Aberdeen Rapid Transit

Detailed Options Appraisal – Technical Report (Draft)

On behalf of: Nestrans and the North East Bus Alliance

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1 Introduction

1.1 Overview

1.1.1 As part of its response to the climate emergency, the Scottish Government committed to providing a long-term investment of over £500m to deliver bus priority measures on local authority and trunk roads. This is intended to reduce the negative impacts of congestion on bus services and address the decline in bus patronage to **help tackle the climate emergency** and **reduce private car use**. The investment takes the form of the Bus Partnership Fund (BPF) which supports the design, appraisal, approval and delivery of the infrastructure.

1.1.2 The BPF complements the powers in the Transport (Scotland) Act 2019, enabling local authorities to work in partnership with bus operators, to develop and deliver ambitious schemes that incorporate bus priority measures. The Fund focuses on the evidence of how bus services will be improved by addressing congestion, but the partnership approach is also expected to leverage other bus service improvements.

1.1.3 The North-East Bus Alliance partners (Aberdeen City Council, Aberdeenshire Council, FirstGroup, Stagecoach Bluebird, Bains and Nestrans) submitted an application to the fund, which was successful, with £12million in funding awarded in June 2021. The funding is being used across a range of projects, including the appraisal of significant bus priority in the city centre, and on key routes into the city, and for an appraisal of the options for an Aberdeen Rapid Transit (ART) scheme (this study) with Stantec commissioned in September 2021 to undertake the ART options appraisal.

1.1.4 The study involves a Scottish Transport Appraisal Guidance (STAG) based appraisal and business case preparation considering the future development of Aberdeen's bus-based public transport network, inclusive of links into Aberdeenshire. This work is being undertaken in the context of a vision to develop an ART network, detailed in the Regional Transport Strategy and associated Nestrans ART vision document[17]. The study includes confirmation of the Case for Change, Preliminary Options Appraisal, Detailed Options Appraisal, and subsequent business case development (subject to gateway reviews with the members of the North East Bus Alliance and Transport Scotland).

1.1.5 The Case for Change (CfC) for ART was reported in March 2022 (*Aberdeen Rapid Transit – Options Appraisal – Case for Change, Stantec, March 2022*) and presented the problems and opportunities identified, the rationale for the development of ART, and set out associated Transport Planning Objectives (TPOs) developed for the study. The CfC also defined a set of success factors for ART and presented a review of planned, under construction, and operational Bus Rapid Transit (BRT) schemes across the UK and Europe.

1.1.6 The Preliminary Options Appraisal for ART was reported in June 2022 (*Aberdeen Rapid Transit – Option Generation and Development / Preliminary Options Appraisal, Stantec, June 2022*) and detailed the option development process and the, mainly qualitative, appraisal of these options in line with STAG.

1.1.7 As noted above, in tandem with this study, Aberdeen City Council commissioned and are progressing, a series of multi-modal corridor studies considering options for improving public transport on the key arterial corridors into Aberdeen. These studies are also funded through the BPF, with a focus on improvements to public transport priority infrastructure and, as such, cover the bus priority measures that would be required to facilitate the success of ART. These studies cover:

[17] https://www.nestrans.org.uk/wp-content/uploads/2021/06/Aberdeen-Rapid-Transit-Our-Vision.pdf

- A92 / A956 / A9013 (Ellon to Garthdee)
- A96 (Inverurie to Aberdeen)
- A944 / A9119 (Westhill to Aberdeen)
- A92 South (Aberdeen to Laurencekirk)

1.1.8 Further similar corridor studies are underway considering:

- A93 (Banchory to Aberdeen)
- A947 (Parkhill junction to Bucksburn)
- A92 orbital corridor (Bridge of Don to Bridge of Dee)

1.1.9 It is noted that while these studies are considering bus priority measures, the study remits also cover active travel options.

1.1.10 A further study, considering options for the A956 (Wellington Road) south of the city, was previously undertaken, prior to the emergence of ART, and not funded through the BPF. However, the focus of the study was similar to the ongoing corridor studies.

1.1.11 Given the multi-modal corridor studies are progressing the infrastructure which would support ART implementation, the options being developed and appraised for ART, as part of this study, are focussed on the form the ART network and services may take and, as such, the regulatory framework required to deliver ART.

1.1.12 The Detailed Options Appraisal, reported in this report, includes the further development of the options progressing from the Preliminary Options Appraisal stage, the smartening of the TPOs for the study, and a more detailed (and where possible quantitative) appraisal of the options. While the study focuses on public transport, consideration has been given to impacts upon all road users.

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2 Overview of the Case for Change and Preliminary Options Appraisal

2.1 Introduction

2.1.1 This Chapter provides an overview of the Case for Change and a summary of the outcomes of the Preliminary Options Appraisal, which culminated in the recommendation of options for appraisal at this Detailed Options Appraisal stage. Full details for these stages of the study can be found in the Case for Change report (*Aberdeen Rapid Transit – Options Appraisal – Case for Change, Stantec, March 2022*) and the Preliminary Options Appraisal report (*Aberdeen Rapid Transit – Option Generation and Development / Preliminary Options Appraisal, Stantec, June 2022*).

2.2 Case for Change

Problems

2.2.1 The key problems identified at the Case for Change stage of the study included:

- **PR1**: Bus journey times are longer than travel by car or rail (where rail is an alternative)
- **PR2**: Bus journey times can be unreliable or are at least perceived to be unreliable
- **PR3**: The cost of bus travel is not competitive with travel by private vehicle / is perceived to be poor value for money
- **PR4**: Poor quality bus infrastructure
- **PR5**: Park & Ride options do not offer an attractive alternative to the car
- **PR6**: Poor integration between bus services and other modes
- **PR7**: Public perceptions of travel by bus as a low-quality travel option

Transport Planning Objectives

2.2.2 Recognising the issues noted above and the ART vision, five initial objectives were set for the study:

- **TPO1**: Substantially reduce public transport journey times in ART corridors
- **TPO2**: Achieve consistent public transport journey times across the day and week in ART corridors
- **TPO3**: Make travel on ART corridors fully accessible to all
- **TPO4**: Improve the perception of quality of bus travel in ART corridors
- **TPO5**: Integrate ART services with all transport across the region and urban realm improvements

2.2.3 These have been smartened during the Detailed Options Appraisal, and further detail on this is provided in Section 3.

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Success Factors

2.2.4 Success factors were developed under seven categories, to help inform and guide the option development and appraisal process at the Preliminary and Detailed Options Appraisal stages, with success against these factors enabling achievement of the TPOs for the study. The seven high level categories into which these success factors fall are:

- Political Support & Policy Compliance
- Demand
- Regulatory Framework & Funding
- Highway Operating Environment
- Vehicles
- Supporting Measures
- Technology

2.3 Preliminary Options Appraisal

Option Generation

2.3.1 While the ART vision document set out the overarching vision for the rapid transit system, in order to guide option development, a first step in the process was to determine what was meant by rapid transit. The Institute for Transportation and Development Policy defines rapid transit as:

2.3.2 *…a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. It does this through the provision of dedicated lanes, with busways, off-board fare collection, and fast and frequent operations*.

2.3.3 In short, BRT should deliver:

- High Segregation (infrastructure to reduce interactions with general traffic)
- Fast Services (delivered on direct routes with rationalised stops and priority at junctions)
- Frequent Services (‘turn up and go’ services)
- High Capacity (through the vehicles and service frequencies that operate)

2.3.4 These four key factors were used to frame the options for ART, with options generated based on the **form of the network** (infrastructure, network and services) and the **deliverability and regulatory framework** model required.

Option Approaches

2.3.5 Bus services in Aberdeen are delivered on a largely commercial basis by the two main operators and the public sector has a minimal role in planning or supporting services. However, the options identified include stepping away from this commercial operating environment to one where services are ultimately planned and franchised by the public sector, where the public sector is also likely to take the revenue risk.

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2.3.6 Five broad option approaches were set out in an 'options tree', shown in Figure 2:1 below. This illustrates how the four defining elements of ART (high segregation, fast services, frequent services, and high capacity) are reflected in the five options. The options range from Option 1 (at the top of the tree), requiring the least change from the existing position with just new bus priority and other infrastructure but no change to services or vehicles, to Option 5, which reflects the most changed position (i.e., infrastructure changes, existing service integration / revisions, bespoke vehicles etc.). The two branches of the tree also reflect the likely delivery model required, with the left-hand 'branch' of the tree (Options 1,2 and 3) being highly likely to be able to be delivered through a Bus Service Improvement Partnership (BSIP) but with Option 4 and 5 on the right-hand branch more likely to require a bus franchising arrangement to be in place.

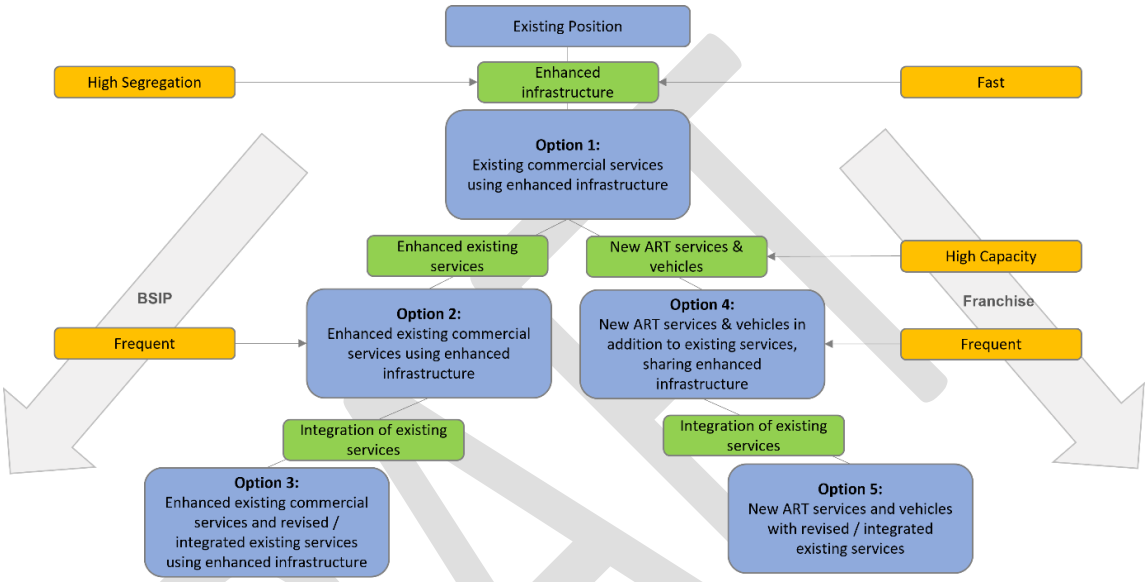

Figure 2:1: ART Options

2.3.7 All options assume the implementation of **enhanced infrastructure** on the ART corridors. As noted above, the form and nature of this infrastructure is to be drawn from the multi-modal corridor studies commissioned by Aberdeen City Council where possible. However, it is important to note that the infrastructure options are less well developed for the corridor to the south of the city, along the A92 (south of the Bridge of Dee), and while the A956 Wellington Road study has previously been progressed, as noted above, this study commissioned prior to the emergence of ART.

2.3.8 The five broad options in greater detail are:

Option 1: Existing commercial services using enhanced infrastructure

2.3.9 Over and above the infrastructure outcomes from the corridor studies, the assumption is also that Option 1 provides improved infrastructure improvements at stops. No changes are assumed to existing bus services (although it may be that operators are able to improve services at the margin through the increased network efficiency). **The option does not fully address the key BRT factors of frequent or high capacity services.** Option 1 could be provided under the current regulatory framework although a BSIP would provide a mechanism for securing operators' commitment to operational standards such as vehicle specification, ticketing and publicity.

Option 2: Enhanced existing commercial services using enhanced infrastructure

2.3.10 Option 2 builds on Option 1, but also introduces more significant enhancements through increased services on the ART corridors to provide **frequent** travel options. **The option does not fully address the key BRT factor of high capacity services** (although the increased

frequency of services would provide greater overall capacity across the network). Option 2 could be delivered through a BSIP.

Option 3: Enhanced existing commercial services and revised / integrated existing services using enhanced infrastructure

2.3.11 Option 3 builds on Option 2 by then revising and integrating existing services as ART 'feeder services' to enable more efficient bus operations on the corridors and so improve **commercial viability** in the overall bus network. **The option does not fully address the key BRT factor of high capacity services** (although the increased frequency of services would provide greater overall capacity across the network)**.** Option 3 could likely be delivered through a BSIP.

Option 4: New bespoke ART services and vehicles in addition to existing services, sharing enhanced infrastructure

2.3.12 Option 4 builds on Option 1 by considering new bespoke ART specific services and new vehicle types and, in doing so, provides **frequent services** and **high capacity services** (dependent on the vehicles used). Importantly, these new services would provide new fast cross city connections. Option 4 would likely need to be delivered through a bus franchise given the presence of commercial services in the ART corridors.

Option 5: New bespoke ART services and vehicles with revised / integrated existing services

2.3.13 Option 5 builds on Option 4 by considering new bespoke ART services and vehicle types and in doing so provides **frequent** services and **high-capacity** services, and even **faster services** (through reduced bus congestion on the corridors). Importantly, these new services would provide new fast cross city connections. The option also seeks to improve **commercial viability** in the overall bus network through an integrated approach. Again, Option 5 would likely need to be delivered through a bus franchise.

Option Appraisal

2.3.14 The five option approaches were appraised against the STAG criteria which were, at that time, Environment, Economy, Safety, Accessibility & Social Inclusion, and Integration, and against Implementability criteria considering each options Feasibility, Affordability and Public Acceptability. *Note: STAG was revised in early 2022 and the Detailed Options Appraisal is being undertaken in line with the updated guidance.*

Option Selection and Rejection

2.3.15 The table below presents the key rationale for selection or rejection of the options considered, with the selected options agreed for progression to the Detailed Options Appraisal.

Table 2.1: Option Selection or Rejection

Option	Description	Select	Rationale for selection or rejection
1	Existing commercial services using enhanced infrastructure	×	Providing new infrastructure but no specific enhanced existing or ART services does not offer a step change in public transport in the city and is likely to generate the lowest modal shift of all the options. Cross-city Park & Ride to Park & Ride services would not be provided so no new direct connectivity would be generated. Option 1 also would not fulfil the objectives of the BPF which requires match finding by operators through improved services.

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Option	Description	Select	Rationale for selection or rejection
2	Option 1 + enhanced existing commercial services	✓	While providing new infrastructure but no specific ART services does not offer a step change in public transport in the city, enhanced services operating along the ART corridors would endorse the corridors as strong public transport routes operating on the enhanced infrastructure. This option would also be reasonably easily delivered through a BSIP arrangement.
3	Option 2 + rationalised / integrated existing services	✓	While no specific ART services are provided, the enhanced service frequencies on existing services on the corridor, and the revision / integration of existing services to provide 'feeder' services, would provide additional journey benefits to users (through reduced bus congestion) and form a coherent ART 'network' of services across the city. Option 3 could be delivered under a BSIP arrangement (more simply than under a bus franchise) and is less open to challenge.
4	Option 1 + bespoke ART services and vehicles	×	Operating additional ART services alongside the existing services on these corridors would result in duplication of services and not be commercially viable. If ART services were implemented thorough a bus franchise, services which overlap with ART services would clearly be amended – see Option 5.
5	Option 4 + rationalised / integrated existing services	✓	Option 5 provides ART services with new distinctly branded buses, and with the revision / integration of existing services to provide 'feeder' services, which would form a strong and identifiable ART 'network' of services across the city which importantly provide new cross city connectivity. This option is likely to be met favourably by the public, stakeholders and businesses given the new services and distinct vehicles with a modern image and a feeling of a new public transport offering in the city.

2.3.16 It was recommended that **Options 2, 3 and 5 be progressed to the Detailed Options Appraisal** stage of the study, in addition to two **new 'hybrid' options (Options 3A and 5A),** with all options set out in the table below**.**

Table 2.2: Options for Detailed Options Appraisal

Op	Extensive bus priority	Services	Bus Stop	Stop Spacing	Vehicles	Parking Policy
2	✓	Current ART corridor services[18] with increased frequency	Conventional, Upgraded	No change	Conventional	No change
3	✓	Current ART corridor services with increased frequency Integration of other services to feed ART corridor services	Conventional, Upgraded	No change	Conventional	No change
3A	✓	Current ART corridor services with increased frequency Integration of other	Platform style	800m	Conventional ART branded	No change

[18] Assumed as: A956 (city centre to Bridge of Don P&R), A96 (city centre to Craibstone P&R and airport), A944 (city centre to Kingswells P&R Westhill), B9013/A92 (city centre to Portlethen (new) Park & Ride)

Op	Extensive bus priority	Services	Bus Stop	Stop Spacing	Vehicles	Parking Policy
		services to feed ART corridor services				
5	✓	New bespoke cross-city services[19] Integration of other services to feed bespoke ART services	Platform style	800m	Tram-style	No change
5A	✓	New bespoke cross-city services Integration of other services to feed bespoke ART services	Platform style	800m	Conventional ART branded	No change
5P	✓	New bespoke cross-city services Integration of other services to feed bespoke ART services	Platform style	800m	Tram-style	Increased parking charges in city (as a proxy for traffic restraint measures)

2.3.17 **Option 3A**, is similar to Option 3 but with bespoke vehicle branding applied to strengthened services to distinguish ART services and the ART network from the local bus network feeding into it (as opposed to the use of wholly new and branded vehicles as assumed under Option 5). Option 3A would offer some of the benefits of Option 5 but with reduced vehicle purchase and maintenance costs, and likely reduced infrastructure costs to account for a potentially longer vehicle design (as may be required under Option 5). Under this option, the ART vision would therefore be delivered by the existing operators independently changing their current services (in combination with the infrastructure works) to deliver the ART services, likely through a BSIP (although the scale of change implied may be too great for a BSIP depending on the commercial arrangements). This will require consideration of existing services operating to identify 'candidate' services to be rebranded as part of the ART network. Also note this option does not provide new cross-city routes as per Option 5.

2.3.18 **Option 5A** is as per Option 5, except that conventional vehicles would be branded and used to operate the ART service, rather than new bespoke 'tram-style' vehicles being used. This would save on the cost of purchasing and operating these new vehicles and would ensure that existing assets can be fully utilised, but the vehicles themselves would be less distinct from other bus services and boarding and alighting times could not be reduced as would be expected with a new multi-door vehicle.

2.3.19 **Option 5P** is as per Option 5 but additional supporting traffic restraint measures are applied (an illustrative doubling of city centre parking charges has been used) to represent a range of traffic restraint initiatives.

Supporting Measures

2.3.20 Potential supporting traffic restraint measures were identified to encourage greater modal shift from car to public transport and to improve bus journey times along ART corridors. While such

[19] Assumed here as: Westhill to Bridge of Don P&R via A944 and A956, and Craibstone P&R to Portlethen P&R via A96 and A92

measures are not specifically incorporated into the ART options, their importance in ensuring the success of ART is recognised and are worthy of consideration as the ART scheme progresses. These include:

- **Parking controls:** Manage public on-street parking and off-street parking, private off-street parking and introduce a workplace parking license via the Transport (Scotland) Act 2019. It is noted however that in April 2022, in the run up to the local elections, a cross party consensus was established against implementing a workplace parking license.

- **Low traffic streets:** Implement the Sustainable Urban Mobility Plan (part of the Aberdeen City Centre Masterplan) and associated proposals to remove/reduce car traffic on key city centre streets, which will further improve bus journey times and make the city centre a more enjoyable place to walk, cycle and spend time. In addition, consider Low Traffic Neighbourhoods.

- **Low Emission Zone:** progress existing Aberdeen LEZ plans which should contribute to improved air quality, discourage private car travel to the city centre, and indirectly support public transport patronage.

- **Reduce public transport fares:** Expand the concessionary travel scheme and/or remove charges for travel by further traveller groups.

- **Congestion / road user charging**: Charge drivers for entering a defined city centre area / all roads, reducing the attractiveness of private car travel and encouraging use of ART.

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3 Smartening the Transport Planning Objectives

3.1 Introduction

3.1.1 STAG states that at the start of any Detailed Options Appraisal, the TPOs for the study should be revisited and 'SMART-ened' to ensure that they are:

- **Specific:** the TPO will say in precise terms what is sought
- **Measurable:** there will exist means to establish to stakeholders' satisfaction whether or not the TPO has been achieved
- **Attainable:** there is general agreement that the TPO can be achieved
- **Relevant:** the TPO is a sensible indicator or proxy for the change which is sought
- **Timed:** the TPO will be associated with an agreed future point by which it will have been met

3.2 Review of existing TPOs

3.2.1 TPOs have been assessed against SMART criteria and their wording SMART'-ened. This has been undertaken through discussion and agreement with Transport Scotland's BPF team. Table 3.1 shows, for each TPO set at the Case for Change stage (and used in the Preliminary Options Appraisal), the original and revised TPO alongside the appraisal method (to be utilised during the Detailed Options Appraisal) and the metric envisaged for the monitoring and evaluation of the TPO post scheme implementation. In terms of the monitoring and evaluation metrics, these are set out for both the *supply side* and *demand side* outcomes sought.

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Table 3.1: SMART-ening the Transport Planning Objectives

Original TPO	Revised TPO	Rationale for revision	Appraisal Method	Metric for Monitoring and Evaluation

TPO1: Substantially reduce public transport journey times on ART corridors	**TPO1:** Achieve average ART bus speeds on the urban sections of the ART corridors (i.e, within the Aberdeen city boundary) of at least 25kph (16mph) by 2030.	The Bus Rapid Transit Planning Guide (*Institute for Transportation & Development Policy, 4th edition*) notes that a Gold Standard BRT system speed will be roughly 20 kph in a 'downtown' area and about 25 kph on a major urban arterial. Designers of BRT systems should aim to engineer a network which can achieve average vehicle speeds of 25 kph or higher, and a similar aspiration is held for ART.
		
		From a range of existing bus timetables for services across Aberdeen covering a range of city and urban radial corridors, bus speeds (between termini) have been calculated to provide a baseline which represents typical AM / IP / PM bus speeds. Services 1, 3A, 4, 5, 23, 727 have been used to provide this baseline.
		
		From this an average daytime bus speed has been established through:
		((AM*3) + (IP*6) + (PM*3)) /12
		
		The average daytime bus speed calculated is approximately 17kph.
		
		Work to date has assumed an average public transport speed of **25kph** along the corridors. (It is noted that the 727 achieves 25kph in the early hours of the morning when there are likely to be very few passengers and no congestion, with the bus being stopped at red lights only).
			The Aberdeen Sub Area Model (ASAM19) is the main tool used in the Detailed Options Appraisal to provide quantitative outcomes to inform the appraisal.
			
			Appraisal against this TPO will be undertaken by:
			
			• Selecting the bus routes, or sections of bus routes, to be typical of each ART corridor
			• Using the ASAM19 'on-offs' file data to obtain modelled inbound and outbound AM / IP / PM bus service times and hence speeds
			• Establishing an average daytime bus speed for each corridor following the calculation:
			• ((AM*3) + (IP*6) + (PM*3)) /12
			• Undertaking this calculation for the base year and both reference case years
			• For the option appraisal, use the above services / new ART services where relevant to compare the Do Min to option tests bus speeds, and hence journey time along each of the ART corridors
				A baseline should be prior to scheme opening with a timeframe linked to a 5-year period from year of opening with interim monitoring in line with the finalised Monitoring and Evaluation Framework.
				
