FINAL REPORT

Review of how National Highways and Network Rail Manage Large Renewal Projects

Prepared for:

Office of Rail and Road

Prepared by:

In association with:

CPCS Ref: 25388
February 9th 2026
www.cpcs.ca

Statement of confidentiality and validity

Capability and availability statement

The CPCS and Croftstone Team has all the capabilities and qualifications to undertake this assignment. Furthermore, our team warrants that the resources listed in this proposal have the availability to carry out the assignment according to the proposed work plan.

Acknowledgements

The CPCS and Croftstone team acknowledges and is thankful for the input of National Highways and Network Rail staff who were consulted as part of this study, as well as for the input and guidance of the ORR team.

Conflict of interest declaration

The CPCS and Croftstone Team warrants that, to its knowledge, no actual or potential conflict of interest would arise from undertaking this assignment.

Our Integrity Code

CPCS conducts its business ethically, honestly and fairly.

Our Integrity Code applies to all CPCS People, which we consider as anyone working at, with, or for one of the CPCS Group companies, regardless of their title, seniority, or location.

CPCS works with business partners who conduct their business lawfully and are committed to act with integrity.

Cover and image below: Illustrations drawn for CPCS by Toronto artist Mike Parsons.

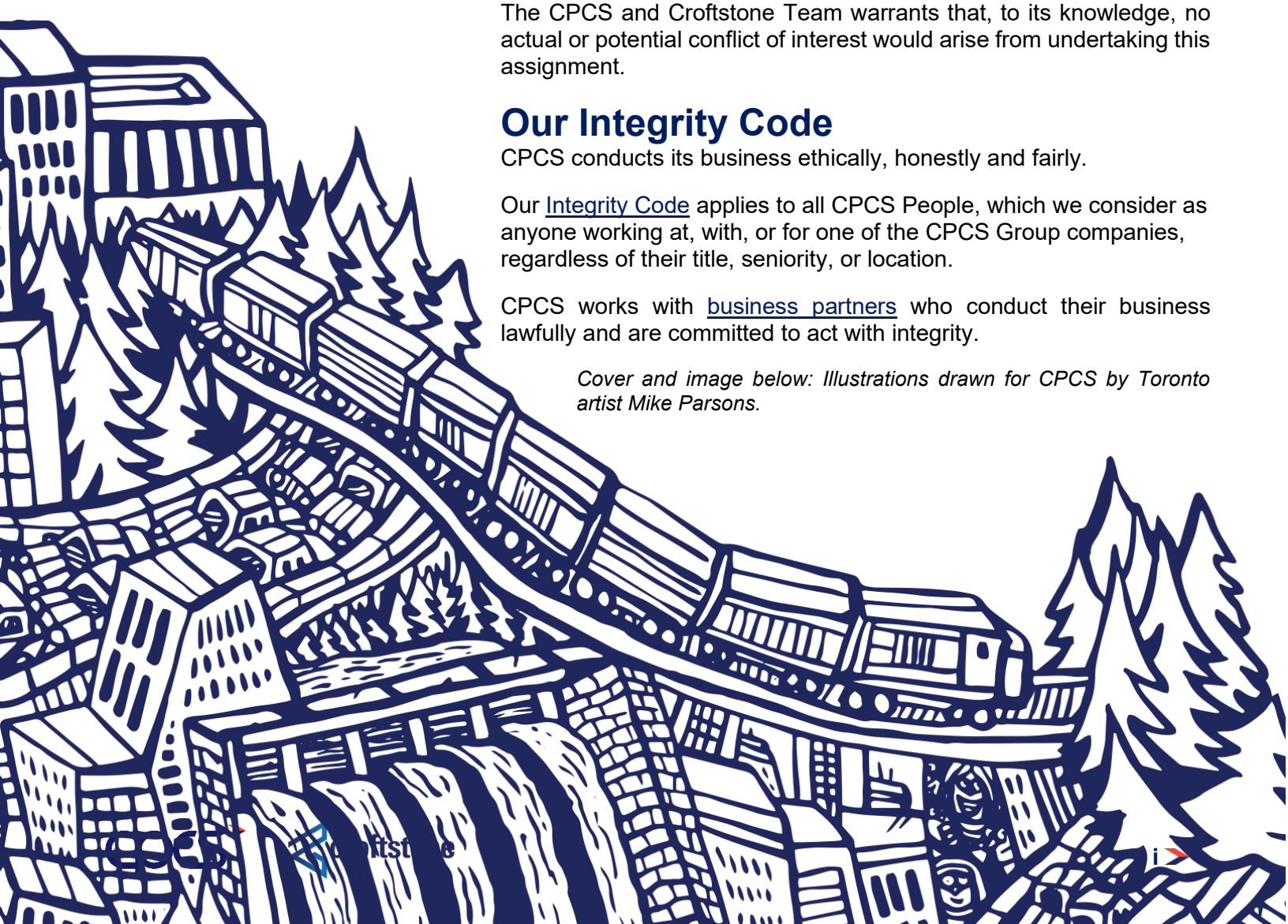


Table of contents

Index of Figures

List of Abbreviations

List of Abbreviations	
Abbreviation	**Definition**
3D	National Highways' standardised delivery management for the delivery of Renewals Projects, consisting of stages with stage gates
3D+	3D+ is a National Highways delivery management methodology used for large renewals that are delivered by Major Projects and are defined as Significant Renewals. 3D+ is an enhanced version of 3D, incorporating select assurance elements from PCF.
ARM	Active Risk Manager (Risk Management software)
CDMT	CDMT
CICF	Capital Investment Capability Framework
CMM	Capability Maturity Model
CPCS	CPCS (consultancy preparing the report)
ECI	Early Contractor Involvement
KPI	Key Performance Indicator
MVP	Minimum Viable Product
NH	National Highways
NR	Network Rail
ORR	Office of Rail and Road
PACE	Project Acceleration in a Controlled Environment
PM	Project Manager / Project Management
TfL	Transport for London
TM	Traffic Management
US FTA	United States Federal Transit Administration
VRS	Vehicle Restraint System

Executive Summary

