Appendix H

H1 Bus Stop Review Methodology

H2 Bus Stop Review Analysis

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Bus Stop Review Methodology (REV 3)

Project name	Date	Prepared by
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1.0 Introduction

The location and design of bus stops will be critical to the success of the operation of BusConnects Dublin. Bus stop catchment areas and safety will need to be maximised, the size of the stop needs to be sufficient to meet the expected passenger and bus demand, and the bus stop itself must not become a bottle neck to the operation of the corridor. This methodology outlines how each corridor shall be assessed so as the location and operation of bus stops can be optimised.

This Note does not relate to the physical layout of the bus stops which is addressed in Chapter 11 of the Preliminary Design Guidance Booklet, although spatial considerations are discussed in section 5.4. Standard details for bus stop layouts are to be included in the next draft of the Design Guidance Booklet.

It is important to note that existing bus stops located along the Core Bus Corridors will have been subject to considerable thought by Bus Operators, An Garda Siochana, and the Local Authority. For this reason, it is imperative that each location is closely examined before it is considered for relocation or removal.

For avoidance of doubt this manual assumes the standard bus is a twin axle double decker bus (10 to 11m in length) with a front and middle doors. Other vehicles, such as 3-axle double decker, are in use by Dublin Bus and should be considered when undertaking the Geometric Design.

Figure 1.2 Standard Bus being used on the CBC's.

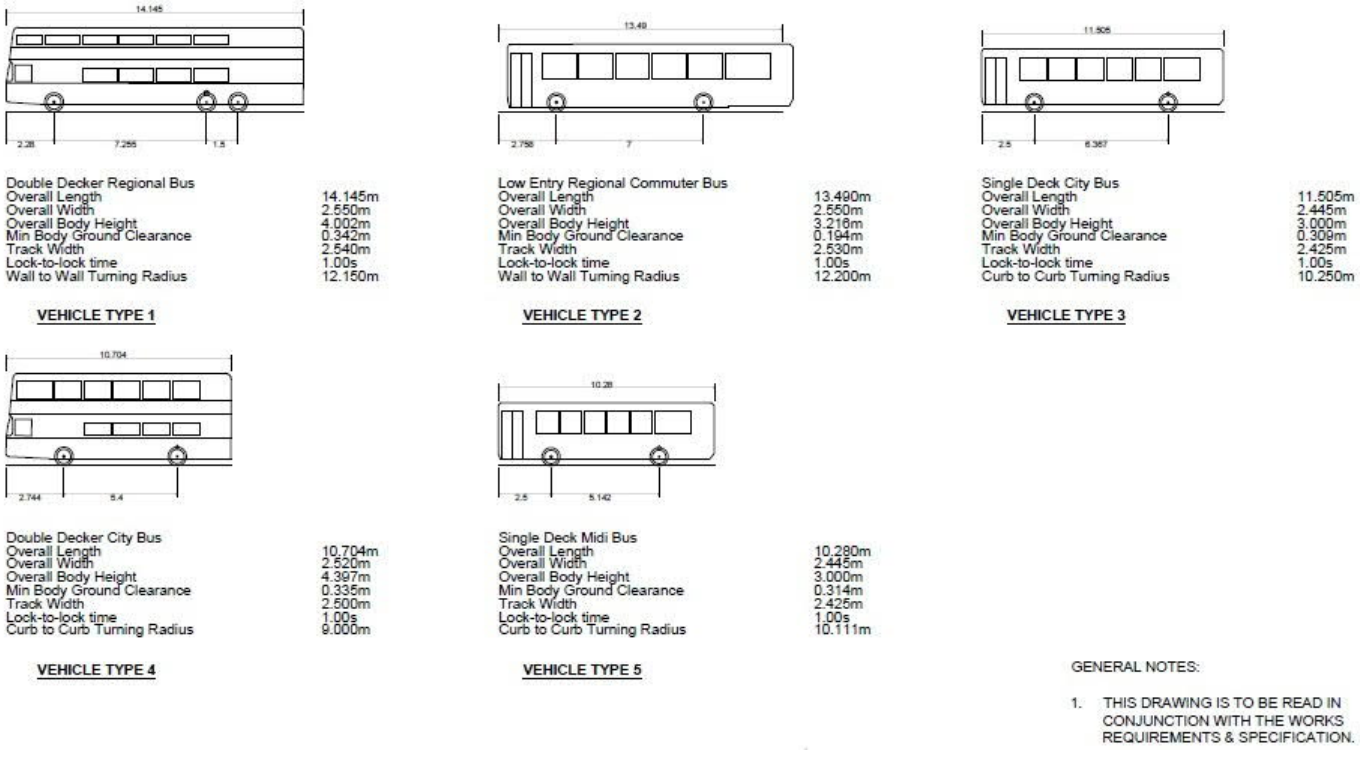


Figure 1.3 Standard Transport for Ireland Bus Specifications.

