



HIGHWAYS ENGLAND'S APPROACH TO DELIVERING SCHEMES THROUGH ITS RING-FENCED FUNDS

OFFICE OF RAIL AND ROAD (ORR)

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ANNEX A – IN-DEPTH CASE STUDIES

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National Air Quality Monitoring Network

The National Air Quality Monitoring Network (NAQMN) was identified by Highways England as part of its strategy for improving air quality around the SRN, and as part of the UK government's air quality strategy. The project involves the development of 60 air quality monitoring stations across the SRN which will record real-time information to understand pollution levels on the network, monitor the impact of major schemes and analyse the effectiveness of mitigation measures.

Highways England currently monitors pollution on a scheme-by-scheme basis using diffusion tubes which are suitable for assessing the impact of particular schemes over a long period of time but do not provide a real-time picture of pollution levels. One of the main risks to the future delivery of major road schemes is the UK's performance against legal limits on pollution, specifically NO₂ emissions. The real-time data gathered by the NAQMN stations will create an evidence base which Highways England will use to help improve the planning and development of new schemes by considering air quality impacts at an earlier stage. This could help to identify the most effective air quality mitigation measures, thus enabling Highways England to deliver major schemes and realise the associated economic benefits earlier.

Highways England has set up an Air Pollution Strategy Board (APSB) to help guide the project and ensure that it meets the needs of stakeholders across the organisation. The project is also reporting into the Designated Funds Programme Board, as a significant element of its funding (£3.8m) is sourced from the Air Quality ring-fenced fund.

The business case for the scheme was based on a simple calculation of the benefits of delivering ten "average" smart motorway schemes one year earlier than would be the case if Highways England 'did nothing'. This leads to an estimated £4.2m in benefits and a BCR of 1.2 which falls into Highways England's 'low' value for money category. Highways England acknowledged that the value for money of the scheme was uncertain and difficult to assess quantitatively. The project was therefore justified more on its quantitative benefits, but Highways England did not provide us with evidence of the IDC's view on the value for money case. There is also wider support for these types of projects from stakeholders.

Highways England carried out cost estimates at various points during the development of the project. The latest estimate, based on a full business case completed in August 2016, put the total cost at £3.8m. Although the estimate included a 20% contingency, it is unclear whether it includes all of the relevant costs associated with the project because Highways England admitted that earlier estimates had underestimated or not taken into account significant elements such as the costs associated with ongoing maintenance of the stations, data management and inflation.

In 2016, Highways England carried out its own internal health check on the project, to ensure that the team was properly prepared for the investment decision gateway as well as to learn lessons for future delivery. The review gave an amber delivery confidence assessment and made a number of recommendations to support the project, but concluded that successful delivery by March 2017 appeared 'feasible' (this has not been achieved). The full business case stated that Highways England had addressed most of these recommendations, but it had yet to address a recommendation rated 'critical', which was to implement a data strategy. Validation, storage and management of the air quality data is central to realising the benefits of this project, and it is therefore concerning that Highways England planned to seek IDC approval for full funding for delivery of the NAQMN before it had a plan in place to manage the data.

Highways England has not provided any evidence which assures us that it has addressed this issue. Although we have been told it has been discussed at the ASPB since the internal health check, it remains unresolved and a data strategy plan is still not in place. Although Highways England

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focuses on the value NAQMN can give to its internal specialists, Defra – a key stakeholder due to its responsibility for air quality – sees the additional data from the NAQMN as complementing their own air quality data. While opportunities to share data with Defra are still being considered, Highways England do not know if the business case for the NAQMN can stand up to the additional cost of this further functionality.

In September 2017, the Designated Funds IDC approved a request for £1.5m of capital funding from the Air Quality Fund and £1.4m of resource funding from underspends elsewhere in Highways England's budget. It also gave approval to award the contract for the design, build, integrate, operate and maintain (DBIOM) 30 new monitoring stations to the preferred bidder, and to refurbish and integrate a further 15 existing stations into the network at a later date.

33 of the planned 60 stations are currently operational, with this number expected to reach 50 by June 2018. Highways England acknowledges that the NAQMN will be delivered at least 12 months behind schedule and it is currently forecasting completion by December 2018. This is partly due to a failure to let the DBIOM contract on time, and it was awarded almost 14 weeks behind schedule. Highways England had to reissue tender documentation and the tender assessment took longer than planned because resource constraints meant that it took longer than expected to reply to tender queries and clarifications. Scope creep also resulted in delay, as a number of changes were made to the stations covered by the contract. Highways England acknowledges that procurement specialists should have been involved from an earlier stage in the process.

One key lesson learned by Highways England is that they initially believed cost efficiencies could be achieved by delivery through each of the Area contractors. They have since acknowledged a single national contractor could have resulted in fewer contracting issues. The delays due to Area contractors can be seen as a manifestation of a wider issue of limited engagement from regional Highways England teams. The delivery of projects from the ring-fenced funds are often not a priority for regional teams, who must also deal with other pressing business-as-usual activities. This could also be a reason why 6 monitoring stations have faced significant delay due to suitable locations not yet being confirmed. The completion of a number of other stations have also been delayed because the concrete plinth they rest on has yet to be constructed.

The slow progress of the delivery of the NAQMN project is indicative of how Highways England is struggling to disburse the air quality fund. This is in part due to the difficulty of finding projects that satisfy the strict criteria of the air quality fund, but also in part due to regional engagement. The air quality fund best exemplifies the lack of momentum generated in some of the ring-fenced funds, and the risk that Highways England is unable to deliver on its commitments during RIS1.

Main Findings

- 1. Lack of momentum.** The air quality fund best exemplifies the lack of momentum in some of the ring-fenced funds, as it is the fund which is struggling the most to deliver on the RIS commitments.
- 2. Lack of focus.** The key benefits of the NAQMN derive from the earlier delivery of future enhancement schemes by mitigating or avoiding air quality concerns. But it seems Highways England has lost focus on the business case as completion of the monitoring network has slipped significantly.
- 3. Project planning and contingency.** Highways England has learned lessons from this project that the commercial and procurement strategy needs to be considered from an earlier stage in the project's development and have contingency plans in place. For example, Highways England acknowledges that a single national contractor could have resulted in fewer contracting issues, and that a number of fall-back station locations could have mitigated power supply constraints.

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- 4. Wider benefits.** The NAQMN will only have an indirect impact on air quality, and the potential benefits of this project are uncertain, difficult to quantify and may not be realised for many years. Highways England has not yet put in place a plan to evaluate whether the project provides value for money, or to inform any future decision to expand the network. Highways England should pay special attention to cases such as this that rest on wider benefits but should not shy away from this.
- 5. Low priority for delivery teams.** Delays in completing the network can be seen as a manifestation of a wider issue of limited engagement from regional Highways England teams. The delivery of projects from the ring-fenced funds are often not a priority for regional teams, who must also deal with other pressing business-as-usual activities.
- 6. Capital / resource funding.** This project shows that Highways England requires both capital and resource funding to deliver and maintain air quality assets, but this is not possible solely through the use of the air quality fund which is capital only.

Incentivising Ultra Low Emissions Goods Vehicles

The Air Quality fund has provided around £200k to investigate the use of an incentive to encourage fleet operators to switch from diesel powered to ultra-low emission (ULE) goods vehicles, e.g. electric and hybrid vehicles. A £20k extension was added to reflect the evolving objectives of the trial, as described below. This small-scale trial is currently underway and its results will provide the evidence upon which a wider roll-out of the scheme funded by the Air Quality Fund could be justified.

