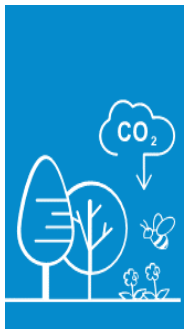
Strategic Procurement Strategy

General Plant Category Executive Update

Executive Summary

Current Status: The UK plant hire market was estimated to be worth £7bn in 2020 with average industry growth 2015–2020: 3.1% and UK construction equipment sales 70% above 2020 levels in first half of year. Plant hire is a highly competitive market and as such hire rates are reflective of this, remaining relatively static in recent years. There is limited movement in the market due to significant capital investment required and narrow margins available.



Challenges

- **Innovation:** Ability to invest in equipment and innovations, alternate environmental sustainable options and fleet management
- **Consolidation:** Multiple plant and equipment innovation projects..
- **Operator Skills:** Lack of new plant technology operators (ageing workforce / new technology retraining requirements)
- **Capacity:** Increase in UK construction projects.
- **Collaboration:** Minimum new technology development alignment between original equipment manufactures and the supply chain
- **Missed Benefit:** Unrealised opportunities through lack of integrated supply chain processes and consolidated programs
- **Fuel:** Transition from traditional diesel plant to alternate fuel
- **Influence:** Minimal influence on original equipment manufactures development

To fully address the challenges and to align with our imperatives, the strategy recommendations are as follows:

- **Carbon:** Carbon targets part of contractual/operational measurement
- **Innovation :** Transition from traditional diesel
- **Commitment :** Implementation of alternate solutions across our business
- **Alignment:** Standardised plant supply chain process and programmes.
- **Influence:** Better relationships with plant manufacturers,
- **Training and Development:** Support and develop social value through training, skills development and retention.

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Key Aims of Our Strategy

Carbon Net Zero:
Introduction of specific plant carbon targets or alternative fuel targets part of operational measurement
Influence the supply chain to identify and implement alternate solutions to deliver against our KPIs (Net Zero Maintenance and Construction Emissions 2040)

Planning :
Establish short and medium options for transition to hybrid/electric, fully electric or hydrogen for vehicles, plant and generators, lighting towers etc.
HVO fuel usage as potential interim fuel solution

Commitment :
Identify actual opportunities (schemes) across our business to actively implement innovative and alternate solutions (step change and proof of concept)
Utilisation of existing technology for operational effectiveness via telemetric and planning to better inform production decisions

Consolidation:
Standardised integrated plant supply chain process and consolidation of programmes across operations and major projects.
Increased supply chain investment requires long terms commitment and focused supply options

Influence:
Build closer working relationships with plant manufacturers, reducing the reliance on intermediary plant and equipment hire companies
Accelerate original equipment manufacture innovative solution implementation and roll out across the supply chain

Training and Development:
Support the development of training opportunities in line with advancement in technology.
Technology opens industry participation to new and diverse demographic.

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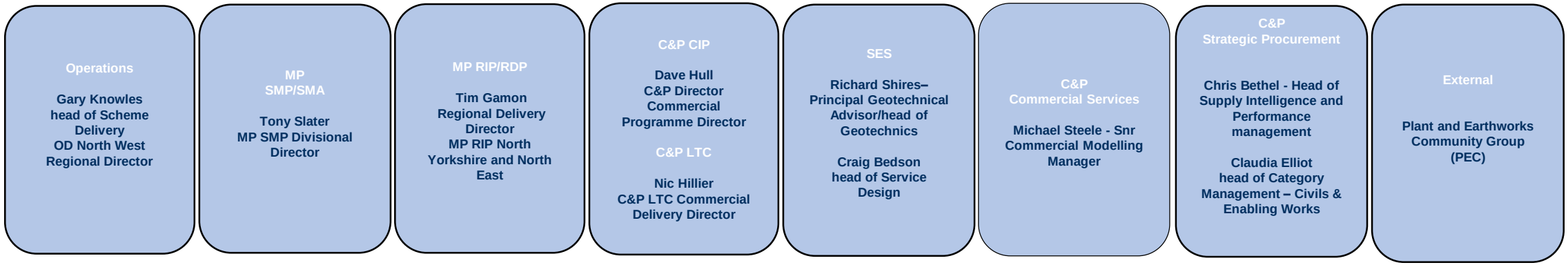
Engagement Matrix for Strategy & Approach



Business Area/Investment Programme:	Individual & Role:	Comment if required:	Review:	Date:
Executive Team – Panel Chair	Malcolm Dare - Executive Director C&P		Approval Meeting	5/10/2021
Executive Team	Duncan Smith – Interim Exec Director Operations		Exec Review	8/10/2021
Executive Team	Peter Mumford - Exec Director Major Projects		Exec Review	8/10/2021
Executive Team	Mike Wilson – Exec Director SES		Exec Review	8/10/2021
MP – RDP Leadership Leadership Team	Tony Slater - MP SMP Divisional Director (SRO)		Approval Meeting	1/10/20021
C&P Leadership Team	Sanyalax Kelly - Strategic Procurement Director		Approval Meeting	1/10/2021
C&P Leadership Team	Andrew Stephenson - Procurement Director		Provided for Review	1/10/20021
C&P Leadership Team	Martyn Gannicott – Commercial Services Director		Provided for Review	1/10/20021
C&P Leadership Team	David O'Neil – Supply Chain Director		Provided for Review	1/10/20021
C&P Leadership Team	Mark Ollerton – MP Commercial Director		Provided for Review	1/10/20021
C&P Leadership Team	Richard Cerruti – Operations Commercial Director		Provided for Review	1/10/20021

Stakeholder Engagement Link: http://share/share/llisapi.dll/open/91820243

How will this deliver to the Business Objectives

Problem Statement/Challenges: **Innovation, Consolidation, Operator Skills, Capacity, Collaboration, missed Benefit, Fuel and Influence** *The problem statements/challenges that are addressed within the Plant and Equipment Strategy can be summarised into the following key themes;*
Carbon: influence the supply chain, ***Innovation:*** delivering carbon targets, safety and productivity ***Commitment:*** proof of concept and accelerate delivery ***Alignment:*** security of supply ***Influence:*** accelerate implementation
Training and Development: delivering on social value and mitigating labour constraints

Directorate	Benefit/Objectives	Short	Medium	Long term
Operations	SDF in place (GENERAL CIVILS) Continue to update on developments	• Engagement/Cross Category Collaboration	Engagement/Cross Category Collaboration	Engagement/Cross Category Collaboration
Major Projects	**Carbon Net Zero: Objective:** Specific plant carbon targets **Benefit:** Deliver against carbon reduction target: • Only zero carbon plant on our sites by 2030 • Only zero carbon HGVs deliver to our sites by 2040 **Innovation: Objective:** Alternate fuel / Electric/ Hybrid / Hydrogen and semi and autonomous plant **Benefit:** Influence supply chain investment / align with carbon net zero targets improve safety/reduced environmental impact / safety **Influence : Objective:** Build relationships with original equipment manufacture **Benefit:** Accelerate original equipment manufacture solution deployment / reducing the reliance on intermediary plant and equipment hire companies. **Commitment: Objective:** Implement alternate solutions and utilisation of available technology **Benefit:** Carbon reduction via data driven behaviour / proof of concept / maximise the planning, productivity and efficiency gains and support operations / Monitor and drive efficiencies in fuel usage and idle time plant operation. **Project Alignment: Objective:** Multiple scheme agreements, project alignment, redeployment of supply chain resources **Benefit:** Maximise productivity / efficient use of supply chain /mitigate cost increases / accelerate scheme delivery. **Training and Development: Objective:** Support the development training opportunities in line with advancement in technology. **Benefit:** New and diverse demographic / delivering on social value / operator capability / mitigate potential capacity constraints.	• Define baseline, incremental target / timeline • Sector Improvement Project –Plant • Plant Innovation Day 12/10/21 • CAT Command demo 1/11/21 • Volvo Technical day 19/10/21 • Komatsu demo 20/10/21 • JCB Hydrogen 01/12/21 • As above • Plant Innovation Day 12/10/21 output being to establish commitment. • HVO deployment with Belfour Beatty (RDP A2) • Benchmark alternate agreement solutions A1 Morpeth to Ellingham (B10) • Alignment with labour strategy and on / off site training opportunities	• Replicate areas of best practice across SMA/CIP & LTC • Supply Chain roadmap and commitment plan • Influence original equipment manufacturers (Hydrogen) • Support continued development • Extend across other schemes • Leverage supply chain expertise to develop productivity and efficiency opportunities • New technology/ training to support a diverse demographic and delivering on social value	• Continuous improvements to support RP2/RP3 • Supply Chain Fleet upgrade Deliver zero fossil fuel on all heavy machinery • Continuous security of supply forward planning and delivery • Replace by alternate Hydrogen technology • Continuous security of supply forward planning and delivery • Continuous training development process aligned with industry and technology changes
SES	**CAP Working group (Continuous Autonomous Plant)** **Carbon Net Zero:** • Only zero carbon plant on our sites by 2030 • Only zero carbon HGVs deliver to our sites by 2040	• Define industry definitions • Demonstration day in conjunction with Costain (provisional March 2022)	• Engaging the supply chain to define roadmap to implementation	• Move from semi autonomous to fully autonomous plant

Snapshot on Our Future Vision

Short-Medium Term

Commitment, Influence Alignment & Training

impacts

Shaping the market

- Standard agreed format and expectation to design for machines (technology)
- Supply chain investment in training and development across a wider demographic with enhanced technological skills
- Carbon requirements and targets to become an integral part to any economic evaluation
- Carbon reduction roadmap and specific supply chain deliverables
- Proof of concept and benchmark productivity, efficiency and carbon gains

Medium-Long Term

Investing in the Future – Carbon Net Zero

impacts

Shaping the future

- Sustainable and non-carbon autonomous plant operations, remotely manged and operated
- Delivering carbon net zero requirements
- Innovative solutions, alignment of development and implementation
- Alignment of delivery schemes maximising productivity, efficiency and speed of delivery
- Reallocation and sharing of resource and planning
- Installation of permanent communications network connectivity (4G/5G). The network will remain in use for the asset life to improve end user experience
- Compaction use automatic pass counting, mapping and operator visualisation
- Develop an industry wide recognised maturity matrix for Connected Autonomous Plant.
- Long term investment planning
- Drive towards alternate environment fuel and electric alternative solutions

