SUPPLY CHAIN SUSTAINABILITY SCHOOL

Low Carbon Innovation Lunch 'N' Learn – National Highways

22nd November 2023, 1pm - 2pm

Please Participate!

Please ask your Questions via the Question and Answers

Speakers will respond during the session

The session will be recorded

Slides/recording will be distributed afterwards.

SUPPLY CHAIN SUSTAINABILITY SCHOOL

Welcome

Chris Williams-Lilley
Senior Consultant, Climate and Carbon
Supply Chain Sustainability School
chris@actionsustainability.com

Agenda

- **Welcome and introductions**
- **The Low Carbon Opportunities Register -** Natalie Bird, Principal Asset Sustainability Advisor, National Highways
- **Net Zero Carbon Major Projects** – Gill Danby, Senior Project Manager, Net Zero Carbon, National Highways
- **Innovation Accelerator** – Imran Janjua, Senior Innovation Advisor, National Highways
- **Kier Highways Exemplar Projects** – Matt Tompsett, Head of Environment and Sustainability, Kier
- **Questions and Answers**

Forthcoming National Highways Workshops

To view all the available School training sessions use the events search on the School website.

Weds 29 November 2023 9.30am to 12.30pm	**Improving Digital Leadership Skills – book here**	Workshop
Tues 9 January 2024 1pm – 3.30pm	**Social Value for Highways: Embedding Equality, Diversity and Inclusion – book here**	Workshop
2024 Training Programmes for National Highways RDP/SDF and PDF will be published shortly.		

SUPPLY CHAIN SUSTAINABILITY SCHOOL

REGISTER NOW

Decarbonising Transport Together (Part 3): Low Carbon Innovation

WEBINAR - THURSDAY 18 JANUARY 2024, 11:00 AM - 12:00 PM

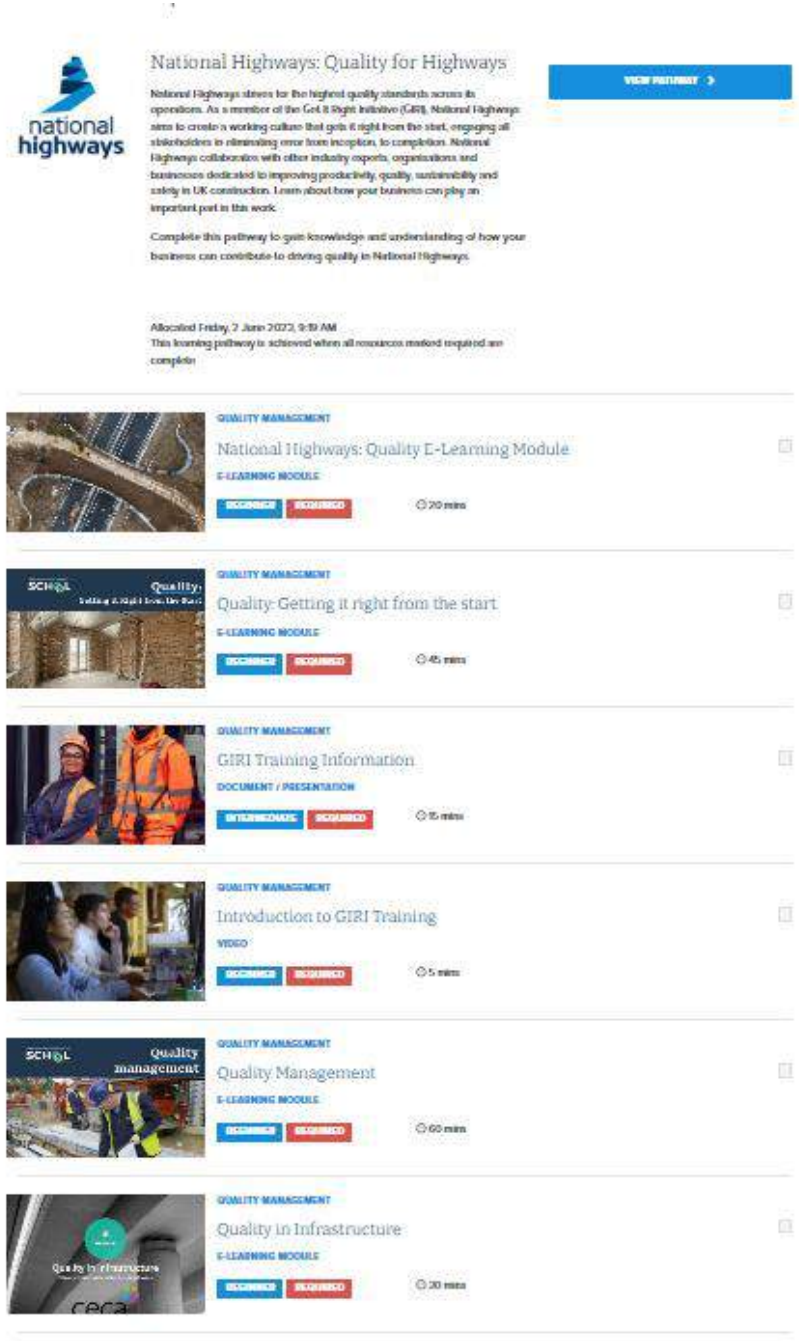
Supported by:

HS2 national highways NetworkRail

New National Highways E-Learning Pathways

Pathways include:

- NEW Business Improvement, Productivity and PPC (Percentage Plan complete)
- NEW An Introduction to Health and Safety
- NEW Productivity and Lean
- NEW Quality for Highways
- Social Value Pathways 1 & 2
- FIR Pathways Level 1 & 2
- Customer Experience Pathways x 3 – Strategic Procurement, Roadworks & Supplier Customer Maturity
- Supplier Development System
- Core 1 & 2 Pathways
- Sustainability and Net Zero Pathway



New E- Learning Pathways Business Improvement, Productivity and PPC (Percent Plan Complete)

National Highways - Business Improvement, Productivity and PPC (Percent Plan Complete)

Measuring and improving productivity is vital to the successful delivery of National Highways major projects and schemes to enhance the Strategic Road Network. National Highways is dependent on the deep engagement and collaborative support from the supply chain to achieve this strategic imperative.

This Learning Pathway explains the productivity challenge and the importance of driving productivity and continuous improvement to National Highways.

It introduces the new National Highways Productivity Dashboard (created through the Innovation Reapplied initiative) which will provide standard measures of productivity for the highways sector, including a metric for Percent Plan Complete or PPC.

The Pathway includes video content from senior leaders from National Highways, and explains how related issues of lean and quality are intrinsic to meeting this challenge.

List of contributors:

David Bray – Smart Motorways Programme Director, National Highways

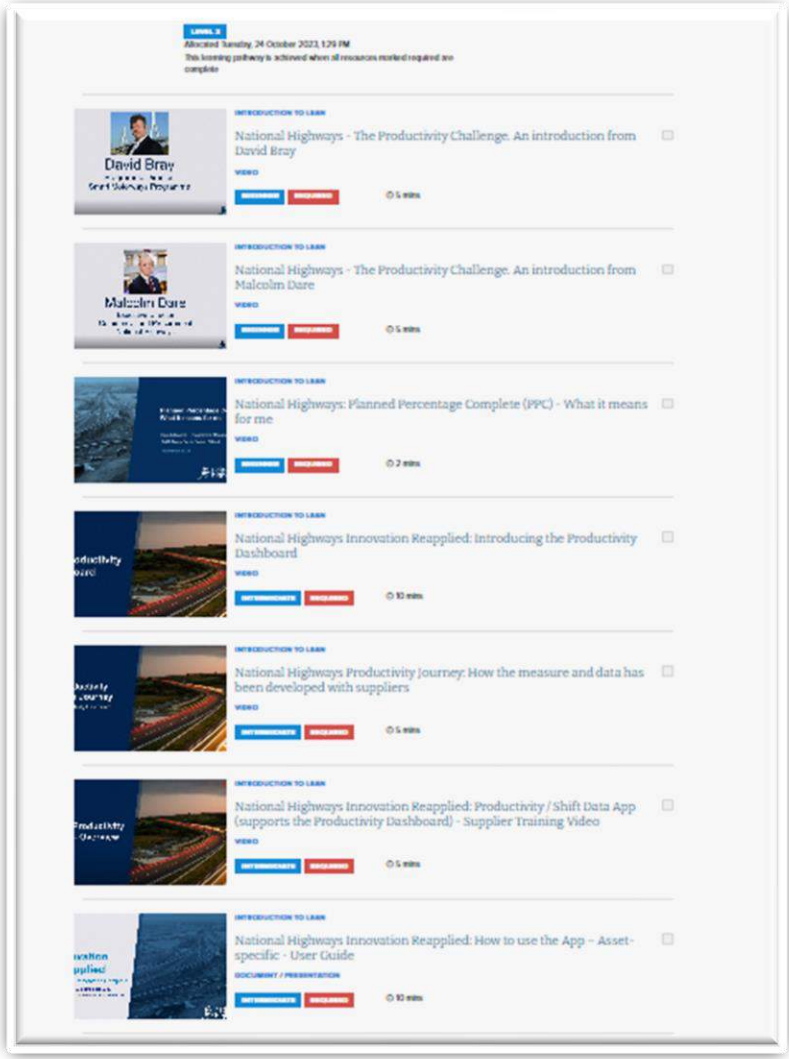
Malcolm Dare – Executive Director, Commercial and Procurement, National Highways

