Proactive Management Review

Contract Year 12
April 2020 to March 2021

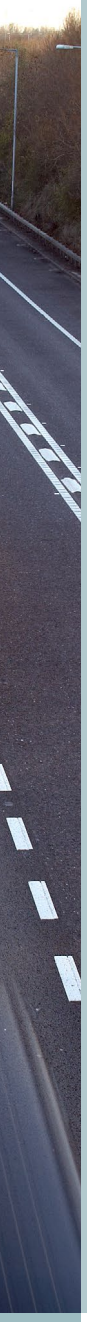
Connect Plus

Connect Plus Services
A Balfour Beatty, Atkins & Egis joint venture

Contents

Executive Summary

For the second consecutive year we have decided to produce this supplementary PMR brochure, in order to highlight the case studies that we are submitting to the PMR panel for this qualifying year (CY12 April 2020 – March 2021).



As it did last year, the brochure also includes a progress update on some of the case study submissions from CY11, and a snapshot of some of the work and innovations that we're currently undertaking, and may consider for submission in the future.

Each year we are required under the Contract to submit Proactive Management Review evidence for the PMR Panel to review and score. It is one element of the Payment Mechanism that aims to encourage and reward our commitment to managing and improving the M25 network, through the adoption of best practice, innovation and new technologies.

The past year has been incredibly challenging for everyone, however, throughout this unprecedented time, we have ensured that the M25 network remains open to enable the transportation of vital goods and services across the SRN.

Collectively we have achieved so much of which we are incredibly proud.

We've successfully delivered a wide range of projects and work activities, from improvement schemes and inspections to incident support and attendance, network maintenance, environmental improvements and innovations. The amazing work to complete ten emergency area bays within the year was an outstanding achievement and rightly recognised as such by National Highways, and the launch of the M25 digital map really does move us onto the next level of innovation.

We believe that this brochure showcases some of the outstanding work our teams have produced over the past year.

Updates from last year

In this section of the brochure, we take a look back at some of the case studies we submitted in CY11 and provide an update on how they are progressing.

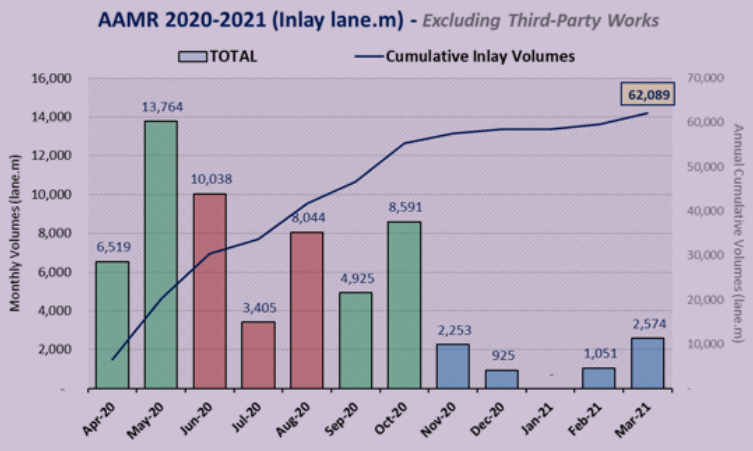
1. Using data analytics to inform seasonal resurfacing
2. Social value baseline
3. Nurturing nature
4. Lean working
5. State-of-the-art thin surface course trials on the strategic road network, containing 50% reclaimed asphalt

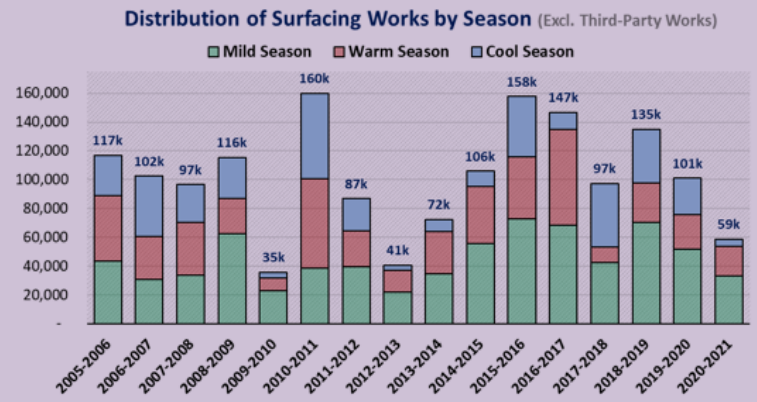
Using data analytics to inform seasonal resurfacing

Last year, our research statistically demonstrated that materials laid in adverse conditions, such as low air temperature and wind chill, are unlikely to provide the same serviceability and durability as those laid in ideal conditions. As such, the delivery programme of pavement schemes was slightly adjusted this year to embrace those climate-aware findings and minimise winter thin surfacing works (see graph below).

Last year, only 8.80% of thin surfacing works were conducted during the cool season (November to March), against an historic contract average of 24% per year (third-party schemes excluded). Surfaces laid in mild to warm periods are believed to have longer serviceable lives, up to 2 years longer. Thus, at this stage, we estimated that our streamlined programme last year is likely to save us ~£200k in long-term lifecycle investments.

Thanks to these findings, any change to our network can be better assessed in terms of expected durability and performance of the pavement asset on the long term.





Social Value Baseline

We have continued to measure our social value and have collected data up to the end of 2020, to ensure we have a full understanding of our baseline.

The first Social Value Forum was held in March 2021. With each discipline sharing the measures they will prioritise for 2021, and how this will be done. Below are some examples of what will be prioritised:

Human Resources:

- Training opportunities created or sustained (NVQs, BTEC, City & Guilds, HNC)
- Diversity training
- People with disabilities
- Increase in female employees with site operational roles

Communications:

- Number of hours volunteering time undertaken, provided to support local community projects
- Local school and college visits
- Number of hours dedicated to support young people into work

Environment:

- Car miles saved on the project
- Number of low or no emission vehicle miles on the project

These forums are due to continue into 2021 and there are three more scheduled for the calendar year. At each one the intention is for each department to update on their progress for improving the measures are prioritising.

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Nurturing nature

Greater Thames Marshes
This year we have undertaken some additional ditch maintenance. On the below image, the top photo shows the area immediately after the work, with the one underneath showing how the land has now developed and has become a home for local flora and fauna.

Surrey Iron Railway Earthwork
This site has been added to our 5 yearly AMFP inspection regime. Any need for vegetation clearance will be identified and programmed in, at that time. The interpretation sign will also be inspected as part of this.

Oak Processonary Moth (OPM) – Innovation Vacuum
We are hoping to carry on using this technique this year, however, as we are still in the process of procuring new soft estate contractors, we're not yet in a position to know if they will be able to offer the same capability. If they don't, we will definitely seek to develop it in collaboration with them.

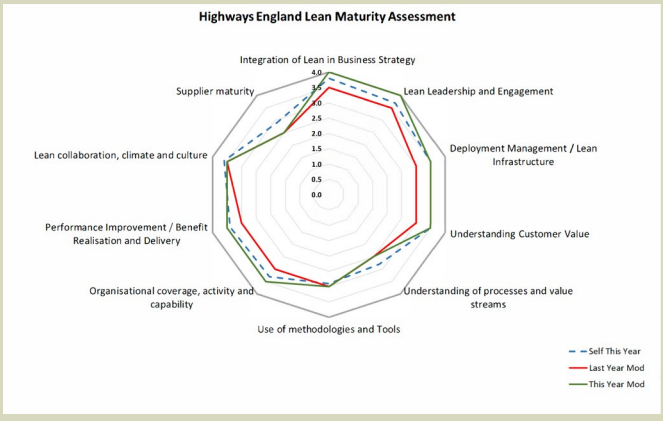
Lean working

As an organisation, we are fully committed to Lean. This is something which is demonstrated in the integration of Lean into the Business Strategy, where we are committed to maximising efficiency by driving down waste through increased productivity and reducing on site activity. We aim to generate a culture of innovation making it "safe to fail", aiming for the submission of over 300 business improvement ideas by 2025, each with a conversion rate of 40%.

To improve the quality and quantity of the submissions, we are working collaboratively with our innovation and digital teams to trial a new reporting tool. We're encouraging the business to report their ideas through the tool together with email and Yammer.

The conversion rate of ideas submitted to ideas approved, has increased from 20% last period to 27% in this period. This equates to 50 ideas approved for implementation. As the business matures, we are starting to see a number of projects that are being self-delivered. Fifteen of the ideas that have been approved, were delivered by the teams as 'Just Do It" ideas.

In October 2021 we were awarded an industry leading HELMA score of 3.4, scoring the maximin of 4 in two areas – Lean in business strategy and Lean leadership. This achievement is something of which we are immensely proud.



State-of-the-art thin surface course trials on the strategic road network, containing 50% reclaimed asphalt

The 50% reclaimed asphalt trial is ongoing and continues to show encouraging results.

The Griptester skid resistance measurements throughout the first year indicated that the inclusion of reclaimed asphalt has had no detrimental impact upon on the early life skid resistance. The average Griptester results over three runs for the 14mm SurePhalt, incorporating 50% reclaimed asphalt, are directly comparable and significantly higher than the investigatory level of 0.35.

'Cradle to Gate' carbon footprint analysis has been conducted utilising asPECT and the associated protocol. The analysis has demonstrated a 7.69kg CO2e/T saving for the 50% reclaimed asphalt mixture, compared to the control. This represents a 16% saving.

In addition to these fantastic results, the project was the winner of the CIHT Climate Change Award in 2020 and was highly commended in the 'Environmental Sustainability in the Highways Sector' category, of the Highways Awards during the same period.

The following case studies highlight some of the many innovations, industry best practices and new products that we are implementing and trialling across the network.

From dealing with the challenges we have faced over the past year, to pushing the boundaries in protecting the health of our workforce, these case studies provide an example of the range of work we're undertaking.

- Working through a pandemic
- Healthier Highways
- Road space improvements
- Network intelligence – Binder and surfacing dashboards
- Network intelligence – Deterioration of asphaltic plug joints
- Retrofitting emergency areas
- Sustainability roadmap
- Carbon strategy and designer carbon tool
- Biodiversity net gain
- Mutual aid for area 4
- Developing our digital twin

Working through a pandemic

As custodians of Europe's busiest motorway, it was essential that we overcame the COVID-19 challenge to keep the M25 open and safe for the transportation of essential medical supplies, key workers and groceries.

This put additional pressure on all our teams to maintain a business-as-usual working environment. It was crucial that we put safe operating procedures in place to allow our teams to work safely and effectively to continue providing the best possible service for our customers.

The completion of our Business Continuity Plan (BCP) was timed perfectly to provide the business with the response needed to do this. The plan itself incorporated new methods of working and communicating, as well as demonstrating how office-based staff and those working on the network could continue to do so in a safe environment.

The need

Long before lockdown, our COVID-19 resilience teams were planning for a range of scenarios to ensure we would be in the best possible position for what was to come. Keeping the network in a safe and serviceable condition had never been more important than during this time due to the national need for the strategic road network.

When the pandemic hit and our world changed, we were able to leverage the skills of our workforce and the innovative contracts we hold with our framework community, to manage the changing situation.

Never has the environment we have created and the relationships and culture we have established been more important than during the pandemic. The leadership skills and training that members of the community have acquired, really came to the fore during these unprecedented times, and the additional skills they developed to work in a complex and uncertain (VUCA) environment were crucial to keep a steady hand on the tiller.

Every business, regardless of their size, needs a workable Business Continuity Plan (BCP), and the arrival of the pandemic illustrated that more than ever. We realised that we needed a plan that was adaptable in order to manage this huge impact, as well as managing more 'normal' trigger incidents such as fire, flooding etc.

The health and wellbeing of our staff became crucial throughout this time, and we needed to ensure support was available to help everyone deal with this new and unknown working environment. From the teams working on the network who continued to support the delivery of schemes and maintenance works under very trying conditions, to those working from home and dealing with the exponential increase in online meetings while trying to accommodate home schooling and other caring responsibilities.

These were challenging times which for some offered a period of reflection to reconsider aspects of their life including their priorities and work-life balance, yet for others, they were full of stress, anxiety, sometimes fear and feelings of being overwhelmed.

Deliverables and benefits

Working together to keep the network moving

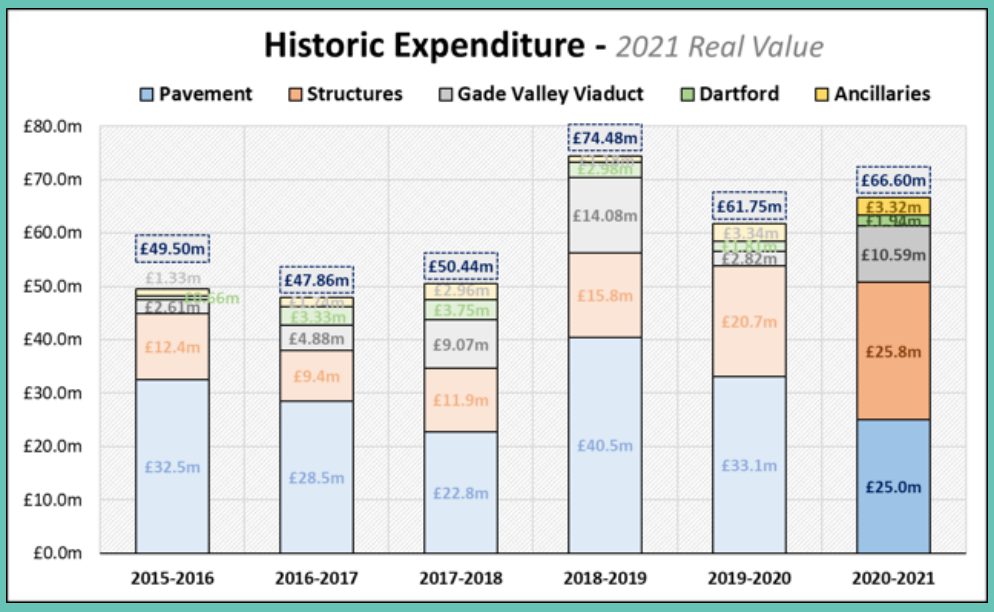
Whilst other clients were stopping all work; because of our innovative contracts, built on a strong culture of collaborative working and the relationships we have with our framework community, we were able to issue our annual call off contracts, worth £36.6m, one week after we went into a national lockdown. This was followed up with a further £10.1m of work resulting in £46.7m of work delivered through our Framework.