This is a high level picture. We will develop different aspects further with stakeholders across all solutions as our implementation plan progresses

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Phased High-Level Implementation Plan to Deliver Our Key Aims

Short-term
(RP2 Year 2)

- Commitment
- Influence
- Alignment and Carbon

Establish deliverables and scope requirements. Engage with the supply chain and cross functional working groups to support development and implementation

Mid-term
(RP2, Years 2-3)

- Decarbonisation of construction plant project (innovation)
- Alternate short term fuel (HVO)
- Utilisation of existing technology
- Plant specification to requirement alignment
- Enterprise alignment agreement
- Training and development plan and execution aligned to technology
- NH and Supply Chain Carbon reduction alignment

Development of alignment agreements, implementation road map and commitment plans for new technology and environmentally sustainable alternate plant and equipment solutions
Social engagement and skills development opportunities across a wider demographic

Long-term
(beyond RP2, Years 4-5+)

- Continuous roll out of alternate environmental plant and equipment
- Standardised supply chain and investment
- Accelerate implementation of innovative solutions and standard practices
- Attainment of carbon reduction targets

Continuous improvement process to refine and extract maximum value

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Rollout of Short-Medium Term Solutions

Carbon	**Delivery against Targets** • Define timeframe and target reduction • Alternate sources of supply • TCO on investment decisions	**Benefits:** • Incentivise the supply chain to invest and align with NH requirements • Clear path to delivering net zero • Long term commitment
Commitment	**Implementation and Utilisation of Alternative Solutions** • Identify actual opportunities (schemes) across our business • Utilisation of existing technology • Alternate fuel HVO	**Benefits:** • Proof of concept • Productivity, efficiency and carbon gains
Alignment	**Project Supply Chain Alignment** • Enterprise alignment agreement • Standardised integrated plant supply chain • consolidation of programmes across operations and major projects	**Benefits:** • Improved planning and execution delivering to carbon net zero targets Leverage of suppliers' expertise to develop increased productivity and efficiency opportunities
Social Value	**Training and Development** • Development of opportunities through the Plant and earthworks community and Supply Chain Sustainability School	**Benefits:** • Industry investment and commitment • Delivering on social value • Increased capacity and labour reliance mitigation • New technology allows for diverse demographic

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Rollout of Medium-Long Term Solutions

Influence

Original Equipment Manufacture
- Closer working relationships with plant manufacturers

Benefits:
- Accelerate original equipment manufacture innovative solution implementation reducing the reliance on intermediary plant and equipment hire companies

Innovation

Industry Investment
- Construction plant project trials to establish viability
- Alignment on CAP, PEC and SCS innovation and technology developments
- Mind mapping of industry wide projects, workshops, development groups
- Hydrogen alternate fuel

Benefits:
- Improve safety
- Contribute towards our carbon net zero target
- Reduced environmental impact Increase speed of implementation

Acronym
CAP: Connected and Autonomous Plant
PEC: Plant and Earthworks Community
SCS: Supply Chain School

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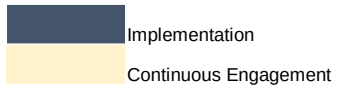
Recommendation Summary

Earthworks Strategy	Requirement	Benefit	Imperatives
Carbon Net Zero	• Specific plant carbon targets or alternative fuel targets part of operational measurement	• Define NH requirements and expectations • Delivery against commitment • Incentivise the supply chain to be proactive (TCO) • Clear guidance and expectations of delivery • Supply chain time to plan and invest.	• Delivery • Customer
Commitment	• Identification of scheme delivery opportunities (live implementation) • Utilisation of existing technology	• Proof of concept • Benchmark productivity gains. • Maximise the planning, productivity and efficiency gains and support operations • Operator behaviour • Monitor and drive efficiencies in fuel usage and idle time plant operation.	• Delivery • Customer • Safety
Influence	• Engage original equipment manufactures	• Accelerate original equipment manufacture • Reducing the reliance on intermediary plant and equipment hire companies	• Delivery • Customer
Innovation	• Decarbonisation of construction plant project (innovation) • Alignment on CAP (connected and autonomous plant), PEC (plant and earthworks community) and SCS (supply chain school) innovation and technology developments • Alternative fuel supply HVO/Hydrogen	• Remove man/machine interfaces and improve safety • Optimise plant movements and improve cycle times • Contribute towards our carbon net zero target • Reduced environmental impact • Reduce waste (time, money and effort) • Increase speed of implementation • 3D Machine control productivity gains • Mitigate red diesel	• Delivery • Customer • Safety
Project Alignment	• Standardise integrated plant supply chain process Enterprise alignment agreement	• Maximise productivity and efficiency (supply chain) • Allows for long term investment • More robust certification and payment systems • Bringing-in telematics, so these can better inform production decisions • Reducing HAVs. • Reducing lifting/loading accidents. • Reducing accidents with operator's access/egress. • Reducing loss and damages.	• Delivery • Customer
Training and Development	• Support the development of training facilities • Encourage social value	• Support technology developments and implementation • Mitigate future skills and capability requirements • Deliver on social value (open to a wider demographic)	• Delivery • Customer • Safety

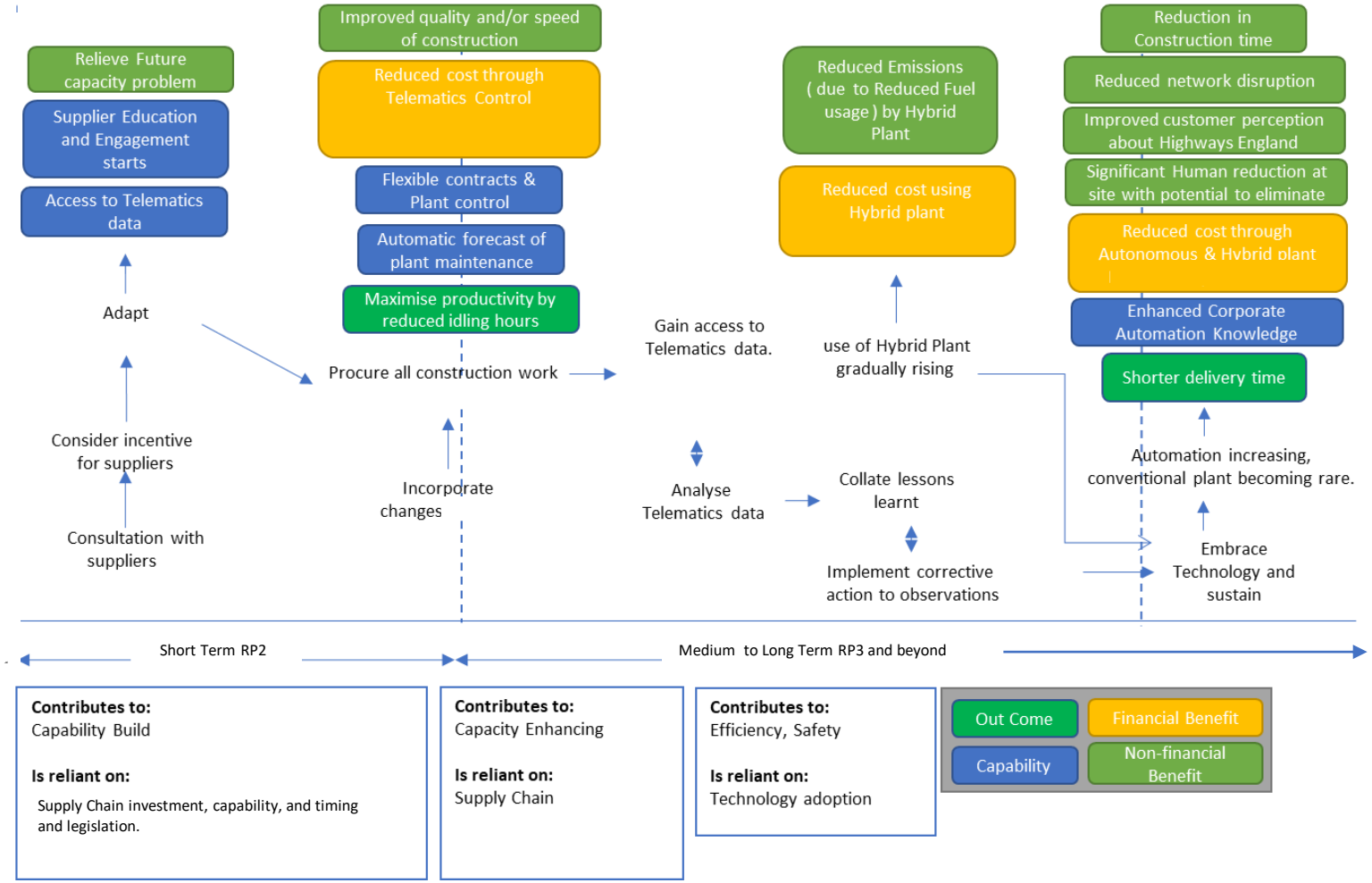
For further detail refer to *Strategy - Short to Medium to Long Term* slide

Opportunity Analysis: High-Level Implementation Plan

Opportunities	Activities	2022	2023	2024	2025	2026
Carbon	Implementation Plan and Targets					
Commitment	Identify scheme opportunities					
Influence	Engagement with original equipment manufactures					
Innovation	Decarbonisation of construction plant project (innovation)					
Project Alignment	Enterprise alignment agreement across all of MP Standard Supply Chain Approach					
Training and Development	Support the development of training facilities					



Value Chain Analysis: Key Benefits & Transformation Map



The flow diagram outlines indicative transformational opportunities, dependencies and benefits with the implementation of autonomous and hybrid plant, telemetric and data controls across RP2,RP3and beyond

Value Chain Analysis: HVO Fuel Benefits

A recent study identified the benefits both in terms of cost, emission reduction and health and safety by using HVO as an alternative to fossil fuels.