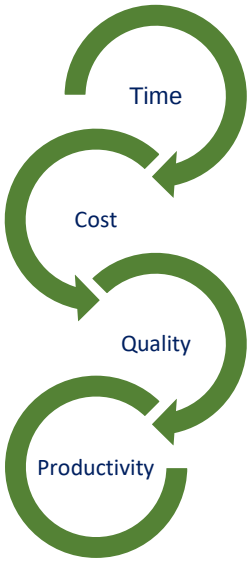
Rob Andrewes - Head of Quality – Design & Standards, National Highways

Daniel Kittle – Senior Lean Expert, National Highways

Gareth Moores – Programme Lead, National Highways

Tyrone Fletcher – Business Improvement Director, Skanska





Natalie Bird

Principal Asset Sustainability Advisor,
National Highways

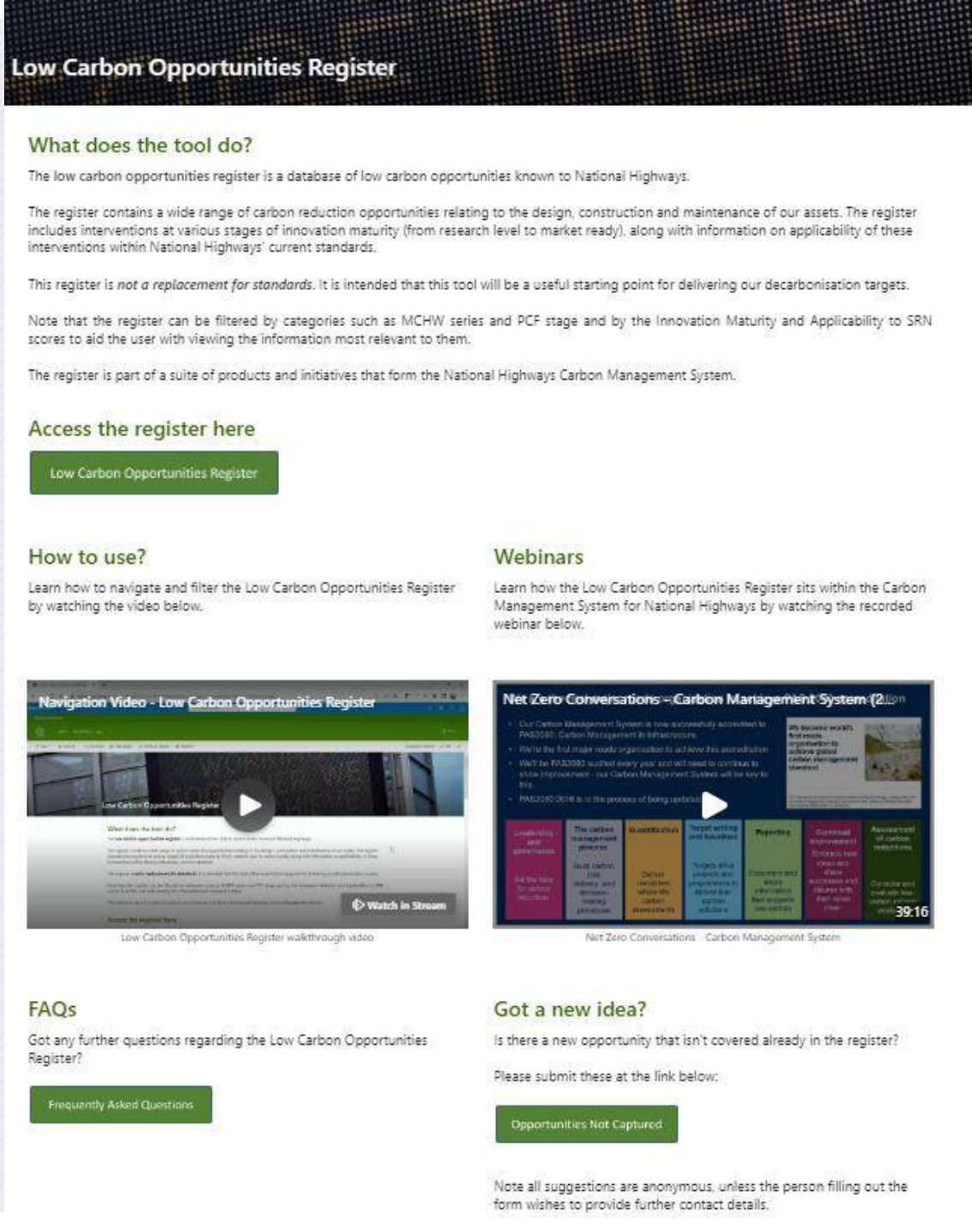
national highways

Low carbon opportunities register

Low Carbon Opportunities Register

Our ambition was: to develop and maintain a comprehensive register of all low carbon opportunities known to National Highways. This is designed to be a single source of reference.

- Hosted on the National Highways Environmental Sustainability SharePoint page
- Available to all national highways staff and the supply chain (request access)
- Contains ~200 carbon reduction opportunities & growing



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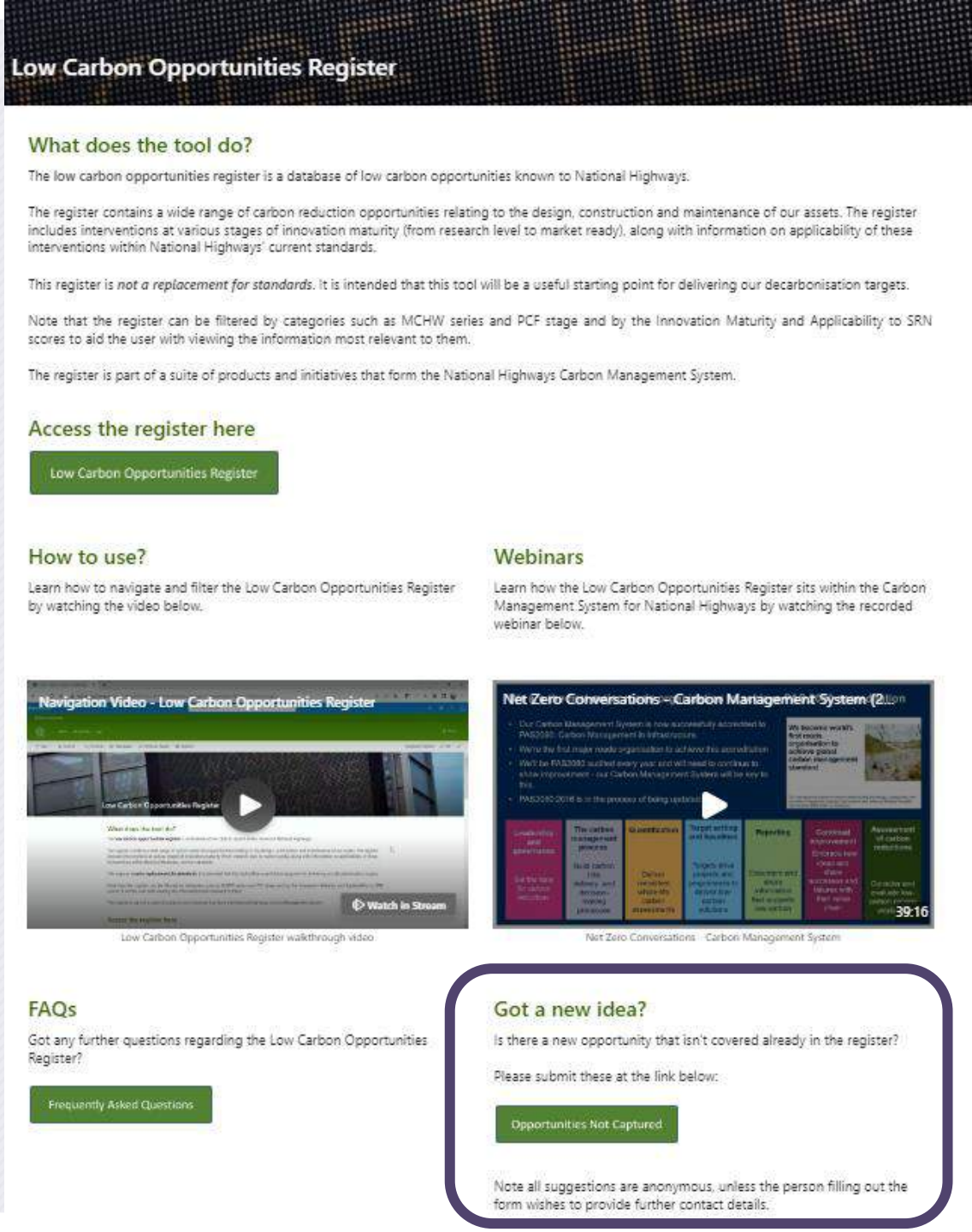
Updates or additions to the register can be logged via a form available on the landing page