Considerations for Bus Stop Locations

The basic criteria for consideration when locating a bus stop:

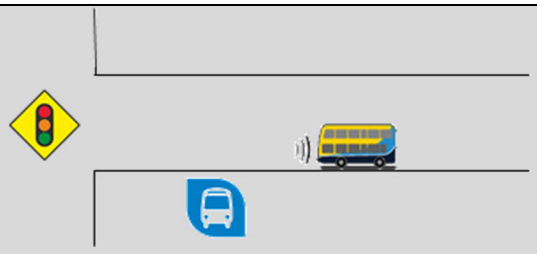
- Driver and waiting passengers are clearly visible to each other;
- Located close to key local facilities;
- Located close to main junctions without affecting road safety or junction operation;
- Located to minimise walking distance between interchange stops;
- Where there is space for a bus shelter;
- Located in pairs, 'Tail to tail' on opposite sides of the road;
- Close to (and on exit side of) pedestrian crossings;
- Away from sites likely to be obstructed; and
- Adequate footway width.

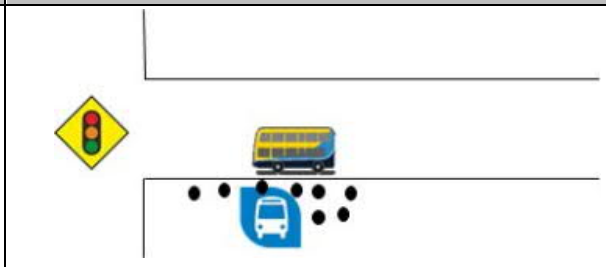
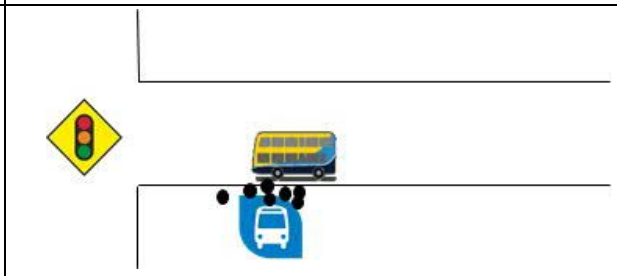
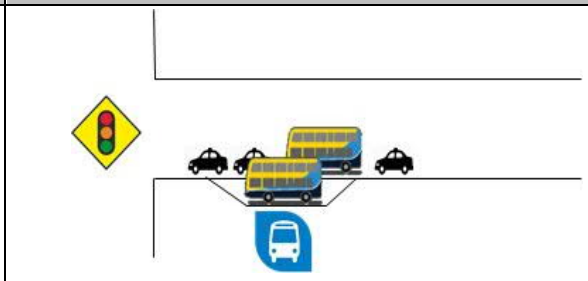
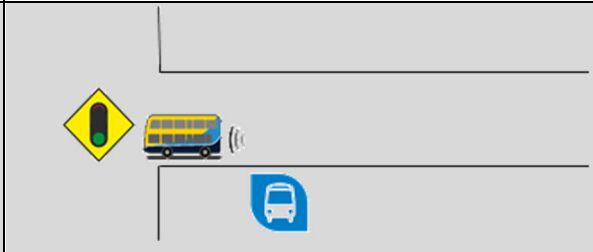
Principals of Bus Stop on high capacity Bus Systems.

The Core Bus Network Report (2015) noted that the distances between bus stops influences the efficiency of the bus network. In general, the lower the distances between stops along a corridor, the higher the delay that is incurred for buses. This delay is caused through acceleration and deceleration and delays associated with pulling in and out of bus stops with some estimates suggesting that stopping at bus stops makes up in excess of 20% of the journey times along the QBC corridors. International literature on bus stop spacing recommends a distance of 300 to 500m (NTA Report on Core Bus Network Infrastructure Network, February 2015) between stops in suburban areas is optimum, whereas in Dublin many routes have bus stops located at far lower spacing. The Core Bus Network Report concluded that increasing spacing between bus stops was part of the solution to reduce delays along the corridors.

The following indicates where delay materialises when accessing bus stops.

Table 1.1 Sources of Bus Delay associated with Bus Stops (TCQoSM, TRB)

1 Deceleration Time spent slowing to serve the stop.	

2 Bus stop failure Waiting for other buses to clear the stop	
3 Boarding lost time Waiting for passengers to reach the bus	
4 Passenger service time (dwell time) Opening the doors, boarding and alighting passengers, and closing the doors	
5 Traffic signal (traffic control) delay Waiting for the signal to turn green, or other traffic control delay	
6 Re-entry delay Waiting for a gap in traffic	
7 Acceleration Time spent getting back up to speed	

Boarding of passengers, layout of stations are not being examined as they are either not relevant in this case or dealt with elsewhere as part of the overall BusConnects Programme.