The case for such a demonstration project was first put forward internally within Highways England in Summer 2016, where the relatively few ways in which the company can influence NO_x emissions from vehicles on the SRN was noted. Alternative solutions, such as restricting vehicle access or charging for use of parts of the SRN were quickly dismissed as politically challenging. Measures affecting private motorists were also ruled out, leaving reducing emissions from the HGV fleet as “the most attractive” option. Similar schemes, such as DfT’s Clean Bus Technology Fund, were noted by Highways England in the identification of their scheme. We also note TfL’s Scrappage Scheme as a similar project that we have experience with. As described elsewhere (see Box 2), such schemes are extremely difficult to justify on purely air quality grounds.

Formal approval was given in late October 2016 and Highways England signed a funded Memorandum of Understanding with EST to provide up-front payments to secure 17 electric vans for the project.

It was not considered necessary to seek IDC for the small pilot scheme – instead only the approval of the SRO was required. The funds for the project came from under the ‘Delivering Better Environmental Outcomes’ umbrella portfolio, which had previously been IDC approved to provide up to £1.54m in Air Quality pilot studies and management support. Grouping projects under one umbrella is a proportionate method of ensuring effective reporting and management of a multiplicity of small projects.

Given the amount of funds invested in the project, an economic appraisal was not attempted, with the difficulty in monetising all potential benefits cited as justification. Instead, a qualitative assessment was considered proportionate.

Although the project initially considered directly appointing (logistics) companies operating goods vehicle fleets, it was quickly decided it would be more appropriate to work with the Energy Saving Trust (EST), a not-for-profit social enterprise with an objective to promote sustainable use of energy and transport. This is a one of the few cases where Highways England has employed a grant-style provision of its ring-fenced funds and has taken advantage of stakeholder supply chains. Making use of EST’s experience and established industry links was expected to allow faster delivery than would have otherwise been possible. Highways England may want to consider using this approach more frequently across the funds where appropriate.

Although the project initially intended to look at larger goods vehicles as well as vans, we have been informed ULE lorries simply couldn’t be acquired. Users have reported being open to using them, but the technology required for batteries powerful yet light enough are not currently suitable for large vans or lorries. Having identified the limited range of ULEVs available on the market as a key barrier, Highways England shifted the focus towards working to understand the market and the companies who would be manufacturing the technology required. This change in focus was accompanied with the slight increase in the funding provided to EST. Nevertheless, some success has already been achieved – one example noted by Highways England was South Yorkshire Police looking to switch some of its fleet to ULEVs.

Although some change in a project’s scope might be justified, particularly a pilot scheme with an objective to learn about the potential barriers to wider roll-out, the continued evolution of the project is perhaps indicative of how Highways England has struggled to generate momentum in the delivery of the air quality fund, and in some of the other ring-fenced funds more widely.

Incentivising Ultra Low Emissions Goods Vehicles

Initially scheduled as a three-month trial to start in early 2017, Highways England has told us the final report is now due to be published in March 2018. Assuming that the final report is delivered by then, Highways England needs to start considering how it plans to use the knowledge gained from this trial scheme when evaluating the business case for an expanded scheme.

Main Findings

- 1. Stakeholder delivery.** Although it remains to be seen if this pilot leads to a viable full-scale intervention, this sort of grant-style funding to, and delivery by, the EST might be indicative of a more pragmatic approach to tackling air quality.
- 2. Proportionality.** The umbrella funding approach taken might also be beneficial in other ring-fenced funds with many small projects, particularly Environment and CSI.

A.2. Cycling, Safety & Integration

A5 Long Buckby Wharf signs

This project concerns two rail bridges near Long Buckby, Northamptonshire. Although the sites are close to the M1 and the project concerns signage on the A5 trunk road, these bridges cross over roads on the local network. An estimated £160k will be provided by the Integration sub-fund of the CSI fund.

Network Rail raised the issue of a number of incidents occurring at the bridges in the area as early as 2008. Each time a vehicle is reported to have struck a bridge, they must reduce the speed of trains until a safety inspection confirms nothing is out of order. This can lead to train delays which Network Rail must then pay a financial penalty for. Such delays at the Long Buckby bridges cost Network Rail just under £9k a year. However, neither of the two bridges were major priorities for Network Rail – in the year ending March 2014, the top 10 sites for rail bridge strikes had between 10 and 20 collisions. With two strikes in this period, one of the Long Buckby bridges sits at joint No. 275 on the list.

In 2008 Northamptonshire County Council remeasured the headroom on one of the bridges and found it to be incorrect. Signs on the local road network were changed to reflect this. The issue was only brought to Highways England's attention in 2014. By 2015, the stated height of this bridge had still not been changed on trunk road junctions, and scope for improving trunk road signs for the second bridge were also identified. This delay predates the ring-fenced funds' control; the scheme was originally designed as a Local Network Management Scheme (LNMS) but LNMS funding was pulled from 2015. The only delivery route remaining was therefore through the ring-fenced funds.

In addition to the cost to Network Rail after collisions, the mismatch between the signs and the incorrect information being displayed was causing problems with vehicles turning from the trunk road and then having to reverse back onto the trunk road when they realised that their vehicles were overheight. It was therefore decided to progress through the CSI fund, specifically the Integration sub-fund.

As the work is required as a change in the local authority / Network Rail systems, it would typically be paid for by the third party. However, in 2015 Highways England stated they were "keen to see changes made to the signing to assist both the local authority and Network Rail [and are] therefore assuming the costs will be met by Highways England". This was justified by the pressure from stakeholders to complete the work and the fact vehicles turning back around after reaching the low bridges were causing problems on the SRN. It would appear to us that, even if Highways England could not recover the cost from third parties, this project is closely related to the company's business-as-usual activity.

Only a limited value for money exercise was carried out for the project. The only benefit that was monetizable in the scheme appraisal was the reduction in bridge strikes due to the improved signs. Taking a reduction of 20% and Network Rail's estimated of the cost in delay penalties they receive, the project would save £1,760 a year. None of this benefit directly impacts the SRN. Collision savings or journey time savings could not be demonstrated for the business case, which instead used a qualitative SAR to justify the investment.

The scheme is currently approaching the end of detailed design, and construction is expected to take place in 2018/19 – a decade after it was first identified by the local authority. This is despite there being "considerable pressure from Network Rail for this work to be completed". Although the ring-fenced funds cannot be held responsible for the first seven years of this, it remains unclear why it has not been delivered sooner – when CSI funding was applied for in September 2015, the expected date of completion was April 2017.

A5 Long Buckby Wharf signs

The significant delay in the delivery of this project suggests that there is a lack of momentum within the Integration sub-fund. The company has told us that over the first two years of the RIS period it had greater difficulty identifying a pipeline of Integration schemes, compared to the Cycling and Safety sub-funds. This could in part be due to the delivery arms of the company having less understanding of desired integration outcomes. While this sub-fund creates opportunity to fund projects that might not otherwise have been delivered, it should not be used as a depository for projects that should have been delivered as business-as-usual.

Main findings

- 1. Low priority.** Despite being a relatively straightforward project to correct signs, the project has faced significant delays. It is currently in the design phase, with construction expected in 2018/19. This is a decade since the issue was first identified and addressed on the local network and is evidence of the low priority given to some ring-fenced funds projects.
- 2. Business-as-usual.** The funding for this project was originally intended to come from Highways England's LNMS funding which suggests that it is closely related to the company's business-as-usual activity, but when this funding was pulled the ring-fenced funds were seen as the only remaining delivery route.
- 3. Lack of momentum in Integration sub-fund.** Highways England told us that it has been more difficult to establish a pipeline of Integration schemes compared to the Cycling and Safety sub-funds. This could in part be due to the delivery arms of the company having less understanding of desired integration outcomes. Although a pipeline of schemes has now been established, given these challenges there is a risk that it could be used to fund projects that should have been delivered elsewhere in the company.