Given the pending transition from red to white diesel in April 2022 with an forecast price increase in cost approx. £0.47 per litre this offers a cost effective, low emission and safe alternative.

What is HVO?

HVO is a crop waste fuel that can be used as alternative fuel to fossil fuels such as diesel.

- HVO is much cleaner than traditional fuels such as diesel, with obvious benefits to the environment. It can be utilised in any combustion engine, particularly to generate electricity in a temporary power generation application.
- HVO power solutions require no component change or modifications to the combustion engine. This means the operator can use HVO as an immediate replacement fuel in assets that are currently being run on diesel.

Emission Reduction

- 90+% reduction in net CO2 – calculated and confirmed by the ISCC.
- > 15% reduction in NOx emissions.
- > 40% reduction in particulate matter.
- Fuel consumption reductions of up to 10%.

health and Safety

- Unlike red diesel HVO carries no carcinogen warning on the Safety Data Sheet making it less harmful to human health.
- Unlike red diesel HVO does not harm the environment water table and is biodegradable.
- Orders less than 1,000 litres 20-25% increase vs red diesel
- Orders from 1001 -10,000 litres 15-20% increase vs red diesel
- Orders from 10,001 - 36,000 litres 10-15% increase vs red diesel
- National delivery – up to 2.5million litres can be supplied per month on a two - three-day lead time, seven days per week, 365 days per year with emergency same day deliveries on request.

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Carbon Strategy

Key drivers of carbon emissions in category	Corporate emission	Maintenance & construction emission	Road user emission	Estimated Carbon emissions per year associated with key driver [tons of CO2]
1. Decarbonisation of Construction Plant		x		*pending volume analysis and decarbonisation of plant roadmap project and CAP

Identified measures to address key drivers in category	Expected impact / CO2 reductions [tons of CO2]			Timescale	What is needed to implement measure (investment/support, etc)?
Alternate Fuel Source	Electricity (kWh)	Carbon Factor 0.233 (CF 0.001)	Factor Units: kgCO2e/kWh	2022-2025	Innovation and road map to implementation of alternate fuel source Decarbonisation of plant project
	Biodiesel (kg)	Carbon 0.540 (CF 0.001)	Factor Units: kgCO2e/l	2022-2025	

General Plant and Equipment Strategic Sourcing Strategy

Business Need
- Engagement & Comms Plan
- Statement of Need
- Business Requirements and Objectives
- Product Description – Material & Techniques
- Previous & Current Spend
- Current Sourcing and Contract Options
- Future Forecast Spend
- Demand Profile
- Value Chain

Market Intelligence
- Market Insight & Landscape
- Supplier Capability & Capacity
- Supplier Financials
- Supplier Engagement
- Category Analysis
- Key Supplier Risks
- Risk Map

Strategic Approach
- Preferred Options and Recommendations

Template v1.3
September 2020

Category Profile

Vision:

Sustainable and non-carbon plant operations, maximised utilisation and efficiency and designed for purpose plant and equipment ensuring the on-time delivery of customer, exceeding value deliverables, zero safety incidents and delivering carbon net zero requirements

Goals:

Due to increased demand on the existing supply chain from other major programme projects outside of national highways there is a requirement to ensure that national highways have sustainable procurement setting the strategic agenda, innovative solutions to drive carbon net zero, maximise utilisation and fit for purpose plant throughout the supply chain to both undertake all and accelerate NH requirements and delivery to the customer

Scope:

The Plant Hire sector historically focused on providing a lower capital solution to sourcing equipment, differentiating on pricing, resulting in tight margins and lower cost of capital funding. Major players now differentiate by a combination of niche products, international capability and the provision of supporting services such as training creating bespoke solutions

Opportunities:

- Build closer working relationships with plant manufacturers, reducing the reliance on intermediary plant and equipment hire companies
- Standardised integrated plant supply chain process across operations and major projects.
- Deliver plant and equipment value, productivity and efficiency
- Environmental zero carbon targets.

Business Need

General Plant and Equipment Summary

Landscape:

Whilst Plant Hire is prevalent in the industry, larger users of specialist plant maintain their own fleets e.g.

- Balfour Beatty is expanding their specialist earthworks fleet.
- Walter's owns its earthmoving plant and equipment and operates their own dedicated heavy haulage fleet, to transport their plant.

- Self-drive rental, Operated Plant hire, Sales of plant and equipment, Vehicles, Service and support

Market Analysis

- The UK plant hire market was estimated to be worth £7bn in 2020 with average industry growth 2015–2020: 3.1%.
- The UK is the largest producer of construction equipment in Europe and in 2018 earned manufacturers around £13bn, indicating a strong export business.
- Plant hire is a highly competitive market and as such hire rates are reflective of this, remaining relatively static in recent years. Companies holding the largest market share in the Construction Equipment Rental & Leasing in the UK industry

Strategic Approach

Opportunity Analysis: High-Level Implementation Plan			
Objectives	Year 1	Year 2-3	Year 4+
Carbon Net Zero	Define plan and targets	Align with market capability	Continuous reduction
Commitment	Productivity solutions & behaviour requirements	Implementation defined projects	Continuous enhancement of productivity
Innovation	OEM Engagement Plant Innovation Day	Road map to Implementation	Continuous development
Influence	OEM Engagement	Support continued development	Security of supply forward planning and delivery
Project Alignment	Define opportunities and process	Implement options (trial)	Extend across MP
Training and Development	Scale of requirement v capability	Expand on implementation plans	Revisit and revise

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Statement of Need

1
Statement of Need
Define the outcome needed by the business and what is needed to deliver it

- Accelerate the implementation of innovation.
- Remote operator adoption

- Relationships development with plant manufacturers
- Specific environmental and social value targets

- Demand planning.
- Improved safety
- Efficiency and productivity gains
- Informed production decisions

The Requirements

Due to increased demand on the existing supply chain from other major programme projects outside of the there is a requirement to ensure that the have sustainable procurement, capacity coverage and continuity of capability and skills throughout the supply chain to both undertake all and accelerate he requirements and delivery to the customer

The Objectives

- Build closer working relationships with plant manufacturers, reducing the reliance on intermediary plant and equipment hire companies
- Standardised integrated plant supply chain process across ops and major projects
- Deliver plant and equipment value, productivity and efficiency

The Challenges

- Ability to invest in equipment and innovations
- Transition from traditional diesel plant to semi-automated hybrids/alternative fuels to fully automated electrical plant
- Unrealised opportunities through lack of consolidated program and community collaboration and market influence

The Outcomes

- Bringing-in telematics, so these can better inform production decisions
- Reducing HAVs.
- Reducing lifting/loading accidents and with operator's access/egress.
- Reducing loss and damages.
- Removing inefficiencies and achieving carbon targets or alternative fuel targets

Conclusion:
Increase in UK construction projects such as HS2, NWR's CP6 will put constraints on the supply of plant and resources.
New technology will create efficiencies and improved safety however the cost of investment in innovation is seen as prohibitive which also leads to the challenge of retaining an aging workforce and attracting new skills and capabilities inline with technological advances.

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Business Requirements

Requirement	Low Importance	1	2	3	4	5	High Importance
Assurance of supply	Disruption to supply has a minor impact on operations and / or brand perception					X	Security of supply is critical, disruption will affect safety and damage reputation
Quality	Quality issues have minimal impact on operations and/or					X	Quality performance has a major impact on our operations and/or brand
Regulatory, Ethical, Environmental	Compliance to ethical, environmental or regulations have a minimal impact on our operations or our brand					X	Compliance to regulatory, ethical and environmental issues has high impact on our operations and/or our brand
Service	Flexibility in delivery dates and service levels can be accommodated with minimal impact.					X	Late deliveries / poor service has a major impact on operations / brand
Cost	Cost competitiveness is not a major requirements.				X		Cost competitiveness is highly important for the business as is the ability to understand costs drivers of product / service
Innovation	R&D capability or investments in innovation has minimal impact on operations and/ or brands.					X	Excellent R&D / product engineers and investments to innovate are critical to our operations and/or brand

he Directorate	Specific Objectives
CIP	• Over reliance on frameworks • Enterprise based procurement • Influence the supply chain how do we influence and get value back • Influence Tier 1
RIP	• Shifting design to deliver outcome • Understand sub tier supply chain
Operations (Asset Delivery)	• Professionalise Tier 2 contractors and the way Tier 1 deal with Tier 2 opportunity
SMA	• Embedded as part of the wider Alliance enterprise • Early involvement in projects and engagement in collaborative planning.