The acceleration and deceleration will be similar at all stops and clearly the overall impact is dependent on the number of bus stops along a route; this will be dealt with by examining the number of bus stops along a corridor.

Bus Stop failure is linked to the amount of time buses are stopped and the frequency of buses along the route and has a significant impact on the overall corridor capacity and efficiency, particularly where non stopping buses are present (Express or Regional Buses). A situation where a bus arrives at a bus stop to find all loading areas full:

- The bus must wait until space becomes available;
- Slows down the bus and creates schedule reliability issues; and
- Delay can also increase further as bus bunching occurs and bus dwell and traffic control delay times will increase.

The proximity of a bus stop to signalised junctions has an impact on bus speeds with far-side stops having the least negative impact on speed and capacity, and also favored as passengers cross the road behind the bus which increases safety.

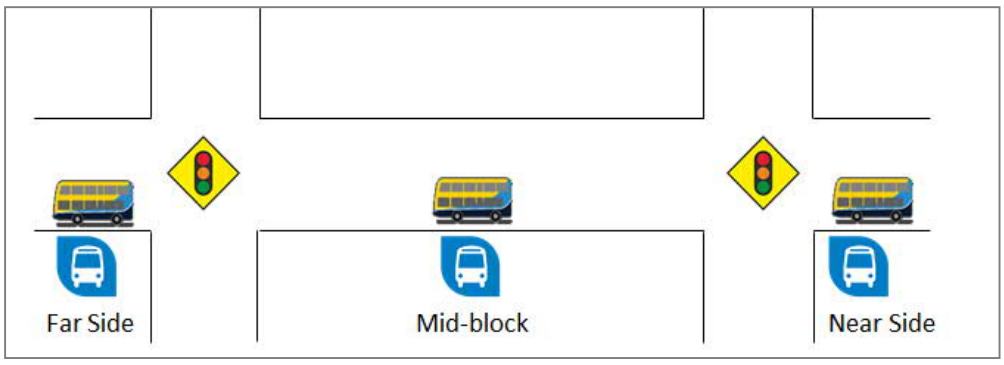


Figure 1.4 Typical Location of Bus Stops.

Ability to overtake slower buses is an important parameter where the route is made up of both express (rarely stopping) and slower (stopping at all stops) buses. For example, on the N11 QBC lay-bys (or passing lanes) were introduced after the original QBC was built to increase the capacity and allow express buses to pass the slower vehicles. On some of the BusConnects schemes this will need to be considered particularly on those routes that include regional and intercity services.

Figure 1.5 Stillorgan QBC with high bus flows and no bus laybys resulted in bus bunching/ platooning; bus lay-by's provided at key locations to allow express buses to pass slower buses. (Source: Google Maps)

Figure 1.6 A typical bus lay-by adjacent to a bus lane; note concrete surface for additional durability.

Consideration should also be given to locations where coaches stop along the Corridors, particularly those serving the airport which could require longer dwell time to allow passengers to load/unload their luggage. In these cases, a layby separate to the CBC Bus Stop maybe desirable (Figure 1.7).

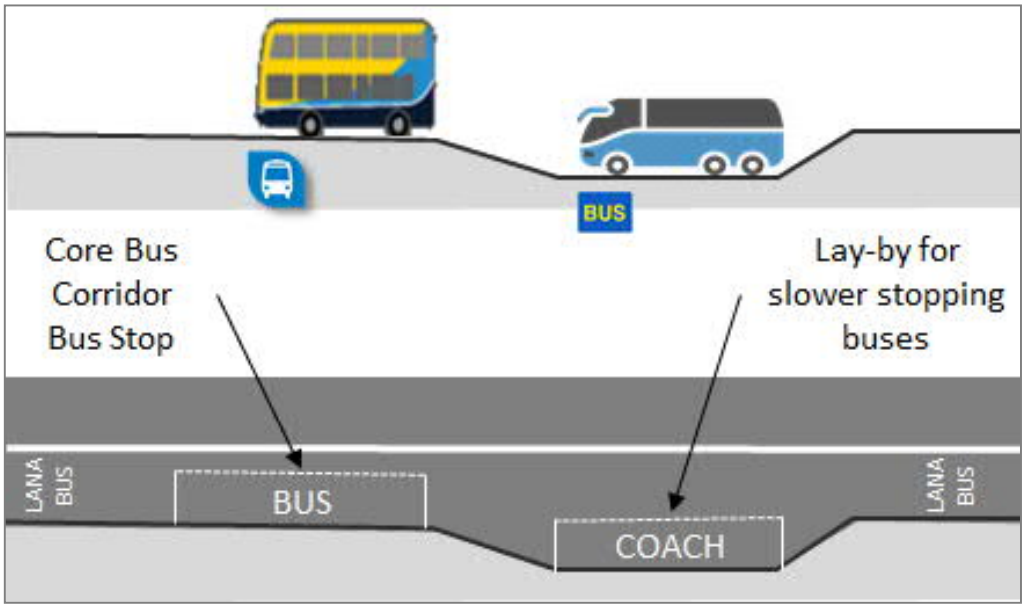


Figure 1.7 Double Bus Stop (in-line for BusConnects routes) concept for locations with buses requiring different dwell times.