We were able to do this, confident that we could manage the risks associated with COVID, including additional costs, by giving our Framework full flexibility in how they dealt with the pandemic. This allowed us to offer security to our supply chain with a pipeline of work for the year. The special relationship we have built, has enabled us to work through, and adapt to, what was a constantly changing situation.

During 2020/21 we recorded a 6% increase in initial Call-Off Contracts, compared to the previous year, this was an 18% increase compared to 2018/19.

Whilst the planned Pavement program was slightly reduced from the previous year, the structures program was significantly increased. We procured and delivered a 14% increase in Structures work (by year-end) compared to the previous year.

By the 31st of March 2021 we had delivered our second biggest year of delivery at £66.6m, and our biggest ever structures program at £25.8m. By the end of October 2020, we had delivered 90% of our planned pavement surfacing program, which is our best performance ever. During this period value was generated and recorded of up to £7.5m, and performance improved by 10%.
In addition to this, we delivered £45m of improvement projects for National

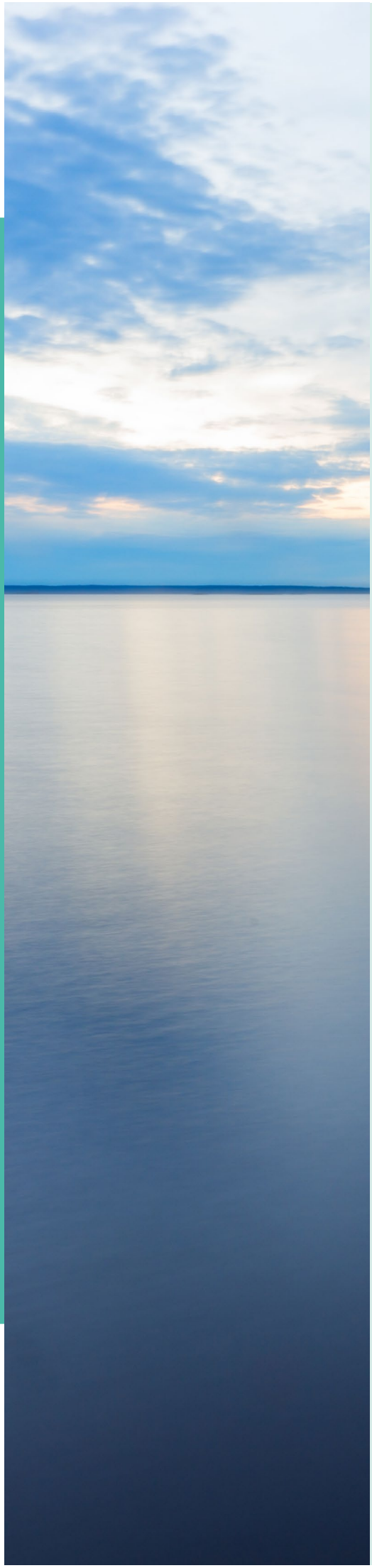


Highways, including keeping some large and complex static sites operational including: Gade Valley viaduct with an average workforce of 120 and a large Christmas railway possession, the Emergency Areas project and also opening a key junction improvement project at junction 13.

All this was delivered with a decreasing AAFR and RIDDOR rate that, for our framework contractors, reached zero in March 2021.

Our frameworks are set up to deliver a sustainable, supportive and innovative community vision, that creates an environment - both contractually and culturally - for everyone to work in joint interest to deliver works on the M25. These principals, tools and systems were thoroughly tested during the pandemic.

That we were able to do this, was in part due to the leadership training we have in place. This training supports leaders across the community from board level to project managers. It has been, and continues to be, delivered to over 80 people across all organisations, focussing on the personal attitudes, skills and awareness required to work in a complex and uncertain environment. When the pandemic hit and our world changed, we were able to leverage these skills, our culture and our contracts to manage this difficult situation.



Business as unusual

At the start of the first lockdown we delivered a series of blogs to support the lead coach community and act as a reminder of what they had learned and to engage with them on their skills and thinking in this unprecedented time.

The intention was to remind everyone that now, more than ever, was the time to activate their lead coach training and reflect upon their capabilities and lead coach practices. Each blog in the series took on a lead coach theme, and explored different areas, linked to the national picture at the time.

The face-to-face collaboration and leadership skills training we had planned for the year was inevitably cancelled due to the pandemic and the restrictions that were put in place. We realised it was business critical to continue to train new community members and develop others. As it became evident the pandemic was here to stay, we took the decision to redesign our programmes and move all our cultural training online, together with our forums, and balanced scorecard dialogues.

We were found that by re-working the plan so that training was delivered in modules over a longer period, it had a much bigger impact on those taking part, as well as being more effective.

We also found that we were able to engage larger numbers of people more easily with online webinars, seminars, forums and our lessons learnt dialogue.

Delivering a robust and adaptable business continuity plan

Our original Business Continuity Plan was further developed in light of the pandemic. We undertook a number of business impact assessments to understand the processes in place if key team members, or even entire teams, were unable to work. We spoke to business leaders as it was essential for each team to take ownership and identify what was required to facilitate an undisrupted service and what the business needed to do to support them. We looked at how they would continue to operate, for example, who was their appointed deputy and were they aware of critical information such as passwords and document storage for example. We then created a framework for each team to follow.

The BCP now incorporates new levels of process that have enabled us to continue both office and on-road operational effectiveness, by having a linked communications plan, IT input and health and safety protocols, together with operational delivery, whether working from home, in the office or on the network.

We all faced new and sometimes difficult challenges during lockdown, however, it also provided an opportunity for us to minimise disruption to our customers.

As lessons were learnt, the plan evolved and was updated as required. Early in 2021, each part of the business undertook a further business impact assessment to assess if any additional changes were needed or if they would do things differently.

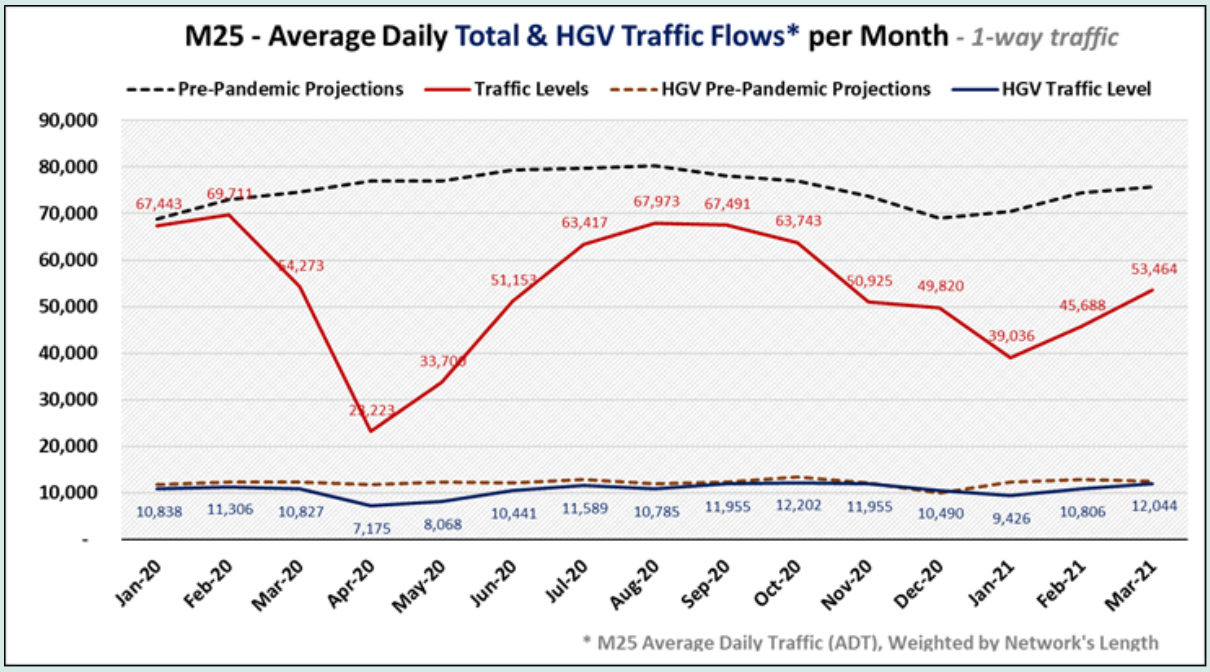
As a result of the BCP, the business was in a position to continue to deliver, operate and, importantly, adapt, during the lockdown. Because of the systems that were put in place, our teams were able to go above and beyond business as usual, keeping the network running to:

- *Allow for the transportation of essential goods such as medical supplies*
- *Enable key workers to travel without having to rely on public transport*
- *Help keep the economy moving during this difficult time*

In addition to the BCP, there were a number of examples of best practice, opportunities and initiatives that were implemented to facilitate the effective operation of the business during this time.

Resetting the working window

We all faced new and sometimes difficult challenges during lockdown, however, it also provided an opportunity for us to minimise disruption to our customers. Using big data analytics, we produced detailed analysis to visualise the impact that lockdown was having on the volume of traffic using the network. Working with National Highways, we were able to make the most of these reduced levels to reset and extend the current working window, allowing us to use this time to offset the impacts of COVID (additional resources required such as vans and people). The earlier start times and lower traffic levels experienced during the Pandemic allowed us to offset the initial anxiety experienced by the workforce in managing Covid as well as health and safety and improved the certainty in planning our work and getting Traffic management out on the network.



Regular communications
It was essential that during this time we continued to communicate with the business and our framework community, not only on COVID specific matters, but also to ensure we didn't lose momentum on business campaigns and national awareness days. We issued a huge number of timely communications to t he whole business which included:

- *COVID specific communications with information such as working safely on the network and working from home*
- *Health and wellbeing advice*
- *Campaigns and national awareness days*
- *Increased engagement opportunities for those feeling isolated such as Monday morning meditation and 'Friday Fun' sessions*

In addition, we also took our quarterly in-person roadshows online, and with great success. The turnout was much higher than usual with really positive feedback and strong engagement. The briefing content was tailored for network-based teams and recorded as a video so the briefing could reach as many people as possible, despite the much smaller shift bubbles.

Wheel of wellbeing
As well as the communications around wellbeing, we also worked with Temporal Consulting – the company who brought to life the concept of the Wheel of Wellbeing. It became apparent wellbeing was going to be important during the pandemic, as people were exposed to the pressures of work and homelife and the constant expectation of being available for online meetings.

The Temporal Consulting team worked with the framework community leadership team to develop and trial a cultural intervention programme aimed at:

- *Creating a community conversation in support of wellbeing*
- *Improving personal awareness of wellbeing*
- *Supporting leadership in tracking the cultural climate of wellbeing and identifying policies to strengthen it*

The leadership group invited up to 100 community members to attend voluntary weekly mindfulness sessions and to complete a short survey concerning their wellbeing after each session, for a total of seven weeks.

The cultural calculator (a TC product) monitored three aspects of wellbeing:

- *The personal felt experience – happy, work-life balance, healthy, optimistic*
- *How people are looking after their wellbeing – rest and energy levels, stress management, nutrition, physical care*
- *How people are experiencing their environment – ways of working, community and connection, leader ship listening, extra hours, resources and equipment.*

The leadership group were given opportunities to tailor interventions during the programme with their teams using the data to inform each intervention. The findings from the programme were:

- *Despite having more meetings an experience of disconnection remained*
- *Despite having more freedom to work from home a lack of work life balance remained*
- *Despite having less of a need to travel to work common themes were low rest, low energy and working additional hours*

In addition, there was a growing sense of them and us between the site operatives and those working from home together with a 'big brother' feeling of needing to be seen to be online.

The conclusion was that it simply wasn't enough to undertake a digital transformation, and to be operationally set up for the 'new' normal. Our way of working – our policies and culture –- needed to be carefully adjusted with compassion to support the lifestyle change.

Meditation sessions
Nicola Temporal also ran a four-week 'introduction to meditation' course which was offered to the whole business and had the purpose of providing the support needed to start and maintain a meditation practice. This was found to be incredibly helpful during this time, given the challenging environment that some of our teams were working in. Those who took part benefitted from:

- *Achieving a greater sense of wellbeing*
- *Learning how to manage levels of stress*
- *Growing of self-awareness and self-confidence*

National Highways have reviewed the Business Continuity Plan and it has been put forward as 'best practise' for use by other Areas on the strategic road network. In addition, it has been successfully audited by external auditors and also used by Balfour Beatty in relevant areas of their business.

National Highways are aware. A COVID specific edition of the Motion newsletter was also created to share positive developments on the network with National Highways during this challenging time.

We delivered £45m of improvement projects for National Highways, including keeping some large and complex static sites operational.

Healthier Highways

Connect Plus recognises the need to improve worker health protection in line with our strategic themes of ‘Promoting Health’ and ‘Leading in Safety’.

Through a collaborative partnership with Steve Perkins Associates (SPA), experts in risk-based health leadership and culture transformation, we have started to develop a strategic health leadership framework to improve the protection of health for all those who work on the M25 network.

The need

Safety is both an imperative and a value for National Highways. There is rightly a strong focus on work-related accident prevention across the SRN, but much more could be done on work-related ill-health prevention. The Health and Safety Executive estimates that each year 4000 construction workers die from occupational lung disease; there are 5500 new cases of occupational cancer; and at any one time there are nearly 81,000 construction workers with work related ill-health ranging from musculoskeletal disorders to lung disease, and noise-induced hearing loss to stress.