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Product Description

Name	Description	
Environmental		There is the need to reduce fuel consumption. Fuel consumption has become one of the main focuses for plant manufacturers, challenges with the transition from red to white diesel. Reducing carbon footprint, minimising air pollution, use of cleaner, quieter electrified machinery gains would be achieved productivity by extending the working hours and better for the environment
Resource		The cost of manpower is considerable due to reasons like rough working conditions and the training process of the equipment operators. Construction operations are complex systems where many resources (equipment and manpower) requires collaboration to perform tasks. Lack of skilled resource or plant will delay and impact on the sequence operations significantly
Digitalisation (Technology)		a digital revolution, where technology is supporting decision making and offering significant productivity improvements. Data can be collected from connection to machines, devices and drones saves and shares from the cloud, construction managers on projects will have a much greater understanding of what work has been done and whether they are on track to the next phase or work
Autonomous Vehicles		Smart systems include digitalisation solutions where machines can talk to each other to increase the productivity and quality of earthmoving and making the work safer and more sustainable. Taking away the hard dirty work of earthmoving projects bringing the idea of digitalised robots and innovation in technology. The is automating earthworks activities by using semi-autonomous machine control excavation via (Komatsu, BOMAG and Volvo) on the A19 Testos roundabout. All i3P clients will reference where appropriate the i3P CAP statements in their business process and procurement to accelerate and transform industry adoption of connected and autonomous plant
Fleet (Plant)		In modern construction plant is completely mechanised and is performed by highly efficient machinery also known as plant. Operations require specially designed heavy equipment with significant purchasing/leasing price, as well as high operating and maintenance costs The typical types of plant used in earthworks are of varying design and load capacity depending complexity and size of the projects. Typical plant used include excavators, articulated dumpers, loading shovels, rollers, tractors, dozers

Product Description

Name	Description	
A connected site		The future of a connected site is a system of technology and processes which bring together a data rich safe and productive work site. Meaning materials can be tracked on, autonomous machined are programmed with digging data. People are kept at a safe distance from working plants and people working on site have detailed understanding of what is happening and where everything is including buried utility assets. Aerial monitoring of the sites which is tracking progress through satellites and drones. There is good communications facility which can beam data, real time data back to the control rooms
i3P		The connected and autonomous road map was launched in June 2020 in partnership with a organisation called i3P. i3P unite a whole host of infrastructure clients such as NH, HS2, TRL, energy companies with our wide range of supply chain of industry experts manufactures, subcontractors. The road map runs from 2020 to 2035 and looks at the current state, people and society, technology and hardware, data and digital techniques which leads to the future vision Road Map Link
CAP Statement	i3P HS2 highways england	The CAP community have issued CAP Community commitment statement to lead and accelerate the roadmap to a connected arena. Some example of areas the CAP community is asking the clients to reference i3P CAP statements within their business processes. Other examples to really drive the change include review the possibility for early installation on connectivity installation (4G/5G) at their locations. For example in Designs the community request designs for machines in a digital format which will allow automated design from drawings to machine. In procurement –encourage the adoption of CAP technology where there is a clear whole life business case to be produced. And machine manufactures to comply with Part 4 ISO 151143 to allow data exchange between different types of equipment and acceptance from design. Link

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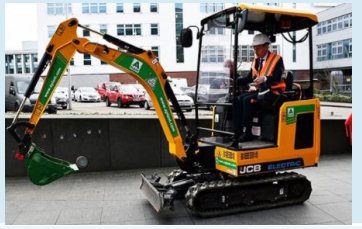
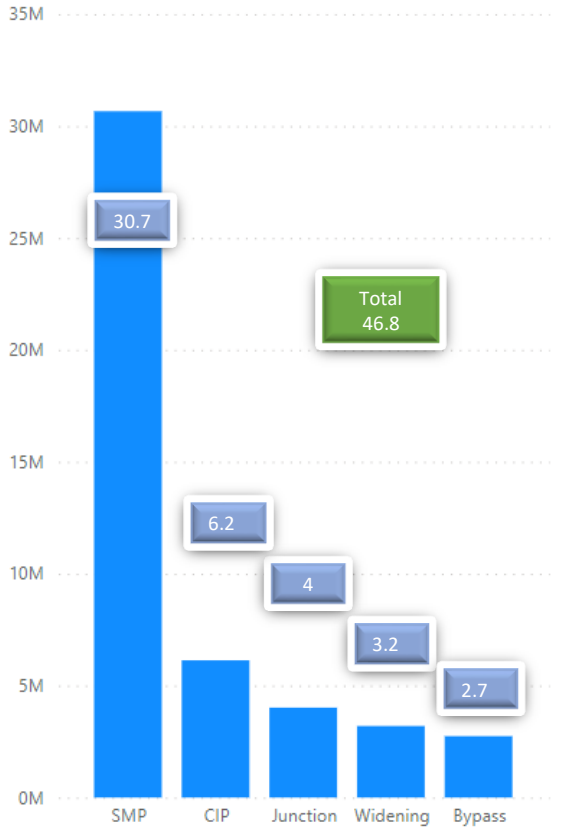
Innovation in the Category

Innovation Theme	Description	Key Innovators	Exemplary Products
Zero Carbon hydrogen – powered excavator JCB 22t 220X machine	JCB makes history with the world's first hydrogen powered excavator in July 2020. The 20-tonne 220X excavator was in development for 12 months and underwent rigorous testing at JCB's quarry grounds for a further year. The excavator is generated by reacting hydrogen with oxygen in a fuel cell to create the energy needed to run electric motors, the only emission from the exhaust is water. JCB continue leading the sector on zero and low carbon technologies https://www.jcb.com/en-gb/news/2020/07/jcb-leads-the-way-with-first-hydrogen-fuelled-excavator	JCB RYSE	
JCB Electric mini digger JCB E-Tech	The industry's first electric mini excavator with zero emissions at point of use. JCB state it can work a full days shift on a single charge and offers the same performance as a conventional 1.9t mini excavator. The machine is five times quieter than its diesel counterpart and can be fully charged in under two hours. JCB state the charging cost will be 50% cheaper than running an equivalent machine on red diesel and servicing costs are expected to be 70% lower than diesel machines https://www.jcb.com/en-gb/products/mini-excavators/19c-1e	JCB	
Road to cleaner plant	Skanska and Volvo retired out the world's first emission free quarry in Sweden, where every stage of the process has been electrified. Tests shown a 98% reduction in carbon emissions, 7% reduction in energy cost and 40% reduction in operator costs. The equipment included trialled battery electric load carriers, 70 tonne dual powered cable connected excavator and electric hybrid wheel loader. The machines are currently prototypes and not commercially available yet https://group.skanska.com/media/articles/creating-the-world-s-first-emission-free-quarry/	SKANSKA VOLVO	
Hyundai Hydrogen-Powered diggers	Korean manufacture's Hyundai Construction Equipment have set a target to start mass distribution of medium/large capacity hydrogen fuel excavators in 2023. They are working in conjunction is Hyundai Motor Group and Mobis and are also looking to develop hydrogen powered forklifts. Hydrogen based electric construction equipment uses electricity produced through chemical reactions between hydrogen and oxygen as the power source, therefore no emissions of toxic gases in the air https://www.hyundai-ce.eu/en/news/2020-03-pr-hyundai-hydrogen-fuel-excavators	HYUNDAI CONSTRUCTION EQUIPMENT	

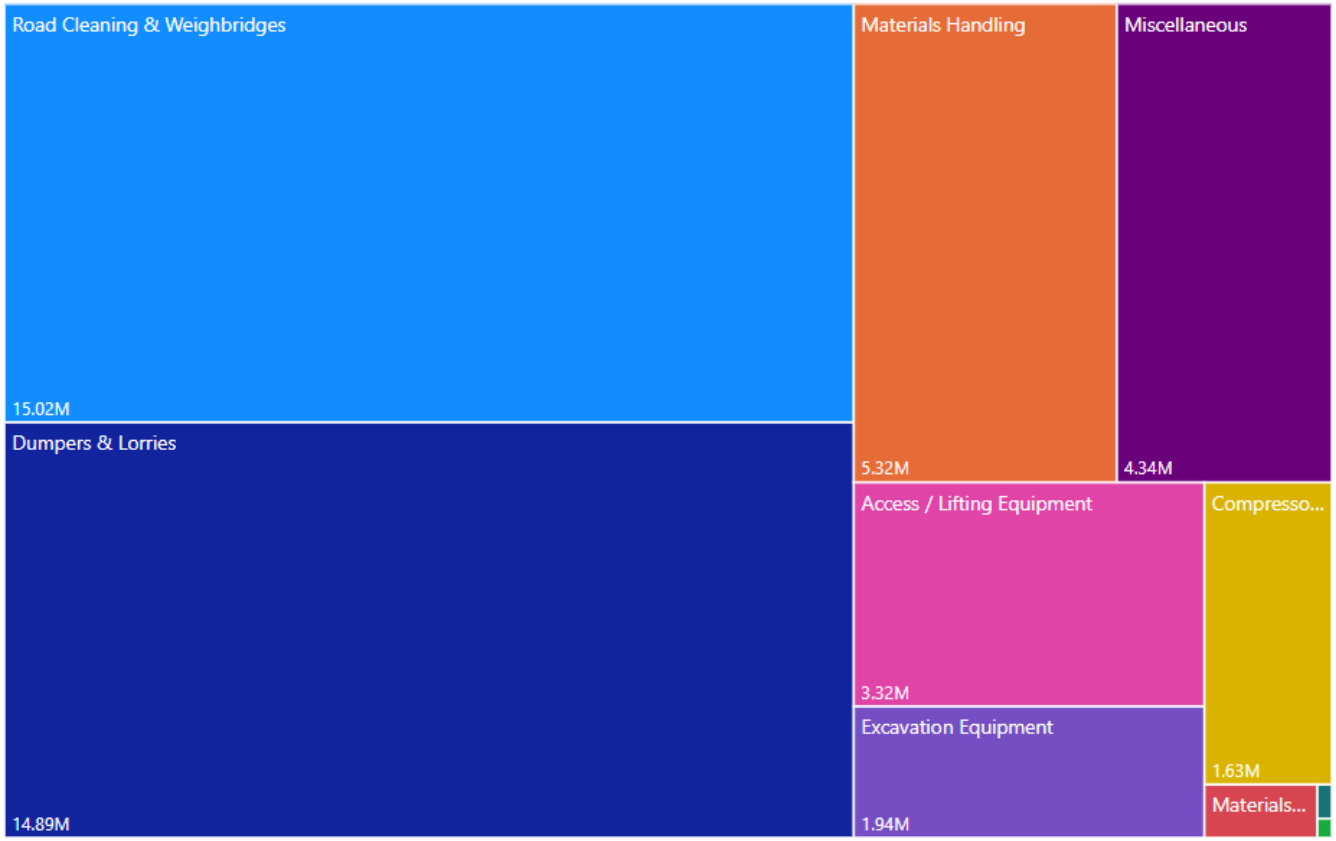
Historical Spend RIS1 (based on target prices with inflation adjustment)

1
Statement of Need
Define the outcome needed by the business and what is needed to deliver it

Cost by Work Type



Spend split by Components



Conclusion:

- Spend data based on NH payment directly to plant suppliers
- Road cleaning and weighbridges accounts for approx. 64% of total spend