A12 Gunton Church Lane to Hollingsworth Road

The Gunton Church Lane to Hollingsworth Road scheme involved a series of adjustments to a busy junction and pedestrian/cycle crossing on the A12 in Lowestoft. Works included the removal of pedestrian islands, widened footpaths to avoid pedestrian/cyclist conflicts, new footpath signage, a narrowed junction to reduce traffic speed, and the creation of a new off-road cycle facility to connect the cycling network to a nearby quiet street.

We understand that this stretch of the A12 had been an area of known safety risk for some time, and especially since the fatality of a young pedestrian in 2007. The Highways Agency (as it then was) made a number of safety interventions and carried out a safety audit in 2013 in order to assess the case for any further interventions.

Highways England told us that a series of cycling interventions, of which this was one, were identified as potential Local Network Management Schemes. However, when the potential funding for the projects was withdrawn, the company considered funding them through the ring-fenced funds. Highways England commissioned a feasibility report by AECOM in November 2014, which investigated the feasibility of priority cycling schemes in 12 locations in the Lowestoft area, which had been identified in consultation with Sustrans and the local authority (Suffolk County Council).

The Gunton Church Lane scheme was included in the feasibility work because the area is used by school pupils from the Gunton area to access the schools west of the A12(N), and by cyclists wishing to connect with National Cycle Network Route 1 through Hollingsworth Road and the west of the A12(N). It is an area of high demand among pedestrians and cyclists throughout the day and particularly at the start and end of the school day. The feasibility report observed that the crossing over the A12 is dangerous for cyclists due to the presence of sub-standard pedestrian islands in the carriageway, and that a number of vehicles (including HGVs) were observed travelling at speeds in excess of the legal limit (30mph).

Highways England appraised the scheme as part of the wider package of cycling interventions. The company found that schemes will likely benefit existing users by improving journey quality but are unlikely to encourage many new users on a scheme by scheme basis. Collectively, it is considered that the schemes will encourage increased walking and cycling in the area, and reduce traffic accidents, but this is difficult to quantify. Likewise, these outcomes could in theory reduce noise, carbon and air quality impacts, but these are unlikely to be noticeable.

Although the 2014 feasibility report estimated that this individual component of the wider package of Lowestoft interventions would cost around £200,000 (including a 44% allowance for optimism bias), Highways England told us during interview that it had been possible to deliver the project for less than £50,000 because efficiencies had been found during tendering of the package, although the company did not provide us with documentary evidence of the final cost of the project.

The project is now delivered and complete. But Highways England did not provide us with any close-out documents, so we are not able to determine what the company's close out procedures are for such projects. This is an important step in informing future investment plans and securing best value for money from the fund's activities.

Main Findings

- 1. Stakeholder engagement.** The scheme had support from external stakeholders which helped to ensure that it was identified for early delivery.
- 2. Value for money.** Highways England appears to have secured better value for money through the tendering of the project
- 3. Close-out procedures.** We did not see evidence of the company's close-out procedures. This is an important step in informing future investment plans and securing best value for money from the fund's activities.

A.3. Environment

A38 Haldon Hill Green Bridge

Highways England is in the design stages of a new 'green bridge' on the A38 at Haldon Hill. The Environment Designated Fund will provide £10.7m for its design and construction. Green bridges are structures designed to provide wildlife and non-motorised users with easy and safe crossings of main roads and railways. They have a layer of soil on the top to enable soft landscaping measures and vegetation planting. We understand that green bridges are a popular retrofit solution with environmental and sustainable transport stakeholders, including Campaign for Better Transport.

The Haldon Hill site on the A38 was first identified by Kier, Highways England's regional service provider, in 2014. Highways England commissioned a feasibility study into green bridge opportunities in Area 1 (Cornwall and Devon) in early 2015. The study looked at a number of potential locations, including Haldon Hill, and carried out an initial assessment of the potential environmental, economic and social impacts at each site. The study also identified any practical constraints which would make a green bridge impractical.

The interim feasibility report identified two preferred locations at Haldon Hill and Saltram. At this stage, it was estimated that the Haldon Hill option would cost c£11.4m to construct and would take around 70 weeks to deliver. The Saltram option was estimated to cost £10.5m, take around 60 weeks to deliver and had strong support from the National Trust. A number of other locations were identified as potential opportunities for further feasibility work, but others were discounted.

Haldon Hill and Saltram were considered by Highways England to be frontrunners but Saltram involves a road in a deep cutting so the final decision to progress Haldon Hill took into account the relative complexity of the sites. Saltram remains in the green bridge programme but will not be progressed until the success of Haldon Hill and lessons learned from that project have been considered. As noted elsewhere Highways England considers this project to be a pilot which will inform development of similar structures elsewhere.

There were two other key drivers supporting the development of the Haldon Hill option. First, the area had previously been identified by Highways England as having a very high number of deer-vehicle collisions. A 2010 Highways England study identified on average between 13 and 27 deer-vehicle collisions every year, with the number of incidents in the area increasing in recent years. The proposal also offered the potential to connect local cycling routes and was supported by Devon County Council as it fitted with its local cycling strategy. It was also supported by the Forestry Commission as it could serve to improve the number of leisure users of the Haldon Hill SSSI.

The project will be funded exclusively through the Environment fund in recognition of the landscape benefits and Haldon Hill's SSSI status. However, it is worth noting that the initial business case identified the main quantifiable benefits of the scheme as relating to safety, cycling and walking. Our observation is that the project might have been eligible for the Cycling, Safety and Integration (CSI) Fund. Although our discussions with Highways England do not indicate that this ambiguity was the source of any delay to the project, it does highlight that additional flexibility is needed if Highways England is to make use of multiple funds, an improvement that Highways England is interested in pursuing. This could be valuable in making best use of the funds overall and for future RIS periods Highways England may want to test whether DFT has any appetite for additional flexibility.

In March 2016, Highways England was presented with a business case to support the scheme. The cost estimate had not changed substantially - £10.5m in 2010 prices - but we noted that the estimate included a risk allowance of only 20% compared to DFT's guidance of 66%. We are advised that the cost estimate originally omitted risk funding entirely and the 20% was added at the suggestion of the project team. The inference of our discussion was that this is not abnormal, as there is some expectation of project costs growing as they are developed. Given that the ring-

A38 Haldon Hill Green Bridge

fenced funds have been undersubscribed in the early years of RIS1, cost growth has been accommodated. But there is recognition that this situation is likely to change as the funds become progressively more subscribed and that cost estimates including risk are necessary. It would be good practice however to ensure that there is a proper estimate of risk and its associated costs for every project in the ring-fenced funds portfolio

The initial business case (May 2016) identified monetizable benefits worth £19m across improved tourism revenues, walking, cycling, safety and improved journey quality, equating to a BCR of 1.8 – representing “medium” value for money – but this did not include any environmental benefits. Since the business case was written, we have received a more recent scheme appraisal report (July 2017) demonstrating a BCR of 3.7, which includes monetizable landscape benefits but does not include other tourism and safety benefits. This suggests that the initial appraisal was not carried out to Highways England’s expected standards.

We queried the use of non-standard time periods in the business case (the project is assessed at 120 years not 30 or 60 as per a more standard WebTAG appraisal). Highways England stated that it employs a standard methodology for project appraisal and longer time periods are permitted for long lived civil assets. We asked whether any sensitivity analysis had been undertaken around the base case benefits and were told that there was none. We think this could be valuable addition at least for larger projects, as it would give more sense of how key assumptions or risks might impact the VFM of the project.

More generally Highways England routinely carries out two appraisals. A traditional appraisal based on WebTAG and a further Highways England appraisal which recognises wider benefits etc. The latter is particularly important for the EDF where benefits cannot always be monetised using WebTAG. Highways England’s ring-fenced funds PMO and project managers use internally developed tools to prepare both business cases. These tools are ‘owned’ and managed by Highways England’s internal modelling and economics function (TAME) not by the PMO. These processes are therefore discussed elsewhere in the report.