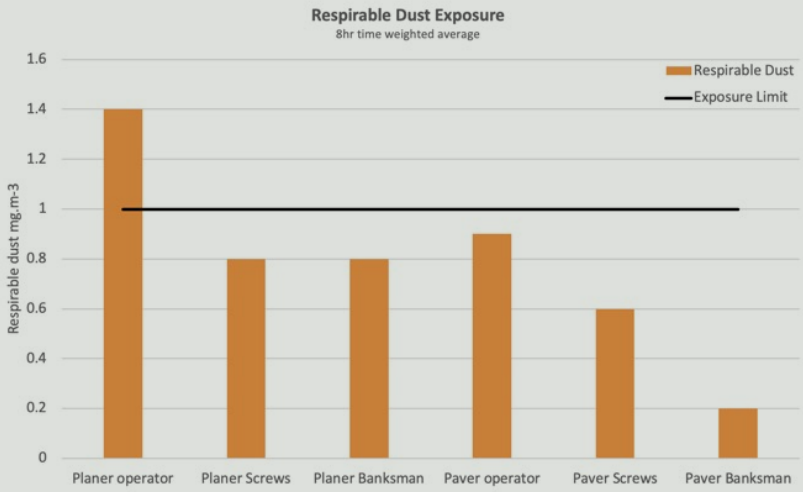
Highways construction and maintenance involves a wide range of health exposure hazards including; respirable crystalline silica, other respirable dusts and particulates, noise, vibration, welding fumes, isocyanates, VOCs, manual handling, diesel exhaust emissions and solar radiation. Unfortunately, awareness of these hazards and their associated health risks is generally poor across the industry. We recognise this situation needs to be addressed and embarked on work to begin the journey to ‘treat health like safety’ across the M25 network.

Deliverables

The collaborative leadership team, established for this project and including volunteers from across the M25 community, as well as National Highways and experts from Steve Perkins Associates (SPA), has undertaken a wide range of activities throughout the year, including:

- *Embedding a communications approach for Healthier Highways messages using regular community e-newsletters, health and safety forums, and a dedicated Microsoft Teams channel for downloading resources available to the whole community.*
- *Creating bespoke toolbox talk videos on dust and noise awareness contextualised for the M25, which have had very positive feedback.*
- *Production of task-based fact sheets on the health hazards and controls for road planing and paving, targeted at supervisors and works managers.*
- *Designing 'Good Health Conversations' playing cards to stimulate health protection engagement on site and in online meetings.*
- *A new Supervisors' dust awareness modular training course delivered live online. It incorporates practical training using the dust toolbox talk video, together with a short test.*
- *Introduced a new Health 'Don't Walk By' quarterly award for the best health protection submission/observation. First awarded in Q2 2020.*

We're particularly proud of the work undertaken by the collaborative surfacing supply chain working group on dust control in asphalt planing, which includes framework contractors and supply chains, the planer manufacturer and SPA specialists. Exposure assessments revealed low levels of RCS, but high levels of respirable dust requiring control improvement. Working together the group discovered existing planer water spray controls were not being fully used due to misunderstandings on their use and function. Further measurements conclusively demonstrated that full water spray halves dust exposure.



In addition, we discovered that the planer vacuum extraction system isn't regularly maintained and checked, thus reducing dust extraction efficiency. A case study on M25 planing dust control has been published on our website.

The team also planned and have now began to trial a new active noise control protection and measurement system by Eave. This is being rolled out across the framework community.

We also conducted a coached gap analysis project for health protection policies, systems and practices across the framework community. This highlighted a number of community-wide areas for improvement with each company agreeing to develop their own specific improvement plans.

We're starting to realise fantastic benefits following the development of our Healthier Highways initiative.

Benefits

There is now wider access across the Community to Healthier Highways resources through our communications programme resulting in increased awareness. A survey of attendees at the 2021 M25 stand down event showed that 70% of delegates were now either very/somewhat aware of the campaign and its messages.

Trials of the supervisors dust awareness training course yielded very positive feedback with 94% highly met rating for our objectives and 100% rating for recommending the course to colleagues. A noise awareness course is now in development.

Community trials of the Good Health Playing cards showed very positive feedback with unanimous agreement from participants that the cards helped to start health conversations and provided new ideas for discussions. As a result of this success a wider roll-out is now planned.

With regard to the dust control in asphalt planing work, follow-up and further exposure testing on planing dust revealed that water sprinkling controls were not used to full effect (usually at about 50%). Rectifying this results in a halving of respirable dust levels taking them to a safe level.

As we delved deeper, it turned out there was a belief in the planing sector that saving sprinkling water was the right thing to do for several apparently legitimate reasons. We disproved all of them as far as M25 planing is concerned. They were:

- *A belief that tailings from planing needed to be dry to facilitate reheating at the asphalt recycling plants. Directors of those plants confirmed that was not true as they put no specification on the water content of tailings and in-fact store them outside in all weathers prior to recycling.*

- *As water usage is measured as an environmental resource, everyone felt a pressure to conserve it.*
- *People were concerned that there would be a need to refill the planer's water tank during a shift which would delay the job and incur extra cost. However, calculations showed that for the short planing windows on the M25 a full tank of water was more than enough to complete every job with the sprinkling system running at 100%.*
- *Finally, there was a concern that spraying more water would make the carriageway excessively wet for the cleaning sweepers preparing the planed surface for the next part of the process. However, planing is conducted in all weathers – wet or dry – and the cleaners will also be spraying water during their work.*

Through honest and open conversations within our supply chain working group we were able to work through each of these reasons and collectively agree that none of them applied to M25 planing work, and therefore there were no operational or commercial reasons why the water spray should be turned off on the conveyor belts.

Our conclusions have provided significant improvements to health protection for our workforce, without incurring additional cost.

These findings are relevant across the road planing industry and are now being communicated more widely through webinars, conferences and articles in industry publications.

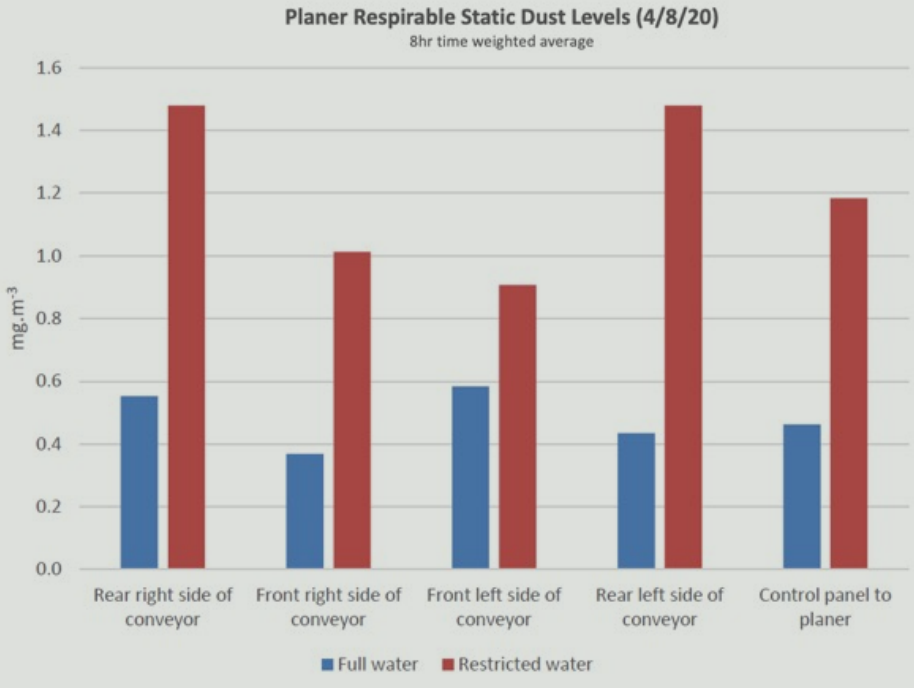
During 2020, following the introduction of our Health DWB prize, health protection submissions more than doubled and we saw a four-fold increase in numbers which involved solutions further up the hierarchy of controls than just PPE.

Our messages and resources have received wider attention across the industry through our communication efforts with Safer Highways and Highways UK.

All of the work undertaken as part of the Healthier Highways initiative has been shared with National Highways and we would hope that there is scope for it to be adopted more widely in the future.

- *National Highways teams in the South East region under Nicola Bell were included in the M25 strategic Health and Safety Forums in December 2020 and June 2021, where Healthier Highways outcomes were reported.*

- *We presented Healthier Highways to the HE Highways Safety Hub in February 2021 and the HE Supply Chain Safety Leadership Group in March 2021. The latter included Mark Byard, HE Health, Safety and Wellbeing Director.*



Road space improvements

Road space planning accuracy is a critical enabler for informing customers moving smoothly through our network.

In recognition of this, National Highways has set a target to achieve 90% accuracy of carriageway closures booked at least seven days in advance. This means that seven days' notice should be able to be provided to customers and stakeholders for at least 90% of bookings.

Historically, the performance in Area 5 (up to January 2021) was approximately 30% on this measure, one of the worst performing areas in England. It is therefore essential that we improve.

Road space planning is complex, involving many stakeholders and there are many reasons why the 90% target is not being achieved. However, through the analysis of the data, we have been able to identify targeted areas for improvement, some of which are already in place. Further improvements, including a drive for true integrated planning across the M25 community, will take longer, but will ultimately provide a platform to deliver long term sustainable improvement.

As a result of improvements already delivered since February 2021, 7-day road space accuracy is now approximately 60% per month on a regular basis and Area 5 is no longer the worst performer in the country.

The need

In order to align with National Highways' strategic imperative of customer service, road space booking accuracy needs to be strong to provide reliable information to customers and other stakeholders. Performance across England is currently well below the 90% strategic target and in Area 5, we have historically been significantly below, averaging c30%, and during the winter, much less than this.

Deliverables and benefits

A detailed analysis of the reasons for not achieving the current target has been completed. This has revealed a wide range of issues including process, systems and organisation, all of them impacting on performance. So far, the following have been put in place to start to address performance:

Cone time reporting
A daily report has been developed to allow the road space team to follow up with contractors and Service Delivery when cone times are not recorded on a booking. Without this information, bookings are classified as 'not used'. This improvement has led to a 5% improvement in performance compared to 2020, by ensuring that accurate records are kept of when cones are placed and removed.

Cone Time App
A cone time app has also been developed to allow Connect Plus Services (CPS) and traffic management contractors to log cone times directly through their tablets or mobile phones. The app is in use within the CPS Service Delivery team and with some of the traffic management community who use Google-based devices. Currently, approximately 10% of cone times are being logged through this method. Additional training and familiarisation are ongoing to increase this figure. The app is also in the process of being published on the Apple store and we're confident that adoption will increase once this has been finalised. The benefit of the app is that notification of cone times can be logged more accurately against road space booking numbers, without using an automated phone service which is liable to human error in the entry of information.

Process review of our approach
Through a process review of our approach to road space booking, and by benchmarking our practices with other Areas within the strategic road network, we identified that the our process

for booking road space was subtly different to all others, in respect of when bookings are confirmed. Within Area 5, bookings previously were typically not confirmed to National Highways until all diversions were approved. Often, local highway authorities or TfL do not confirm their agreement to diversions until very late in the process. This means that bookings were being confirmed late and then failing the 7-day accuracy measure.

We have now adjusted the process to align with the rest of the country, so confirming bookings ahead of receiving confirmation and agreement of diversions. On rare occasions diversions may not approved resulting in a cancellation, but this happens in only a minority of cases and has so far proved to be very low. Road space bookings are now confirmed 7-10 days ahead of works, giving National Highways and stakeholders greater visibility of events. This process change has had the most significant impact on performance, and is responsible for at least a 20% improvement in performance on the 7-day accuracy measure.

Road space booking good practice guide

To support changes that have been implemented, we have also published a road space booking "Good Practice Guide". This document outlines the processes to be followed by applicants and describes the best practices for each step. Lunch and Learn webinars have been held across the M25 Community to share this information and the document is available online to all road space applicants through the Network Occupancy Management System (NOMS).

Power BI reports

An important enabler to improved Road Space performance is to allow applicants to see their own performance and how that compares to the rest of the community. In order to facilitate this, a suite of Power BI reports have been developed, showing a range of road space metrics and enabling benchmarking of performance across the M25. These reports will be published to the community in the second half of 2021.

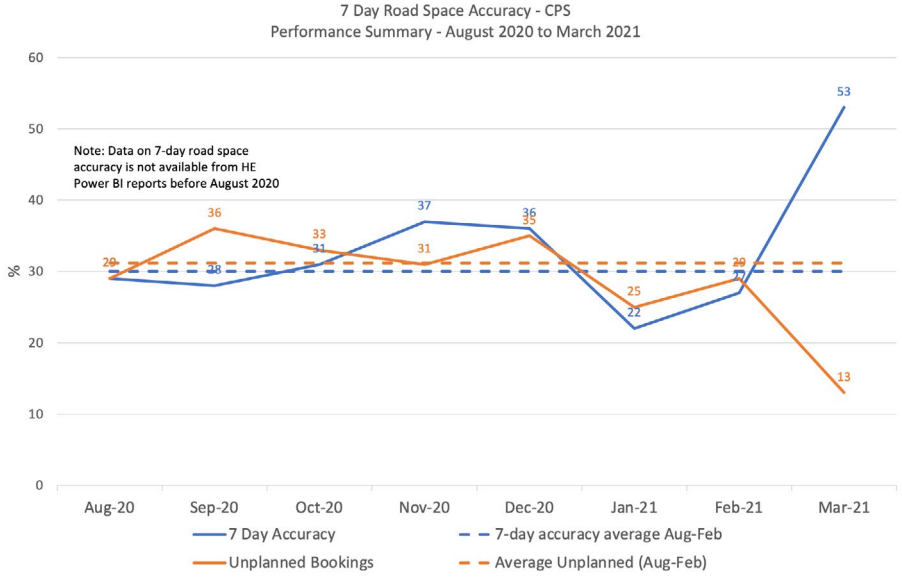
New format co-ordination meeting

An important change that has been implemented following the review of the road space booking process is to implement a new format co-ordination meeting. These meetings are now weekly, involving all road space applicants, and review the status of road space bookings up to 8 weeks out from the works date. The meetings provide a final opportunity for works co-ordination and also act as a reminder for applicants to cancel bookings that are no longer required – well ahead of the works date and therefore positively impacting the 7-day accuracy measure. These meetings are well attended and are an enabler to sustaining performance above 60% on the 7-day accuracy measure.

