our trains will be used by tens of thousands of people every day, transforming links across the Midlands and the North and providing much-needed extra capacity between Britain's major cities." All five bidders will be invited to tender in spring 2018, with contracts awarded in 2019. Maintenance services will be provided from a depot planned for Washwood Heath in Birmingham. The area will also be home to the HS2 Network Control Centre, which will together create hundreds of skilled jobs.

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Designing the future of infrastructure

Last year saw HS2, the hotly anticipated high speed rail network linking the north and south, receive Royal Assent. After three years of intense Parliamentary scrutiny, HS2 has been rubber stamped and delivery of the railway is now a priority. HS2 is a monumental infrastructure undertaking. The first phase, from London to Birmingham, will not be operational until 2026, with the entire route expected to be delivered in 2033. However, the economic benefits are clear, and not just for business: HS2 Ltd has launched a raft of community funding opportunities alongside the development. Designed to engage local communities in the project, the funds will help integrate the railway into the landscape of Britain. With Royal Assent granted, the hard work begins, and 2018 is being heralded as the 'Year of Design' by HS2's developers.

UK Construction Online spoke exclusively to Kate Hall, Design Director at HS2 Ltd, about the plans and how development of Britain's largest infrastructure project is getting under way.

UKCO: This year is being heralded as the 'Year of Design' for HS2; can you tell me more about why that is?

Kate: Well, this is the year that all the major design gets under way. The major contractors, Joint Ventures, and designers are on board, and now we have to deliver. There are quite a lot of things going on as part of the project, as well as the actual railway. For instance, there is a massive infrastructure undertaking in terms of construction that goes along with the main railway project. We are saying it's the 'Year of Design' as all the main works contractors for Phase I were appointed last summer, and we are now six months into the 18-month stage 1 design period. At the end, by Feb 2019, they will proceed to stage 2, and there will be detailed

design. This is the year that everybody is designing Phase I of HS2. This year is so instrumental and influential for the future of our built environment in our towns, cities and the countryside, perhaps for the next 150 years, which is why I'm so passionate about 2018, and why the team is so excited to say that it *IS* the year of design. My role is Design Director. I've been at HS2 Ltd for the last three years, in my role as champion of design. I've been working on creating written standards, specifications and design guidance for the project. What I'm really proud of on this project is that we've written a Design Vision. We've really stated what it is we want to achieve. It's a simple document, we've said that there are three key elements to this vision: people, place, and time. We are designing for people, for everyone to enjoy and benefit from HS2.

Can you tell me more about the design principles that are being applied to HS2?

Kate: Under each element are key points:

People: Design for our diverse need; engage communities in the project; inspire excellence and creative talent.

Place: Designing a sense of place; designing spaces and places that support real quality of life; celebrating the local within a coherent national narrative. It's not just about branding HS2 and its construction infrastructure and plonking it in the countryside, it's about making it really right for the location. We also want to demonstrate our commitment to the natural world, so things like environmental standards and what we're doing to push the circular economy are important. I think these areas are really ground breaking. And the last element is:

Time: Standing the test of time, adapting to future generations. Really thinking about that. Placing a premium on a person's time as a customer; and also making the most of time in design, which I am also very passionate about. This design vision gives us the whys of wanting to design differently, and build

something different on the project, and what we are setting out to achieve. The other commitment that we have delivered is a design handbook, which gives us illustrations of how we are doing things differently and trying to think about things differently.

And how are you achieving that?

Kate: Firstly, we have an independent design panel on the project, now that's not unusual, but what we have done is set up this panel right at the start of the project, from inception really. Now this is gaining quite a lot of interest in the civil engineering sphere. While it is quite common to set up some sort of independent design review panel for major infrastructure projects, this is usually done quite far on in the process. What we have done is looked at other major infrastructure projects, and thought about the best lessons we can learn from them.