Figure 1.8 Multiple bus operators may be using bus stops along the Corridors.

In general, most bus stops along corridors will be in-line (bus stops within the bus lane), as a result re-entry delays will not impact the operation of buses. However, on busier corridors where lay-bys are used re-entry may delay buses. ED's need to consider the flow of buses and taxis passing lay-by's, and where there is increased risk of delay additional measures may be required to generate

gaps in traffic (far-side) or the installation of a yellow box to allow buses to renter the traffic queue (near-side).

Pedestrian accessibility

Another important aspect of bus stop positioning is proximity to pedestrian crossings. Failure to provide high quality pedestrian facilities on the pedestrian desire line may lead to a higher accident risk associated with a bus stop. Therefore, designers need to consider how passengers are going to cross the road to get access to the stop, in general this will require bus stops to be located close to safe crossing points.

2.0 Methodology

This section outlines the process for examining each BusConnects Corridor and assessing and reporting on the bus stops along each route. The flow chart summarises the process and this is followed by a more detailed description of the tasks to be undertaken.

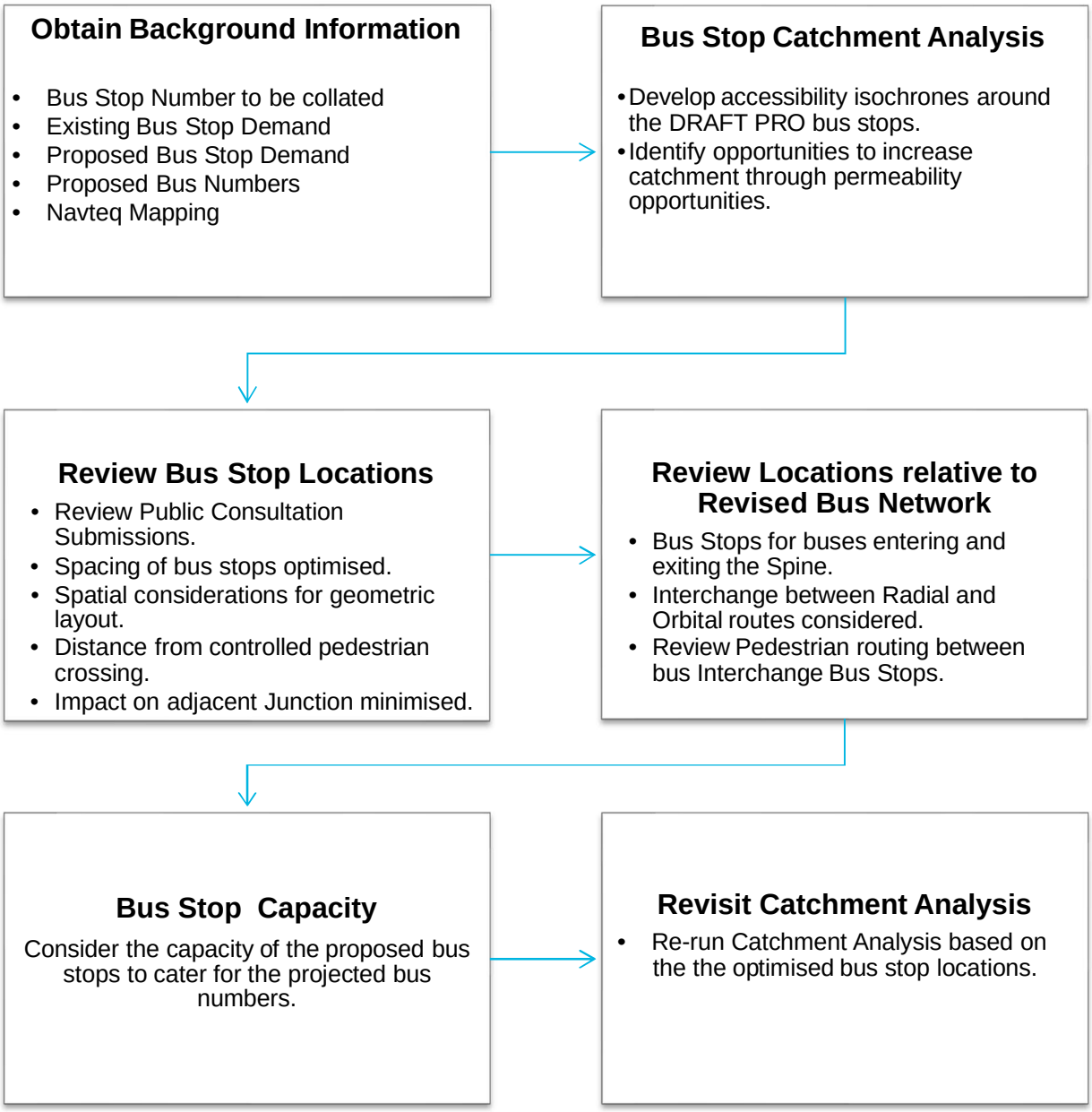
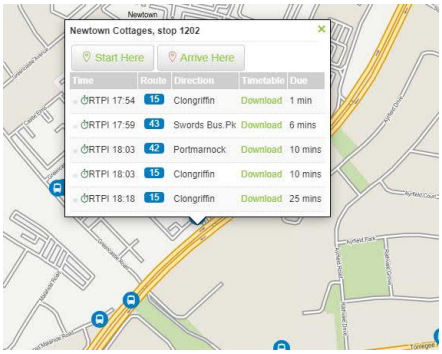