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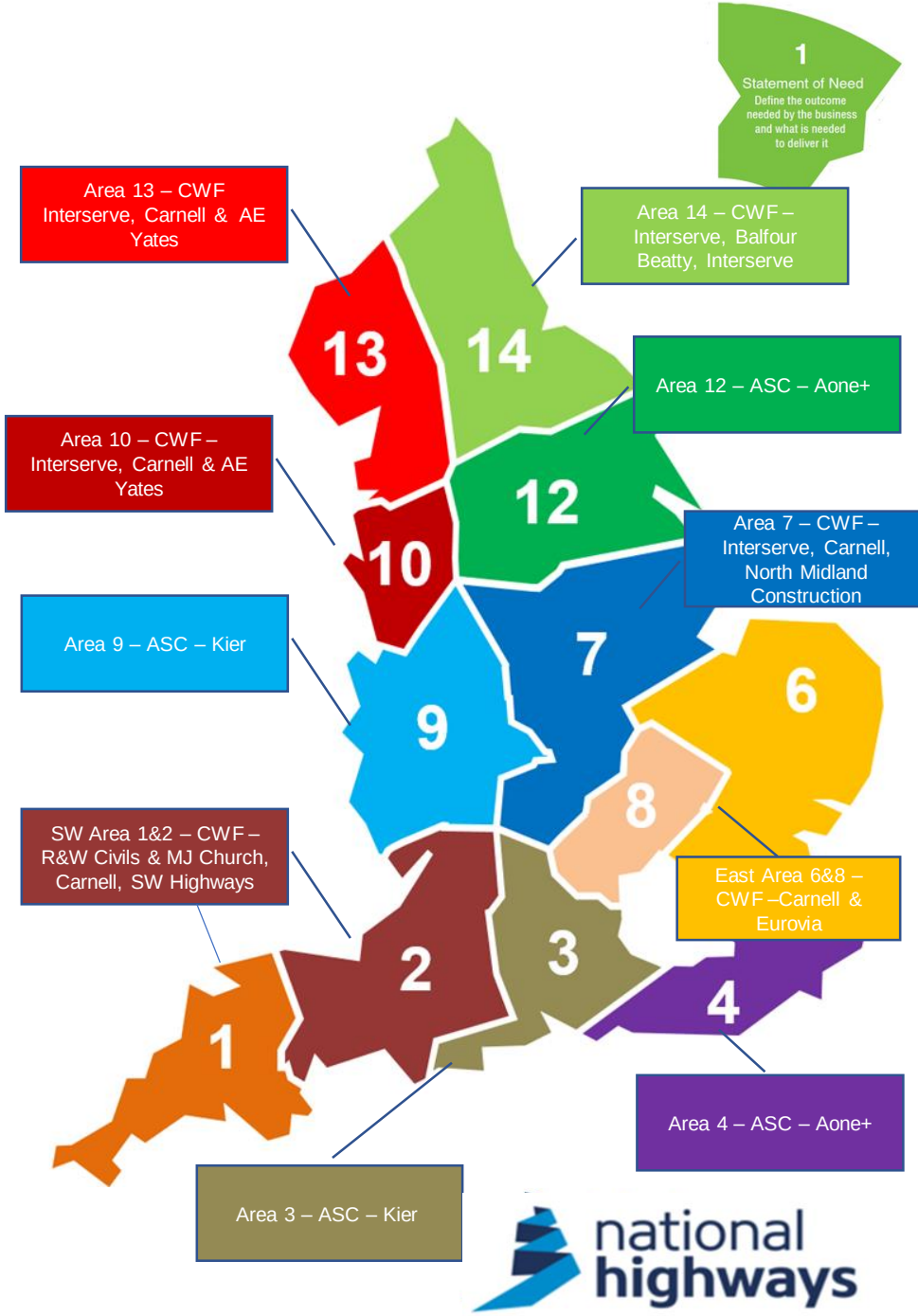
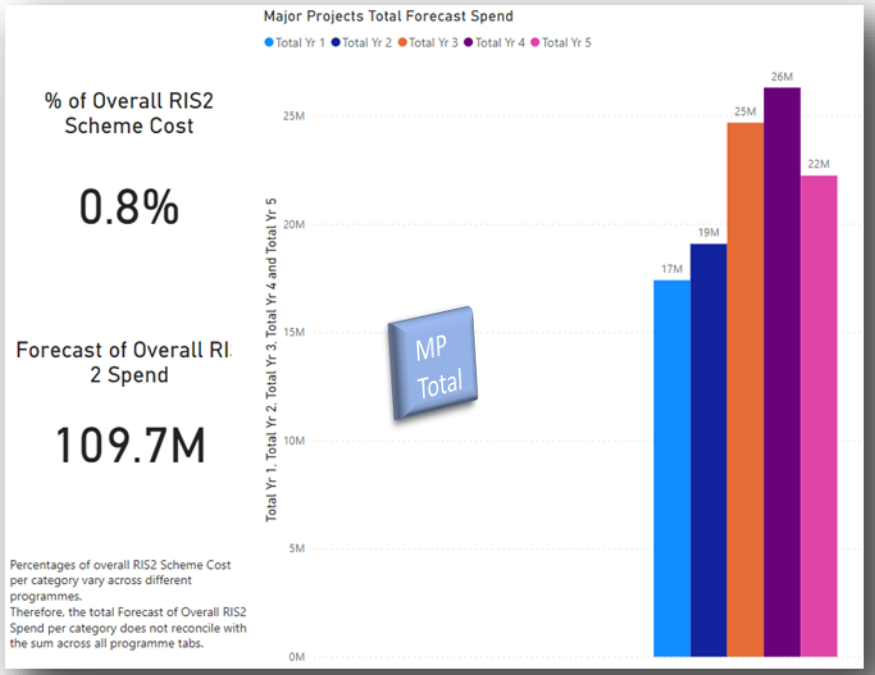
Current Sourcing & Contract Options

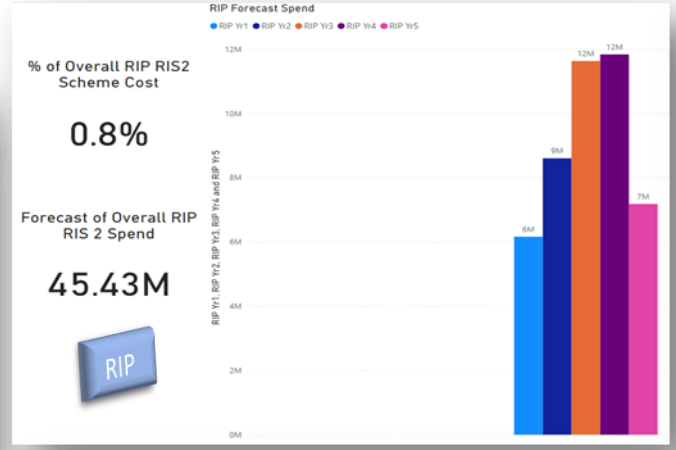
Delivery Model	Procurement Method	Advantages	Disadvantages
Asset Delivery – CWF transitioning to SDF	SDF contracts will succeed CWF which lapse by area, many between 2021 & 2023	Allocation allows share to be managed between regional competitors with regard to performance and capacity	Competitive leverage will reduce following the appointment of SDF suppliers.
Asset Delivery	Tier 1 Contractor appoints Tier 2 sub-contractor.	Potentially introduces some SME's and non CWF / SDF suppliers, reducing barriers to entry and developing capability	Tier 1 may procure on a least cost basis he no influence on Tier2 selection
Major Projects SMP	Direct contract with principal contractor on a scheme-by-scheme basis	SMP Alliance able to leverage existing relationships for deliver, efficiency and safety	Uncertainty in regard to alliance operating model managing supplier performance and innovation
Major Projects RIP	Direct contract with RDP on a scheme-by-scheme basis	Mechanism exists to co-ordinate with DIPs through Sustainable Supply Chain Group.	he unable to drive standards and delivery performance improvements Risk to cost over value in supplier selection
Complex Infrastructure Projects	Direct contract with principal contractor on a scheme-by-scheme basis	Principle contractor to contract on a project-by-project basis	Delivery dependent upon principal contractor. Risk to cost over value in supplier selection

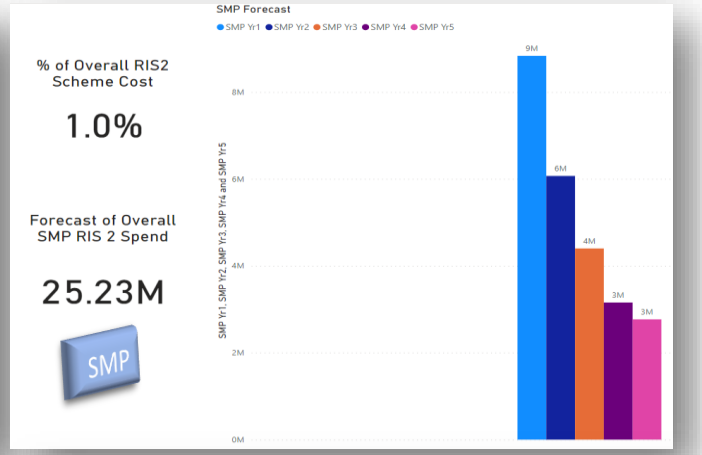
Conclusion:
Continue to monitor framework performance and identify incremental or alternate changes on a regional basis, aligning programmes to leverage volume demand and better manage and influence the market.