In any project, the later you change the design, the more expensive it is, the more disruptive it is to the project, and the less likely it's going to happen. So, if you're going to take independent advice, then set it up really early. Which is what we did, before we even had detailed design, while we are writing the strategies, and standards, and specifications, before we'd even procured contracts! And it has been a really fascinating process. The independent design panel has been set up since September 2015. I sat in a review this morning, and we believe we are half way through all the panel reviews we will do, bearing in mind we haven't got a single spade in the ground at the

moment for the permanent design. It just goes to show that actually having design review and interrogation, and doing it early on, can really shape a project. You can shape the vision and the procurement, you can shape strategy, and standards and specifications, because once the army of contractors begin, there is less opportunity and influence. What's really encouraging to see is that Network Rail is talking about setting up a design panel for all of their infrastructure works. The National Infrastructure Commission is also setting up a design panel for all national infrastructure projects, and the Lord Mayor of London set up design advocates in his 'Good for Growth' document. All this is based on and built from what we've done with HS2. That's a really nice legacy that we have already created.

How are you ensuring the legacy left by the project will be a good one, as the infrastructure is going to be part of our landscape for such a long time?

Kate: Part of this goes back to our design vision, in terms of a sense of place and sense of time, in particular, the personal time of customers. What we have done is create an augmented reality simulation, where we've taken the whole route of the actual journey. So, if you were sitting on the train, what would you see out of the window?

Using new technology is a big part of the project then?

Kate: Yes, a huge part. Here we started with using augmented reality (AR) as part of a landscape study. If we do special scenes or planting, or even have some strategic artwork, we would use new technology to consider where to put it. We are also looking at creating landmarks, which we know offer passengers valuable visual clues along their journey, that can enhance communities and even become visitor attractions in their own right. We've had such a fantastic response, using this technology, that we've expanded it. The AR experience we've developed allows you to arrive on the pavement at Euston, walk through the station, go down onto the platforms, walk onto the train, and it takes you off on the HS2 route. As you glance out of the window, you go through tunnels, and we see the impact on the customer experience.

And how has that affected the design decisions?

Kate: With the tunnel design for example, it's enabled us to look in more detail at the perforated section of tunnel on the approach. This helps lower the air pressure you feel in your ears and reduce noise "whooshes", but we've also realised from the AR that it could also mean when you're in the train, you can see the sky, which is quite calming. We've been able to use the AR to show us whether you can see out, or not, and what can you see on the embankment. What do you see and what does it look like? And it's a fantastic technology. We primarily invested in it to encourage landscape design, but what it has enabled us to do is see how all these





