Item 10

9th April 2019

Glasgow City Region – City Deal

Cabinet

Report by Senior Project Manager, Airport Access Project

Contact: George Vincent Phone: 0141 287 9477

Airport Access Project Update

Purpose of Report:

The purpose of this report is to update Cabinet on progress made on closing out the audit of the Airport Access Project Outline Business Case which was commissioned by Scottish Ministers and carried out by Jacobs consultancy. It does not seek to give a detailed discussion on what are highly technical transport planning/ project delivery issues, rather it seeks to give the Cabinet a summary of the key focus of this, whether there are any major outstanding issues and the way forward for the project.

Additionally, the report identifies the implications of the work that has been undertaken on the way forward for the project, and in particular the recommendation that PRT is adopted as the new preferred option for the Airport Access Project.

Recommendations:

The Cabinet is asked to:

(i) note the content of this report and the work which has been completed by the Airport Access Project Team and stakeholders in the past year to address the Jacobs audit of the Outline Business Case commissioned by Scottish Ministers, and the implication this may have for the way forward on future delivery of the project;

(ii) note the timetable to delivery and the need for all stakeholders to collectively work together to ensure the project is progressed to this timetable; and

(iii) agree that further work is done to develop out the PRT option and note that the costs required shall be contained within existing approvals

1.0 Background

1.1 The £1.13bn Infrastructure Fund within the Glasgow City Region City Deal has identified the Airport Access Project (AAP) as the flagship regional project (with a project cost of £144.3m), due to its strategic importance to the overall City Region. It has long been recognised that Glasgow Airport is heavily reliant on road based access to the airport and that there is a desire to deliver a more sustainable form of surface access to the airport to support the continued growth of the airport and the sustainable and inclusive growth of the Glasgow City Region economy.

1.2 Since the cancellation in 2009 of the Glasgow Airport Rail Link there have been a numerous studies carried out to help inform and identify the best form of surface access transport intervention to assist with improving sustainable access to the airport, and the City Deal team built on them to develop a Business Case for a preferred option to deliver improved access. A list of these studies and City Deal Business Cases, together with a short summary of their findings, are included in Appendix A for information.

1.3 In December 2016, the Glasgow City Region Cabinet considered the Outline Business Case (OBC) for the project, which noted that tram-train has been identified as the option most suitable to be taken forward as the preferred option in this Outline Business Case and developed further through to Full Business Case. Cabinet agreed that the project should proceed to Full Business Case. Within the OBC, PRT was identified as the next best performing option and able to be delivered within budget.

2.0 Audit of OBC

2.1 Following the Cabinet's consideration of the OBC, the Scottish Ministers commissioned Jacobs to undertake an audit of the OBC on their behalf in February 2017, with the final audit report being provided to project partners on 21st November 2017. On 8 December 2017 the AAP Executive Steering Group met and agreed that all partners would work together collaboratively to close out the audit findings. This approach was noted by the Cabinet on 12 December 2017.

2.2 The main items identified in the audit included:

(i) Options Appraisal
(ii) Airport Demand
(iii) Airport Accessibility
(iv) Airport Benchmarking
(v) Economic Case
(vi) Rail Operational Issues

2.3 The issues raised by the audit and the outcomes of the 'audit close out' work are summarised below. It should be noted that the project team have fully involved all stakeholders and the Jacobs Audit team in the development of the audit responses.

3.0 Options Appraisal

3.1 In response to comments in the Jacobs audit and discussion at the Executive Steering Group on 8 December 2017 it was agreed that previous or potential new options for meeting project objectives would be revisited. A workshop with all stakeholders identified and agreed a list of options which were to be taken forward for further/updated review and testing. These included:

- **Tram Train**: specification as per the OBC interim service (including looking at minor timetable alterations to smooth train paths and allow flexibility to accommodate tram train within the timetable))

- **PRT**: specification as per the OBC (pods on elevated guideway linking the airport to Paisley Gilmour Street)

- **LRT**: on road option from Central Station to the Airport following the Fastlink route (the estimated cost for this was £980m and was therefore discounted as being unaffordable).

- **Bus**: 2 variants were identified incorporating additional Fastlink Services to the airport as part of the bus solution (the First M8 Service 500 bus was a part of the 'do minimum' service specification).

    - Variant 1 - Fastlink Extension following surface roads between Glasgow City Centre and the Airport (including Pacific Quay, Govan, QEUH, Braehead, Renfrew and GAIA)

    - Variant 2 - Fastlink Extension following a similar route before joining the M8 at Braehead and then running on hard shoulder for part of the way to the Airport.