Figure 2.1 Flow Chart for proposed Bus Stop Review.

3.0 Background Information

In order to undertake the review of the bus stops along each corridor background information must be gathered. The following section outlines this information and how to obtain it.

Table 3.1 Information to be gathered to undertake the Bus Stop Review

Item	Description	Location/Contact
Bus Stop Number	Bus Stop Numbers can be obtained from a number of online sources. 	https://www.transportforireland.ie/plan-a-journey/
Existing Bus Stop Demand	Estimated boarding and alighting figures are available from NTA Business Intelligence Unit. Using Leap Card Data and Machine Learning the NTA has recently developed a tool for estimating where passengers are alighting buses along each route. The format that this will be available in is currently under development. This information can include details on use of Free Travel Pass which may help in identifying locations which are a higher priority for the elderly and those with accessibility issues.	**NTA Business Intelligence Unit**
Proposed Bus Stop Demand	Obtain future passenger demand for each corridor, this will come from the ERM. This will not be linked to specific bus stops, but zonal. The bus stop demand will then be linked to bus stops by using the existing bus stop data and factoring up existing boarding and alighting figures.	TIAR Consultant
Proposed Bus Numbers	The number of buses on each corridor is available from the BusConnects Network Redesign Team. This information has already been issued to each ED. It is the ED's responsibility to confirm that these figures are correct at this time.	Confirm that the numbers provided are the revised network data.
Navteq Mapping	The GIS Mapping is required to understand permeability in the area surrounding bus stops. NTA has this information and will provide it to each ED. Note that this base data will need to be reviewed thoroughly as from experience there will be many permeability routes that are missing.	NTA to issue mapping to all teams.

4.0 Bus Stop Catchment Analysis

Bus stop passenger catchment areas are critically important to the success of a high-quality bus corridor. The catchment at each bus stop needs to be maximised so as each stopping movement collects sufficient passengers to justify the loss in journey speed; a bus stopping at each bus stop to pick up one passenger will result in a very slow journey time, the ideal scenario is to stop less often and collect more passengers at each stop. Clearly too few bus stops could also be detrimental to the success of the scheme. To assess if bus stops are optimally spaced to maximise the passenger catchment area it is recommended that a catchment analysis using the NTA Navteq data(or similar process) is undertaken.

