



# Executive Summary

This pre-feasibility study has been commissioned by Bristol City Council to explore the viability of a light underground system in the Greater Bristol area and where appropriate to provide sufficient evidence that partially or fully underground route options are worth pursuing further.

The study focuses on technology options, build costs, operational costs, and funding options. Key benefits of the proposal are also highlighted, along with the possible interventions.

A review of technology options currently available has identified a number of options that are currently available and have the ability to deliver the level of service and capacity required to operate the underground system, based on approximately 3,000 passengers per hour per direction. The options considered include both autonomous and operator based operation.

A review of existing ground investigations across Bristol has been undertaken which has been supplemented with historic boreholes information obtained from the British Geological Survey's database. The investigation has identified that tunnelling is generally expected to be through Mercia Mudstone, but is also likely to encounter Alluvium, Tidal Flat Deposits and Redcliff Sandstone, especially when tunnelling near the River Avon and in the centre of Bristol. There is also a likelihood that some sections of the route would need to be tunnelled through Coal Measures. Consideration has been given to the many listed buildings, scheduled Monuments, Listed parks and Gardens and Site of Special Scientific such as Pen Park Caves.

The study has concluded that the system has the potential to cover its operating costs, but that further work, including detailed financial modelling, will be required to confirm these initial assumptions. It has also concluded that it will likely result in significant enhanced public transport connectivity for areas currently poorly served by public transport.

Based on experience from other systems the Underground Metro is also likely to have an impact on land values along the route and lead to increased delivery of housing stock and/or acceleration of the delivery rate. This is also likely to positively impact on employment sites along the route which could be densified, as a result of better public transport accessibility for employees and thus need to provide lower levels of parking.

The study has assessed the funding potential to support WECA Underground Metro This assessment focuses on funding that can be generated locally from third parties (i.e. not local grant funding) and presents funding scenarios. The study presents a high level range of potential funding sources and notes that there is a reasonable chance that more than 50% of the capital requirement of the Metro (excl. financing costs or Optimism Bias for capital costs) could be generated from various combinations of these local funding options.

The outcome of the study provides sufficient evidence to recommend that a proposed underground option should be considered as part of the development of the West of England Rapid Transit Study.

## Executive Summary

This feasibility study has been commissioned by the West of England Authorities (through Bristol City Council) to explore the feasibility and viability of a mass transit system in the Greater Bristol area. This study will evaluate both underground and overground route options and, where appropriate, will provide sufficient evidence that route options are worth pursuing further. The study also provides recommendations of the next steps to developing a comprehensive transport appraisal for the options. This work builds on and complements the October 2017 Jacobs (formerly CH2M)/Steer Davies Gleave) pre-feasibility study on the viability of a light underground system and incorporates the evidence from that to consider the potential for mass transit within the construct of whether the system should be under- or overground.

Four corridors have been defined for investigation:

- South Bristol and Bristol Airport;
- North Bristol and North Fringe;
- East Bristol and East Fringe; and
- Hicks Gate/Keynsham<sup>1</sup>

The West of England region is already expected to experience growth in travel demand, resulting from committed and planned economic and housing growth, both within and into the Bristol urban area from neighbouring authorities. The increase in traffic demand in the urban area poses significant challenges, to the viability and continued growth of the region.

The aim of this study is to determine whether the prospects for the mass transit system are reasonable in delivering sufficient demand, considering potential alignment issues (both overground and underground) and identify many transformative opportunities for the WECA central urban area and the wider region. Further work into the construction and operation of options has been undertaken to help inform whether it would still represent value for money.

Key corridors in Bristol's urban area are characteristically long and, in many places, narrow, when compared to the majority of other UK cities who have reintroduced overground (street-running) trams in recent decades. When considering the routes, a key factor taken into consideration has been the potential impacts on the current street scenes and what the impact of the route would be in terms of place making and generation of an enhanced public realm.

This report considers that there remains a good case for continuing the development of the defined options to a point that the impacts and benefits can be fully understood and quantified. The work undertaken shows a mass transit system will provide major opportunities for unlocking significant growth in housing and stimulating the economy in the wider West of England urban conurbation and is likely to result in unprecedented wider economic impacts. The outcome would be enhanced public transport connectivity and fully connected interchange facilitates, which would be transformational in terms of how people live and travel around the sub-region.

There are considerable differences between the over- and under-ground schemes that include:

- the level of development (housing and employment unlocked);
- the ease of delivery and acceptability (in terms of construction and general traffic impacts); and
- the level of funding to be assembled to deliver the scheme.

The overground proposal is clearly the most affordable scheme being around 20% of the capital expenditure to construct than underground proposals, however the user benefits and development opportunities enabled by the scheme are also reduced proportionately. Whilst beneficial in terms of

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<sup>1</sup> It should be noted that mass transit extensions to Bath are to be considered as part of the Bath Transport Study and the next phase work.

transport user benefits and mode share, overground mass transit proposals would also have significant adverse impacts on communities, street scenes and existing transport infrastructure. There would be considerable impacts on general traffic on three out of the seven main roads into Bristol, not only during construction but also during operation. Further work and major additional traffic and environmental modelling, including later year future horizon scenarios are required to determine whether the direct and consequential impacts are acceptable. The measures required to maintain local access for communities will also need to be mitigated along the impacted mass transit corridors.

In contrast whilst an underground option would require substantial capital expenditure that could be difficult to secure, the development (both housing and employment) opportunities enabled by the scheme are also considerably more substantive. These proposals also have generally positive impacts on communities, the environment and transport infrastructure, with adverse impacts primarily as a result of the movement of excavated and construction materials and the construction of stations, vent shafts and tunnel portals.

The outcomes of the study suggest that the system has the potential to cover its operating costs and the value for money of the options are comparable to other infrastructure schemes of similar size scope and impact. It is however the wider economic benefit potential to the region which is key and transformational, this would drive the regional West of England economic area to a level only currently experienced in the London and south east area within the UK.

The study considers the potential to support the required level of funding for the options, focusing on funding and financing options. Funding of the scheme remains a reasonable prospect yet will be a challenge, as both are very large-scale infrastructure projects and require a consequentially high-level of investment.

The new transport network will lead to an increase in the land value across much of the urban area, which can be captured by specific mechanisms defined. Local funding potential is not likely to be able to cover the entire cost of the project, therefore alternative funding measures will need to be considered to close the funding gap. Additional mechanisms could also be introduced at the transport-enabled development areas, such as retention of a proportion of local taxes.

The outcome of the study provides sufficient evidence to recommend that the mass transit system scheme options should continue to be considered further to enable a preferred option to be identified. Key considerations for further work, include: developing the modelling for construction and operation, for both over- and underground options, requiring initial construction programme development; further refinement of demand forecasting; stakeholder engagement planning; further development of options and potential hybrid options; and testing of additional funding mechanisms, particularly the appetite for local taxation measures.