3.2 The Transport Planning Objectives (TPO's) were also reviewed and revised, this review mainly focussed on clarifying the need to make sure that the changed context arising from NMIS/AMIDS was included in considerations and that the potential demands on the wider transport network were taken into account.

Glasgow Airport Access Project – Transport Planning Objectives

- Increase the modal share of public and active transport modes for passengers and employees to and from Glasgow Airport;
- Improve public transport journey times and their reliability to and from Glasgow Airport such that they are increasingly competitive with the private car;
- Support sustainable growth of Glasgow Airport and business investment and regeneration of its surrounding area and the City Region;
- When unlocking the economic and development opportunities in and around Glasgow Airport mitigate any negative impacts on the operation and performance of the strategic transport network.

The revised TPOs together with a high level appraisal of the identified options are provided in Appendix B.

4.0 Airport Demand

4.1 A comprehensive review of Glasgow Airport passenger forecast data has been carried out. This included an overview of available passenger demand forecasts, a review of historical evidence of passenger demand growth, consideration of passenger characteristics, resulting in defined forecast scenarios for airport demand which could then be used for the AAP transport modelling and economic appraisal.

4.2 In the original OBC, the core passenger growth scenario adopted was the 'BAA Low Growth forecast', which was viewed as a conservative approach and in line with the STAG work previously carried out. Following further consideration of future airport growth, and in discussion with stakeholders and auditors, the most likely (core) growth scenario has been agreed as the 'BAA Central Growth forecast', which will form the basis of the Glasgow Airport Masterplan which is due to be published in early 2019. It should be noted that going forward sensitivity testing will be carried out to include low, central and high growth. The headline figures for these are:

Growth Forecast	**2025**	**2040**
BAA Low Growth	9.6m	11.9m
BAA Central Growth	11.5m	15.5m
BAA High Growth	11.9m	17.4m

* Current Patronage (2017) – 9.895m

5.0 Airport Accessibility

5.1 The Jacobs audit suggested more information was required on the origin and destination of passengers and associated accessibility benefits relative to each option. It was agreed that existing network journey time information, to and from Glasgow Airport, would be considered for each option and appraised against the current airport passenger demand profile and forecast airport passenger demand profiles. This would provide analysis on the level of provision and identify daily gaps in each option, assist estimates of unserved passenger demand and further inform airport accessibility. Following discussion between the project team and Jacobs it is felt that this will not be a material consideration in the decision made on the option chosen for further consideration within a revised OBC. Therefore, whilst this work has not been completed at this time, it is not a barrier to progressing with the project, but will be carried out and presented within a revised OBC.

6.0 Airport Benchmarking

6.1 A wide ranging benchmarking exercise was carried out building on the work done in the OBC. This exercise included 18 airports (incl Glasgow) which generally had comparable patronage and distance to city centre. Overall, the analysis has highlighted Glasgow Airport as having more limited surface access links than the vast majority of the benchmark airports and generally with a corresponding lower public transport share. Therefore, the ability of Glasgow Airport to compete with its competitor airports will be diminished if the public transport offer is not strengthened.

6.2 The impact of M8 congestion on airport patronage is difficult to model however there is a strong body of evidence (including industry reports and parliamentary reports) which suggests good surface access is required to support airport growth, therefore increasing M8 congestion will become a constraint to airport growth, and make non road based alternatives (or road based alternatives with built in priority) more attractive when considering surface access modes to support airport growth.

6.3 A recent report by Jacobs examined congestion on the M8 Glasgow Motorway Corridor. This showed that traffic flows on the M8 between Glasgow city centre and Glasgow Airport are increasing. Jacobs identified the opening of the M74 extension in 2011 as one of the main driving factors behind this trend. Analysis of journey time data also provides evidence that the M8 between Glasgow city centre and Glasgow Airport suffers from recurring congestion in both directions at peak times. In addition, journey times have been increasing over recent years exacerbating the magnitude of these problems and their impact upon Glasgow Airport.

6.4 Analysis carried out by the project team has also shown that the First Bus Service 500 is suffering from journey time variability in both directions on a regular basis and that, at peak times, the doubling of the scheduled 15 minute journey time is not an unusual occurrence. As this analysis focuses entirely upon the section of the route on the M8 there is clear evidence that the performance of the strategic road network is impacting upon the reliability of journey times for the current main public transport link to Glasgow Airport.