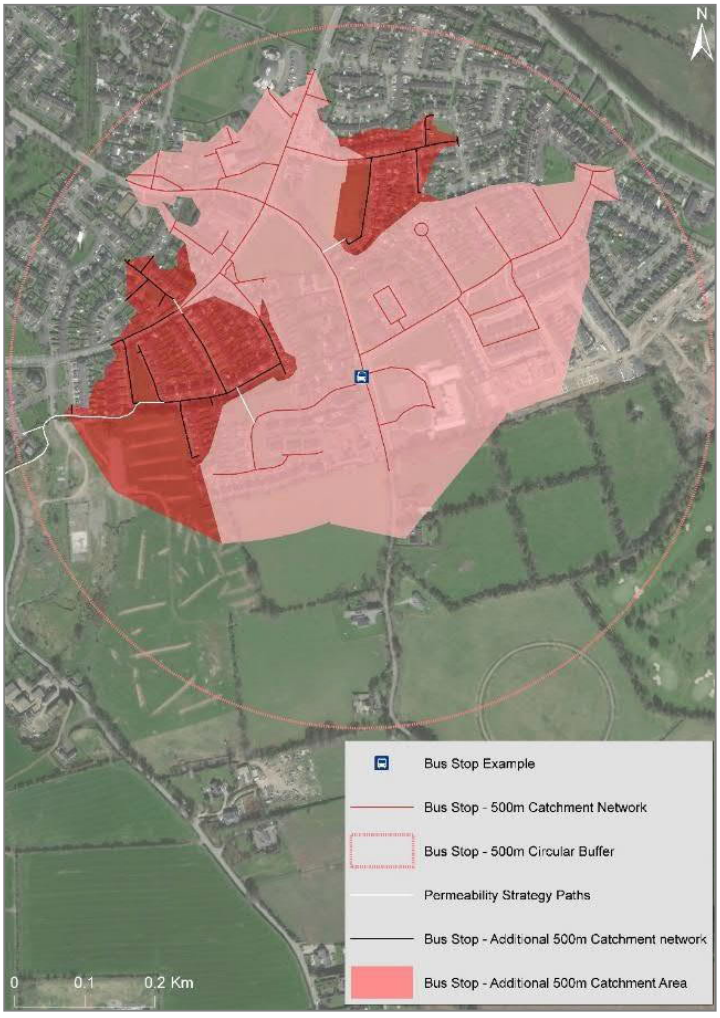


Figure 4.1 Passenger catchment analysis for a bus stop indicating the existing and possible catchment areas assuming permeability improvements can be undertaken.

Figure 4.1 indicates the area that is within a standard walking distance of a bus stop (400m for BusConnects CBC's) based on the actual walking distance rather than "as crow flies" analysis which can be misleading particularly where there are long sections of blank, inaccessible, wall along

corridors. The number of people living within this area can be obtained from GeoDirectory data. In addition, permeability solutions can be identified and the impact of making these changes can be quickly assessed in terms of increased catchment area. The process of undertaking this analysis is outlined below:

Task 1: Enhancing the Navteq network using OpenStreetMap to add footpaths, greenways, cut throughs which are accessible to most people, paths over greens or parks, etc., this is required as the network supplied by the NTA is a primarily a driving network not a pedestrian network.

To do this you will add walk links extracted from OpenStreetMap's data clearly coding these into the Navteq supplied by the NTA. Google Streetview should be used as a check to ensure any link added to the Navteq exist on the ground and are accessible to all. Informal walk links should not be added at this stage.

Figure 4.2 Example of permeability link missing from Navteq mapping on Tallaght/Clondalkin Cor Bus Corridor.

Task 2: Once the Navteq has been enhanced to the required level to capture all major pedestrian movement within bus stop catchment areas, catchment analysis shall be run for the proposed and existing bus stops. Using the Network Analyst Extension in ArcGIS generating 400m and 800m walking bands to reflect 5 and 10-minute walking catchments of bus stops.

