



Buckinghamshire **Live Lab** *Trial* *Final Business Case & Impact* *Assessment*

Gulley Sensors and Flood Management System



Strategic Case (1)

The Strategic Case sets out why the intervention is needed, how it furthers national, regional and local policy and whether there is a clear case for change.

National, regional and local policy fit	<ul style="list-style-type: none"> • Department for Transport, regional and local authorities need to embed consideration of climate change into policies, strategies and research e.g. Department for Transport Road Strategy and National Policy Statements. • The Flood and Water Management Act 2010 and the Highways Act 1980 state that highway authorities must provide suitable highway/roadside drainage remove surface water from the highway.
The case for intervention that meets those policy needs	<p>The objectives of this trial are to investigate whether sensors have the potential to:</p> <ol style="list-style-type: none"> 1. Reduce the effects of flooding due to drainage gulley blockages in Buckinghamshire, expected to increase in frequency and severity as our climate changes. 2. Provide efficient and proactive responses to potential blocked gullies and clear the gullies before the blockage, and therefore flood, occurs. 3. Reduce the number of road traffic accidents and cost of road damage caused by flooded surfaces. 4. Reduce emergency call-outs (local authority and emergency services) and routine maintenance call-outs
The national, regional & local needs and challenges	Due to climate change, peak rainfall is expected to increase by 20% by 2050 and 35% by 2085 resulting in more severe flooding. Flooding will lead to complaints, journey delays, congestion, traffic incidents, increased emergency service response time and so forth, this will reflect adversely on the authority's level of customer service.
The wider case for the intervention	<p>The gulley sensors and flood management system should allow a proactive response when there are early signs of potential blockage, allowing the gulley to be cleared before a full blockage occurs and reducing the risk of associated flooding onto the highway.</p> <p>The need for routine manual checks to gulleys should improve the efficiency of resources.</p>



Strategic Case (2)



Social

Happier road users due to fewer journey delays and fewer road traffic accidents.



Financial

Operational cost saving in the long term after initial capital expenditure.



Environmental

Reduction in congestion and traffic delays due to flooding hence reduced carbon emissions



Economic

Reduction in road traffic accidents, emergency call-outs, potholes/pothole induced accidents and unnecessary routine maintenance.



Climate Change

Resilient to severe weather events. Combats increased flooding that will occur due to climate change.

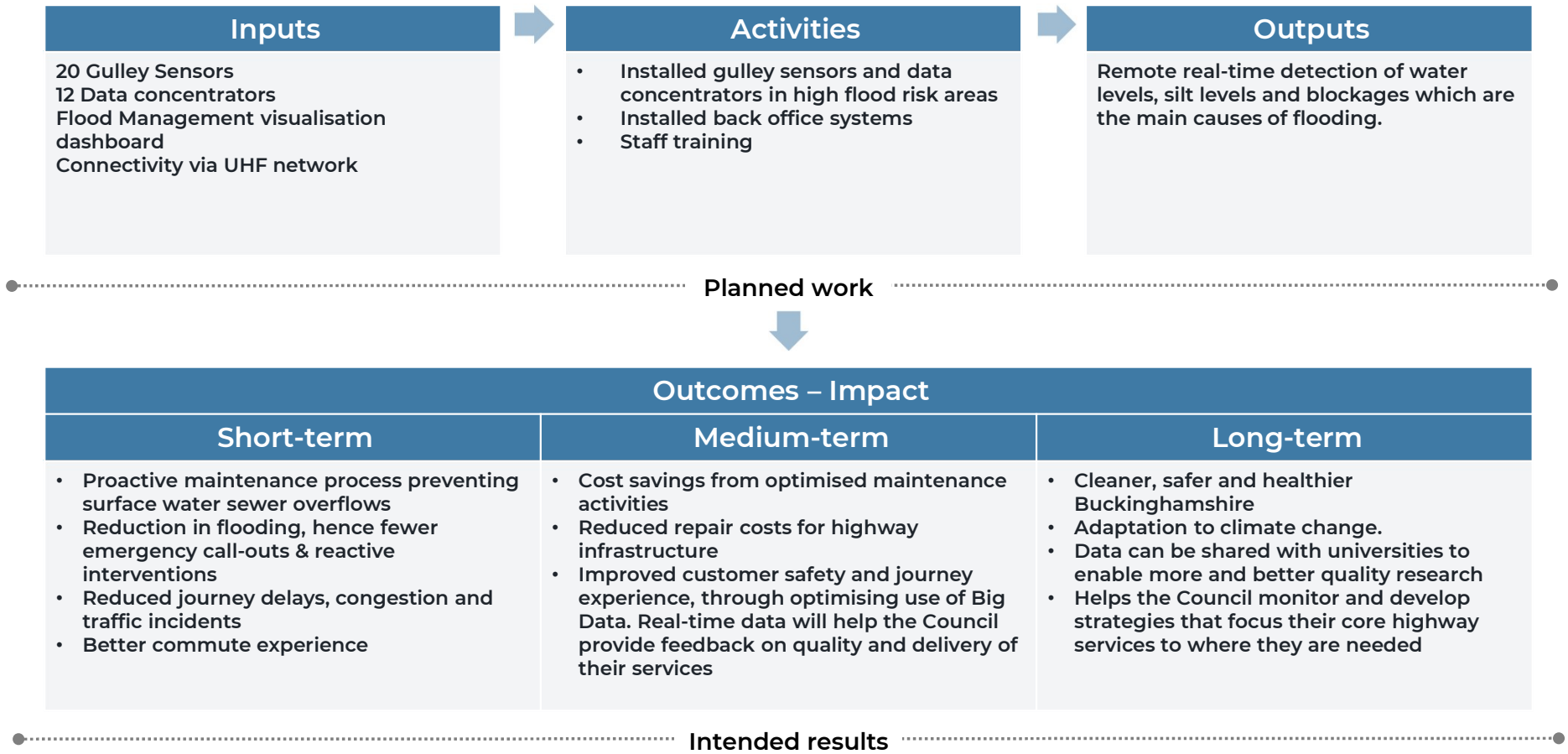


Future Ready

A proactive and efficient response to clearing silt in gullies helps combat the potential of increased flooding due to future climates