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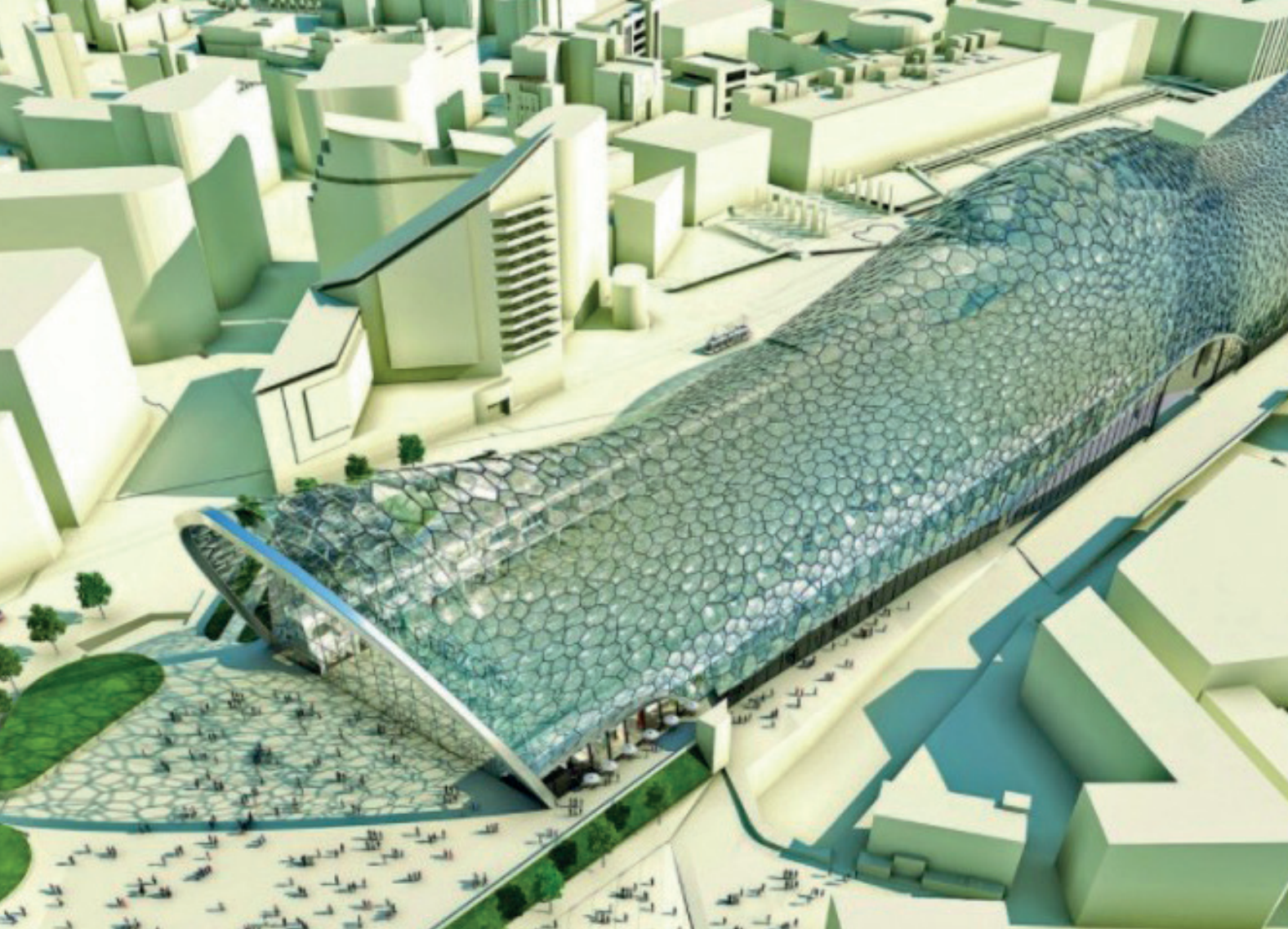
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variables impact the passenger and community; what are you thinking in these tunnel environments? If we make the decision to keep the tunnel lights off or alter the position of the seat, it changes what you can see and feel about your journey. This has led to all these design decisions being made in the very early stages, and in a safe environment, where we can trial and test it. And the beauty of AR is that you can change things very quickly and can compare them against each other, in a way that you just can't do even with 3D renderings.

This technology is being used to give you some really cutting-edge design experience, then?

Kate: Definitely, what Arup has done recently is to supplement the AR visual interactive experience with an aural experience. We had the actual sound of the train, and there is a rig which actually simulates the vibrations of the train. So, it was more than a 3D experience, it was sensual as well, it gave you a feeling of what it would be like as a passenger. And that is exactly what we have stated in the design vision; that we care about people's time as our customers, just as much as designing for the communities

that we are building through. Investing in the AR has allowed us to really think about the design of the infrastructure that we are building. Tools like this allow us to bring all those facets together and look at the details, allowing us to realise that if we take a slightly different angle to an approach it becomes a much more pleasant experience for the passenger and community. Using technology such as this, you can quite easily create different scenarios and explore how the design can affect the landscape. You can consider all sorts of scenarios and use AR to create many permutations of what that experience looks, feels and sounds like. Within the HS2 train, we can consider things like changes in window height. How does that affect the passenger view? Should there be windows, or should we make them screens? This technology has allowed us to look at some really exciting developments.