For this project Highways England drew upon an analysis of health benefits developed for Devon County Council’s *Granite and Gears*¹ business case, as opposed to calculating the benefits independently. Devon’s figures are based on the World Health Organisation’s HEAT tool² which provides a standard assessment process for walking and cycling projects. This assessment of Health benefits predates the ring-fenced funds process but seems to us to be a good use of extant information that reduces costs.

The project is now in detailed design, final approval for construction was planned to be sought alongside other EDF schemes from the Designated Funds IDC by the end of 2017. However there have been some issues with the road safety audit related to lighting/shadows being cast on the road and there is a long standing issue of land assembly for the project. Highways England is currently waiting on the Forestry Commission, who lease the site from the landowners, Whiteway Estate. Negotiations are ongoing and Highways England has decided to leave this matter in the hands of the estate owner and the Forestry Commission on the basis that those parties are working productively towards a deal. We understand that Highways England has obtained CPO rights for the land so there is a fall back if required.

The project is being overseen by a project steering group, chaired by Highways England Senior Programme Manager and attended by programme managers for both EDF and CSI, with representation from the Forestry Commission and Natural England. The steering group has a

¹ <http://www.devon.gov.uk/dartmoor-granite-and-gears.pdf>

² <http://www.euro.who.int/en/publications/abstracts/health-economic-assessment-tool-heat-for-walking-and-for-cycling.-methods-and-user-guide-on-physical-activity,-air-pollution,-injuries-and-carbon-impact-assessments-2017>

A38 Haldon Hill Green Bridge

number of aims, such as: ensuring the project remains on course to deliver outcomes; contributing expertise to test and evaluate third party guidance; disseminating information about project internally and externally; and monitoring project risks for reporting/escalation.

Highways England does not currently have an agreed approach for measuring and evaluating the outcomes of designated fund schemes. We were told that a large amount of baseline data has been gathered during preliminary work and is continuing to be gathered during detailed design. We think these will focus mainly on cycling and wildlife impacts but it remains unclear how the evaluation might approach the baselining of landscape benefits. However, one area of good practice which is immediately observable is how the Haldon Hill project is being used as an internal case study. A 'Lessons Learnt' document is being produced parallel to the project which will provide guidance for future green bridge proposals.

Main Findings

- 1. Flexibility between funds.** This project is entirely funded by EDF but could also be supported by CSI. Our discussions with the PMO suggested that Highways England's current processes don't support projects which span multiple funds. There is a potential need for flexibility in the allocation of funds and Highways England should find a route for such projects to access multiple funds without compromising good governance or slowing down scheme progress.
- 2. Delay.** As with other cases this project is in delay, in this case in part due to land having to be acquired. This should have been a key risk in the risk register and an important factor in choosing this location given the known difficulties of acquiring land for projects in the UK.
- 3. Immaturity of risk processes more generally.** Limited competition for some funds to date has allowed for cost growth that is simply drawn from the fund (rather than being part of the project costing/contingency).
- 4. Bid guidance.** Green bridges are popular with external stakeholders (for example CfBT) and there are other locations which Highways England considered before Haldon Hill and may be investigated further.⁶ However, they may not always be cost effective solutions, so Highways England should continue to develop their lessons learnt exercise in order to provide detailed bid guidance for promoters of similar schemes.

Residential Noise Insulation

Background

Mitigation of noise falls within the environmental designated fund. The noise component of the fund amounts to £39m. The funds form part of Highways England's response to the Noise KPI which is part of the RIS1 performance regime. The target for which is the mitigation of 1,150 noise important areas or NIAs.

The fund is directed at two main mitigation measures – residential insulation and the installation of noise barriers. Together with Highways England's business as usual approach to noise reduction, which is centred on resurfacing, these three activities form the basis of actions to meet DfT's NIA performance requirements.

This case study focuses on projects within the designated funds programme considering Highways England's approach to residential noise insulation by reference to a particular property and then the barrier programme by reference to a project on the A19 at Peterlee.

Residential noise insulation - overview

Over the course of RIS1 Highways England expects to mitigate noise in around 850 smaller NIAs via the residential insulation scheme³. As such it is the main driver of the performance KPI. The scheme is applied to those NIAs comprised of less than ten residential properties. Initially Highways England employed ARUP to create a register of NIAs with less than 10 affected properties using land registry data. These were split by region and Highways England initially opened the programme in the north East. It has since widened the scheme to the Midlands and East regions.

Highways England is supported by Forrest⁴ which currently has the contract for these areas. Highways England initially excluded the South East and South West regions from the Forest contract in order to allow scope to add another delivery contractor if it believed that would assist in meeting targets. The expectation now that the programme is more established is that these additional regions will also be awarded to Forest who will become in effect the national contractor.

The Highways England designated funds PMO acts directly as project manager for the scheme and its staff are involved in the process of approving and signing off individual installations. They also manage the contractor Forrest.

Process

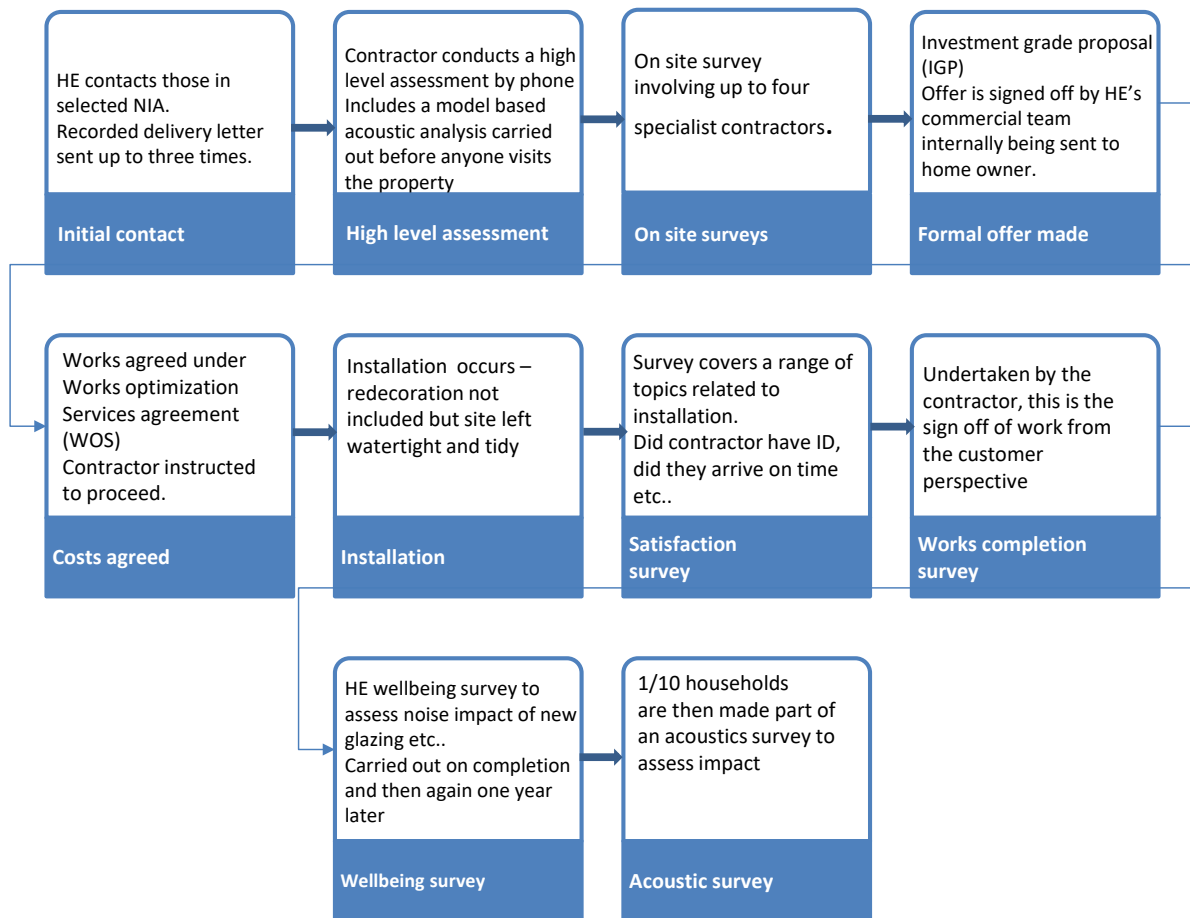
The scheme operates as described in the diagram below:

³ <https://www.gov.uk/guidance/how-to-apply-to-highways-england-for-noise-insulation#how-it-works>

⁴ <https://forrest.co.uk/>

Residential Noise Insulation

HE Residential noise insulation scheme

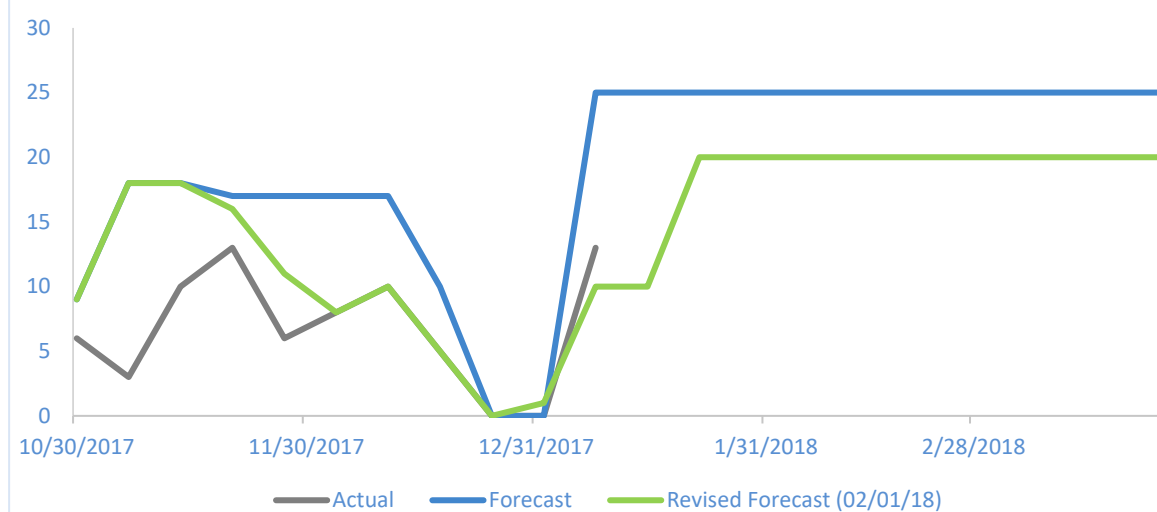


We have followed a single address through the process and had sight of the associated documentation produced by Highways England and Forrest at each stage.

Progress

Initially the scheme was challenging to establish with homeowners being sceptical of the offer of free double glazing etc., but latterly the programme has established a degree of momentum as Highways England/Forrest have been able to improve the process of engaging eligible homeowners, though it is yet to meet its anticipated run rate of installations. Recent progress is shown in the graph below indicating that forecasts for installation have been revised downwards as they were not being routinely met; we note that time of year may be a factor in delivery but at the moment Forrest is delivering only about two thirds of the required run rate.

Residential Noise Insulation



Main Findings

- 1. Scheme is critical to achieving KPI.** Highways England's performance under the noise KPI is closely related to this programme and will only be met if Highways England manages to increase the run rate for delivery. Highways England's confidence in this area is however growing as the process becomes more established.
- 2. Choice of contractor.** Notwithstanding the fact that Forrest is now established as the contractor in some regions and in Highways England's view is performing well, we consider that there may be benefits, e.g. in competition/costs terms, in having a second contractor. Highways England will want to consider the business case for a single national contractor before awarding the additional regional contracts.
- 3. Complex process.** The process is complex, comprising ten stages as shown above, and as a result labour intensive. Highways England is now utilising internal resources to assess whether there is scope for simplification.
- 4. Flexibility of requirements.** Simplification may rest on the ability to introduce greater flexibility around how the scheme is interpreted given that discussions with technical experts and technical survey can be more expensive than fitting additional windows where homeowners query results or press for additional windows to be included. Again more data from installation will give Highways England a better basis for assessing whether it could relax some of the existing requirements and maintain the VFM of the scheme
- 5. Prioritisation.** As the scheme gathers pace it generates more cost information which will allow Highways England to assess more accurately how many NIA's it is likely to mitigate for the funds available. The scheme manager is now expecting the scheme to be fully spent and potentially oversubscribed by the end of the RIS1 period. It may therefore be the case that some prioritisation of NIAs is necessary in this roads period.
- 6. Possible expansion of scheme.** Eligible NIAs may also be worthy of further consideration going forward if the VFM of this scheme is very good compared to alternatives. Perhaps the scheme should expand in RIS2 to slightly larger NIAs, where the cost of barrier schemes could be prohibitive.

A19 Peterlee Noise Barrier

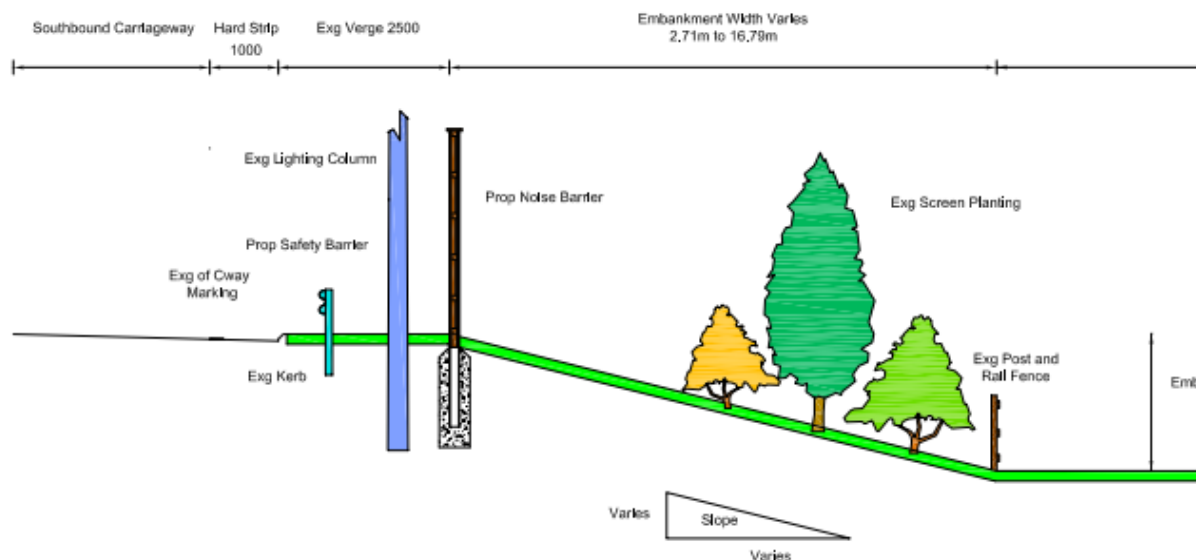
Barrier Schemes

Alongside road resurfacing, which is not within the designated funds but in business as usual, noise barriers are the main mitigation method for roads noise in larger NIAs. For this project we have considered a single scheme – the A19 project at Peterlee.