0.1 Objectives of Review

0.1.1 Context

ORR has commissioned this review to better understand why costs and schedules of Large Renewals projects across National Highways and Network Rail are often subject to changes during development and design, and to identify where efficiencies could be achieved.

The study aims to support the ORR in:

Findings will inform ORR's regulatory oversight and future guidance on how Large Renewals should be scoped, planned and delivered more effectively.

0.1.2 Methodology

We applied a structured, evidence-based methodology to review how National Highways and Network Rail plan, estimate, govern and deliver the early stages of large renewals projects.

After confirming scope and working arrangements with ORR during project inception, we issued a targeted data request drawing on existing ORR datasets and supplemental materials from both organisations. All data received was consolidated, cleaned and normalised to support consistent analysis, with clarifications sought through ORR-facilitated ad-hoc sessions.

The methodology was structured around five core areas of investigation:

1. **Effectiveness of governance processes:** We reviewed governance structures, assurance arrangements and decision gateways, supported by policy and process reviews and stakeholder discussions, to understand how early-stage decisions are taken and controlled in practice.

2. **Estimate changes across project stages:** We analysed cost and schedule estimates across development and design stages to understand the scale, timing and nature of estimate changes as projects mature.

3. **Drivers of cost and schedule deviations:** We used case studies and available wider data to compare by region, asset type and project stage, supported by targeted case studies, to identify recurring drivers of cost and schedule deviation.

4. **Measurement and delivery of efficiency:** We examined how efficiency is defined, measured and monitored, including the tools, data and governance used to evidence delivery and track performance over time.

5. **Cross-sector comparison and best practice:** We carried out cross-sector benchmarking across UK water, energy, road and international rail sectors to contextualise findings and identify transferable good practice.

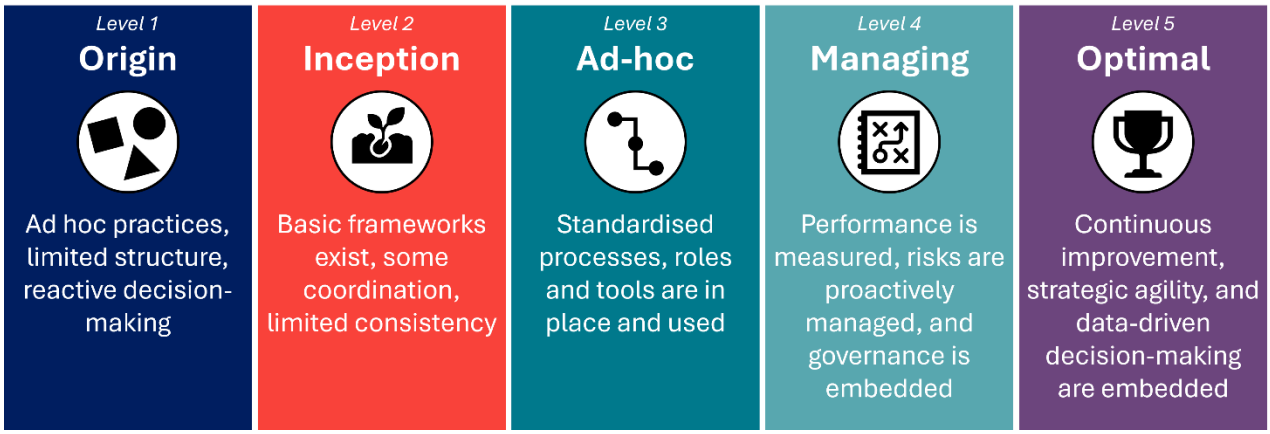
To provide structure, consistency and comparability across Network Rail and National Highways across these five areas, we applied CPCS's tailored Capability Maturity Model (CMM), outlined in Figure 1 and the subsequent sections.