Over the coming months, we will be introducing further improvements to make the booking process more integrated with the overall programme planning approach. This includes introducing an integrated planning approach to look further ahead at all road space bookings, and integrate works with each other much earlier in the process. The aim is to avoid late clashes of works, late cancellations and enable more sharing of road space. This activity will be led from the CPS PMO team but will involve multiple stakeholders from across the M25 community. Through the development of this approach, we aim to achieve the 90% strategic target by 2025.

We are actively involved in regional and national forums on road space management and have been sharing our good practices with these groups.

We have also had early discussions with National Highways regarding our programme optimisation approach. They recognise that integrating road space planning into strategic programme planning will help to unlock higher levels of accuracy. We will be keeping National Highways updated on the progress we are making.



Network intelligence - Binder and surfacing dashboards

In this case study we explain the latest developments undertaken to enhance network intelligence on Paved Areas.

To this end, multiple dashboards using HAPMS Construction Datasets were constructed to map networkwide binder and surface courses, that will deliver a number of actionable insights.

The need

Our pavement strategy on fully flexible (FF) pavement stipulates that binder course failures and deterioration should be avoided by increasing surface course replacement, especially on Lane1. As such, it is deemed important to recognise and scrutinise high-risk locations where binder courses are particularly aged and vulnerable, and where the failure risk could be exacerbated without prompt preventative maintenance. Investigations including coring and testing can be carried out to determine the condition of the binder courses, and on this basis, further actions can be taken to either protect or fully replace it. It was for instance, found that networkwide, binder courses on Lane 1 are on average 29 years old, against 9 years old for thin surface courses.

Deliverables

A comprehensive dashboard, mapping the type and age of both binder and surface courses throughout the network, was assembled. Specifically, the dashboards were constructed by using modern data scripting methods to ingest, cleanse, and process HAPMS construction datasets. The processed dataset was then visualised through Power BI, and shared within the M25 community.

A set of filters including, but not limited to, Date Laid, Lane Code, Material Type, Road Number and Direction (e.g., Clockwise versus Anti-Clockwise) – which all provide meaningful insights – are directly usable, and metrics including average age of courses, given a prespecified set of filters are also presented.

Two screenshots are presented on the opposite page.

Benefits

The dashboard will be initially used to strategically select representative samples of binder course to be investigated (i.e., sampling on site, core logging and further asphalt testing). The aim would be to build up a comprehensive database of binder course types and ages to determine where the risks are for future schemes, meriting additional testing to assess the binder course prior to any inlay works and minimise the occurrence of early failures.

It is also aimed to be widely used by asset engineers and designers when planning annual Asset Management Forward Plan (AMFP) programmes. Combined with other data sets such as defect occurrences (CAT1 hotspots), inspection data (i.e., TRAffic-speed Condition Surveys), and other available visual information, this could enhance network knowledge and understanding of pavement modes of failure. Further analysis will be undertaken over the course of 2021/22 to consolidate the results.

The information will be included in the AMFP and shared with National Highways.


XSP_Code
CL1 CL4 CR1
CL2 CL5 CR2
CL3 CL6 CR3
DIR
AC-SB-WB CW-NB-EB
BINDER COURSES - DATA ANALYTICS
Length and %GT Length by Material
Dense Bituminous Macadam
Hot Rolled Asphalt
Material
Select all
High Modulus R...
Dense Bituminou...
Hot Rolled Asphalt
EME2
PQ Concrete
Heavy Duty Macadam
Stone Mastic Binder Cou...
Length and %GT Length by Year
Connect Plus
2224K
Length
30.45
Average of Age
Material, WGS_Y and WGS_X
Material Dense Bitu... EME2 Heavy Dut... High Mo... Hot Rolle...
ROAD_TYPE
Link Road
M25
Average of Age by Junction
Average of Age, Earliest Date_Laid and First Material by WGS_Y and WGS_X
Bing

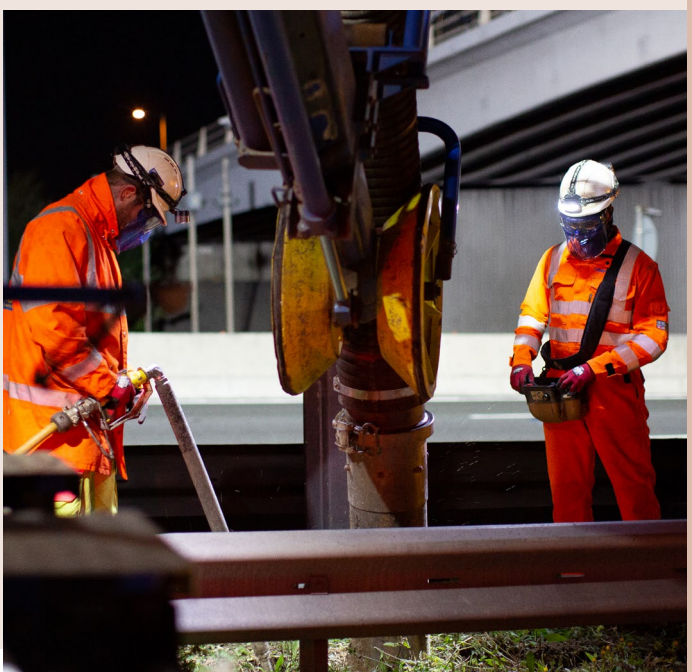

XSP_Code
CL1 CL3 CL5
CL2 CL4 CL6
DIR
AC-SB-WB CW-NB-EB
SURFACE COURSES - DATA ANALYTICS
Length and %GT Length by Material
Thin Surfacing (Gener...
Length by Year
Connect Plus
PAV_CLASS
Select all
IHRA
Others
PQ Concrete
TSCS
2208K
Length
9.64
Average ...
PAV_CLASS, WGS_Y and WGS_X
PAV_CLASS TSCS
ROAD
Link Road
M25
Average of 2021_AGE by Junction
Average of 2021_AGE, First Section_Label and Earliest Date_Laid by WGS_Y and WGS_X
Bing

Network intelligence – Deterioration of asphaltic plug joints

A detailed review of asphaltic plug joint service life has been undertaken to evaluate the use of longer life high modulus materials.

The replacement of these joint types represents a very significant part of the planned structures investment portfolio and innovation, and greater understanding of service life has a direct benefit in both investment requirements but also minimises expected network disruption and long-term risk reduction.

Analysis of high modulus expansion joint performance has been undertaken using asset data to identify and evaluate performance trends. This has reinforced the fact that these joint types are performing above the previous deterioration model, with a forecast 50% improvement in service life. The Decision Support Tool used for future asset intervention identification and investment forecasting has been updated with the revised service life.



The need

Bridge expansion joints are one of the structural inventory components that require the most frequent intervention. These joints allow structures to articulate and provide a running surface for traffic. As such, they are subject to a large amount of localised and high loading, traditionally causing deformation and failure over time.

Deliverables

The installation of high modulus asphaltic plug joints has been adopted for a number of years. However, this year, a detailed review of deterioration trends has been undertaken and compared with the traditional deterioration model used previously for these joint types. This review has demonstrated a substantial reduction in the rate of deterioration, providing confidence in the adoption of a revised deterioration curve in the Decision Support Tool.

Benefits

The installed high modulus asphaltic plug expansion joints are demonstrating improved performance characteristics when compared with standard joints of this kind.

Comparison of inspection data review for a number of structures has demonstrated this improved performance and a comparison of initial deterioration patterns suggests these joints take approximately 50% longer to reach a severity condition three. The first graph below depicts the APJ refined deterioration in comparison with the traditional deterioration model.

It is anticipated this trend will continue for greater severity levels, and additional reviews will be undertaken to confirm this, and to verify further improvement to future condition modelling.

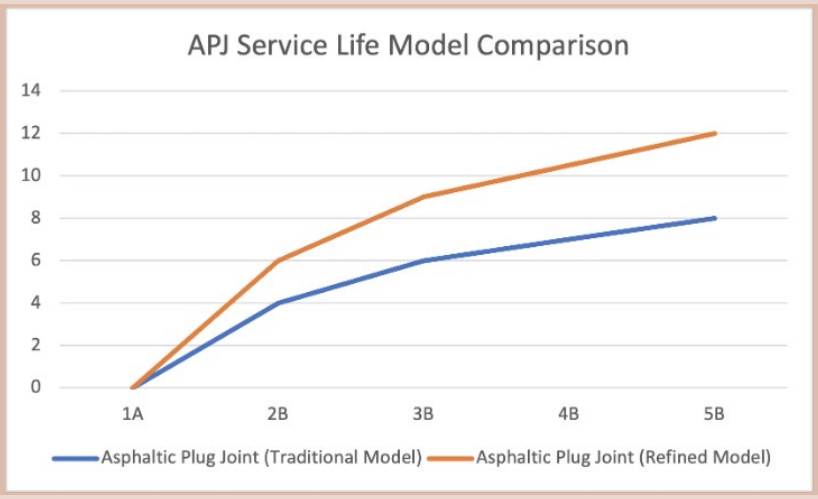
Utilising an expansion joint system that has greater resistance to deterioration directly reduces the frequency that replacement is required. As a result, fewer road closure will be required – every 12 years as opposed to every 8 – meaning less disruption to the travelling public and less exposure to a live traffic environment for our workforce. In addition, by using longer-lasting materials, we reduce the risk of premature failures, thus reducing the likelihood of serious joint-induced road accidents.

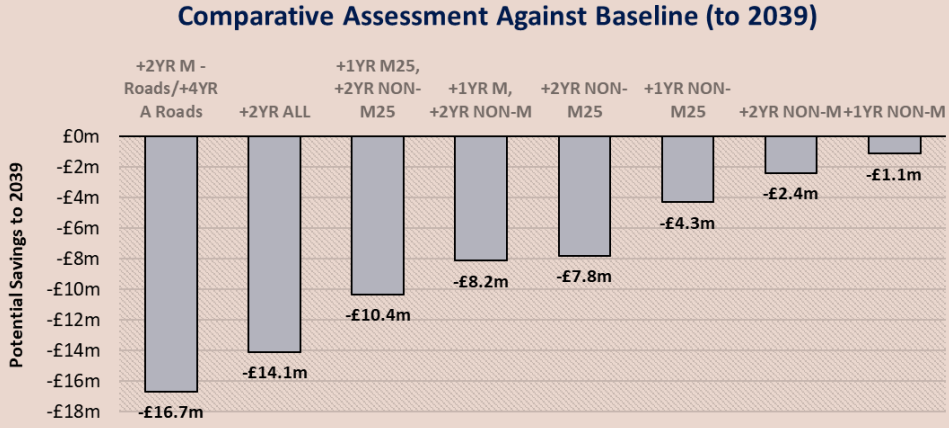
This improvement in deterioration forecasting offers greater network availability and supports journey time reliability.

We adopted a probabilistic approach to quantify savings that could be generated through longer-lasting APJ life expectancies. Different scenarios, including differentiated assumption for A and M-roads, were considered, as shown in the second graph below.

High modulus expansion joints have been adopted within other National Highways areas however, it is believed this study is the first of its kind to holistically review their performance and utilise the results to refine future condition modelling.

National Highways are not currently aware of the study but this shall be reflected through the AMFP.





Connect Plus were asked by National Highways to retrofit ten emergency areas on the smart motorway sections on the M25, and to do this within 12 months.

Working collaboratively with our framework community, we were able to successfully deliver this project, causing minimum disruption to the travelling public while having to deal with the challenges caused by a global pandemic.

The need

National Highways introduced new standards for Smart Motorways which required emergency areas to be spaced between three quarters and one mile apart, so that in the event of a break-down, a vehicle travelling at 60mph will reach the next emergency area within 45 seconds. Previously, the spacing requirement was 1.5 miles. This change aimed to make customers feel safer and improve confidence when driving on all lanes running (ALR) sections of the M25.

We were asked by National Highways to construct ten emergency areas on the smart motorway sections of the M25 within 12 months, this was the first time that extra emergency areas had been retrofitted to a completed section of the motorway. These extremely tight timescales were driven by the Department for Transport's action plan to improve smart motorway safety, which was announced by the Transport Secretary in January 2020.

Construction began in the same month, and the extra emergency areas had to be delivered by December 2020.

Deliverables and benefits

An innovative community culture
This project was delivered under our innovative COFA framework – six organisations working closely together with a community culture at its heart, to deliver renewal and improvements works around the network.

At the start of the project we involved all six contractors, plus the designers, in an open discussion, using their collective vast experience to assess the potential challenges to delivery, particularly in light of the tight timescales. Based on a range of criteria including the urgency of the project, we came to a mutual decision about who was best placed to deliver the scheme and opted to use two contractors. This would help to build resilience into the delivery and ensure the deadline was met.

The approach we undertook for this scheme was made possible by the M25 community-wide commitment to collaborative working, and the formal collaboration training programme which aims to ensure that everyone buys in to the cultural ambitions of the M25 Community.