Strategic Case (3)

The Logic Impact model shows how the inputs and activities carried out during the trial flow through to short, medium and long-term impacts. Where trials are not yet operational, anticipated impacts are provided.





Economic Case – Costs

(Assumptions are given on the next slide)

Estimated whole life cost of ownership of a network of 200 number of sensors for high risk fold locations over a 10 year period:

Capital Cost / £	Maintenance Cost / £	Operational Cost / £	Total whole life Cost / £
£400k	£200k	£300k	£900k

Estimated cost savings over 10 years:

Cost saving for reduction in traffic accidents / £	Maintenance Cost Savings / £	Cost saving of call-outs / £	Total Cost Savings/ £
£600k	£1.9M	£20k	£2.5M

- This provide a Benefit Cost Ratio of 2
- Breakeven should be by the end of Year 2



Economic Case – Assumptions

- It is assumed that 200 sensors would be required to cover the higher risk flood areas.
- Annual maintenance and operational costs are assumed to be £300k for a network of 85,000 gullies.
- According to STATS19 road collision data, in the past 5 years Buckinghamshire had two serious and four slight accidents due to flooding alone. This business case assumes the network of gully sensors is likely to prevent 50% of such accidents.
- Maintenance cost savings assume approximately 60% reduction of periodic cleansing across Buckinghamshire. This is based on the reported savings by Bristol Council with deploying their network of sensors and the application of a risk based approach to their maintenance strategy.
- The number of emergency call outs due to flooding in Buckinghamshire Council could not be identified. It is assumed that the deployment will save approx. 300 no. emergency call-outs due to flooding, this is based on data reported by other authorities of an equivalent size (population and road network length).
- Discount factor of 3.5%
- Further benefits, not quantified within the business case include:
 - The cost savings exclude damage to infrastructure and wasted time in delays/congestion due to flooding.
 - Cost savings exclude reduction in carbon due to reduction in congestion.



Economic Case – Benefits realised through the trial

Monetisable

- Cost savings via a targeted and proactive maintenance and risk based approach.
- Increased efficiencies through transformation to a needs-based operation for these locations.
- Reduction in infrastructure repairs associated with flooding damage such potholes, etc.
- Real-time data to inform strategic decision making creates operational and financial benefits, enabling the authority to target services and manage revenue budgets.

Quantifiable not monetisable

- Reduction in traffic incidents.
- Reduction in number of highway flooding incidents requiring reactive maintenance.
- Reduction in flood related emergency callouts.

Qualitative

- Reduction in traffic delays, traffic congestion and CO₂ emissions.
- Improved health and safety for operatives and the public.
- Customer satisfaction.
- Emergency response time improvement.



Commercial Case

Procurement journey

No issues were reported on the procurement process for this trial.

Implementation efficiency

The data collection was delayed due to the late mesh network installation however the supplier implemented an alternative communications approach to overcome that issue.

The initial trial operating period was between spring and autumn 2021, however, it was extended through to the autumn/winter season through to May 2022 in order to assess how the sensors performed during seasons of increased rainfall and leaf fall which are the main causes of flooding.

Funding sources

All funding for this trial was provided by the ADEPT Live Lab programme.





Management Case (1)

Project management approach

It originally planned that the gulley trial would make use of the bespoke mesh communications network being installed in the parallel trial. However, due to delays in installing the mesh network, the supplier used an alternative UHF network to connect the sensors wirelessly to collect and transmit the data.

The risks associated with reliance on other trial technologies need to be considered from the outset. In this case the 'Plan B' could be implemented without adversely affecting the overall gulley sensor trial.





Management Case (2)

Delivery plan

The original delivery plan was optimistic which led to insufficient trial duration to evaluate the performance during all seasons of the year, this was overcome with the six-month extension through to May 2022.

Obtaining lessons learnt from other councils with recent experience deploying similar systems would likely have provided insight on typical challenges, timescales and dependencies for such deployments. This would have aided risk planning and contingencies.

Project management team and qualifications

Stakeholder engagement and change management approaches were not fully applied on this trial.

The Buckinghamshire Council and Maintenance Contractor also required additional training to visualise and interpret data captured by the system.





Management Case (3)

Benefit realisation and contract management plan

Limited engagement with key internal stakeholders led to omissions in requirements such as initially remotely monitoring the gully water levels during the winter season as well as delays in moving the implemented system into business-as-usual operation.

A benefits realisation plan should be in place from an early stage of the project. The Council's strategy owners should have been involved at an early stage in developing the use cases to ensure they would contribute to strategic objectives and enable decision making at project completion.

Evaluation strategy

Trial locations were selected to align with other initiatives such as Greenway & Aylesbury Garden Town rather than evaluating the high flood risk locations which would have provided the most value.

In the future, gully sensor trials of this type would benefit from inclusion of multiple suppliers so that performance can be compared, and future system resilience is embedded.