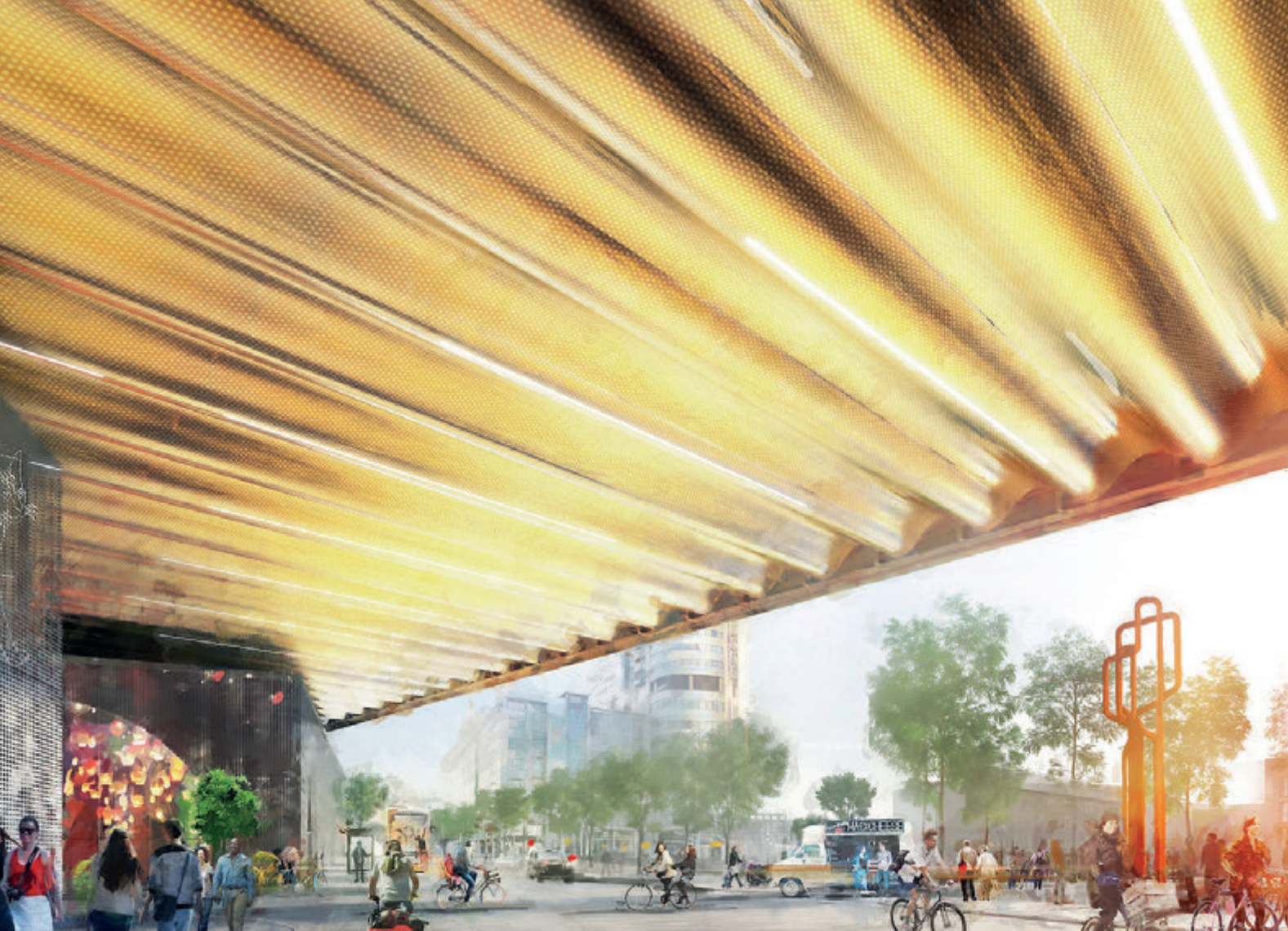
With the launch of AR & VR and the leaps forward in technology, it seems that you can really start to design a project right from the very beginnings of an idea, rather than going back and having to

retrofit things. To actually be able to get it right, from the very start of a project, sounds like it will be very transformative for the construction and engineering industry.

Kate: Yes. HS2 really is a once in a lifetime opportunity for us, and for us to improve the things we do. It's not an upgrade or extension, it's an entirely new project, and a huge responsibility for us. I think the design legacy that we leave absolutely has to be of the highest quality, because of the impact and the length of time it will be there. That is why we've spent a lot of time writing the vision and strategy and working with the design team to use new tools, and to push technology.