Registration Number	Intervention	Details of intervention	Opportunity type	Carbon reducti...	Carbon reduction potential	Innovation maturi...	Innovation mat...	App
CON-175	Concrete admixtures	Admixtures are used to both increase workability and reduce the water/cement ratio, and hence increase strength and reduce permeability of hardened concrete, without increasing cement content content. Chemical admixtures can reduce the cost of construction, modify properties of hardened concrete, ensure quality of concrete during mixing/transporting/placing/curing, and	Low carbon material/t	Switch	When considered appropriately, admixtures can reduce the cement content required in mix designs, contributing to a reduction of the overall concrete A1-3 CO2e emissions	5	Admixtures are widely available on the market and extensively used.	5
CON-162	Quality of construction	Avoiding construction waste from rework. A number of issues could lead to rework including poor communication, poor planning, missing information, poor coordination and design and construction errors. Proactive action to minimise rework will lead to less waste and over procurement. Using KPIs to monitor outcomes and publishing results can introduce an incentive to	Construction approac	Improve	Carbon reduction potentially achieved through reducing concrete usage.	5	Many tools and processes are widely available and researched.	4
CON-183	Carbonation curing	Carbonation Curing is the use of CO2 to cure precast concrete products. It results in high early strength gain compared to steam hardening, which is the usual method. Typically the process currently uses pure CO2 produced industrially, but there is potential for the flue gases from cement plants to be used for the process.	Low carbon material/t	Switch	The emissions reduction from Carbonation curing comes from two sources: reduction of cement content, and CO2 fixed in concrete by carbonation. 50% emissions reduction of resulting concrete (CarbonBuilt, 2020)	5	Commercially available outside the UK	3
CON-169	Specify concrete strength at 56 days	Specify strength at 56 days rather than the conventional 28 days, where appropriate. This enables more realistic quality control of concrete mixes with higher SCMs (e.g. GGBS, PFA, pozzolanas, limestone fines).	Design approach	Switch	Typically saves 15 to 20Kg/m3 cementitious on structural mixes (The Concrete Centre) without affecting long term strength or durability.	4	A viable solution and used elsewhere across the construction industry, although not BAU. Implications need further in depth study.	3
CON-165	Mix optimisation - aggregate packing	Optimised aggregate blends can provide concrete with improved performance while designing a mix with lower cement content.	Design approach	Switch	Aggregates only account for less than 5% of the carbon but marginal carbon reduction can be potentially achieved where possible.	3	No technical barriers that aren't surmountable by planning or compensatory design.	3
CON-		e required until demoulding may increase if the concrete mix contains percentage of cement replacement material e.g. GGBS, PFA.	Design approach	Improve	Potential programme implications may limit the viability of using slower setting concrete mixes in pre-cast elements.	3	No technical constraints to changing demould times.	3
CON-		ne is a naturally occurring material and is the main input material for duction of OPC. It can be used in powdered form to replace a ion of OPC, and reduce emissions by avoiding the calcination of the	Low carbon material/t	Switch	Limestone is naturally abundant in the UK - no long term supply chain constraints. Use can result in	3	Limestone is widely used in small quantities, and is abundant in the	3

~200 opportunities identified with high level summary details and unique reference numbers

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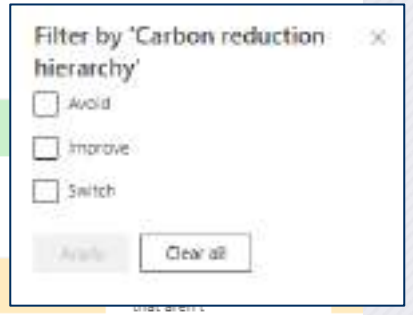
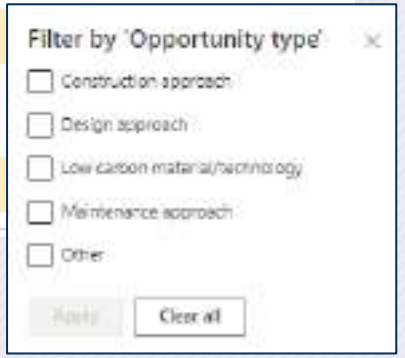
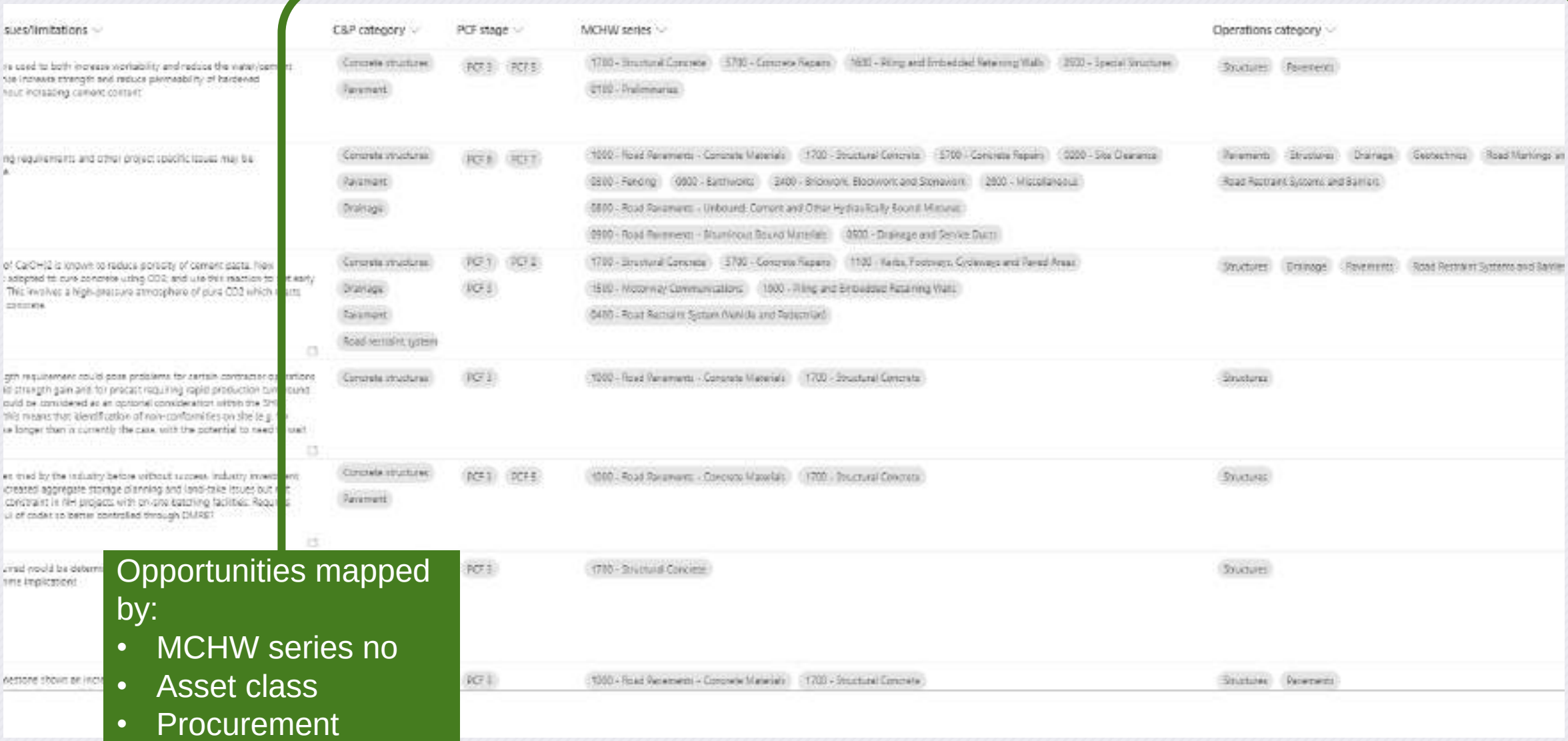
Carbon reduction hierarchy and **opportunity type** to help users filter for relevant opportunities