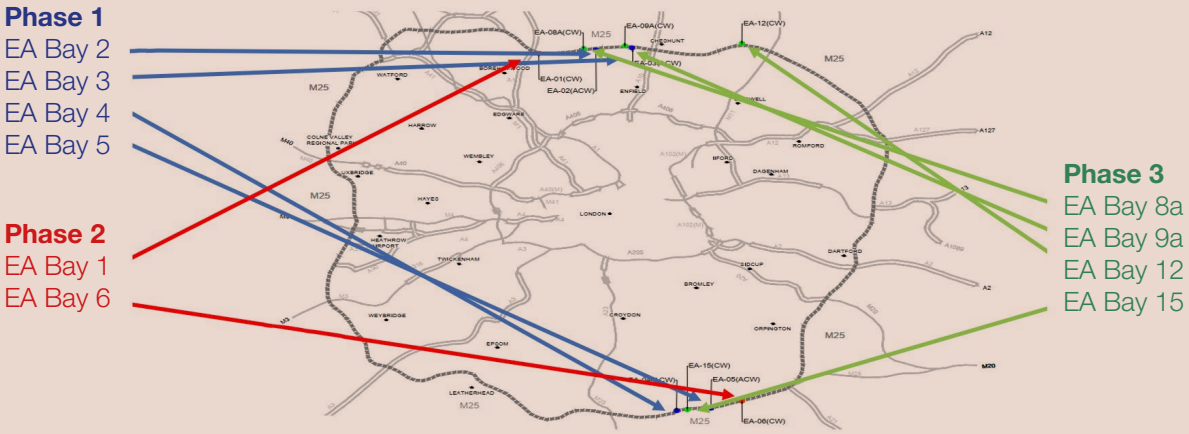
Working unconventionally
Delivering this project in the conventional way – design, tender and then construction - would have taken approximately three years, which would have been unacceptable given the context of the scheme.

By running the design and construction phases simultaneously, the team were able to find the quickest route to construction, cutting out the 'dead' time which is usually found in conventional project programming.

There were 17 possible locations for the 10 areas. In January 2020, representatives from all parties including National Highways visited each one during daylight, to make assessments. This helped identify the most suitable locations, ensuring both design and operational constraints were identified and solved collaboratively at the earliest opportunity.

Using a conveyor-belt approach, the team used selection criteria to identify quick wins on design, which allowed construction to begin almost immedi-ately, whilst design of the more complex bays was undertaken afterwards. This resulted in the project being delivered in three phases – as illustrated on the next page.

Managing risk
Risk can always be a factor in these scenarios, however, by assembling the entire project team at the outset, we were able to assign the risk management to the person best placed to manage it. This way, if there were any design issues, we were able to provide the mitigation in real time. While adopting this method incurred more costs upfront, overall, the project came in on budget, be-cause costs associated with poorly managed risk had already



been ironed out, making construction almost frictionless.

The programme and its associated risks were managed in several ways, including:

- *Project board meetings, which helped to maintain focus and remove blockers*
- *Collaborative planning sessions, where the teams met for a full day on a weekly basis*

Overall, this approach gave far more predictability and certainty of delivery against the challenging timescales.

Minimising disruption to the travelling public is an essential part of our project planning. The team did a fantastic job of phasing the work and refining construction methods and traffic management designs as the project progressed, to ensure continuous improvement.

For example, we were able to phase four separate emergency areas into two pairs, constructing them simultaneously. As a result, this required only two traffic management layouts. On the M25, traffic management forms a large part of the project cost, so planning in this way allowed the team to save £400,000 per layout, while minimising disruption to our customers.

In addition, during phase two of the construction process, the team conducted a range of surveys including topographical, ground penetrating radar (GPR), drainage, electrical, communications, ground investigations and pavement cores which allowed them to design out the need for narrow lanes in phase three of the construction process. This dramatically improved the driving experience for our customers.

Biodiversity net gain

During 2020 we recruited a biodiversity advisor, and this project was the first scheme to consider biodiversity net gain from the outset.

The construction of the emergency areas necessitated the removal of areas of the soft estate, therefore, replanting was a required to replace and enhance adjacent land. The sites were assessed to calculate the biodiversity unit value and a replanting scheme was designed to achieve biodiversity net gain.

For the first time, biodegradable cardboard tree guards were specified, reducing the greenhouse effect that traditional plastic tree guards can have on the plants. Using this product should also mean that, unlike the plastic guards, we won't need to remove them, saving manpower and traffic management costs.

Collaboration at its best

This project was truly a collaborative effort, something that was brought to light even more during the global pandemic. The teams had to change and adapt to this new way of working. Extra reporting was also put in place to ensure COVID was effectively managed at site level, together with extra welfare and other arrangements.

It was an immense challenge to deliver all bays by the end of 2020, but the whole team were galvanised by that. Each challenge that the team encountered was tackled with a one team approach - where the team owned the issue not the individual or organisation.

With all parties focussed and pulling in the same direction – we proved that it could be done.

The project team have already shared learning back to National Highways, and are playing an ongoing role as they move forward with the rest of their Smart Motorways Programme.

Furthermore, the team now has a design catalogue of emergency areas, covering a wide range of design constraints and site conditions (e.g. sheet-piled retaining wall constructions, precast concrete units, L-shaped retaining walls etc) which is already being used to inform the design of other emergency areas on National Highways network.

The project is well known and highly regarded throughout National Highways. Nicola Bell took the time to write to everyone who worked on the project, thanking them for the part they played in what was a fantastic achievement.

In addition, the tree guards were shown at the National Highways showcase by the communications team.

Sustainability roadmap

The Sustainability Roadmap sets out the sustainability objectives for the M25 network. This roadmap is the key to ensuring all parties involved in the contract are working to the same plan and ensuring environmental and social responsibility, whilst maintaining a healthy business.

The Roadmap is reviewed each year, however the overarching design of this Roadmap and the strategy that supports it was re-written in contract year 11 to ensure it is relevant to the business, the industry and all parties contributing to the M25 network.

The need

Sustainability is becoming the focus of many companies' agendas as we learn the importance of our environmental and social responsibilities beyond business as usual. A good sustainability plan is structured to represent the UN sustainable development goals, which ensure that every aspect of our work can be analysed and improved upon.

Safety is represented in development goal 3, good health and wellbeing. This translates to a business that nurtures the staff's mental wellbeing, putting huge importance on promotion of good mental health for everybody working on the M25.

Our customer remains the focus of multiple goals and actions, including reducing the number of environmental incidents and designing new ways for scheme designers to reduce the carbon that their projects produce.

During this contract year we continue to measure social value to ensure that our customers across the network are at the forefront of our activities, resulting in higher community engagement in the geographical areas that need it the most.

Deliverables

We have delivered a number of sustainability-led projects during project year 12, as part of the sustainability roadmap.

The first Green Travel Plan.
We submitted the first iteration of the Green Travel Plan which included information regarding the distances our staff commute from home to their place of work, and the relevant carbon savings that could be made by implementing video conferencing systems in offices, eliminating the need to travel to meetings. We also factored in the amount claimed against business mileage, and where our supply chain are located around the network.

Funding for energy improvements.
Following the success in the reduction of network lighting that has led to considerable energy savings, funds have been allocated to improve energy consumption across all our depots. Initial ideas include electric vehicle charging points and solar powered car ports.

Adding additional skills to the team
In March 2021 we recruited a Sustainability Analyst with the remit of managing the increasing amount of data the environment and sustainability team is negotiating. This will include building environmental and sustainability dashboards using Power BI.

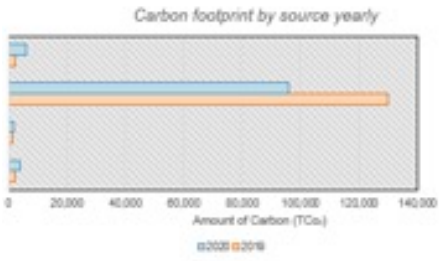
Continuing on the success of last year
Our sustainability forums have continued throughout 2020, with themed sessions to create focus within the group. Themes have included social value and energy & fuel. Following the social value session, a colleague from within our framework was inspired to start collecting data on their own social value impact.

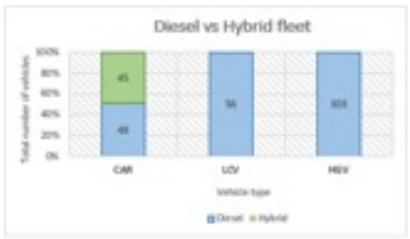
Getting the message out
With the help of our communications team, we've run a number of environmental awareness campaigns during the year, including Earth Hour and World Environment Day. We also ran a campaign specifically aimed at raising awareness on the importance of submitting Environmental Don't Walk Bys.

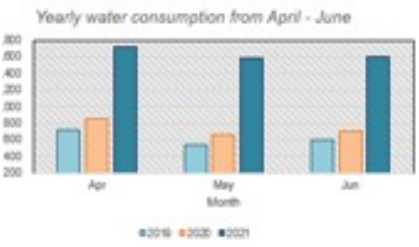
Benefits

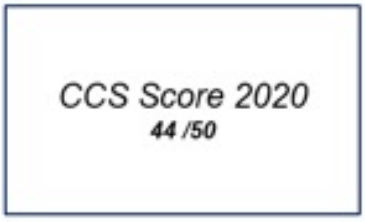
We're currently creating various dashboards to communicate and understand the complex and vast data that is being collected in relation to all our work. These dashboards will allow us to analyse and understand our data better and therefore set targets accordingly. An example of a recent dashboard is below.

A carbon assessment form has been created for our design team to use at design stage. This form mirrors the carbon returns that the framework contractors complete post construction. Having the data at both ends of a scheme will allow us to identify where we can make carbon savings. Work continues with various disciplines to adjust the assessment to ensure we are gathering the most accurate data to achieve the ability to forecast our carbon for the remainder of our contract.









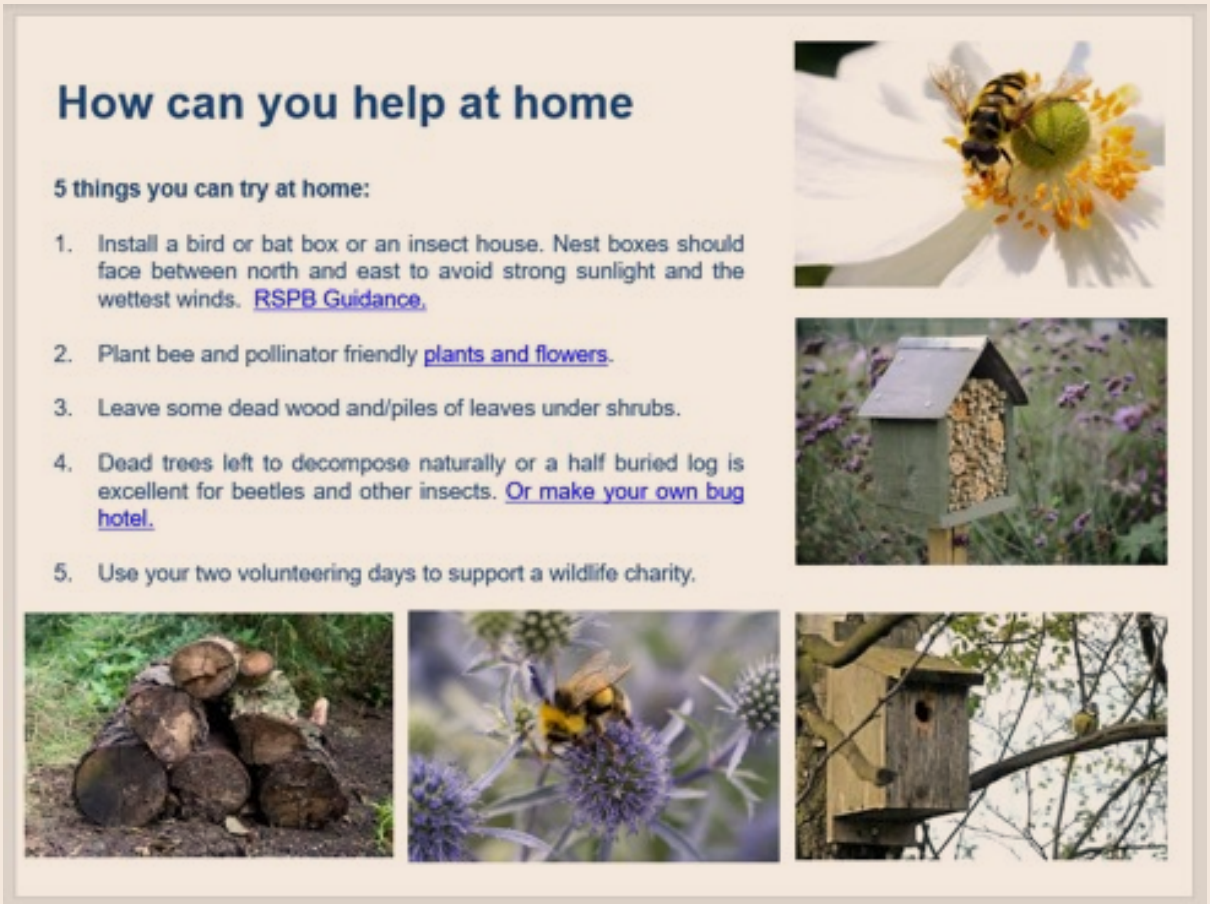
Work is ongoing to implement an environmental training plan for all staff. It is recognised that there would be a benefit from some basic environmental training to assist in particular those staff that are out on our network. The training plan has been delayed due to the coronavirus pandemic, but work is ongoing to roll this out as soon as possible.

Building on the submission of the first Green Travel Plan, a staff travel survey has been designed to be released to all staff to understand how people are currently travelling to work and how they would possibly like things to change. In light of the coronavirus pandemic working arrangements have been dramatically different and this has given all staff and businesses the opportunity to investigate whether there are more efficient ways of working.

The various awareness campaigns run throughout the year are designed to raise awareness for our staff on environmental issues.

An example below shows how one of the campaigns for World Environment Day encourages people to try things at home to improve biodiversity in their immediate surroundings.

As we gather more data we will begin to share the dashboards across National Highways.

