Údarás Náisiúnta Iompair
National Transport Authority

Draft Transport Strategy for the Greater Dublin Area

South West Corridor Study

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Contents

1 Introduction

1.1 Background

The National Transport Authority (NTA) is preparing a new transport strategy for the Greater Dublin Area (GDA) which will consider the future of the transport system in the GDA for the period up to year 2035. As a means towards informing the direction of the new strategy the NTA has defined eight Study Areas to be assessed for this review in order to understand more fully the 2035 travel demand coming from the Study Areas, and the public transport services that will be required to effectively meet that demand.

Jacobs Engineering Ireland (Jacobs) and SYSTRA provide consultancy services to the NTA through a Modelling Services Framework. By this means Jacobs and SYSTRA were commissioned by the NTA to undertake a desktop transport assessment of six of the eight identified corridors within the GDA.

This report focuses on the **Dublin South West Study Area**. There are also Study Areas being examined by Jacobs / Systra in the West, the Inner Orbital, the South East, Navan and North West. Reports that consider the role of Park and Ride and Demand Management in increasing public transport usage will also be informing the transport strategy for the Greater Dublin Area. The provision of public transport for orbital movements outside of the M50 have been considered by Clifton Scannell Emerson Associates in the *Dublin Orbital Movement Strategy Options Report.* Options developed in this report would provide orbital services through the study area, rather than services to the City Centre

1.2 Study Objectives and Principles

The study objectives for the South West Study Area were outlined by the NTA and have guided the study and assessment process. These objectives include developing public transport measures that will:

- Cater for existing public transport usage;
- Cater for 100 per cent of future demand growth; and
- Cater for more of the existing car-based demand, if feasible.

The focus is placed on meeting the demand of those trips that are greater than 3km in distance, as it has been assumed that the majority of trips less than 3km may be taken by walking or cycling.

Based on the level of demand that is identified, and considering functionality and cost, a set of appropriate public transport solutions, are presented. Packages may include bus, bus rapid transit (BRT), light rail, and heavy rail. Interchange between public transport modes has been considered. The public transport options identified are considered to offer the most effective, efficient and sustainable solution to serve this growth and provide the best means of contributing to an integrated public transport strategy for the GDA.

This study has considered the existing road network in the study area and has included the various significant road proposals that are under consideration. Discussions have been held by the NTA with the National Roads Authority and local authorities to establish the likely road network changes that will be required during the period of the transport strategy. While many of these road proposals have not yet been developed in detail, and designs are not available, the impacts of these proposals have been accounted for in the analysis of the public transport requirements. Accordingly, while the analysis of the public transport necessary for the future is the focus of this study, it has involved a composite consideration of the road network.

1.3 Study Methodology

The study has been undertaken in four stages;

- Stage 1 established travel demand within the 2011 base year and 2035 forecast year using the demand from the Greater Dublin Area Regional Model (GDARM);
- Stage 2 identified public transport options that have the potential to meet the demand identified in Stage 1 based solely on capacity thresholds by public transport mode (e.g. rail, light rail, BRT and bus);
- Within Stage 3 the most appropriate public transport options that meet the demand requirements were scored and sifted based on functionality (journey time and ability to meet demand) and cost (capital cost as related to service level); and
- Stage 4 tested the preferred option in the GDARM to confirm its viability.

These stages are discussed in the following sections.

1.3.1 Stage 1 - Establish Demand

To forecast the strategic public transport needs for each of the Study Areas in 2035, demand was established using the Greater Dublin Area Regional Model (GDARM) which has a base year of 2011. To produce the 2035 forecast, planning data was provided by the NTA based on the 2035 population and employment projections.

The 2011 demand outputs were generated for the GDA for the AM peak hour (08:00–09:00) for trip ends for all trips greater than 3km within these time periods. The same process was applied for the 2035 demand. The AM peak hour was chosen for the demand analysis because this is when the travel demand is at its highest over the day. The PM peak was not used for this stage of review, as demand tends to be spread over a longer time and it also does not typically cater for both work and school trips.

Screenlines were used to develop an understanding of travel demand passing through the Study Area. This analysis is primarily used to inform the capacity requirements for future public transport options for the Study Area.

1.3.2 Stage 2 - Public Transport Option Development

The second stage of the study focuses on developing public transport options to meet the travel demand growth from 2011 to 2035, from the Study Area orbiting the Dublin City Centre during the AM peak hour (8:00-9:00).

Catchment bands for existing public transport services were defined and applied to identify growth within the catchment of existing service areas and to identify areas where the level of service provided by public transport is low or where no service is provided.

Service capacities for patronage on possible public transport modes were then defined. This includes the definition of the seating capacity and crush capacity for DART, commuter, light rail, Bus Rapid Transit, Urban Bus, Intercity Bus, and Shuttle Bus. For the purpose of option development for the 2035 transport strategy, public transport options are considered based on an operating level of service that is at or below 85 per cent of crush capacity in 2035. This ensures that at no time will the entirety of the target demand be accommodated by a service that is underutilised, or is so busy as to make the service less desirable. Crush capacity is an industry standard expression relating to the loading upper limit of public transport services that allow standing as a means of catering for higher levels of patronage. Design capacity is assumed at 85 per cent of this to allow for a more comfortable and attractive level of service to be provided.

Development of public transport options for Stage 2 of the study focused on utilising the capacity and frequency definitions to determine the appropriate public transport mode to meet AM peak hour demand.

1.3.3 Stage 3 - Public Transport Option Scoring

Stage 3 takes the output of the high level public transport options developed in Stage 2, and scores them based on categories relating to demand, functionality and cost.

The functionality scoring category analysed the capacity of the public transport option to meet the 2035 travel demand from the Study Area into Dublin City Centre during the AM peak hour. It also considered the average duration of the journey for trips within and out with the catchment bands of the public transport services proposed.

The cost scoring category is based on the capital costs per option. It also considers the extent to which existing infrastructure is utilised and maximised for efficiency. Typical capital costs have been assumed, generally based on a cost per km. Typical costs may include a level of risk. A more detailed review would be required to confirm the likely cost, for example to account for land and all major risks. Operational costs are not considered. Despite this, the outline costs are considered to provide a reasonable estimation of costs at a suitable level for comparative purposes for this stage of review.

The public transport options with the best score were recommended to be considered further as part of the larger 2035 Greater Dublin Area Transport Strategy.

The Do Minimum scenario, described in Section 2.3 is used as a basis for the development of the public transport options to serve the growth in demand to 2035 originating within the South East Corridor.

1.3.4 Stage 4 – Transport Modelling Assessment

This stage tested the preferred option in the Greater Dublin Area Regional Model (GDARM). The modelling exercise was undertaken to determine the likely viability, usage and operation of the proposed services for implementation by 2035.

In addition to the Do-Minimum scenario, the GDARM includes additional schemes assumed (described in Section 2.3) as part of the wider GDA Strategy.

The modelling exercise has not included the collective benefits that could be provided by Park and Ride and demand management measures. It should be noted that because the Park and Ride facilities and Demand Management Measures were not included in the modelling stage, the actual benefits of the proposed measures are likely to be greater than reported.

1.4 Report Structure

The report is structured as follows:

- Section 2 describes the Dublin South West Study Area and outlines the Do Minimum scenario;
- Section 3 details the results of the demand analysis for the study area;
- Section 4 develops the public transport options to meet the demand established in Section 3;
- Section 5 scores the public transport options developed in Section 4 outlining an emerging preferred option to be brought forward to the modelling assessment;

- Section 6 outlines the modelling assessment of the proposed orbital public transport services;
- Section 7 describes the Preferred Emerging Scheme; and
- Annex 1 outlines the Stage 2 capacity analysis of the different options considered.

2 Study Area

2.1 Corridor Description

The South West Study Area, shown below in Figure 2-1, approximately covers the Firhouse / Old Bawn area. It is bounded to the north by the N81 and to the east by the M50. The Study Area covers an area of 13.5km^2 and consists primarily of sub-urban residential and employment land uses.

2.1.1 Constraints

The following lists the key constraints to the provision of public transport services to / from the South West Study Area.

- River Dodder – One bridge crossing;
- N81 – Five access points from the Study Area; and
- M50 – Two Bridge Crossings and Two Grade Separated Interchanges.

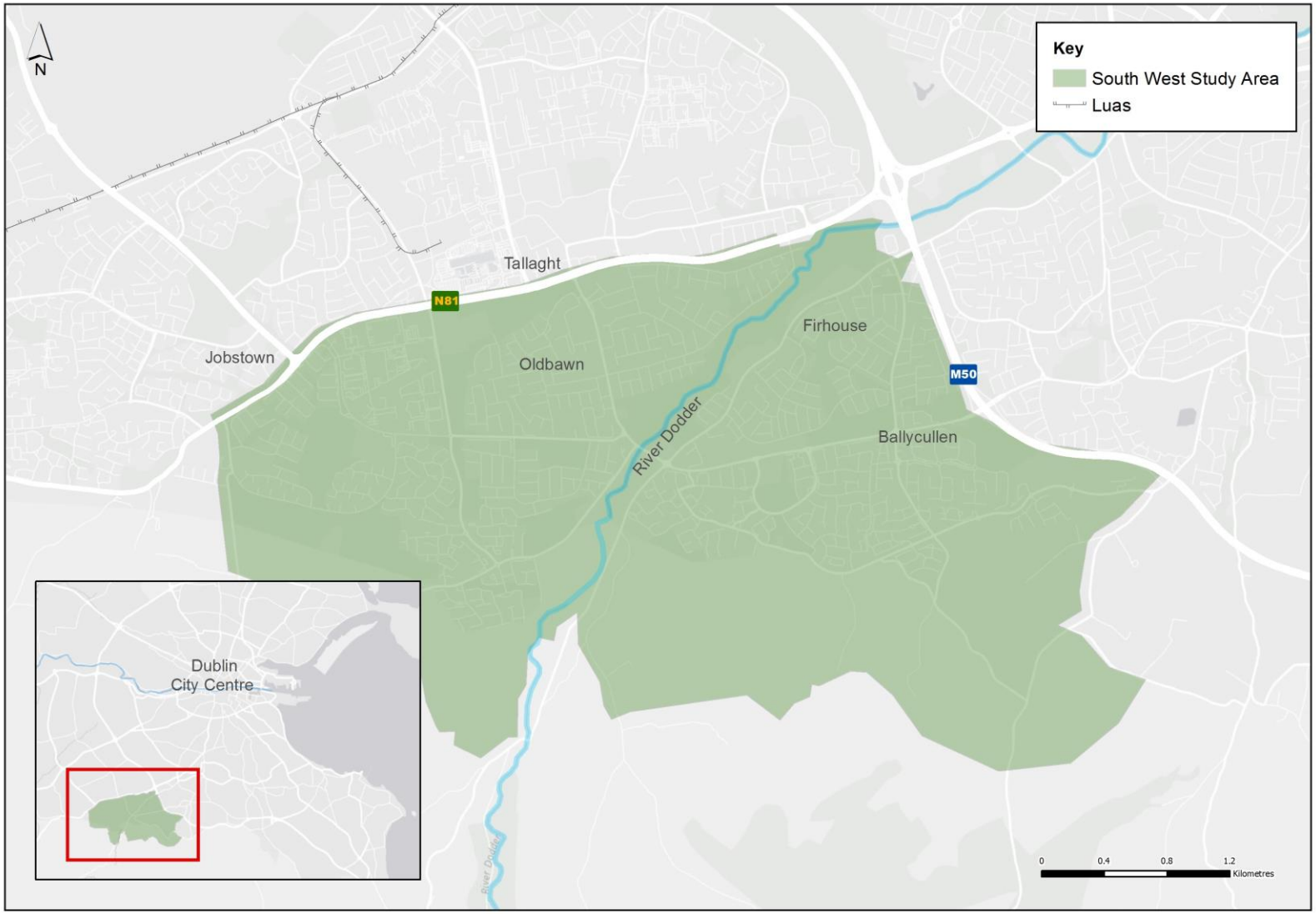


Figure 2-1: Dublin South West Study Area

2.1 Existing and Planned Strategic Road Network

The corridor is bounded by the M50 to the west, a major national inter urban route which caters for significant volumes of orbital traffic, and contains the N81 national secondary route which connects the City Centre with the west of Wicklow via Tallaght.