Opportunities mapped by:

- MCHW series no
- Asset class
- Procurement categories

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Potential **CO_2e reduction** captured qualitatively (other tools & guidance available for estimating benefits)

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Carbon reduction potential	Innovation maturi...	Innovation maturity co...	Applicability to SRN	Applicability to SRN comme...	Approvals requi...	Standards	Additional comments for...	Potential issues/limitations
When considered appropriately, admixtures can reduce the cemer content required in mix designs, contributing to a reduction of the overall concrete A1-3 CO2e emiss ons	5	Admixtures are widely available on the market and extensively used.	5	Many admixtures covered within existing standards.	Sometimes	BS EN 934 BS 8443	Series 1700 currently requires admixtures to comply with BS EN 934-2, but admixtures complying with other standards e.g. BS 8443 have been permitted by Departures	Admixtures are used to both increase v ratio, and hence increase strength and concrete, without increasing cement cc
Carbon reduction potentially achi ved through reducing concrete usage	5	Many tools and processes are widely available and researched.	4	Building to a high quality and to the specifications and requirements provided is already a requirement of construction on the SRN. This is something that contractors should be already doing.	No	GG 103 LA 110		Client changing requirements and othe unforeseeable.
The emissions reduction from Carbonation curing comes from t o sources: reduction of cement con ent, and CO2 fixed in concrete by carbonation. 50% emissions reduction of resul g concrete (CarbonBuilt, 2020)	5	Commercially available outside the UK	3	Not available commercially in the UK, not covered by existing standards. Curing of precast concrete using carbon dioxide does not comply with NH standards and will require substantial	Yes	Not currently covered by standards		Carbonation of Ca(OH)2 is known to re technology is adopted to cure concrete age strength. This involves a high-pres and solidifies concrete.
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Aggregates only account for less han 5% of the carbon but marginal ca bon reduction can be potentially achi ed where possib	3	No technical barriers that aren't surmountable by planning or compensatory design.	3	Requires pre-planning and optimisation.	No	NH standards don't apply	Not directly relevant to NH construction standards but more about techniques for mix design that are specific for the concrete industry to develop/use - but	May have been tried by the industry be required in increased aggregate storag considered a constraint in NH projects major overhaul of codes so better cont
Potential pro may limit the setting concr elements.		nstraints to uld times.	3	Departure from standards required currently. MCHW Series 1700 does provide some guidance on minimum time period before removing formwork, but based on OPC cement. SES considering opportunity for changes in future standard updates.	Yes	BS EN 206 (BS 8500) BS EN 13670	BS EN 206 clause 5.5.1.2 says that unless specified otherwise, compressive strength is determined on specimens tested at 28 days. BS 8500 infers 28 days is the default	The time required would be determine have programme implications
Limestone is		dely used in small	3	Departure from standards required	Yes	EN 197-1	SES considering inclusion in	Up to 15% limestone shows an increas

All opportunities have been allocated 5point scales for **innovation maturity** and **applicability to the SRN**

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Not a replacement for standards

Interpretation of which opportunities to pursue ultimately sits with the end user

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Innovation Maturity Level

This is an indication of the readiness of the technology and availability in the wider market. Note this 1-5 scale is used with National Highways as an interpretation of the widely used 1-9 Technology Readiness Level scale

1

Initial Research
Understanding the problem and exploring possible solutions

2

Concept & feasibility
Developing or testing a concept, designing the solution and testing feasibility of solutions

3

Development and Verification
Developing the preferred solution, verifying the design through prototype demonstration in a real world

4

Validation and optimisation
Scaling up the solution for roll-out or commercialisation

5

Deployment and post-launch
Implementing or rolling out the solution and assessing its impact

In use in wider construction industry

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Applicability to the SRN Scale

This scale gives an indication of how viable the opportunity is within National Highways standards

1

Not Desired
National Highways is unable or unwilling to pursue this intervention.

2

Concept or scaling back
In concept level stage, with good potential to go to trial on the network or desire to limit or withdraw usage in the future.

3

Trial or departure
Used in trial on the network or used on the network successfully but requires a departure from standard to implement.

Potential to trial

4

Approved and ready
No departures from standards required. Used already in places on the network, but no widespread use.

5

Used consistently
Already used consistently and widespread by National Highways, with a desire to continue use in the future. No departures required.

Easy to implement

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Low carbon opportunities - examples

Some examples (not comprehensive!)

Warm mix asphalt

Use of approved asphalt preservatives in routine maintenance

Asphalt recycling techniques

Use of SuDS eg over edge drainage to reduce need for pipework and manholes

Use of recycled aggregate (in non-structural concrete)

Use of concrete mixes with lower cement content

This is just a couple of quick suggestions – use the filters and scores in the register to identify more opportunities you can apply to your schemes.

Note this is being updated all the time with new opportunities and when standards change.

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Gill Danby

Senior Project Manager, Net Zero Carbon, National Highways

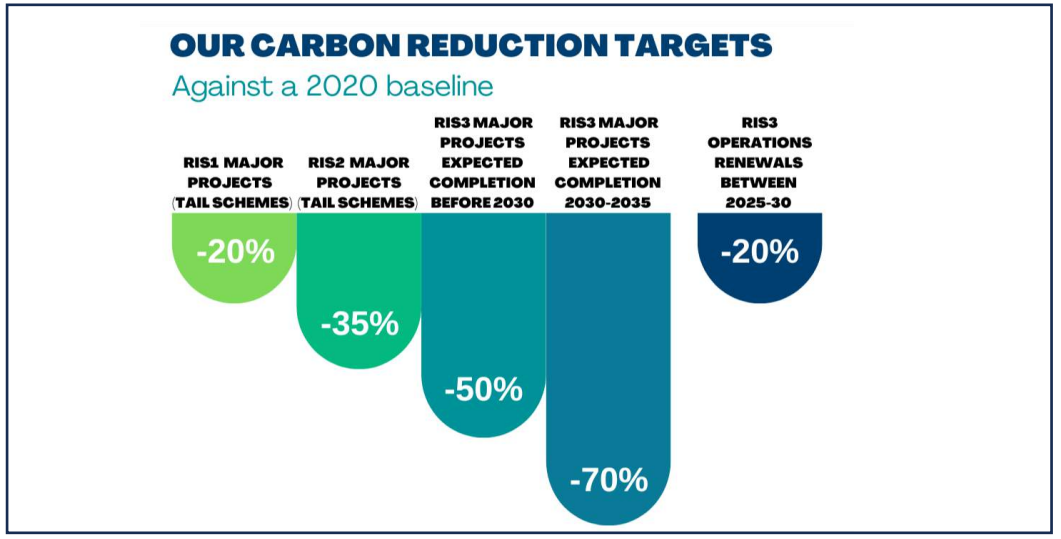
Major Projects Net Zero Carbon

Exemplar Programme Overview

Why Exemplars?

What are the drivers?