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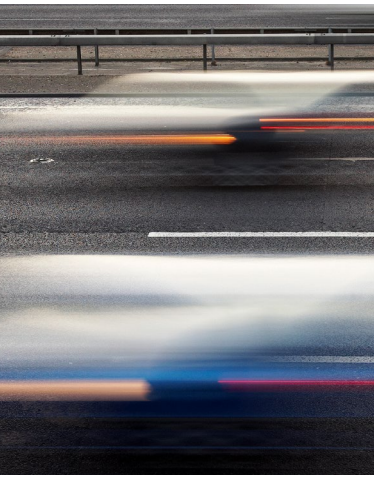
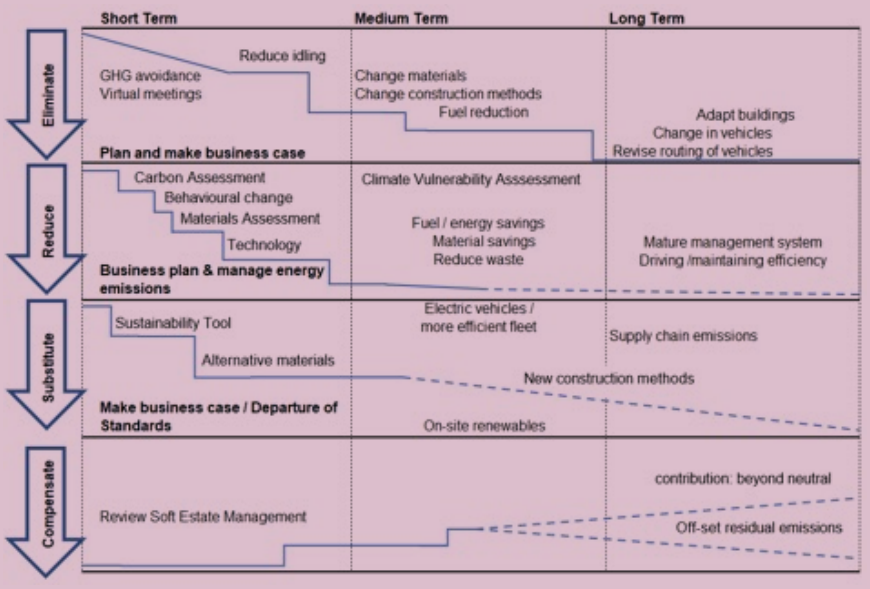
Carbon strategy and designer carbon tool

We have developed a Designers Carbon Tool, which will be used to undertake a carbon assessment of their designs using material, waste, energy, water and fuel usage data.



The tool mirrors National Highways' Carbon Tool, which we use to submit our data on a quarterly basis. The premise for the tool is to allow designers to identify materials with a high carbon content, and prompt them to consider less carbon intensive materials. The Designers Tool will be linked to the Framework Carbon Tool in the Aconex system so that a comparison of predicted versus actual carbon, materials, waste and water can be calculated. The intention of this tool is to drive a more sustainable approach to design.

In addition, we have started to develop a framework to calculate the carbon impact of our long-term asset management strategy. As such, we aim to produce a long-term carbon emissions plan – based on future volume of works identified in the 30 Year Plan – to be presented in a new AMFP appendix created for this. Specifically, we intend to relate any carbon-intensive scheme of works routinely undertaken on the network to its embodied carbon footprint coefficient, whose scope will be accurately defined, and limitations discussed. That would be regarded as a carbon baseline, upon which the impact of further carbon reduction actions shall be measured. A preliminary carbon assessment was completed for Paved Areas in November 2020, and the assessment of carbon-intensive renewals activities will follow in 2021.



The need

The design manual for roads and bridges – LA114 Climate – necessitates designers predict carbon emissions of their designs at preliminary and detailed design stages. LA110 Waste and Materials also requires assessment at preliminary and detailed design stage. National Highways are currently developing their approach to net zero greenhouse gas emissions, where one of three main areas of focus is: '*Supply Chain – emissions from making products like concrete, steel and asphalt to build and maintain our network.'*

The carbon tool has been developed to meet these standards and drive a cultural change within our business. Previously, materials and waste data were captured through an excel site waste management plan, the data was documented but not analysed and acted upon. The new tool will prompt the designers to consider materials and if alternatives are available.

The designers and construction t ools will be linked, so that it will be possible to identify how designs were constructed and if any lessons about materials can be identified.

We have also started to develop an approach to calculating our carbon footprint for the AMFP portfolio for the remainder of the contract.

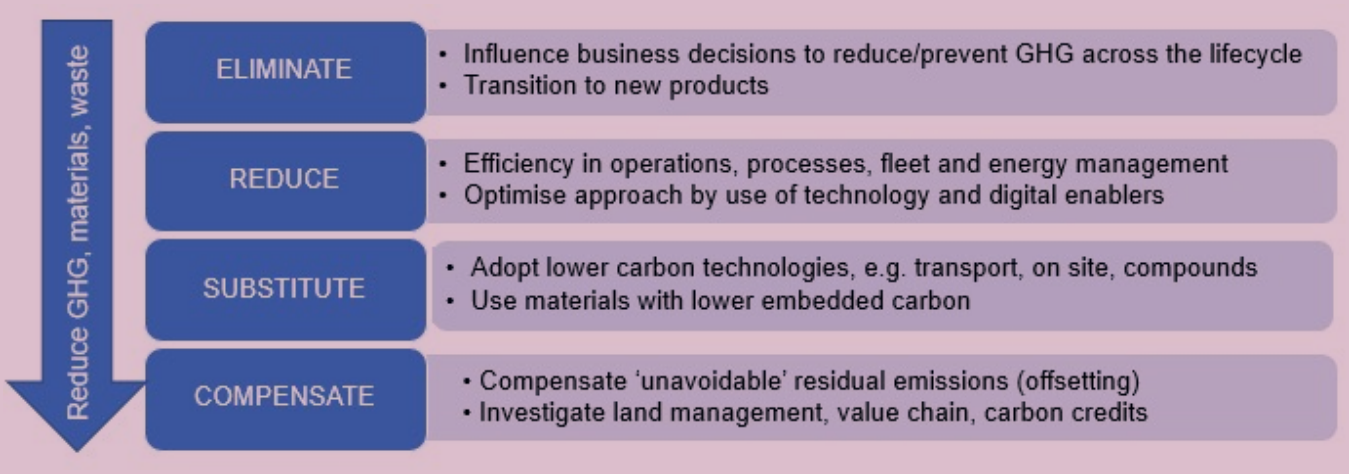
Deliverables

The project management team worked collaboratively with all stakeholders to create and launch the Designers Carbon Tool. Working together they created a form on Aconex mirroring that used by our Framework Contractors, which reflects National Highways' Carbon Tool.

It was necessary to create our own version, so that Aconex can collate all the entries into one form - previously our contractors were completing the National Highways form themselves. We would then copy and paste the individual scheme information into one spreadsheet to add it all up, which was incredibly time consuming.

Once the form had been created and tested on Aconex, it was made live. To then inform teams of the change in procedure and new requirements, presentations were organised for the design and project management teams. They were well-received with very positive feedback. It was encouraging to hear that all the teams were keen to reduce their carbon emissions. Guidance for completing the form was also created to accompany the rollout.

In regard to the carbon reduction strategy, a framework, detailed below, was devised:



Benefits

The collaborative working displayed in creating, completing and assessing the designers carbon tool, substantially increased communication between the teams involved, raising awareness of roles and responsibilities which in turn ensures a more efficient working practice.

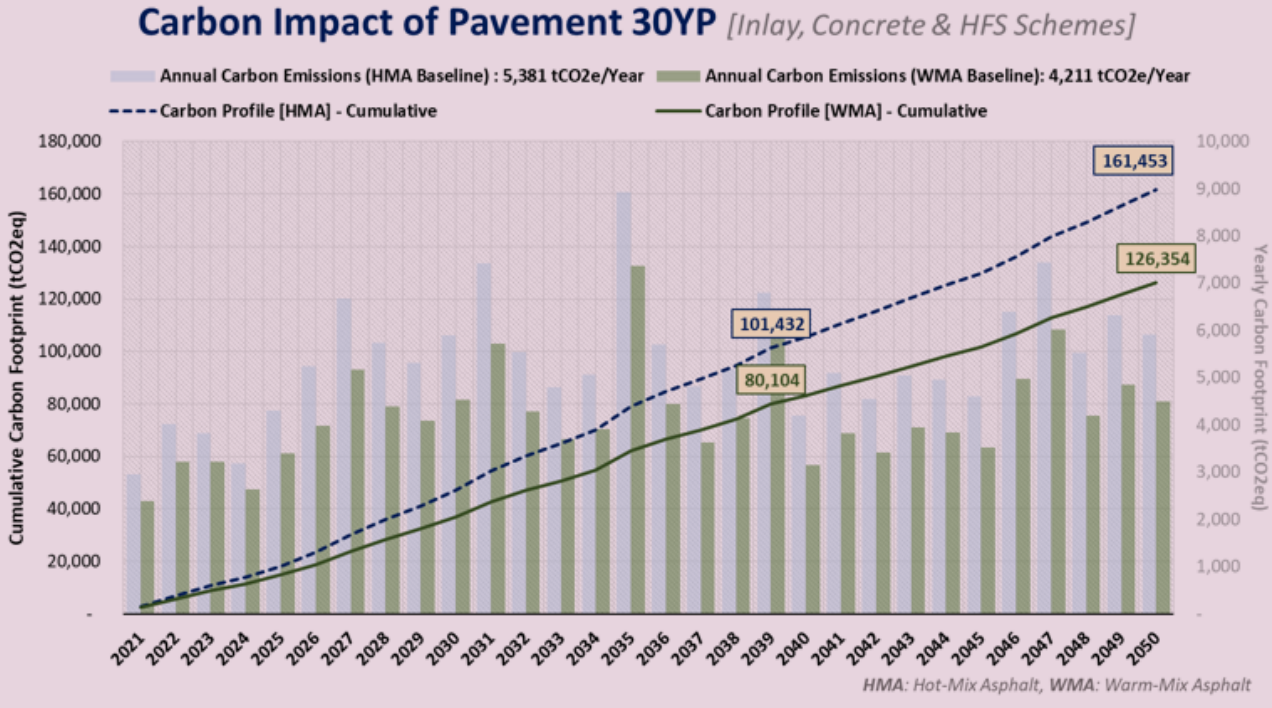
Mirroring the Designers Carbon Tool to the one already completed by our framework contractors, enables us to make direct comparisons of predicted carbon footprints to the actual emissions. The use of Aconex for both forms means that the data is easily accessible for analysis as both follow the same format. Additionally, this will also allow us to identify carbon savings from other schemes and/or savings made when on site constructing the scheme.

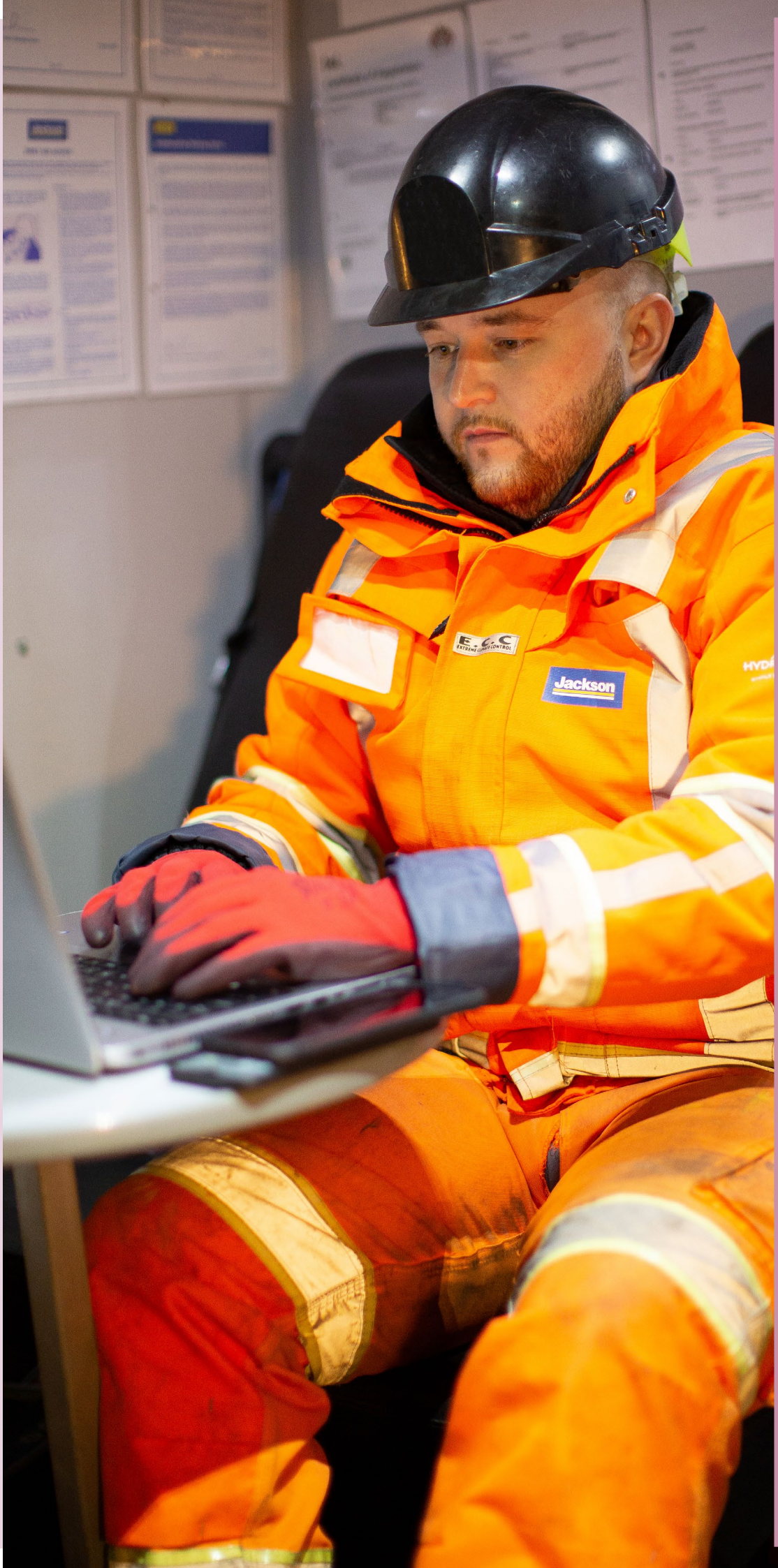
We calculated an estimate of the carbon footprint derived from the latest 30-year plan on paved areas, using latest cradle-to laid road surface emission factors. As a result, the cumulative carbon footprint of our pavement renewals schemes to 2039 is expected to approach ~100,000 tCO2e (c.f. graph below). This profile will be revised downwards once the environmental impacts of innovative recycled mixtures and technologies (e.g., reclaimed asphalt, warm-mix asphalt, and longer-lasting materials) are better understood. An indicative profile showing the expected benefits of laying warm-mix asphalt – which reduces emissions associated with asphalt production - is also forecasted.