The capacity of the M50 and N81 must be protected for strategic traffic movements, including the distribution of goods. Congestion along the M50 is an increasingly serious issue, particularly at peak times.

There is limited opportunity for significant road capacity enhancements in the South West Study Area from the perspective of both physical constraints and environmental considerations. Therefore, providing for increasing transport demand through alternative modes, such as public transport, will be necessary to protect the function and operation of the M50 and N81 as strategic corridors. Figure 2-2 presents the wider strategic road network in relation to the South West study area.

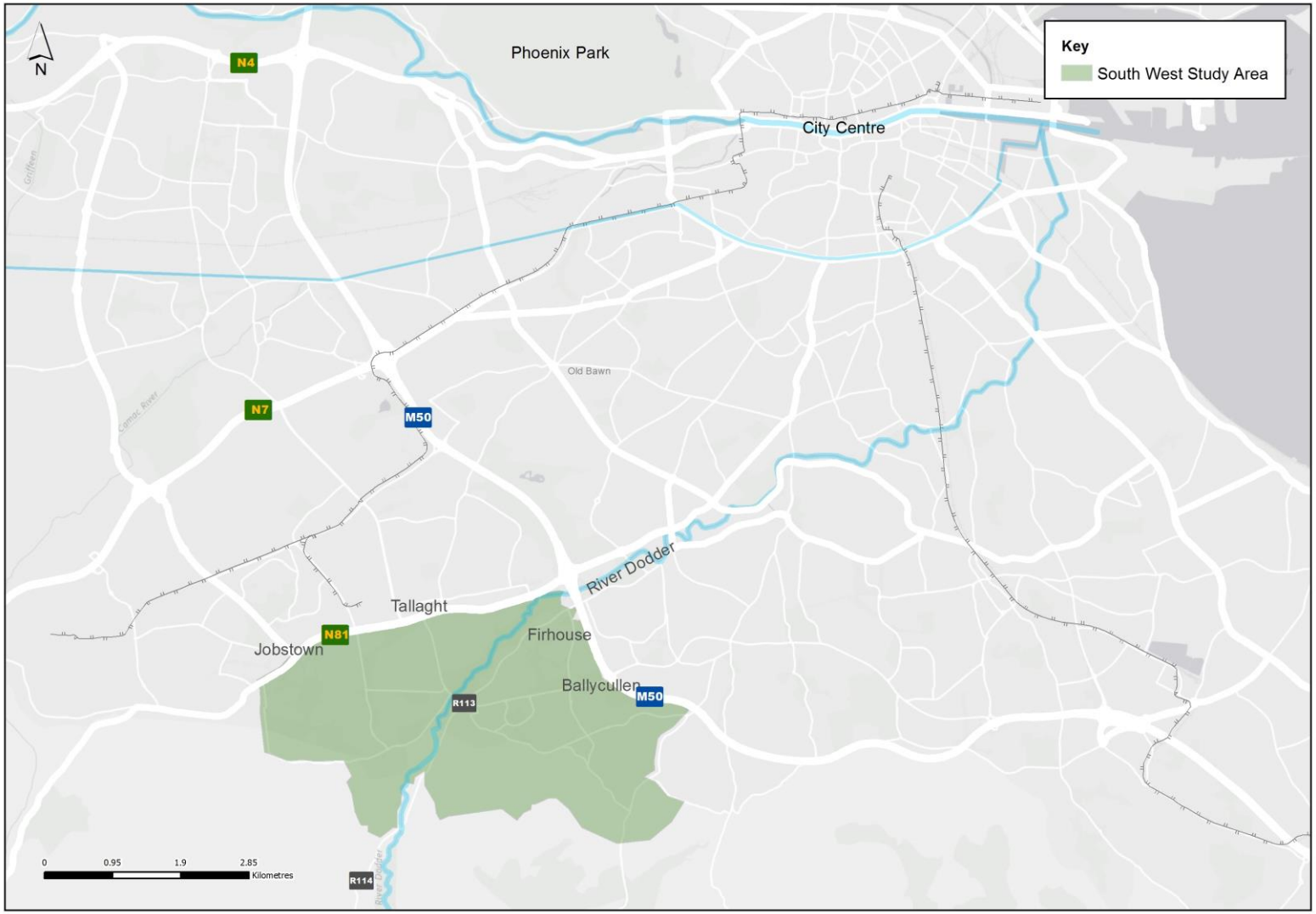


Figure 2-2: Dublin South West Study Strategic Road Network

2.2 Existing Public Transport Provision

The existing public transport provision in the South West Study Area consists of Dublin Bus services as outlined in Figure 2-3. These services predominantly provide connectivity to Tallaght and to the Inner Orbital (the area between the M50 and the City Centre as defined by the canals) and the City Centre.

The following lists the existing Dublin bus Services catering for the South West Study Area:

- 15;
- 15B;
- 49;
- 54A;
- 65;
- 65B;
- 75; and
- 77A.

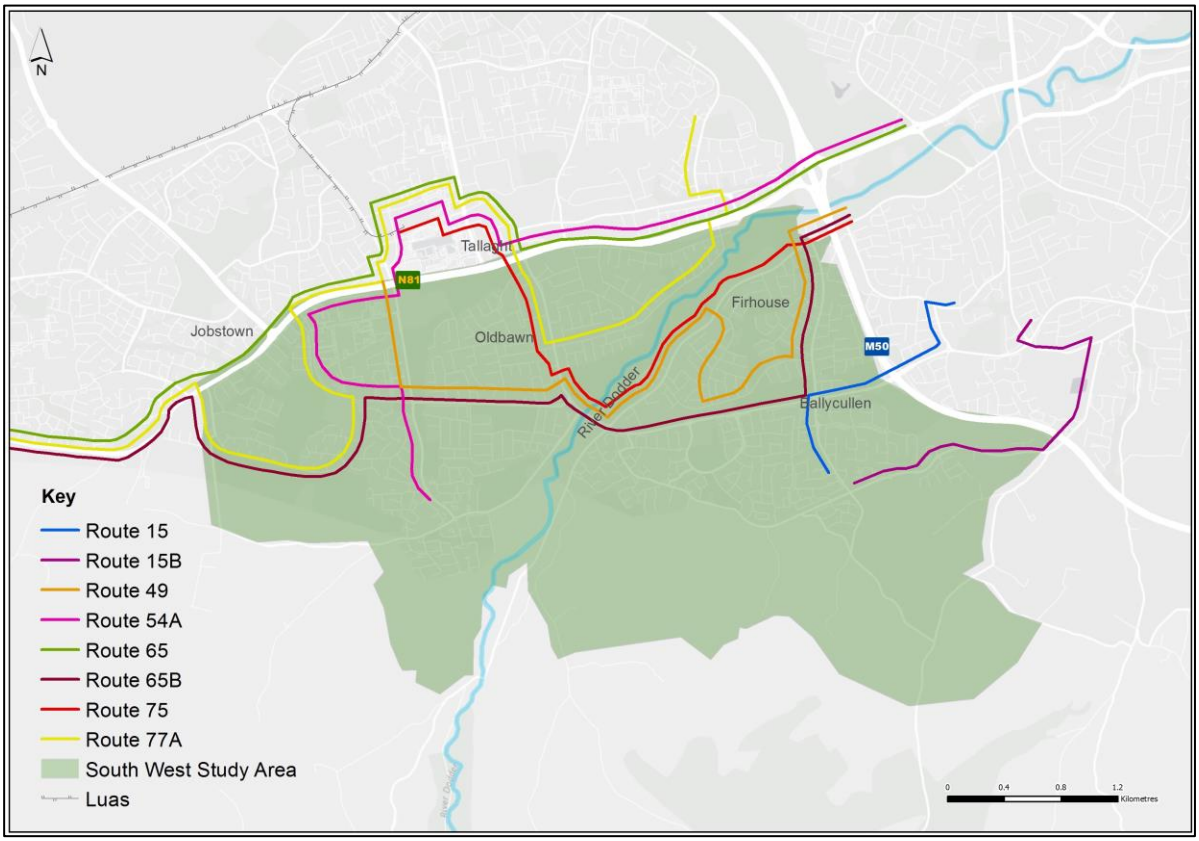


Figure 2-3: Dublin South West Study Area – Existing Bus Services

2.3 Do Minimum – Proposed Public Transport Provision

The Do Minimum scenario includes public transport improvements within Dublin City Centre that have a high degree of certainty for completion before the forecast year. The Do Minimum public transport improvements include the following:

- Phoenix Park Tunnel;
- Dublin City Centre Rail Re-Signalling Project; and
- Luas Cross City.

In addition, the Firhouse-Ballycullen QBC, partially located in the South West corridor, is included in the Do Minimum scenario. It should be noted that the Do Minimum measures will have a minimal impact on servicing the South West Study Area demand as the proposed measures will not serve demand from this area. This Do Minimum Scenario is illustrated in Figure 2-4.

The re-opening of the Phoenix Park Tunnel will allow for rail connectivity from the South West Line to the South East Line serving Drumcondra, Connolly, Tara Street, Pearse and Grand Canal Dock Stations. The trains using the Phoenix Park Tunnel will not stop at Heuston Station.

The proposed improvements can accommodate four trains per hour (4tph) in one direction and 3tph in the other direction. It is likely that the 4tph would travel eastbound from the South West line using the tunnel in the AM peak and westbound in the PM peak to cater for the peak tidal demand into and out of the city centre.

2.3.1 Dublin City Centre Rail Re-Signalling Project

The Dublin City Centre Rail Re-Signalling project will enable increased train path capacity across the City on the Loopline Bridge over the Liffey. The current capacity constraint of 12tph will be raised to 17tph. It is considered possible to operate with 20tph but operational resilience may be compromised at this level. A new turn-back platform at Grand Canal Dock is proposed, providing turn-back facility for 9tph, leaving at least 8tph to carry on southbound.

2.3.2 Luas Cross City

Luas Cross City is an extension of the existing Luas Green Line beginning at the current Green Line Terminus at St. Stephen's Green, interchanging with the Luas Red Line at O'Connell Street / Abbey Street and continuing northbound to the DIT Grangegorman Campus, Phibsborough and terminating at Broombridge Rail Station on the Maynooth line. A loop is included at O'Connell Street and Marlborough Street to enable northbound services to return south.

Luas Cross City is currently under construction and the planned operation is for 10 trains per hour extended from the increased 20 trains per hour Green Line service using lengthened 53m long trains. This will provide a design capacity of approximately 3,000 in the peak hour. As demand increases, frequency of service can be increased to 20 trains per hour, with a maximum design capacity of approximately 6,000.