A19 Project – Background

A19 Peterlee – A PFI Road with 10 years remaining on contract. The contract does not cover noise mitigation. As a result this section of the A19 is on the NIA mitigation list. An application for funds was made internally under the designated funds tranche 4/4A

The proposed barrier is 1.3km in length and 3m high and delivers £4.3m of benefits (noise reduction) based on Highways England’s WebTAG analysis. A high level feasibility study was undertaken by AECOM⁵ which includes consideration of the geography of the scheme and local topography all based on extant information rather than a site survey and including early stage design on the form and height of barrier. Details of which are shown below (from the AECOM Report):



The resulting budget estimate is set out below and provides for contingency (£169,000) and optimism bias of 44%. These figures suggest a BCR ratio of greater than 2 (i.e. “good” value for money).

⁵ A19 Noise Barrier – Peterlee, Feasibility Report, March 2017

A19 Peterlee Noise Barrier

A19 Peterlee Noise Barrier – Indicative Budget Estimate

	Quantity	Unit Cost	Item Total	Sub-Total	Running Total
Works					
Welfare and Traffic Management (includes for night time lane closures)	105 nights	£1600	£168,000		
Site Clearance	1.4 Ha	£6000	£8,400		
Vehicle Restraint System	1350 m	£141	£190,350		
Noise Barrier (includes 35% Premium for night time working)	1350m	£405	£546,750		
Street Lighting Works	-	Item	£69,000		
Landscaping	-	Item	£14,000	£996,500	£996,500
Contingencies					
Allow for cost of moving Noise Barrier 0.5 m down existing embankment if necessary.	-	item	£69,000		
Allow notional cost for alteration to utility apparatus in absence of any other information	-	Item	£100,000	£169,000	£1,165,500
Inflation					
Allow 10 %	-	-	£116,550	£116,550	£1,282,050
Design and Supervision					
Allow 10 %	-	-	£128,205	£128,205	£1,410,255
Site Investigation	-	Item	£20,000	£20,000	£1,430,255
Optimism Bias					
Add 44%	-	-	£629,312	£629,312	£2,059,567
Budget Estimate (March 2017)					£2,059,567

Notes:

- 1) Budget Estimate at March 2017.
- 2) The cost of Noise barrier is based on a Reflective system.
- 3) The cost for Site Investigation includes for trial holes, window samples and locating existing utility apparatus.
- 4) Quantities and rates are based on limited information at this stage and therefore the indicative cost estimate will only be an approximate indication of eventual price.
- 5) The indicative cost estimate does not include VAT.

In March 2017 AECOM estimated, based on its' experience, that the barrier would take 17 months to complete including the detailed design and bidding stages. Design is now complete, bids have been submitted and work is underway, with some cost increase as a result of geotechnical issues. A geotechnical survey was not included in the feasibility report but AECOM indicated that this would be necessary as part of detailed design. Highways England is hoping to complete the project this financial year but acknowledges that doing so would be challenging. This seems particularly challenging given AECOM view of programme length.

Main Findings

1. **Risk.** The fund is becoming tight so cost escalation for risk is now a more significant issue that the fund is considering how to manage.
2. **Fully assured cost estimates.** For this project there was an issue with ground condition which caused price increase between early stage and final design. The impact was only understood when detailed design was undertaken. We understand that this is an issue with a range of barrier schemes which suggest that either feasibility studies need to assess this issue at a more detailed level or risk provision for geotechnical issues should be increased.
3. **Low BCRs.** Appraisal is via the standard environmental process. Benefit cost ratios can be low as barrier schemes are expensive. A decent business case ratio may be dependent upon wider benefits and changes to the scheme to improve its environmental impact. Unexpected cost

A19 Peterlee Noise Barrier

increases could affect VFM and potentially bring the ratio below one. This is an issue that Highways England is grappling with on at least one other scheme promised by Ministers.

- 4. Delay.** This scheme looks like it will be delivered later than originally planned. Based on discussion with Highways England staff it seems that there may be a wider capacity issue impacting delivery; Highways England expects to fully deliver 5/8 planned schemes this year.

A.4. Growth and Housing

M181 Lincolnshire Lakes

The Growth and Housing Fund is providing £8.7 million towards a new roundabout junction on the M181 in North Lincolnshire, close to a designated national priority housing site. The total cost of the project is an estimated £13.4m (including a prudent allowance for optimism bias), with local developers contributing £4.7m towards the cost of the improvement works.

The new junction has been funded on the basis that it could unlock two housing development sites and deliver up to 4,000 jobs and 6,000 new homes by 2028 of which 1,300 jobs and 1,500 homes are predicted to be delivered by 2021. The junction will provide easy access to the new development sites and because the improvements are necessary to accommodate the extra journeys the housing development will create, it is a condition tied to planning consent. The developer contributions will be collected and underwritten by North Lincolnshire Council. The scheme is being delivered by Highways England, but under the terms of the funding agreement with North Lincolnshire Council, the local authority will bear any increases in cost.

The need for infrastructure improvements were identified a number of years ago as plans for the development sites were drawn up. Alongside a number of other national government stakeholders, Highways England appears to have been closely involved with the project through the GHF, identifying it internally as one of the first wave 'pilot' schemes to progress through the fund. Highways England ran its own internal value for money assessment which concluded that the scheme offered "excellent value for money", with a traditional WebTAG BCR of over 50.

The project could also provide substantial local economic and growth impacts, with an estimated local GVA impact of £243m per annum and leveraging significant private investment into the area. Although there is an established and growing evidence base on the wider economic impacts of transport improvement schemes, this is still an area where DFT is regularly improving and updating the appraisal guidance. Therefore these estimates should be interpreted with caution. GVA analysis can estimate the change in output associated with an intervention at a local or regional scale, but any increase in output may not be 'additional' at a national scale, since a change in activity in the treated area could be the result of displacement from a neighbouring area. Highways England attempts to address this by adapting displacement, leakage and substitution factors from Homes and Communities Agency guidance, however DFT's updated wider economic impacts guidance notes that "there are not off the shelf additionality/displacement factors that apply to all schemes".

Highways England also commissioned an external viability and deliverability appraisal to assess the need for public support. Although the cost of the new junction is small relative to potential value of the development sites, the viability assessment found that the site was marginal from a commercial perspective, as both development sites exhibited high abnormal costs (relating to flood defence and other site-specific works). The assessment concluded that the risk of developers making an excessive return from the project was low and that public funding was needed to support the project. However, a high level review by Highways England's advisers found that the developers' assumed build-out and sales rates were likely to be optimistic compared to typical residential rates and in the North of England. Given the marginal viability of the site, the full delivery of the predicted jobs and homes by 2021 was considered uncertain.

Finally, Highways England completed a buildability assessment to identify any obstacle to the scheme's ability to move quickly to delivery. Although a couple of legal agreements (between Highways England and NLC for the provision of match funding, and between Highways England and one of the private developers for the transfer of some land), the buildability assessment concluded that the scheme could progress quickly.

M181 Lincolnshire Lakes

The detailed design works were completed in early 2016 and Highways England announced that it would proceed with the scheme in August 2016, with construction due to start early in 2017. However, a combination of internal and external delays have prevented Highways England from starting on site:

- One of the scheme developers made changes to the planning application;
- The design of the scheme evolved between the point of IDC approval and procuring a provider to complete the works, which led to a higher cost estimate and a c£5m funding gap.

Highways England told us that they are now waiting on local partners and developers to bridge the funding gap before the scheme can proceed. They are hopeful that this will happen in the near future and that the works will be able to start in early 2018 (around a year later than originally planned). The works are currently expected to last for around a year, meaning that the junction could be open in early 2019.

Main Findings

- 1. Delay.** In a large portfolio of projects it is reasonable to expect that some might fall behind schedule. Highways England is now building up an 'over-programmed' pipeline of GHF schemes to account for projects which are delayed or drop out.
- 2. Fully assured cost estimates.** Highways England has recognised that project designs and cost estimates need to be fully assured from an early stage, including an allowance for uncertainty, and told us that they have addressed this issue. This is critical to avoid funding gaps which prevent other schemes from progressing to delivery.
- 3. Excellent value for money.** The high BCR generated by this scheme illustrates the potential for small highways improvement schemes to deliver actions beyond business as usual and offer excellent value for money. The final BCR will depend on how the funding gap is filled.
- 4. Enhanced oversight of benefits realisation.** Where Highways England has less control over the realisation of assumed benefits, it has put mandatory reporting obligations on the developers. This information is key to any future evaluation of the fund's success.