A dashboard showing predicted carbon emissions at design stage versus live actuals will be produced and widely deployed in the near future, for the M25 Community's benefit. As of today, the pavement schemes delivered from April 2020 to March 2021 are believed to have generated 1,830 tCO2e, but also avoided ~144 tCO2e through the laying of warm-mix asphalt (WMA).

The work undertaken during 2020 is only the start of our consideration of the carbon impact of our AMFP work, and our intention is to continue to build on this over the coming years. Further carbon assessments will be undertaken for carbon-intensive renewals activities during 2021, with the aim of producing a new Appendix from AMFP 2022/23 onwards, which will be an indicative carbon emission plan.

National Highways are aware of the work we've been undertaking in this area.

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Biodiversity net gain

Biodiversity is a core focus for the M25 team and the past year has seen the network take great strides towards it's goal of biodiversity net gain.

This has included a number of biodiversity projects, in addition to the recruitment of a dedicated new Biodiversity Advisor.

Key projects throughout 2020 have included:

Emergency Area biodiversity net gain – The building of the Emergency Areas was one of the larger projects of 2020; it was the first scheme on the M25 to consider biodiversity net gain from the outset and implement a replanting scheme to achieve this. In addition, the scheme trialled innovative compressed cardboard tree shelters, thus reducing future plastic waste.

Titsey Woods – A Site of Special Scientific Interest (SSSI) partially falling within the M25 boundary. It is noted for its specific grassland vegetation and associated insects, however over time, this area had had significant regrowth which had started to negatively impact on-ground flora. Phase 1 works were carried out in 2018-19, followed by phase 2 during 2020, which saw carefully planned removal of regrowth to allow fauna and flora to flourish.

Lullingstone Castle – A Grade II Registered Park and Garden (RPG), which was once a medieval deer park, forming part of the wider estate of Lullingstone Castle. The western boundary is located approximately 170 m to the east of the M25 and within the Kent Downs Area Of Natural Beauty (AONB).

As part of National Highways' 5-year Delivery Plan (2020-2025), feasibility and design work to reduce the visual impact of the network on the Castle park took place in 2020. This had the aim of conserving and improving the landscape of the area and the condition of this heritage asset, helping to safeguard it for future generations of people and wildlife.

The need

The Government's 25 Year Environment Plan sets out a vision that will embed an 'environmental net gain' principle for development, including infrastructure. National Highways' Roads Investment Strategy 2 has a specific RIS2 action to ensure 'no net loss of biodiversity from National Highways' activities.'

Emergency Areas

The construction of the Emergency Areas necessitated the removal of areas of the soft estate, so replanting was a required to replace and enhance adjacent land.

The sites were assessed to calculate the biodiversity unit value and a replanting scheme was designed to achieve biodiversity net gain. This included the use of environmentally friendly and more visually pleasing compressed cardboard tree guards.

From a safety perspective, for the first time, there is now a reduced need to remove the tree guards due to the new material used, reducing contractor time on site, and traffic management requirements. This is mutually beneficial for the safety of the workforce, but also the impact on the customer. The guards also do not end up becoming plastic litter in the soft estate.

This project is contributing to both the biodiversity and sustainability aims of National Highways by providing a net gain of 7.32, which is an increase of 61%.

Titsey Woods

Whilst vegetation is positive, vegetation in the wrong place can be damaging. It was identified that the overgrown vegetation at this location needed to be managed to allow more beneficial vegetation to flourish.

Lullingstone Castle

A lack of screening between the M25 and the park had been identified for about 380m, between the marker posts 18/6A and 18/2A. This caused a visual impact on the Lullingstone Registered Park and Garden (RPG), the adjacent public footpath and several Grade II and II listed buildings in and around Lullingstone Castle. The project also identified biodiversity benefits by creating an ecological linkage between existing hedgerows.

Deliverables

Biodiversity Advisor

During 2020, the M25 team continued developing its biodiversity net gain capability by recruiting a Biodiversity Advisor; a new role for the company. The purpose of this role is to develop a biodiversity baseline for the network; assess schemes where there is biodiversity net loss and design schemes so that there is no net loss; and identify EDF schemes that create biodiversity net gain.

Emergency areas

In May/June 2020, a biodiversity assessment was completed for each Emergency Area and areas for biodiversity net gain were identified. To enable this, new species of vegetation were specified, all of which were English native species appropriate to the South-East region. In line with National Highways' MPI-85 Low Nutrient Grassland guidance, a minimum topsoil depth was specified, and the grass seed mix was a tussock one, which is beneficial for insects and small mammals.

For the first time, biodegradable cardboard tree guards were specified, which reduce the greenhouse effect of plastic on the plants as well as being 100% plastic free. The stakes are integrated into the shelter, also removing the need for plastic ties. The shelters will be monitored to identify how long they take to biodegrade.

Replanting of the Emergency Areas was completed in March 2021, and over 30,000 tree guards installed.

Summary

Strategy	Biodiversity Net Gain Outcome	Time to Target Condition / Management Plan Duration
Habitat loss only	-21.74%	-
Option 1	53.85%	3 years (from last phased clearance/planting event)
Option 2	115.24%	20 years

Titsey Woods

Agreement with Natural England was sought to remove a strip of woody trees and vegetation (circa 3,000m2) from the plot, in order to enhance the local environment for flora and fauna. The arisings were retained on-site as a dead hedge to reduce deer ingress and reduce waste disposal. Two fruiting trees were retained for their food source, but their crowns raised to allow light to the ground surface. Some larger trees were ringbarked to provide standing dead wood. A specific requirement of the project was not to import seed to restart the grassland. Instead, removal of regrowth and poisoning of the stumps has allowed the ground flora to rapidly recolonise the area, greatly meeting the project needs.

3,000m2 of species rich grassland has been delivered and uploaded into EnvIS.

Lullingstone Castle

A mixture of native trees and shrubs were selected for replating along the eastern bank of the M25 to provide additional screening to the area. The hedgerow plants were also specifically chosen to benefit the population of Dormouse present in the area.

Benefits

There have been extensive benefits realised across the network to date. These include:

Emergency Areas

Net gains have been achieved in biodiversity (a net gain of 7.32, which is an increase of 61%). Installation of plastic free tree guards, which are sustainable, biodegradable, and aesthetically pleasing.

Titsey Woods

Recovery of the native ground floral layer. Over time this will develop to support greater invertebrate diversity.

Lullingstone Castle

An ecological linkage has been created between existing hedgerows, in addition to helping to conserve and enhance the condition of the heritage assets by reducing the visual impact of the SRN on the registered park and garden and from the nearby public footpath. The works undertaken here will also promote enhanced air quality.

"Well done and good work in delivering this on time and getting around the challenges of access. You have exceeded the expectations of the delivery plan." Feedback from National Highways' project sponsor – Michael Woodman

We believe the use of the cardboard tree guards across the network is a first on the SRN.

The tree guards were featured in the monthly 'Motion' newsletter of success stories which is shared with National Highways. The initiative was also discussed with the National Highways press team on the Area 5 feeder call.






Photos

Top row; Tree Guards in place.

Bottom row; Start of works at **Titsey Woods**, showing woody vegetated plot;
Works Completion in March 2020 – standing dead wood in plot;
August 2020 – showing huge diversity of ground flora.

Mutual aid for area 4

We were asked to undertake pavement renewals schemes in the adjacent Area 4 while A-One+ demobilised at the end of their contract term.

We were asked to undertake pavement renewals schemes in the adjacent Area 4 while A-One+ demobilised at the end of their contract term. It was a challenging task, set to be delivered in a short timeframe and required assembling a team and progressing multiple project facets in parallel, including governance and procurement.

The team were able to overcome these challenges and worked with National Highways to set realistic yet still challenging targets while undertaking works through the early stages of the COVID-19 pandemic. £4.9m of works were delivered over seven months using cost reimbursable forms of contract within 2.5% of budget at the final account, demonstrating fair and sensible, collective management of risk.

Innovations were implemented including using the pre-planing method, thus improving productivity and proving that this can be achieved on the Strategic Road Network (SRN) where conditions are favourable.

The need for good relationships between the team members and between the team and third parties such as local authorities, residents and stakeholders has been reinforced and the value of investing in managing such relationships has been proven, particularly on challenging, complex projects that require a high degree of collaboration.

The need

The Area 4 Asset Services Contractor (ASC), A-One+, was in the process of demobilisation during 2020. Rather than increase pressure on those teams at a difficult time, we were asked to design and construct 15 pavement renewals schemes in Area 4. These schemes were necessary to address poor road condition, thereby improving road user safety and to reduce the reactive maintenance required, ahead of wider renewals schemes. There was also a drive to deliver these schemes by the end of March 2020, or soon thereafter due to in-year budget availability.

Deliverables

Recognising the difficult challenge, we assembled a team of individuals with a track record of efficient delivery from our supply chain, and provided them with the tools and contractual flexibility to deliver the programme successfully.

While design work began in January 2020, the first scheme on the ground was in mid-March, with most schemes being delivered from April through to September. A total of £4.9m was spent on pavement and footway renewals schemes, including work to structures, such as joint replacement.

The team had to adapt to working in an unfamiliar territory and completion of all site works was achieved in a period of seven months, despite each scheme being heavily constrained by road space availability, and the entire programme being delivered during a global pandemic.

In comparison, Area 5 delivered circa £25.3m of planned pavement renewals that began with detailed planning by an already established team during the preceding year.

Benefits

Incentivised forms of contract are a popular choice to balance risk between contractors and clients, and are an encouraged option for our Call Off Contracts. For this programme of works we promoted use of a cost-reimbursable form instead, recognising the multiple variables and challenging success criteria. We have proven that with the right people and behaviours, and open discussions on cost estimates for works and associated risk, it is possible to deliver a complex programme of works within 2.5% of the budget. This has brought cost reimbursable forms of contract to the fore, as a solution to heavily constrained, complex projects.

Our team's determination to succeed in delivering the programme within a tight budget and timeframe created value, for example, by taking the time to identify inactive traffic detection loop sites initially designed for replacement, and therefore avoiding unnecessary replacement and future maintenance at Cophall, Sussex.

Relationships with local communities and stakeholders were improved through an effective communications campaign which, for example, allowed us to negotiate free parking for some residents at a local hotel, while footway works were undertaken in front of their driveways. We also facilitated a private water supply installation for the same group of residents.

Elsewhere, we received positive feedback from other residents for reacting to resolve complaints during a shift, and from Network Rail at Arundel Station. These interactions will allow future project teams to face less resistance and therefore achieve smoother and efficient delivery.

Our organisations carry this project with pride as a demonstration of unified delivery. One of our site team summed it up perfectly when he said: *"This has been the highlight of my career".*

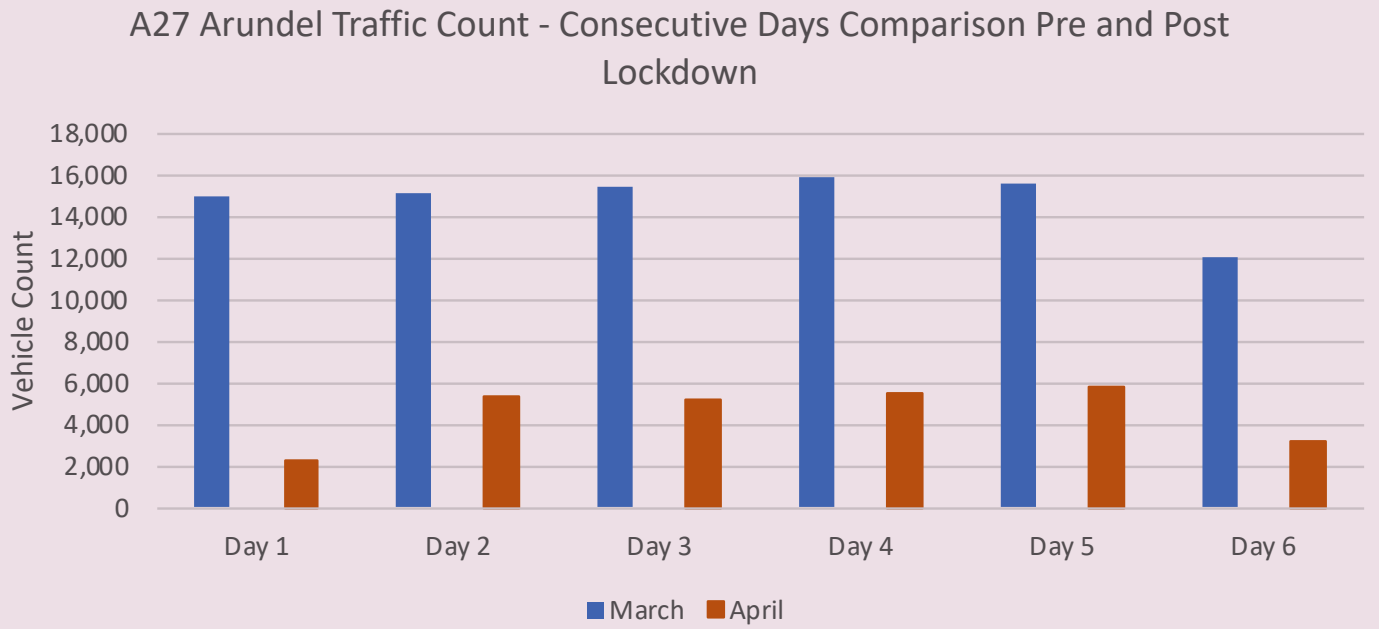
During a kick-off collaboration workshop that was designed to ensure the team members understood each other, as well as forming the basis for future relationship building, an idea was shared by one of our framework contractors to use WhatsApp as a means for instant communication.