7.0 Economic Case - Cost Estimation

7.1 Scheme option costs (Capex and Opex) were developed for the additional options identified and together with Tram Train and PRT costs were shared with Jacobs.

Costs identified for each option are detailed below:

Option	Tram Train[1]	PRT	Bus - Fastlink via surface roads[2]	Bus – Fastlink via M8 [3]	LRT[4]
Capital Costs	£138.8m	£138.4m	£48.9m	£48.1m	£980m

[1] Specification as per the OBC
[2] Variant 1 - Fastlink Services to the airport via local surface roads
[3] Variant 2 - Fastlink Service to the airport via M8
[4] Discounted as being unaffordable

It should be noted that costs include Construction Costs, Rolling Stock (or buses), Design, Project Management and Site Supervision Costs, Optimism Bias, Inflation, Land Costs, and Network Rail Costs (where applicable).

8.0 Economic Case - Core Economic Case

8.1 The economic case for each option has been revisited taking account of revised airport patronage, use of the Strathclyde Regional Transport Model (which was not available when the OBC was being prepared), further discussion on the potential options with Jacobs, taking account of new information such as that relating to managed motorways, and the growing influence of NMIS/ AMIDS. The key economic metrics are outlined below in the section titled ‘key metrics’.

9.0 Economic Case - Wider Economic Impacts

9.1 After discussion with stakeholders and Jacobs it was agreed that the best way to build on the work contained within the OBC was to utilise the Strathclyde Regional Transport Model (SRTM) and the Transport/Economic/Land-Use model of Scotland (TELMoS). This exercise will allow identification of where potential land use changes could occur with any of the identified options, providing a measure of increased/reduced economic activity in the geographical area impacted by the options identified.

10.0 Rail Operational Issues

10.1 Throughout the project development there have been numerous discussions between the project team, Transport Scotland and Network Rail in relation to the capacity of the existing rail network to accommodate tram train, particularly when considering potential future competing priorities for rail capacity. It has been agreed that in the interest of moving the project forward and providing an improved public transport ‘offer’ for the airport by 2025 that an alternative option to tram train should be pursued. From an examination of the available evidence this would identify PRT as being the option which should be further developed as part of a revised OBC.

11.0 Key Metrics/ Commentary

11.1 Key metrics associated with each option are identified in Table 1 below together with commentary identifying key issues worthy of noting. It should be noted that in order to keep the information presented as succinct as possible all metrics are based on the 'BAA Central Growth' forecasts, and a forecast year of 2037 in line with the information presented in the original OBC. The detailed background reports, which all stakeholders have access to, contain the information relating to low and high growth.

Table 1(a) Patronage Summary

Option	Tram Train	PRT	Bus via Fastlink	Bus via M8 hard shoulder/Fastlink
Journey Time to/from City Centre	18 mins	17 mins**	52 mins	45 mins
AAP Patronage: Airport Users*	1.37m	1.16m	0.21m	0.14m
Airport AAP Service Mode Share*	7.8%	6.2%	~1%	~1%

*2037 forecast year
** interchange included within economic assessment

Table 1(b) Economics Summary

Option	Tram Train	PRT	Bus via Fastlink	Bus via M8 hard shoulder/ Fastlink
Capital Costs	£138,812,542	£138,394,866	£48,965,404	£48,095,138
NPV	217,464,000	219,041,000	-31,989,000	-22,924,000
BCR	3.4	3.3	-0.2	0.1

*2037 forecast year
** interchange included within economic assessment

Table 1 (c) OBC Patronage Comparison

Option	OBC Tram Train	Updated Tram Train	OBC PRT	Updated PRT
Journey Time to/from City Centre	16.5 mins	18 mins	17 mins**	17 mins**
AAP Patronage: Airport Users*	1,471,000	1,372,000	1,186,000	1,161,000
Airport AAP Service Mode Share*	9%	7.8%	7%	6.2%

*2037 forecast
** interchange included within economic assessment

Table 1(d) OBC Economics Comparison

Option	OBC Tram Train	Updated Tram Train	OBC PRT	Updated PRT
Capital Costs	£132,083,775	£138,812,542	£144,236,052	£138,394,866
NPV	206,562,000	217,464,000	169,049,000	219,041,000
BCR	3.3	3.4	2.7	3.3

11.2 Commentary

There have been a number of changes made to key assumptions on patronage and modelling parameters, some as a result of responding to the Jacobs Audit, others due to the changing landscape of activity at the airport and its surrounding area, and others due to changing thoughts on transport modelling 'good practice'. However, the key headline comment is that the updated key metrics, developed through the work on the audit close out, are of a similar order to that identified at the previous SBC and OBC work.