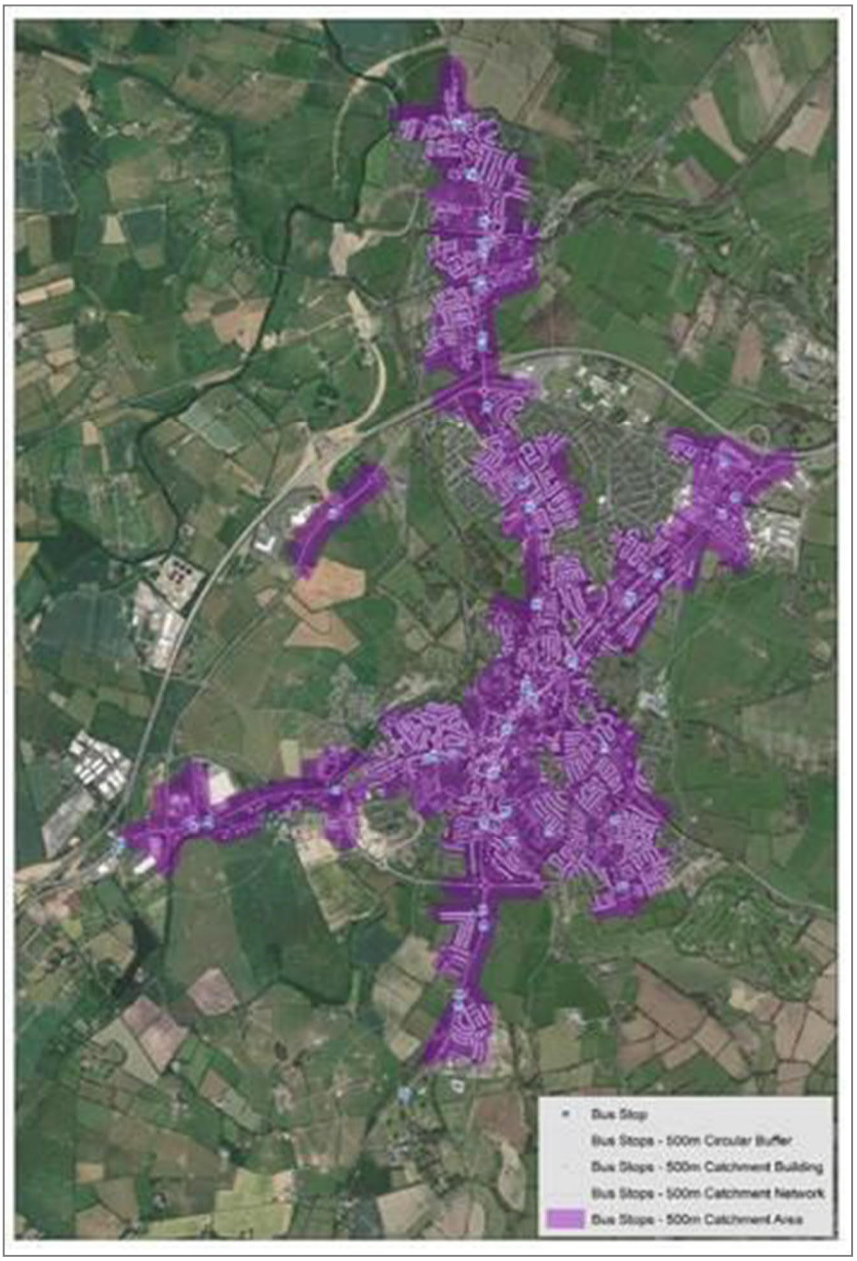


Figure 4.3 Example of catchment analysis run for all bus stops in Naas

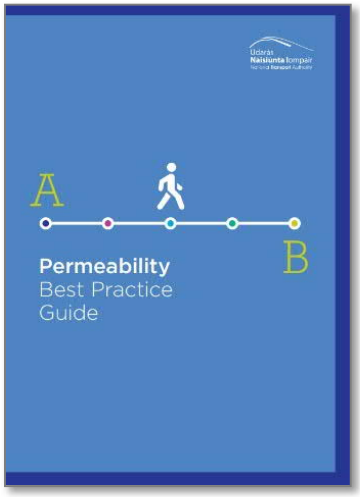
Task 3: Production of catchment tables identifying number of households using Geo Directory or population estimate using census 2016 and Geo Directory to apportion sections of Census Small Area within 400m and 800m catchments of each bus stop. Catchments will be non-overlapping to avoid double counting between stops along the same alignment.

Task 4: Maps will be generated for each stop along each of the alignment, or stops can be grouped together to reflect particular study areas. Maps can be generated in any particular format to match the theme of previous reports (EPR Reports).

Task 5: Quality Assurance and Checking of catchments is critical as missing, or additional, links will be easily identified by the public and could discredit the analysis if there are errors.

Having developed a detailed understanding of the catchment areas consideration should then be given to how the catchments can be widened through identification of permeability opportunities along the corridors. Permeability describes the extent to which an urban area permits the movement of people by walking or cycling. Such an approach is known as “filtered permeability”. Barriers to filtered permeability can include:

- Boundary walls around estates and within residential areas that prevent movement along natural desire lines, being usually the shortest and most direct route connecting two points;
- Cul-de-sacs which prohibit through movement;
- Poorly designed linkages that are difficult or unattractive to use; and
- Connections which require much longer travel distances than direct linkages.



The NTA Permeability Best Practise Guide should be followed for the identification and assessment of these opportunities. Careful consideration should be given to whether or not these proposals should form part of the Bus Connects scheme or if they should be identified to the Local Authority for actioning. Only those linkages that are directly linked to the corridor should be considered as part of this application.

An example from the Clongriffin to City Centre CBC can be seen in Figure 4.4 where a very large housing estate which is located immediately adjacent to the proposed bus corridor has a continuous boundary wall that runs for over 800m preventing easy access to the bus routes and requiring a walk of almost 1km to access the bus routes. Opening a pedestrian access on the boundary wall could create a much shorter route to the buses and substantially increase the bus passenger catchment area.