				For monitoring and evaluation of observed data, the following is proposed:
				
				Supply Side
				
				Use Google API data to provide data on journey times between origin-destination pairs as follows:
				
				• Using origin-destination pairs representative of each ART corridor (bus stop to bus stop)
				  ○ Bridge of Don to City Centre (North Donside Road / Ellon Road to Union Street / Market Street)
				  ○ Craibstone to City Centre (Dyce Drive / A96 to Union Street / Market Street)
				  ○ Westhill / Kingswells to City Centre (Fairlie Road / A944 to Union Street / Market Street)
				  ○ South to City Centre (tbc to Union Street / Market Street)
				• Obtain average public transport journey times across a weekday (0700-1900) based on e.g., departing every 10 minutes
				• Obtain baseline public transport journey times from year prior to any construction work
				• Obtain post project Years 1, 3 and 5 journey times for comparison
				
				Demand Side

Original TPO	Revised TPO	Rationale for revision	Appraisal Method	Metric for Monitoring and Evaluation
		Achieving 25kph assumes: • ART services travel at the speed limit i.e., 30mph (48kph) • ART services only stop at bus stops (i.e., no delay at signals) • ART bus stops are spaced at least 500 metres apart • Average bus stop dwell time is 20 seconds • The deceleration/ acceleration rate is +/- 1.5 ms^{-1} . Given this, achieving 25kph would represent a 40% increase in speed / a 40% reduction in journey time (against the 17kph average noted above).		• Screenline counts by mode in corridor
TPO2: Achieve consistent public transport journey times across the day and week in ART corridors	**TPO2:** By 2030, achieve a public transport service for which the timetables (with journey times reduced as per TPO1) are consistent across the day and the week, and where 95% of the services operate to within 5% of the timetabled journey time	The sample routes noted for TPO1 above see bus speeds reduce / journey times increase in order as follows (fastest to slowest): post PM peak, inter-peak, AM peak, PM peak. If travelling by rail, stopping patterns aside, this pattern would not be observed and the same journey times are achieved across the day, regardless of time of travel. ART aims for a more 'train like' service where the user can be confident about the journey time whatever the time of day. There is some overlap here with TPO1 but TPO1 could be achieved by not necessarily achieving TPO2 (i.e., you could reduce journey times but the	As noted above, ASAM19 is the main tool being utilised in the Detailed Options Appraisal to provide quantitative outcomes to inform the appraisal. Appraisal against this TPO will be undertaken by: • Selecting bus routes or sections of bus routes considered to be typical of each corridor. • Using the ASAM19 'on-offs' file data to obtain modelled inbound and outbound AM / IP / PM bus times for each ART corridor • Obtain data for the base year and reference case years	A baseline should be prior to scheme opening with a timeframe linked to a 5-year period from year of opening with interim monitoring in line with the finalised Monitoring and Evaluation Framework. For monitoring and evaluation of observed data, the following is proposed: *Supply Side* • Using origin-destination pairs representative of each ART corridor (bus stop to bus stop) ○ Bridge of Don to City Centre (North Donside Road / Ellon Road to Union Street / Market Street) ○ Airport / Craibstone to City Centre (Dyce Drive / A96 to Union Street / Market Street)

Original TPO	Revised TPO	Rationale for revision	Appraisal Method	Metric for Monitoring and Evaluation
		variation in journey time could still differ depending on time of travel). High frequency 'turn up and go' means that punctuality is less of an issue – it's the journey time which becomes pivotal – and consistent operation would help maintain e.g., 6-minute headways.	• For the option tests use the above services / new ART services where relevant • For the appraisal, the proportional difference between average IP and AM/PM Peak journey times will provide the metric for assessing consistency. • Where IP and peak journey times are within 5% or 2 minutes of each other, JTs are considered highly consistent. Where this difference is less than 10% or 5 minutes, JTs are considered moderately consistent.	○ Kingswells to City Centre (Fairlie Road / A944 to Union Street / Market Street) ○ South to City Centre (tbc to Union Street / Market Street) *Demand Side* • Screenline counts by mode in corridor
TPO3: Make travel on ART corridors fully accessible to all	Remove	Ensuring the full end-to-end ART-based journey is accessible to all and that there is equality in the transport network is integral to the ART vision. This TPO had been designed to reflect that. However, after discussion it was agreed to remove the TPO, recognising that the key issues in relation to accessibility will be picked up through the STAG criteria appraisal for Equality and Accessibility.	N/A	N/A
TPO4: Improve the perception of quality of bus travel on ART corridors	**TPO3:** Improve the perception of quality of bus travel on ART corridors by 2030 Now TPO3.	The Case for Change noted poor public perceptions of bus travel including poor perceptions of reliability, quality bus stop infrastructure, and vehicle security at the Park & Ride sites. All of the above problems feed into some having a poor public perception of bus travel and that travel by bus is a low-quality travel option. There is a perpetual negative perception of bus travel amongst a cohort of the population leading to a reluctance to use the bus, and the image	In order to provide a quantitative appraisal methodology to this TPO, a matrix based appraisal approach is proposed. In line with WebTAG, Table M.3.2.1 (Segmented value of bus quality interventions), the following quality measures will be appraised and scored for both the Do Minimum and options to provide a level of improvement against this TPO:	A baseline should be prior to scheme opening with a timeframe linked to a 5-year period from year of opening with interim monitoring in line with the finalised Monitoring and Evaluation Framework. For monitoring and evaluation of observed data, the following is proposed: *Supply Side*

Original TPO	Revised TPO	Rationale for revision	Appraisal Method	Metric for Monitoring and Evaluation
		of bus travel needs to be improved (by reducing or removing the problems above) to address this and increase modal share for public transport. This is considered an important factor in getting non-bus users to change their travel habits and increasing modal shift by public transport. The ART will provide a step change in public transport in the city, and this includes improving the quality and image of public transport to encourage modal shift. This TPO is seen as important in this regard.	• Security (CCTV) at stops • Security (CCTV) on buses • Climate control in buses • Audio announcements in buses • Waiting shelters • Accessibility of vehicles • Interchange facilities • On-board screen displays • Real time information • Simplified ticketing • Trained drivers • Branding (quality image)	Audit of bus services in corridor against quality criteria *Demand Side* • Aberdeen city and shire 'panel' surveys • Passenger numbers and surveys • Screenline counts by mode in corridor
TPO5: Integrate ART services with all transport across the region and urban realm improvements	Remove	This TPO is about the integration of the new ART network with the existing transport network in the region and reflects the ongoing nature of urban realm improvements within the city, most notably within the City Centre Masterplan area. However, after discussion it was agreed to remove the TPO, recognising that the key issues in relation to integration with other modes will be picked up through the STAG criteria appraisal.	N/A	N/A

3.2.2 The final TPOs set for the study are therefore:

- **TPO1:** Achieve average ART bus speeds on the urban sections of the ART corridors (i.e, within the Aberdeen city boundary) of at least 25kph (16mph) by 2030
- **TPO2:** By 2030, achieve a public transport service for which the timetables (with journey times reduced as per TPO1) are consistent across the day and the week, and where 95% of the services operate to within 5% of the timetabled journey time
- **TPO3:** Improve the perception of quality of bus travel on ART corridors by 2030

4 Option Development

4.1 Introduction

4.1.1 To provide sufficient detail to enable informed appraisal (including modelling), further work was undertaken to develop the options prior to the appraisal. This has focussed on:

- **Development of the ART network**: Consideration of the potential ART routes and a high-level evaluation of these to compare potential patronage. Development has also been undertaken around the various forms interchange may take between and onto ART services.
- **Form of ART services**: Consideration of service routeing
- **Infrastructure**: Defining the more precise nature of the infrastructure required for ART – through an understanding of the potential for bus priority along the main arterial routes into Aberdeen
- **Stops:** through consideration of the requirements for both existing and new ART stops along the ART corridors
- **Integration with existing services**: specifically, under Options 3, 3A and 5 where existing bus services have been considered and where appropriate integrated into the ART network to generate a more coherent and robust city-wide public transport network
- **Vehicles:** through consideration of the advantages and disadvantages of various potential forms for the ART vehicles
- **Ticketing:** consideration of the potential forms of ticketing required, and desired, under the various ART options and the advantages and disadvantages of differing ticketing methods including revenue protection

4.1.2 It is worth re-noting that Options 2, 3 and 3A seek to **enhance existing services** to promote an ART network, whereas Options 5A, 5 and 5P provide **wholly new ART services**.

4.2 ART Routes

4.2.1 Chapter 4 of the Preliminary Options Appraisal report included a high-level analysis of likely ART journey times, the potential demand catchment and patronage for ART, and from this an initial 'viability 'analysis. The analysis was undertaken based on an ART network broadly as indicated in the *Aberdeen Rapid Transit - Our Vision* document produced by Nestrans (and shown in Figure 4:1). For the purposes of this early analysis, this broadly encompassed two ART routes:

- **West to North** route: Kingswells Park & Ride to Bridge of Don Park & Ride (assumed for the purposes of the analysis undertaken that the route was via the A944)
- **North-West to South** route: Craibstone Park & Ride to planned Portlethen Park & Ride (via A956 – Wellington Road)

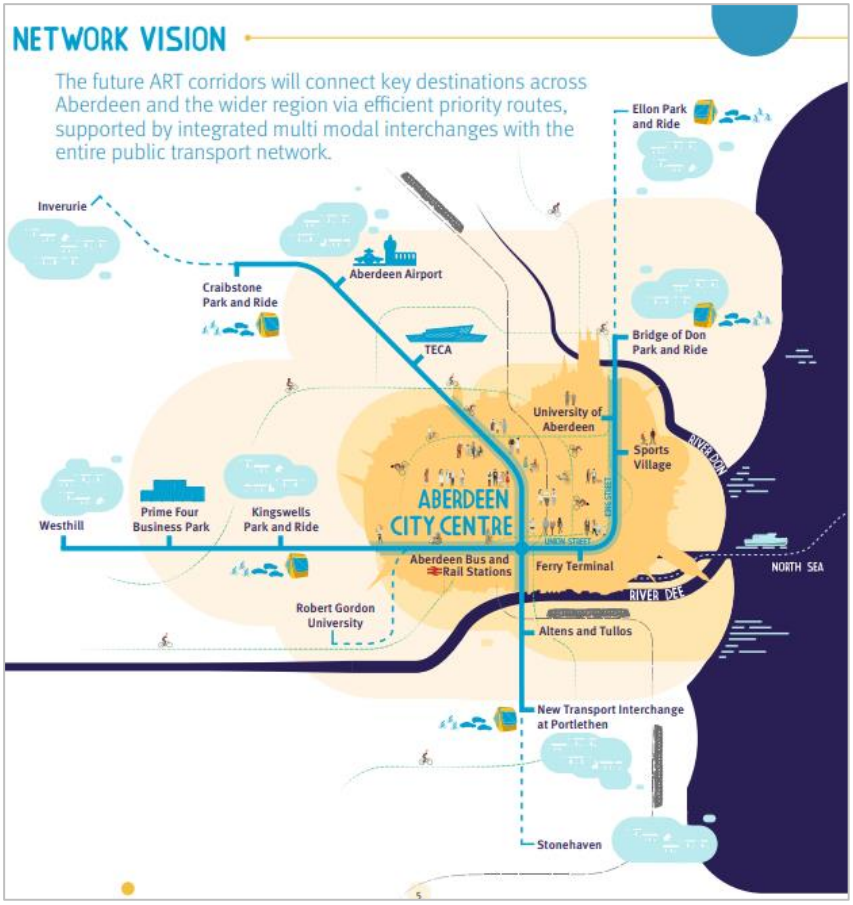

Figure 4:1: ART Vision Network

4.2.2 The network and services assumed for the purposes of this initial analysis were most akin to Option 5, and the network and services which most closely match the ART Vision.

4.2.3 At Detailed Options Appraisal stage this work was expanded to identify and compare the range of network forms (service and route combinations) and the patronage and the viability of ART under the various network and service permutations.

4.2.4 The Detailed Options Appraisal requires more quantitative information to inform the appraisal. The modelling of the options (using the Aberdeen Sub Area Model (ASAM19), a strategic transport model covering Aberdeen and Aberdeenshire) has been an integral component to this end.

4.2.5 Recognising that not all network permutations could be modelled as part of the appraisal (due to time and budget constraints), the initial analytical work (discussed below) provided a guide as to the most appropriate ART network to take forward to the ASAM19 modelling work, which modelled the remaining options all on the same single network in terms of priority infrastructure and service routeing. Modelling all options across the same ART 'network' enabled comparison between options to provide an indication of how the options performed all other things being equal. Note however that **this is not to say that the network chosen for modelling in ASAM is the preferred network, just that it is considered at this stage the most appropriate network on which to undertake robust testing**.

ART Routes – Initial Route testing (to inform modelling)

4.2.6 Eleven network tests were identified to support analysis of the ART network and how the ART network infrastructure could affect demand and service viability. These tests are summarised

in the table below. Supporting Technical Note B contains the full details of the testing undertaken, including the methodology employed.

4.2.7 The tests considered:

- Options for routing to the west:
  - A944 or A9119
  - Network extending to Kingswells Park & Ride or further west to Westhill
- Options for routeing to the south:
  - A956 (Wellington Road) or A9013 (Holburn Street) / A92
  - Network extending to a new Park & Ride site north of Portlethen, to Portlethen itself, or to Robert Gordon University (RGU)

4.2.8 Test R2, as shown in the table below, aligns most closely with the ART Vision document. Where proposed corridors deviate from Test R2, these changes are highlighted in orange for clarity.

Table 4.1: ART Tests

Test	Corridors	Purpose of Test
R1	Kingswells P&R to **Union Street** via A944	Test four sperate ART routes (one on each corridor) connecting in the city centre, on corridors highlighted in Vision Document.
	Bridge of Don P&R to **Union Street** via A90	
	Craibstone P&R to **Union Street** via A96	
	Portlethen P&R to **Union Street** via A956	
R2	Kingswells P&R to Bridge of Don P&R via A944 + A90	Combination of corridors identified under Test R1 to create two separate ART routes, which cross in the city centre.
	Craibstone P&R to Portlethen P&R via A96 + A956	
R3	Kingswells P&R to Bridge of Don P&R via **A9119** + A90	Variation on Test R2 to gauge comparative benefits of routeing western corridor along A9119.
	Craibstone P&R to Portlethen P&R via A96 + A956	
R4a	Kingswells P&R to Bridge of Don P&R via A944 + A90	Variation on Test R2 to gauge comparative benefits of routeing southern corridor along A92.
	Craibstone P&R to Portlethen P&R via A96 + **A92**	
R4b	Kingswells P&R to Bridge of Don P&R via A944 + A90	Variation on Test R 4a to gauge comparative benefits of extending southern corridor (A92) to Portlethen town.
	Craibstone P&R to **Portlethen town** via A96 + **A92**	
R5	**Westhill** to Bridge of Don P&R via A944 + A90	Variation on Test R2 to gauge comparative benefits of extending western corridor to Westhill.
	Craibstone P&R to Portlethen P&R via A96 + A956	
R6	Kingswells P&R to Bridge of Don P&R via A944 + A90	Variation on Test R2 to gauge comparative benefits of extending southern corridor (A956) to Portlethen town.
	Craibstone P&R to **Portlethen town** via A96 + A956	
R7	Kingswells P&R to Bridge of Don P&R via A944 + A90	Variation on Test R2 to gauge comparative benefits of routeing southern corridor along A9013 and terminating at RGU Garthdee.
	Craibstone P&R to **RGU Garthdee** via **A9013**	

Test	Corridors	Purpose of Test
R8	Kingswells P&R to Craibstone P&R via A944 + A96	Alternative combination of corridors identified in Test R1.
	Bridge of Don P&R to Portlethen P&R via A90 + A956	
R9	Kingswells P&R to Portlethen P&R via A944 + A956	Alternative combination of corridors identified in Test R1.
	Craibstone P&R to Bridge of Don P&R via A96 + A90	
R10	Westhill to Bridge of Don P&R via A944 + A90	Combination of West to North route identified under Test R5 with North-West to South route identified under Test R4a.
	Craibstone P&R to Portlethen P&R via A96 + A92	

4.2.9 The analysis undertaken, as presented in Supporting Technical Note B, considered potential 'in catchment' demand and from this, potential ART patronage and hence revenue, and then using estimates of operational costs for each route, the 'viability' of each network test was considered.

4.2.10 The outcome of the testing highlighted that:

- the greatest revenue is expected under Test R10 – with two ART services routeing on Westhill to Bridge of Don Park & Ride via A944 + A90 and Craibstone Park & Ride to Portlethen Park & Ride via A96 + A92
- the tests with the lowest operating costs are:
  - Test R7 – with two ART services routeing on Kingswells Park & Ride to Bridge of Don Park & Ride via A944 + A90; and Craibstone Park & Ride to RGU Garthdee via A96 + A9013
  - Test R8 – with two ART services routeing on Kingswells Park & Ride to Craibstone Park & Ride via A944 + A96 and Bridge of Don Park & Ride to Portlethen Park & Ride via A90 + A956
  - Test R2 – with two ART services routeing on Kingswells Park & Ride to Bridge of Don Park & Ride via A944 + A90 and Craibstone Park & Ride to Portlethen Park & Ride via A96 + A956
- the most *operationally* 'profitable' combination of ART corridors would be Test R7 - with two ART services routeing on Kingswells Park & Ride to Bridge of Don Park & Ride via A944 + A90; and Craibstone Park & Ride to RGU Garthdee via A96 + A9013. Of the other tests, Test 8 performed well, with both Tests R7 and R8 returning a positive value for ticket revenue minus operations costings. This was achieved under the scenario where services were assumed to run at a 10-minute frequency (but not at the 6-minute frequency).

4.2.11 Based on the testing undertaken, it was agreed that, given Test R10 closely reflects the Vision document and also was the option with the highest estimate of catchment demand, and hence revenue, that this test network would be the network used within ASAM19 for the more detailed option testing.

Interchange between ART Services

4.2.12 For an effective rapid transit system, it is important that travellers can interchange quickly and easily between services, and so careful consideration has been given to identifying a suitable location for ART interchange, between ART services and between other services and the ART network. This applies to Options 5, 5A and 5P only and consideration has been given

specifically to interchange within the city centre. It is assumed that bus routes and stopping patterns would remain as they are at present under Option 2, although improvements to existing stops on the ART corridors is assumed.

4.2.13 Good practice involves the provision of high-quality bus stopping infrastructure on each side of the road with a high-quality crossing point in between. Given that two bi-directional high frequency services will meet at this interchange point, it is suggested that each stop should be capable of accommodating two buses and that dual stops should be provided for each service (i.e., space to accommodate up to 4 vehicles simultaneously). The space required to accommodate these vehicles will vary between options. Options 5 and 5P assume that new high-capacity multi-door vehicles may be used on the ART routes measuring potentially 18 metres in length. Options 3, 3A and 5A assume that ART routes will be served by 'conventional' buses similar to those currently operating across the city, of approximately 13.5m in length.

4.2.14 Three broad locations have been identified for interchange between ART services:

- Union Street between Market Street and Broad Street
- Union Street on either side of Market Street junction
- Union Square Bus Station

Union Street between Market Street and Broad Street

4.2.15 The figure below illustrates the potential arrangement of an ART interchange on Union Street, east of Market Street.

Figure 4:2: Union Street Interchange between Market Street and Broad Street

4.2.16 Further detailed design work will be needed to fully design and clarify supporting traffic control requirements at the junctions with Adelphi and Flourmill Lane.

4.2.17 This location has the benefit of being immediately adjacent to the main shopping avenues through Aberdeen, sitting between the Bon Accord / St Nicholas Centres and Trinity Centre / Union Square. The section of Union Street to the east of Market Street is quieter in terms of pedestrian volumes than the western section, which can become quite congested during busy shopping periods. This should support a more comfortable waiting environment.

4.2.18 Under CCMP proposals, Market Street will also be closed to general traffic, which will allow the widening of footways and the narrowing of Union Street for traffic. This should also permit a reduction in cycle times at the pedestrian crossing compared with the existing situation, enhancing road safety.

Union Street on either side of Market Street junction

4.2.19 Figure 4:3 illustrates the potential arrangement of an ART interchange on Union Street, if stops were placed either side of Market Street.

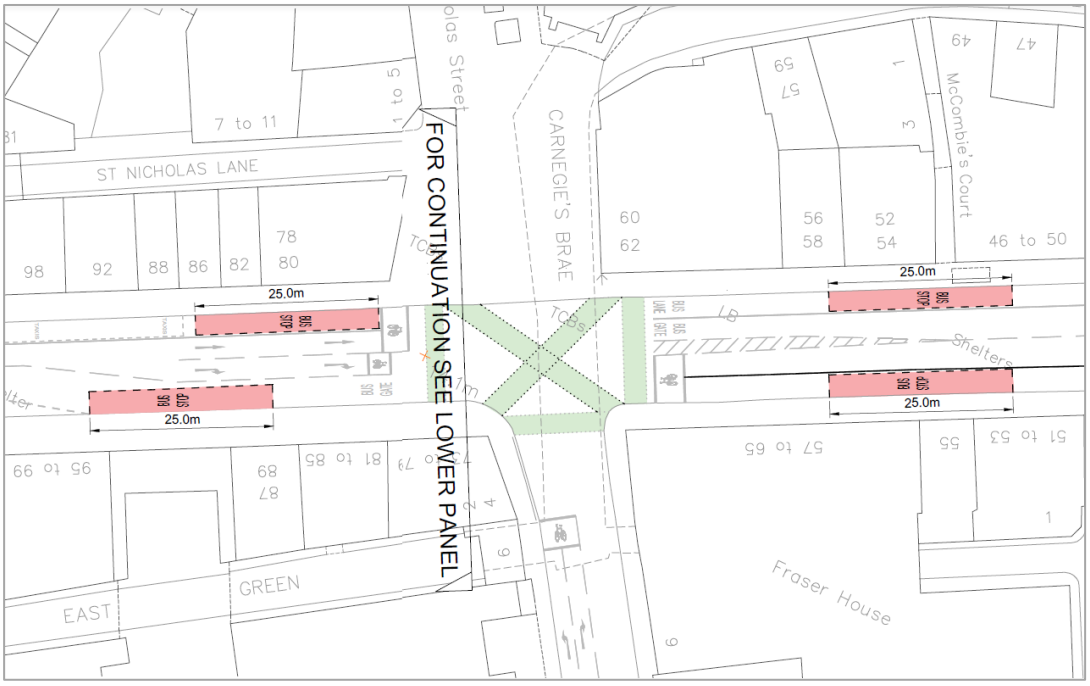

Figure 4:3: Union Street Interchange either side of Market Street

4.2.20 This arrangement would place paired bus stops either side of the Union Street / Market Street junction, with the pedestrian crossing at the same junction supporting movement between stops. This is not an ideal arrangement as travel distance between stops would be greater than under the above alternative and more crossing activity would be necessary to accommodate interchange between westbound and southbound services.

Union Square Bus Station

4.2.21 A final alternative would be to provide interchange between ART services at Union Square Bus Station. The extent of works needed to accommodate ART interchange at the bus station will depend heavily on whether standard conventional buses are used or whether more tram-style longer multi-door vehicle buses are used, as per Options 5 and 5P.

4.2.22 Under Option 5A, the bus station should be able to continue to operate in much the same way as it does at present. While a high frequency ART service would increase demand for stances at the bus station, it is assumed that the integration of existing bus services into the ART network would free up some capacity to balance out.

4.2.23 However, under Options 5 and 5P, Union Square Bus Station would require redesign to accommodate frequent movements by new tram-style buses, which do not have the same capacity to make the reversing manoeuvres needed to egress bus stances at the existing bus station. The figure below provides an illustration of a theoretical alternative arrangement for

the bus station; however, this is only a high-level suggestion at this stage and would require careful consideration in tandem with bus operators.

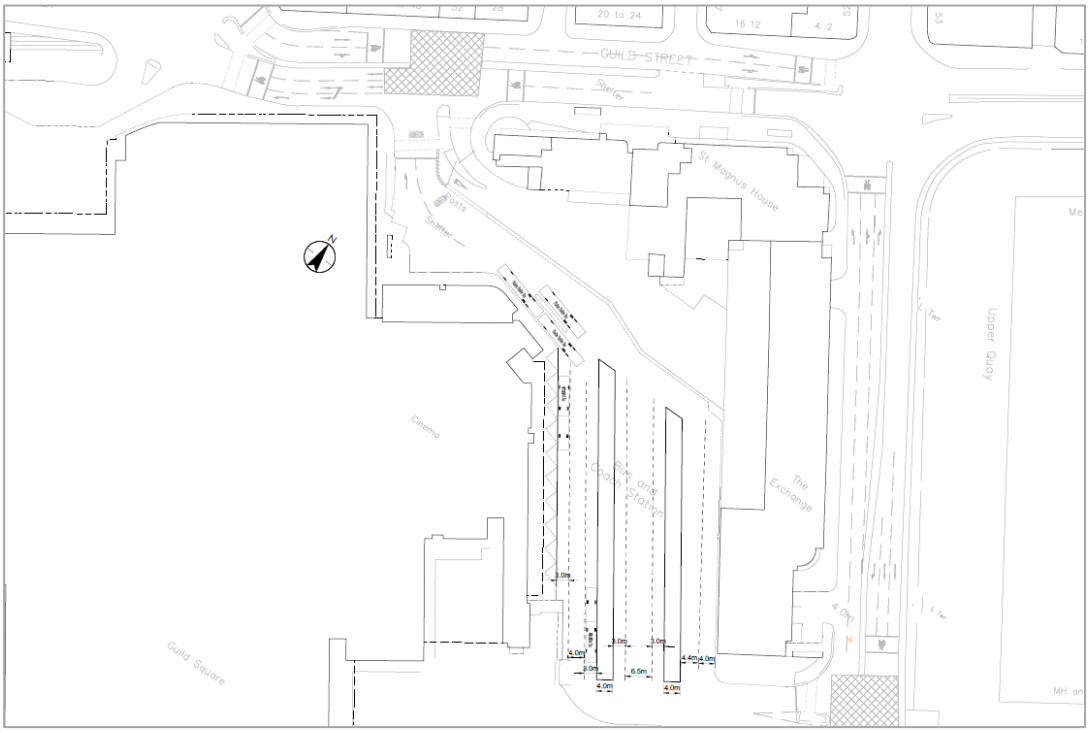

Figure 4:4: Union Square Bus Station Interchange

4.2.24 If it were not possible to redesign the bus station in this way, a further alternative would be to provide interchange on Guild Street, but this would require closure of the Guild Street access to the bus station.

4.2.25 At Union Square Bus Station, ART users could interchange with other local bus services, and there would be direct off-road access to Union Square Shopping Centre and Aberdeen Train Station. Additionally, the bus station is located directly opposite Aberdeen Ferry Terminal, easing travel for those headed to/from Orkney and Shetland.

4.2.26 While interchange at Union Square Bus Station would provide more direct interchange with a wide range of bus and rail services, it would also involve a diversion to ART services and closer interaction with other bus services, incurring a small time penalty.

Preferred Interchange Option

4.2.27 Interchange on Union Street between Market Street and Broad Street is considered the most appropriate option on balance, as this location sits directly on ART routes, between the substantial trip generators of the Bon-Accord/St Nicholas Centres, and Trinity Centre/Union Square, and does not require reconfiguration of the Bus Station. Under all options, there will be connecting (existing) services linking to the bus/train station to the south. Additionally, the Aberdeen City Centre Masterplan and associated Sustainable Urban Mobility Pan include plans to improve connectivity between Union Street and Union Square through the Merchant Quarter to make a much nicer pedestrian route. There are also proposals as part of the Market redevelopment to consider a lift between Guild Street and Union Street to address the level difference.

4.3 Form of the Service

4.3.1 In terms of service provision, ART will take one of two broad forms:

- higher frequency versions of selected existing services on ART corridors, i.e., enhanced existing services (Options 2, 3 and 3A)
- new ART services (Options 5, 5A and 5P)

Enhanced Existing Services

4.3.2 Under Options 2, 3 and 3A, key existing services have been identified which would benefit significantly from new ART corridor bus priority infrastructure. It is envisaged that service frequency on the following routes would be increased to provide a service every six minutes (i.e., a 'turn-up and go' frequency). These services are:

- Stagecoach 727: Aberdeen Airport to Union Square Bus Station
- Stagecoach 14: Kingswells Village to Union Square Bus Station
- Stagecoach 7B: Stonehaven to Aberdeen Union Square Bus Station (service frequency assumed to increase from Portlethen Park and Ride, not Stonehaven)

4.3.3 There are no proposals to strengthen services on the A92 between Bridge of Don Park & Ride and Aberdeen city centre as there is already a sufficient frequency of services (i.e., >10 services per hour) operating along this section.

New ART Services

4.3.4 For the purposes of the appraisal, new ART cross-city services (are assumed to operate between Bridge of Don Park & Ride and Westhill, and between Craibstone Park & Ride and a new Park & Ride site at Portlethen, as per the ART vision. This routeing was also shown to be the best performer in the initial service permutation testing (discussed in Section 4.2). These new services are assumed under Options 5, 5A and 5P and would operate with a 'turn up and go' frequency (a service every six minutes).

4.4 Infrastructure

4.4.1 As noted previously, the multi-modal corridor studies are progressing infrastructure options for improving bus priority along the main arterial routes in Aberdeen. As such, in terms of the assumed public transport priority infrastructure required to facilitate ART, all options assume the same physical infrastructure (with the exception of bus stops) is in place, and assume:

- Maximised priority along the ART corridors, including dedicated bus lanes and priority at signals where possible
- Reallocation of road space from general traffic to public transport to facilitate the above
- Construction of a new Park & Ride facility to the north of Portlethen, by Findon junction

4.4.2 Further infrastructure is assumed on the ART corridors in terms of the upgrading of bus stops – either upgraded existing bus stops or wholly new ART 'platforms', dependent on the option. Options 2 and 3 which focus on enhancing existing services on ART corridors assume upgraded existing bus stops, whereas Options 3A, 5, 5A and 5P include new 'ART 'platforms'.

4.4.3 Detail on the infrastructure assumed along each corridor can be found in Supporting Technical Note F, which discusses the infrastructure costs for the options. It should be noted that **as the multi-modal corridor studies were still ongoing, the infrastructure assumed to derive costs for this report, and which was that coded into the ASAM19, was the best available at the time of writing based on the available plans and information at that time**, gained through discussion with the consultants and council involved in the various corridor studies.