- Science based Targets
- NH Net Zero Policy
- PID 2.1a
- Material Roadmaps
- Innovation captured

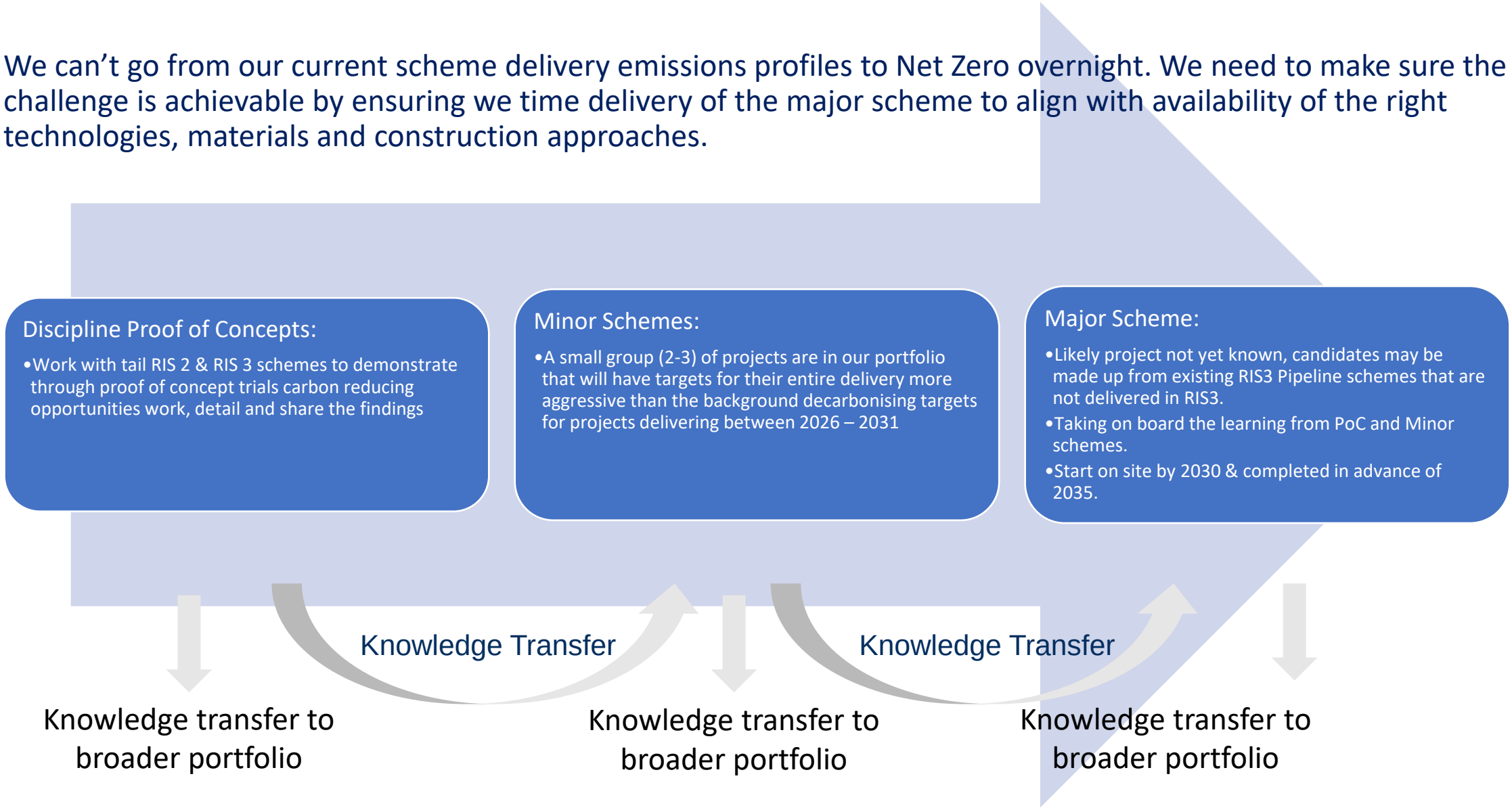


What should be the outcomes?

- Accelerate
- Prove
- Learn
- Inform
- Action
- Embed

How are we planning to deliver it?

- We can’t go from our current scheme delivery emissions profiles to Net Zero overnight. We need to make sure the challenge is achievable by ensuring we time delivery of the major scheme to align with availability of the right technologies, materials and construction approaches.

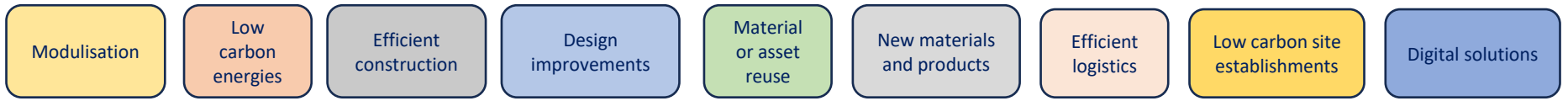


The types of “trials” the exemplar programme could be

Light Touch- Watch and learn something that has been conceived already in Early PCF stages to reduce carbon, how that translates into constructability and the impact on carbon, cost, time, safety, customer. Be an active observer, communicate to others and document outcomes

Medium Touch – A mix of watch and learning already conceived opportunities along with added new opportunities that come out of the carbon reduction exploration workshops. Be an integral participant, communicate to others and document outcomes

Game Changer – New carbon reduction opportunities that haven't been identified early PCF stages that bring a new dimension to a schemes construction and more carbon reduction potential. Be an integral participant, communicate to others and document outcomes



What should be the outcomes?

Accelerate	Working backwards from 2040 we know we have to accelerate not just what materials and technologies NH needs to adopt but how the industry needs to adapt
Prove	There are unanswered questions in some new materials and innovation construction solutions. We need to understand Carbon reduction potential, constructability, cost impact and what process we need to potentially change
Learn	Conduct trials in measured, controlled environments with; the right people, defined outcomes and path for
Inform	Do our specifications need to change, how do standards meet what is needed, how do our systems, governance and contracts reflect our carbon reduction path
Action	Taking findings and making the changes necessary to accelerate and embed
Embed	No silo learning - outputs need to turn into tangible actions that inform the many. Use tools and pathways that already facilitate decision making, but also recognise where we can enhance for greater innovation adoption

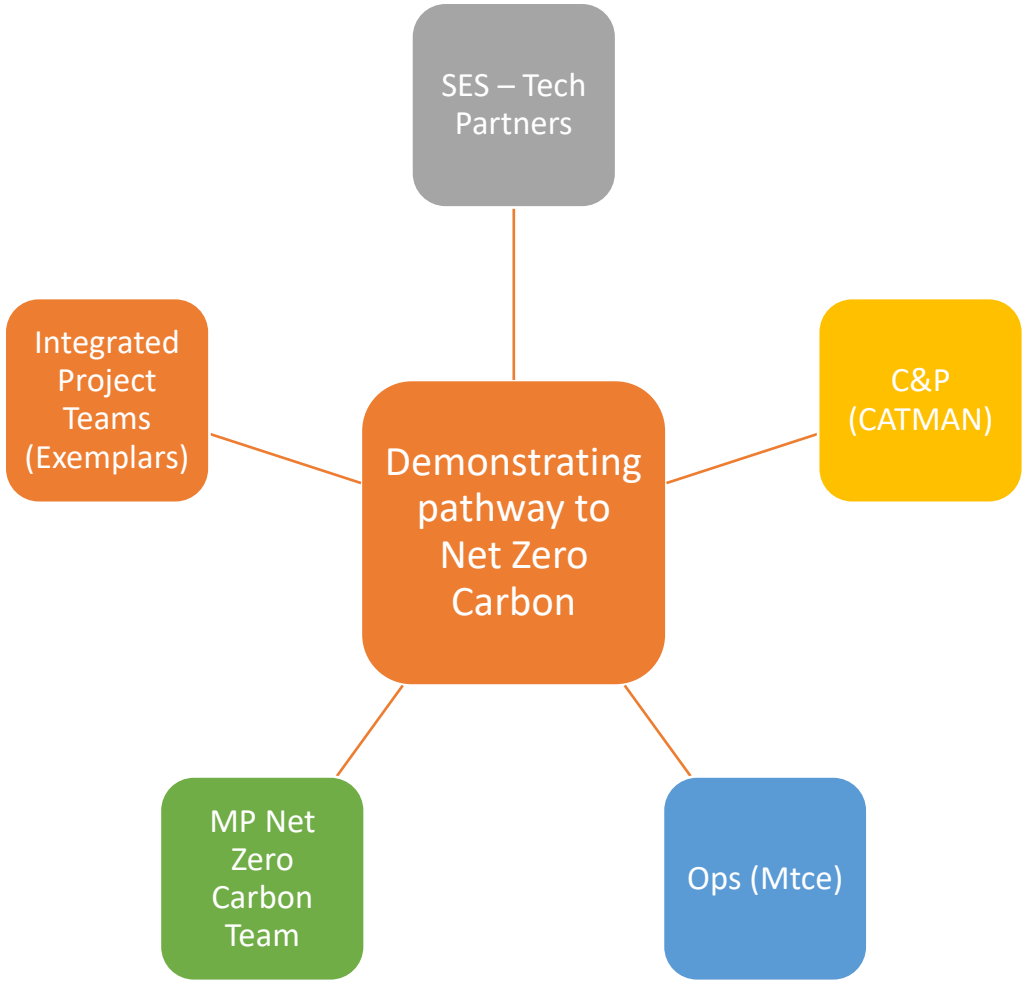
Exemplar update

Schemes identified as part of the exemplar programme

Road	Title	Exemplar
A12	Chelmsford	Bulk Materials
A47	North Tuddenham	Earthworks
A417	Air Missing Link (Air Balloon)	TBD
A66	North Trans- Pennine	Earthworks, Pavement, Concrete & Steel Structures
M3	Junction 9	TBD
M6	Lune Gorge	Structures