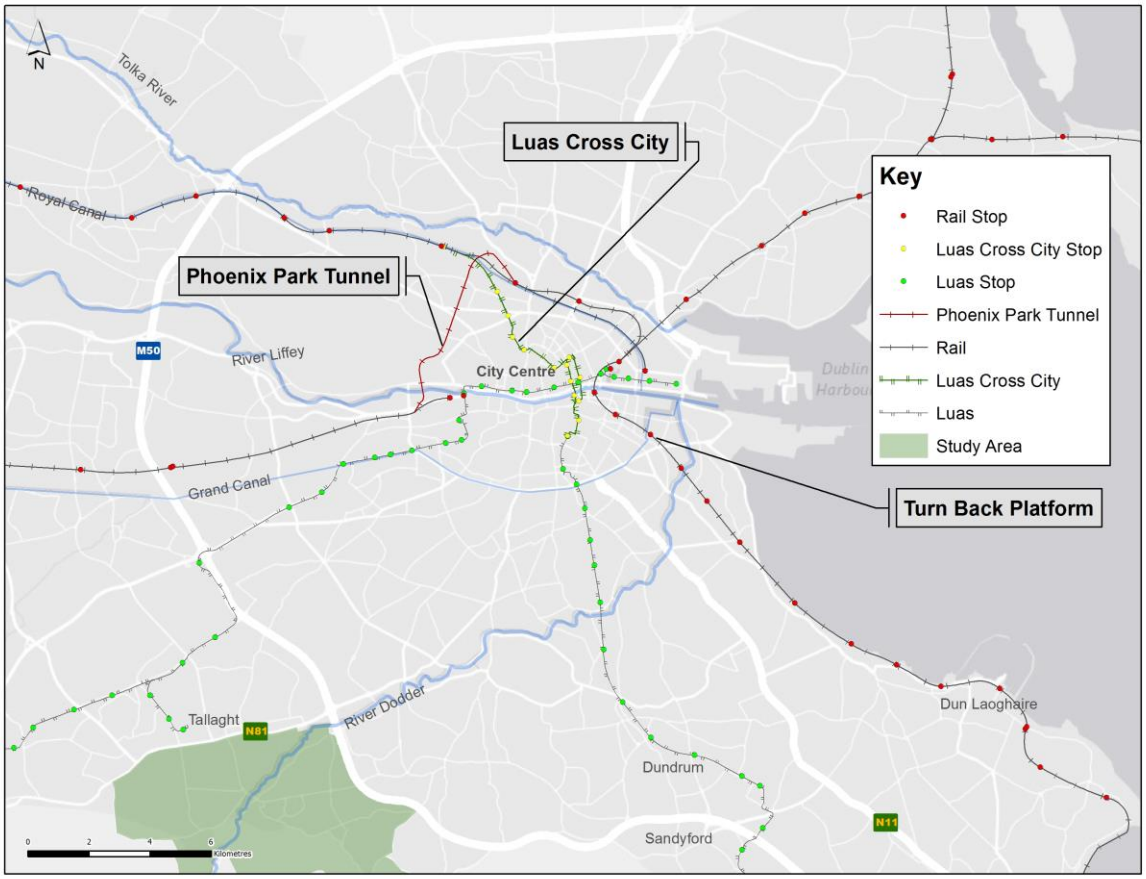


Figure 2-4 Do Minimum Proposed Public Transport

2.3.3 Additional Schemes

The Do Minimum represents the future network supply based on current commitments. However, for the purpose of this study the additional schemes of the DART Underground, Metro North and the M50 multi-point tolling are also considered to be part of the future network for the Greater Dublin Area. A core bus network for the Orbital Corridor outside the M50, as well as the Bus Rapid Transit Network was also considered as additional schemes for the South West Study Area. See Figure 5.2. Although these schemes are not fully committed, they have been considered as these could influence the choice of schemes that could evolve from the study. All of these schemes will increase the attractiveness of public transport within the GDA and are therefore tested with the preferred public transport option for the South West Study Area through the GDARM (please refer to Chapter 6: Transport Modelling Assessment).

The specifics of these additional schemes are still yet to be finalised but for the purposes of this study it is assumed that Metro North would connect the City Centre to the Airport and Swords and would connect with the Luas Green Line. DART Underground is assumed to be a tunnel linking Heuston Station to St. Stephen's Green and Pearse Stations.

The introduction of the DART Underground is a step change in capacity for the heavy rail network in Greater Dublin. Increased electrified services are made possible in a more efficient manner across the City with more connectivity and a much increased capacity. With 12tph through the tunnel in each direction a design capacity of 14,400 is available on 8-car DART trains.

With the introduction of Metro North it should be possible to operate northwards of Sandyford with 30 services per hour, reducing to 20 services per hour in tunnel just south of St Stephen's Green, leaving the currently planned 10 services per hour for the Luas Cross City route. The metro trains would be designed for in-tunnel operation.

The M50 multi-point tolling scheme is assumed to consist of the proposals contained with the M50 Demand Management Report, published by the NRA (now Transport Infrastructure Ireland, TII) in April 2014. Strategic Park and Ride locations within the Greater Dublin Area have also been identified are considered to be a component of the public transport system, although there are no strategic locations within the South West Study Area. It should be noted that demand management measures and Park and Ride are not included in the modelling exercise described in Section 6 of the report. It is assumed that with the addition of these measures, the benefits of the proposed options will be greater than those reported.

The Bus Rapid Transit Network would operate between Blanchardstown and UCD, Swords to the City Centre, and Clongriffin to Tallaght. The Orbital Core Bus network outside the M50 would operate between Donaghmede and Blanchardstown, Blanchardstown to Tallaght, and Dundrum and Dun Laoghaire.

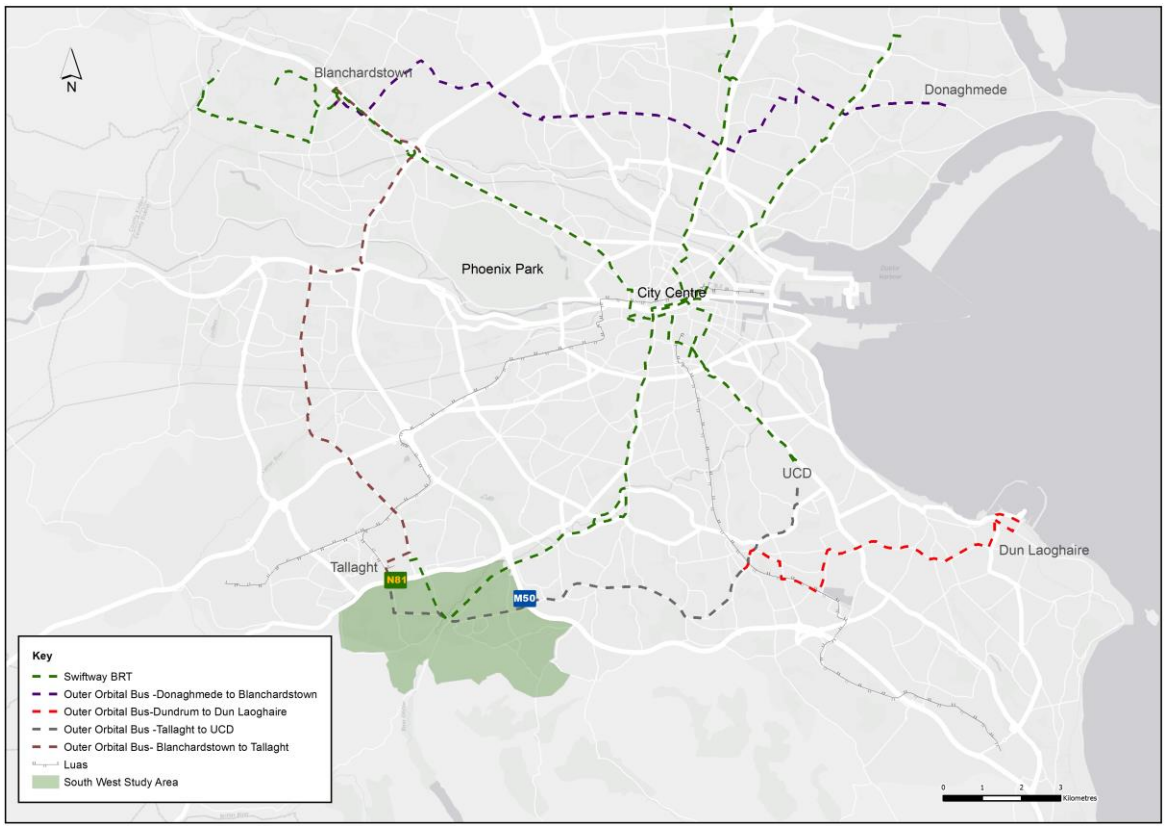


Figure 2-5: Additional Bus Schemes Considered for South West Corridor

3 Demand Analysis

3.1 Establishing Demand

3.1.1 Establishing Base Year and 2035 Forecast Demand

The demand data utilised for this study considers assessment of a typical AM (08:00 – 09:00) peak hour. Demands for a 3 hour AM period and an average midday Inter Peak hour were also derived, however these were not utilised as part of the assessment. The assessment considers the 2011 base year and a 2035 forecast year.

The trip end data for the GDA was derived from planning data for both the Base Year and 2035 forecast scenarios. The base year data is based on Small Area Population Statistics available from the Central Statistics Office as well as a combination of NACE building data, and POWSCAR variables and has been used in the calibration of the base year trip end model and demand model. The forecast data has been prepared by the NTA based on their most up to date forecasted land use assumptions which cover the entire country, although particular focus is given to the GDA region.

Having derived trip ends the GDA demand model applies destination choice algorithms to derive travel matrices which have been calibrated in the base year to replicate observed mode shares and trip length distributions. For this analysis, only trips with a distance of longer than 3km were considered as it is assumed that trips with a distance of less than 3km will be provided for through walking and cycling and local public transport. As such these trips were not considered in the assessment of the strategic public transport requirements for the study area.

3.1.2 Target Demand Level

As part of the demand analysis, a target demand level has been identified which represents the catering for 100 per cent of growth between year 2011 and 2035. It is therefore assumed that there will be no growth in car use to the City Centre. The current public transport provision may cater for an element of growth, however for the purpose of this review it is assumed that current public transport services are effectively at capacity. To determine the growth in public transport demand and capacity within the corridor in 2011 and 2035, an assessment was undertaken of the total demand to the City Centre and other destinations.

In 2011 it was estimated that up to 20 per cent of trips to the City Centre used public transport and that the present road network in the City Centre is close to capacity.

The existing public transport provision has the design capacity to cater for approximately 20 per cent of the existing Study Area demand. As such all of the existing demand is catered for by car trips and/or similar level of public transport trips. If existing trends were to continue a significant amount of future demand would not be directly provided for.

In future, all forecast growth in demand from the Study Area to the City Centre is assumed to travel by public transport. The study will attempt to identify public transport options that could cater for 100 per cent of future growth, plus 30% of existing demand.

3.1.3 Overall Demand Levels

Table 3-1 outlines the overall AM Peak hour demand levels for 2011 and 2035, also highlighting overall demand growth and the overall target demand. Table 3-1 also outlines the approximate public transport percentage that would be achieved if the target demand levels are met. The proportion levels exclude short trips (<3km) which are considered to be made as by walking and cycling.

Table 3-1: Overall Demand Levels – AM 1 Hour

	2011	2035	Growth	Target Demand: Growth + 30% Existing
Total Demand	6,000	6,100	100	2,050
PT Percentage	10 - 20%	20%	100%	50 - 60%

3.2 Demand Assessment

3.2.1 South West Study Area Screenlines

In order to determine the level of demand to be accommodated by the potential options, three screenlines were applied to the South West Study Area. The screenlines were developed to address the demand toward Tallaght and the Outer Orbital Area (defined as the built-up area of Dublin outside the M50), the Inner Orbital Area, and Dublin City Centre. The following screenlines were applied to the demand assessment:

- N81;
- M50 (including to City Centre); and
- Eastern Boundary of South West Study Area.

3.2.2 Screenline Demand

Figure 3-1 illustrates the level of AM peak hour demand crossing the three screenlines for the 2011 base year and the 2035 forecast year, the demand growth from 2011 to 2035, and the target demand (demand growth + 30 per cent of 2011 demand).

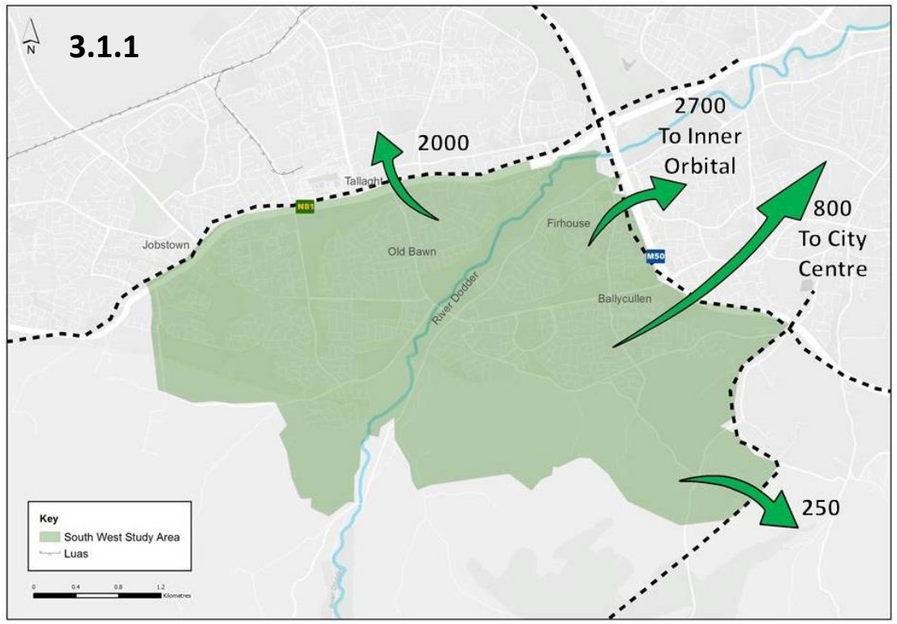
2011 Base Year AM peak hour demand from the study area towards Tallaght and the Outer Orbital Area is 2000 trips, while demand to the inner orbital is 2700 trips. Base year demand to the City Centre from the study area is 800 trips. Growth in demand across all screenlines in 2035 is relatively low. City Centre bound trips grow by 11% to 900 trips. Trips to Tallaght and the Outer Orbital grow 5% to 2100, and trips destined inside the M50 grow by 4% to 2800.