Our procedural review assessed governance, estimating processes, benchmarking, standards, assurance mechanisms and lessons learned frameworks as they are applied in practice. Central to this assessment was the use of the CPCS-tailored Capability Maturity Model (CMM), outlined in Figure 1 and the subsequent sections, which provides a structured framework for evaluating how clearly procedures are defined, how consistently they are applied and how well organisations monitor and improve their practices over time.

The CMM looked at seven maturity measures, all of which were weighted evenly for this project. They were Tools, Contracting, Governance, Policy, Lifecycle Integration, Digital & Data and Programme Management. Given the scope of our study, five areas were not assessed (Competence and Framework from the Capability section, and People, Collaborative Behaviours and Stakeholder Alignment from the Culture section).

Using quantitative analysis, process reviews and case studies, such as West Coast North Modernisation Programme and selected Road Investment Period schemes, enabled us to triangulate our evidence base in populating the CMM, which delivered scores for each of the seven maturity areas. These scores were based on a maximum of five and represent levels of maturity in line with those set out below in Figure 1.

Figure 1 - Capability Maturity Model – Five-point Maturity Scale



These scores in each area build up to give a quadrant percentage score (Capability, Process, Culture and Enablers), which are evenly weighted to produce an overall level outcome for each organisation, in line with those in Figure 1.

The CMM therefore set the measurement and assessment criteria for measuring the effectiveness of governance and the processes for early-stage development of projects. It also allowed for a fair comparison of Network Rail and National Highways by using a weighted and evidence-based

approach to compare different approaches in two industries where there are some significant differences in their renewals portfolios.

It is important to note that the CMM used here by CPCS is tailored to capital investment and large renewals and differs from ORR's broader Capital Investment Capability Framework (CICF); results from the two models are not directly comparable and should be interpreted independently.

To contextualise findings, we carried out cross-sector benchmarking drawing on UK water, energy, road and international rail sectors to identify transferable practices and improvement opportunities.

In addition, to check our findings and recommendations, , findings were tested through an interim presentations and stakeholder workshops with National Highways and Network Rail, and the final conclusions were validated and refined through joint sessions with both organisations and the ORR.

0.2 Capability Maturity Model Outcomes

0.2.1 Network Rail

0.2.1.1 Overall Maturity Assessment

Based on the areas assessed using the Capability Maturity Model (CMM), Network Rail's capability is assessed at the **"Managing"** maturity level. At this level, processes are understood, applied, and show clear signs of being well embedded, particularly within the context of planning, estimating, governance, and the early stages of delivering renewals.

0.2.1.2 Performance Across CMM Quadrants

Figure 2 – Network Rail – Quadrant Scoring Overview

Capability – only one area of capability was within scope which was Tools. Network Rail has a broad range of tools to support teams. These are accessible to all, well understood and integrated across others processes and systems. The tools focus mostly on enhancements and would benefit from being reviewed for applicability to renewals.

Process – this area showed at a managing level of maturity due to the clearly identifiable policies and supporting processes in use, triple locked governance and robust supply chain contracting approach.

Culture - This was not assessed as part of this assignment

Enablers - identified as the lower-performing area, with specific weaknesses in Digital & Data and Lifecycle Integration. These areas represent the primary constraints to progressing beyond the current maturity level.

0.2.1.3 Key Areas for Improvement to Reach an Optimal Rating

To progress from a “Managing” to an “Optimal” maturity rating, the assessment identifies a need to prioritise improvements in the following areas:

- **Stronger data management and controls**, including improved rigour, accessibility, and quality control over how data is collected, used, and shared
- **More consistent application of processes** across the organisation
- **Improved use of benchmarking**, particularly to better inform early-stage planning. Better deployment of benchmarking would support improved cost and schedule forecasting accuracy at early stages of renewal planning
- **Systematic consideration of whole-life cost,** including consistent quantification and application. Embedding whole-life cost considerations in line with ISO 55001 Asset Management principles, and reinforcing this through policy and guidance, would support a more structured and sustained approach to continuous improvement
- **A structured approach to continuous improvement.**

A consistent assessment of whole-life cost within policy documentation, alongside strengthened data practices and benchmarking, could collectively form a coherent, continuous improvement plan to support progression toward an Optimal maturity rating.

0.2.2 National Highways

0.2.2.1 Overall Maturity Assessment

Based on the areas assessed using the Capability Maturity Model (CMM), National Highways' capability for large renewals is assessed at the "**Managing**" maturity level. At this level, individual processes are understood, applied, and show signs of continuous improvement. Given the scope of this study, this review had a particular focus on governance, and it is noteworthy that the governance score was at "Ad-Hoc" level.