From a review of the above table, and the assessment of performance of options against TPOs (see Appendix B), it can be seen that in terms of ranking the options that tram train and PRT are the best performing options both in terms of qualitative assessment of options against TPOs, and the key metrics including patronage/ mode share and BCR, re confirming work previously done.

With a mode share of 6.2% for PRT and 7.8% for tram train, the modelling would suggest that mode share is not as high as other benchmark airports, as typically airports with similar characteristics to Glasgow Airport with light rail or heavy rail links having 13-19% mode share (with the exception being Edinburgh which has a mode share of 8%). Therefore it is not unreasonable to assume that the mode share predictions are an underestimate. However, both still have

healthy business cases with annual patronage well in excess of 1 million passengers per annum, and BCR's in excess of 3.

PRT, tram train, and bus option costs can be contained within the £144.3m budget.

If it is accepted that there is insufficient capacity available on the rail network to accommodate tram train, then, given its key metrics, PRT would become the most deliverable and preferred option for development in a revised OBC.

The added value any link brings to improved accessibility to the NMIS/AMIDS development cannot be overstated. The exact nature of how the link to NMIS/AMIDS will be achieved will be further reviewed as part of a revised OBC (and further ongoing project development). Such a link will significantly improve access to NMIS/AMIDS, add patronage to the system, and contribute to the inclusive growth agenda by improving linkage to the airport and NMIS/AMIDS from Ayrshire and Inverclyde. The Business Case will therefore almost certainly be strengthened from both a qualitative and quantitative perspective. This will be explored as part of a revised OBC.

Should PRT become the preferred option, and considered as part of a revised OBC, then PRT and other similar modes such as driverless shuttles would be further considered. The revised OBC would reconsider issues such as:

- wait time and headway,
- interchange opportunities,
- passenger capacity,
- availability of system providers,
- current technology developments (incl developments on autonomous vehicles),
- station configuration at Paisley Gilmour Street,
- Interface with the airport; and
- Potential for interfacing with NMIS/ AMIDS

Further review of these issues will assist in better understanding key risks associated with the PRT option, particularly in reviewing the interface with Paisley Gilmour Street Station and seeking to minimise any major construction activity within the footprint of the station. Equally, it needs to be recognised that should PRT be adopted as the preferred option, that all partners and stakeholders require to get fully behind the project and use all of their combined skills and efforts to assist in ensuring the best possible interface experience for users at Paisley Gilmour Street and the Airport, that the NMIS/AMIDS developments are integrated into the project development, and that statutory processes are progressed expeditiously to assist in meeting project timelines.

It should also be recognised that M8 Journey times between Glasgow City Centre and the airport have been increasing over recent years, and their variability between peak and off peak has also been growing. Airport passengers and staff are consequently subject to increasing delays and uncertainty regarding their journeys. Whilst it is difficult to reflect this in the

modelling which derives the metrics associated with the Bus option it is an issue that requires to be taken into consideration for any road based mode, particularly those using the M8.

Additionally, it should be recognised that transfer to public transport modes not reliant on the M8 can only be helpful in terms of reducing the number of M8 trips. Whilst it could never be claimed that this would be a panacea for the congestion issues on the M8 it will help to reduce traffic levels on the M8, with 517,000 person trips and 335,000 person trips removed from the M8 in 2037 on tram train and PRT modes respectively.

The enhanced bus option (i.e Fastlink extension) has been considered in association with the existing M8 bus as it is not considered that the M8 bus would be withdrawn under the current deregulated bus regime. Both services deliver different journey times with the M8 bus having a journey time of 25 minutes and the Fastlink bus having a journey time of circa 50 minutes. Most of the airport patronage associated with bus would be attracted to the M8 bus as it has the shorter journey time. This should not detract from the Fastlink solution as a means of servicing developments in the Clyde corridor, but it is clearly not an option worth pursing for delivering direct access to Glasgow Airport.

12.0 Revised OBC

12.1 Having reviewed the available options and worked with Jacobs to progress issues raised in the audit, it is suggested that the way is open to move forward with the project. The information available at this time would suggest PRT to be the most deliverable option, displaying strong key metrics, and should therefore be considered as the preferred option. As this is a different option from that recommended in the original OBC then a revised OBC will be required. This approach was agreed at Cabinet on 12th February 2019.