4.5 Platforms / Stops

4.5.1 In terms of stops on ART routes, there are two broad scenarios:

- Existing stops on ART corridors undergo basic upgrade (Options 2 & 3):
  - Bus stop clearways are protected by a Traffic Regulation Order that is fully enforceable and keeps the bus stop clear of parked vehicles at times when buses operate (ideally this should cover a 24 hr period, 7 days a week to improve compliance)
  - The boarding point should be located beyond the bus stop flag to support those who are visually impaired
  - Bus stop kerb heights will allow level boarding
  - Boarding/alighting zones are clear from street furniture or other obstacles and will be indicated using tactile paving as appropriate.
  - Bus shelters provide a good level of protection against the weather
  - Waiting passengers have clear visibility of oncoming traffic
  - Bus shelters are well lit and be exposed to high levels of natural surveillance
  - Bus shelters will contain suitable seating arrangements for waiting passengers
  - Easy to understand real-time information about bus routes, destinations and service arrival times is provided at all stops
  - Bus stops are clean and well-maintained
- Bus stopping locations are rationalised on ART corridors (800m spacing) and new premium ‘platform’ ART stops are installed (Options 3A, 5, 5A and 5P). These ‘platforms’ will feature:
  - Modern, distinctive and attractive design, which makes the platforms easy to locate on a street environment and reinforces the ART branding
  - Spacious, weather protected shelters, which provide a comfortable waiting experience for ART users
  - Infrastructure constructed from high quality materials which inhibit vandalism and require cleaning/maintenance in line with what the transport authority can reliably provide
  - Internal and external lighting, CCTV and a ‘one button’ security system which allows platform users to contact a security attendant

- Ticket machines / advance fare collection to support speedy boarding (although such machines may not be necessary given advances in payment mechanisms with potential for contactless self-service ticket machines on the vehicles rather than at the stops)
- Suitable seating arrangements for waiting passengers
- Real-time service information, including dynamic messaging which can provide warnings/additional information to passengers as required
- Bicycle storage and/or access to bike share
- ART branding and a unique name for each stop/stop pair

4.5.2 A visualisation of an ART 'platform' from the vision document is shown in the figure below.

Figure 4:5: Visualisation of an ART Platform (Nestrans)

4.5.3 Examples of similar 'platforms' in place for existing bus rapid schemes are shown in the figures below for the Belfast Glider and Birmingham Sprint Schemes.

Figure 4:6: Birmingham Sprint Bus Stop (photos courtesy of Transport for West Midlands)

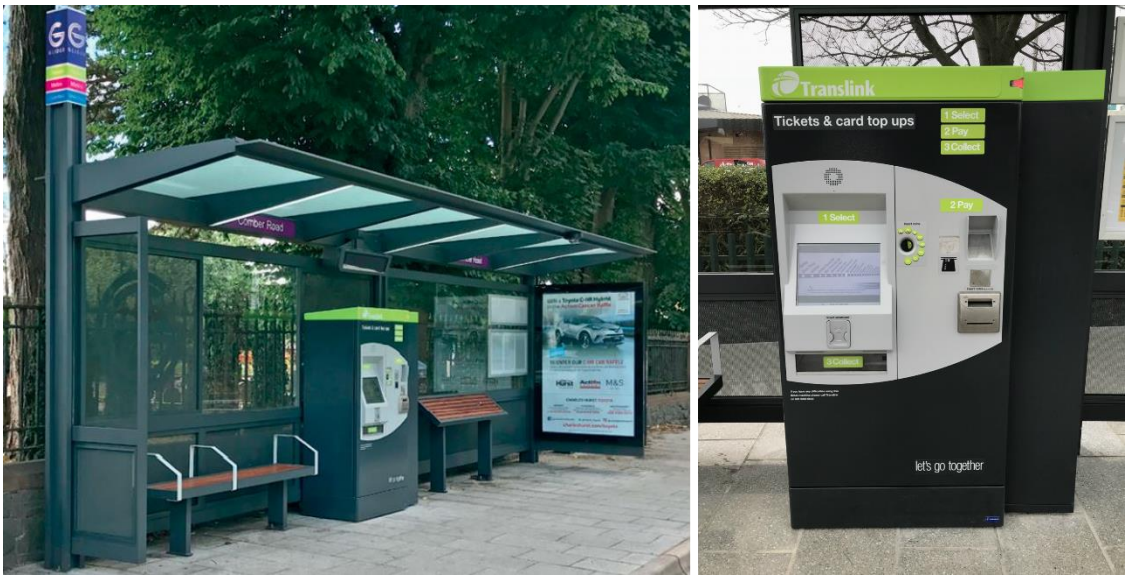

Figure 4:7: Belfast Glider Stop (photo courtesy of Translink)

4.5.4 The upgrading of an existing stop along the ART corridor or the introduction of a new ART 'platforms' have differing costs, as incorporated into the ART infrastructure costs presented in Supporting Technical Note F, depending on the option. Constructing a new ART platform carries a greater cost than upgrading an existing bus stop. However, as along an ART corridor, the number of existing bus stops to be upgraded is greater than the number of new ART platforms (given the greater spacing between stops), the cost differential between options which differ in this way is not significant.

4.6 Integration with Existing Services

4.6.1 If ART is to be part of an integrated and efficient city-wide bus network, changes will be required to existing bus routes and services to minimise the duplication of services and associated operating costs and 'bus congestion', while maximising the potential for a commercially viable ART network.

4.6.2 All options except Option 2 include proposals for the revision of existing bus services which run along ART corridors. Proposals for Options 3 and 3A are somewhat different from those

for Options 5 and 5A, given that 3 and 3A involve the enhancement of existing bus services, whereas Option 5, 5A and 5P comprise the provision of a new ART service which will essentially replace the services enhanced under Options 3 and 3A. For the purposes of option modelling within this appraisal, the analysis undertaken to consider this has been developed for Option 5, 5A and 5P (see Chapter 5).

4.6.3 A detailed discussion of how the existing network has been considered, and the existing network revisions used within the testing of Options 5, 5A and 5P as part of the appraisal, is presented in Supporting Technical Note C. The main steps undertaken were:

- Analysis of the existing bus network, considering the role of existing intra-urban and inter-urban bus services
- Mapping of all existing bus stops served by current services
- Route Assessment – consideration of existing bus routeing to identify routes that overlapped or ran closely with proposed ART services. Depending on the extent of the overlap or parallel running, these services were identified as candidates for:
    - Retention of the route
    - Removal of the route
    - Cutting-back or shortening of the route
    - Extending the route
    - Increased service frequency

4.6.4 The initial route assessment was evidenced through the use of the ASAM19 model. While Option 4 was sifted out at the end of the Preliminary Options Appraisal, it has been modelled to provide outputs to inform the services to be used in the modelling of Options 5, 5A and 5P. Option 4 included new ART services ‘layered’ on top of the existing bus network, with no changes to the underlying network - the outputs from the modelling of Option 4 therefore identify the existing services most at risk of ‘abstraction’. This was used to determine how the underlying bus network can be adapted, and hence modelled appropriately, in Option 5. An assessment was then undertaken to understand how potential changes to existing services would affect people’s ability to catch a bus. This was used to sense check and refine the route assessment work and make sure the combined changes did not leave areas without a bus service or with a significantly reduced service compared to the current provision.

4.6.5 The table below sets out the outcome of the assessment. More detailed information alongside the rationale for all proposed changes based on the route and bus stop connectivity assessment, is presented in Supporting Technical Note C, and includes:

- ART services operating along the proposed ART corridors with a ‘turn up and go’ frequency and bus platform spacing of approximately 800 metres. All other bus stops on the ART corridor are to be removed, for the purpose of this exercise
- The ART platforms would serve all bus services that pass the stops including those on city and long distance routes (assuming these buses are standard low floor configuration – in terms of access)
- Long distance routes will continue to serve their existing bus stops outside the ART network for the purpose of this exercise
- The removal of nine city routes, for the purpose of this exercise

- The cut-back or shortening of 2 city routes
- An increase to the service frequency of Route 11 from 2 to 6 buses per hour to compensate for the removal of Routes 5, 6 and 23
- The extension of the ART route from the Craibstone P&R to the Airport (non-stop) via Airport Way and Argyll Road using the existing stops on Brent Road (currently used by X27) as the terminating and first stops
- A new bus route connecting Westhill, Kingswells, Sclattie Park and the Kirkhill Industrial Estate to mitigate the loss of bus services in these areas[21]. It is proposed the routes operate 4 buses per hour (7-10am and 4-7pm) and 2 buses per hour (10am-4pm). It is proposed that this route operates along the following roads using existing bus stops unless stated

4.6.6 **It should be noted that this exercise does not seek to establish the exact nature of any changes to the underlying bus services if ART were implemented. This analysis has helped establish an illustrative bus network for the purposes of modelling and testing Option 5. The work has also fed into an understanding of the potential commercial implications to bus operations. The precise nature of changes that may be required to the existing network needs greater consideration as the ART project progresses.**

Table 4.2: Proposed existing network services changes - Summary

Service	Change (for ASAM testing purposes)	Comment
1B	*Removed*	*Remove due to significant overlap with A956 (N) ART services*[22]
3/ 3A	Cut-back	Remove Mastrick - City Centre section. Retain Cove - City Centre
3G	Cut-back	As above for Route 3/ 3A
5/ 5A	Remove	Remove due to significant overlap with A944 ART services
6/ 6A	Remove	Remove due to significant overlap with A944 ART services
7/ 7B	*Remove*	*Remove due to significant overlap with A92(S) ART services*
8/ 8A	Cut-back	Remove ARI - City Centre section. Retain Cloverhill - Persley - City Centre
11	Increase	Increase to 6 buses/hr in each direction Frequency of Route 11A remains the same
14	*Remove*	*Remove due to significant overlap with A944 ART services*
17/ 17A	Remove	Remove due to significant overlap with A96 ART services
20	Remove	Remove due to significant parallel with A956 (N) ART services
23	Remove	Remove due to significant overlap with A96/ A944 ART services
727	*Remove*	*Remove due to significant overlap with A96 ART services*
X27	Remove	Remove due to significant overlap with A96 ART services

[21] Although this new route operates orbitally, opposed to the radial routes it is intending to replace, the route would include good connections to ART operating on the A944 and A96, allowing bus users to interchange for trips to and from the city centre.

[22] Services shown in italics would not be removed but strengthened in Options 3 and 3A.

4.7 Vehicles

4.7.1 In terms of vehicles which could operate on the ART network, there are three broad scenarios:

- Existing vehicles (or those as would be brought into service through natural cycles of operator fleet upgrades) are used, with no change to appearance (Options 2 & 3)
- Existing vehicles (or those as would be brought into service through natural cycles of operator fleet upgrades) are used, and are branded to indicate that they are part of the ART network (Options 3A and 5A)
- New, bespoke, multi-door tram-style vehicles are used (Options 5 and 5P)

Existing Vehicles

4.7.2 Under Options 2 and 3, selected bus routes operating on the ART corridors would see more frequent services on the enhanced bus priority infrastructure. These services would continue to be operated using existing vehicles, which would be upgraded in line with the natural cycles of operator fleet upgrades.

4.7.3 It should also be noted that buses across both First and Stagecoach's fleets in Aberdeen are already progressing towards zero emissions. In 2021, First Bus announced their commitment to purchase no diesel buses after 2022 and to operate a fully zero-emission fleet by 2035. Further to a successful application to the Scottish Zero Emission Bus (ScotZEB) Challenge Fund, First Aberdeen will be introducing 24 single deck electric vehicles in the city in Spring 2023, and they have also lodged plans to overhaul their King Street depot to accommodate up to 148 electric vehicles. In September 2021, Stagecoach announced a £11.2 million investment in 22 electric buses for Aberdeen, supported by £4 million from the Scottish Government Ultra-Low Emission Bus Scheme. These zero-emission buses are now operational on the 59 and 727 bus routes, and Stagecoach has confirmed an order of a further 13 electric buses following a successful ScotZEB application.

Branded existing vehicles

4.7.4 Branding vehicles on strengthened existing or new routes (as proposed under Options 3A and 5A) would generate an ART 'brand' awareness and provide visual distinction of the services from existing services. This likely to raise awareness and positive perceptions around the service offering.

Bespoke ART vehicles

4.7.5 It is clear through review of BRT schemes elsewhere that multi-door vehicles are an essential element in ensuring scheme success due to the significant part such vehicles play in reducing dwell times at stops through enabling large numbers of passenger to board and alight simultaneously and by removing the need for interaction with the driver.

4.7.6 For the purpose of the appraisal, it has been assumed that in Options 5 and 5P, the vehicles operating on the ART routes are similar to those employed on the Belfast Glider system, which operate with 18m tram-style Van Hool ExquiCity[23] articulated buses and are as shown in the figures below.

[23] Exqui.City18 Electric | Van Hool

Figure 4:8: Belfast Glider tram-style vehicle at stop (Photo courtesy of Translink)

Figure 4:9: Belfast Glider tram-style vehicle - interior (Photo courtesy of Translink)

4.7.7 Each Glider vehicle operates with three doors, and the vehicles:

- utilise a mixture of seating and standing, with designated space for wheelchairs and prams
- have free wifi and USB charging sockets
- display real-time visual and audible information
- are covered by on-board security CCTV

4.7.8 While the Van Hool ExquiCity vehicles operating on the Glider utilise the best available low-emission technology in terms of value-for-money, which is currently diesel-electric hybrid engines, it is assumed for ART that due to technological advances, the vehicles will use zero-emission technology.

4.7.9 It is noted that significant infrastructure changes may be required at the depots of the chosen operators for overnight fuelling and/or recharging as well as for undertaking preventative maintenance and presentation (cleaning) activities of the new fleet of vehicles.

4.8 Ticketing

4.8.1 The options available for ticketing and fares collection on the ART system have been considered, alongside the benefits, shortcomings and risks of each. The detailed discussion is presented in Supporting Technical Note D and covers the price and range of ticketing products offered, as well as the means of purchase, method of payment, validation process, eligibility criteria, physical form and relationship with other tickets/systems.

4.8.2 Conclusions drawn from the discussion include:

- **Pricing** - it is recommended that ART is **not priced as a premium product**, principally because it is anticipated that there will be instances where ART replaces existing services, and it would not be appropriate for those users' fares to rise when they do not have an alternative (cheaper) service

- **Structure** - it is recommended that pricing follows latest best practice in the bus industry with **simple fare scales, multiple options for ticket duration and specific products aimed at key user groups**. The need to balance affordable fares with avoiding interference with individual operator tickets is important

- **Purchase** – in terms of the options for payment and purchase arrangements, it is recommended that advantage is taken of the latest developments in **electronic ticket system technology** while maintaining **accessibility for users who rely on cash**

4.8.3 Further work is required at the next stage in scheme development to more fully consider the ticketing mechanism adopted.

5 Detailed Options Appraisal

5.1 Methodology

5.1.1 In line with the revised (February 2022) STAG, the Detailed Options Appraisal has encompassed appraising each of the options against:

- TPOs
- STAG Criteria:
- Environment
- Climate Change
- Health, Safety and Wellbeing
- Economy
- Equality and Accessibility
- Cost to Government
- Public Acceptability
- Risk and Uncertainty

5.1.2 All elements have been appraised again the STAG seven-point scale as shown in Table 5.1.

Table 5.1: STAG seven-point scale

Major Negative Impact	Moderate Negative Impact	Minor Negative Impacts	No Impact	Minor Positive Benefit	Moderate Positive Benefit	Major Positive Benefit
xxx	xx	x	-	✓	✓✓	✓✓✓

5.1.3 The information contained within the appraisal table has been developed through consideration of:

- **Existing studies** – drawing on multi-modal corridor study appraisals undertaken to date
- **Benchmarking & case studies** – this has been particularly appropriate e.g., where step changes are made to the availability and quality of bus network
- **Professional knowledge and consensus** – through various internal workshops, where the option impacts have been fully considered by the entire appraisal team
- **Quantitative analysis**, including the following elements:
  - **Preliminary Catchment and Viability Analysis** - Supporting Technical Note B
- **Transport modelling** - Supporting Technical Note C, using the Aberdeen Sub-Area Model 2019 (ASAM19). Given the scale of the impacts of the options, various modelling

methodologies were explored to enable the impacts to be understood, recognising the potential for wider strategic re-routeing due to the options. Using ASAM19:

- Provides an understanding of the general traffic re-routeing impacts across a much larger area (than e.g., local junction modelling could provide) – this is important given the scale of the proposed options and network
- Provides a more quantitative understanding of the modal shift impacts and other behavioural responses associated with the options via the ASAM19 demand model
- Provides changes to average journey times relating to both general traffic and public transport

- **Option Costing** - development of high-level cost estimates for the infrastructure and services to inform the Cost to Government and Economy appraisal criteria, and feed into TUBA analysis - Supporting Technical Note F
- **Economic Impact Analysis** including TUBA outputs and Transport Economic Efficiency (TEE) tables - Supporting Technical Note G
- **'Hansen' Connectivity Analysis** - Supporting Technical Note H
- **Equality Impact Assessment** screening exercise - Supporting Technical Note I
- **Market research** – 'panel' surveys undertaken to understand public attitudes towards the ART concept and options - Supporting Technical Note J.

ASAM19 Modelling

5.1.4 Outputs from the testing of ART options in ASAM19 have informed an understanding of public transport journey time changes, ART patronage estimates, potential abstraction from existing bus services, modal shift, changes in greenhouse emissions, impacts on general traffic and traffic re-routeing, connectivity impacts, as well as feeding into the economic appraisal of the options and ultimately cost to government and value for money estimates.

5.1.5 To provide inputs to the appraisal, outputs from ASAM19 were considered for the future years of 2030 and 2045. ASAM19 has a 2019 Base year. For forecast years, ASAM19 uses a set of forecast scenarios derived for 2020 – 2045 from the Transport Model for Scotland (TMfS), and its associated land-use model (TELMoS).

5.1.6 The forecasts within TMfS were developed as part of Transport Scotland's *Strategic Transport Projects Review 2 (STPR2)*, published in December 2022. As part of STPR2, a methodology for an *Approach to Scenario Planning* was developed and published as Appendix F of the STPR Technical Report in December 2022[24]. Two transport behaviour scenarios were developed, capturing 'without policy ambition' and 'with policy ambition' levels of travel by mode. The 'with policy' scenario reflects some of the current policy ambitions of the Scottish Government. Such policies include:

- 20% reduction in car kilometres by 2030
- Phase out the need for new petrol and diesel cars and vans by 2030
- Net zero carbon emissions by 2045

[24] Final technical report - December 2022 - STPR2 | Transport Scotland

5.1.7 The two scenarios present two very different views of the future, and the figure below, recreated from the STPR2 technical report, helps illustrate the difference, showing how the two forecasts diverge in terms of the estimated annual road traffic (measured in veh-km) between the two scenarios. The without policy' scenario has around 35% more veh-km than the 'with policy' scenario by 2045. This represents a very different view of the future and the conditions on the North-East road network.

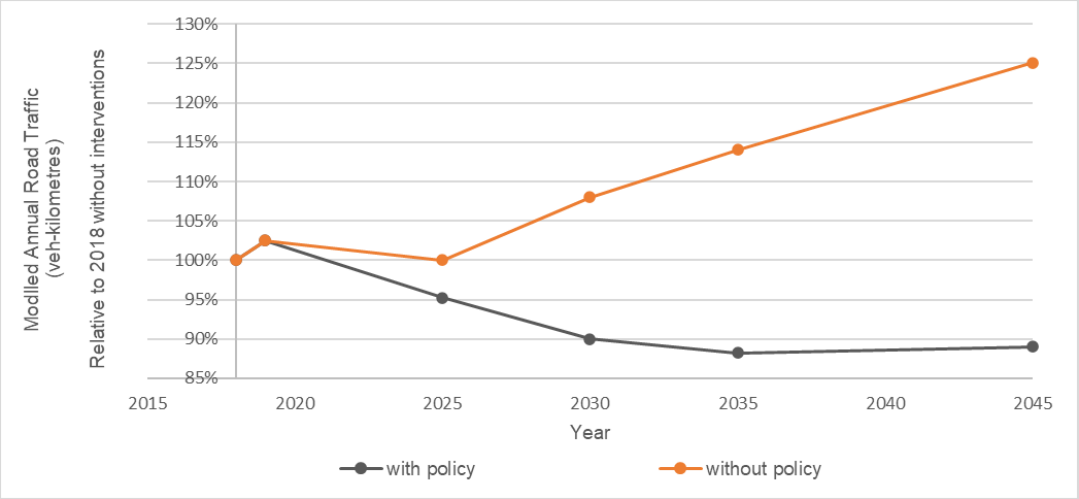

Figure 5:1: STPR2 North East Scotland – With and Without Policy Scenarios (Annual Road Traffic veh-kilometres)[25]

5.1.8 While the two scenarios offer very different potential views of travel demand into the future, they do **present a potential spectrum into which the future may fall**. It is important to understand the benefits, impacts and value of ART under these differing potential futures. Understanding this, **while introducing an element of uncertainty into decision making**, also provides decision makers with a **clearer picture of the potential risks** in scheme implementation should a certain future come to transpire. As such, modelling has been undertaken under both the 'with policy' and 'without policy' scenarios.

5.1.9 To provide a robust and proportionate approach to modelling to inform the appraisal of options, the following was undertaken:

- Modelling of options within the 'with policy' scenario – given that this reflects the current policy ambitions of the Scottish Government
  - Modelling of Option 2
  - Modelling of Option 4 – while Option 4 was sifted out at the end of the Preliminary Options Appraisal, it has been modelled to provide outputs which have then been used to inform the modelling to be undertaken under Option 5, specifically as an input to inform the existing service integration into the ART network
  - Modelling of Option 5 (as derived from Option 4) and also Options 5A and 5P under similar assumptions
  - Modelling of Options 3 and 3A was not undertaken with the likely outcomes considered to be in the range between those of Options 2 and 5

[25] recreated from the STPR2 technical report, North-East Detailed Appraisal Summary Table, Annex C

- Modelling of Option 5 (given Option 5 best represents the ART vision) within the 'without policy' scenario – to provide an understanding of the different future position for the option under this more congested road network future, as discussed in the section above.

5.1.10 Various modelling assumptions were applied to reflect the ART network, including relating to stop spacing and dwell times when testing new ART services.

5.2 Options Recap

5.2.1 To recap, Option 2, 3 and 5 were brought forward from the Preliminary Options Appraisal and Options 3A, 5A and 5P added for additional consideration, as set out in the table below.

Table 5.2: Options for Detailed Options Appraisal

Op	Extensive bus priority	Services	Bus Stop	Stop Spacing	Vehicles	Parking Policy
2	✓	Current ART corridor services with increased frequency	Conventional, Upgraded	No change	Conventional	No change
3	✓	Current ART corridor services with increased frequency Integration of other services to feed ART corridor services	Conventional, Upgraded	No change	Conventional	No change
3A	✓	Current ART corridor services with increased frequency Integration of other services to feed ART corridor services	Platform style	800m	Conventional ART branded	No change
5	✓	New bespoke cross-city services Integration of other services to feed bespoke ART services	Platform style	800m	Tram-style	No change
5A	✓	New bespoke cross-city services Integration of other services to feed bespoke ART services	Platform style	800m	Conventional ART branded	No change
5P	✓	New bespoke cross-city services Integration of other services to feed bespoke ART services	Platform style	800m	Tram-style	Increased parking charges in city

5.2.2 Also, as explored in Section 3.2.2, the physical ART network may take multiple forms, with the ultimate decision being influenced by patronage, commercial viability, infrastructure costs and quality of service achievable. The appraisal is undertaken on the basis of Test R10, which largely reflects the original Nestrans vision, but which also performed well in terms of initial commercial viability testing.

5.3 Options Appraisal

5.3.1 The table below sets out the detailed appraisal of ART options against TPOs, STAG criteria and relevant policy directives. It also sets out the key appraisal points against each of the five options. Comments which are relevant across more than one option and / or network test are noted in a merged comments box and/or refer to earlier sections.

5.3.2 It is worth noting that this study was undertaken as the country transitioned out of the COVID-19 pandemic. While all travel restrictions have been lifted, travel patterns have not returned to a pre-COVID position and are unlikely to do so. Monitoring of travel behaviour and trends as the country continues to transition out of the pandemic will enable an understanding of the potential legacy.

Transport Planning Objectives

TPO1: Achieve average ART bus speeds on the urban sections of the ART corridors (i.e, within the Aberdeen city boundary) of at least 25kph (16mph) by 2030

5.3.3 The Bus Rapid Transit Planning Guide (Institute for Transportation & Development Policy, 4th edition) notes that a Gold Standard BRT system speed will be roughly 20 kph in a 'downtown' area and about 25 kph on a major urban arterial. Designers of BRT systems should aim to engineer a network which can achieve average urban vehicle speeds of 25 kph or higher, and a similar aspiration is held for ART.

5.3.4 The following aspects of ART are anticipated to affect average speeds on ART corridors:

- **Infrastructure** - all options are assumed to include the same infrastructure provision on the ART corridors that will provide the maximum bus priority achievable. This will include dedicated 24hr operational bus lanes between the Park & Ride sites and the city centre. The hours of operation could be reduced to a shorter time period, but clear enforcement is required to deter non-compliance. It should be noted that under Options 2, 3 and 3A, where existing bus services are enhanced i.e., there no new ART services, no change is proposed to the routeing of these existing services (which do not directly travel along ART corridors for their entire route), and the services will only benefit from bus priority infrastructure over the sections of their route on the ART corridors. Additionally, under all options, it is assumed that a new Park and Ride facility will be constructed at the A92 Findon junction, approximately 2.5km north of Portlethen, 'anchoring' the ART network to the south of the city.
- **Signalling** - under Options 2, 3 and 3A, the strengthened existing services (1B, 7B, 14 and 727) will receive priority at signals to reduce / remove the need for buses to stop at signals. The same applies to new ART services under Options 5, 5A and 5P.
- **Stops** – Under Options 2 and 3, existing bus stops will be retained and upgraded. Under Options 3A, 5 and 5A, new ART 'platforms' will be constructed at approximately 800m intervals and the existing bus stops will be removed. New ART stops will have ticket machines and all users of ART services will complete their ticket purchase prior to boarding, a key element in speeding up boarding times and in reducing bus dwell time at stops. Under the remaining options, ticketing will operate as per the existing operations.
- **Vehicle type** - under Options 5 and 5P, it is proposed that new zero-emission, multi-door, tram-style vehicles will be used to operate the new ART cross-city services. These vehicles will have multiple sets of doors (similar to that used for the Glider in Belfast) to allow simultaneous boarding and alighting, reducing dwell time at stops. Conventional buses (or those as would be brought into service through natural cycles of operator fleet upgrades) will be used under all other options.
- **Integration of existing services** - under all options except Option 2, there will be a revision of existing services to minimise the parallel running of bus services alongside ART. The work undertaken to determine changes to the underlying bus network is discussed in Section 4.6, with Supporting Technical Note C presenting a more detailed explanation of the work. As noted in these sections, **this exercise by no means sought to establish the exact nature of any changes to the underlying bus services if ART were implemented. The analysis was undertaken to help establish an illustrative bus network for the purposes of modelling and testing of the options to support appraisal.**

5.3.5 ASAM19 provided journey times and journey distances for bus services under the Do Minimum, Option 2 and Option 5/5A/5P 'with policy', and the Do Minimum and Option 5 under the 'without policy' scenario. This was used to compare bus speeds on ART corridors both with and without the options in place. The table below sets out the sections and services for which journey speeds were calculated under each of the options. Assessment was completed for travel within the urban extents of Aberdeen and sections chosen where existing bus services and proposed ART service can both provide a direct connection.