0.2.2.2 Performance Across CMM Quadrants

Figure 3 – National Highways - Quadrant Scoring Overview

Capability - only one area of capability was within scope which was 'Tools'. National Highways has a range of appropriate tools which are specific to managing renewals. There was evidence of these in use. These are accessible internally, embedded and used consistently, which was evident in document reviews and case study interviews. The Capital Delivery Management Tool (CDMT) is referred to and used consistently by teams.

Process - The lower maturity score in Governance is directly related to the management of change control and some lack of clarity in documentation and in the application of 3D and 3D+.. 3D is used for renewals. 3D+ is used for large renewals which are delivered by Major Projects and defined as Significant Renewals. 3D+ was described as an enhanced version of 3D which incorporates elements from the Major Projects project management approach, Project Control Framework (PCF). Evidence of this came from interviews and review of project artifacts however a documented process for 3D+ was not available. Core processes and supporting enablers are generally well established and effectively applied. Performance was particularly strong in the Contracting measure, where National Highways achieved an Optimal maturity score. They demonstrated

applying a range of procurement options directly relevant to the project complexity and market appetite for managing risk.

Culture - This was not assessed as part of this assignment.

Enablers – identified at a managing level across all measures in this category. There are consistent policies and processes in places related to these areas. These are understood and applied by teams. There was evidence of lifecycle and whole-life costs thinking built into systems as well as policy. For example, the CDMT tool has specific fields that must be completed for stage gate reviews with quantitative evidence of whole-life costs.

0.2.2.3 Key Areas for Improvement to reach an Optimal Rating

To progress from a "Managing" to an "Optimal" maturity rating, the assessment recommends a focus on improving governance, including:

- Implement more robust change control including the proposed change panel and ensuring visibility of previous project controls data when re-baselining.
- Enhanced use of live data to update and inform cost estimates, schedules and benchmarks. This is working well and should be expanded into consistent practice.
- Removing, managing or mitigating the risk of manual data transfer between Oracle and CDMT and any other systems where data relies on manual transfer.
- Stronger consideration of whole-life cost in line with ISO 55001 Asset Management principles, and reinforcing this through policy and guidance, would support a more structured and sustained approach to continuous improvement.
- An ongoing focus on continuous improvement in each of the key CMM areas. This should include fully embedding the policies and processes into working practice across the project management methodologies of 3D and 3D+. The 3D+ process should be well defined and documented in a way that is easy to interpret for practitioners and provides a clear pathway for applying project controls and methodology.

Collectively, these areas represent the primary opportunities to strengthen governance arrangements and support progression toward an "Optimal" maturity rating.

0.3 Summary of Findings across key areas

0.3.1 Network Rail

0.3.1.1 Evaluating the effectiveness of governance processes

Governance Framework

Network Rail operates a mature, risk-based project lifecycle and governance structure for large renewals through its bespoke PACE framework (Project Acceleration in a Controlled Environment). The approach provides a "triple-lock" to ensure project, finance, and procurement approvals are all satisfied, robust, and aligned before a project can proceed. Stage gates and escalation processes are well understood and consistently applied, with clear documentation such as Investment Regulations, PACE, and regular policy updates as all documents reviewed had a specified date for review and update or had been recently updated in line with Network Rail's own policy.

Assurance and Risk Management (governance and control)

Network Rail's Active Risk Manager (ARM) software system is an enterprise risk management software to collect, store, analyse, report, and govern risk information. All project risks and contingencies are available in the system and linked to the anticipated final costs, ensuring robust risk management. Network Rail's regions have developed other approaches as well, such as Scotland's retained risk fund. However, there is some variation in process maturity across regions.

0.3.1.2 Understanding estimate changes across project stages

Estimating and Benchmarking

Early-stage estimating benefits from bundling workbanks and collaborative planning, supporting more informed initial estimates. However, benchmarking and lessons learned are not consistently synthesised at the portfolio level, limiting Network Rail's ability to systematically understand how and why estimates change as projects progress through development stages.

Scope Management and Change Control

Network Rail case studies demonstrated that actively challenging initial requirements and adopting a minimum viable product (MVP) approach can help reduce unnecessary scope and deliver better value for money. For example, the Crewe Overarching Programme showed that re-evaluating scope in response to external changes, such as scope changing on an interfacing project led to more targeted investment decisions and improved alignment between scope and cost over time.

Lessons Learned Integration

While lessons are captured at the project level, limited portfolio-level synthesis reduces their effectiveness in informing early estimates and improving cost certainty at subsequent stages. More systematic synthesis and sharing at portfolio level to ensure that improvements are embedded across the organisation.