General update:

- Schemes on board
- Carbon baseline data available
- Working on identifying carbon hotspots per scheme
- Pulling together carbon info packs to start conversations with Category Management and SES Asset Leads (Nov/Dec)
- Carbon Opportunity Exploration Workshops with exemplar schemes planned Jan



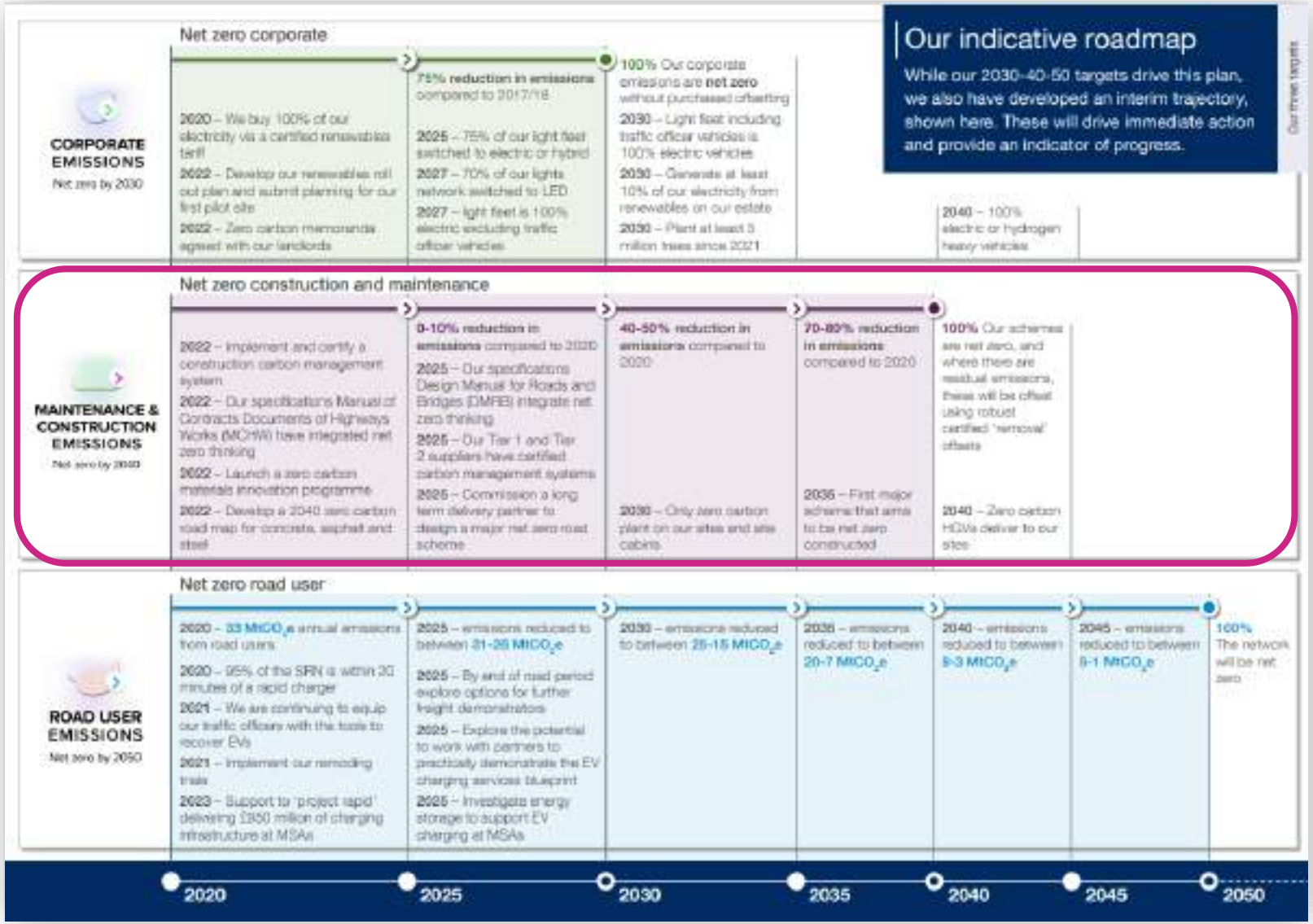
Imran Janjua

Senior Innovation Advisor,
National Highways

National Highways - Accelerating low carbon innovation programme

Nov 2023 – Imran Janjua, Senior Innovation Advisor

Net Zero Strategy



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The Challenges

1

Alternative Materials

- National Highways want to reduce emissions from cement, concrete, asphalt and steel by developing or applying alternative materials and techniques.
- These options should reduce emissions by 50% or more if possible, compared to the materials used today, and should be usable for a large proportion of all applications including major projects and renewal schemes.

2

Decision-making enablers for asset management and whole life value of assets

- Innovations which can improve asset management decision-making considering whole lifecycle value, including carbon emissions.
- Innovations able to support decision-making for future maintenance choices, promoting planned, predictive, and preventive interventions.

3

Enablers for the circular economy in construction and maintenance of highway assets

- Innovations which can contribute to reusing, redeploying and recycling materials and assets in construction, especially those not recycled consistently to their highest value today.
- Innovations contributing to “design for deconstruction”, enabling the use of decommissioned and recycled materials and assets for different purposes from construction through to maintenance, considering the end-to-end lifecycle of the asset.

4

Open Challenge

- Although this accelerator focuses primarily on the three challenge areas described above, we are also open to additional innovative ideas which can contribute to our target of zero emissions in maintenance and construction by 2040.

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Programme Overview

Select up to **10 SMEs (~TRL 5-7)** and up to **5 existing suppliers**

Access to testbed locations to trial their solutions

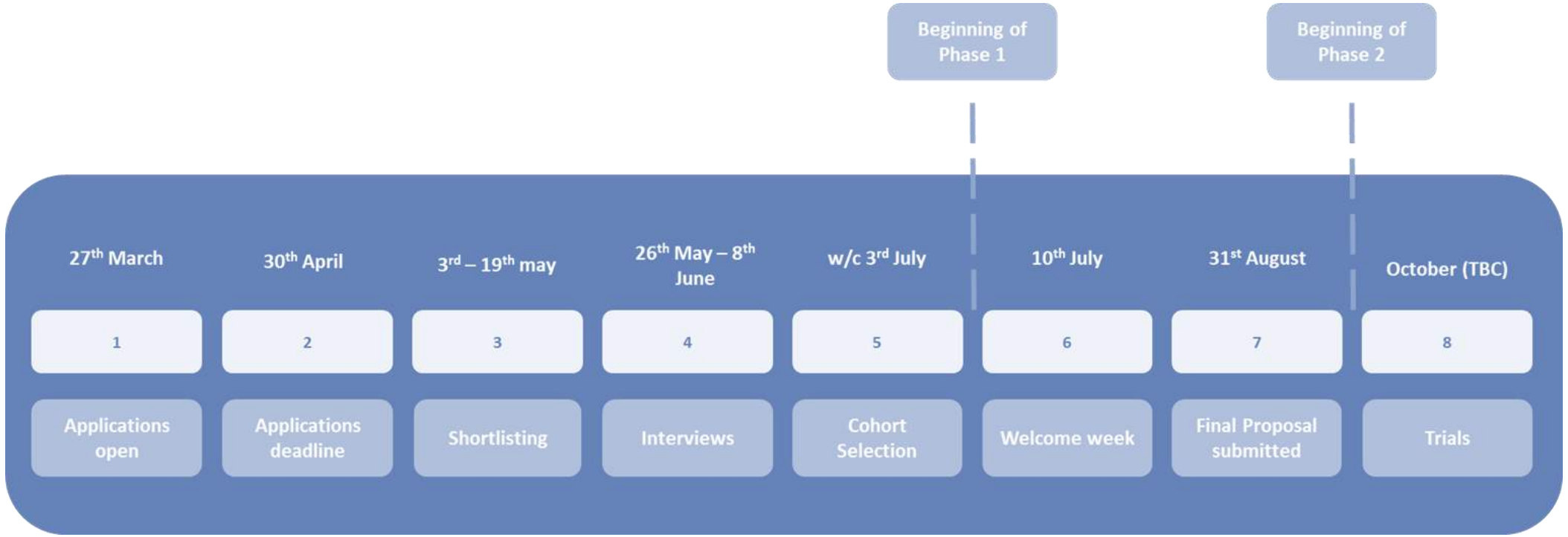
From July to Mid-2024

- 2 phase programme:
  - Phase 1: July – August
  - Phase 2: October – Mid-2024

SMEs must address at least one challenge of the programme and link back to accelerating advancements in the NH Roadmaps and/or the low carbon opportunities register