For the South West Study Area, this report aims to capture 100% of future growth and 30% of existing demand. Figure 3-1, schematic 3.1.4 shows this level of demand and includes:

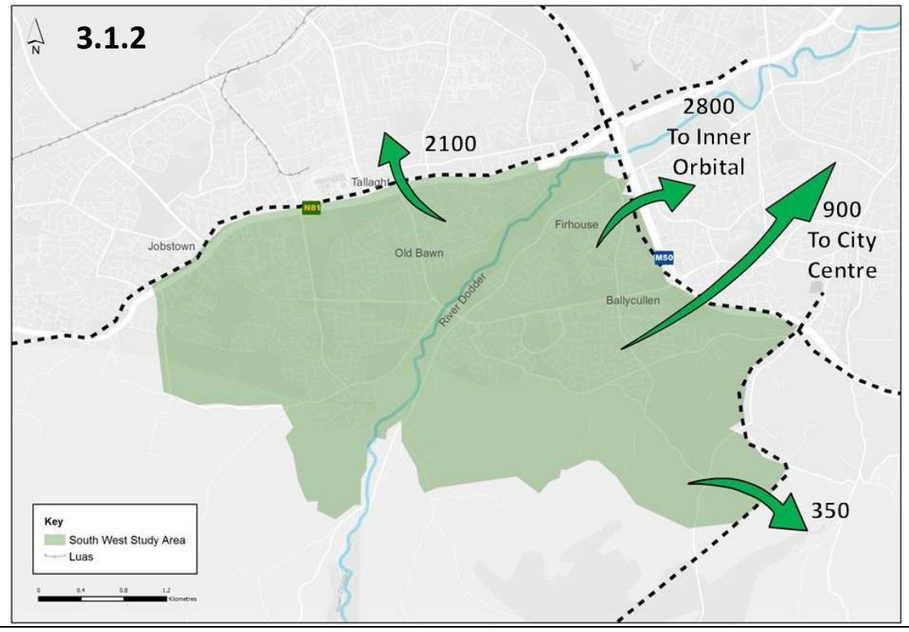
- 350 trips to the City Centre;
- 900 trips to Inner Orbital (area inside the M50, but outside the Grand Canal);
- 600 Outer Orbital trips bound north and west to Tallaght and other destinations outside the M50; and
- 200 Outer Orbital trips bound to the south and south east.

This report aims to identify public transport services that can cater for the overall target demand of the 2,050. Which is the combined trips crossing all screenlines in figure 3.1.4.

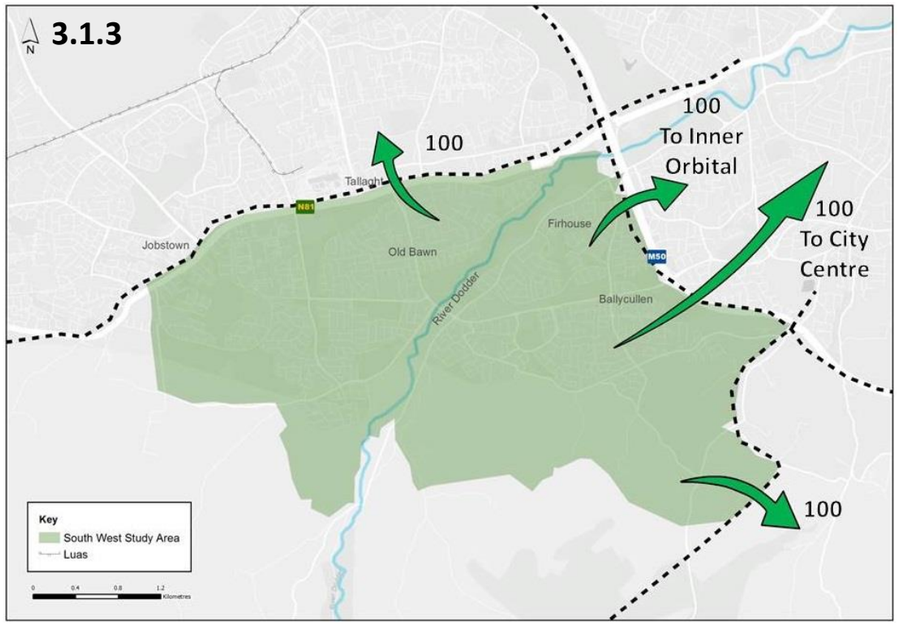
2011 Demand



2035 Demand



Demand Growth (2011 to 2035)



Target Demand (Demand Growth + 30% Existing Demand)

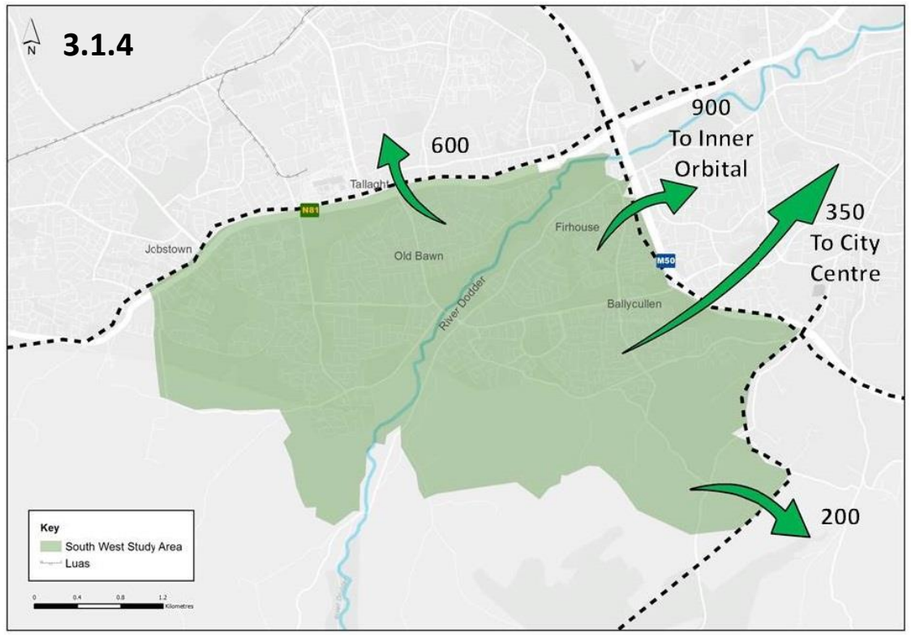


Figure 3-1: Screenline Demand

4 Public Transport Option Development

4.1 Introduction

This section outlines the development of various public transport options at a high level in order to meet the target demand crossing the screenlines. The options, in the first instance, did not consider network constraints or other factors and focussed solely on the proposed services ability to accommodate the screenline demand.

For the purposes of the assessment it is assumed that during the AM peak hour the current public transport services are generally close to or at capacity and therefore can accommodate little or no increase in demand. From schematic 3.1.4, in Figure 3-1, the target demand to be accommodated by public transport includes 100% of the growth in AM peak hour demand, plus 30% of existing AM peak hour demand. The Target Demand is calculated by summing all trip movements crossing the M50, N81 and southern screenlines. It is therefore assumed for the purpose of this study, that the additional demand to be served by public transport for the South West Study Area is 2,050 trips. This includes 350 trips to the City Centre, 900 trips to Inner Orbital area, 900 trips to the Outer Orbital bound north and west to Tallaght and other destinations outside the M50; and 200 Outer Orbital trips bound to the south and south east.

It is necessary therefore, to generate likely public transport options that can provide a level of service to accommodate this target demand level. The options, in the first instance, were generated by focussing solely on the proposed public transport services/modes ability to accommodate the screenline demand. This method was adopted so that the option generation process was not restricted by current network constraints that could be removed in the future.

As mentioned previously in Chapter 2, the Do Minimum Network is used as a basis for the development of the public transport options to serve the South West Corridor. The recommended public transport option is then assessed further within the GDARM with other additional schemes such as DART Underground, Metro North, BRT, and Core Orbital Bus Network outside of the M50 which will have an impact on the demand for public transport in the South West Corridor.

4.2 Design Capacity of Public Transport Modes

The following lists the potential alternative public transport modes that could be considered to meet the target demand:

- Heavy Rail (DART and Commuter);
- Light Rail (Luas and Metro);
- Bus Rapid Transit (BRT);
- Urban Bus Services (including feeder and express bus services);
- Intercity Bus Service; and
- Shuttle Bus.

Each service type has a predefined seated capacity and crush capacity (peak standing capacity). In order to ensure that a quality level of service is provided by the proposed options, design capacities for each of the above service types were developed. Design capacity is assumed to be 85 per cent of crush capacity or 100 per cent of seated capacity, whichever figure is greater. This ensures that at no time will the entirety of the target demand be accommodated by a service that is underutilised or is so busy as to make the service less desirable.

Crush capacity is an industry standard expression relating to the loading upper limit of public transport services that allow standing as a means of catering for higher levels of patronage. Design

capacity is assumed at 85 per cent of this to allow for a more comfortable and attractive level of service to be provided.

Frequency	Design Capacity (per service vehicle/train)							
	DART	Commuter	Light Rail	LRT Segregated	Bus Rapid Transit	Urban Bus	Intercity Bus	Shuttle Bus
60 min	1,190	410	260	300	100	70	50	30
40 min	1,780	610	390	450	150	110	70	40
30 min	2,380	820	520	600	200	150	100	60
20 min	3,570	1,230	780	900	310	220	150	90
15 min	4,760	1,630	1,040	1,200	410	300	200	120
12 min	5,950	2,040	1,300	1,500	510	370	250	150
10 min	7,140	2,450	1,560	1,800	610	450	300	180
8 min	8,920	3,070	1,940	2,300	760	560	370	225
6 min	11,900	4,090	2,590	3,050	1,020	740	500	300
5 min	14,280	4,910	3,110	3,650	1,220	900	600	360
4 min	17,850	6,130	3,890	4,550	1,530	1,120	750	450
3 min	23,800	8,180	5,180	6,050	2,040	1,500	1,000	600
2 min	35,700	12,270	7,780	9,100	3,060	2,240	1,500	900

Table 4-1: Design Capacity and Peak Hour Service Frequency

Note: The highlighted text in the table above indicates where the target demand of approximately 2,050 trips could be provided by a single transport mode operating at the specified service frequency.

4.3 High Level Public Transport Options

This section outlines the different public transport options developed at a high level to cater for screenline target demand based on the service frequencies and capacities in Table 4-2 Public Transport Options to Meet Target Demand**Error! Reference source not found.** shows the high level capacity of the proposed service for each possible option that could meet the targeted demand of 2,050 trips in the AM peak hour to the City Centre. Each option is described in more detail below.

Target: 2,050 trips in AM peak hour

Public Transport Option	Capacity	Service to Meet Capacity	Option 1 Increase Bus Service Provision	Option 2 Luas Extension + Increase Bus Service Provision	Option 3 Luas Extension + Increase Bus Service Provision	Option 4 BRT Extension + Increase Bus Service Provision
Rail	10,000					
Rail Enhanchment	2,000					
LRT	3,000	5 min freq				
LRT Enhancement	1,500					
LRT Extension	1,000	10 min / 15 min freq		X	X	
BRT	3,000	6 min freq				X
QBC	1,000					
Bus	75	38, 26, 18 or 12 New Services	X	X	X	X
Metro	7,800					
Total New Capacity			2,800	2,950	2,850	2,900

Table 4-2 Public Transport Options to Meet Target Demand

The high level options developed do not consider network constraints or existing public transport services. The sole focus at this high level options development stage is to outline public transport services than can accommodate the maximum clockwise and anti-clockwise screenline demand within the South West Study Area.