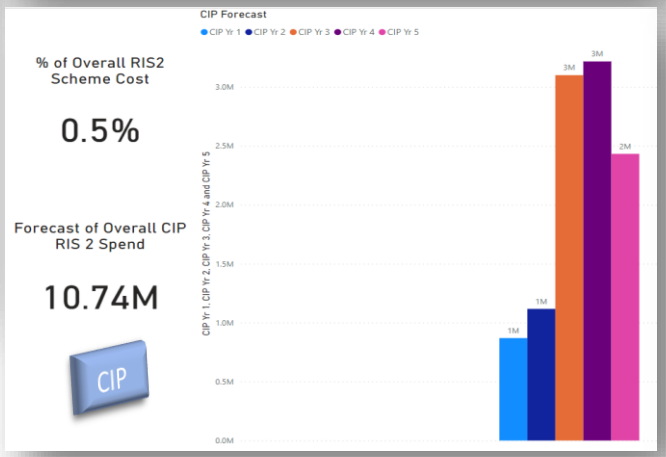


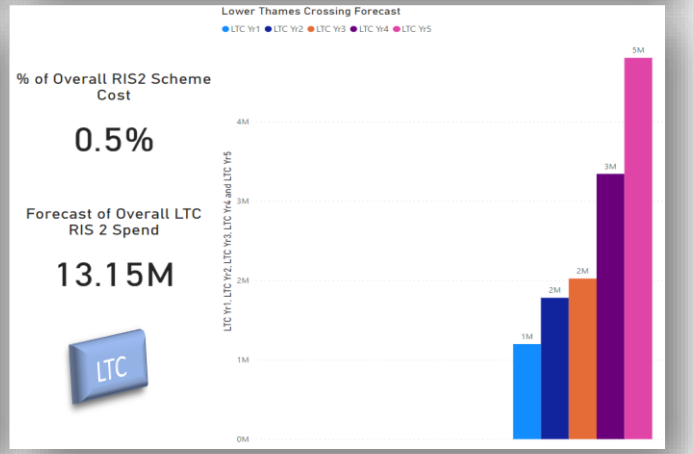
Future Forecast Spend











Conclusion:

- The value forecast is based on previous percentage spend against WBS elements from RP1 and the mid-point of RP2 assumptions then modelled against the current NH capital budgets for our investment programs.
- These figures will be reviewed and enhanced when Webcast data becomes available.
- These are MP only. Operations to be confirmed.

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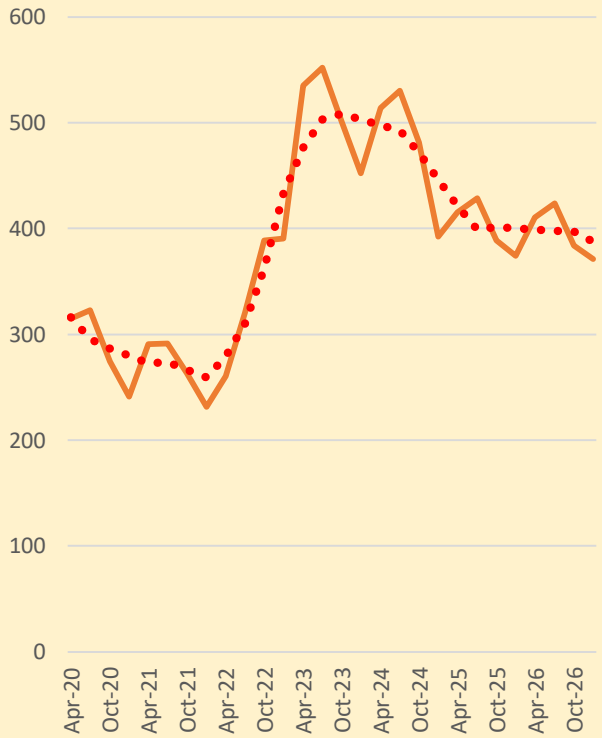
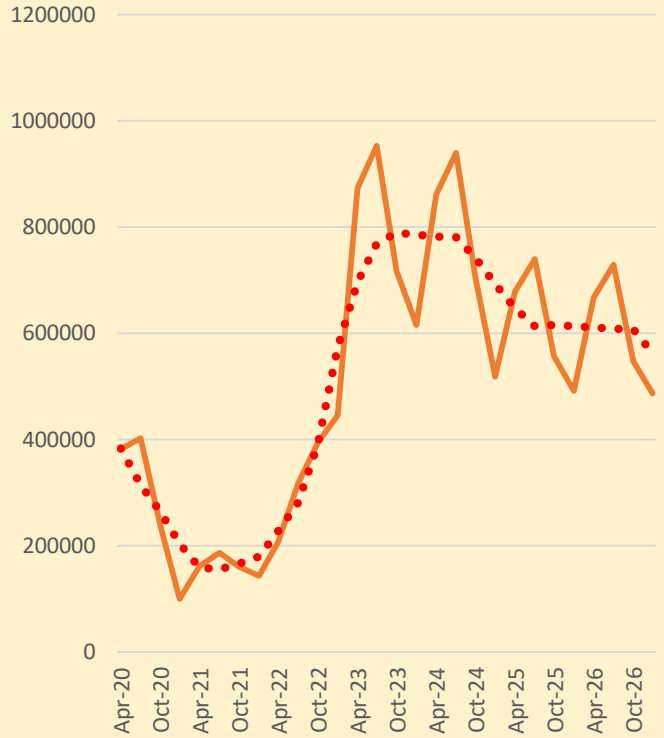
Plant and Earthworks demand data shows peaks in 2023 and 2024

Demand Side

- Both trend builds to middle of RIS2 with Smart Motorway Programme.
- End of RIS2 remains high due to Complex Infrastructure Programme pushing up demand.



Plant: 360 Excavators Small (5T <> 15T)



Earthworks: Cut – Site Haul (m3)

Supply Side

- Increase in UK construction projects such as HS2, NWR's CP6 will put constraints on the supply of plant and resources
- Lack of new technology digital plant operators
- Installation of digital corridors
- No consistent approach across he programmes and schemes and reaction times takes too long
- An aging workforce within the industry which may lead to long term capacity issues with supply of resource
- Safety technology -the drive for safety improvement is at different pace between the supply chain and OEMs.
- Cost of investment of new technology and innovative solutions could be prohibitive
- No early engagement with contractors/subcontractors at design stage causing disruption to works in the main phase

Actions/Opportunities

- Visibility/tracking of resource forecasts and capacity are needed
- Better planning to resolve resource conflicts/shortages. (HS2 used CITB's Labour Forecasting tool)
- Promote improved collaboration between suppliers and OEMs through community group meetings to promote safety and efficiency through innovation uptake
- Planning Managers to provide granular detail of labour and material requirements and cascade information to the business
- Early contractor involvement in the early planning and design stages
- Installation of digital 5G networks on all projects

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Supply Chain Mapping – value and objectives

1 Statement of Need
Define the outcome needed by the business and what is needed to deliver it

- Organisations with expertise in delivery solutions, particularly in terms of satisfying regulatory standards & maximising whole-life costing by applying design principles.
- Principles for the most efficient use of Plant across the life-cycle of the scheme will be built into a co-ordinated approach.
- Design consultants are expected to take inputs from delivery agents with specific areas of knowledge & experience.

- Tier 1 management organisations offer contract & project management services, delivering expertise in managing the overall operational needs of the client.
- Primarily work as integrators, managing end-to-end projects on behalf of contracting agencies / government & sub-contracting to designated tier 2 category suppliers.
- Primary works contractors will also act directly as management suppliers if the contract adopts this mechanism / practice.
- Many tier 1 suppliers will have Plant asset, which will influence their need for hiring from the supply chain. The scale of plant requirement will dictate outsourcing.

- Tier 2 suppliers will be specialists in the field & predominantly the primary delivery contractor for Plant on schemes.
- They provide the Plant, operating labour and potentially any design / ECI input to ensure co-ordination is efficient.
- Their service offering is specific in terms of providing machinery, equipment & apparatus used in construction works.
- More established primary contractors tend to own Plant asset limiting the need to insource (dependent upon the scale of project and availability).

- The enabling organisations for the provision of Plant asset for he works.
- Includes plant hire, welfare units & any labour requirement; although primary works contractors or managing agents often self-supply alongside hired provision in their schemes.
- Such suppliers provide mechanical equipment (such as excavators, dump trucks and loading shovels, cranes, forklifts) and operating labour for road works, for hire or purchase.
- Services also inc. support or ongoing maintenance of mechanical equipment.
- Manufacturers of plant includes JCB, Caterpillar, Scania, Volvo, Terex, DAF.

Since many types of heavy construction equipment are needed based upon the size of the project, significant investment in plant asset is necessary. Instead of investing in all plant types, it is often more economical to hire the right equipment; reducing lost capital when asset is idle, limiting logistical constraints & also eradicating responsibility for ongoing maintenance.

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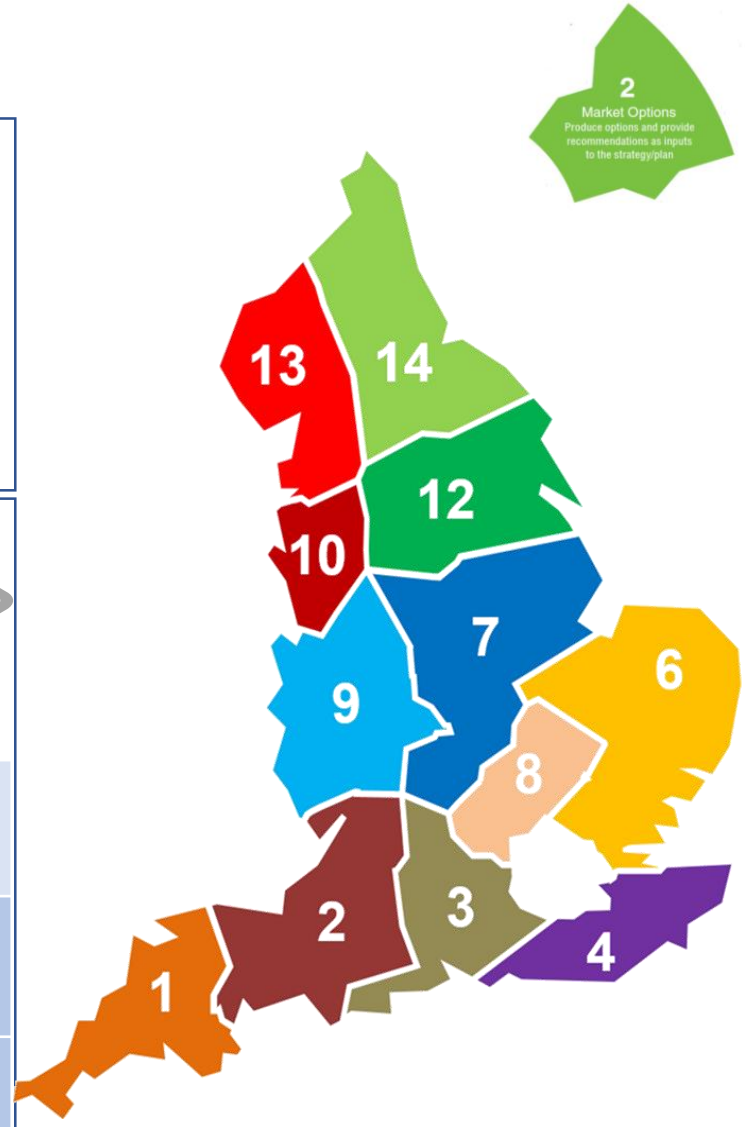
Market Insight and Landscape

- The UK plant hire market was estimated to be worth £7bn in 2020 with average industry growth 2015–2020: 3.1%.
- The UK is the largest producer of construction equipment in Europe and in 2018 earned manufacturers around £13bn, indicating a strong export business.
- Plant hire is a highly competitive market and as such hire rates are reflective of this, remaining relatively static in recent years. Companies holding the largest market share in the Construction Equipment Rental & Leasing in the UK industry include Sunbelt Rentals Ltd and Speedy Hire plc.
- Earth moving equipment (such as excavators , dump trucks and loading shovels), represent the largest equipment sub sector, accounting for around 22% of all hire value; several leading hire operators also sell a range of plant and machinery.