M5 J29 / A30 Tithebarn

This is a £9.1m project, representing phase two of the A30 / M5 Junction 29 Tithebarn Link Road programme, to the east of Exeter. £4.5m from the Growth and Housing fund will provide a cycle bridge across the M5 and a new link road. Phase one – a link road connecting Cumberland Way to Science Park Drive – opened in July 2015. The programme aims to increase the capacity of a strategically important intersection and accommodate the development of several key housing and employment sites nearby.

Even before the creation of the Growth and Housing fund, the private developers had identified the need for improved road links to unlock their sites and, given the large infrastructure costs, were pressuring the local council to act. The scheme was therefore identified internally by Highways England as a priority pilot scheme in its first wave of Growth and Housing projects, as it could offer quick delivery of jobs and homes.

The scheme will be delivered by Devon County Council. Under the terms of the funding agreement, Highways England will provide a base contribution of just over £4m, with a further £0.5m contingency which can be accessed in the event of cost increases. The cost estimate includes an allocation for optimism bias of 40%, so there should be scope to absorb unexpected costs without accessing the contingency. Any cost increases will be shared between Highways England and DCC until the £4.5m limit is reached, beyond which DCC bears full risk. The remainder of the project cost (c£4.6m) will be collected from private developers and is being underwritten by DCC.

When put through Highways England's appraisal process, the scheme demonstrated "very good value for money" and a BCR of 18. It is also estimated to unlock 467 jobs and 350 homes by 2021, with 1,844 homes beyond this and an estimated increase in local Gross Value Added of £155m.

As an early pilot scheme identified in 2015, this is one of the projects furthest along in its life cycle. The scheme passed the GHF programme sifting exercise in August 2015 and along with 14 other schemes was progressed through viability and value management workshop processes by the regional team. Although Highways England's scheme appraisal was completed by March 2016, the decision to proceed was not approved by the company until September because they had yet to establish the necessary investment control gateway - the Strategy & Planning Directorate IDC. Highways England told us that this resulted in only a marginal delay to the project and, due to interfaces with other projects being taken forward by DCC, it did not prevent Highways England from getting on site to start the work.

The first part of the project – a cycle bridge over the M5 – was completed in late 2017. The second part of the project, the link road serving Exeter Science Park is currently under construction and on schedule. Highways England told us that the scheme is expected to open by Spring 2018 and do not currently foresee any significant risks to this schedule.

Main Findings – work in progress

- 1. Stakeholder delivery.** Delivery of the scheme through Devon County Council may have sped up the delivery of this scheme and enabled the delivery of jobs and homes more quickly than would have otherwise been possible had Highways England undertaken the work itself.
- 2. Investment controls.** Even though this scheme was ready to proceed, Highways England had yet to establish the appropriate investment control gateway to approve Growth and Housing schemes, and did not do so until late 2016.
- 3. Monitoring and evaluation.** Highways England has yet to establish a monitoring and evaluation plan for the Growth and Housing fund. Although it acknowledges that this is an issue, it does not appear to have work in progress to fill this gap – even though a number of schemes are now in delivery. Given the longer time horizons involved in the delivery of major

M5 J29 / A30 Tithebarn

housing and commercial developments, and the wider economic benefits that might be unlocked, Highways England will have to develop a bespoke POPE process.

A52 Wyvern Junction, Derby

The A52 Wyvern Transport Improvements scheme is a package of measures to improve traffic flow on the A52 and to reduce peak hour congestion at a key intersection between local roads and the SRN. In addition, it will enable Highways England planning conditions restricting the development of the adjacent Derby Triangle site to be lifted. Combined with a wider infrastructure scheme led by Derby City Council (DCC), the project could help to deliver up to 3,000 jobs in the Derby area.

The project has been part of the local authority's plans since 2013, but it was brought to Highways England's attention through the second wave of bids for the Growth and Housing Fund launched in spring 2016, which invited local authorities and LEPs to submit proposals to Highways England for funding. The company completed the initial sifting exercise in May 2016.

The Wyvern proposal passed the sift as it was considered that the GHF was the 'last resort' to bridge a shortfall in the scheme funding. But after the initial sift, the GHF Programme Group (GHFPG) paused the project whilst the regional network development team sought further assurance on whether the highways improvements were really needed to mitigate the impact of the Derby Triangle development on the SRN (rather than the local road network). The developers of the Derby Triangle site also needed to secure planning permission, which was itself dependent on the junction improvements. These issues were resolved by February 2017.

The total cost of the project is estimated at £14.9m, of which the Growth and Housing Fund will provide £2.6m. The private developer is contributing £2.9m and the remaining funding is from other public sources – primarily the Local Growth Fund.

Highways England commissioned a viability and deliverability appraisal which noted that in addition to the contribution to funding the infrastructure works and other abnormal site costs, the private developer could expect to earn a return on Gross Development Value (GDV) of [0 – 15]% - a level of profit which falls well below the level that a commercial developer would normally require (c15%). Without public support for the junction improvement scheme, Highways England concluded that the development would be unviable. Although the private sector is meeting a relatively small share of the scheme's costs, Highways England's commitment to the scheme is less than 20% of the total cost.⁶

Highways England's economic impact assessment demonstrated that the project could have significant impact to the local economy, resulting in an estimated regional GVA increase of £130m. However, although the wider strategic argument may be strong, the traditional BCR generated by the scheme is not as strong as other case studies we looked at from the growth and housing fund. Excluding wider economic impacts, the BCR of the scheme is just 1.5. Once wider economic impacts related to cycling are included, the increased BCR becomes 2.2 indicating "good" value for money. Highways England told us that there is an effective cut-off point where schemes with a BCR below 2 would not be funded.

Following completion of scheme appraisal, Highways England was able to approve its financial contribution. It will be delivered through DCC, and they will draw down the grant in stages during construction. Highways England's contribution to the scheme is capped, and all financial and delivery risk is owned by the local authority. There was an additional 3-4 month delay in starting the scheme as the local authority held extended negotiations with its preferred contractor on the

⁶ By comparison, Highways England told us that at an overall portfolio level the typical split of funding between Highways England/other public sources/private sector is about 33%/33%/33%.

A52 Wyvern Junction, Derby

final scheme costs. The project started on site in late 2017 and construction is now underway. Highways England told us that they expect construction to take around 18 months and be completed by April 2019.

In due course Highways England will need to establish a monitoring and evaluation process to establish whether the scheme delivers the anticipated benefits, but like most of the other ring-fenced funds this has yet to be addressed. However, Highways England told us that there are provisions in the funding agreement with the local authority to require support for a formal evaluation of the improvement works, and should it transpire that the associated development sites have performed materially or significantly better than expected, and where there is a clear risk of excessive returns having been made by any of the private developers, the local authority and Highways England agree to work together to identify and enact any reasonable steps to increase the private match-funding contributions from those developers at an appropriate level.

Main Findings

- 1. Value for money.** This particular scheme compares less favourably to other projects in the Growth and Housing fund pipeline on VFM grounds. This may be because of a shortage of other schemes offering “very good” VFM passing the initial sift, perhaps because the initial sift is too strict, or else because there is a blockage in identifying potentially better VFM schemes.