The following lists the three public transport options considered:

- ***Option 1: Increase bus service provision across N81 and M50***
- ***Option 2: Luas extension across N81 from Tallaght & increase bus service provision across M50***
- ***Option 3: Route BRT across M50 and N81 & increase bus service provision across M50***

As part of each option above it is proposed to extend three existing bus services to target areas of forecast demand growth, ensuring full coverage within the Study Area.

4.4 Capacity Assessment of Proposed Public Transport Options

A capacity assessment of the proposed public transport options was undertaken and is included in A1.1. The capacity assessment highlights that for each option the proposed public transport provision can accommodate all of the target demand.

5 Public Transport Option Scoring

This section outlines the comparison of the five options that were brought forward from the Option Development stage. This comparison is based on the ranking of the options against three criteria:

- Demand Accommodated within Catchment;
- Journey Time; and
- Cost.

The higher the ranking score, the better the option achieved the criteria. The overall ranked scores for each criterion are then summed for each option. The highest scoring option is considered as the preferred option.

5.1 Proposed Public Transport Options

As part of the option scoring assessment a more detailed approach to the public transport options was taken. The routing of the proposed public transport services was undertaken in greater detail, taking into account; proposed demand growth locations, network constraints and interchange with existing and proposed public transport. Figure 5-1 to Figure 5-3 illustrates the identified routes of the proposed public transport options.

The routes identified are shown to terminate just beyond the boundaries of the South West Study Area; however, these services will need to tie into existing or proposed public transport services or continue beyond the Study Area boundary in order to ensure that they can provide appropriate access and connectivity.

5.1.1 Option 1: Increase Bus Service Provision across N81 and M50

Option 1 shown in Figure 5-1 proposes to increase the existing bus service provision towards the Inner Orbital, Outer Orbital and City Centre. Twelve additional buses per hour are proposed to cater for demand to Tallaght, City West and the Outer Orbital. In addition 15 additional buses per hour are proposed to cater for demand to the Inner Orbital and the City Centre. These services would be spilt across the two M50 bridge crossings and the Firhouse Interchange (M50 Junction 12).

Services 15, 15B and 54A are proposed to be extended to cover the wider catchment and forecast growth areas within the Study Area.

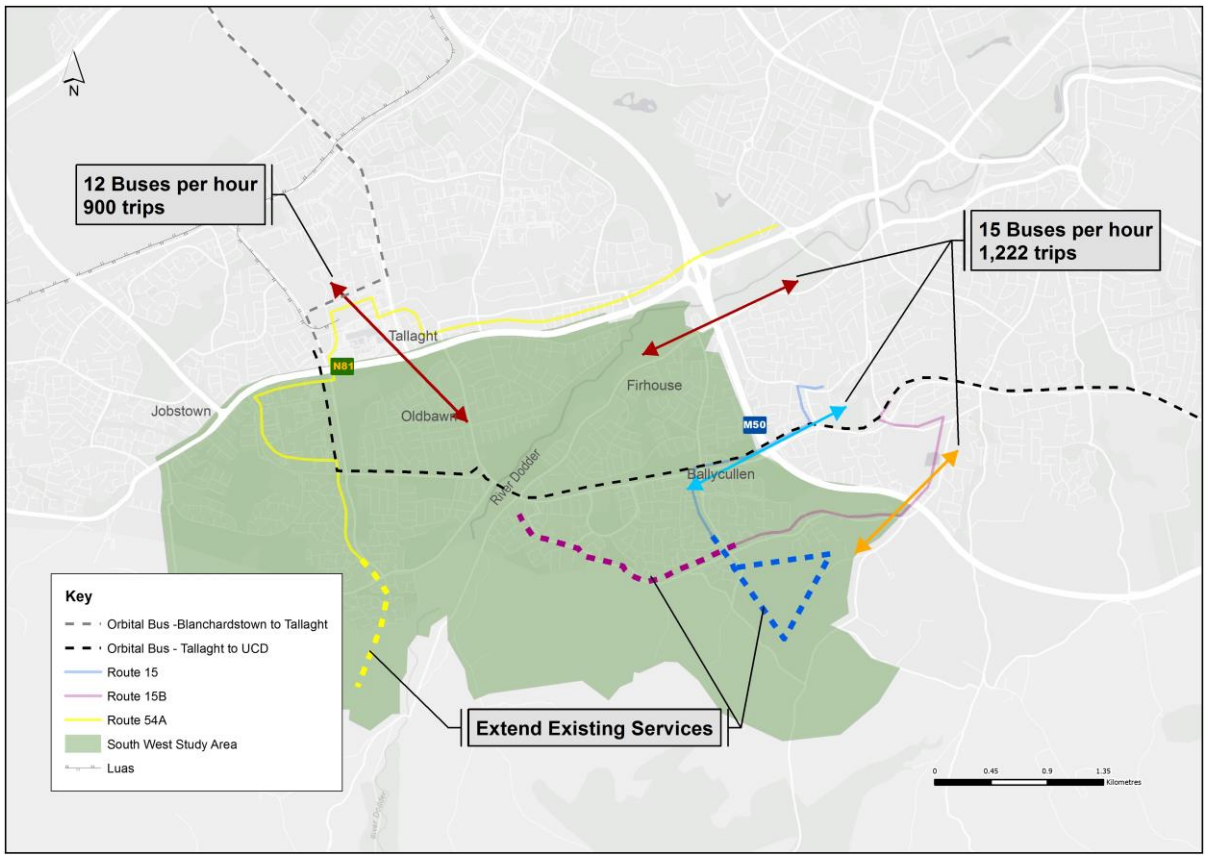


Figure 5-1: Option 1: Increase Bus Service Provision across N81 and M50

5.1.2 Option 2: Luas Extension from Tallaght & Increase Bus Service Provision

Option 2 shown in Figure 5-2 proposes to extend the existing Luas Red Line from Tallaght into the South West Study Area via Old Bawn Road. In addition this option proposes to increase the existing bus service towards the Inner Orbital, and City Centre.

Four Luas trams per hour are proposed to cater for demand to Tallaght and destinations in the Outer Orbital along the Luas Red Line. The Luas extension would also serve demand for toward the City Centre along the Luas Red line.

An additional 12 buses per hour are proposed to cater for demand to the City Centre as well as the Inner Orbital. These services would be spilt across the two M50 bridge crossings and the Firhouse Interchange (M50 Junction 12). The bus improvements will strengthen the connectivity between the study area and the city centre.

Services 15, 15B and 54A are proposed to be extended to cover the wider catchment and forecast growth areas within the Study Area. This proposal complements the Core Orbital Bus Routes proposed as described in Section 2.3.4 and shown on Figure 5-2.

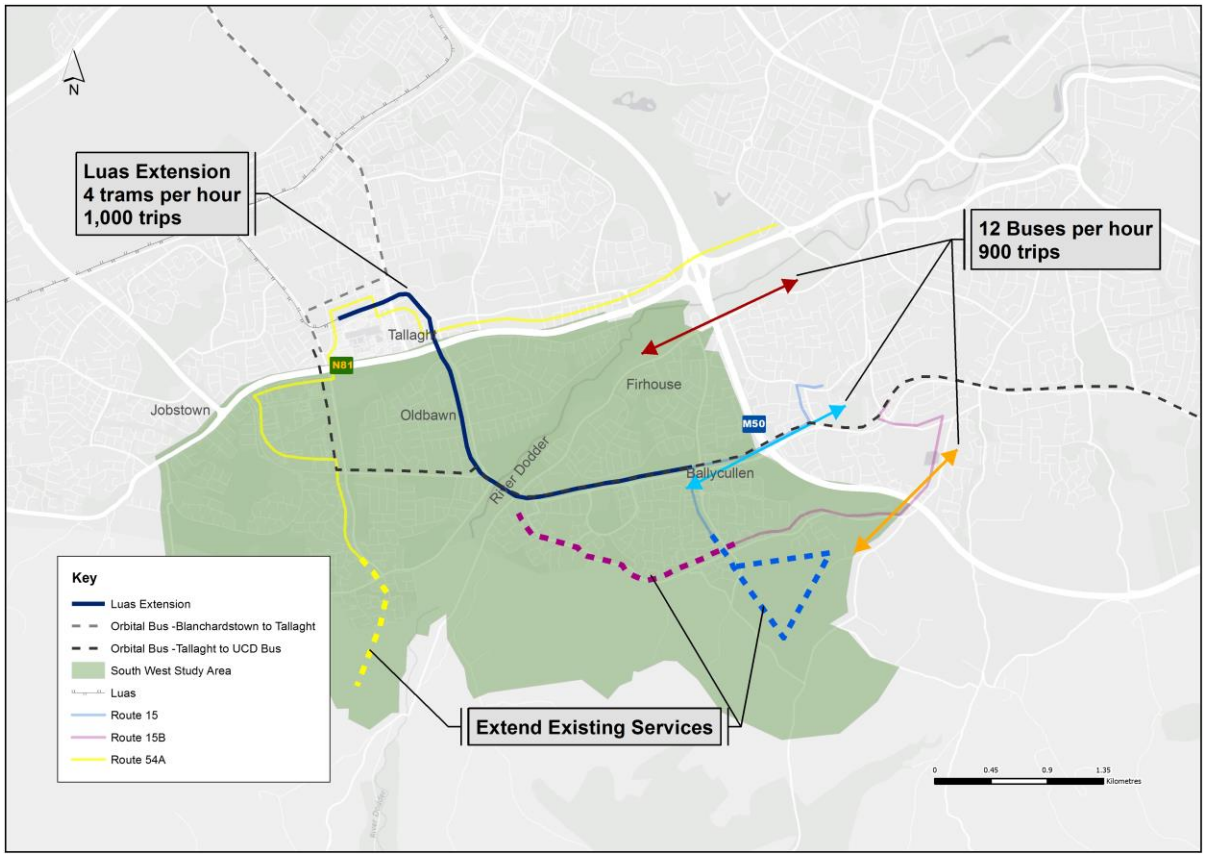


Figure 5-2: Option 2: Luas Extension from Tallaght & Increase Bus Service Provision

5.1.3 Option 3: Bus Rapid Transit & Increase Bus Service Provision

Option 3 shown in Figure 5-3 proposes to route the Swiftway BRT from Clongriffin to Tallaght through the South West Study Area via Firhouse Road and Old Bawn Road. This option also proposes to increase the frequency of the existing bus services across the M50. Ten BRT vehicles per hour are proposed, to cater for the demand east to the City Centre and destinations to the east inside the M50. Additionally the BRT will provide connectivity west to Tallaght, and the area outside of the M50. 12 additional buses per hour are proposed to also cater for demand to the Inner Orbital and the City Centre.

Services 15, 15B and 54A are proposed to be extended to cover the wider catchment and forecast growth areas within the Study Area. This proposal complements the Core Orbital Bus Routes proposed as described in Section 2.3.4 and shown on Figure 5-2.