12.2 This would build on the previous OBC work and further develop the knowledge of the Personal Rapid Transit Option. It should be noted that other 'automated people movers' e.g shuttle type systems such as those in operation in airports in the UK and Europe (such as Birmingham, Luton and Pisa) will be included in this work.

12.3 It is expected that 2 consultancy commissions will require to be employed to develop the revised OBC:

(i) OBC Redraft Consultant (incl drafting the revised OBC document, revisit of transport and economic modelling, Green Book compliance)

(ii) Technical Support for the OBC
- Systems
- Route development
- Engineering design
- Traffic modelling
- Costs (CAPEX and OPEX)

- Interface Design (Airport / Paisley Gilmour Street Station and AMIDS)

It is expected that this work will cost circa £500K-£600K and the cost will be contained within existing approvals previously agreed by Cabinet in December 2016.

13.0 Way Forward

13.1 The timeline and process for moving forward would therefore be:

April 2019	Cabinet consider request to develop revised OBC
Autumn 2019	Revised OBC approved by City Deal Cabinet
Autumn 2022	FBC approved by City Deal Cabinet (includes approval of Works tender)
Early 2023	Works start
Early 2025	Project completion

14.0 Conclusions and Recommendations

14.1 The project team believe most of the areas of concern raised by the Jacobs audit have been closed out, with any relevant issues raised taken into consideration in a revised OBC, and that PRT has emerged as the most deliverable and preferred option for the Airport Access Project.

14.2 It is therefore recommended that the Cabinet:

(i) notes the content of this report and the work which has been completed by the Airport Access Project Team and stakeholders in the past year to address the Jacobs audit of the Outline Business Case commissioned by Scottish Ministers, and the implication this may have for the way forward on future delivery of the project;

(ii) notes the timetable to delivery and the need for all stakeholders to collectively work together to ensure the project is progressed to this timetable; and

(iii) agrees that further work is done to develop out the PRT option and note that the costs required shall be contained within existing approvals

APPENDIX A: LIST OF AAP STUDIES AND REPORTS

(i) **Glasgow Airport Strategic Transport Network Study (2011)** carried out by MVA Consultants, commissioned by Glasgow Airport

(ii) **Glasgow Airport Strategic Transport Appraisal (STAG Part 1) (June 2013)** jointly commissioned by Transport Scotland, Glasgow Airport Renfrewshire Council and Glasgow City Council and undertaken by consultants Aecom. (This study considered a long-list of over 80 potential transport interventions, with 7 options taken forward to the STAG Part 2)

(iii) **Glasgow Airport Strategic Transport Appraisal (STAG Part 2) (March 2014)** carried out by Aecom and jointly commissioned by Transport Scotland, Glasgow Airport, Renfrewshire Council and Glasgow City Council. (This study carried out a detailed analysis of the 7 options identified at STAG1. It should be noted that the STAG methodology does not recommend a preferred option, rather it allows the relative merits of options to be understood when assessed against a multi-criteria framework. The appraisal results were accepted by the client group, and all agreed to use the findings in future studies.)

(iv) **Glasgow Airport Surface Access Tram–Train Feasibility Study (January 2015)** carried out by Transport Scotland. (This study allowed Transport Scotland to better understand the Tram Train option – one of the 7 options identified in the STAG work)

(v) **Glasgow Airport Access Project – Strategic Business Case (December 2015)** prepared by Glasgow City Council and Renfrewshire Council with external technical support from Aecom & PBA. (This study assessed the Business Case of the 7 options identified by the STAG process and identified tram-train and PRT as being suitable for further consideration at OBC stage)

(vi) **Glasgow Airport Access Project – Outline Business Case (December 2016)** prepared by external technical consultants Aecom on behalf of Glasgow City Council and Renfrewshire Council with further consultancy support on the economic benefits of an airport rail link from PBA. The Councils then commissioned two further audits of the OBC from Turner & Townsend (costs) & KPMG (economics/ operating model). (Further detailed analysis of the 2 remaining options led to the conclusion that tram train should be taken forward as the preferred option for further development in the Full Business Case)

APPENDIX B: OPTION APPRAISAL AGAINST TPO's

Job Name: Glasgow Airport Access Project

Subject: Option Appraisal Against TPOs

Introduction

As part of the work to revisit the Strategic Business Case for the Glasgow Airport Access Project (AAP), a high-level appraisal of the options against the agreed Transport Planning Objectives (TPOs) has been undertaken.