Threat of New Entrants Low — High	Bargaining Power of Suppliers Low — High	Rivalry in the Industry Low — High	Bargaining Power of Buyers Low — High	Threat of Substitutes Low — High
Opportunity for small-scale market entry e.g. DIY tools or non-operated machinery (+ve)	Large demand from construction, agriculture & other sectors (+ve)	Providers differentiating on price, resulting in increasingly tight margins (avg. 4.1%) (+ve)	The supplier market for plant hire is very large and diverse (+ve)	ECI may reduce need of plant (+ve)
Capital intensive - discourages new entrants (-ve)	R&D produces low-emission vehicles, more attractive to today's customers (+ve)	Fragmented market with presence of numerous Tier 2 and 3 suppliers (+ve)	Providers differentiating themselves on pricing and tightening margins (+ve)	Construction plant is itself a long-held superior option to manual labour (-ve)
Highways England requires large amounts of plant across England – scale of requirements (-ve)	Plant not easily substitutable (+ve)		Idle plant unprofitable, encourages margin reduction to maintain Revenue (+ve)	
Difficult entry as a manufacturer due to economies of scale and strong R&D (-ve)	Low switching costs for buyers (-ve)	Differentiation by a combination of niche products, international capability, and provision of supporting services (-ve)	Plant not easily substitutable (-ve)	Brand loyalty is not evidenced - more focus on the right tool for the job rather than the right brand (-ve)
	Few differentials between hiring suppliers & products (-ve)			



Conclusion: There is limited movement in the market due to significant capital investment required and narrow margins available. Whilst there is scope for growth, this is reliant on the ability of the UK economy to recover post Covid-19. In the meantime there is a good degree of pricing competitiveness for customers, albeit with an average margin of 4.1 % (for top 5 suppliers by revenue).

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Supplier Engagement: Plant and Earthworks Community PEC Workshop

PEC Community Workshop Representation					
Balfour Beatty	Bomag	Effiag	Flannery	M O'Brien Group	Skanska
C A Blackwells	Caulfield	GAP Group	JCB	SMT (Volvo)	Sunbelt Rentals
CAT	Collins	Leica-geosystems	Komatsu	SC Sustainability School	
Content with Media	Costain	Mick George	MJ Church	Topcon	
Walters	K Rouse	SITECH UK.	Trimble Civil	Wacker Neuson	

Topic	Question	Key Feedback
A Safer Network	How can we influence safety including references to innovation, new products and the availability of new technology?	• Consistent approach across all he schemes and programs - reaction time to trials takes too long. • Need an understanding of jobsite Wi-Fi/cellular coverage and if there is going to be a regulation per new project?
Improving Customer Satisfaction	How can we influence customer outcomes by improving time to deliver, reducing maintenance, improving efficiencies etc?	• Use the technology available to today (pay for it) and understand whole life cycle cost. Early understanding at design stage and DCO stage in approach. Public/Air quality
Delivering RIS	How can we improve delivery for he or provide faster or better outputs, whole life cost, value etc.?	• Engagement of technology available now and tomorrow
he Engagement	Advise on areas where he should consider improving within the supply chain and advise possible solutions	• We should expect the client to scope the technology because this is understood to be "required". Outcome based specification over minimum standard. (unless a specific business case is provided)
Current and Future Business	What are the major risks and also opportunities that you see within your business sector?	• Huge lack of plant operators, digital plant people. remote operator adoption • Scale of capex required to keep pace with rate of change in digital and renewable areas; client willingness to support investment decisions with longer term hire/lease commitments.
Innovation	What innovations can/should be implemented (short term) and if not already done so why?	• Use the technology available - semi-auto excavators/ intelligent compaction etc
Carbon Net Zero	How are you engaging with manufactures/suppliers/each other to achieve zero carbon fleets?	• Early adoption of new technology in order to contribute feedback and help further the innovation and development of these technologies to make them better, more efficient and long term mass produced therefore more affordable. Short term pain, long term gain • Low/zero carbon fleet; battery/solar/hydrogen alternatives available; on site manufacture of hydrogen;

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Supplier Engagement: Focus on 3 Key Imperatives: Safety Customer and Delivery.

Earthworks Community Workshop Feedback – December 2020 / June 2021	Short term	Medium term	Long term
Delivering RIS: How can we improve delivery for GE or provide faster or better outputs, whole life cost, value etc	Early engagement and scope expectations Long term partners Engagement of technology available now and tomorrow	Value not price Compliant bid process Low technology adoption rate	Environmental,, space constraints, trades, site traffic Split shift working Contra flows
Improving Customer Satisfaction: How can we influence customer outcomes by improving time to deliver, reducing maintenance	Use of technology and early engagement Cost implications Learn from other countries	Managed KPIs and productivity Connect site and client Improve productivity, plant uptime	New roles, digital managers Realistic project timeframes Technology adoption
A Safer Network: How can we influence safety including references to innovation, new products and the availability of new technology	Knowledge sharing. Showcase success Understand what industry is willing to try and test	Consistency and OEMs slow to change Understanding culture differences Understanding project plants for WIFI coverage	Manufactures need to drive change Safety starts with operators
Carbon: How are you engaging with manufacturers/ Suppliers/each other to achieve zero carbon fleets?	Training /education sustainability schools BIO fuels, investment in electric (battery /solar) Increase cost of purchase/investment Become less competitive	Adoption of technology Long term mass production more cost effective Investment required	Fuel targets and options Battery /solar /hydrogen alternatives available Onsite manufacture of hydrogen
Current and Future Business: What are the major risks and also opportunities that you see within your business sector	Lack of digital plant operators Significant capex investment requiring long term agreements Adoption rate of technology	Lack of digital plant operators Require skills and training	Lack of digital plant operators Tiers 2 as head contractor
NH Engagement: Advise on areas where he should consider improving within the supply chain and advise possible solutions	Client scoping technology requirements Outcome based specifications Consistent approach across schemes and programmes	Changes in tender process (technology outcome based) Realistic timeframes Longer lead times	Community representation to he Early engagement Realistic timeframes of projects Provide R&D technology funding
Innovations: What innovations can/should be implemented (short term) and if not already done so why?	Machine data Client dashboards Use of available technology	5G networks autonomous plant Remote control Investment required	CAP 2035

- The workshop was attended by representatives from tier 1, tier 2 and OEMs. Breakout sessions to discuss and obtain feedback on 7 key areas with a focus on the short, medium and long term objectives.

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Category Analysis

Strengths
- Commitment to safety and sharing best practice
- Collaboration between Suppliers and OEMs
- Multiple supply chain provider options
- Doesn't appear to be brand loyalty

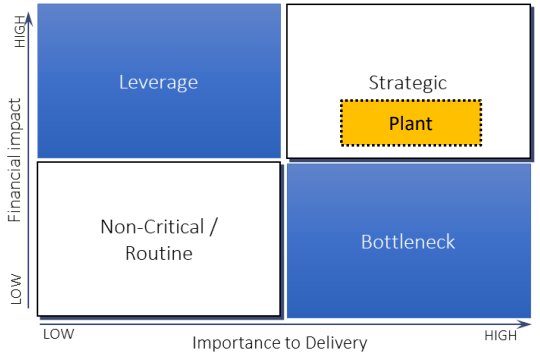
Weakness
- Over reliance on frameworks
- Total value as opposed to lowest cost
- Capital intensive whether delivered as self-drive or operated plant

Opportunity
- Implementation of 5G and WIFI coverage
- Consistent approach across schemes and programmes
- Transition to hybrid/electric, fully electric or hydrogen for vehicles, plant and generators, lighting towers
- Plant uptime: telemetric
- Manage and supply all aspects of site setup
- Specific plant and carbon targets or alternative fuel targets
- Reduce the necessity of the plant itself via initial design

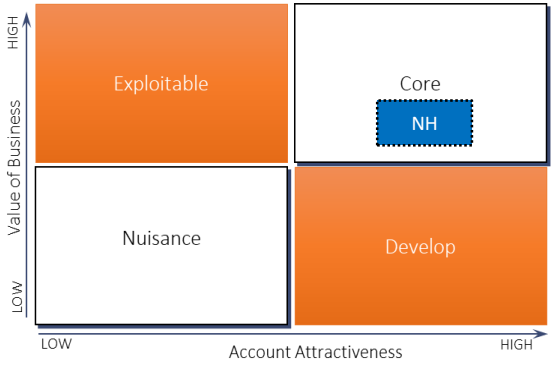
Threats
- Cost of investment in new technology
- Skills development and retention (digital managers)
- Economic uncertainty
- Increase in UK construction projects such as HS2, NWR's CP6
- An aging workforce and lack of plant and digital plant operators
- Unrealised opportunities through lack of consolidated program and community collaboration and market influence

PESTLE	Developments	Significance H/M/L
Political	• Government policy and future project(s) approval	M
Economic	• Industry cost factors (Oil, materials, equipment)	M
Social	• Ageing workforce and retention • Lack of new sector skills and apprentices for new technology. Re-training of employees with regards to new skill sets requirements • New technologies demand for new skill sets will increase and will compensate job losses	H
Technological	• Uptake in new technologies and innovative plant equipment • Cost of investment: CAPEX	M
Legal/ Regulatory	• Health and Safety requirements • NH project sites will be off road and will not be subjected to Road and Traffic laws. Insurance laws may also require revision	M
Environmental	• Zero carbon targets • Autonomous and Hybrid plant will produce less emissions, which is inline with he policy for Environment	H

Highways England Perspective



Supplier Perspective



Conclusion:
NH is still an attractive proposition for the supply chain market however increased demand will put a strain on availability.