Table 5.3: Sections used for Journey Time Comparisons

Corridor	Section	Service Tested	
		Do Min & Option 2	Option 5/5A/5P
A956N	Bridge of Don P&R to city centre	First 1B	New ART service
A96	Aberdeen Airport to city centre	Stagecoach 727	New ART service
A944	Lang Stracht to city centre	Stagecoach 14	New ART service
A92S	Cairngorm Way to city centre	Stagecoach 7B	New ART service

5.3.6 Average weekday speeds were calculated for the forecast year of 2045, for each of the above sections and services, and results are displayed in the table overleaf with a discussion on the various options thereafter. These values were calculated using 2045 AM Peak Hour, IP Average Hour and PM Peak Hour travel time information for the sections identified above from ASAM19 files. Hourly values were factored up to 12-hour values using ASAM19 specific peak hour to peak period factors.

Table 5.4: Journey Time Comparisons

Scenario	ART Corridor	Average speed (kph)					*In Bus Time Saving vs Do Min (minutes)*			
		Do Minimum	Option 2	Option 5A	Option 5	Option 5P	*Option 2*	*Option 5A*	*Option 5*	*Option 5P*
With Policy	A956N	16	16	23	24	24	*-1*	*-6*	*-7*	*-7*
	A944	15	17	26	27	27	*-3*	*-11*	*-12*	*-12*
	A96	20	24	30	31	31	*-5*	*-10*	*-12*	*-12*
	A92S	18	18	20	20	20	*-2*	*-1*	*-2*	*-2*
Without Policy	A956N	15	-	-	23	-	-	-	*-7*	-
	A944	15	-	-	27	-	-	-	*-12*	-

Scenario	ART Corridor	Average speed (kph)					*In Bus Time Saving vs Do Min (minutes)*			
		Do Minimum	Option 2	Option 5A	Option 5	Option 5P	*Option 2*	*Option 5A*	*Option 5*	*Option 5P*
	A96	19	-	-	31	-	-	-	*-12*	-
	A92S	17	-	-	20	-	-	-	*-3*	

5.3.7 In the 'with policy' scenario':

- Under Option 2, urban bus speeds never achieve the desired 25kph average speed along the ART corridors (with average speeds ranging from around 16-24kph), with journey time reductions of up to 4 and a half minutes (achieved on the A96)
- Under Option 5A, average urban bus speeds range from 20 to 30kph which relates to time savings of between one and 11 minutes, with the greatest benefits accrued on the A944 corridor. Journey time savings under Option 5A are slightly lower than under Option 5, reflecting the additional time needed for boarding and alighting from conventional buses as opposed to tram-style 'multi-door' vehicles.
- Under Option 5 and Option 5P, urban bus speeds of over 25kph are achieved on the A944 and A96 corridors, with speeds of 24kph achieved on the northern ART corridor to the Bridge of Don and 20kph on the southern corridor up to Cairngorm Way (higher speeds are achievable outside of the urban area though). Journey time reductions range from just under 2 minutes to just under 12 minutes, with the near 12-minute reduction achieved on both the A944 and A96 corridors. These reductions represent an over 40% reduction in public transport journey time on the A944 and over 35% reduction on the A96 and northern corridor between the city centre and the Bridge of Don.
- Option 3 is likely to produce outcomes slightly improved over Option 2 given the option also includes integration of the underlying bus network helping to reduce 'bus congestion' on the ART corridors. Option 3A is likely to provide journey time benefits more closely aligned with Option 5A, given the use of more widely spaced platforms and the journey time benefits a reduced stopping pattern generates.

5.3.8 Under the 'without policy' scenario, average urban bus speeds in the Do Minimum are similar or slightly lower given the higher levels of forecast traffic. The bus priority measures provide similar journey time benefits relative to the 'with policy' scenario.

5.3.9 Given that **Option 5** provides new cross city connections, a comparison of journey time reductions for the full cross-city journeys (not just individual corridors terminating in the city centre) against the Do Minimum travel times by car and public transport has been undertaken and is shown in the table below for the AM 2045 period. It should be borne in mind that the values for public transport include time walking to and from bus stops, whereas those for road only reflect time spent driving.

Table 5.5: Cross-city Car to Public Transport Travel Time Differentials

Route	Scenario	Option	Journey Time (mins)		Difference from Do Minimum (mins)	
			Car	Public Transport	Car	Public Transport
Airport to Portlethen[26]	With Policy	Do Minimum	20	85		
		5	20	52	0	-33
		5A	20	54	0	-31
		5P	20	52	0	-33
	Without Policy	Do Minimum	21	86		
		Option 5	22	53	+1	-33
Kingswells to Bridge of Don	With Policy	Do Minimum	21	62		
		5	25	41	+4	-21
		5A	25	42	+4	-20
		5P	24	41	+3	-21
	Without Policy	Do Minimum	22	64		
		Option 5	26	41	+4	-23

5.3.10 Under the 'with policy' scenario, cross-city services provide even greater journey time savings given that users no longer need to interchange to make this connection:

- Between Aberdeen Airport and Portlethen, cross city bus journey times reduce by 33 minutes (39%) compared to the Do Minimum, and the gap between car and public transport journey time reduces from 65 minutes to 32 minutes. This is a significant reduction.
- Between Kingswells and Bridge of Don, cross city bus journey times reduce by 21 minutes (34%) compared to the Do Minimum, and the gap between car and public transport journey time reduces from 41 minutes to 16 minutes. Again, this is a significant reduction.

[26] Note that a trip by car between Aberdeen Airport and Portlethen would most likely be made via the AWPR and as such will not be impacted by any reduction in road space due to the proposed ART infrastructure

- Results for the 'without policy' scenario reduce public transport times by a further 1-2 minutes on both routes compared to the 'with policy' times
- Car journey times between Aberdeen Airport and Portlethen are expected to increase by up to one minute, and by up to four minutes between Kingswells and Bridge of Don under the 'with policy' and 'without policy' scenarios. It is worth noting that a trip by car between Aberdeen Airport and Portlethen would most likely be made via the AWPR and as such will not be impacted by any reduction in road space due to the proposed ART infrastructure (and only potentially impacted by increased traffic on the route due to traffic re-routeing due to the option). Hence the very minimal impact on car journey times between the Do Minimum and option results

5.3.11 The combination of reduced stopping patterns and short bus stop dwell times associated with the use of tram-style vehicles enables bus speeds of over 20kph on all corridors and over 25kph on two of the four corridors. Providing new cross-city services facilitates a very significant reduction in public transport travel time for these cross-city movements. Option 2 does not deliver the required bus speeds, and it seems unlikely that Option 3 could do so.

Table 5.6: Appraisal Table TPO1

TPO	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses and reduced stopping pattern	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
TPO1: Achieve average ART bus speeds on the urban sections of the ART corridors (i.e, within the Aberdeen city boundary) of at least 25kph (16mph) by 2030	<u>With Policy Outcomes</u> In the 'with policy' scenario, Option 2 is forecast to facilitate speeds of between 16kph and 24kph in urban areas, which translates **to journey time savings of up to six minutes**, compared with the Do Minimum. It is assumed that under Option 3, vehicle speeds would be slightly higher given that there would be less parallel running of services and congestion at stops, but without modelling, the exact scale of this difference cannot be quantified.		With Policy Outcomes Option 3A is likely to provide bus speeds to Option 5A given similar reduced stopping pattern assumed; however, Option 3A would not provide the benefits of a full cross-city service as interchange would still be required in the city centre.	<u>With Policy Outcomes</u> Option 5/5A/5P will achieve 25kph+ speeds on the A96 and A944 and will come close on the A956N. This will generate time savings of up to 12 minutes on the corridor sections identified. Note: these values only reflect in-bus vehicle time savings on the urban sections of ART corridors. Comparing cross-city journey times under Option 5/5A/5P with the Do Minimum highlights even further the scale of journey time savings that can be accrued when there is no need to interchange in the city centre. Cross-city journey time savings of 31-33 minutes are expected between the Airport and Portlethen P&R and 20-21 minutes between Kingswells and Bridge of Don. Once parking search and travel from car parking to the final destination are factored in, it is considered that journey times between Kingswells and		

TPO	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses and reduced stopping pattern	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
				Bridge of Don will be comparable, but it will remain faster to travel by car between the Airport and Portlethen (via the AWPR). <u>Without Policy Outcomes</u> Under the 'without policy' scenario, average bus speeds are slightly higher in the Do Minimum due to the higher levels of underlying congestion. Options produce similar results to the 'With policy' scenario, although speeds remain slightly lower and journey times are up to 3 minutes longer. From comparison with the Option 2 results, given both use the same priority infrastructure, it is clear that **a significant part the journey time reduction achieved is gained through reduced stopping patterns and reduced boarding and bus dwell time at stops.** Comparing the results for Option 5 and 5A (where the key difference is the vehicles used) shows the reduced stop spacing to be the more significant factor in reducing journey times. This highlights the importance of the vehicle employed and the increased distance between stops in increasing bus speeds and reducing bus journey times. This has been noted by the operators of other BRT schemes across the UK.		
TPO1 Scores	✓	✓	✓✓	✓✓✓	✓✓✓	✓✓✓

TPO2: By 2030, achieve a public transport service for which the timetables (with journey times reduced as per TPO1) are consistent across the day and the week, and where 95% of the services operate to within 5% of the timetabled journey time

5.3.12 A key feature of the ART network is that public transport services are reliable and punctual with the service providing consistency in travel time, regardless of the time of day. This means that a passenger travelling on the network can turn up at a stop, expect to board a bus within 6-10 minutes, and expect their on-board journey to their destination to always take the same time.

5.3.13 Across all options, the main factor enabling consistency (i.e., the same) in bus journey times across the day and week on ART corridors is the provision of segregated infrastructure offering dedicated bus right of way. Therefore, this aspect is largely dependent of the quality of bus priority infrastructure which can be accommodated on each route. For the purposes of the ASAM19 modelling and testing, the latest available information on the proposals was assumed from the ongoing multi-modal corridor studies.

5.3.14 New bus priority infrastructure will be provided along all ART corridors under Options 5, 5A and 5P; however, under Options 2, 3 and 3A this new bus priority infrastructure will only be provided on sections of ART corridors which are used by strengthened services (1B, 7B, 14 and 727). Under all options, bus priority infrastructure is intended for use by all bus services which use those sections.

5.3.15 There are number of other factors which will also affect journey time consistency, including:

- Under **Options 3A, 5, 5A and 5P**, the assumed level of **bus stop rationalisation** is likely to further increase journey time consistency due to the reduced number of stops
- **Options 5 and 5P** introduce bespoke ART **multi-door vehicles,** which will allow simultaneous boarding and alighting to reduce dwell times / dwell time variability (similar to tram operation)
- Additionally, under **Options 3A, 5, 5A and 5P**, ticket purchase would be completed prior to boarding which would further streamline boarding / boarding time variability
- Under **Options 3, 3A, 5, 5A and 5P** the assumed level of existing **service integration** would further increase the consistency on the ART corridors by reducing the amount of parallel running of bus services on the corridors

5.3.16 ASAM19 outputs were reviewed for the Do Minimum under the ‘with policy’ scenario, and it was identified that the greatest variation in journey times between the Interpeak and AM/PM peak occurs in the outbound direction during the PM Peak.

5.3.17 Consideration was then given to how the gap between interpeak and PM peak journey times would be affected by the options being considered. This was calculated using the same journey time information gathered for TPO1 (i.e. journey times for 1B, 7B, 14 and 727 services under the Do Minimum and Option 2, and travel times for the same journeys on the new ART services for Options 5A, 5 and 5P). The table below sets out these findings.

Table 5.7: Journey Time Variability

Scenario	Corridor	Difference between PM Peak and Interpeak journey times (mm:ss)					*Change from the Do Minimum (mm:ss)*			
		Do Min	Option 2	Option 5A	Option 5	Option 5P	*Option 2*	*Option 5A*	*Option 5*	*Option 5P*
With Policy	A956(N)	1:40	2:40	2:10	2:10	1:50	*+1:00*	*+0:30*	*+0:30*	*+0:10*
	A96	1:50	1:00	0:30	0:20	0:20	*-0:50*	*-1:20*	*-1:30*	*-1:30*
	A944	3:00	1:20	1:00	0:50	0:50	*-1:40*	*-2:00*	*-2:10*	*-2:10*
	A92(S)	3:10	2:20	1:40	1:40	1:40	*-0:50*	*-1:30*	*-1:30*	*-1:30*
Without Policy	A956(N)	2:30	-	-	3:00	-	-	-	*+0:30*	-
	A96	2:10	-	-	0:20	-	-	-	*-1:50*	-
	A944	6:10	-	-	0:50	-	-	-	*-5:20*	-
	A92(S)	4:10	-	-	1:40	-	-	-	*-2:30*	-

5.3.18 The Case for Change identified that there was notable difference between peak and off-peak/interpeak journey times on the main routes in and out of Aberdeen, which prompted the introduction of this TPO. However, modelling the Do Minimum under the 'with policy' scenario indicates that there is at most a difference of 3 minutes between average peak hour and interpeak journey times on the identified corridors and services. This suggests that assumed policy changes have successfully reduced congestion on these corridors, which has in turn aided journey time consistency, in the absence of ART. Under the 'without policy' scenario, it should be noted that PM Peak journey times are typically two to six minutes longer than interpeak journey times, which relates to PM peak journey times being up to 30% longer than interpeak.

5.3.19 It is worth noting that, on the A956(N), journey times during the interpeak reduce by more than journey times during the peak hour under the options. Therefore, although journey times are shorter, the gap between interpeak and PM peak is actually wider.

Table 5.8: Appraisal Table TPO2

TPO	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
TPO2: By 2030, achieve a public transport service for which the timetables (with journey times reduced as per TPO1) are consistent across the day and the week, and where 95% of the services operate to within 5% of the timetabled journey time	Journey time consistency will be aided by new bus priority infrastructure. PM peak journey times are estimated to be up to 3 minutes longer than interpeak journey times under the 'with policy' scenario. This reflects an improvement of between 50 seconds and one minute forty seconds on the A96, A944 and A92(S). However, on the A956N, interpeak journey times reduce more than PM Peak journey times and the gap between interpeak and PM peak journey times extends by one minute. Given the findings from Option 5, there is	Modelling was not undertaken for Option 3, but it is estimated that journey time consistency will be similar to, if not slightly better than under Option 2 as rationalisation of services will reduce parallel running on ART corridors.	Modelling was not undertaken for Option 3A, but it is estimated that journey time consistency will sit somewhere between Options 3 and 5A, as increased stop spacing and off-vehicle ticket purchase will reduce time lost for boarding/alighting but standard vehicles will be used.	Under Option 5A, journey time consistency will be aided by new bus priority infrastructure and wider stop spacing. It is estimated that the difference between peak and off-peak journey times will reduce to under two minutes under the 'with policy' scenario. However, more substantial consistency improvements would be yielded under the 'without policy' scenario where there is more underlying congestion on the network.	Under Options 5 and 5P, journey time consistency will be aided by new bus priority infrastructure and wider stop spacing, in addition to the use of bespoke ART multi-door vehicles and off-vehicle ticketing, both of which will reduce dwell time at stops. <u>With policy</u> The greatest improvements to travel time consistency, under the 'with policy' scenario, apply on the A944 and A96 corridors, where typical journey times during the PM peak hour fall within one minute of journey times during the interpeak. By comparison, peak to interpeak travel times in the Do Minimum vary by over a minute on all corridors, with the A944 and A92S showing a variation of approximately 3 minutes. <u>Without policy</u> Greater consistency benefits are obtained for Option 5 in the 'without policy' scenario, as bus journey times in the equivalent Do Minimum are more variable due to the more congested networks (e.g., the variability on the A944 between peak and interpeak journey time is over 6 minutes). **This highlights the greater ability for bus priority measures to provide benefit when the underlying traffic network is more congested.**	

TPO	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
	expected to be a greater improvement to journey time consistency under the 'without policy' scenario.					
TPO2 Scores	✓	✓	✓✓	✓✓	✓✓	✓✓

TPO3: Improve the perception of quality of bus travel on ART corridors by 2030

5.3.20 It is clear from the work undertaken for the Case for Change that poor public perceptions of bus travel persist. Through engagement and the site visits a range of issues relating to the quality of the public transport offering were identified as dissuading people from using the bus. This included poor perceptions of reliability, bus stop infrastructure and the waiting environment, and vehicle security at Park and Ride sites.

5.3.21 All options would generate some change in the perception of public transport:

- **Existing bus users** would benefit from the improved infrastructure providing better waiting, and boarding and alighting environments, enabling faster journey times and improved service reliability, although the degree of change would vary based on the option.
- Those **switching to ART** will do so in part due to an improved perception of quality (Options 5A, 5 and 5P in particular), and potentially also as a result of the new Park and Ride facility at Portlethen, which should facilitate access to public transport.
- Some **non-bus users** may deem the reallocation of road space to provide bus priority as a negative impact if their journey time by car is increased as a consequence, and they cannot / do not want to travel by bus, while some may welcome the improvements and 'step change' in provision, particularly given the climate emergency, even though they are unable to use the services.

5.3.22 WebTAG Table M.3.2.1 defines characteristics of a quality bus service as being: audio announcements on buses; CCTV at bus stops; CCTV on buses; climate control on buses; new bus shelters; new bus with low floor; new interchange facilities; on-board screen displays; real time information; simplified ticketing and trained drivers

5.3.23 An exercise was undertaken to identify whether each of the identified options can satisfy these criteria. This exercise is summarised in the table below.

Table 5.9: TPO3 Quality Appraisal

Factor	Do Min	Opt 2/3	Opt 3A	Opt 5A	Opt 5/5P	Comment
Audio announcements on buses	✓	✓	✓	✓	✓	The majority of buses do not currently provide audio announcements, but it is assumed that next generation vehicles will provide this functionality. **To be confirmed with operators.**
CCTV at stops			✓	✓	✓	Stop specific CCTV is not presently provided.
CCTV on buses	✓	✓	✓	✓	✓	CCTV is provided on the majority of buses operating in Aberdeen in 2023.
Climate control on buses					✓	Heating is available on most buses in Aberdeen. Air-conditioning equipment is fitted on most Stagecoach vehicles but a minority of First services. It is understood that in some cases, air conditioning equipment is fitted but is not used, due to impacts on fuel efficiency. **To be confirmed with operators.**
New bus shelters		✓	✓✓	✓✓	✓✓	Modern bus shelters are present on Union Street, but there are few modern shelters beyond the city centre.
New bus with low floor	✓	✓	✓	✓	✓✓	All buses operating in Aberdeen are 'low-floor' and DDA compliant, but it should be noted that new tram-style buses proposed under Option 5/5P will provide a level floor across the full-length of the vehicle, a wider corridor than standard buses and both doors will be equipped with wheelchair ramps.
New interchange facilities		✓	✓✓	✓✓	✓✓	At present, interchange facilities in Aberdeen are of varying quality. Aberdeen bus station is modern and attached to a shopping centre providing high quality facilities. Existing Park and Ride sites around Aberdeen require modernisation. A new P&R site is proposed by Findon Junction. Under Options 5A, 5 and 5P a new ART interchange will be provided on Union Street adjacent to existing shops, restaurants and coffee shops.
On-board screen displays	✓	✓	✓	✓	✓	Only a handful of buses currently have on-board display screens. It is assumed that all buses will have this functionality by 2030. **To be confirmed with operators.**

Factor	Do Min	Opt 2/3	Opt 3A	Opt 5A	Opt 5/5P	Comment
Real time information at stops		✓	✓	✓	✓	Real-time information is available at stops in the city centre but is not present at the majority of stops outside this area. Under all options, stops across ART corridors will be updated to provide real-time information screens.
Simplified ticketing	✓	✓	✓✓	✓✓	✓✓	Tap-On Tap-Off / Tap and Cap contactless ticketing is available on most buses which currently operate in Aberdeen.
Additional training for drivers				✓	✓	All bus drivers in Aberdeen receive training, but drivers of new ART services under Options 5A, 5 and 5P would be given enhanced training.
Change vs Do Min	**-**	**+3**	**+4**	**+5**	**+6**	

Table 5.10: Appraisal Table TPO3

TPO	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
TPO3: Improve the perception of quality of bus travel on ART corridors by 2030	Public transport quality under **Options 2 and 3** is likely to only reflect a small improvement on existing, as a result of bus stop enhancements and a new interchange at Findon Junction, in addition to increased service frequency. Options 2 and 3 will look like an evolution of the status quo rather than a step-change.		Under **Option 3A**, perceived quality will be boosted by provision of higher quality ART platforms, and branding of vehicles and stops. These improvements should help to differentiate ART services from other existing bus services.	**Option 5A** will be largely as per Option 3A in terms of quality enhancements but will also feature new ART services which maximise use of new bus priority infrastructure and provide a step change in the efficiency of cross-city public transport. Under Option 5A, drivers	**Options 5 and 5P** should further increase perceptions of the quality of bus travel through the use of modern, high specification tram-style vehicles and a state of the ART BRT offering. These vehicles will provide a very visually different offering and will help to generate brand awareness, while also providing additional on-board facilities relative to standard buses. The use of zero-emission technology will provide a positive environmentally focussed offering, likely to improve the overall image of	

TPO	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
				will also benefit from enhanced training.	the scheme; however, it should be recognised that by 2030, this is expected to be commonplace. Officers involved in the development of the Bristol metrobus scheme stated that had the original branded Streetcar ('tram on wheels') type vehicle been adopted, publicity around the scheme would have been much more successful.	
TPO3 Scores	✓	✓	✓	✓	✓✓	✓✓

STAG Criteria

Environment

5.3.24 The Environment sub-criteria are: Biodiversity and Habitats; Geology and Soils; Land Use (including Agriculture and Forestry); Water, Drainage and Flooding; Air Quality; Historic Environment; Landscape and Noise and Vibration.

5.3.25 In this appraisal, the primary impacts considered are traffic related, mainly through (i) mode shift from car to ART and (ii) the impact of the reallocation of roadspace away from general traffic to ART on general traffic routeing in and around Aberdeen - both of which could impact on Air Quality and Noise and Vibration in particular.

5.3.26 As the infrastructure being developed primarily involves the reallocation of road space, in most instances, as opposed to building of new carriageway, it is unlikely there will be any significant impacts on biodiversity and habitats, geology and soils, water, drainage and flooding, historic environment, or landscape. There may be some minor impacts during road improvement works. Junction changes, including junction widening, may be required to accommodate new signal control to enable public transport priority through the signals, and in some locations, existing roundabouts may require to be altered to signalised junctions. In some localised areas some properties, gardens etc. may be affected, but these issues will be picked up in more detail in the individual corridor studies, along with any construction impacts associated with ART infrastructure.

Modal Shift

5.3.27 The level of mode shift associated with each option provides a broad indication of the impact on traffic levels and their associated negative environmental impacts. A comparison of the modelled public transport trips was undertaken for the Aberdeen urban area (including relevant parts of Aberdeenshire e.g., Westhill).

Table 5.11: Modal Shift and change in vehicle kilometres

Scenario	Option	Change in PT trips vs Do Min (0700-1900, 2045)		Change in road vehicle km vs Do Min (0700-1900, 2045)	
		No. trips	%	No. km	%
With Policy	Option 2	+1,700	+2%	-22,300	-0.1%
	Option 5A	+6,500	+8%	-41,600	-0.3%
	Option 5	+8,900	+11%	-51,400	-0.3%

Scenario	Option	Change in PT trips vs Do Min (0700-1900, 2045)		Change in road vehicle km vs Do Min (0700-1900, 2045)	
		No. trips	%	No. km	%
	Option 5P	+9,600	+12%	-76,400	-0.5%
Without Policy	Option 5	+9,700	+14%	-59,700	-0.3%

5.3.28 This indicates that modal shift will be maximised under Option 5P, and lowest under Option 2. Under the 'with policy' scenario, Options 5 and 5P will increase public transport use in Aberdeen by 11% and 12% respectively, which equates to approximately 9,000-9,500 additional trips per day (equating to over two million annual trips).

5.3.29 In the Do Minimum, there is higher baseline public transport usage under the 'with policy' scenario, than under the 'without policy' scenario, as policy is assumed to have already prompted a transfer of car trips to public transport. This means that road traffic volumes are slightly lower under the 'with policy' scenario too.

Traffic Rerouting

5.3.30 Whist the absolute volume of car travel is important, it is the distribution of this traffic which will determine its impact on Air Quality and Noise and Vibration. Mapping has therefore been produced which illustrates how road traffic volumes are expected to change across the city if each of the options were implemented, under both the 'with policy' and 'without policy' scenarios. As all of the options are based on essentially the same quantum of roadspace reallocation, the impacts of the different options will be similar, albeit the scope for negative impacts reduced somewhat where the reduction in car-km is the greatest.

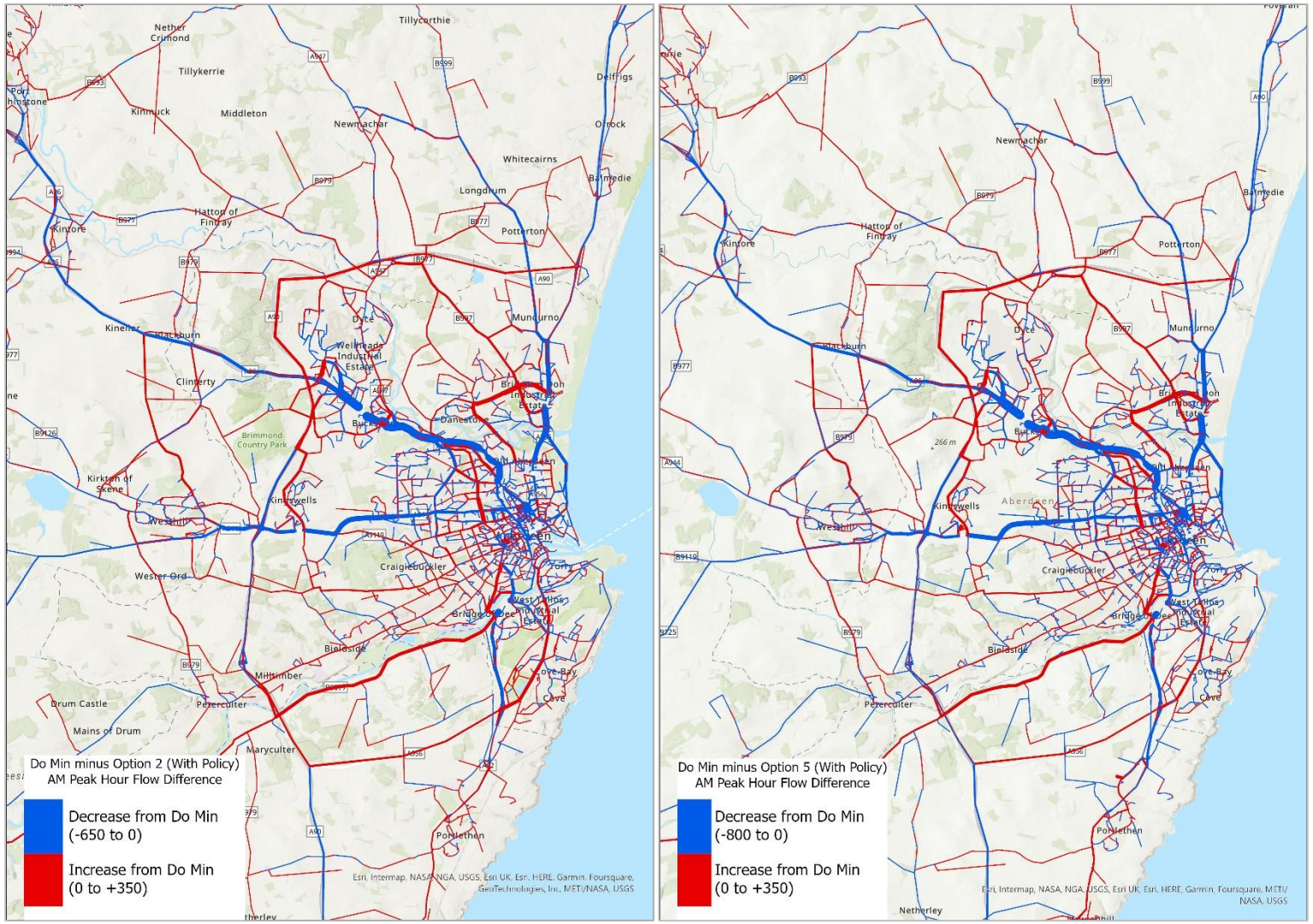

Figure 5:2: Flow Difference Diagrams (Options 2 and 5, 'with policy')

Air Quality

5.3.31 The new bus priority infrastructure proposed under all options will reduce the amount of congestion faced by buses and the number of stop-start movements undertaken on each trip, which will support improved air quality, although this impact will diminish over time as the fleet transitions to zero emission buses. However, if not mitigated against, negative impacts on air quality are possible if general traffic re-routes onto less suitable roads, particularly in residential areas. No detailed assessment has been made of the impact of this re-routeing at this this stage, but this will be required as any mitigation measures are developed.