The AAP options have been revisited and confirmed following the findings of the Audit and subsequent Stakeholder Working Group discussions. This identified the following four options to be taken forward for more detailed analysis and assessment:

- Tram Train
- PRT
- Bus via Fastlink;
- Bus via M8 Hard Shoulder / Fastlink

This Note sets out the findings of the appraisal of each of these options against the TPOs. It should be noted that the appraisal draws on the evidence available from the work undertaken to date, including the option modelling assessment and economics, and that no additional analysis has been carried out of the purposes of this exercise. Where referenced, the option modelling assessment data refers to the 2037 Central forecast scenario, which provides an indication of broad impacts.

Transport Planning Objectives

1.1.1 As part of the Glasgow Airport Access Project appraisal process, a Mission Statement and set of SMART TPOs were developed. This process was informed by consultation with Glasgow Airport, Glasgow City Council, Renfrewshire Council, and Transport Scotland with further information available in Table 8.1 of the STAG Part 2 report.

Mission Statement

"To support the nationally significant economic and social contribution of Glasgow Airport by maintaining and improving sustainable access for passengers and staff"

1.1.2 The STAG process initially identified four TPOs. Through the original SBC development process these were reviewed against the evidence base and City Deal objectives and it was determined the proposed TPOs should be retained. However, stakeholder engagement as part of the SBC re-visit led to the refinement of the TPOs to reflect the most current issues and evidence. The final TPOs are outlined below.

Glasgow Airport Access Project Objectives

- A. Increase the modal share of public and active transport modes for passengers and employees to and from Glasgow Airport;
- B. Improve public transport journey times and their reliability to and from Glasgow Airport such that they are increasingly competitive with the private car;
- C. Support sustainable growth of Glasgow Airport and business investment and regeneration of its surrounding area and the City Region;
- D. When unlocking the economic and development opportunities in and around Glasgow Airport mitigate any negative impacts on the operation and performance of the strategic transport network

1.1.3 Subsequent work has sought to make these objectives SMART by defining indicators, a baseline situation and associated targets, which will be finalised at the appropriate stage.

1.1.4 The remainder of this Note describes the assessment of the performance of each option against the TPOs to support the SBC revisit.

Option: Tram Train

A. Mode Share	✓✓-✓✓✓	Modelling indicates that public transport mode share for airport passengers is forecast to increase from 12.1% in the Do Minimum to 15.2%. This represents a 25.6% increase in public transport passengers compared with the Do Minimum representing a moderate to major positive benefit. Airport staff public transport mode share is forecast to increase from 8.6% to 9.7% which is a 13.0% increase in public transport passengers representing a moderate positive benefit.
B. Public Transport Journey Times	✓✓	This option is expected to offer an overall moderate improvement to existing public transport links to Paisley town centre and Glasgow city centre which will be directly served by the proposed service as well as reducing journey times to other locations via connecting services. Paisley would achieve a moderate positive impact from a direct service that is least ten minutes faster than the existing bus service. This would also provide direct connections with existing rail services to Inverclyde and Ayrshire, which would benefit from a reduction in total journey times. Tram Train would offer an 18-minute journey time to Glasgow Central and onward connections. This compares with the existing First 500 bus service, which it is expected would be retained, and it has a timetabled journey time of between 15 to 25 minutes depending on the boarding and alighting point within the city centre. This means some locations may be quicker by bus than tram-train. However, the bus service is subject to extensive variability in journey time caused by peak period congestion on the M8 and Tram Train would be expected to be more reliable. Overall, there is expected to be a moderate benefit in comparison with car and taxi journey times taking into account the increased journey time reliability that Tram Train offers in comparison to road-based modes that utilise the M8.
C. Economic and Land-use Development	✓-✓✓	Whilst this option would provide no direct connectivity to the Glasgow Airport Investment Area (GAIA) sites it does offer potential to provide a minor positive impact on these developments due to its close proximity. It is anticipated that Tram Train would have a moderate positive impact on economic activity and development at

		Glasgow Airport and its important function in the wider economy, which would be facilitated through an increase in jobs and economic output.
D. Strategic Transport Network Performance	××-✓	There are a number of future competing demands on the rail network between Paisley and Glasgow and at Glasgow Central Station. Tram Train would place an additional demand on this infrastructure, and it has been difficult to reach agreement that tram-train could be accommodated. Overall, the implications of this option for the rail network may be a moderate negative impact although it should be noted that the forecast modal shift may have a minor positive impact on the strategic road network by reducing traffic on the M8.