I imagine it's very much part of the project to push the boundaries of technology and to try and develop something that is future proof?

Kate: Absolutely. With the HS2 programme being of such long duration, we can scale and take ideas on board, test them, adjust them, and use them on our project. If there's a great idea now that we can't use on Phase I, we'll definitely use it on Phase II. Then we can share these developments with the wider rail and infrastructure community.



I think that is what's exciting about this project. Normally, in any new project, people would like to use ideas or technology, but think they're too risky and the idea gets pushed off the table. On HS2, we have the opportunity to use it now, or it can be tested and used in the next stage. And this is really for the rail and infrastructure industry. It doesn't have to have its traditional outlook, and ignore innovation, it can use and operate small-scale experiments. What I'm trying to do within HS2 is ignite a passion for innovation and learning, trying creative solutions and giving people the courage to do things differently and learn from the new technology.

The way you describe it, it appears that HS2 will not just be leaving a legacy of a massive infrastructure project, but a legacy of how to design projects, and how to engineer for the future. You have been given the opportunity to do it differently now, and do it right from the beginning, exploring different designs and technologies, and the way you build.

Kate: That's right. How do you design in flexibility? Stations won't be the same in the future as they

are now, so how do you design in that flexibility, so your building isn't redundant in 80 years' time? It's really great challenge for design and a fantastic creative opportunity. It's a really exciting year for stage 1, because we are seeing a lot of what we've done come to fruition and become visible and tangible.

And finally, with 2018 being the Year of Design, I'm sure there are some exciting announcements to come out around that?

Kate: January saw us announcing the designers of the stations. We are about to start our rail systems procurement, another part of our design draft, and procurement of that, and we are selecting our master development partners for around Euston and Old Oak Common stations. In the spring, we will be inviting our suppliers to bid for the rolling stock. We have done a lot of work on design challenges for this, and making sure the rolling stock meets our aspirations as set out in the design vision. Spring will see us publishing our art strategy. This is another thing I'm very passionate about, that we can really leave a legacy behind for our communities, not just in the stations,

which will be great places to have art, but also in the countryside. There are some fantastic examples where earthworks have been used to create lovely features that become a local place for walking, taking the kids etc. It is not as costly or wasteful as taking it to landfill, and it can function as noise attenuation, so instead of a hard barrier, residents have a beautiful sculpted grassed area. You can integrate art in some really interesting ways and, by starting this early, rather than as an add-on later, you can really design and build it in to what you are building anyway. I'm really excited about that and the opportunities that we have here, and I think this is the year for us really starting to engage with it.

So, the HS2 design process is really taking a look into the future and building the future of design.