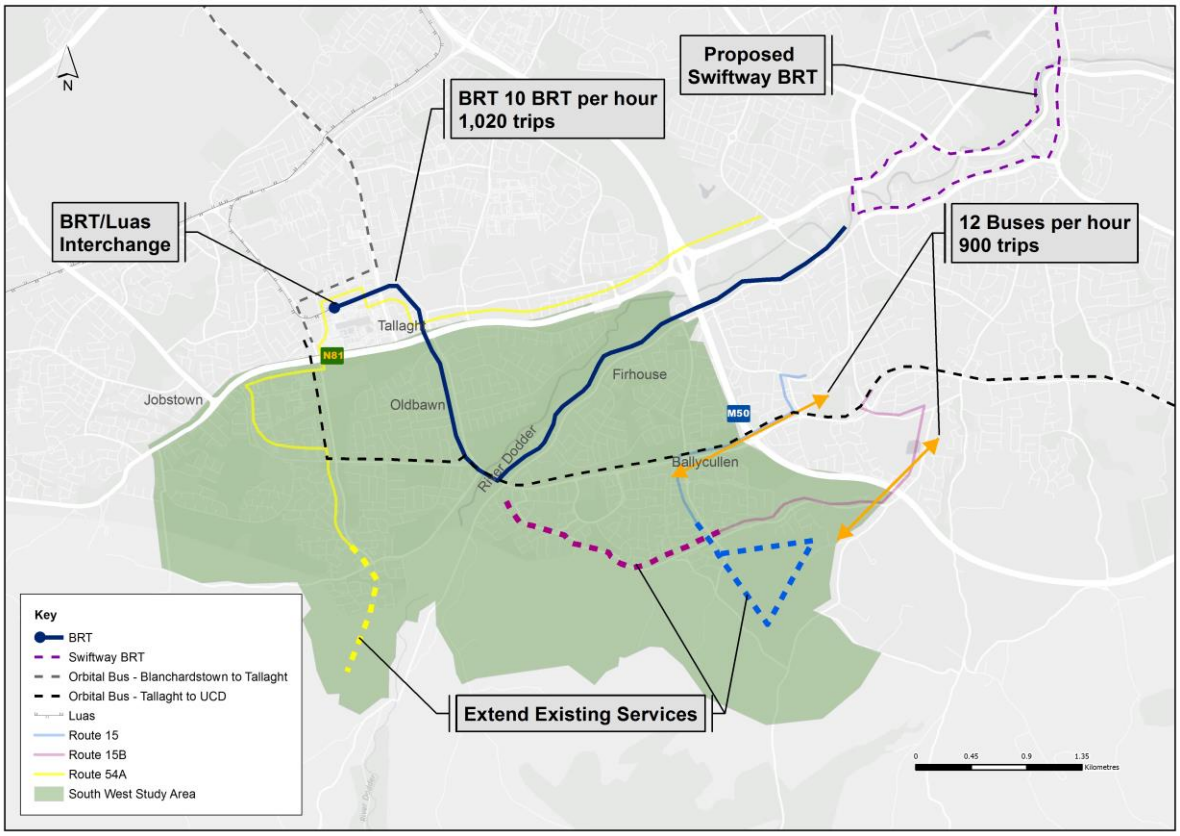


Figure 5-3: Option 3: Bus Rapid Transit & Increase Bus Service Provision

5.2 Demand Accommodated Comparison

As already outlined earlier in the report, each of the proposed six options provides adequate service capacity that can cater for 100 per cent of the target demand, while also extending the existing services to cater for the forecast demand in growth areas. Therefore each option caters for the same level of demand. As such no further comparison has been undertaken of the catchment.

5.3 Journey Time Comparison

5.3.1 Journey Time Analysis

The journey time analysis considered the average journey time to Dublin City Centre for each option. The following lists the assumptions upon which the journey time comparison was based:

- Existing Luas Journey Time to Tallaght is 45 minutes;
- Existing Dublin Bus Journey Time to Study Area is 54 minutes;
- Proposed Swiftway BRT to Rathfarnham / Templeogue is 35 minutes;
- Proposed Bus speed is 17kph;
- Proposed Luas speed is 22kph; and
- Proposed BRT speed is 20kph.

5.3.2 Journey Time Analysis of Proposed Options

Table 5-1 details the journey time analysis for the four options, showing the average of the journey time for all modes in the option. It can be seen that Option 3 has the shortest journey time to the City Centre when compared with the other Options. This is due to the BRT having a faster speed than the existing bus services and a more direct route than the extended Luas.

Table 5-1: Journey Time Analysis

	Description	Direct Journey Time (min)
Option 1	Increase Bus Services	00:59:42
Option 2	Extend Luas and Increase Bus Services	00:57:21
Option 3	Bus Rapid Transit and Increase Bus Services	00:52:24

5.4 Cost Comparison

The estimated cost of each option proposed was considered as one of the scoring criteria. Table 5-2 outlines the service and infrastructure unit cost for the proposed services and required infrastructure. These high level unit costs per meter of infrastructure have been based on recent schemes developed and introduced in Dublin, and have been agreed with the NTA. Detailed cost estimates would be necessary at a later stage of assessment.

Table 5-2: Service & Infrastructure Unit Cost

Service / Infrastructure	Units	Unit Cost	Source
Luas	€M/km	**40**	Luas B1 RPA Proof of Evidence 2006
BRT	€M/km	**11**	NTA / RPA Presentation on BRT
QBC	€M/km	**3.65**	Assumed 1/3 of BRT Cost

Table 5-3 details the comparison of the cost estimates for each proposed option. Option 1 is the cheapest option due to extension of existing bus services with QBC level provision. Due to the significant costs associated with the foundation and track infrastructure associated with light rail, Option 2 has the highest cost estimates. The BRT cost falls between the Luas costs and the extension of existing bus services cost, due to the provision of BRT level provision and priority from Tallaght to Rathfarnham through the Study Area.

Table 5-3: Cost Estimate Comparison

Option	Description	Cost €M
Option 1	Increase Bus Services	20
Option 2	Extend Luas and Increase Bus Services	165
Option 3	Bus Rapid Transit and Increase Bus Services	90

5.5 Summary of Option Scoring

Table 5-4 outlines the summary of the option scoring process. For each scoring criteria the options are ranked from 1 to 4; 1 representing the lowest performance in that criterion and 4 representing the highest performance. Each criteria rank is summed to provide a total value for each option. The option with the highest score is considered to best meet the criteria. No cost benefit analysis or modelling has been undertaken and therefore this is intended to provide a high level scoring method to compare all of the options considered.

Based on this scoring approach, Option 3 (Bus Rapid Transit & Increased Bus Service Provision) is seen to score the highest in overall terms, providing the greatest additional coverage, the fastest journey time and the second cheapest option.

Table 5-4: Option Scoring Summary

Scoring Summary	Description	Journey Time Rank	Cost Rank	Overall Scoring
Option 1	Increase Bus Services	1	3	4
Option 2	Extend Luas and Increase Bus Services	2	1	3
Option 3	Bus Rapid Transit and Increase Bus Services	3	2	5

6 Transport Modelling Assessment

6.1 Background

Following identification of the preferred public transport option for the South West Study Area, a modelling exercise has been undertaken to determine the likely usage and operation of the proposed new services that may be in place by year 2035.

The modelling testing exercise is reported within this section. The emerging measures were tested Greater Dublin Area Regional Model (GDARM).

This testing stage also includes the majority of initiatives that form the GDA Strategy and therefore takes cognisance of the impacts of both the corridor initiatives and interaction with those services being proposed within the overall strategy.

It should be noted that within this modelling exercise, the model testing does not include the full impact of Demand Management measures that may be utilised to further enhance the level of journeys made by public transport. In addition, Park and Ride facilities and shuttle bus services to rail and light rail stations have not been modelled and therefore the model output is likely to under represent the actual level of use on public transport. The outcome of the current model testing, therefore, provides a conservative view of demand levels that may use the measures included within the Strategy. Implementation of strategic Park and Ride facilities, and demand management measures are likely to increase the attractiveness of the public transport measures. These benefits are not encompassed in the modelling results.

Further information on the transport modelling and strategy measures tested is provided within an overarching Transport Modelling Report.

Figure 6-1 illustrates the proposed GDA public transport proposals in the context of the West Study Area corridor.

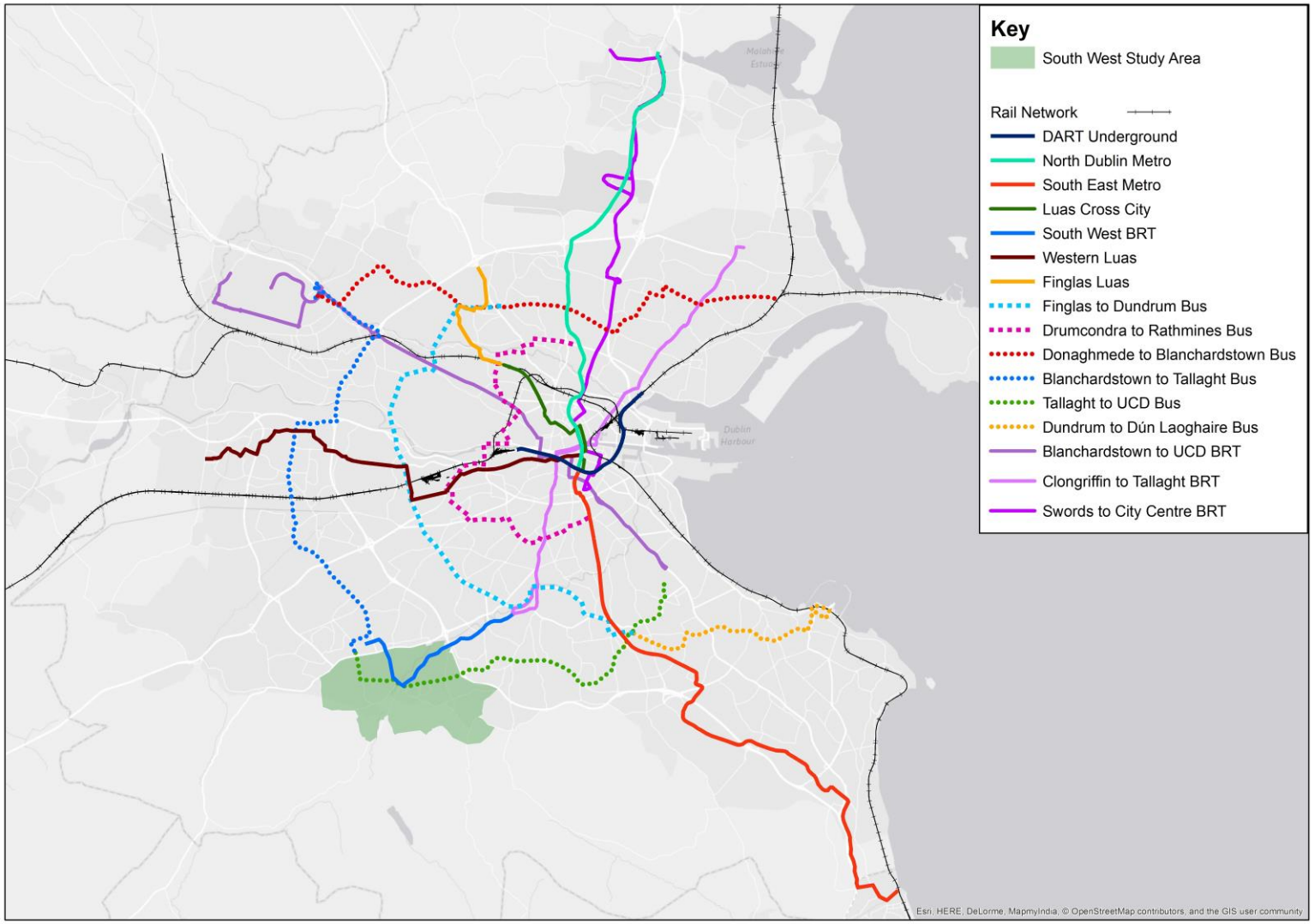


Figure 6-1: Proposed GDA Strategy Public Transport Proposals

6.2 Modelled Public Transport Proposal

The proposed public transport provision for the South West Study Area tested within the GDARM includes a BRT Route from Tallaght to Clongriffin.

While providing a high frequency BRT service for journeys made along the catchment of this radial route, the South West BRT will also provide interchange with radial Luas services and orbital bus services at its Tallaght terminus. This key transfer location to a wide range of services widens the catchment of the Study Area by providing connection to radial and orbital routes in other corridor Study Areas. This proposal is tested within the wider Strategy measures presented in Figure 6-1. The additional schemes of the Core Outer Orbital Bus Routes described in Section 2.3.3 are included this modelling assessment.

Table 6-1 describes the public transport service plan for the South West BRT.

Table 6-1: Proposed Public Transport Service Plan

Service	Vehicle	AM headway	IP headway	PM headway
South West BRT	BRT (120 pax crush)	4	8	4

6.3 Modelling Assessment

6.3.1 Screenline Assessment

As described earlier in the report, the demand level was defined across screenlines within the Study Area to determine the appropriate service to accommodate the forecast total demand growth. This assessment made the assumption that all growth would use public transport. The public transport service proposals were then modelled to determine a more conservative projection of 2035 public transport usage. Figure 6-2 illustrates the forecasted 2035 AM peak hour public transport patronage crossing each of the screenlines.

The public transport services in the 2035 AM Peak Do Strategy scenario capture 2050 trips in the AM peak hour of which 1450 are from the study area crossing the M50 towards the inner orbital / city centre and 600 are crossing the N81. These Do Strategy public transport services are capturing 100 per cent of the target demand for 2035 in the AM peak hour for the screenline crossing the N81. The 2035 AM Peak Do Strategy scenario is capturing 116 per cent of the of the target demand for the screenline crossing the M50. This is mostly achieved by the South West BRT, but the orbital bus service between UCD and Tallaght and Tallaght and Blanchardstown attracts trips across the screenlines as well.