5.3.32 Improved air quality would have a greater impact in areas within the city centre where there are air quality issues. The City Centre Air Quality Management Area (AQMA) includes Union Street, Market Street, Bridge Street, Guild Street, Castle Street, King Street, and Holburn Street, which also form part of the proposed ART network, and so stand to benefit from proposals.

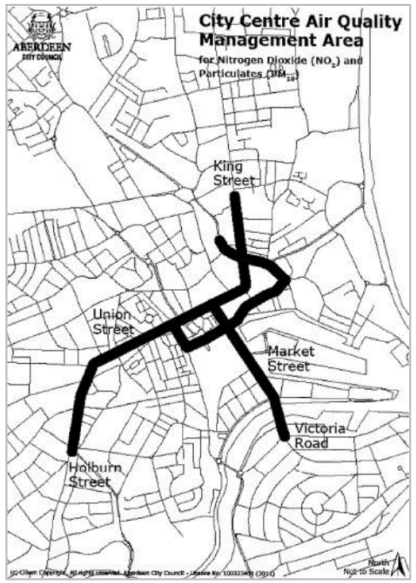

Table 5.12: Appraisal Table – Environment

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Environment	With policy Under Option 2, it is estimated that there will be an increase in public	Option 3 benefits are likely to be similar to Option 2, but with less parallel running of services on key	Option 3A is likely to yield air quality benefits more similar to Option 5a. Through increasing stop spacing, there	With policy Under Option 5A, it is estimated that public transport usage will increase by 9%,	Providing high quality, uniquely branded vehicles and a very visually different offering to existing services are likely to generate greater modal shift and remove additional traffic from the road with the associated air quality improvements.	

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
	transport usage of 2% and the potential environmental benefits will be the least of the options.	corridors, there may be some improvement.	should be fewer stop-start movements, providing benefits over Options 2 and 3.	removing car trips from the network, reducing overall congestion and yielding air quality benefits.	<u>With policy</u> Modelling estimates that Option 5 and Option 5P will increase public transport use by 11% and 12% respectively. <u>Without policy</u> Without policy, Option 5 will increase public transport use by 14% (albeit from a lower base).	
Environment Scores	✓	✓	✓	✓✓	✓✓✓	✓✓✓

Climate Change

5.3.33 The Climate Change Criterion includes three sub-criteria: Greenhouse Gas Emissions; Vulnerability to Effects of Climate Change and Potential to Adapt to Effects of Climate Change. This section focusses on Greenhouse Gas Emissions only. The other two sub criteria are more relevant to the engineering design of the network and infrastructure and will be addressed within the individual corridor studies.

5.3.34 The Climate Change Scotland Act (2019) includes a target date of 2045 for achieving net zero carbon as well as a target of 75% reduction against 1990 emissions levels by 2030. Improvements to bus infrastructure and the reallocation of road space should encourage modal shift from the car to more sustainable modes, which in turn should reduce traffic related levels of carbon emissions and contribute to the aspirations for net zero carbon by 2045.

5.3.35 Greenhouse gas emissions (as reported through the analysis of the ASAM19 results in the Department for Transport's Transport Users Benefit Appraisal (TUBA) software), have been considered to estimate the carbon impacts of the options. The monetised benefits (over the 60-year scheme appraisal period) are set out in the table below. Also shown is the 12hr daily change in vehicle kilometres under each option.

5.3.36 ART has the potential to impact on vehicle kilometres across the Aberdeen road network. The extent of the impact will depend on the balance of mode shift from car to ART and additional car-km caused by traffic re-routeing in response to the reduction in road space. The modelling results to date suggest that the impact of mode shift is generally outweighing that of re-routeing. If re-routeing impacts are further mitigated against, this will likely encourage further modal shift to public transport and support an increased reduction in vehicle kilometres.

Table 5.13: Greenhouse Gas Benefits

Scenario	Option	12 hour daily change in road vehicle km from Do Minimum (2045, 0700-1900)	Greenhouse Gas Benefits (millions) (monetised and discounted over the 60-year appraisal period)
With Policy	2	-22,300	-£1.2
	5A	-41,600	£0.6
	5	-51,400	£1.6
	5P	-76,400	£5.1
Without policy	5	-59,700	£1.6

5.3.37 The results show that in all options, vehicle kilometres reduce and as noted in the section above, bus use increases. Under Options 5A, 5 and 5P, the benefits of this modal shift outweigh the costs of reducing road space for general traffic (to accommodate new bus priority infrastructure); however, under Option 2 that is not the case and greenhouse gas emissions are expected to increase.

5.3.38 The CO_2 figures derived in TUBA do not include emissions from buses. The options which involve the immediate purchase of new zero-emission ART vehicles (5 and 5P) may bring forward carbon reductions compared to other options where the transition to zero emission buses is more evolutionary.

Table 5.14: Appraisal Table – Climate Change

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Climate Change	Under Option 2 there are -£1.2m in 'benefits' (i.e., disbenefits) but a reduction in vehicle kms (the smallest reduction of all options). This indicates that while modal shift has occurred (as noted in the section above), the reduction in vehicle kilometres is not enough to outweigh the additional re-routeing emissions under the option. It is also worth noting that bus km, and hence emissions from buses have increased through the provision of increased service provision on the ART corridors, with no changes to other services.	Option 3 (not modelled) is expected to perform more favourably than Option 2, as there will be an integration of these enhanced services with the existing bus network to minimise the parallel running / duplication of service provision. Nevertheless, it is estimated that Option 3 will generate a disbenefit in terms of greenhouse gas emissions.	Under Option 3A (not modelled), increased stop spacing and fewer stop-start movements should reduce greenhouse gas emissions, but this may not be enough to outweigh the additional emissions from road traffic.	Option 5A shows a substantial reduction in vehicle km relative to Option 2, and TUBA modelling indicates that in the 'with policy' scenario, modest greenhouse gas emissions benefits of approximately £0.6m can be expected.	Option 5 provides similar greenhouse gas benefits under both the 'with policy' and 'without policy' scenario, but vehicle kilometres are more reduced (compared to the corresponding Do Minimum) in the 'without policy' forecast scenario. TUBA indicates that Option 5 will generate £1.6m in greenhouse gas emission benefits under both the 'with policy' and 'without policy' scenarios. Further reductions in carbon emissions may result from the earlier introduction of zero emission ART vehicles.	Option 5P shows vehicle kms and greenhouse gases reducing considerably more than the other options, resulting in a higher greenhouse gas benefits of £5.1m under the 'with policy' scenario. This is not unexpected given the higher modal shift achieved under this option compared to other options. Further reductions in carbon emissions may result from the earlier introduction of zero emission ART vehicles.
Climate Change Scores	✗	✗	-	✓	✓✓	✓✓✓

Health, Safety & Wellbeing

5.3.39 The five Health, Safety and Wellbeing sub-criteria are: Accidents; Security; Health; Access to Health and Wellbeing Infrastructure and Visual Amenity.

Personal Injury Collisions

5.3.40 A switch to bus travel from car would reduce traffic on and around the corridors, and within the city centre, and the associated number of injuries on the roads with the scale of this change dependent on the extent of the modal shift achieved. There is however the potential for an increase in casualties where traffic re-routes onto less suitable routes.

5.3.41 In terms of these injuries travel by bus is safer than travel by car, bicycle and indeed as a pedestrian. Any reduction in accidents provides savings to the public purse from the reduced social-economic cost including:

- Loss of output due to injury
- Human cost of casualties
- Damage to vehicle and property
- Police and insurance administration cost

5.3.42 Modal shift from car to bus should support a reduction in both casualties and accidents. In the UK in 2019, there were 128 passenger casualties per billion passenger kilometres driven by car, compared with 95 passenger casualties per billion passenger kilometres when travelling by bus (i.e., bus casualty rate is 26% lower)[27]. For this reason, options which can generate greater modal shift (e.g., Options 5 and 5P) will generate greater road safety benefits.

5.3.43 No quantitative assessment has been made at this stage, but this may be required at a later stage as mitigation strategies are developed for roads affected by traffic re-routeing.

Security

5.3.44 ART stops will be upgraded under all Options, although the extent of improvement will vary by option: Under Options 2 and 3, existing bus stops will be enhanced to provide better lighting, improved shelters which offer good natural surveillance and RTI screens to confirm how long users should expect to wait for their service. Under Options 3A, 5A, 5, and 5P, new state-of-the-art ART 'platforms' will be provided which will additionally provide CCTV, and 'help points' to allow users to request assistance if they feel concerned. This would offer improved security over the current situation which

[27] RAS0203: Transport Casualty Rates by Mode, Transport Statistics Great Britain 2021, Department for Transport

includes stops that are poorly lit (often only relying on street lighting levels), positioned in secluded locations and/ or where visibility to and from the stop is obscured by street furniture, parked cars or highway structures. Under the Birmingham Sprint scheme significant benefits to personal security were accrued through the introduction of improved bus stop facilities including improved lighting and CCTV cameras within stop shelters.

5.3.45 Under Options 5 and 5P, new bespoke tram-style vehicles will additionally be single level and incorporate substantial amounts of glass, making passengers more visible.

Health Outcomes

5.3.46 All journeys by public transport involve an element of active travel and if modal shift can be delivered, this will encourage more active lifestyles by building in additional walking or cycling as part of the overall trip. The additional provision of safe and secure cycle parking at ART platforms under Options 3A, 5A, 5 and 5P, would encourage the use of cycling to access the ART network while the main footway route will be made fully accessible with pedestrians provided priority over motorised traffic where needed. Aberdeen's developing e-bike hire scheme could be integrated to ensure seamless and easy journeys between cycles and the ART network.

5.3.47 Although modal shift from walking trips to ART is considered unlikely, there is some potential for cyclists switching to bus, but as cycle improvements are proposed on, or parallel to all ART corridors, the scale of this shift is expected to be low.

Access to Health and Wellbeing Infrastructure

5.3.48 Aberdeen Royal Infirmary is the largest hospital in the NHS Grampian region and provides tertiary care for approximately 600,000 people residing in Aberdeen City, Aberdeenshire and Moray meaning that people travel to ARI from as far west as Forres and as far south as Laurencekirk.

5.3.49 Under **Option 2, 3 and 3A**, the frequency of services on the 14 bus route will be increased to 10 per hour, which will improve access to Aberdeen's main health facilities including Aberdeen Royal Infirmary, Aberdeen Maternity Hospital, and Royal Aberdeen Children's Hospital, as well as Royal Cornhill Hospital. Increased frequency on the 14, 727 and 7B services would additionally improve access to the following parks and sports facilities, supporting healthy lifestyles: Curl Aberdeen and Aberdeen Indoor Bowling Club adjacent to the A944, Bucksburn Swimming Pool and Woodside Sports Complex adjacent to the A96 and Duthie Park, Kincorth Football Pitches, Bridge of Dee Park and Goals Aberdeen adjacent to the B9077.

5.3.50 Under **Options 5, 5A and 5P**, the new ART service tested would connect Westhill with Bridge of Don, routeing directly past Aberdeen's main healthcare facilities as noted above, providing 10 services per direction per hour, shortening journey times and also providing direct connectivity with Bridge of Don, which does not exist at present. ART platforms would be located to provide good access to the Foresterhill Health Campus and to local parks and green open spaces that encourage recreational and play activities, such as:

- the Aberdeen Aquatics Centre, Aberdeen Sports Village and Royal Aberdeen Golf Club located close to the A956(N),
- Woodside Sports Complex along the A96,

- Curl Aberdeen, Aberdeen Indoor Bowling Club and Aberdeen Tennis Centre, Westburn Park and Victoria Park along the A944
- Duthie Park, Kincorth Football Pitches, Bridge of Dee Park, and Goals Aberdeen adjacent to the B9077
- Burnside Park in Portlethen itself.

5.3.51 Modelling data has been interrogated to identify how each of the options may affect the number of people who could reach ARI within one hour, by road and by public transport during the AM Peak in 2045. The results are summarised in the table below for public transport. It should be noted that the public transport journey times reflect the full journey from door to door, including walk time and waiting time at stops.

Table 5.15: Accessibility to ARI

Scenario	Option	No. people living with one hour of ARI (by Public Transport)	Change relative to Do Minimum
'With policy'	Do Minimum	202,000	-
	Option 2	213,000	+5%
	Option 5A	226,000	+12%
	Option 5/5P	230,000	+14%
'Without policy'	Do Minimum	198,000	-
	Option 5	225,000	+13%

5.3.52 This analysis shows that all options will increase the accessibility of ARI by public transport. Under the 'With Policy' scenario, Options 5 and 5P perform the best, allowing an additional 28,000 (+14%) people access to ARI within 60 minutes by public transport, and similar results are seen under the 'without policy' scenario. Analysis for accessibility by car shows a negligible reduction in the number of people who can access ARI across the ASAM area (change of <0.5%).

Visual Amenity

5.3.53 The ART network implementation will facilitate modal shift from car to ART. This will reduce traffic on the ART corridors and reduce the intensity of traffic movements along the corridors, providing benefit to those living and working along the corridors. The reallocation of road space from general traffic would also further reduce the traffic intensity on the corridors. All of this would improve visual amenity.

5.3.54 It is however noted that there may be disbenefits to other roads / routes if there is traffic re-routeing, rat running due to the road space reallocation on the corridors. This would have negative impacts on those residing away from the corridors from whom traffic levels may increase, especially in neighbourhoods where the road network is not suitable for higher traffic volumes. In such instances, this should be mitigated against through the use of point closures and/or Low Traffic Neighbourhood planning.

5.3.55 Finally, under Options 2 and 3, existing bus stops will be upgraded and under Options 3A, 5, 5A and 5P, new ART platforms will be installed, and existing bus stops removed on ART corridors. More attractive, modern bus stopping infrastructure should improve visual amenity and under Options 3A, 5, 5A and 5P, this will also reduce street clutter by approximately halving the number of stops.

Table 5.16: Appraisal Table – Health, Safety and Wellbeing

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Health, Safety & Wellbeing	With policy Options 2 and 3 are expected to have similar impacts. Both options include enhancements to existing stops and are expected to provide a minor improvement in terms of the accessibility of health infrastructure, parks and green spaces. 5%/11,000 more people will be able to access the ARI within one hour by public transport.		With policy Options 3A and 5A will include modern ART platforms, with improved lighting, seating and CCTV, which should improve the feeling of security while waiting at stops, and also visual amenity. Additionally, stops on ART corridors will be rationalised, which will reduce street clutter. Option 5A is estimated to improve the one hour public transport catchment of ARI by approximately 12% (+24,000 people).		Options 5 and 5P will benefit from modern rationalised stops, yielding benefits to security and visual amenity as noted under Options 3A and 5A, in addition to high specification tram-style vehicles which provide audio and visual announcements, two sets of doors suitable for wheelchair boarding/alighting, a wider corridor and more internal space for wheelchairs and prams. All of these factors will support inclusion and ease access to healthcare facilities. With policy Given the shorter travel times which can also be delivered by options 5 and 5P, an additional 28,000 people (14%) should be able to access ARI within one hour by public transport. Without policy Without policy, Options 5 and 5P are expected to increase the ARI one hour public transport catchment by 27,000 people, which equates to 13%.	
Health, Safety & Wellbeing Scores	✓	✓	✓✓	✓✓	✓✓✓	✓✓✓

Economy

Impacts on Total Public Transport Patronage

5.3.57 As discussed above, achieving the project TPOs will contribute to a mode shift from car to public transport. A comparison of the modelled public transport trips has been undertaken for the Aberdeen urban area (including relevant parts of Aberdeenshire e.g., Westhill). For 2045, this comparison shows that Option 2 will increase public transport by the smallest amount (2%) and Option 5P will increase public transport by the greatest amount (14%) under the 'with policy scenario'. Increases under the 'without policy' scenario are approximately the same in absolute terms, but proportionally higher given the smaller number of 'do minimum' bus users under this scenario.

Impacts on Existing Services

5.3.58 The introduction of bespoke ART services in options 5/5A/5P involves the removal of some current services on these corridors and the amendment of other services.

5.3.59 In Option 5, when tested under the 'with policy' scenario the remaining non-ART bus services are forecast to see a reduction in boardings of approximately 10,000 (9%) per day (07:00-19:00) and the proposed new ART services are estimated to carry approximately 46,000 boardings over the equivalent period. This suggests that approximately 75% of trips on the ART services are either new trips or have transferred from the bus services which have been removed.

5.3.60 Whilst the abstraction from the remaining services is relatively low, the implications of this need to be carefully considered further through more detailed work to understand the implications to these services in terms of commercial viability, and **to ensure that the connectivity of the bus network is maintained**.

Park & Ride Use

5.3.61 ART is proposed to be anchored off the P&R sites at Bridge of Don, Craibstone and Kingswells, and a new site north of Portlethen (assumed at 1,000 capacity similar to Craibstone), with the aim of increasing the use of the existing underutilised assets. Anchoring ART off the P&R sites will provide those travelling into Aberdeen from Aberdeenshire and further afield with an attractive viable and competitive alternative to the private car, which is currently lacking.

5.3.62 P&R site occupancies in the Do Minimum and options (for the forecast year of 2045) have been analysed across all four sites. Note again that the results here stem from the model and are subject to the modelling sensitivities and assumptions around P&R use. As such, rather than focusing on the absolute figures, it is perhaps more reasonable to focus on the relative changes between the options.

5.3.63 Under the 'with policy' scenario':

- Under the Do Minimum scenario, P&R occupancy across all four sites is 8% (300 spaces utilised at 10am, of a possible 3,550 space provision across all sites)
- Under Option 2 occupancy rises to 10% (360 spaces utilised across all sites)
- Under Option 5A occupancy is 26% (approximately 925 spaces across all sites), and occupancy rises to 31% (approximately 1,100 spaces) under Option 5 and to 32% (approximately 1,130 spaces) under Option 5P.

5.3.64 Under the 'without policy' scenario, P&R use would be expected to be greater, given the higher traffic levels and associated congestion. The results show that under Option 5, P&R occupancy is at 34% (compared to 31% in the 'with policy' case) equating to approximately 1,225 spaces utilised across all sites.

5.3.65 Across all options, Kingswells shows the greatest occupancy, with Craibstone (perhaps influenced by competing rail services alongside the corridor) the lowest. The new P&R site at Portlethen shows occupancy at close to 40% (approximately 390 spaces utilised at the site) under Options 5 and 5A in the 'with policy' scenario and close to 50% in the 'without policy' case (approximately 470 spaces utilised at the site).

Impacts on General Traffic

5.3.66 To provide the priority needed for public transport, significant road space reallocation away from general traffic is required along the ART corridors. This has the potential for additional traffic delay and traffic re-routeing onto less appropriate routes, with traffic routeing on more circuitous routes, and potentially increasing trip distances.

5.3.67 Traffic flow differences between the Do Minimum and the option networks confirm significant traffic reductions on the ART corridors. The most significant reductions are seen on the A96. There is an increase of traffic on the AWPR, in the northbound direction from the A93 to Craibstone and in the southbound direction from Blackdog in the north to Craibstone, where traffic is routeing round the AWPR to find alternative arterial routes into the city centre.

5.3.68 As shown in the traffic re-routeing plots in the Environment criteria appraisal above (Figure 5:2), across the options overall, traffic re-routeing shows increases in traffic on less strategic and minor roads including alternative routes between the ART corridors, including on the:

- B997 (linking the AWPR into the Bridge of Don)
- The Parkway / Diamond Bridge
- Esplanade and Park Road into the city centre
- Stoneywood Road through Dyce
- C898C Chapel of Stoneywood – Fairley Road liking from the A944 through Kingswells to Bucksburn and Craibstone

- A9119 / Kings Gate, running parallel to the A944 from east of Kingswells into the city centre
- Countesswells Road
- A93 from the AWPR into the city centre
- On the B9007 from west of the AWPR through Banchory of Devenick and towards the city centre
- Wellington Road from the AWPR into the city centre

5.3.69 As can be seen in Figure 5:2, the greatest increases in traffic occur on other arterial routes into the city, particularly on the B997 / The Parkway / Diamond Bridge in the north and the A93 and B9007 in the west / south.

5.3.70 Noting the above, it is crucial that further work is undertaken as the ART scheme develops to mitigate against the impacts of traffic inappropriately re-routeing due to delay on the ART corridors. Additional measures to prevent this may provide further scheme benefit through encouraging greater modal shift to public transport. In this regard, it is worth noting that generating adverse impacts to general traffic should not be viewed wholly as negative in the context of the study (and Scottish Government policy) objectives, as this will encourage modal shift and support the Government's 20% vehicle kilometre reduction target.

Transport Economic Efficiency

5.3.71 Transport Economic Efficiency (TEE) analysis focusses mainly on monetised changes in travel times and, as such, the reallocation of road space away from general traffic is likely to create disbenefits to general traffic when measured using this criterion.

5.3.72 The monetised economic impacts of the options have been estimated for both road traffic and public transport using the TUBA software to generate TEE impacts. In line with HM Treasury guidance, these figures reflect a 60-year appraisal period with all monetary values discounted to 2010 values and prices. The TEE analysis provides both a monetised estimate of this impact for general road traffic, and also a similar monetised estimate of benefits to public transport users (existing and new). It is important to recognise that the quantitative economic impacts presented here only represent a part of the overall appraisal picture and overly focusing on the monetised benefits generated by the options as a means of assessing the value of each option is not advised.

Table 5.17: TEE Results

Scenario	Option	TEE (millions)		
		Road	Public Transport	Overall TEE benefit
With Policy	2	-£233	+£111	-£122
	5A	-£220	+£156	-£64
	5	-£210	+£196	-£14
	5P	-£180	+£201	+£21
Without policy	5	-£307	+£182	-£125

5.3.73 There are both significant benefits to public transport users as well as significant disbenefits to general traffic under all options. In particular, there are significantly higher disbenefits to general traffic for Option 5 under the 'without policy' scenario where the network is more congested to start with - indeed general traffic disbenefits are nearly £100m higher in the 'without policy' forecast situation.

5.3.74 The Option 5 'with policy' and 'without policy' results both show a similar public transport journey time benefit. However, given the differing underlying future forecast scenarios, this benefit has a different composition under the scenarios. A greater proportion the benefits derived under the 'with policy' scenario result from existing users transferring to ART services, whereas more of the benefit is generated through new bus users in the 'without policy' scenario.

5.3.75 **The greatest benefits to public transport, and indeed the lowest disbenefit to general traffic are achieved under Option 5P highlighting the additional benefits that ART could achieve if appropriate supporting traffic restraint measures were implemented.** Indeed, Option 5P is the only option tested where the benefits to public transport are greater than the disbenefits to general traffic generating a benefit overall. In general, it should be borne in mind that **disbenefits to general traffic should not necessarily be viewed negatively** and indeed could be viewed as a desired policy outcome. Behavioural change and policy objectives require both 'pull' factors (through the provision of a high quality and efficient public transport network) but also 'push' factors, such as increased car journey times to make travelling by car less attractive. The potential adverse impacts to essential and freight traffic are however acknowledged, and future more involved discussion with the freight sector is required as the project progresses, to ensure the movement of goods, and the potential impacts on businesses, are understood and mitigated against.

5.3.76 Under all options except Option 5P, disbenefits to general traffic outweighs the benefits to public transport users, meaning overall monetised travel time disbenefits. Greater modal shift to public transport will reduce general traffic disbenefits, and supporting traffic restraint measures, such as parking policy, if implemented alongside the scheme, have the potential to ensure overall monetised benefit. Disbenefits to general traffic are substantially higher under the 'without policy' scenario.

Wider Economic Impacts (WEIs)

5.3.77 Whilst no quantification of WEIs has been made at this stage, some commentary is provided here around the key issues from an ART perspective.

5.3.78 Large transport projects can accrue benefits which are not captured by traditional cost benefit analysis. For example, wider labour market catchments for businesses and changes in property values through improved accessibility. These wider impacts are additional and separate to standard transport user benefits and are generally regarded as a sensitivity test in appraisal.

5.3.79 WEIs fall into three broad categories: induced development, employment effects and productivity impacts. Those considered of relevance to ART are:

- Move to More Productive Jobs (employment effect)
- Agglomeration (productivity impact)

5.3.80 Induced investment is not expected on any notable scale, particularly as existing transport networks do not appear to be significantly constraining development at present.

Move to More Productive Jobs

5.3.81 ART will improve connections between residential areas and existing employment clusters at Westhill and Kingswells business parks, Foresterhill Health Campus, Aberdeen City Centre, Aberdeen Airport and Kirkhill Industrial Estate, Bridge of Don Industrial Estate, University of Aberdeen, North East of Scotland College, Robert Gordon's Garthdee Campus and Garthdee shopping area. Through reducing journey times between homes and jobs, workers can access more jobs within an acceptable travel time and employers will have a wider pool of potential employees to recruit from, improving the match between jobs and skill sets. This in turn should support sustainable economic growth and improved productivity.

5.3.82 Under Options 3, 3A, 5A, 5 and 5P, some existing bus services will be replaced by ART or curtailed to prevent parallel running under. However, 'Hansen' connectivity analysis shows that there will be an overall increase in employment accessibility by public transport across the study area, although some small decreases in accessibility may occur in pockets of the city, where walking distances to ART services are longer (See Supporting Technical Note H).. Where ART brings no improvement in accessibility, there will be a decrease in relative accessibility compared with other parts of Aberdeen, and there may be some displacement of economic activity as people and businesses move to be closer to the high frequency ART corridors.