This proved hugely beneficial to timely decision-making and reducing waste on site or improving customer experience, for example, by extending planned surfacing works into additional adjacent areas upon the site team's recommendation. This communication tool has since been used on other National Highways schemes.

The pandemic reduced traffic levels by one third in some areas as shown in Figure 1 and we were able to employ a method not normally used on the SRN to improve productivity on some of our schemes. Through undertaking a GG104 Risk Assessment and introducing control measures we were able to plane surfaces during a night shift and allow traffic to run on the exposed binder course, and then return the next evening to complete surfacing. This saved a total of six shifts and associated costs over the course of the programme. While opportunities are limited, it has been proven that this method can be used successfully on the SRN.

The team has received external recognition in being shortlisted in the Supply Chain Excellence category for the Construction News Awards 2021.

Through the award submission the press team have been made aware of the project.



Developing our digital twin

As a first step on our journey to create a digital twin of the M25 network, we worked with Sensat to undertake a drone-based data capture of the M25 ring and visualised the data captured in a 3D web-based platform.

The platform is available to the whole M25 community and allows users to visualise the road and surrounding lands, take measurements and plan for activity before 'placing boots on the ground'. Longer term, we are working towards a wider digital twin, which will layer data about the assets with live visual representations – this will be based around a digital toolset, identifying the appropriate platform for the specific need of the team or individual. The Sensat Mapp platform is delivering benefits - the team to explore the possibilities of 3D visualisation and capture use cases.

The need

The team on the M25 manage a vast array of assets and it is difficult to visualise these assets without visiting a live highways environment. This often leads to multiple trips to the roadside to scout the area before work commences. The survey data, obtained by Sensat, allows for a reduction in trips to the roadside, improving the safety of our employees and the road user.

Deliverables

From July to September 2020, Sensat used its advanced drone data capture and visualisation capability to cover 120 miles of highway to capture 23 billion data points and 85,000 high-resolution images of the M25 in just 30 days – ***the largest drone mapping endeavor to have taken place in the UK to date.***

With permission from the Civil Aviation Authority to fly drones within built up areas, combined with EVLOS (extended visual line of sight) exemption, the Sensat drones were used to remotely capture physical photogrammetric survey data safely and efficiently.

Following the survey, the data was 'visualised' by turning the images and data into a 3D model of the road network, which has been used to create a digital representation of the M25 environment. It has become a key source of detailed information, supporting the team in planning and decision-making, ultimately reducing the need for physical surveys to be carried out in a live highways environment.

Benefits

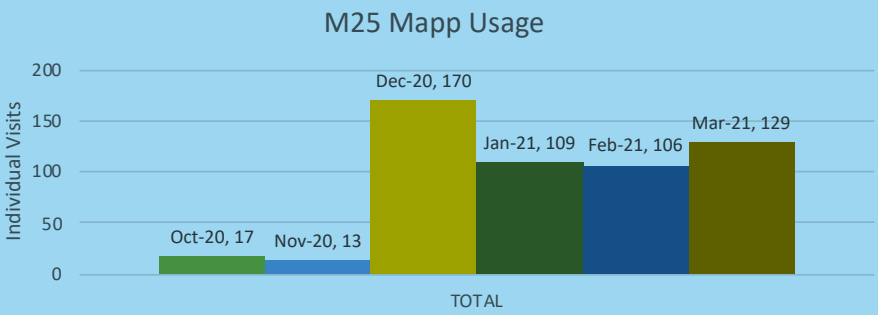
The benefits gained from using desktop surveys to confirm asset condition and to plan works are wide-ranging. Capturing, visualising and then sharing topographic data in our platform means asset and road quality inspections, measurements and accurate reports can be undertaken quickly without people on site. Mark-ups can be made and are visible for all users, and descriptions and attachments can be added directly to enrich the data. With these tools, the complexity is taken out of physical data management and it ultimately streamlines manual processes, increases productivity and supports the project's safe delivery.

Reducing site inspections.
This first digital scan has had immediate measurable benefits by reducing the number of site inspections on some schemes, as the information provided by the scan is sufficient and to the same level of quality as the information gathered on site.

Using traffic management as an example who would often be on site 3 or 4 times a week, they have now reduced their site visits by 80%. As a result, during last year we conducted 160 fewer shifts for TM surveying, when compared to traditional survey methods. In addition, specific surveys of particular structures that were difficult to obtain because of access restrictions, are now no longer required, as all the information can be extracted from the digital survey.

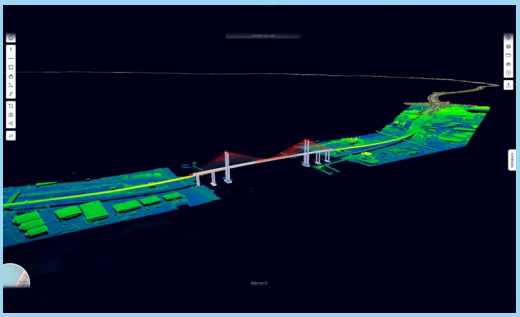
Taking boots off the ground and reducing disruption to our customers.

The interface between road users and operatives is a statistically proven area of primary risk and, through the hierarchy of controls, our priority is always to eliminate risk where possible while reducing any hazards that may affect our workforce. This bespoke data capture service allows for right-first-time detailed desk-top decisions that reduce the time our workforce need to spend in a live highways environment, delivering works or conducting surveys. In addition, the process allows optimisation of traffic management planning for road closures and safe taper locations, resulting in further risk mitigation and more reliable journeys for our customers.



Reducing carbon emissions.

Also top of mind for our team is the importance of decarbonisation for a better-built future. By using innovative technology, we now have fewer vehicles on the ground moving between traditional survey points and have reduced carbon emissions by more than 95% compared to traditional survey methods.



We have engaged with National Highways on the M25 digital twin journey and digital surveying techniques that are currently being utilised. National Highways are using drone-based scans for other areas of the SRN and Connect Plus are seeking to share digital survey output and utilise National Highways' digital platforms, such as AVIS. The team will continue to engage and share ideas and experience on the wider digital twin.

A press release on our work was issued in December 2020, and as a result an article was published in Civil Engineering Surveyor magazine. The work around the digital twin has also been submitted to several awards and has been shortlisted for two - Digital Initiative of the Year category for the British Construction Industry Awards 2021, and Digital Construction Excellence for the Construction News Awards. The National Highways press office were consulted throughout.

In this section we'd like to share some of the fantastic projects and innovations that our team are currently working on.

We believe that some of these projects will progress throughout the year and potentially develop into full case studies, showing real benefits in the future.

1 Trialling new materials on the M25 network
2 Safe to dig
3 Using augmented reality on the M25
4 Climate vulnerability assessment
5 Next generation concrete surfacing
6 Road space – future direction
7 Self-healing asphalt
8 MLS machine
9 E-learning

Trialling new materials on the M25 network

The current life of Cl. 941 materials on the M25 network varies from 9-12 years. Using a more durable material with a life expectancy of 16-20 years has clear benefits in terms of a reduced number of future interventions. In addition, the lower void nature of this material should also lead to reduced Cat 1 / Cat 2 defects, as the material will be less prone to ravelling and sudden failure towards the end of its life.

There have been a number of developments in the UK in terms of a more durable pavement surface over the last 10 years and, working together with our framework contractors, we are aiming to trial two materials on the M25 network. Both are 10mm nominal aggregate size.

A business case has been written and presented to the Innovation Board. It shows that, while the material is more expensive per m2, based on available research and data, the approach has the potential to provide considerable savings over the remaining concession period (up to £80M), through a reduced number of interventions prior to hand back.

The suppliers of the material are developing 10mm mix designs to go forward to trial. They are currently at the laboratory mix design stage, and it is anticipated that following an assessment we will start the network trial towards the end of in Q3 this year.

We're very excited about this trial and the potential benefits it will bring. It will be the first use of this type of surfacing on the Strategic Road Network. We're aware that National Highways are looking to develop a premium product for use in high stress areas, and we're looking forward to sharing the results with them in the future.

Safe to dig

Our teams undertake many kinds of work on a daily basis in order to maintain and enhance the network. In areas where it is necessary to dig, a 'permit to break ground' must be requested and approved before any works can commence.

This is currently a manual process and, at times, can be incredibly convoluted. Permits that have been authorised are often difficult to search on and review.

We are starting a project that will see all permits digitised, starting with our 'permit to dig', for which we are currently processing approximately 35 permits per day. The solution will digitise the process of submitting and authorising the permits, before overlaying each one on a mapping solution (GIS), to enable future geo-referencing of permits. This will enable us to not only improve our efficiency in processing, but will also enhance health and safety, as it will be clear what has been approved and who is authorised to carry out the works.

Using augmented reality on the M25

From August 2021 we are commencing a trial of augmented reality digital glasses. They allow the user to either receive instructions from a person who is remote from the site, or relay information to another location. Two initial use cases have been identified on the M25.

The first use case is for the tunnel maintenance team, where the glasses will be used for an expert engineer to remotely connect to an operative at the asset, and provide instructions on how to service the asset in location. Today, specialist engineers are often flown in from Europe, however, utilising these glasses should allow for this input to be received remotely, and for the engineer to sign off the inspection or service of the kit.

The second use case is for the incident support crews. Often when crews are called to an incident, damage has been caused to assets that require specialist input from an engineer before the road can be reopened. This can involve a lengthy wait for an engineer to arrive at the scene and pass the repair safe for the road to reopen. Today, when this situation occurs the road can be shut for a long period of time causing lengthy delays and frustration for the road user. In the future, using this technology, engineers should be able to remotely inspect the repair and give the go ahead for the road to be reopened.

Longer term we can envisage many different use cases where remote input is required, for which this could provide an ideal solution.

Climate vulnerability assessment

Climate change is happening now, and if it continues to rise at the predicted rates its impact will be felt globally and locally. We're already experiencing climate related impacts on the network and, according to climate projections released by the UK Climate Impacts Programme, without mitigation and adaptation these will become increasingly more frequent and more damaging.

As a result, we have undertaken a climate vulnerability assessment to understand the predicted climate change for the south east, and to identify the potential impacts and risks that it could have on our assets. This is so that we can begin the process of mitigating the effects of climate change on the M25 network.

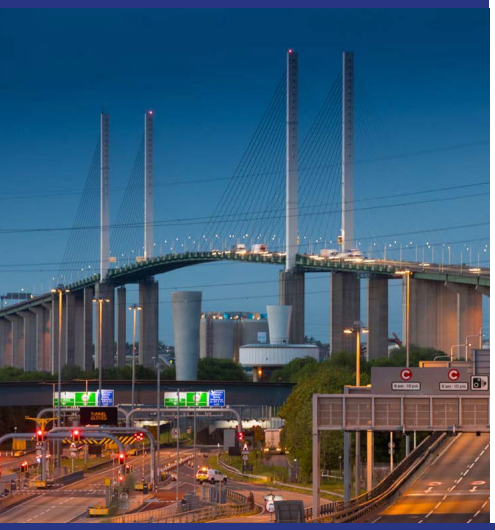
We're only at the starting point for adapting and mitigating the impacts of climate change, however we are excited to see where this will lead. We are already engaging with asset and service delivery leads and this has prompted them to consider what the future could hold.

Next generation concrete surface

The Next Generation Concrete Surface (NGCS) is an innovative concrete surface treatment applied to concrete pavement that reduces noise, whilst still providing adequate safety in terms of skid resistance. It was developed in the United States under an extensive three-year research programme for new and existing concrete, and is a refinement of Longitudinal Diamond Grinding. The research identified that refinements to the blades significantly improved the noise performance, texture and durability.

A business case has been put together and presented to the Innovation Board showing that, based on available research, the technique has the potential to provide considerable savings over the remaining concession period (up to £8M) compared with a thin overlay option.

A location for the trial has been identified close to the current trial on the M1, which will enable efficiencies in survey operations and allow for direct comparisons in performance over time. The treatment is due to be installed in September 2021.



Road Space – Future Direction

Based on the analysis conducted by CP/CPS on road space accuracy and the reasons for historic low levels of performance, a key reason for suboptimal outcomes is that road space and diversion requirements are not always fully considered during the programme planning process.

CP/CPS are exploring solutions to allow the planning of maintenance and investment programmes to be undertaken using more automation, factoring in consideration of where road space can be shared, where clashes can be designed out and how works can be better scheduled to minimise weather risks. The expectation is that this approach will improve the accuracy of the delivery programme and have a consequential benefit of improving 7-day road space accuracy. Development work is ongoing to build software tools to enable this improvement which are anticipated to roll out in 2022.

Self-healing asphalt

Embedding encapsulated rejuvenators in asphalt mixture is a sustainable way to extend the lifetime of roads, while minimising the negative environmental impacts of current maintenance processes. With funding from our Innovation Board, we have been able to sponsor Tarmac, one of our framework contractors in collaboration with Nottingham University, to produce micro capsules. These capsules will be added to asphalt to create self-repairing road surfaces, thus extending the life of a pavement.

We are currently upscaling the production of capsules following the successful manufacture of the asphalt at Nottingham University's lab. We're currently planning to start off-network trials towards the end of September this year.

MLS machine

We are planning to purchase an MLS 11 accelerated pavement testing machine to expedite the testing programme on some of our pavement innovations. We're doing this so that initial assessments can be made sooner, on the potential for introducing these innovations on to the M25 network.

The MLS 11 model is a one third scale Accelerated Load Testing (ALT) machine which can deliver up to 1.2 million, 2.7kN wheel loads per week, under controlled loading and environmental conditions.

In addition to purchasing the MLS machine, together with Connect Plus Services and our framework contractors, we are also looking to procure a laboratory who can provide housing and operational management of the MLS 11.

E-learning

We have been exploring a new way to provide customised learning experiences for our workforce, something that would be more efficient and effective and make a valuable impact on the business.

Kineo allows us to create e-learning that showcases real case studies, with challenging assessments, demonstrating the importance and value of managing the M25 network. It ensures the content is much more than simply a compliance exercise – it is a valuable tool for protecting and enhancing the reputation of our organisation.

The e-learning portal launched in March 2021.

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