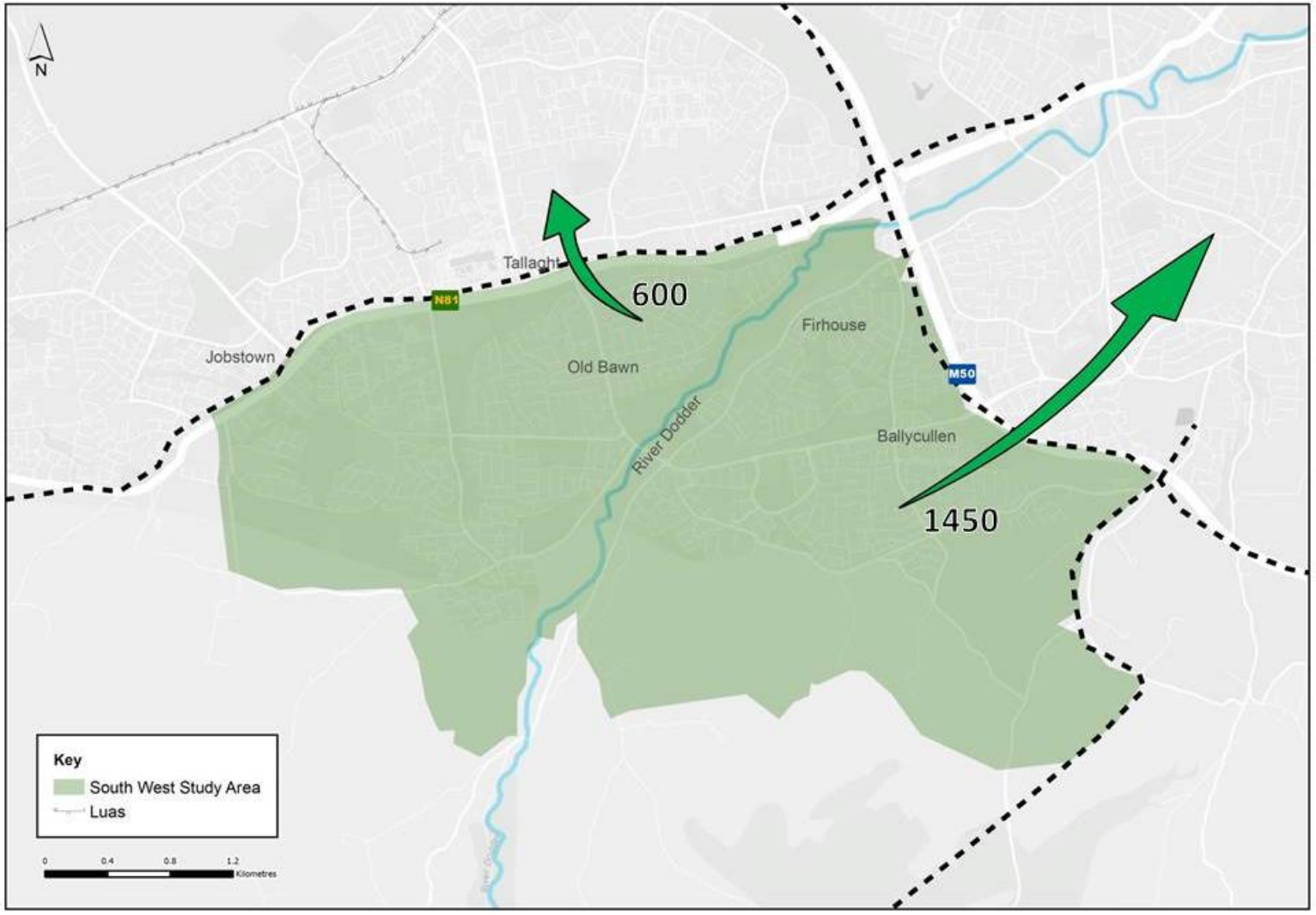


Figure 6-2: 2035 AM Peak Screenline Public Transport Patronage

6.3.2 Corridor Study Area Mode Share

The introduction of the proposed public transport measures within the corridor Study Area, and the introduction of wider GDA public transport proposals can accommodate increased public transport patronage. Figure 6-3 outlines the overall mode share of the South West Study Area to Dublin City Centre for trips greater than 3 km; showing a public transport mode share of 61 per cent, which is less than the mode share for private car travel of 39 per cent. As per Table 3-1 the objective was to reach a public transport mode share between 50 and 60 per cent for trips travelling to the city centre. The Do Strategy proposal meets this mode share objective.

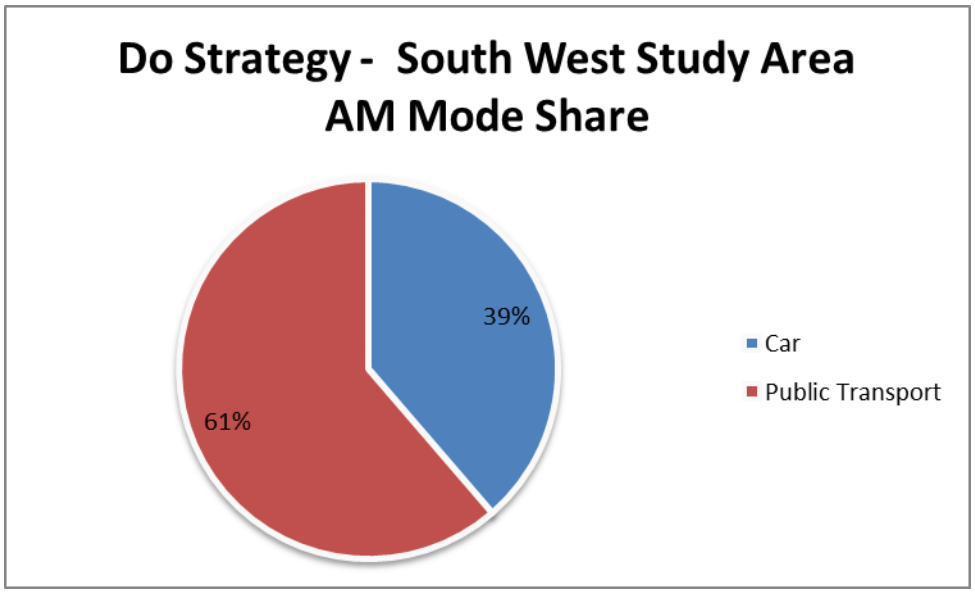


Figure 6-3: AM Peak Corridor Study Area Mode Share

6.3.3 Public Transport Boarding and Alighting Profile

Figure 6-4 and Figure 6-5 detail the boarding and alighting profiles for the BRT from Tallaght to Clongriffin and Tallaght to the M50 (Study Area boundary) respectively. Each graph shows the cumulative passenger numbers for each service, as well as the overall design and seated capacity modelled for these services.

The BRT route is seen to have a maximum cumulative passenger number when it reaches the City Centre. Within the Study Area it has its highest cumulative passenger number when it reaches the M50, at the periphery of the Study Area. Figure 6-4 shows that design capacity is exceeded for the BRT service traveling towards the City Centre in the AM peak hour. This is based on a service running every six minutes or 10 times per hour. The level of public transport demand generated within this Study Area can be met by increasing the service frequency to every 4 minutes or 15 services per hour.

The analysis indicates that the proposed improvements will attract sufficient demand to be viable. In order to operate under design capacity up to 2035, the BRT frequency would need to be increased to a 4 minute frequency. This public transport service will then operate efficiently and effectively with adequate scope for further patronage increases beyond 2035.

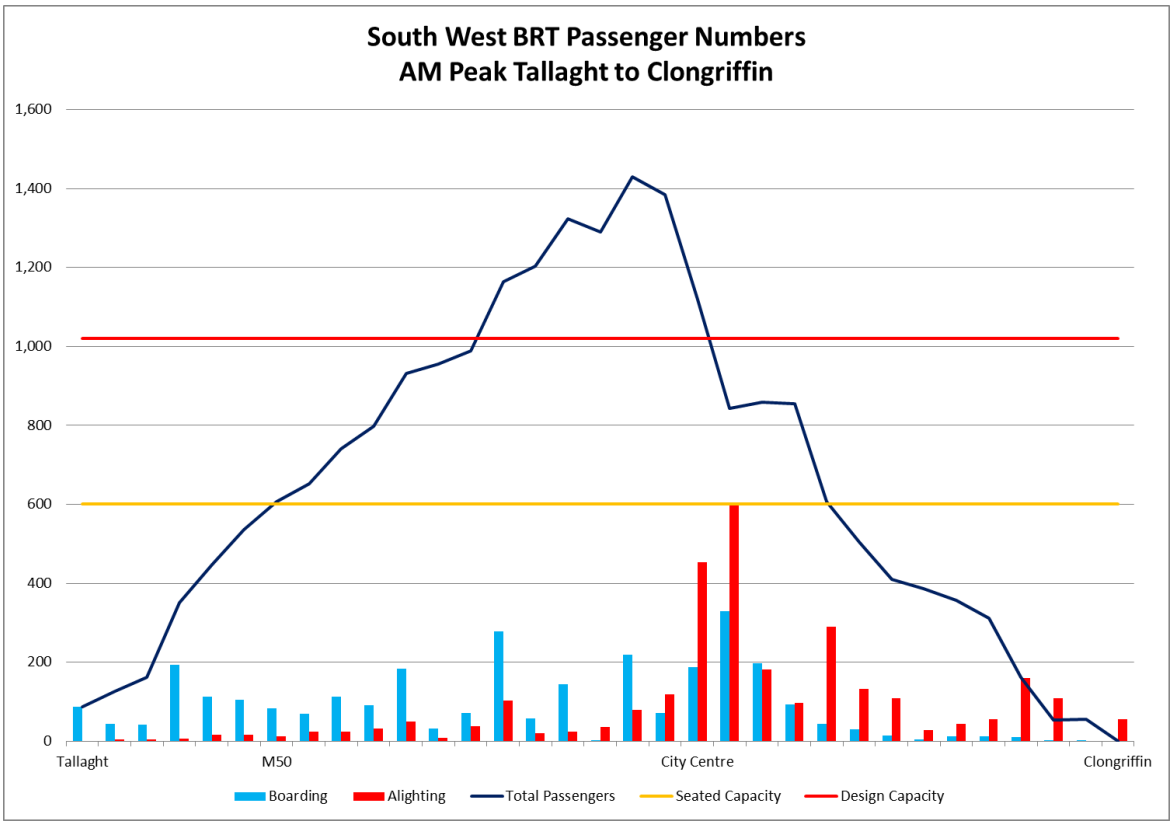


Figure 6-4: South West BRT Boarding and Alighting Profile – Tallaght to Clongriffin