Agglomeration

5.3.83 Agglomeration impacts are the productivity benefits which result from businesses being located in closer proximity to each other (i.e., clustered). Proximity in terms of the movement of people doesn't relate to physical distance, but instead travel time and so transport improvements such as ART

can generate agglomeration benefits through increasing the effective economic density. Agglomeration is particularly relevant in an environment like Aberdeen where there is a high concentration of businesses and employees working within the energy industry.

5.3.84 Shorter travel times mean lower transport costs, and a larger potential pool of jobs and employees to support businesses. Static agglomeration effects occur where there is no change in location of residences or workplaces (i.e., not change in spatial concentration), but the cost of interaction between workers, businesses and consumers decreases. Dynamic agglomeration reflects the situation where transport improvements make an area more attractive to live, shop or do business, which can result in people and businesses relocating to that area. This will increase the effective economic density of that area and so yield positive productivity impacts; however, there may be a corresponding decrease in economic density elsewhere which generates negative productivity impacts. It is considered unlikely that significant dynamic agglomeration will occur as a result of ART, given the nature and scale of proposals.

5.3.85 The value of agglomeration benefits has not been estimated as part of this study, but the Final Business Case for the Edinburgh Tram York Place to Newhaven Project (February 2019) notes that "*the inclusion of [agglomeration] benefits for public transport projects in large urban areas (UK outside London) typically adds in the range of 15% to 40% above conventional transport benefits*".

Table 5.18: Appraisal Table - Economy

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Economy	TEE analysis indicates that Option 2 will generate Public Transport journey time benefits of £111m, but these benefits are dwarfed by the road journey time disbenefits, creating an overall TEE benefit of -£122m.	It can be surmised that the benefits for Option 3 would lie closer to that of Option 2, as bus lane and stop congestion is not expected to be significant on these corridors.	It can be surmised that the benefits for Option 3A would lie closer to that of 5A, given that stop spacing has a substantial influence on journey times.	TEE analysis indicates that Option 5A will generate public transport journey time benefits of approximately £156m; however, these are entirely offset by road disbenefits, resulting in an overall TEE benefit of -£64m.	Option 5 public transport benefits are only slightly lower than road disbenefits, resulting in an overall TEE benefit of -£14m.	Option 5P is as per Option 5, except it is assumed that parking costs are doubled in the city centre. This helps to boost the relative attractiveness of bus travel and results in an overall TEE benefit of £21m.
Economy Scores	✓	✓	✓	✓	✓✓	✓✓✓

Equality & Accessibility

5.3.86 The sub-criteria here are: Public Transport Network Coverage; Active Travel Network Coverage; Comparative Access by People Group; Comparative Access by Geographic Location; and Affordability.

5.3.87 The ART vision states that '*ART will need to support connectivity with other forms of transport, meet specific accessibility needs and recognise that not all users benefit from access to the internet and smart technologies*.' An **Equality Impact Assessment Screening** exercise undertaken to support the options appraisal is presented in Supporting Technical Note I and has drawn on discussions the Aberdeen Disability Equity Partnership and

various Aberdeenshire Access Panels. Furthermore, targeted questions on specific features of the potential ART network were asked during the market research exercise.

5.3.88 The Active Travel Network Coverage sub-criterion will be more fully addressed in the individual corridor studies where active travel is a key element of the corridor design process. The Affordability or otherwise of travel by bus in Aberdeen is currently a result of the commercially set fares in the area. As a core assumption, any new ART services would not be priced as a premium product. Only through a Franchising arrangement could fares be set by a public authority and this is considered further in Chapter 6.

Comparative Access by People Group

5.3.89 Some elements of ART, included in various options, have the potential to both negatively and positively impact members of society with particular protected characterises:

- **Vehicles:** new tram-style vehicles, alongside new ART 'platforms' would provide completely level boarding and alighting (like that experienced at a tram stop) via multiple sets of doors, with the vehicles providing a wider corridor for manoeuvring and space to accommodate numerous wheelchairs, pushchairs and prams. ART vehicles would also be covered by on-board CCTV and have real-time visual and audible information, ensuring the information is appropriately communicated to all. Drivers of ART vehicles (per Options 5 and 5P) will also receive enhanced training, above and beyond that received by most bus drivers, and will be able to provide help those who require support with boarding and alighting.
- **Bus Stops:** All options propose improvement to bus infrastructure, but specifically Options 3A, 5, 5A and 5P propose new ART 'platforms' which would be highly visible, well-lit and feature CCTV, helping to deter anti-social behaviour and/or harassment of stop users. Stops will provide seating arrangements and shelter for waiting passengers, as well as real-time information screens which will notify users of how long they will have to wait until the next bus. Such improvements will offer benefits to those with a long-term illness or disability, the elderly and children, women and some ethnic minority groups (who are more likely to be subject to hate crimes and discrimination) through improving both safety and security at stops as well as through the improved physical waiting environment.
- **Stop spacing:** Under Options 3A, 5, 5A and 5P, wider stop spacing is proposed (with stops up to 800m apart – bus stops at present are located between approximately 150m – 400m apart depending on location). It is recognised that certain groups will be impacted disproportionately by this due to the requirement to walk longer distances to bus stops. This is particularly pertinent for the elderly and disabled and in places where the removal of parking (to enable road space reallocation) would increase walking distances between cars and homes. This can adversely affect the elderly and those with children (although it is noted that the corridor studies are also considering active travel and, as part of this, improving the walking environment which encompasses improvements in walking routes to bus stops). Ongoing and continuous dialogue with equalities groups and local communities is fundamental as the scheme progresses, with improved walking access to bus stops considered as part of the ART project.
- **Integration of the underlying network:** As discussed in the option development section, options 3A, 5, 5A and 5P all involve integration of the existing bus network to minimise the duplication of services and associated operating costs and 'bus congestion', while maximising the potential for a financially viable bus network across the city and wider region. The reduction or removal of any existing 'local' buses is likely to impact

those less able to easily access an ART service and is likely to disproportionately impact those with a disability or mobility problem, the aged and those with children. However, ART will also provide cross-city services which do not currently exist, reducing the waiting and interchange requirements of these trips and benefitting those with mobility problems. Engagement with local communities as the study progresses will be vital to fully understanding the potential impacts once a greater understanding of where any changes required is more firmly known.

- **Ticketing:** various options for ticketing for the ART scheme have been explored and are discussed in the main body of this report, with Supporting Technical Note D, presenting a more detailed discussion. It is however noted that any changes to ticketing should ensure simple fare scales, multiple options for ticket duration and specific products aimed at key user groups, ensuring balanced affordable fares. Advantage would be taken of the latest developments in electronic ticket system technology while maintaining accessibility for users who rely on cash. As such, ticketing under ART should be accessible to all, and it is expected that all concession cards will be valid on ART services.

- **Shorter journey times:** With reduced bus journey times and increased car journey times, the travel time differential between the two modes will decrease. This will increase accessibility by public transport and expand the number of jobs, educational opportunities, and services within reach of those living, working and visiting the city. This will help to 'level the playing field' in terms of opportunity, between those who do and do not have access to a car. The impact will be more greatly felt under Option 5, 5A and 5P where the journey time benefits to public transport are greater, and this is borne out in the journey time improvements discussed above with regards to TPO1, where significant benefits for cross-city travel by public transport are noted.

Public Transport Network Coverage and Comparative Access by Geographic Location

5.3.90 The implementation of ART will not widen the currently existing bus network coverage as there are already public transport services operating along all the ART corridors; however, substantially improved public transport journey times on ART corridors with increased service frequencies, will vastly improve the accessibility of jobs, education and social opportunities, which may now become 'time' accessible. In addition, ART would provide for the mass movement of people during events given services would provide improved connectivity to the large venues The Event Complex Aberdeen (TECA) and to the Aberdeen Football Club ground at Pittodrie.

5.3.91 Bus stop rationalisation, as proposed under Options 3A, 5A, 5 and 5P would require passengers to walk further to access a stop; however, this will mean buses spend less time dwelling at stops and support reductions in journey times. It is noted that during the development and consultation on the Bristol metrobus scheme, no significant concerns were raised around accessibility issues due to increased bus stop spacing. **A balance is needed between bus stop spacing to reduce journey times alongside ensuring accessibly to the ART network for all**.

5.3.92 Those living within walking distance of the ART corridors, and those for whom use of Park & Ride sites is viable, will benefit from the ART network. Those for whom interchange is now required, under Options 3 and 5 (from a feeder service) may experience a disbenefit in accessibility, especially if they have mobility issues, luggage, a pram etc. making interchange difficult. In addition, any reduction in existing services on parallel routes may also reduce accessibility for those whose services are impacted.

5.3.93 ART will improve connectivity between some of Aberdeen's major employment/education sites (Arnhall, Prime Four, Kirkhill Industrial Estate, Aberdeen Airport, Bridge of Don, University of Aberdeen, North East of Scotland College, Robert Gordon University's Garthdee Campus, and the city

centre) and residential areas. This will reduce time spent commuting and provide a wider pool of potential employees to recruit from, improving the match between jobs and skill sets.

5.3.94 'Hansen' analysis[28] has been undertaken to understand the impact that ART could have on access to jobs. For this analysis, public transport travel times reflect the full door-to-door journey, including the walk to/from the stop, waiting time at the stop and time on board the vehicle. This means that accessibility analysis addresses both the shorter bus journey times but also the wider stop spacing/longer walking distance to/from stops seen under Options 3A, 5A, 5 and 5P.

Table 5.19: Hansen Connectivity to Employment Analysis

Scenario	Option	Change in Hansen Employment Accessibility Score vs. Do Min	
		Public Transport	Road
With policy	Option 2	+4%	-2%
	Option 5a	+11%	-2%
	Option 5	+12%	-1%
	Option 5p	+12%	-1%
Without policy	Option 5	+12%	-2%I

5.3.95 Hansen analysis shows an increase in accessibility by public transport to jobs of 4% under Option 2 and as much as 12% under Options 5 and 5P in the 'with policy scenario'. Similarly, employment accessibility is estimated to improve by 12% for Option 5 under the 'without policy' scenario.

5.3.96 Given that these proportional improvements in public transport accessibility to employment were derived model-wide, and so include many journeys unrelated to the ART network (e.g., commute from Huntly to Inverurie), **the real-world improvement to those living and/or working close to the ART corridors should be far more significant**.

5.3.97 The figures below illustrate Hansen Employment Accessibility Analysis (AM, 2045) results for Options 2 and 5 at a zonal level. For more information, see Supplementary Technical Note H.

[28] This analysis computes a single figure for each 'zone' which represents the connectivity of that zone to all other zones. A weighting is applied, usually jobs, to determine how 'attractive' each potential destination zone is. In this way a zone with a large number of jobs is 'worth' more if the travel time is shorter rather than longer.

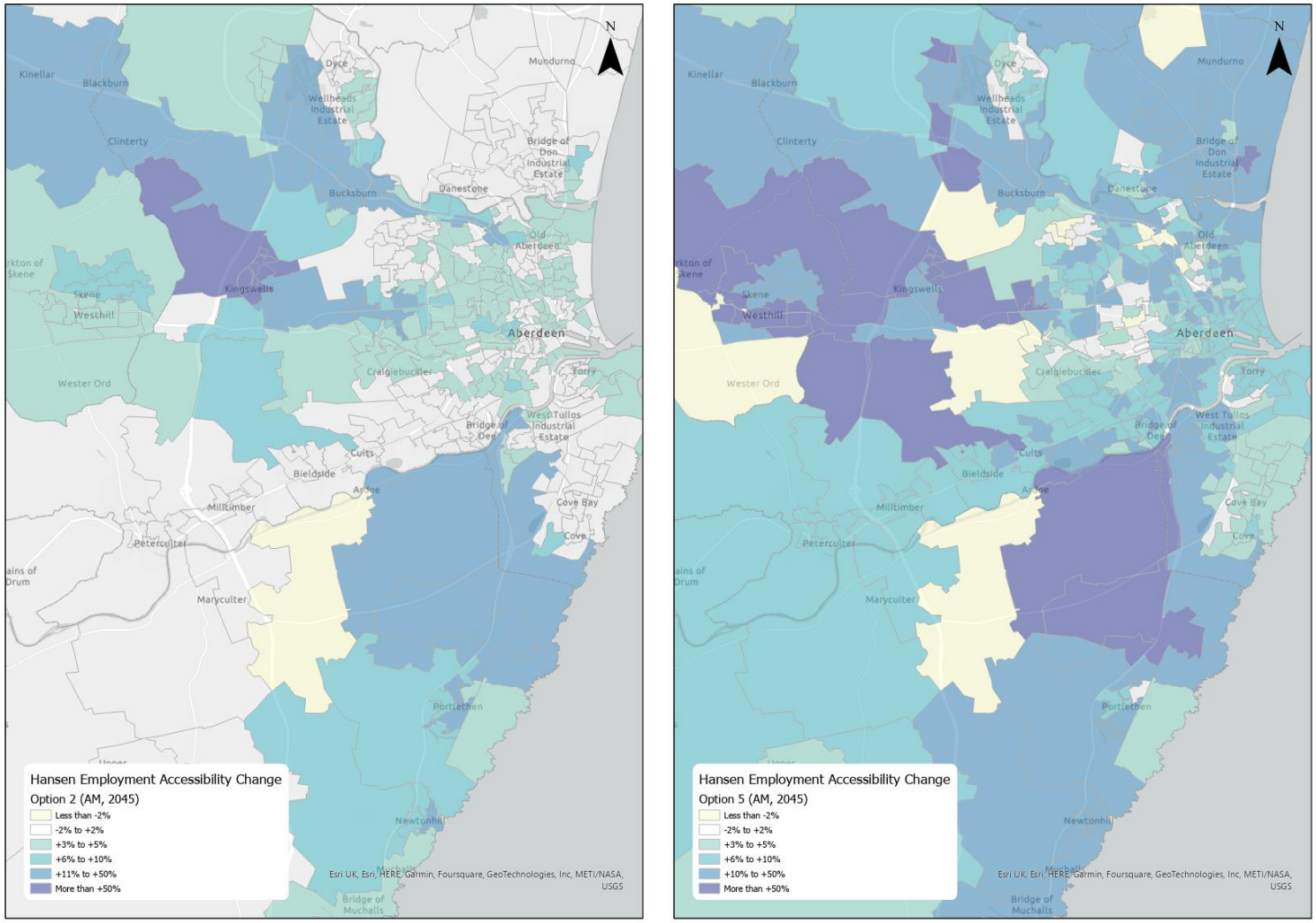

Figure 5:3: Hansen Employment Accessibility Change (Options 2 and 5, 'with policy')

5.3.98 Hansen analysis specifically shows employment accessibility improvements of:

- 10% or more along the A944 between Kingswells and Mastrick, along the A90S between Portlethen and Bridge of Dee and along A96 between Woodside and Kintore under Option 2.
- 25% or more along the same sections under Option 5A, as well as improvements of 10% or more along the northern A956/ A92 corridor up to Cruden Bay.
- Options 5 and 5P perform similarly in this respect as Option 5A, although accessibility improvements around Westhill and Kingswells rise to over 50%. This is likely to result from both the new ART services and the new conventional bus service modelled between Westhill and Dyce.

5.3.99 As noted earlier, ART proposals will also support improved public transport accessibility to the region's main health facilities including Aberdeen Royal Infirmary, Aberdeen Maternity Hospital, and Royal Aberdeen Children's Hospital, as well as Royal Cornhill Hospital.

5.3.100 One important point to recognise here is the length of the trip being undertaken. In terms of trips by public transport, these involves a walking element at both the start and end of the trip to reach the bus stop to board the service, and after alighting, to reach the final destination. As such, longer public transport trips gain greater benefit from the ART proposals as a more significant part of the trip is gaining the journey time improvement.

5.3.101 While ART will increase the accessibility of employment, education, and social and leisure facilities by public transport, and will primarily have positive impacts on members of society with particular protected characteristics, it should be noted that the increased stop spacing may have a negative impact on those with mobility problems (but, as noted above, increased stop spacing provides a significant part in reducing overall bus journey times on the ART corridors). Ongoing dialogue with equalities groups and local communities is fundamental as the scheme progresses to ensure ART is fully accessible to all.

Table 5.20: Appraisal Table – Equality & Accessibility

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Equality & Accessibility	Option 2 increases the frequency of existing connections and provides some small journey time benefits which improve accessibility overall. It is largely as per the status quo and so provides limited benefits over the Do Minimum. Hansen analysis indicates a city-wide improvement in public transport accessibility to employment of 4% under the 'with policy scenario.	In terms of accessibility, Option 3 is largely as per Option 2 except that Option 3 will also include the integration of ART with the existing bus network to reduce the parallel running of services. This is expected to provide some small additional journey time benefits.	Option 3A falls somewhere in between Options 3 and 5A. It will be as per Option 3, except it will use new ART platforms with wider stop spacing. This will increase the distance walked to a stop for some users but enable much greater journey time savings, helping to close the gap between travel by car and public transport and supporting equality. New ART platforms will provide improved security, passenger information and seating facilities which will support use of ART by marginalised groups and those with mobility problems.	Option 5A builds upon Option 3A and also involves replacement of the existing 1B, 7B, 14 and 727 bus services with two new cross-city ART services. This allows users to make cross-city connections, which are currently only possible with the use of 2 or more bus services. Hansen analysis indicates a city-wide improvement in public transport accessibility to employment of 11% under the 'with policy' scenario.	Under Options 5 and 5P, new ART services will be operated using new tram-style vehicles which permit additional journey time savings through simultaneous boarding and alighting, and which further support use by those with disabilities. These features include level boarding via two separate doors, wider aisles, more space for wheelchairs and prams, audio and visual announcements. Hansen analysis indicates a city-wide improvement in public transport accessibility to employment of 12% under both the 'with policy' and 'without policy' scenarios.	
Equality & Accessibility Scores	✓	✓	✓✓	✓✓✓	✓✓✓	✓✓✓

Cost to Government

Capital Costs

5.3.102 The capital costs of implementing the infrastructure for ART have been estimated using information from the ongoing multi-modal corridor studies. From these, an average cost per kilometre was derived (including preliminaries at 15% and optimism bias at 46% - as per TAG guidance). Cost estimates include allowance for link infrastructure, junction upgrades, bus stop infrastructure, and a new P&R site north of Portlethen.

5.3.103 It has been assumed that, under Option 2, the new infrastructure would only be provided over the extents of the network used by the strengthened services. As such, the capital cost of implementing the infrastructure for ART, assuming it was implemented across the four corridors is approximately £200m for Option 2, 3 and 3A, and approximately £215m for Options 5, 5A and 5P, all in 2021 prices.

5.3.104 It is assumed that vehicles, depot upgrades and bus service operating costs would be borne by the bus operators rather than Government.

Operating Costs

5.3.105 Operating costs have been developed for each option using our bus industry operating cost model (taking account of the estimated journey time improvements under the options) and are included in the 'business private sector provider impacts' in the cost-benefit analysis (presented below). These costs include variable (staff, maintenance, fuel and tyres), semi-variable costs (vehicles, finance and operational costs such as insurance and cleaning) and fixed costs such as overheads.

5.3.106 It is worth noting that under Options 5, 5A and 5P where the underlying bus network has been integrated into the ART network, the overall operating costs for the city-wide bus network is lower than under Option 2 (where additional services are provided on the ART corridors), despite the addition of the new cross-city services, although these costs are still increased relative to the base position.

Vehicles

5.3.107 For the purpose of this appraisal, it has been assumed that vehicle costs are depreciated over the life of the vehicle as per bus operators' accounting conventions. This means that vehicle costs will represent an annual operating cost, borne by the operator. However, the financing of new vehicles, and by whom, needs further consideration as the ART scheme and delivery mechanism become clearer.

5.3.108 In order to strengthen the number 14, 7B and 727 bus services, additional standard vehicles will be required under Option 2. For the purposes of the operational costing, it has been assumed that an ADL 400MMC vehicle would be used, which has a purchase price of approximately £225,000 (2019 prices). It is estimated that 33 additional vehicles would be needed to operate the additional services, at an approximate purchase cost of £7.4m (2019 prices).

5.3.109 Option 5 and 5P involve an additional cost to acquire the new tram-style vehicles and some further cost likely required at maintenance depots. It has been assumed that 18m articulated vehicles would operate the ART routes[29] (similar to the Glider system in Belfast) which have a purchase price of approximately £705,000 (2019 prices). It is estimated that 32 vehicles would be needed to operate the two cross city ART routes, at an approximate cost of £22.5m (2019 prices).

5.3.110 Under Options 3, 5A, 5 and 5P there will be an integration of existing services with the ART network and so a lesser vehicle requirement on existing services. This will mean that existing vehicles can be redeployed on the ART network (Options 3, 3A and 5A) or alternatively vehicle costs offset.

Revenue

5.3.111 Services improvements proposed under the options will come at extra cost, but these additional costs will be offset by additional carryings and associated revenue. TUBA was used to generate an estimate of changes to public transport revenue generated by each of the options, and these estimates were used to inform the BCR.

Value for Money

5.3.112 The monetised economic impacts of the options have been estimated using the TUBA software (as discussed above) to generate TEE benefits (as presented above) which, when combined with scheme costs, provide an indication of the benefit to cost ratio (BCR), or 'value for money', of each option. Supplementary Technical Note G presents detailed information on the derivation of the value of money of each option.

5.3.113 The Value for Money assessment has considered BCRs derived through including all costs and benefits, and then through the costs against the benefits to public transport only. **This recognises that traffic disbenefits should not necessarily be viewed negatively and indeed could be viewed as a desired policy outcome.**

5.3.114 Key elements considered within the cost to benefit derivation are noted in the table below.

[29] Exqui.City18 Electric | Van Hool

Table 5.21: Cost Elements Considered

Element		Included in
Costs	Capital infrastructure scheme costs	All options
	New tram-style vehicle acquisition	Options 5 and 5P
	Additional 'standard' vehicles to permit strengthening of existing services	Options 2 & 3
	Additional operational costs associated with strengthening existing services	Option 2, 3 and 3A
	Cost savings from integration of existing bus network	Options 3, 3A, 5, 5A and 5P
	New ART service operating costs	Options 5, 5A and 5P
Revenue Impacts	Lost revenue from integration of existing bus network	Options 3, 3A, 5, 5A and 5P
	Additional revenue on existing bus services	Options 2, 3 and 3A
	ART revenue	Options 5, 5A and 5P
Benefits	Travel time benefits (as presented in the Economy section above)	All options
	Greenhouse gases	
	Fuel and Vehicle Operating Costs	
	Indirect Tax associated with spend on fuel	

5.3.115 Under Options 3, 3A, 5, 5A and 5P, if the change in revenue (ART revenue minus 'lost' revenue from existing services) is greater than the change in operating cost of running the network (new ART/strengthened service costs minus reduced existing services costs) then the overall scheme will produce a 'surplus' in revenue. It is important to note that the revenue assumed within the BCR calculation has been derived directly from ASAM19 and TUBA. It is advised that detailed derivation of the revenue impacts is undertaken at Outline Business Case stage to provide confidence in the likely revenue impacts.

5.3.116 The 'present value' of the benefits and costs for the options (PVB, PVC), alongside the resultant BCRs is presented in the table below.

Table 5.22: Present Value of Benefits and Costs and Benefit to Cost Ratio

Scenario	Option	Present Value of Benefit (PVB) Including: time, fuel, vehicle operating costs, revenue, indirect tax revenue and greenhouse gases (millions)			Present Value of Cost (PVC) (millions)	BCR	
		Road	Public Transport	Total Benefit (millions)		Road and Public Transport	Public Transport
With Policy	2	-£244	+£49	-£195	£84	-2.3	+0.6
	5A	-£228	+£218	-£10	£91	-0.1	+2.4
	5	-£216	+£272	+£56	£91	+0.6	+3.0
	5P	-£176	+£285	+£109	£91	+1.2	+3.2
Without policy	5	-£318	+£263	-£55	£91	-0.6	+2.9

5.3.117 Under the 'with policy' scenario**, if only public transport benefits are considered against scheme costs, ART (as delivered under Option 5) can be considered 'value for money' in conventional terms, with a BCR of >1** (indeed the BCR is +3.0) i.e., scheme benefits outweigh the scheme costs. The potential value for money increases further should supporting traffic restraint measures also be introduced as per Option 5P (where the BCR increases to +3.2), again **reaffirming the additional benefits that ART could achieve if the appropriate supporting traffic restraint measures, such as parking control policy, were implemented**. It is worth noting that Option 2 has a BCR less than 1 (even when only public transport benefits are considered) indicating the option could not be considered value for money.

5.3.118 The benefits to users of ART are offset by the disbenefits to general traffic in terms of increased journey times. Depending on the extent of this, the BCR could reduce to <1. Under the 'with policy' scenario, with general traffic disbenefits included, the BCRs range from approximately -2.3 (for Option 2) to +1.2 (for Option 5P). However, these journey time increases to general traffic can be viewed as a means to achieving the scheme, and indeed a range of national objectives. Nevertheless, future scheme development should seek to minimise these impacts for essential traffic and mitigate the impacts of any re-routeing.

5.3.119 These results **highlight the potentially quite significant benefits of the combination of new cross-city services, new vehicles and platforms and supporting traffic restraint measures** (as per Option 5P). It can be surmised that the BCR for Option 3 would lie closer to that of Option 2, and that of Option 3A closer to that of Option 5A.

5.3.120 As noted above in the section on operating costs, under Options 5, 5A and 5P, the operating costs for the city-wide bus network (with new ART services and an integrated underlying network) is lower than under Option 2 (where additional services are provided on the ART corridors). The change in operator revenue under these options (taking account of gained revenue from ART service and lost revenue from the underlying network) is greater than the change in operating costs. Based on the model outputs, ART could be introduced with a net operating surplus.

5.3.121 Of particular note is the BCR generated under the 'without policy' scenario for Option 5, where the disbenefit to general traffic generates a negative BCR of -0.6 (indicating that the scheme generates overall disbenefits and would not be considered value for money), whereas the BCR under the 'with policy' scenario is approximately +0.6. This range in outcomes should be borne in mind by decision makers when considering full scheme impacts. **However, the BCR under the 'without policy' scenario when public transport benefits alone are considered (+2.9) is very similar to Option 5 under the 'with policy' scenario (+3.0), indicating 'value for money' for the option under both future forecasts.**

5.3.122 Caution should be applied in not placing undue emphasis on the scheme value for money calculated through these standard economic monetised figures, recognising the range of scheme benefits not included within the derivation of the BCRs. The economic vitality of the region, contribution to net zero and accessibility and social inclusion benefits are all additional to the traditional BCR calculations.

5.3.123 It is also important to recognise the additional set-up costs required to enable an appropriate delivery mechanism. These are discussed below in the context of scheme delivery, but the set-up costs associated with the development of the regulatory framework as well as the planning and mobilisation for an enhanced public transport offer could be of the order of £300,000. This would increase considerably if franchising was pursued.

5.3.124 In summary, ART will generate significant public transport benefits, and if only public transport benefits are considered against scheme costs, ART (as per Option 5) can be considered 'value for money' in conventional terms, with a BCR of >1. The potential value for money increases further should supporting traffic restraint measures also be introduced. If the existing network is integrated appropriately into ART, a more operationally robust city-wide bus network can reduce overall operational costs, improving overall scheme value for money. The outputs from the modelling suggest that under the Option 5 variants, the net additional public transport revenue will outweigh the net costs.