M5 Fuel Price Signs

A report by the Office of Fair Trading in 2013 highlighted the disparity in prices for fuel bought on motorway service stations compared to elsewhere and suggested the lack of transparency of pricing could have been a factor. In response, the government announced plans to display fuel prices on motorways in the 2013 Autumn Statement. Ultimately, this led to there being a ministerial commitment to a pilot scheme investigating how to improve fuel price transparency on motorways that was to begin by the end of 2015. As a project name-checked in the RIS, this fuel price signs project may not be typical of the type of project which Highways England aspires to deliver through the Innovation fund, or the way in which those projects may be identified. However, it demonstrates how the fund approaches the delivery and evaluation of projects.

This trial was intended to inform both Highways England and DfT about ways to provide motorway users with up-to-date fuel prices and facilitate competition amongst service station fuel providers. This was done through providing four comparative price signs along the motorway. It took place between the spring of 2016 and December 2017 on the southbound M5 from Bristol to Exeter. Highways England provided a total of £2m from the Innovation fund to deliver the trial.

The identification of this project was driven by DfT, who commissioned, funded and managed a feasibility report that was completed in November 2014. Highways England provided technical input at this stage. The study focused on the technical viability, industry and stakeholder buy-in and research of over 350 customers through the Highways England customer panel. In order to select a site for the trial, the feasibility study identified all 114 service stations on the motorway network and scored various routes against criteria such as flow of traffic and spacing of service stations. The M5 was identified as the preferred route due to a mix of fuel providers and an expectation that traffic will include drivers unfamiliar with the area and on journeys long enough to allow choice between fuel stops.

The feasibility study also identified four key Critical Success Factors (CSFs) to be used as criteria to determine whether the trial was a success and whether national roll-out should be considered:

- A reduction in the cost of fuel at service stations
- Absence of any discernible impact on road safety
- Provision of an accurate, useful and effective information service (in relation to the technology and user trust)
- Efficient and reliable deployment of technology with high availability

Following this study, and at the request of DfT, Highways England took forward the study's recommendation and developed a business case, which was completed August 2015. It was at the feasibility study stage that a roughly £1.8m cost of the project was first estimated and this appears to have been broadly carried forward as the cost estimate to the Highways England IDC business case, which asked for £2m. The total project cost was ultimately increased to £2.31m, largely due to the tight schedule for designing the technology system. However, total costs remained below the £2.5m estimated by the DfT when Ministerial approval was sought.

Due to the ministerial commitment, the programme of work aimed to have the first sign available by the end of 2015. This was a tight schedule allowing little room for any delays. Procuring the technology services to manage the updating of fuel prices was therefore run in parallel with the civil engineering activities developing the signs. Another consequence of the commitment was that the 'do nothing' option was not considered in the economic appraisal of the trial.

The trial was concluded in December 2017 broadly on schedule and on budget. However, it should be noted the service of the signs was extended for a month beyond the end of the trial while

M5 Fuel Price Signs

Highways England and DfT decided how best to decommission the signs and how to communicate its results. Although the original budget included funds for the decommissioning of the signs, a small increase in funds of £40k had to be provided through the change control process for the extension.

The evaluation plan developed in the DfT feasibility report, as embodied by the four CSF criteria, was enacted at the close of the trial in an evaluation report currently being drafted. This will conclude with a recommendation not to roll out the scheme more widely, which was estimated to cost in the region of £50m. Alternative strategies using existing signs, such as encouraging long-distance travellers to take a break, would likely provide better value for money. Although the pilot signs were reliable and left safety unaffected, the trial suggested they also had no significant positive impact on behaviour of drivers on the motorway, nor did it reduce fuel prices at the service stations. There were therefore insufficient benefits in terms of fuel costs saved by users to cover the costs of the service. In addition, customer feedback was polarised, with some respondents noting they never buy fuel on the motorway due to the expectation it will always be more expensive than off the motorway network.

Main Findings

- 1. Informing decisions.** The trial provided Highways England and government stakeholders with good evidence that could be used to inform Highways England's recommendations on whether to roll out the scheme more widely. That the criteria with which the scheme was to be evaluated were clear from the beginning of the project represents good practice.
- 2. Initial project screening.** Although this particular project was a ministerial requirement name-checked in the RIS, it remains necessary for Highways England to adequately screen all projects to ensure their funds are being used in the most effective way possible. This may in some cases require making it clear to government stakeholders that Highways England would not otherwise move forward with a scheme unless given express instructions to do so.

Connected Intelligent Transport Environment (CITE) Trial

The Connected Intelligent Transport Environment (CITE) is an industry led consortium of multi-national companies who are specialists in the field of Connected and Autonomous Vehicle (CAV) technology. These companies are Jaguar Land Rover, Vodafone, Huawei, Siemens, Mira and Visteon. The Universities of Warwick and Coventry, as well as Coventry City Council are also involved.

Highways England is a key collaborator with this consortium in this project to test the potential use of CAV technology on the SRN. Highways England's role in the trial is to provide use of the SRN and to fund and install CAV technology at the roadside. The trial of these technologies is taking place over motorway and trunk roads (the M42, M40, A45 and A46) as well urban roads in Coventry. In total the trial covers approximately 40 miles over various road types.

The RIS commits Highways England to trialling CAV technology, while the UK government sees autonomous vehicles as a potential opportunity to reduce congestion and improve road safety. The project is expected, among other things, to establish a live test environment that will encourage vehicle manufacturers to use the UK as a hub for connected & autonomous vehicle research and development. It will also help to facilitate the development of CAV technologies in compliance with Highways England safety and security protocols.

Other potential benefits for the SRN include the possibility of CAV technology becoming a viable replacement for signage and signalling technology which requires ongoing maintenance, although the realisation of these benefits is highly uncertain.

The trial has been led by the industry consortium with Highways England in a supporting role, as industry recognised that there was a need for more research on the safety elements of CAV technology as more manufacturers included it in their vehicles.

Highways England initially approved £1.7m for the project in 2016, however by March 2017 further work on construction design and initial safety and cyber security assessments, it became apparent this funding would be insufficient to deliver the trial. The additional costs were caused by:

- The need for specialist support in carrying out work on safety and cyber security due to the high-risk nature of implementing CAV technology on the SRN for the first time.
- Full costs for construction could not be accurately estimated until the design work was completed.

As a result, the total cost of project stands at around £10.6m, including £4.9m from Highways England and £5.7m from Innovate UK.

The updated business case notes estimates for the purchase and installation of the CAV technology provided contractors were reviewed by Highways England cost engineers and deemed appropriate, but it we have not seen any evidence that Highways England took steps to satisfy itself that the initial cost estimates were reasonable.

Without the increase in funding, the CITE project would have had to be reduced in scope, only trialling one communication technology rather than the four initially planned. This would come at a reputational cost to Highways England, who would not be delivering on either their RIS commitment or their letter of support to the consortium. However, it is not clear what further analysis Highways England performed before the increased funding was approved.

The Highways England components of the trial are being delivered by the area contractor. The funding will contribute towards a one-off purchase of CAV technology from Siemens and then the installation and maintenance of the road-side equipment for the length of the 2.5 year trial.

Construction of the CAV infrastructure is currently on track, and delivery is within budget due to efficiency savings against the approved budget. All the M42 sites are now live and planning for the

Connected Intelligent Transport Environment (CITE) Trial

testing of the technology is in place. The business case noted that an external review of the outcomes of the project will be provided to Highways England to help inform future policy, however we did not receive any information on how the success of this project will be evaluated.

Main Findings

1. **Optimism bias.** There is a need to ensure projects are providing robust evidence to support early cost estimates in order to mitigate the risk of increasing costs during the detailed design stage. Including contingencies for risk and optimism bias is important, especially as the pipeline of innovation projects grows.
2. **Evaluation criteria.** Although Highways England are intentionally taking a supporting role in this area of research, we have not seen evidence of its involvement in any future evaluation. This will make it difficult to determine whether the trial has been successful. Given Highways England are a key stakeholder and the largest single contributor of funding towards the project, they should expect to have a greater say in how the evaluation of CAV technology should be conducted.