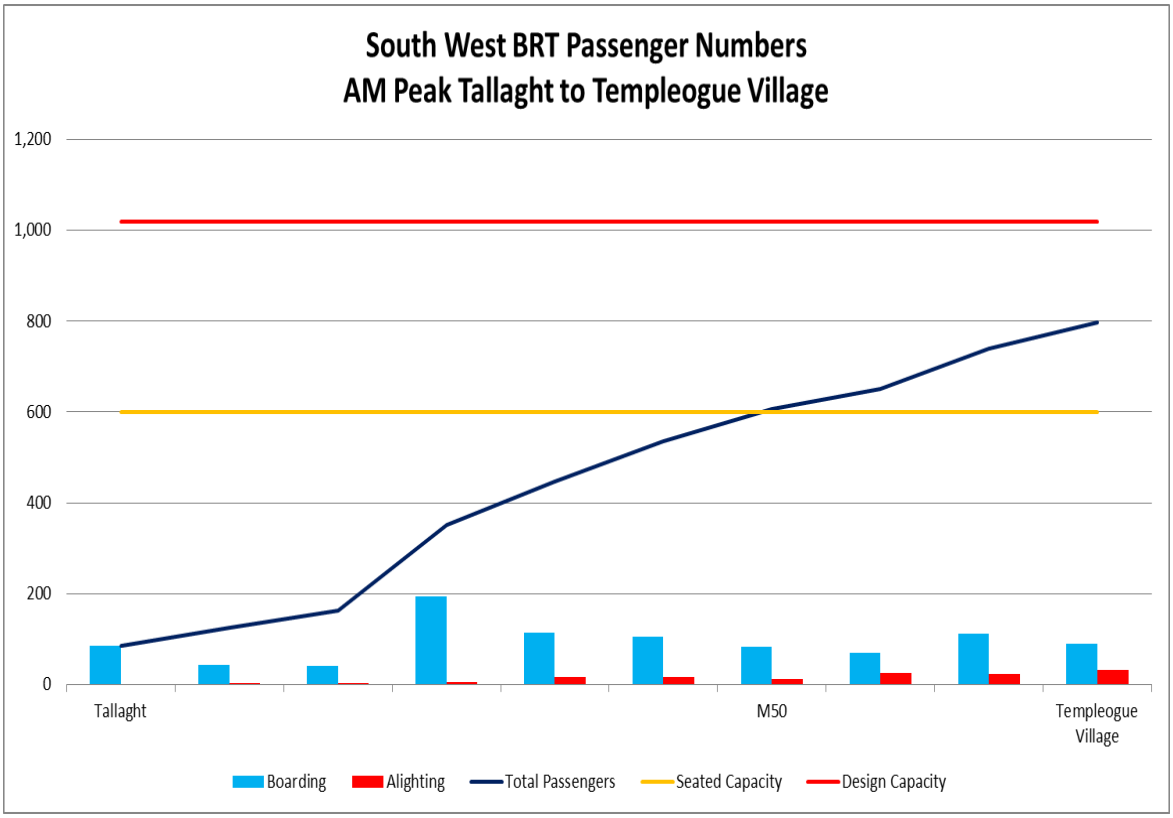


Figure 6-5: South West BRT Boarding and Alighting Profile - Tallaght to Study Area Boundary

6.3.4 Journey Times and Service Speeds

Table 6-2 outlines the high level journey times and average service speeds for the proposed BRT public transport provision from Tallaght to Clongriffin in the AM peak hour. Table 6-2 shows that passengers from Tallaght can access the city centre in less than 25 minutes, providing an efficient public transport options to cater for different origin and destination locations along its catchment.

Table 6-2: Proposed Public Transport Journey Times and Service Speeds

South West BRT	Distance Km	Journey Time min	Speed kph	Travel Distance pas.km
Tallaght to City Centre	12	40	18	9,376

6.4 Modelling Summary and Conclusions

The modelling assessment has shown that the patronage and passenger numbers using the proposed services align with the anticipated demand, indicating that the public transport proposed is of the appropriate scale to accommodate the forecast demand growth. The overall public transport mode share for trips from the Study Area to Dublin City Centre is 61 per cent in the 2035 Do Strategy AM peak hour. The modelling exercise hasn't included the collective benefits that could be provided by Park and Ride and demand management measures. Benefits of the proposed measures are likely to be even greater with the introduction of Park and Ride and demand management.

The comparison of the service passenger numbers against the design capacity indicates that at no point are the services over-crowded and that by 2035 there is still scope to accommodate further growth.

The assessment also has shown that the journey time from Tallaght to Clongriffin is less than 70 minutes and journey time from Tallaght to City Centre is 40 minutes, providing an efficient, reliable service.

In summary the proposed public transport measures can accommodate the proposed growth in travel demand to the City Centre and within the Study Area effectively and efficiently.

The modelling has also shown that even with the inclusion of the additional Strategy schemes of the Core Outer Orbital Bus Routes, the proposed BRT is still required to serve demand to the City Centre, the Inner Orbital, the Outer Orbital and Tallaght.

7 Emerging South West Study Area Public Transport Scheme

7.1 Recommendation

The following outlines the recommended South West Study Area public transport proposal (Option 3) to be included in the 2035 GDA Public Transport Strategy. This is shown in Figure 7-1.

- Extend and route proposed Swiftway BRT from Clongriffin to Tallaght via Firhouse Road and Old Bawn Road;
- Extend existing bus services within Study Area to capture areas of growth; and
- Increase bus services to Inner Orbital Area and City Centre.

Trips from the Study Area to the Outer Orbital north and west of the study area are catered for by the proposals included in the *Dublin Orbital Movement Strategy Options Report*

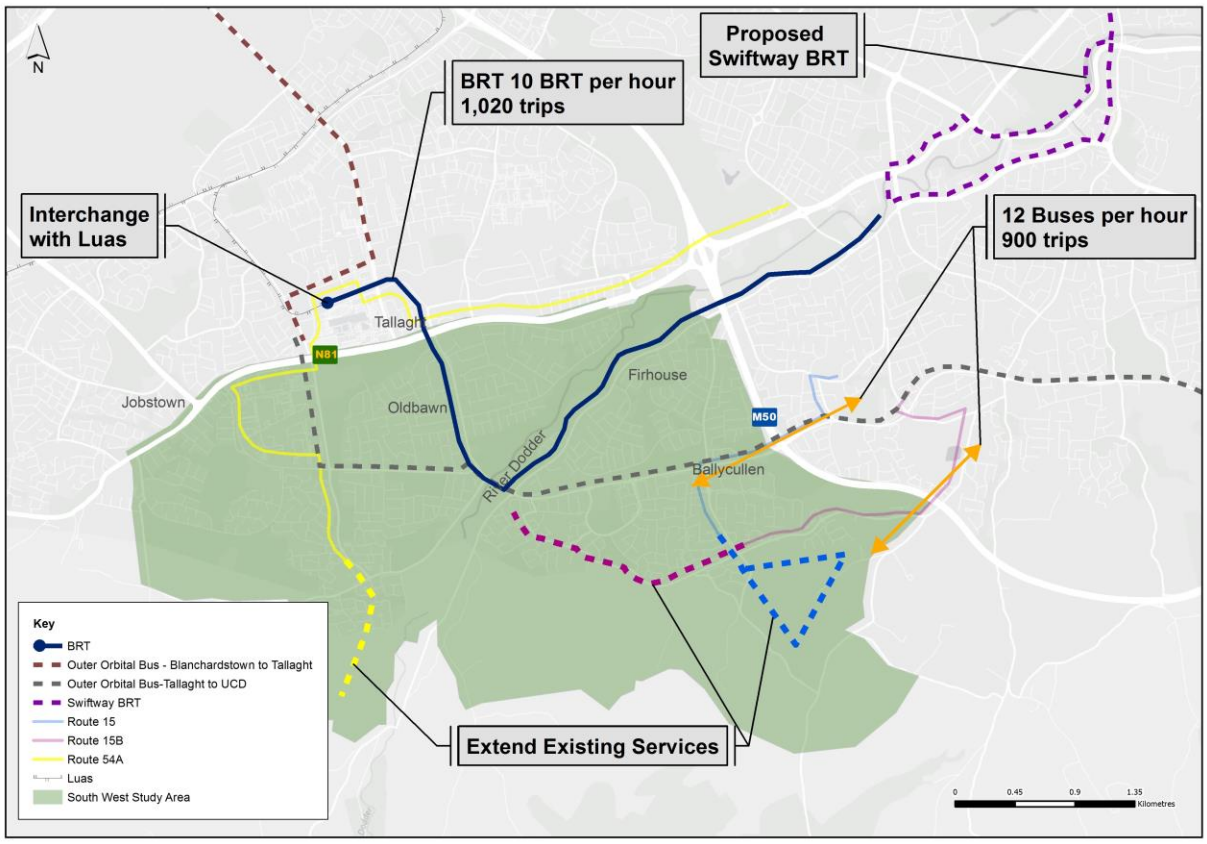


Figure 7-1: Recommended Option: Route BRT Swiftway to Study Area, Extend Existing Bus & Increase Existing Bus Services

7.2 Specification of Public Transport Offering

- BRT at six minute frequency to cater for South West Study Area demand; and
- An additional 12 Bus services are required to meet increased demand to Inner Orbital and City Centre.

7.3 Benefits

- This option provides a feasible alternative to travel demand that currently uses car;
- This option can accommodate demand growth to 2035 + 30 per cent of existing demand;

- The proposed strategy option caters for the target. Trips crossing the M50 and Tallaght screenline are catered by the proposals with approx. 16% spare capacity at the M50 screenline in the AM peak. This can be further increased by maximizing the role of the proposed Core Outer Orbital Bus Services;
- The alignment of the proposed BRT caters for Inner Orbital / City Centre demand as well as demand to the Tallaght area. Trips going north and west beyond Tallaght can interchange with the Luas or the proposed Core Outer Orbital Services, or existing bus services;
- This option makes most of existing infrastructure;
- This option provides improved access to key services for non-car owners;
- The existing bus services can be extended to capture demand in growth areas as and when this growth occurs;
- The existing bus service frequency can be increased in a phased manner over time to meet the growing demand; and
- The option complements and provides connections to the proposed Core Outer Orbital Bus Routes.
- This option provides public transport connections to existing rail, light rail, urban bus, and inner and outer orbital proposals.
- The modelling exercise hasn't included the collective benefits that could be provided by Park and Ride and demand management measures. Benefits of the proposed measures are likely to be greater with the introduction of Park and Ride and demand management.
- Implementation of GDA Demand Management measures will also further encourage the use of the public transport in the South West Study Area.

7.4 Risks

- Requires Swiftway BRT from Clongriffin to Tallaght proposal;
- heavily reliant on Inner Orbital public transport proposals to provide access to Inner Orbital area;
- detailed cost and risk assessment required; and
- cost excludes operation costs.

7.5 Cost

Below is a conceptual high-level capital cost estimate for the recommended public transport option for the South West Study Area. These costs were estimated using per/km costs derived from similar recent projects, details of which are included in Section 5.4 of the report.

- BRT Route: €70M;
- Bus Route Extensions: up to €20M; and
- **Total Cost: €90M.**

The costs associated with the Core Orbital bus services are not included within this estimate as these are included in this estimate as these are established through the *Dublin Orbital Movement Strategy Options Report*.

Annex 1

A1.1 Capacity Assessment

Table A1-7-1 details the capacity assessment undertaken for the target demand, and outlines the following for each of the five options considered:

- **Right Column:** Proposed service type and frequency at each screenline;
- **Left Column:** Comparison of proposed service design capacity and maximum screenline demand; and
- **Middle Column:** Comparison of proposed service crush capacity and maximum screenline demand.

It can be seen in Table A1-7-1 that a small number of screenline demands are not entirely met by the design capacity. A maximum of 72 screenline crossing trips is not catered for by the design capacity through the proposed options in Table A1-7-1, however, this surplus demand is more than accommodated for if crush capacity is considered.

Table A1-7-1: Target Demand Assessment for the Proposed Options (Growth + 30% of Existing Demand)

Option Sifting for Growth + 30% Existing Design Capacity

Option 1 Screenlines	Maximum Demand	DB	DB	DB	DB	Surplus
M50	**1323**	898				426
N81	**544**	898				-354
Total Surplus						**-354**

Option 2 Screenlines	Maximum Demand	LRT	DB	DB	DB	Surplus
M50	**1323**		898			426
N81	**544**	1037				-493
Total Surplus						**-493**

Option 3 Screenlines	Maximum Demand	BRT	DB	DB		Surplus
M50	**1323**	1020	898			-594
N81	**544**	1020				-476
Total Surplus						**-476**

Option Sifting for Growth + 30% Existing Crush Capacity

Option 1 Screenlines	Maximum Demand	DB	DB	DB	DB	Surplus
M50	**1323**	1056				267
N81	**544**	1056				-512
Total Surplus						**-512**

Option 2 Screenlines	Maximum Demand	LRT	DB	DB	DB	Surplus
M50	**1323**		1056			267
N81	**544**	1220				-676
Total Surplus						**-676**

Option 3 Screenlines	Maximum Demand	BRT	DB	DB	0	Surplus
M50	**1323**	1200	1056			-933
N81	**544**	1200				-656
Total Surplus						**-656**

Proposed Service Frequency

Option 1 Screenlines	DB	DB	DB	
M50	5 min			
N81	5 min			
Total Surplus				

Option 2 Screenlines	LRT	DB	DB	DB
M50		5 min		
N81	15 min			
Total Surplus				

Option 3 Screenlines	BRT	DB	DB	
M50	6 min	5 min		
N81	6 min			
Total Surplus				