Table 5.23: Appraisal Table – Cost to Government

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Cost to Government	Option 2 will require new infrastructure in the region of £200m (2021 prices), in addition to supplementary vehicles in the region of £7.5m (2019 prices). At the same time, additional operating costs will be incurred to operate enhanced services. Modelling suggests that while demand will increase, this will be insufficient to cover additional costs. Overall Option 2 has a BCR of -2.3, indicating that the option generates net disbenefits and a public transport only BCR of 0.6, indicating that while Option 2 will generate public transport benefits, these are not sufficiently great enough to offset the costs of implementation. Modelling was not undertaken for Options 3 and 3A, but it is anticipated that overall, both options will generate a transport disbenefit, and so a negative overall BCR. In terms of a public transport only BCR, Options 3 and 3A are likely to generate a BCR in the vicinity of 1.			Option 5A involves the provision of ART services using existing vehicles. Modelling suggests that Option 5A will prompt a lesser modal shift than Option 5 and 5P and generate a net disbenefit and negative BCR overall. **In terms of a public transport only BCR, Option 5A will generate £218m of benefits to public transport users, which outweigh expected scheme costs and generates a positive public transport only BCR of 2.4.**	With policy Options 5 and 5P both generate a net benefit overall, although the net benefit under Option 5P is approximately double that under Option 5. With similar costs, Option 5 and 5P provide overall BCRs of 0.6 and 1.2 respectively. The key differences being that Option 5P generates 20% less road disbenefits and 5% more public transport benefits. Through the inclusion of supporting traffic restraint measures, Option 5P is able to prompt greater modal shift than Option 5, which removes cars from the road and reduces congestion, while also permitting more people to make journey times savings through travelling by bus. **When considering public transport benefits only, BCRs of 3.0 and 3.2 are achievable, indicating high value for money.** Without policy Under the 'without policy' future year scenarios, many more people are travelling by car, and fewer people are travelling by public transport, meaning that with the scheme in place, road disbenefits are higher and public transport benefits are slightly lower than under the 'with policy' scenario. Option 5 generates an overall disbenefit under the 'without policy' scenario. This underlines how impactful the underlying assumptions are surrounding baseline traffic. **Focusing on public transport benefits only, results in a BCR of 2.9**, only slightly lower than under the 'with policy' scenario.	

Risk & Uncertainty

5.3.125 Given the project is at an early stage in its development, there are a range of risks and uncertainties that need to be considered and minimised or eliminated where possible, as the study progresses. These relate to both the development of the scheme in terms of the form of the network and services (including infrastructure, routes, service frequencies, ticketing, vehicles etc.) as well as various risks associated with the funding and delivery of the scheme.

5.3.126 In terms of the scheme itself, while this report presents various route permutations for ART, only one of these permutations was taken forward for the purposes of modelling to provide the outputs to inform the appraisal. While it is clear that two cross city interconnecting ART routes provide benefit over four individual services routeing into the city centre, the exact specification of these routes requires further consideration and development at the business case stage to understand the preferred service routeing and extents of the network more concretely. This is perhaps most pertinent for the routes to the west and south of the city. This will have a knock on effect to the revisions to the underlying network which will have to be considered in parallel.

5.3.127 The infrastructure assumed for the purposes of this appraisal and the modelling of the options took the most up to date information from the ongoing multi-modal corridors studies. As these projects develop further, any further appraisal and testing of ART should ensure the most recent information from these studies is incorporated into the ART project to ensure the benefits of the scheme are robustly estimated.

5.3.128 Other risks relating to infrastructure include:

- Highway widening and potential need to use Compulsory Purchase Order powers, which may be met with resistance and bad publicity
- Required waiting and loading restriction changes to facilitate the infrastructure and how this may impact on businesses and freight movements
- The form that the CCMP will take with regards to Union Street and how this impacts on the development of the ART proposals and interchange between services (e.g., pedestrianisation of Union Street)
- Impacts on other on-going transport projects across the city i.e., Berryden Corridor Improvement Project

5.3.129 It is clear from the analysis of Option 5P that supporting traffic restraint measures, such as on and off-street public and private parking controls and workplace parking licensing, delivered in tandem with ART could positively impact on ART's success. Early consideration of these types of measures would minimise the risk for a less than optimal scheme implementation.

5.3.130 Engagement undertaken as part of the multi-modal corridor studies and for this study, while generally positive (as shown through the market research exercise), has also highlighted both public and stakeholder concerns around the project. Some public opposition to the proposals is inevitable, especially from drivers who will see their journey times increase and for whom there will be a reduction in on-street parking on ART corridors (as was experienced during work on the Birmingham Sprint scheme with designs compromised due to public pressure), and additionally from existing bus users and businesses who may have concerns regarding the future viability of services which run parallel with the ART network. Ongoing dialogue

with businesses, the freight community, access and mobility groups, elected members and the general public is required to positively influence understanding of the scheme benefits and ensure local issues and concerns are properly understood and addressed.

5.3.131 The delivery mechanism for ART presents some of the most significant risks and uncertainties as the project progresses. The delivery model required to implement ART depends heavily on the option chosen and this in turn is likely to be strongly influenced by both the appetite and funding available to pursue franchising. The mechanisms available under current legislation to deliver ART have been explored in more detail in Chapter 7 to assess how each could be applied to the ART options progressing through the appraisal. The assessment has focussed on the following mechanisms for delivery of local bus services in a Local Transport Authority (LTA) area as specified in the Transport (Scotland) Act 2019:

- Bus Service Improvement Partnership
- Franchising
- Municipal Ownership

5.3.132 Furthermore, a 'hybrid' model where, over time, a move was made from a BSIP to franchising has been explored.

5.3.133 It is clear that significant funding is likely to be required to attain a world class transit system and that, in general, outside of the UK, cities considered to have world class systems have a single operator of buses and other public transport modes or have a single transport body that procures bus services (and other public transport services) to single integrated and co-ordinated specifications. However, pursuing a franchising model introduces new, and ongoing, costs and financial risks for the local authority or authorities, including those associated with operating costs, and would be likely to result in legal challenge (considered to be a very high risk) increasing set up costs and timescales. Notwithstanding this, should franchising been pursued (as likely required for Option 5, 5A and 5P), the ART vision could be more fully realised, and the associated benefits are likely to be more significant.

5.3.134 Whichever options and delivery mechanisms are pursued, project success will be critically dependent on the goodwill and co-operation of bus operators and a recognition by all parties of an alignment of objectives. As such, ongoing and more involved dialogue with operators is required as the project progresses to minimise the risk of project derailment through a potential lack of common goals and understanding.

5.3.135 The key risks to be managed are clearly financial. Whilst the modelling undertaken for this study has produced broadly positive picture of the relative operating costs and revenues, these findings are based on the assumptions which underlie the model. These will require to be stress-tested as the process moves forward. The delivery mechanism for ART presents some of the most significant risks and uncertainties as the project progresses and it is clear that significant capital (and potentially revenue) funding is likely to be required to attain a world class transit system. Pursuing a franchising model introduces new, and ongoing, costs and financial risks for the local authority or authorities.

5.3.136 Further detailed consideration of the exact specification of the ART routes, including ongoing dialogue with businesses the freight community, access and mobility groups and the general public is important in minimising the risk of project derailment through a potential lack of understanding of the benefits of ART.

5.3.137 A further risk is that political backing for ART is not strong enough to see the project taken forward or alternatively there is not sufficient political appetite for the less popular supporting traffic restraint measures needed to make ART a success (e.g., increased parking charges in the city centre, or workplace parking levies).

Table 5.24: Appraisal Table – Risk & Uncertainty

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Risk & Uncertainty	Option 2 assumes little change to the status quo with low revenue, operator and legislative risk. However, analysis indicates that Option 2 will generate only a small patronage increase and that the infrastructure costs will far outweigh the benefits. This could pose a reputational risk to the LTA.	Moderate risk to LTA as scheme relies on operators agreeing to service rationalisation and there will be some moderate operator risk if uneven impacts of rationalisation. Options 3 and 3A are generally a good fit for deliverability via a BSIP; however, legislation does not empower an LTA to determine the places served by a bus service (other than specific instances related to road safety or congestion etc), so it may be challenging to effectively address the parallel running of bus services. A network re-design would be difficult to deliver and fundamental changes to route structures and places served would additionally require agreements between individual operators and the LTA.		Options 5A, 5 and 5P have a high risk to LTA as scheme relies on operators agreeing to service rationalisation, these options are likely to require franchising which may be open to challenge, and additionally the LTA must bear revenue risk and also reputational risk of a high-profile intervention in Aberdeen public transport market. Operator risk is also high as operators must win bus franchise so as to avoid patronage decline, and there could potentially be uneven impacts of existing bus service rationalisation. There is also a risk that there may not be the political backing for the supporting traffic restraint measures needed to make Option 5P a reality.		
Risk & Uncertainty Rating	**Low**	**Medium**	**Medium**	**Medium/High**	**High**	**High**

Public Acceptability

5.3.138 To inform the public acceptability criteria, a range of engagement activities have been undertaken during the Detailed Options Appraisal. These supplement the public and stakeholder consultation activities undertaken as part of the supporting corridor studies.

5.3.139 Recognising the importance of early political and stakeholder awareness and buy-in to ART, alongside the appraisal work, Nestrans commissioned Jacobs to undertake a range of engagement and communications activities, which included an ART 'launch' in late November 2022. In the run-up to the launch, a range of activities were undertaken including focus groups, and the development of an ART 'brand'. The launch included press coverage and social media activities, the issue of briefing papers to community councils, engagement with key business influencers (Aberdeen & Grampian Chamber of Commerce, Aberdeen Inspired, Opportunity North East, FSB and SCDI), face-to-face engagement and virtual briefing sessions for local business people.

5.3.140 Prior to the launch, an advanced virtual briefing session was held for all Aberdeen and Aberdeenshire Councillors to provide information to elected Members on the ART project; the vision, work to date and planned forthcoming activities. The appraisal team presented on the ongoing work at the Briefing.

Market Research

5.3.141 Given the complexities in explaining ART to the public at this (still largely conceptual) stage, and to ensure a sample broadly reflecting the demographics of Aberdeen and Aberdeen residents, a targeted market research exercise was undertaken as opposed to an open public engagement exercise. This was undertaken in December 2022 and surveyed 400 Aberdeen City and Shire residents to better understand their views on current public transport, factors which would encourage modal shift and thoughts on the options being considered. This highlighted a positive reception from the public to ART and, of the 400 residents interviewed:

- nearly 40% stated they would be either 'extremely likely', or 'likely', to change their travel behaviour if ART (as per Option 5) were implemented (this dropped to 27% under Option 2)
- 70% stated they would be either 'willing' (33%) or 'maybe willing' (37%), to walk further to a more comfortable ART stop
- 72% stated they would be either 'willing' (43%) or 'maybe willing' (29%), to walk further to catch a faster bus
- 66% stated they would be 'willing' (39%) or 'maybe willing' (27%) to accept that general traffic on the main roads where ART services would operate would need to be more restricted to achieve bus service journey time and reliability improvements
- 81% stated they thought ART would be 'good' (59%) or 'maybe good' (22%) for Aberdeen, with ART being a good news story for the city, providing improvements in access to the hospital and airport, and reducing carbon emissions being key reasons for this view.

5.3.142 Nevertheless, it is likely that ART will be met with some resistance from non-public transport users who will experience journey time increases due to the reallocation of road space from general traffic to public transport. Consultation undertaken as part of the supporting A944-A9119 Multi-modal

Corridor Study also identified that changes to on-street parking are also likely to be contentious. This was also noted by officers involved in the Birmingham Sprint scheme as being very unpopular and a factor in design changes which compromised one of the schemes. 'Fly' parking was also a concern from the public living close to the scheme, i.e., people parking on side roads to catch the Sprint bus. The Bristol metrobus scheme ensured no parking was removed outside of shops.

5.3.143 The Belfast Rapid Transit Phase 2 – Consultation Report published in October 2022 noted that the reallocation of road space was an emotive issue, particularly in the retail sector where there were concerns that access to and from their businesses, both for suppliers, staff and customers, would be adversely affected (including any loss of on-street parking). Consultation undertaken as part of the on-going corridor studies indicates that this is likely to be a concern within Aberdeen too. However, the Belfast Rapid Transit report highlights that the retail economy along the Glider routes has actually grown, with the Glider service making access to the retail area easier and bringing increased footfall. Concerns from both businesses and the general public need to be understood and managed as the ART project progresses with appropriate evidence presented to underpin the potential benefits.

5.3.144 In this regard, it is worth noting the wide range of local community engagement activities undertaken by the Birmingham Sprint team (under a 'Sprint' banner) in the run-up to scheme implementation. This included public realm improvements, local neighbourhood projects and tree planting to create a positive image of Sprint and raise awareness of the scheme and was felt to be highly beneficial in public acceptance of the scheme and implementation success.

5.3.145 Freight industry groups also highlighted concerns about loss of road space during stakeholder consultation undertaken as part of the A944-A9119 Multi-modal Corridor study. Freight movements will suffer journey time increases where road space is reallocated to public transport, but they obviously do not have to option of switching to public transport. Care will be needed to ensure the needs of the freight industry are understood and that the primary routes into the city are maintained at a level which facilitates the effective movement of goods.

Meetings with Mobility and Access Groups

5.3.146 Certain features of the ART network and services could have particular impacts, both positive and negative, on different sections of the travelling public. An Equality Impact Assessment (EqIA) Screening exercise was undertaken to inform the Equality and Accessibility STAG criteria, and in addition meetings were held with Aberdeen Disability Equity Partnership, the South Aberdeenshire Access Panel and the Aberdeenshire Central Access Panel. The EqIA screening form can be found in Supplementary Technical Note I.

5.3.147 In summary, the vision for ART has been positively received by a representative sample of the public, with an indication that many people would change their travel behavioural to use ART if it was implemented. Specific and local concerns from both businesses and the general public, which are highly likely to include some negative sentiment and challenge to the proposals, need to be understood and managed as the ART project progresses with appropriate evidence presented to underpin the potential benefits.

Table 5.25: Appraisal Table – Public Acceptability

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
Public Acceptability	**Option 2** provides new bus priority infrastructure and increases the frequency of existing services. As such, existing bus users are likely to view ART favourably, but modal shift is likely to be lower as there is less discernible change in provision. Non-PT users, residents and businesses along ART routes will experience similar inconvenience under all the options given that infrastructure proposals are broadly the same, prompting a similar loss of road space and on-street parking. As a result, there may be dissatisfaction with the LTA for spending a	**Option 3** is similar to Option 2 but also includes some integration / revision of services along the ART corridors to enable quicker public transport operations on the corridors themselves. This is likely to be met by some public resistance where these changes mean that bus users must now walk further from the bus stop to reach their destination. However, this integration of services should support shorter journey times for all users, which in turn should improve public perceptions.	**Option 3A** will face the same issues as Option 3, except that enhanced bus services will operate under a more recognisable 'ART' branding, and existing stops will be replaced with more widely spaced 'ART platforms'. These platforms will be of a much higher specification than traditional stops and should address some of the comfort and safety concerns cited during consultation as reasons for not travelling by public transport. The ART branding will support the network in being distinguishable from the existing bus network and support more favourable perceptions; however, it is noted that rebranding	**Option 5A** will see the introduction of new branded cross-city services, which modelling indicates will be better able to deliver journey time savings than Options 2, 3 and 3A. This will support favourable perceptions of ART and consideration that investment has provided value for money. But as the option includes some integration / revision of services along the ART, similar to Option 3, it is likely to be met with some resistance from those living adjacent to existing routes which will be curtailed to minimise parallel running of services.	**Option 5** would be as per Option 5A with new zero-emission 'tram-style' vehicles operating the new services. This is likely to be met favourably by the public and will support a more modern, elevated image of the service and a feeling of a new public transport offering in the city. This would provide a more obvious step-change in public transport and clearer product output for the money invested.	**Option 5P** differs from Option 5 only in that it assumes higher car parking charges in the city centre. As a result, Option 5P is likely to likely to be viewed similarly to Option 5 by existing public transport users, but perhaps less favourably by car users who are not open to moving to public transport. In the longer term however, the success of ART will largely be judged based on the patronage achieved, and Option 5P provides the greatest potential to provide a commercially viable service.

STAG Criteria	Option					
	2	3	3A	5A	5	5P
	Option 2: enhanced existing corridor services	Option 3: Option 2 with integrated existing services	Option 3A: Option 3 with ART branded buses	Option 5A: Option 5 but using existing vehicles	Option 5: new ART services with bespoke vehicles with integrated existing services	Option 5P: Option 5 with increased parking charges in city centre
	large sum of money and inconveniencing drivers if the scheme is unable to deliver patronage growth.		existing bus services without notable change to that service, has not historically prompted significant modal shift.			
Public Acceptability Scores	✓	✓	✓	✓✓	✓✓✓	✓✓

5.4 Appraisal Summary

5.4.1 Table 5.26 below presents a summary of all the scores from the appraisal. Thereafter, the main advantages and disadvantages of each option are shown in the tables that follow.

Table 5.26: Appraisal Summary

Op	Bus priority	Services	Bus Stop	Stop Spacing	Vehicles	Parking Policy	TPOs			STAG Criteria						
							TPO1: Bus average speeds > 25kph	TPO2: Consistent journey times	TPO3: Quality of bus travel	Environment	Climate Change	Health, Safety and Wellbeing	Economy	Equality and Accessibility	Public Acceptability	Risk and Uncertainty
2	✓	Current ART corridor services with increased frequency	Conventional, Upgraded	No change	Conventional	No change	✓	✓	✓	✓	×	✓	✓	✓	✓	LOW
3	✓	Current ART corridor services with increased frequency + integration of other services	Conventional, Upgraded	No change	Conventional	No change	✓	✓	✓	✓	×	✓	✓	✓	✓	MED
3A	✓	Current ART corridor services with increased frequency + integration of other services	Platform style	800m	Conventional ART branded	No change	✓	✓	✓	✓✓	-	✓✓	✓	✓✓	✓	MED
5A	✓	New bespoke cross-city services + integration of other services	Platform style	800m	Conventional ART branded	No change	✓✓✓	✓✓	✓✓	✓✓	✓	✓✓	✓	✓✓✓	✓✓	MED / HIGH
5	✓	New bespoke cross-city services + integration of other services	Platform style	800m	Tram-style	No change	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	HIGH
5P	✓	New bespoke cross-city services + integration of other services	Platform style	800m	Tram-style	Increased parking charges in city centre	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	HIGH

6 Deliverability

6.1 Introduction

6.1.1 This section sets out the mechanisms available under current legislation to deliver ART and assesses how each could be applied to the ART options progressing through Detailed Options Appraisal.

6.1.2 The Transport (Scotland) Act 2019 specifies the following mechanisms for delivery of local bus services in a Local Transport Authority (LTA) area:

- Bus Service Improvement Partnership
- Franchising
- Municipal Ownership

6.1.3 Each of these is described in turn below followed by commentary on the feasibility of delivery including likely timescales, the level of costs that may be incurred in set-up and operation, financial risks to LTAs and bus operators, and the potential for legal challenges. Also considered here are any prerequisite market conditions and the scope to progress over time from one delivery mechanism to another.

6.1.4 The applicability of each delivery mechanism to the ART options is then investigated to determine which mechanisms are feasible or appropriate for each option.

6.1.5 The information presented draws on the findings of the Transport Act Scoping Study commissioned by Strathclyde Partnership for Transport (SPT) and Glasgow City Council (GCC) in 2022 which explored the options available to local transport authorities (LTAs) arising from the Transport (Scotland) Act 2019, a review of which is presented in Supporting Technical Note A.

6.2 Bus Service Improvement Partnership

Description

6.2.1 A Bus Service Improvement Partnership (BSIP) 'Plan' is a plan that specifies the area and the period to which the plan relates and sets out for that area:

- an analysis of local bus services
- policies relating to local bus services
- objectives to be met within the period regarding the quality and effectiveness of local bus services.

6.2.2 A Plan may be made for the whole or part of their area by any LTA that considers it appropriate to do so, and two or more LTAs may jointly make a Plan.

6.2.3 At the same time as making a BSIP Plan, an LTA must also make one or more BSIP 'Schemes' relating to the whole or part of the area to which the Plan relates. Schemes agree one or more "Service Standards" in relation to local bus services and specify facilities to be provided or measures to be taken in the area by the LTA.

6.2.4 Service Standards may include:

- Route service standards – relating to the frequency or timing of local bus services, or

- Operational service standards – relating to:

  (a) the vehicles used to provide services

  (b) the maximum fares that may be charged for particular journeys

  (c) ticketing and the manner in which entitlement to travel may be evidenced

  (d) the pricing of multi-operator travel cards

  (e) the provision of information to the public about local services

  (f) the dates on which the timing of local services may be changed

Feasibility

6.2.5 Implementation of a BSIP appears eminently feasible and is, in many ways, a progression from current arrangements and practice. There is currently some uncertainty about the content of the regulations required to enable BSIPs, but this is likely to be largely administrative and, in any event, will be known before any final commitment needs to be made to pursue a BSIP.

Timescales

6.2.6 The secondary legislation required to implement BSIPs has not yet been published by the Scottish Government and, so, no BSIP process has yet been completed in Scotland. However, experience in England with the similar Enhanced Partnership process suggests a timescale of between nine and 12 months from initial informal discussions to the commencement of a scheme and its statutory commitments.

Costs and Financial Risks

6.2.7 There are costs incurred in establishing a BSIP Plan and Scheme given the need for workstreams to review the current network; assess delays to buses on key corridors and develop a programme of bus priority works; and review multi-operator and multi-modal ticketing. Some of this work has already been undertaken or is in programme for ART, so much of the cost is already budgeted for. Overall, it is estimated that the costs directly related to the BSIP process would be of the order of £50,000 split between admin/set-up including operator meetings and the ticketing workstream, with ongoing revenue spend of circa £20-30,000 per year.

6.2.8 The financial risks associated with the BSIP process are considered to be relatively modest and consistent with ‘business as usual’, for both LTAs and operators. There is no material transfer of risk between the parties who should be well able to manage the process.

Legal Challenge

6.2.9 The BSIP concept is consistent with the various transport partnership approaches promoted by the Scottish Government at various times and is unlikely to face resistance or legal challenge from bus operators. Key decisions relating to their commercial businesses remain largely in the control of the operators and any diminution of their freedom of action could be expected to be outweighed by the benefits arising from the requirement for the LTA to provide new facilities or implement new measures.

Applicability to ART options

6.2.10 The table below summarises the key elements of the shortlisted options for ART and assesses the extent to which the project objectives could be delivered under a BSIP, under a range of scenarios set out in the second column.

Table 6.1: Option Deliverability under BSIP

ART Option	Scenario	Deliverability under BSIP
Option 2: enhanced commercial services using enhanced infrastructure	Enhanced services are viable	Yes – enhanced services are self-funded by incumbent operators
	Enhanced services require revenue support	Requires competitive tendering. LTA needs to meet these tests: (a) 1985 Act s63 to secure such services as it considers appropriate to meet requirements which would not otherwise be met (b) Competition Test Pt 1 - intended purpose is to secure improvements in local services of benefit to users If incumbent operator does not win tender, LTA needs to use BSIP Route Standards to specify timings
	Cheaper & simpler fares and joint ticketing	Yes – but operators must be free to determine their own single-operator tickets and fares
Option 3: enhanced commercial services using enhanced infrastructure with integrated existing services **Option 3A:** enhanced ART-branded commercial services using enhanced infrastructure with integrated existing services	Enhanced services are viable	Yes – enhanced services are self-funded by incumbent operators
	Enhanced services require revenue support	Requires competitive tendering. LTA needs to meet these tests: (a) 1985 Act s63 to secure such services as it considers appropriate to meet requirements which would not otherwise be met (b) Competition Test Pt 1 - intended purpose is to secure improvements in local services of benefit to users If incumbent operator does not win tender, LTA needs to use BSIP Route Standards to specify timings Risk of incumbent operator opposition and challenge
	'Rationalised' services are viable and provided by operator of enhanced services	Yes – rationalised services are self-funded by incumbent operators
	'Rationalised' services are viable and provided by different operators	Maybe – requires operators of rationalised services to make independent decisions to change Risk of intervention by competition authorities
	'Rationalised' services require revenue support	Requires notification of intention to deregister by operator and then LTA competitive tendering. Risk of incumbent operator opposition and challenge
	Cheaper & simpler fares and joint ticketing	Yes – but operators must be free to determine their own single-operator and fares
Option 5 / 5P: new ART services with bespoke vehicles using enhanced infrastructure with	New services are viable	Requires independent decisions by operators to start new services
	New services require revenue support	Requires competitive tendering. LTA needs to meet these tests:

ART Option	Scenario	Deliverability under BSIP
integrated existing services **Option 5A**: new ART services operated with exiting vehicles using enhanced infrastructure with integrated existing services		(a) 1985 Act s63 to secure such services as it considers appropriate to meet requirements which would not otherwise be met (b) Competition Test Pt 1 - intended purpose is to secure improvements in local services of benefit to users Risk of incumbent operator opposition and challenge
	'Rationalised' services are viable and provided by operator of new services	Yes – rationalised services are self-funded by operators
	'Rationalised' services are viable and provided by different operators	Maybe – requires operators of rationalised services to make independent decisions to change Risk of intervention by competition authorities
	'Rationalised' services require revenue support	Requires notification of intention to deregister by operator and then LTA competitive tendering. Risk of incumbent operator opposition and challenge
	Cheaper & simpler fares and joint ticketing	Yes – but operators must be free to determine their own single-operator tickets and fares

Conclusions

6.2.11 A BSIP has the potential to deliver many of the attributes of a "world class" public transport system. There are some inherent difficulties in that the Plan cannot specify single fare prices and operators must be free to sell their own range of tickets.

6.2.12 There is a further practical difficulty in negotiating what could be a fine line between delivering the preferred integrated network and avoiding the appearance of collusion and anti-competitive behaviour by operators. This, in itself, could deter operators from fully participating because of the perceived risk of intervention by the competition authorities.

6.2.13 It is also worth noting that while a BSIP agreement in Scotland has no defined duration, the agreement must specify how the plan is to be reviewed and the dates by which the reviews are to be completed. There is no guarantee that operators would agree to similar arrangements at agreement review dates which presents a risk in 'future-proofing' the arrangements.

6.3 Franchising

Description

6.3.1 A franchising framework is a framework under which an LTA determines what local bus services are to be provided in an area, the standards to which the services are to be operated and specifies any additional facilities to be provided. The LTA then grants exclusive rights to operate the services under bus franchise agreements that specify frequencies, fares and standard of services. Such agreements may involve payments by the LTA to the operator or vice versa. An LTA may make a bus franchising framework covering the whole or any part of their area.

Feasibility

6.3.2 To date, **no franchising or quality contract scheme has actually been implemented**, and the terms of subsequent pieces of legislation have often acted as barriers to their formation. However, more recently the legal environment has been relaxed as a result of the 2019 Act and its equivalent in England, the Bus Services Act 2017 resulting in franchising proposals beginning to emerge.

6.3.3 Greater Manchester Combined Authority however is now well advanced in the tendering programme for its first round of franchises, due to commence operating in Autumn 2023. This, and other schemes under preparation, will provide useful lessons for subsequent schemes and franchising now looks more feasible than previously.