Supply chain partners

Programme timeline for preparation activities



7 SMEs awarded funding to design their trials

SME	Project Summary
Low Carbon Materials Limited	Carbon-negative aggregate for use in carbon neutral asphalt.
Asset International Structures	Smart fibre reinforced plastic bridge beams that incorporate a novel optical fibre, enabling structural performance monitoring in real time and over the long term. Offsite manufacture ensures the beams arrive at site right first time, reducing waste, carbon emissions, installation time and route closures
Circular11	Highly durable, vandal-resistance, and low-carbon fencing materials from National Highway's non-recyclable plastic waste streams. The output will be the provision of materials preventing c.1.5 tonnes of CO2e/tonne of product.
PRG (Scotland) Limited	Patented process which can produce multiple value-added products from waste tyres. One of these products is oil which has bituminous component that can be used as a biding agent to produce asphalt for road construction or repair.
Xeroc	Xeroc can recycle National Highway's concrete into concrete, returning each component to its original form with as little contamination as possible. Carbon emissions will be reduced through lower energy demand in making recycled concrete/'aggregates as a service' compared to virgin/single use concrete.
Loop Infinity	By digitizing assets, operatives will be able to accurately track their locations, ensuring that the necessary maintenance and management works are undertaken to keep the asset in optimal condition.
Hausbots	Climbing robot with inspection sensors and if successful it will deliver a 3d model of the structures inspected, which include high quality structural integrity data overlaid. Their technology will enable carbon reduction through better asset management by improving predictive maintenance.

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What we offered to the companies in this stage

- Trial Design support
- Access to NH experts
- Matching with a Tier 1 supplier
- Sessions on Safety Risk Assessment requirement, NH Carbon Strategy, tools and methodologies, NH Standards
- Business support

Technical Support

Solution Showcase

Coaching and Mentoring

Funding Opportunities

Grant Funding

- Between **£15k** and **£30k** of funding to develop a trial proposal

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Programme timeline for trials

4 SMEs awarded funding to deliver their trials

SME	Project Summary
Low Carbon Materials Limited	Carbon-negative aggregate for use in carbon neutral asphalt.
Asset International Structures	Smart fibre reinforced plastic bridge beams that incorporate a novel optical fibre, enabling structural performance monitoring in real time and over the long term. Offsite manufacture ensures the beams arrive at site right first time, reducing waste, carbon emissions, installation time and route closures
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What we offered to the companies for this stage

- Continuous access to NH experts
- Trial Deployment support
- Matching with a Tier 1 supplier and access to testing facilities and trials locations
- Networking opportunities with the community
- Business support

Testbed Support

Technical Support

Solution Showcase

Coaching and Mentoring

Funding Opportunities

Pre-commercial funding

- Funding up to £80k to selected organisation to trial their solution

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Key take aways on innovation

Collaboration framework

Access to a wider suppliers' base

Organisational-wide exercise

Standardised assessment

Consistent approach for knowledge sharing

Matt Tompsett

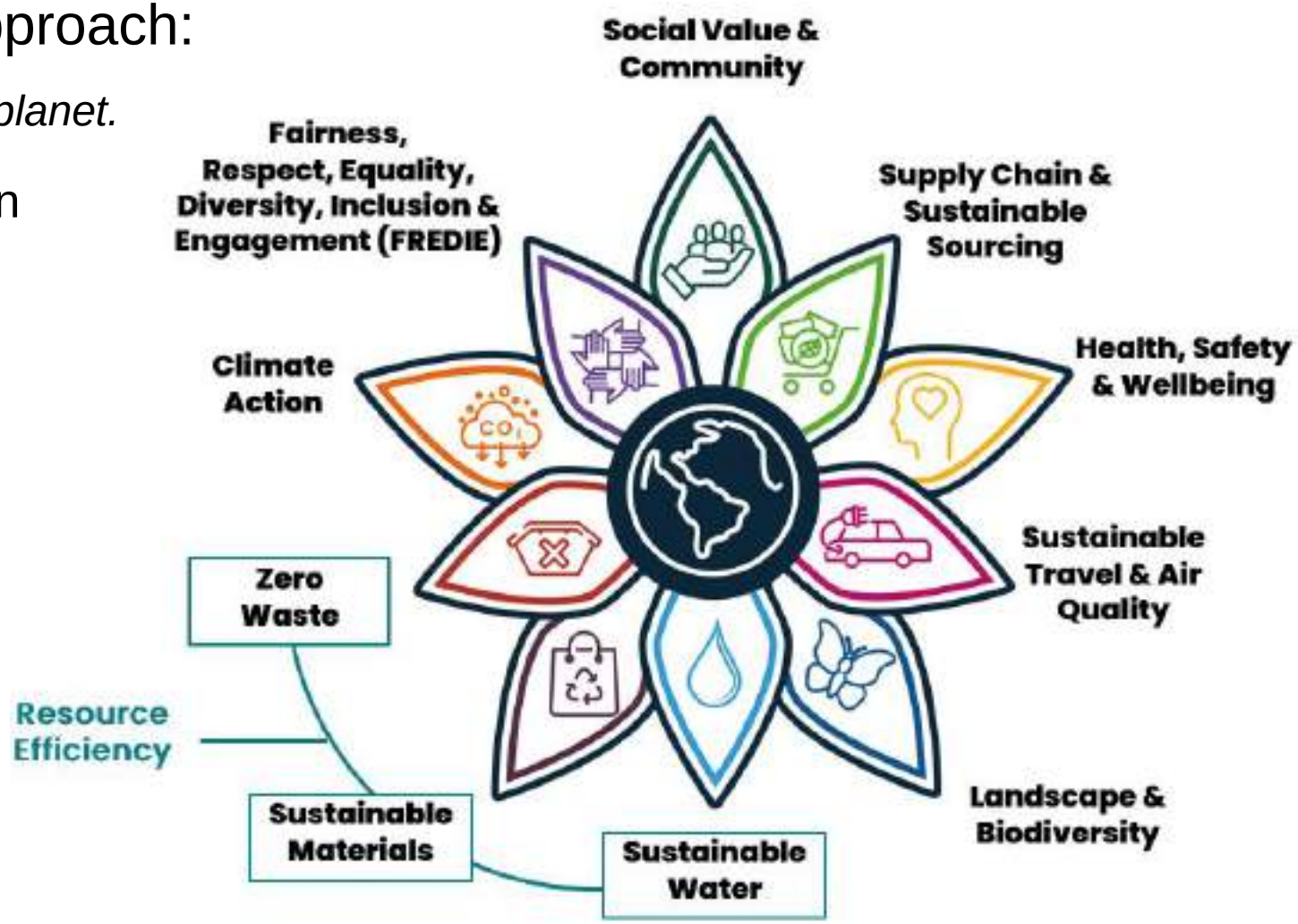
Head of Environment and Sustainability,
Kier Transportation

Kier Transportation
Low Carbon Initiatives

Kier Transportations One Planet Approach:

Connecting people within the limitations of the planet.

- Delivered via our One Planet Action Plan – 10 year anniversary
- 10 One Planet Principles break sustainability down into easily digestible topics
- Award winning – 2019 IEMA Award & 2023 NH Award
- Bold and future focused