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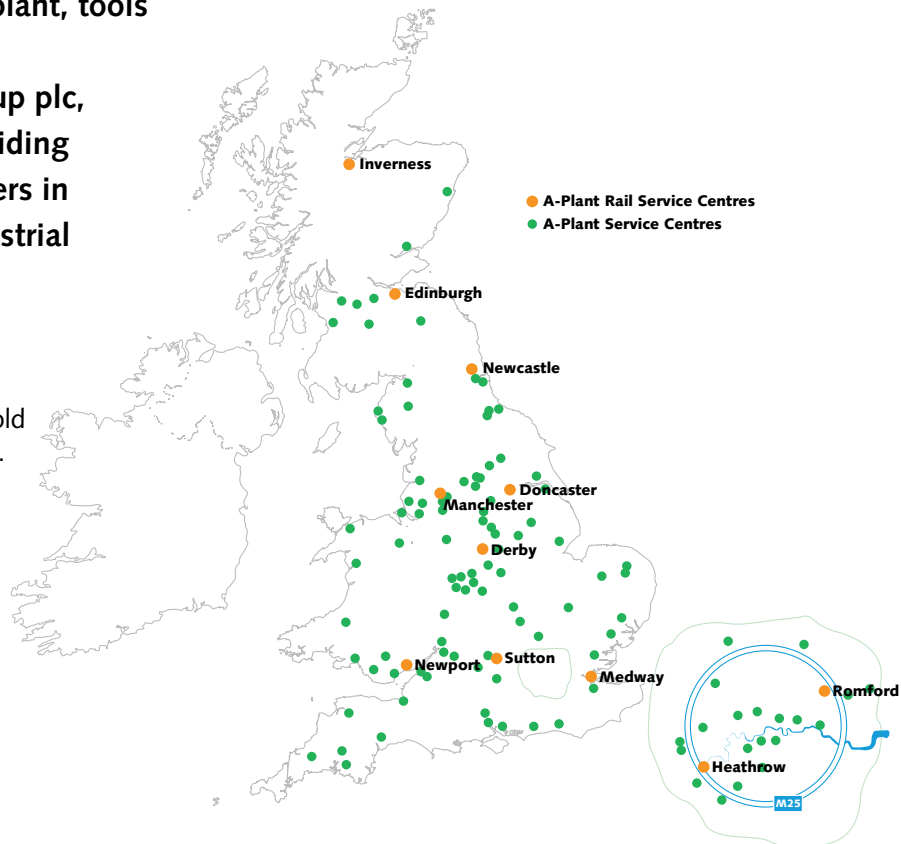
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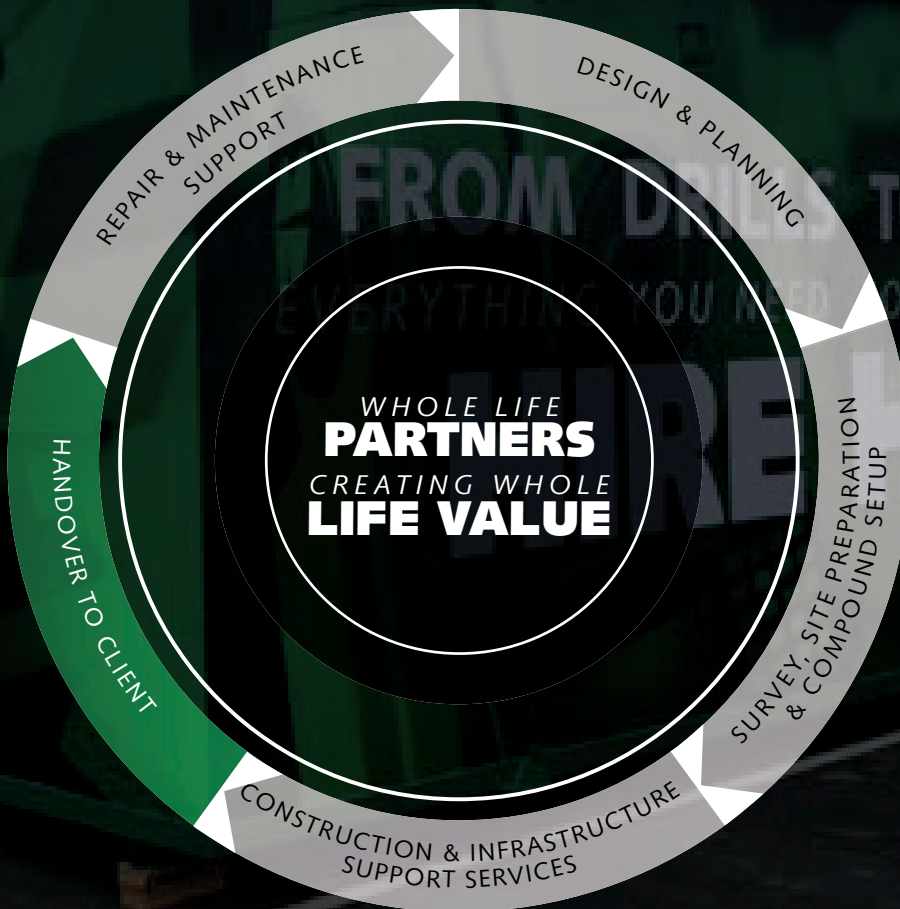
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