6.3.4 The **challenges involved in establishing a franchising framework are still significant**. The management and administrative effort required by the LTA to comply with the provisions of the 2019 Act - the likely hostility and potential lack of co-operation from incumbent operators and the financial modelling and management required mean that franchising, while feasible, is still difficult.

Timescales

6.3.5 The timescale for delivering a bus franchising framework can be lengthy. Before making the bus franchising framework, the LTA must:

- Prepare a proposed franchising framework, specifying:
  - the area to which it relates,
  - the services to be operated,
  - the period it is to remain in operation
  - the standards to which services must be provided
- Prepare an assessment of the proposed framework, setting out
  - how the framework contributes to the LTA's general policies
  - compare the framework to one or more other courses of action
  - describe the expected effect of the framework on adjacent areas
  - how they intend to operate the framework
  - the extent to which they consider that they will be able to secure that local services are operated under bus franchise agreements
  - set out their analysis of the financial implications for them of making the proposed framework
- how they propose to review the effectiveness of the proposed framework once it is made.
- Obtain a report from an auditor on the analysis of the financial implications contained in the assessment and, specifically the quality of data used and of the data analysis
- Carry out the required consultation with local bus operators and others and make any modifications it considers appropriate
- Obtain approval from a panel convened by the Traffic Commissioner.

6.3.6 Estimates, based on admittedly limited experience of the few schemes that have been pursued thus far, suggest a **timescale of up to seven years for delivery**.

Costs and Financial Risks

6.3.7 The franchising model introduces new costs and financial risks for an LTA, compared to a BSIP or the status quo. We do not say that this fact alone means that franchising should be disregarded, rather that the potential costs and risks should be understood and ultimately weighed against the forecast benefits to enable an informed decision to be made.

6.3.8 Franchising involves two streams of management and administration costs: during set-up to prepare and assess the proposed framework, obtain an auditor's report and conduct consultation; then on an ongoing basis to undertake service planning, tendering and monitoring & management.

6.3.9 The set -up costs associated with franchising will depend on the extent of any legal challenges and are therefore difficult to estimate accurately. Taking the example of Greater Manchester which is the most advanced such scheme at present and applying a pro rata factor based on population, **estimated set up costs could be of the order of £200,000 to £300,000 .**

6.3.10 Franchising also transfers many of the market risks from operator to LTA, most particularly farebox revenue where the LTA needs to be able to fund any unexpected shortfalls and/or respond quickly to re-align costs, if it can.

6.3.11 It would be theoretically possible to use net cost contracts with a franchising framework, i.e., transferring the revenue risk back to the operator but it is doubtful if this would be practicable. First, with a high degree of uncertainty in a new market regime, operators will err heavily on the side of caution in their revenue estimates leading to higher net costs; and secondly, the LTA will lose the flexibility to amend contracts 'mid-life' to respond to market conditions if it then needs to engage in revenue renegotiations.

6.3.12 Franchising also transfers an element of operating cost risk from operator to LTA. While contract prices are generally fixed (apart from any specified indexation) for the duration of a contract, the LTA has no control over the prices submitted when contracts are retendered.

6.3.13 Franchising, therefore, creates additional costs and financial risks compared to other models. While some of these are similar in nature to the current tendering regime, they will be of a far greater magnitude and others are not borne by the LTA at present at all.

Legal Challenge

6.3.14 The **risk of a legal challenge** to a franchising proposal **must be considered to be very high**. Incumbent operators have vigorously resisted all previous attempts to introduce franchising or, under previous legislation, quality contracts.

6.3.15 In the case of Nexus, a special board established by the Traffic Commissioner ruled against a quality contract scheme in Tyne & Wear, but it was clear that operators were prepared to take legal action if the decision had gone the other way.

6.3.16 More recently, in Greater Manchester the Metro Mayor's proposals for bus franchising were challenged by two operators who sought judicial review, one of them taking the case as far as the Court of Appeal. While these challenges were unsuccessful, they did add time, cost and uncertainty to the process.

Applicability to ART Options

6.3.17 The table below summarises the key elements of the shortlisted options for ART and assesses the extent to which the project objectives could be delivered under a franchising framework.

Table 6.2: Option Deliverability under Bus Franchise Framework

ART Option	Scenario	Deliverability under Franchise Framework
Option 2: enhanced commercial services using enhanced infrastructure	Enhanced services are viable	Fully deliverable – all services are franchised
	Enhanced services require revenue support	Fully deliverable – all services are franchised
	Cheaper & simpler fares and joint ticketing	Fully deliverable – all fares are determined by LTA
Option 3: enhanced commercial services using enhanced infrastructure with integrated existing services **Option 3A:** enhanced ART-branded commercial services using enhanced infrastructure with integrated existing services	Enhanced services are viable	Fully deliverable – all services are franchised
	Enhanced services require revenue support	Fully deliverable – all services are franchised
	'Rationalised' services are viable and provided by operator of enhanced services	Fully deliverable – all services are franchised
	'Rationalised' services are viable and provided by different operators	Fully deliverable – all services are franchised
	'Rationalised' services require revenue support	Fully deliverable – all services are franchised
	Cheaper & simpler fares and joint ticketing	Fully deliverable – all fares are determined by LTA
Option 5/5P: new ART services with bespoke vehicles using enhanced infrastructure with integrated existing services **Option 5A**: new ART services operated with exiting vehicles using enhanced infrastructure with integrated existing services	New services are viable	Fully deliverable – all services are franchised
	New services require revenue support	Fully deliverable – all services are franchised
	'Rationalised' services are viable and provided by operator of new services	Fully deliverable – all services are franchised
	'Rationalised' services are viable and provided by different operators	Fully deliverable – all services are franchised
	'Rationalised' services require revenue support	Fully deliverable – all services are franchised
	Cheaper & simpler fares and joint ticketing	Fully deliverable – all fares are determined by LTA

6.4 Municipal Ownership

Description

6.4.1 The 2019 Act restored the power of an LTA to "provide a service for the carriage of passengers by road using vehicles that require a PSV operator's licence to do so", provided that the LTA is satisfied that this will contribute to the implementation of its relevant general policies. This had previously been prohibited by the 1985 Act.

6.4.2 Whereas the previous models represent different delivery frameworks for ART, the municipal ownership model is not, in itself, a framework but could be combined either with a BSIP or franchising. The implications for delivery under each of the ART options is discussed later in this section.

Feasibility

6.4.3 The feasibility of this course of action would seem to depend largely on resources and funding: resources, in respect of satisfying the PSV Operator's Licence requirements, particularly by employing a transport manager who "effectively and continuously manages the transport activities of the undertaking" and funding to a sufficient degree to launch and then maintain the operation on an ongoing basis.

6.4.4 There are two principal means of establishing a bus undertaking in this context:

- Establish a new bus undertaking:
  - Set up an arms-length company with social value objectives related to public transport and the authority's general policies
  - Acquire assets (a depot and some public service vehicles) and appoint a Transport Manager, then apply for an Operator's Licence from the Traffic Commissioners. These tasks would have to be done "at risk" financially
  - Begin to tender for local bus service contracts (or bus franchises), recruit staff to operate those services (some staff might be available via TUPE) and secure a workload that allows the company to consolidate and grow as contracts are awarded.
  - Where gaps in the current bus service provision are identified and the municipal operator believes it can make a reasonable return, new commercial services could be registered and operated.
- Acquire an existing bus operator's assets and business.

6.4.5 The first option suggests growth would be gradual depending on the timing of new contract or bus franchise start dates, and on the ability of the undertaking to recruit sufficient qualified staff and fund investment in fleet etc.

6.4.6 Conversely, the second option could result in a more sudden and significant entry into the market, but it would depend on the existence of willing sellers.

6.4.7 It is also perfectly possible to combine the two approaches with expansion coming both from acquisition of existing businesses and organic growth, in both cases depending on market opportunities.

6.4.8 It should be acknowledged that the LTA's bus undertaking would be subject to the same market pressures as existing operators, including for example the currently difficult issue of recruitment of drivers and qualified maintenance staff. Indeed, a new operator with no track record as an employer may find it harder to recruit.

Timescales

6.4.9 The formal processes involved in establishing a new bus undertaking (under option 1 above) are relatively straightforward: a new company needs to be registered with Companies House and Memorandum and Articles of Association prepared. Once registered, the Company needs to apply for an Operator's Licence from the Traffic Commissioner. Minimum turnround times quoted by the authorities for these two stages are 8-10 days and 7 weeks respectively. However, the Operator Licence can be delayed, most commonly, if there any questions or concerns about the proposed operating base or maintenance arrangements.

6.4.10 In addition to these legal stages, the following actions need to be undertaken before the company can commence trading as a bus operator:

- Formal Council decision to establish company, following corporate democratic procedures and approvals
- Preparation of business plan
- Recruitment of management team and, at the appropriate time, front-line driving, maintenance and administration staff
- Identifying, obtaining and equipping depot site
- Obtaining buses – lead time for new zero emission buses is currently up to 18 months
- Bidding for contracts to run services and mobilisation (noting at present that Aberdeen City Council no revenue funding for services and Aberdeenshire Council have just announced a significant reduction to their revenue budget for supported services).

6.4.11 Overall, the likely timescale from formal Council decision to commencement of operations would be of the order of 18 to 24 months. Apart from the variables and uncertainties in the workstreams listed above, timing would also be crucially affected by the LTA's tendering schedule.

6.4.12 Option 2, the straight acquisition of an existing business would telescope these timescales to some extent, as the legal and logistic set-up stages would not be required but replaced by negotiation of a sale agreement; the dependence on the LTA tendering schedule would still apply.

Costs and Financial Risks

6.4.13 The process of establishing a municipally owned bus undertaking will incur costs related to the tasks listed under the 'Timescales' sub heading above. Initially, these would largely consist of officer time and professional fees but as the project progresses, there will be a point at which the new company will need to commit to obtaining and equipping a depot and then a further point at which it commits to acquiring vehicles.

6.4.14 If the decision was to buy out an existing operator, then the costs discussed above would be largely incurred at the point of sale. The overall quantum of cost, however, is likely to be similar in both options.

6.4.15 It is difficult to estimate these costs at this early stage but as an indication, Go Ahead Group paid £11.2m for a 160-bus operation in Greater Manchester (including depot) in 2019. However, the First Manchester fleet was relatively elderly and of low quality so the value of a more modern fleet, such as operated by major operators in Aberdeen, could increase the purchase price to circa £20.0m for 160 buses. On a pro rata basis, a 50-bus operation would cost circa £6.0m. Depending on the terms of either business sale or asset acquisition, it would be possible to smooth the cash outlay through leasing and rental.

6.4.16 There are two categories of risk associated with establishing the bus undertaking:

- Set up costs – related to the possibility that the municipal operator wins fewer contracts or bus franchises than it anticipated and has 'sunk costs' that it cannot recoup. This could be mitigated as far as possible by delaying expenditure where possible until tender awards are confirmed.
- Operating costs – the normal risks involved in running a bus operation, e.g., that revenue is lower than expected or external factors cause costs to rise faster or further than expected. These are risks currently borne by commercial operators as part of their business but would equally apply to a municipally owned undertaking.

Legal Challenge

6.4.17 It is difficult to see any grounds for a legal challenge, given the only caveat in the legislation is that the LTA must be satisfied that the action will contribute to implementation of its policies.

6.4.18 It is possible to conjure up scenarios where the actions or behaviour of such a bus undertaking could be open to challenge, for example in relation to competition law or state aid rules, but not to the setting up of the operation itself. We therefore conclude that the risk of legal challenge is low.

Applicability to ART Options

6.4.19 The table below summarises the key elements of the shortlisted options for ART and assesses the extent to which the project objectives could be delivered under a municipal ownership model.

Table 6.3: Option Deliverability under Municipal Ownership Model

ART Option	Scenario	Deliverability under Municipal Ownership Model
Option 2: enhanced commercial services using enhanced infrastructure	Enhanced services are viable	BSIP – requires municipal operator to operate services prior to BSIP Franchise – requires municipal operator to win one or more franchises
	Enhanced services require revenue support	BSIP – requires competitive tendering and municipal operator to win one or more franchises Franchise – requires municipal operator to win one or more franchises
	Cheaper & simpler fares and joint ticketing	Fully deliverable – all fares are determined by LTA
Option 3: enhanced commercial services using enhanced infrastructure with integrated existing services **Option 3A:** enhanced ART-branded commercial services using enhanced infrastructure with integrated existing services	Enhanced services are viable	BSIP – requires municipal operator to operate services prior to BSIP Franchise – requires municipal operator to win one or more franchises
	Enhanced services require revenue support	BSIP – requires competitive tendering and municipal operator to win one or more contracts Franchise – requires municipal operator to win one or more franchises
	'Rationalised' services are viable and provided by operator of enhanced services	BSIP – requires municipal operator to operate services prior to BSIP Franchise – requires municipal operator to win one or more franchises
	'Rationalised' services are viable and provided by different operators	Maybe – requires municipal operator to operate some services prior to BSIP and operators of rationalised services to make independent decision to change
	'Rationalised' services require revenue support	BSIP – requires competitive tendering and municipal operator to win one or more contracts Franchise – requires municipal operator to win one or more franchises
	Cheaper & simpler fares and joint ticketing	Fully deliverable – all fares are determined by LTA
Option 5/5P new ART services with	New services are viable	BSIP – requires municipal operator to operate services prior to BSIP

ART Option	Scenario	Deliverability under Municipal Ownership Model
bespoke vehicles using enhanced infrastructure with integrated existing services **Option 5A**: new ART services operated with exiting vehicles using enhanced infrastructure with integrated existing services		Franchise – requires municipal operator to win one or more franchises
	New services require revenue support	BSIP – requires competitive tendering and municipal operator to win one or more contracts Franchise – requires municipal operator to win one or more franchises
	'Rationalised' services are viable and provided by operator of new services	BSIP – requires competitive tendering and municipal operator to win one or more contracts Franchise – requires municipal operator to win one or more franchises
	'Rationalised' services are viable and provided by different operators	BSIP – requires competitive tendering and municipal operator to win one or more contracts Franchise – requires municipal operator to win one or more franchises
	'Rationalised' services require revenue support	BSIP – requires competitive tendering and municipal operator to win one or more contracts Franchise – requires municipal operator to win one or more franchises
	Cheaper & simpler fares and joint ticketing	Fully deliverable – all fares are determined by LTA

6.5 Hybrid Model

6.5.1 In addition to the delivery models described above, a further option would be to move, over time, from a BSIP to franchising. The argument for this approach is that franchising would give more benefits overall than a BSIP but would take longer to deliver than a BSIP.

6.5.2 A BSIP could therefore be introduced as a first stage, enabling the most readily achievable benefits to be realised while work continues on the development of a franchising model for later implementation.

6.5.3 However, there is considered to be a philosophical disconnect between the two models. As noted above, incumbent bus operators have consistently shown great hostility to franchising because, as they see it, their businesses are put at existential risk, for example if they fail to win sufficient bus franchises to maintain sufficient scale of operation or, theoretically, any operation at all.

6.5.4 Even where they win sufficient work, operators would be working in a very different environment where all commercial and many operational decisions would be taken by the LTA. The role of the operator then becomes one of a contractor, delivering services in a low-risk market and with consequently lower financial returns and profits.

6.5.5 In some respects, this is an extreme interpretation of the scenario and there are measures that could be introduced to give operators a continued commercial interest in the market, for example quality incentive contracts, as used now in London, where operators are rewarded for patronage growth on their contracts.

6.5.6 Nevertheless, this interpretation is set out as the closest to the view of most established major bus operators.

6.5.7 It should be pointed out that there are passenger transport groups who are in favour of franchising: typically, these are foreign-owned organisations who operate in regulated markets overseas and

are familiar with the franchising model and the associated business implications. However, none of these is an incumbent in North-East Scotland.

6.5.8 In contrast to franchising, BSIPs must rely heavily on partnership working between LTAs and bus operators. If the historic evidence from voluntary partnerships is repeated, it would be expected that the most successful BSIPs would be those that include a high degree of trust and wholehearted co-operation between the parties.

6.5.9 It is difficult to see how such a high level of partnership working can be consistent with an aspiration for the much more transactional relationship of franchising. There will be risks of the LTA not fully committing to the BSIP because it is also developing its franchising plans or of operators reducing or withdrawing co-operation once they learn of the LTA's plans. Given the timescales previously discussed for franchising, this could lead to a lengthy period where the BSIP is failing but there is nothing to replace it.

6.5.10 Therefore, there is some uncertainty as to whether a plan to start with a BSIP and then replace it with a franchising framework is realistic and it would probably be preferable to pick one or the other and unequivocally support it.

6.6 Conclusions

6.6.1 It is concluded that a BSIP could deliver many, but not all, of the aspirations for ART, but this is critically dependent on the goodwill and co-operation of bus operators and a recognition by all parties of an alignment of objectives.

6.6.2 A franchising framework has the potential to fully deliver the ART vision but requires a longer timescale and greater funding and transfers commercial risk from operators to LTAs.

6.6.3 The municipal ownership model could be utilised with either delivery framework. A decision on whether this model should be pursued can therefore be taken independently, based on whether the LTA can achieve its objectives more effectively to an extent that outweighs the costs, risks and management effort involved.

7 Monitoring and Evaluation

7.1 Introduction

7.1.1 The Monitoring Plan should focus on the supply side changes and the resulting changes in travel behaviour across the study area. The evaluation would then interpret this data and perhaps add primary research to assess the success of the option in terms of the TPOs and the STAG criteria. If implemented in isolation, these measures (particularly the reallocation of road space) would likely have a material impact on traffic levels on adjacent radial routes to which traffic would likely reroute (e.g., A944 may become considerably busier if road space is reduced on the A96 to accommodate ART, or vice versa). It is recommended that a Monitoring Plan be developed to cover the totality of the project, and parallel routes, rather than in relation to individual corridors.

7.2 Monitoring and Evaluation Plan

7.2.1 Given that the corridor studies have in the main built from a pre COVID-19 position, a new common travel baseline should be established once the data indicates a more stable post-COVID position. Aberdeen City Council's ongoing monitoring of travel should be used to make a judgement on when a new, settled position has been reached. At this point, for each corridor a baseline data collation should be undertake e.g., as follows:

- Quantitative 'audit' of bus facilities (as per Case for Change audit).
- Description of bus services on each ART corridor – to identify service changes which may / may not be due to the measures over time.
- Analysis of bus travel times and travel time variability / compliance with timetable – using GPS/AVL data.
- General traffic journey times – using e.g., INRIX data for selected point to point movements.
- 'Screenline' counts, as a cordon around the city, by mode on each ART corridor. These counts could be undertaken in a neutral week – recording pedestrians, cyclists, cars, vans, lorries etc. All significant streets crossing the screenline should be included – this will be required to assess the scale of re-routeing in the streets parallel to each ART corridor.
- Bus passenger absolute and origin-destination data in equivalent weeks.
- Bus passenger surveys / pedestrian & cyclist surveys – aimed primarily at 'scoring' satisfaction levels with different aspects of the service.

7.2.2 This exercise could be repeated say one, three and five years after implementation. There may be value in undertaking a subset of this data collection annually (e.g., screenline counts).

7.2.3 In order to assess in this manner, a control area or counterfactual will require to be identified. This should provide a 'no-intervention' scenario in terms of trip making and mode share. Given Scotland's other cities are likely to be implementing similar measures over the next decade, this could be problematic, and the control area(s) may have to be based on larger towns in Scotland where significant reallocation of road space is not planned.

8 Summary and Conclusions

8.1 Summary

8.1.1 This report has presented the evolution and appraisal of option approaches for the development of the ART scheme.

8.1.2 This report has expanded upon the option approaches selected for further consideration in the Preliminary Options Appraisal, looking in more detail at the potential form of the network, deliverability and supporting regulatory framework. These option approaches included one or more of the four defining elements of ART (high segregation, fast services, frequent services, and high capacity) and ranged from Option 2 requiring the least change from the existing position (enhanced frequency on existing services on enhanced corridor infrastructure), to Option 5, which reflects the most changed position (i.e., infrastructure changes, existing service integration / revisions, bespoke vehicles etc.).

8.1.3 The study's Transport Planning Objectives have been further refined and SMART-ened to support the detailed appraisal and ultimately also the evaluation, and are:

- **TPO1**: Achieve average ART bus speeds on the urban sections of the ART corridors (i.e, within the Aberdeen city boundary) of at least 25kph (16mph) by 2030
- **TPO2:** By 2030, achieve a public transport service for which the timetables (with journey times reduced as per TPO1) are consistent across the day and the week, and where 95% of the services operate to within 5% of the timetabled journey time
- **TPO3:** Improve the perception of quality of bus travel on ART corridors by 2030

8.1.4 Further work was undertaken to develop the options prior to appraisal, to allow for more detailed appraisal including the modelling and testing of the options to provide quantitative inputs to the appraisal. This development included consideration of the ART network (routes and interchange), the bus priority measures assumed, bus stop spacing and specification, how ART would integrate with other services, the vehicles to be used, and potential ticketing options.

8.1.5 These study TPOs were used, along with the STAG criteria, to appraise the options developed.

8.2 Conclusions

8.2.1 From the appraisal, it is clear that Option 2 is the least aligned with the ART vision and, of all the options, delivers the least against the study objectives and a range of other success indicators as discussed above.

8.2.2 Option 5, which is closely aligned with the ART vision, could provide far more significant benefits, in terms of public transport journey time reductions, modal shift, improving perceptions of public transport quality, P&R use, equality and accessibility, and overall public transport benefits.

8.2.3 The appraisal of Option 5A (similar to Option 5 but with ART services operated using conventional vehicles) has highlighted the loss of some of the scheme benefits when tram-style multi-door vehicles are not utilised (lower average speeds, lower modal shift, lower P&R use and lower overall public transport benefits). The option would however come with a cost saving as new vehicles and depot alterations to accommodate the vehicles, would not be required.

8.2.4 The appraisal of Option 5P has highlighted the significant additional scheme success that could be realised if supporting traffic restraint measures to deter travel by private car were implemented alongside ART, with the benefits of Option 5P greater than Option 5 (and 5A) across all the metrics considered.

8.2.5 While Option 3 and 3A were not modelled at this stage, it can be assumed that Option 3 would produce results more aligned with those of Option 2, with Option 3A results likely to similar to those under Option 5A.

8.2.6 The modelling and appraisal of Option 5 under both the 'with policy' and 'without policy' future forecast highlighted the public transport benefits of ART under both options but given the more congested forecast network in the without policy' forecasts, the impacts to general traffic under the 'without policy' forecast are considerably more significant. However, while these impacts should be recognised, as noted throughout, generating adverse impacts to general traffic should not necessarily be viewed as negative in the context of the study (and Scottish Government policy) objectives. The quantum of public transport benefits in both Option 5 scenarios are similar although their composition differs.

8.2.7 Option 5 and 5P provide the greatest benefits and could provide Aberdeen with what could be considered a world class transit system. However, implementing such a solution may require pursuing a franchising delivery mechanism. Such a model would likely introduce new, and ongoing, costs and financial risks for the local authority or authorities, including those associated with operating costs, and may result in legal challenge (considered to be a high risk) increasing set up costs and timescales.

8.2.8 As noted above, Option 3A is likely to provide benefits similar to Option 5A. The option includes the strengthening of services on the ART corridors, wider stop spacing (with the significant journey time benefits this brings), and benefits from new ART 'platforms' as well as ART branded vehicles, significantly improving the quality of travel by public transport and differentiating ART from the existing bus network. The option also proposes integration of the underlying bus network, to create a more coherent and robust city-wide public transport network. Such an option could potentially be pursued through a BSIP. The financial risks associated with the BSIP process are considered to be relatively modest and consistent with 'business as usual' for both local authorities and operators and as such, is unlikely to face resistance or legal challenge from bus operators. Successful BSIP delivery however is critically dependent on the goodwill and co-operation of bus operators and an understanding of what can be achieved under such an arrangement will require careful negotiation.

8.2.9 The potential for successful ART implementation was evidenced through the market research exercise which highlighted strong underlying public support for the ART concept and the greater likelihood of changing travel behaviour should a scheme more akin to Option 5 be implemented.

8.2.10 Given the above, and recognising the risks and uncertainties of the scheme and its delivery:

8.2.11 **Option 3A is considered worthy of further consideration** and more involved discussion with operators should be undertaken to explore what could be achieved through a BSIP delivery mechanism. While not delivering all the benefits of what could be achieved under Option 5, the option presents a less risky and uncertain pathway to delivery. A more developed version of Option 3A would essentially provide Option 5A.

8.2.12 **Option 5 is considered worthy of further consideration** and has the potential to provide Aberdeen with a world class public transport system but comes with significant potential additional costs and risk. The political appetite for this needs to be further explored both across the local authority or authorities, and with the potential operators, and consideration of the available funding to pursue franchising is likely to be a critical factor in the decision.

8.2.13 Recognising the additional benefits gained when supporting traffic restraint measures are implemented alongside the option, **supporting traffic restraint measures should be considered and pursued as part of the ART scheme**, regardless of the form of the option or delivery mechanism

8.3 Next Steps

8.3.1 As the project progresses to Business Case, the following next steps are required:

- Further consideration to establish the exact routeing for the ART corridors and services – developed through discussion with those involved in the multi-modal corridor studies and through further modelling work

- Further testing of any progressing options under the preferred network and services. Noting that the 'with policy' and 'without policy' scenarios provide similar public transport benefits and recognising that the ART scheme is one of the measures which will contribute to the 20% vehicle reduction target (as reflected in the 'with policy' scenario), **it is recommended that all further option testing is undertaken using the 'without policy' scenario forecasts**. This forecasting position aligns more closely with what could be considered 'business as usual' i.e., what may transpire if no policy interventions were implemented and will also for a fuller understanding of ART's contribution to Scottish Government targets. While testing in this forecast scenario will increase the disbenefits to general traffic, given this is perhaps a desired outcome of the scheme, **the focus should be on the public transport benefits that are derived**. As part of this testing, an understanding of the mitigation that may be required to deter inappropriate re-routeing is required and should be built into the schemes through discussion with those involved in the multi-modal corridor studies. In terms of all design work for the ART corridors, the 'without policy' 2030 forecasts are deemed the most appropriate for use. Given the likely lead in times to implement ART, this future year forecast represents an appropriate opening year.

- More detailed financial analysis of operating costs and revenues will be required to firm up on the level of commercial viability / risk which will have to be considered

- Recognising the funding constraints and likely requirement for phased construction (for both funding and operational reasons) further testing of any progressing options should be undertaken to enable an understanding of the potential phasing and benefits of ART at the different phased stages, as well as on scheme completion.

- Development of potential supporting traffic restraint measures, including raising awareness of their benefits and exploring the appetite for them

- Entering into more detailed dialogue with operators to understand what could be delivered through a BSIP

- Undertaking a market sounding exercise to gauge operator interest in a potential bus franchise model in Aberdeen. Such an exercise was undertaken successfully as part of the Birmingham Sprint scheme development

- Ensuring ongoing engagement with key stakeholders, businesses and the public as the project evolves to ensure positive buy-in to the proposals as they become more concrete

- Exploration of potential funding streams, particularly in relation to the purchase of zero-emission buses