0.3.1.3 Identifying drivers of cost and schedule deviations

Risk Management and Contingency

Structured risk management, including the use of retained risk funds and clear processes for contingency allocation, enabled better management of unforeseen events and avoidance or reduction of risk impacts, increasing the costs or schedule. The Scotland Region's approach to risk registers and contingency at a portfolio level demonstrated the value of transparent risk ownership and the ability to hand back unused contingency. 50% of risk from each project goes into a project reserve fund. This fund is managed as a locked pot for all projects valued over £1m and can only be released by the Head of Asset Management through a formal governance meeting. This provides a strong example of portfolio-level risk management supported by effective governance. Evidence that this approach, alongside other targeted interventions, is working well in Scotland's renewals programme is reflected in the fact that it now has the lowest signalling renewal rates of any Network Rail region.

Bundling and Collaborative Delivery

Successful bundling of related works, such as combining track, signalling and overhead line renewals, resulted in efficiencies in engineering access and procurement. The West Coast North Modernisation Programme and Scotland Region examples highlighted that coordinated planning

and collaborative partnerships with suppliers can reduce disruption and optimise resource use, provided bundling opportunities are identified early and managed effectively. Engineering Access costs are a significant driver of cost on rail renewal projects. The work to reduce the amount of disruptive access being sought showed that by combining the works and resources, there were reductions in the forecast costs in the areas of mobilisation, possession management and Schedule 4 costs.

0.3.1.4 Assessing how efficiency is measured and delivered

Bundling and Collaborative Delivery

Early identification of bundling opportunities and collaborative delivery with suppliers has supported more efficient use of engineering access and resources, contributing to improved delivery efficiency across programmes, as evidenced through interviews with Network Rail and the review of their documentation.

Data Quality and Reporting

Network Rail's case studies highlighted that fragmented or inconsistent data entry limits the ability to compare performance and identify trends. Standardised templates and validation requirements are essential for enabling meaningful analysis, support continuous improvement, and evidence efficiency improvements at portfolio level.

Lessons Learned Integration

Network Rail has a lessons learned library and requires that projects seeking authorisation demonstrate that they have accessed

and considered relevant lessons. Although lessons are routinely captured at the project level, limited aggregation and synthesis at portfolio level constrain Network Rail's ability to systematically identify and embed efficiency improvements across programmes.

0.3.2 National Highways

0.3.2.1 Evaluating the effectiveness of governance processes

Governance Framework

National Highways has strengthened governance for Large Renewals delivered by Major Projects through adopting additional products from the Major Projects PCF governance approach, which they have stated is defined as 3D+. This process would benefit from being documented and shared with practitioners. In addition, improvements in change control would benefit National Highways.

As the schemes governed under this new policy are still in early stages, it is too early to assess its impact, although it is possible to anticipate likely improvements based on the proposed changes and compare these to good practice.

The Capital Delivery Management Tool (CDMT) supports the 3D and 3D+ governance by tracking approvals and integrating prompts for efficiency, scope control and change control throughout the project lifecycle.

Assurance and Risk Management

Risk management aligns with best practice, using modelled risk and a central retained risk fund. Early market engagement informs procurement strategies and helps anticipate delivery stage risks by asking suppliers to help identify high-impact, low-likelihood risks and deliverability risks at an early stage.

0.3.2.2 Understanding estimate changes across project stages

Estimating and Benchmarking

National Highways case studies showed that consistent use of benchmark rates, detailed cost build-ups, and early contractor involvement improve the accuracy of estimates and reduce optimism bias. Projects that integrated lessons learned from previous schemes, especially in traffic management planning and inflation allowances, were able to refine their estimating approaches and avoid common pitfalls.

Across the portfolio, all schemes initially applied benchmark rates, with the M32 and M6 making particular use of Early Contractor Involvement (ECI) with specialist subcontractors. On the M32, this approach was informed by lessons learned from earlier schemes at the same location. The M55 remains at an early stage of development, limiting the extent to which these practices have been applied to date.

The Concrete Programme framework also maintains a dedicated lessons learned register, with schemes such as the A46 and M27 demonstrating effective use of this resource. In addition, recalculations of inflation allowances on the M32 and A46 resulted in reductions to previously assumed inflation rates, improving the robustness of the final cost estimates.

Estimating and Benchmarking - Traffic Management

Benchmark rates and detailed cost build-ups are consistently used, supported by early contractor involvement. Traffic management (TM) costs, or those associated with managing traffic during construction, including temporary lanes, signage, and modified speed limits, are a significant driver of costs, and sometimes an underestimated component of overall scheme budgets.