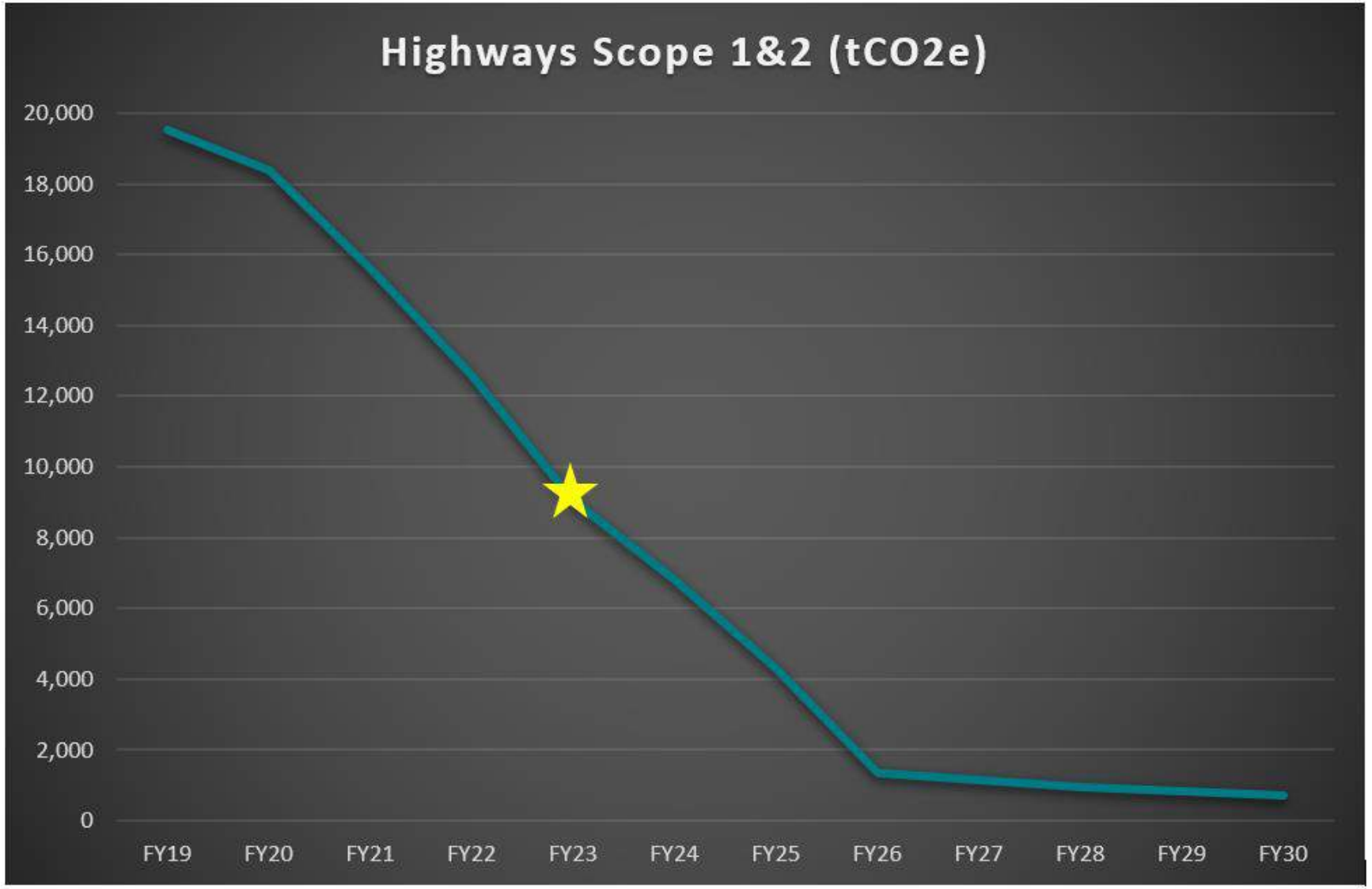


Our Carbon Targets…

- Net-zero across our operations (scope 1&2) by 2030
- Net-zero across supply chain (scope 3) by 2045.

Net Zero Road Map 2019 to 2030 (Scope 1 & 2)

- 53% reduction in scope 1 & 2 since 18/19 baseline
- 64% reduction in milage since 2019
- 25% of cars now EV or hybrid
- 10% of bulk fuel HVO = 860tCO2e saving
- Companywide no idling policy
- Mandatory Carbon Literacy Training
- Science Based Targets validated
- PAS 2080 accreditation
- Carbon Trust Route to net zero Standard



Our current reduction initiatives…plant transition

Small Plant:

- 327 items of small plant have been identified and will be transitioned to electric throughout 2022 & 23.
- Currently transitioned approx. 200 items of plant
- **373 tCO2e** emissions each year, compared to fossil fuel versions
- From a cost perspective (hire + fuel saving) extra cost of £14,104
- Carbon Reduction Return on Investment (CRRoI) = 26.4 kgCo2e per £1
- H&S – quieter, lighter, less vibration, no fumes.

Barriers:

- Behavioural change – education, awareness & perception:
  - Trial in every contract
  - Training session delivered by GAP
  - Feedback forms. Address each query and issue individually
- Charging solutions – What is required? Grid headroom? Safety?

Biochar on the A417

- A417 Missing Link – 5.5km of dual carriageway upgrade between Gloucester and Swindon
- Concept – turn the green waste from the scheme into a material for reuse in the construction of the scheme
- Biochar – a stable carbon rich solid created by pyrolysis
- Example of a circular economy technique and carbon capture and storage technology.

STEP 1 Advance work removes trees and other woody vegetation

STEP 2 Woody materials are chipped

STEP 3 Woody materials are carbonised in a carbon-negative process

STEP 4 Woody biomass volume is reduced by 75%

STEP 5 Sequestered carbon is created, locking CO_2 away from the atmosphere for millennial periods of time

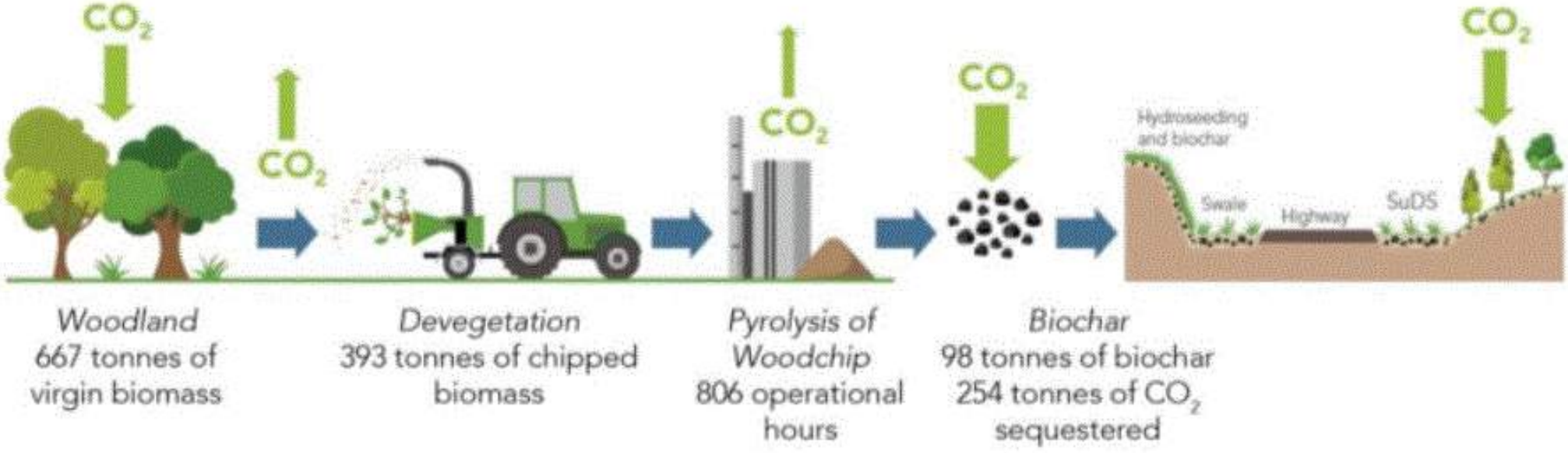
STEP 6 Biochar is created then used in hydroseeding, locking carbon into the soil in newly created biodiverse habitat that draws CO_2 from the atmosphere

STEP 7 Biochar is used in tree planting for water and nutrient conservation; trees draw down CO_2 from the atmosphere

STEP 8 Total carbon sequestered is accounted for with the life-cycle analysis in short-, medium- and long-actor storage

Biochar on the A417

- Partnered with Terrafix to complete a feasibility study.
- National Highways EWDF application submitted and approved
- Vegetation clearance on the A417 starts this month
- Applications on the A417: Hydroseeding, tree planting, green bridge deck - replacing swell gell, mix with filter stone in a section of highways drainage system
- Kier Transportation/RSK joint funded research project at Swansea Uni looking at pollution removal potential, inc. microplastic.



Thank you

COP 28 - Climate Mitigation and Adaptation: Where are we in tackling both?

Wednesday, 13 December 2023, 10:00 AM - 12:30 PM (2.5 hours)

Online - Zoom

REGISTER NOW

This virtual conference will talk about to the issues of mitigation AND adaptation – how we are reducing our energy demand and the carbon emissions arising from that to keep on track with the Paris goals, but also, crucially, how we are adapting to the changing environment.

Aimed at: clients & supply chain organisations in the built environment, who wish to better understand tackling climate change and adaptation.

Featuring: Bouygues, HS2, Kier, and Wates

SUPPLY CHAIN SUSTAINABILITY SCHOOL

Thank you for joining!

We really value your feedback, please do fill out our Feedback Form - click here before you leave.

This will only take 2 minutes!

SUPPLY CHAIN SUSTAINABILITY SCHOOL