KEY	✓	Minor Positive	✓✓	Moderate Positive	✓✓✓	Major Positive	○	Neutral
	×	Minor Negative	××	Moderate Negative	×××	Major Negative		

Option: PRT

A. Mode Share	✓✓	Modelling indicates that public transport mode share for airport passengers is forecast to increase from 12.1% in the Do Minimum to 13.9%. This represents a 14.8% increase in public transport passengers compared with the Do Minimum representing a moderate benefit. Airport staff public transport mode share is forecast to increase from 8.6% to 10.3% which is a 19.9% increase in public transport passengers representing a moderate positive benefit.
B. Public Transport Journey Times	✓✓	This option is expected to offer an overall moderate improvement to existing public transport links to Paisley town centre which will be directly served by the proposed service as well as reducing journey times to other locations, including Glasgow city centre, via connecting services. Paisley would achieve a moderate positive impact from a direct service that is least ten minutes faster than the existing bus service. There would also be a notable reduction in passenger wait time where the proposed PRT is a turn up and go service. The PRT service would also provide direct connections with existing rail services to Inverclyde and Ayrshire, which would benefit from a reduction in total journey times. PRT plus connecting rail would offer a 17-minute journey time to Glasgow Central and onward connections. This compares with the existing First 500 bus service, which it is expected would be retained, and it has a timetabled journey time of between 15 to 25 minutes depending on the boarding and alighting point within the city centre. This means some locations may be quicker by bus than PRT. The PRT would also require interchange at Paisley Gilmour Street which could be a perceived disincentive to passengers choosing this option. However, the bus service is subject to extensive variability in journey time caused by peak period congestion on the M8 and PRT + Rail would be expected to be more reliable. Overall, there is expected to be a moderate benefit in comparison with car and taxi journey times taking into account the increased journey time reliability

		that PRT offers in comparison to road-based modes that utilise the M8.
C. Economic and Land-use Development	✓-✓✓	This option would provide an opportunity to improve connectivity to the GAIA site and therefore it offers a minor to moderate positive impact. It is anticipated that PRT would also have a minor to moderate positive impact on economic activity and development at Glasgow Airport and its important function in the wider economy which would be facilitated through an increase in jobs and economic output. In particular, PRT is forecast to result in a higher public transport mode share for airport staff than any other option due to the distribution of residential locations of existing employees. In future, greater economic growth at Glasgow Airport could be achieved by facilitating easier public transport access to locations south and west of Paisley as PRT would offer very frequent interchange opportunities with trains at Paisley Gilmour Street. This would consequently assist in opening up the labour market of Inverclyde and Ayrshire in particular.
D. Strategic Transport Network Performance	✓	As this option would link to existing rail services at Paisley Gilmour Street it is not expected to have an impact on rail infrastructure capacity. It would lead to additional passengers on existing rail services which may have implications for capacity and overcrowding at peak times. Overall, it is anticipated that there would be a neutral impact on the rail network. PRT is forecast to facilitate a modal shift which would create a minor positive impact on the strategic road network by reducing traffic on the M8.

KEY								
	✓	Minor Positive	✓✓	Moderate Positive	✓✓✓	Major Positive	○	Neutral
	×	Minor Negative	××	Moderate Negative	×××	Major Negative		