Case studies such as M32 Eastville Viaduct and M27 J5–7 Concrete Overlay demonstrate that robust TM planning, specialist input during design, and bundling of works can help control costs while minimising disruption. On the M32 scheme in particular, ECI from key subcontractors covering traffic management, bridge bearings, and temporary works enabled valuable technical and buildability insights to be incorporated. While this input extended the construction programme, it did so in a controlled way, reducing delivery risk.

Without this early engagement, the risk of design clashes emerging during construction, when time-related costs are at their highest, would have been significantly greater.

Lessons Learned Integration

The use of lessons learned from previous schemes, when applied early and systematically, has supported improved estimating assumptions and reduced the recurrence of known estimating issues, particularly in relation to traffic management and inflation.

0.3.2.3 Identifying drivers of cost and schedule deviations

Risk Management and Change Control

National Highways' approach to risk registers, change logs, and contingency allocation supported better forecasting and management of unforeseen events. The use of live lessons learned registers, such as in the Concrete Roads Framework, enabled rapid feedback and continuous improvement, helping to mitigate emerging cost and schedule pressures.

0.3.2.4 Assessing how efficiency is measured and delivered

Bundling and Cross-Workbank Efficiencies

National Highways case study projects demonstrate that bundling related works and leveraging existing traffic management closures can deliver tangible benefits, including reduced disruption to road users and improved cost efficiency.

On the M32, M27 and M6 schemes, this approach was applied through the addition of temporary Vehicle Restraint System (VRS) barriers alongside planned works.

The M6 scheme went further by incorporating carriageway resurfacing following the removal of traffic management. The carriageway was resurfaced ahead of installing TM on the adjacent lanes, thereby significantly reducing the risk of pavement defects, and associated customer disruption, on the remaining open lanes. This reflected lessons learned from previous SMART motorway projects, where prolonged traffic management and maintenance activities had led to carriageway damage. In those cases, the need to reinstate traffic management to carry out subsequent resurfacing resulted in additional cost and disruption. By bundling these activities upfront, the schemes avoided repeat interventions and improved overall value for money.

Data Integration and Reporting

The reliance on manual data transfer between Oracle and CDMT highlights a constraint on the accurate and consistent measurement of efficiency. Improved system integration would strengthen financial reporting, reduce data handling risks, and support clearer tracking of efficiency outcomes across programmes.

0.3.3 Findings from Comparison of other Infrastructure Sectors

International Comparison

National Highways and Network Rail are more mature than many North American agencies, especially in portfolio management and regulatory oversight. However, differences in funding and regulation mean not all practices are directly transferable, or comparable. They do however offer important lessons for Network Rail and National Highways.

Governance and Assurance

Water and energy sectors require independent reviews and strong reporting before funding is approved. Transport agencies like Transport for London (TfL) and the United States Federal Transit Administration (US FTA) use stage gate processes and external challenge to keep projects on track. National Highways and Network Rail have robust governance arrangements, but these could be strengthened through greater use of external assurance and more consistent reporting, enabling earlier identification of overly optimistic assumptions around cost, scope, or schedule.

Estimating and Benchmarking

Other sectors use national benchmarks and unit rate libraries to estimate costs and manage uncertainty. National Highways' benchmarking is mature and reliable, with consistent unit rates and cost modelling. Network Rail's benchmarking also uses these, but is less consistent, with early estimates often too optimistic and higher costs than planned later on. Network Rail would benefit from more structured benchmarking and reference class forecasting.

Risk Management and Change Controls

Leading sectors such as utilities use mandatory risk modelling and scenario testing to identify and manage risks early. National Highways and Network Rail have good risk management practices but could strengthen their change control and contingency planning by learning from the utility sector or other transport agencies such as TfL sectors. Network Rail and National Highways should consider how the rigour in gas renewals could be applied in their setting to drive more schedule stability through the use of probabilistic planning, improving early-stage planning and considering how incentives drive costs and schedule in their supply chain.

Lessons Learned and Continuous Improvement

Regular sharing of lessons learned is common in other sectors and helps drive improvement. National Highways shares lessons monthly at a national level which is then shared regionally and integrated into live and future projects, while Network Rail's lessons are more localised and not always shared across the organisation.

Transferable Practices

National Highways and Network Rail could adopt external assurance for early estimates, improve data quality and further formalise lessons learned processes, particularly in the case of Network Rail. This could include the use of external cost assurers who are independent of the project for projects which have high complexity, risk or scale. National Highways' use of spatial portals for bundling renewals and whole-life cost assessment could be useful for Network Rail. Water and energy sectors' data assurance and external cost reviews offer further lessons on project assurance and management of high volumes of renewals.

0.4 Recommendations

The following recommendations are based on our review and analysis of the evidence gathered during this study. The timing and sequencing of implementation should be determined internally once each recommendation has been fully considered alongside organisational priorities and capacity. For this reason, we have not proposed specific timelines for individual recommendations. However, in general, we consider that meaningful progress against each recommendation should be achievable within a 6–12 month period.