The supply chain already faces challenges in terms of workforce capacity and capability. Long term investment required in innovation and new technology could be prohibitive

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Key Supplier Risks

Risk type	Risk Description	Impact	Priority	Mitigation/Action
Supply Chain	• Plant Hire sector has historically focused on providing clients with a lower capital solution to sourcing equipment, but this brings with it a dilution of ownership & reduced co-ordination.	▪ Inefficient deployment of plant asset.	High	▪ Develop high-level joined-up Plant co-ordination plan across scheme(s) to maximise integrated application.
	• The Plant market is highly competitive & business is very cost-focused with suppliers operating at tight margins so are susceptible to changes in the economy / marketplace	▪ Key Plant suppliers becoming unstable & going out of business.	Medium	▪ Monitor the whole supply chain in terms of financial capability to anticipate potential supply chain threats.
Innovation	▪ Clients are unaware of technological advances or the latest Plant asset that would be better suited to deliver tasks across a scheme due to not being part of the Machinery sector.	▪ Incorrect Plant selected for job leading to either poor service inefficiency.	High	▪ Encourage Plant suppliers to embed themselves in the project & be involved in early design considerations to enable tailored solutions which deliver genuine benefits.
	▪ Brand loyalty can potentially suppress advances if contractors persist with traditional Plant solutions. The fluidity in the market should be harnessed to avoid missed efficiencies.	▪ Time & cost savings, with opportunities for quality improvements in projects	Medium	▪ Examine range of Plant options at an early design stage to assess most suitable (whole-scheme) machinery asset that will deliver broadest benefit & efficiency.
Capacity	▪ Significant investment in large infrastructure projects across other public and private projects is creating an increased demand on Plant asset potentially generating pinch-points.	▪ Unavailability of specialist Plant asset when required.	High	▪ Share demand profiles across government stakeholders to smooth potential peaks/troughs & avoid capacity issues
	▪ Plant Hire is capital intensive, which discourages new entrants to the market as they would be required to generate large initial financing with uncertain long-term returns.	▪ Static market which may be unable to meet the increased infrastructure demand	Medium	▪ Broaden supply base across multiple Plant sources to build resilience into forward plan & ensure capacity challenges can be spread across market.

Conclusion: There is a wide range of options across the competitive Plant Hire marketplace from which opportunities can be gained & risks can be mitigated through increased resilience. While stagnancy of development or innovation can be generated through the market being led by price, this will be overcome by early consideration of Plant needs across the whole scheme & selecting for efficiency.

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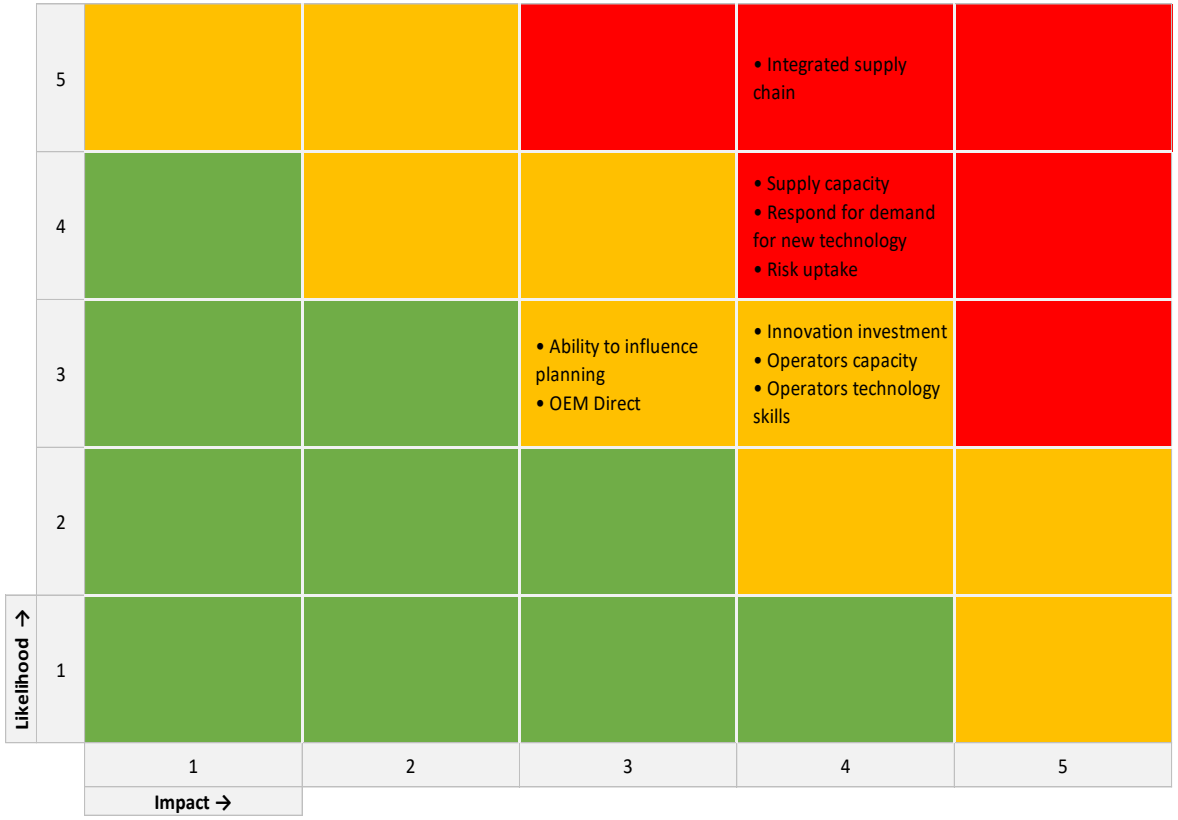
Risk Map



Title	Risk Description	RAG
Innovation investment	Cost of investment in new technology	A
Operators capacity	Aging workforce, skills development and retention	A
Operators technology skills	Lack of plant and digital operators	A
Supply capacity	Increase in UK construction projects	R
Ability to influence planning	Ability of the market to respond for demand for new technology	A
Respond for demand for new technology	Unrealised opportunities through lack of consolidated program and community collaboration and market influence	R
Risk uptake	Uptake of risk against benefits of owned equipment within the organisation	R
OEM Direct	OEMs reluctant to supply direct	A
Integrated supply chain	Unrealised opportunities through lack of consolidated program and community collaboration and market influence	R

Strategy - Short to Medium Term

Procurement Strategy	Description	Benefit	Action
Carbon Net Zero	• Specific plant carbon targets or alternative fuel targets part of operational measurement	• Define NH requirements and expectations • Establish alternate sources of supply • Incentivise the supply chain to be proactive (TCO) • Clear guidance and expectations of delivery • Supply chain time to plan and invest.	• Establish supply chain options and plans for environmental sustainable solutions • Define baseline, incremental target and timeline
Commitment	• Identification of scheme delivery opportunities (live implementation) • Utilisation of existing technology	• Proof of concept • Benchmark productivity gains. • Maximise the planning, productivity and efficiency gains and support operations • Operator behaviour • Monitor and drive efficiencies in fuel usage and idle time plant operation. • Bringing-in telematics, so these can better inform production decisions	• Plant innovation day 12/10/21 • HVO deployment with Belfour Beatty (area tbc) • Implement alternate solutions and utilisation of available technology
Project Alignment	• Standardise integrated plant supply chain process • Enterprise alignment agreement	• Maximise productivity and efficiency (supply chain) • Allows for long term investment • Reducing HAVs. • Reducing lifting/loading accidents. • Reducing accidents with operator's access/egress. • Reducing loss and damages.	• Benchmark alternate agreement solutions A1 Morpeth to Ellingham (B10)
Training and Development	• Support the development of training facilities • Encourage social value	• Support technology developments and implementation • Mitigate future skills and capability requirements • Deliver on social value	• PEC and Supply Chain School • Alignment with labour strategy and on / off site training opportunities

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Strategy – Long Term

Procurement Strategy	Description	Benefit	Action
Influence	• Alternate fuel / Electric/ Hybrid / Hydrogen and semi and autonomous plant • Engage original equipment manufactures	• Accelerate original equipment manufacture • Reducing the reliance on intermediary plant and equipment hire companies	• Plant Innovation Day 12/10/21 • CAT Command Demo: November 21 • Volvo Technical Day: October 21 • Komatsu Demo October 21 • JCB Hydrogen December 21
Innovation	• Decarbonisation of construction plant project (innovation) • Alignment on CAP (connected and autonomous plant), PEC (plant and earthworks community) and SCS (supply chain school) innovation and technology developments	• Remove man/machine interfaces and improve safety • Optimise plant movements and improve cycle times • Contribute towards our carbon net zero target. • Reduced environmental impact • Reduce waste (time, money and effort) • Increase speed of implementation • 3DMachine control productivity gains • *(Alignment with general plant and equipment strategic procurement strategy for environmental sustainable equipment solutions).*	• Innovation SES Decarbonisation Plant Project • Plant innovation day 12/10/21

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Recommendations

Benefits Strategy	Description	Recommendation
See **Recommendation Summery** slide	See **Executive Summery –**slide	• Approval of strategic procurement strategy