Option: Bus via Fastlink

A. Mode Share	✓	Modelling indicates that public transport mode share for airport passengers is forecast to increase from 12.1% in the Do Minimum to 12.5%. This is a minor positive benefit with a 3.4% increase in public transport passengers compared with the Do Minimum. Airport staff public transport mode share is forecast to increase from 8.6% to 9.0% which is a 4.8% increase in public transport passengers representing a minor positive benefit.
B. Public Transport Journey Times	✓	This option is expected to offer a minor positive impact on journey times in comparison to existing public transport links to locations in the wider south west Glasgow conurbation, including GAIA, Renfrew, Braehead and Govan. Journey times to other locations to the north and east are unlikely to be materially impacted. The First 500 bus service, which it is expected would be retained, has a timetabled journey time of between 15 and 25 minutes depending on the boarding and alighting point within the city centre whereas the Fastlink service would have a journey time of ~52 minutes. The First 500 service is subject to extensive variability in journey time caused by peak period congestion on the M8 and the Fastlink service would be expected to be more reliable due to the bus priority infrastructure along the route. However, the overall journey time would be at least double the First 500 journey time making it unattractive for journeys to Glasgow city centre and beyond. This option would have no impact on journeys to the south and west of the airport to locations such as Paisley, Inverclyde and Ayrshire. Overall, there is expected to be a minor benefit in comparison with car and taxi journey times.
C. Economic and Land-use Development	✓✓	This option would provide direct connectivity between Glasgow Airport and GAIA and is therefore expected to make a moderate positive impact on business investment and regeneration of the surrounding area. This option would also provide direct connectivity between Glasgow Airport and the wider south west Glasgow conurbation including Renfrew, Braehead shopping centre, Queen Elizabeth University Hospital and Govan. This is expected to make a minor positive impact on

		economic activity and land-use development with some improvements to public transport accessibility and access to labour markets. However, this is relatively limited with no change in accessibility to the wider region and labour markets.
D. Strategic Transport Network Performance	○	As this option is expected to have a minimal impact on the modal split of demand for travel to and from the airport it is anticipated that the impact on the strategic transport network would be neutral.

KEY	✓	Minor Positive	✓✓	Moderate Positive	✓✓✓	Major Positive	○	Neutral
	×	Minor Negative	××	Moderate Negative	×××	Major Negative		

Option: Bus via M8 Hard Shoulder / Fastlink

A. Mode Share	✓	Modelling indicates that public transport mode share for airport passengers is forecast to increase from 12.1% in the Do Minimum to 12.5%. This is a minor positive benefit with a 3.7% increase in public transport passengers compared with the Do Minimum. Airport staff public transport mode share is forecast to increase from 8.6% to 8.8% which is a 2.3% increase in public transport passengers representing a minor positive benefit.
B. Public Transport Journey Times	✓	This option is expected to offer a minor positive impact on journey times in comparison to existing public transport links to locations in the south west Glasgow conurbation, including Braehead and Govan. Journey times to other locations to the north and east may have a minor improvement where the provision of hard shoulder running for buses on the M8 may provide a minor benefit for existing airport bus services such as the First service 500. This service, which it is expected would be retained, has a timetabled journey time of between 15 and 25 minutes depending on the boarding and alighting point within the city centre, whereas the Fastlink service would have a journey time of ~45 minutes making it unattractive for journeys to Glasgow city centre and beyond. The First 500 service is subject to extensive variability in journey time caused by peak period congestion on the M8 and the hard shoulder running may have a minor positive impact on this. Whilst the Fastlink service would be expected to be more reliable due to the bus priority infrastructure along the route the overall journey time would be almost double the First 500 journey time. Therefore, the overall impact is expected to be minor positive. This option would have no impact on journeys to the south and west of the airport to locations such as Paisley, Inverclyde and Ayrshire. Overall, there is expected to be a minor benefit in comparison with car and taxi journey times.

C. Economic and Land-use Development	✓	This option would provide direct connectivity between Glasgow Airport and the wider south west Glasgow conurbation including Braehead shopping centre, Queen Elizabeth University Hospital and Govan. It is therefore expected to make a minor positive impact on economic activity and land-use development with some improvements to public transport accessibility and access to labour markets. However, this is relatively limited with no change in accessibility to the wider region and labour markets.
D. Strategic Transport Network Performance	✓	The provision of hard shoulder running for buses on M8 may provide a minor benefit for existing bus services. Otherwise, this option is expected to have a minimal impact on the modal split of demand for travel to and from the airport and it is anticipated that the impact on the strategic transport network would be minimal.

KEY								
	✓	Minor Positive	✓✓	Moderate Positive	✓✓✓	Major Positive	○	Neutral
	×	Minor Negative	××	Moderate Negative	×××	Major Negative		

Summary

The following tables summarises the performance of each option against the TPOs.

A. Mode Share	✓✓-✓✓✓	✓✓	✓	✓
B. Public Transport Journey Times	✓✓	✓✓	✓	✓
C. Economic and Land-use Development	✓-✓✓	✓-✓✓	✓✓	✓
D. Strategic Transport Network Performance	×-✓	✓	○	✓

KEY							
✓	Minor Positive	✓✓	Moderate Positive	✓✓✓	Major Positive	○	Neutral
×	Minor Negative	××	Moderate Negative	×××	Major Negative		