0.4.1 Network Rail

Governance and Assurance

- **Network Rail should review opportunities to introduce greater efficiency to PACE products** to factor in the predominance of renewals and extensive workbanks as there may be more efficient approaches available. For example, the use of asset class risk profiles and asset availability or performance criteria could be added to delivery risk profiles for portfolios. This would allow for management of benefits deferrals and acceleration in a multi-year planning approach which is better suited to planning large volumes of repeatable work in workbanks or portfolios than individual projects.

- **Network Rail should undertake a review of the PACE product suite to identify which products can be updated with specific guidance or tools to better support renewals**. This should take place with input from those planning and authorising renewals at regional levels.
- **Network Rail should adopt a similar approach to National Highways in how it takes account of whole-life cost as part of the governance of efficient cost and schedule planning in early stages of scope development.** For example, National Highways quantify the Whole-Life Cost impact for decision makers in their stage gate and investment decision paperwork. At Network Rail there is a box with a 'Yes' or 'No' asking whether it has been considered. This stops short of asking the impact of the consideration on asset condition, performance or the impact of deferred renewals and future costs.
- **Network Rail should improve how lessons learned in routes and regions can be shared in a timely and efficient way**.
- **Network Rail should ensure consistent application of policies and processes** such as data collection and management, risk approach and benchmarking across regions, because regional variation in process application can hinder national consistency.

Estimating and forecasting

- **Network Rail should strengthen benchmarking and governance checks for early-stage estimates,** as benchmarking is not consistently applied or overseen in early estimates. This is one of the key drivers of costs and schedule change at early stages.
- **Network Rail should consider how to reduce optimism by factoring in data from live projects to their forecasts.** The key drivers of cost and schedule are early optimism, scope change, escalation and market fluctuation. They should also consider how scope maturation is being managed and seek to improve this or offset with increased optimism bias.
- **Lessons from estimating and forecasting should be aggregated and used to update central guidance and templates**, since lessons are not routinely synthesised for wider organisational benefit.
- **Consideration should be given to whether PACE requires adaptation** to better support the high volume and repeatable nature of renewals workbanks.

Delivering efficiency through procurement and bundling/workbanking

- **Network Rail should continue to monitor the West Coast North Modernisation Programme** to assess whether the approach of combining multiple renewals delivers forecasted efficiencies and business case outcomes, as this project can be used as a good test case for integrated renewals delivery.
- **Network Rail should decide whether the term 'Intelligent Renewals' gives specific enough guidance** to teams in a way that can be measured against efficient delivery of renewals. The term Intelligent Renewals is currently used without definition or criteria.
- **Network Rail should document and share best practices for bundling and engineering access**, and require early consideration in project planning, since bundling has delivered efficiencies in avoiding multiple mobilisations, possessions and disruptive works, but is not consistently applied.

Data and Key Performance Indicator improvement

- **Network Rail should look to optimise its renewals data, enabling timely access and robust key performance indicator (KPI) tracking across regions and asset types, as centralised data access is limited and hinders analysis.** For instance, improving data quality and assurance for Large Renewals programmes could help enable more consistent, comparable and combinable data across regions and over time. This can be achieved by providing regions with controlled templates for data input, ensuring users understand the importance of data completeness and accuracy, and introducing validation requirements so that information is collected in a consistent format (for example, using specific dates rather than years or control periods). These changes will make it easier to combine data, identify regional and national trends, and support more effective lessons learned and analysis of large renewals.
- **Network Rail should look to report on Large Renewals programmes through a centralised database** to allow for faster analyses and comparisons over timescales and regions, as opposed to using individual excel sheets for regions and disciplines.

0.4.2 National Highways

Governance and Assurance

- **National Highways should complete the development and embedment of their process of applying 3D+ to Large Renewals that are delivered by Major Projects and defined as Significant Renewals.** These projects are complex, high value and often have significant stakeholder complexity. The additional approaches adopted from the Major Projects PCF together with 3D provides a framework for good governance of cost and schedule in early stages, including the use of stage gates, and should continue to be applied.
- **National Highways should complete the embedment of the 3D+ process for Significant Renewal schemes** and for each scheme confirm which additional PCF products are to be included.
- **National Highways should work with Network Rail's Centre of Excellence** to understand what processes or products they have that drive efficiencies and may be applicable in the National Highways context. Network Rail has an extensive product suite specifically related to early stages of development of projects. Given this is where National Highways is seeing significant variation in scope which is driving costs and schedules there may be applicable approaches that they can adopt.
- **National Highways should finalise the national programmes change process and implement a Change Panel** as a priority to strengthen scrutiny of the impact of early stage changes on cost, risk and schedule. This work should pay particular attention to the issues shown on M6 Lune Gorge where post-construction contract award, the significant delays and resulting impacts are not shown in project records.

Estimating and forecasting

- **National Highways should continue using benchmark rates and document inflation adjustments in estimates**, as benchmarking is becoming embedded but needs consistent application.
- **National Highways should set and communicate standard expectations for inflation and risk at each governance stage**, since regional variation in allowances leads to inconsistent estimates.
- **Estimating and forecasting should routinely incorporate live lessons learned**, as real-time sharing is improving but not universal.

- **Each Large Renewals scheme should be reviewed on its ability and merit to determine whether Earned Value will generate the required benefits for cost monitoring and forecasting.** Use of Earned Value will allow comparisons on CPI and SPI for the more complex renewals and is an important measurement tool, particularly when the time-related cost of the non-permanent works can be complex and typically significant on these projects.

Delivering efficiency through procurement and bundling/workbanking

- **Early engagement with potential suppliers should be undertaken consistently as it can deliver efficiencies and highlight where projects are not yet mature enough to be procured**. National Highways should continue using the Crown Commercial Services (CCS) Framework to procure some of the Large Renewals. This has included running early engagement sessions with potential suppliers to better understand risks and deliverability.
- **A plan should be developed to track and share results of new procurement approaches nationally.** National Highways is considering using more alternative methods of procurement including Early Contractor Involvement, Target Prices and Alliances. Alternative procurement models are being trialled, but they have not yet been benchmarked nor have they proven to deliver efficiencies for National Highways.
- **National Highways should seek to systematically consolidate works where possible to reduce disruption and cost**, and document outcomes, as bundling has delivered practical benefits in several projects.

Traffic Management

- **National Highways should look to develop and apply more robust methods for estimating, planning, and controlling traffic management (TM) costs**. Evidence from recent case studies shows that TM costs can represent a significant proportion of overall scheme costs and are often subject to underestimation or scope changes.
- **TM cost build-ups should be detailed and based on current supply chain rates, with clear breakdowns of activities, durations, and time-related charges**. Early contractor involvement and specialist input during design stages have proven effective in improving TM planning and cost accuracy.
- **Lessons learned from previous projects should be systematically captured and used to inform future TM estimating and delivery**. This should include lessons such as the impact of long construction durations, scope changes, and bundling of works.
- **National Highways should benchmark TM costs against comparable UK projects** and ensure that TM planning is integrated with overall project delivery, including opportunities for bundling and cross-workbank efficiencies.
- **TM data and assumptions should be consistently documented and accessible for assurance and analysis**, supporting better forecasting, risk management, and value for money in renewals delivery.

Data and Key Performance Indicator improvement

- **National Highways should consider removing, managing or mitigating the risk of manual data transfer between Oracle and CDMT and any other systems where data relies on manual transfer.** Currently, project managers manually transfer data from Oracle into CDMT, which increases the likelihood of errors and inconsistencies depending on when information is extracted during the reporting cycle. If possible, integrating these systems would help ensure data accuracy and consistency across financial reporting.

- **National Highways should make risk registers, change logs, and benchmarking data complete and accessible at each stage**, since incomplete datasets limit assurance and analysis.
- **National Highways should track performance metrics across governance, estimating, procurement, and delivery**, and use them to adjust processes as needed, as performance metrics are tracked but not always used for process improvement.

0.4.3 Cross-cutting Recommendations (Network Rail + National Highways)

Recommendations for Network Rail and National Highways

- **Compliance Reviews:** Both Network Rail and National Highways should implement six-monthly local compliance reviews covering at least 75% of their regional delivery. Reviews should check compliance with process and policy and classify deviations as either maturity gaps or local and valid innovation or deviation. Cases should be escalated when local practices deliver a 10% or greater impact on cost or schedule. In this way, enterprise wide adoption can take place in cases where savings are made; and in cases where the impact is detrimental, action can be taken to mitigate, avoid or learn lessons.
- **Joint Knowledge Sharing:** Both organisations should, in a timeframe to be agreed with ORR, establish a joint knowledge sharing framework across both organisations and their Tier 1 suppliers. This should include a shared knowledge on lessons learned and benchmarking, recognising some commercial sensitivities. Tier 1 suppliers should be encouraged to share lessons about drivers to cost and schedule driven by client side changes.
- **Cross-Organisation Forum:** Both organisations should establish a bi-annual, cross-organisation forum to review good practices in planning and delivery of Large Renewals. This could in future be expanded to include other large entities delivering renewals such as Transport for London and utility companies.
- **Network Rail and National Highways should adopt more transparent and consistent reporting practices between one another**, particularly in areas such as data quality, benchmarking, and lessons learned. This could be achieved through regular forums or workshops to support cross-sector learning and the sharing of best practice, as well as the implementation of continuous improvement initiatives at both organisations focused on data and reporting quality.