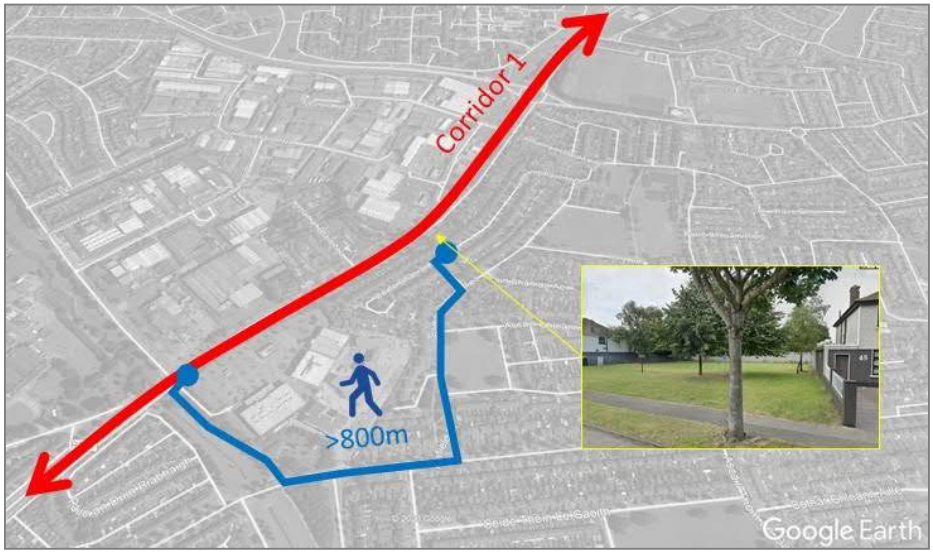


Figure 4.4 Permeability option on the Malahide Road (Source: Google Maps).

Figure 4.5 Boundary wall along Malahide Road (Corridor 1) where local residents have opened up individual doors to access the existing QBC route.

5.0 Review Bus Stop Locations

5.1 Public Consultation Feedback.

An important aspect of the bus stop review is to review feedback received from the general public in relation to the position of an existing, or proposed, bus stop along the corridor. This may identify a specific issue that the reviewer should be aware of before beginning the review. For example, the relocation of a bus stop away from a destination for people with mobility impairments may not have been identified during the preliminary design process and should now be considered. It is also important to review these comments against commitments that may have been given during the "one to one" meetings held during the initial, and subsequent, consultation stages.

Please note that some bus stops were relocated after the EPR public consultation as a result of public consultation comments, if a bus stop is being considered for relocation please also check whether it had been relocated previously by checking the EPR drawings and discussing with the NTA IPO.

5.2 Usage of Bus Stops.

In order to help the reviewer, understand the passenger movements at a bus stop it is recommended that the existing Boarding and Alighting Data is reviewed at this early stage and is used as an approxi for future passenger movements. This will provide an indication of the numbers using a bus stop in an area and would indicate the number of pedestrians movements having to be catered for. It will also indicate those bus stop locations that are relatively lightly used and could be considered for amalgamation with a nearby bus stop, relocation to a more convenient location, or removal completely.

5.3 Spacing of Bus Stops.

The spacing of bus stops has a significant impact on the average speed of a bus corridor, clearly the more times a bus stops the slower the overall journey time will be. A bus incurs a minimum of 15 seconds delay with each stop on an urban street just to decelerate, open and close the bus doors, and accelerate back to speed (25 seconds on a busway). Table 5.1 uses information extracted from the Transit Capacity and Quality of Service Manual (TRB) and indicates the estimated average speed on an 80kph busway. This clearly indicates that bus stop spacing, and dwell time have a large impact on average speed on bus corridors.

Table 5.1 Average Bus Speed (km/h) in Bus Priority Corridors, 80km/h running speed.

Average Stop Spacing (km)	Average Dwell Time (s)				
	0	15	30	45	60
0.8	50	37	32	27	24
1.6	61	51	45	40	37
2.4	68	58	53	48	45

For BusConnects it is proposed that bus stops should be spaced approximately **400m** apart on typical suburban sections of the route, dropping to approximately **250m** in urban centres (CIHT Buses in Urban Developments, January 2018). This spacing should be seen as a recommended spacing rather than an absolute minimum spacing.

The ability to increase stop spacing depends in part on the quality of the pedestrian connectivity in the area and also the availability of safe crossing points in the vicinity of the proposed bus stop. It may also depend on the characteristics of the passengers using the stop, e.g. persons with limited mobility may find it difficult to walk to the next stop. It is therefore recommended that for locations that may generate high number of elderly or mobility impaired bus passengers (health facilities, local businesses) consideration should be given to locating the bus stop within **100m** of the location if spatial considerations permit.

5.4 Spatial considerations for geometric layout.

The provision of high-quality bus stop infrastructure that is customer orientated is considered an essential part of the BusConnects offering, including:

- Being fully accessible for all bus passengers;
- Having a bus shelter for waiting passengers;
- Having both timetable and real time passenger information (RTPI) available to passengers;
- Having sufficient footpath space to allow the free movement of pedestrians passed the bus stop;
- Continuous cycle lane past the bus stop; and
- Provision of Cycle Parking at, or close to, the bus stop.

All of which requires significant space along the already congested radial routes that the Core Bus Corridors run along. Therefore, an important aspect of locating bus stops is identifying locations that have sufficient space to accommodate all, or most, of these elements.

The BusConnects Design Guide suggests that an Island Bus Stop (Figure 34) is the preferred bus stop option to be used as standard on the CBC project where space constraints allow. The **minimum footpath width within which an island bus stop can be implemented is 5.4m** (1.8m footpath + 1.2m cycle track + 2.4m island with shelter). This option assumes a shelter with half bay end panels. Should full panels (as seen on Figure 5.2) be required the width requirement will increase to approximately 6.3m.

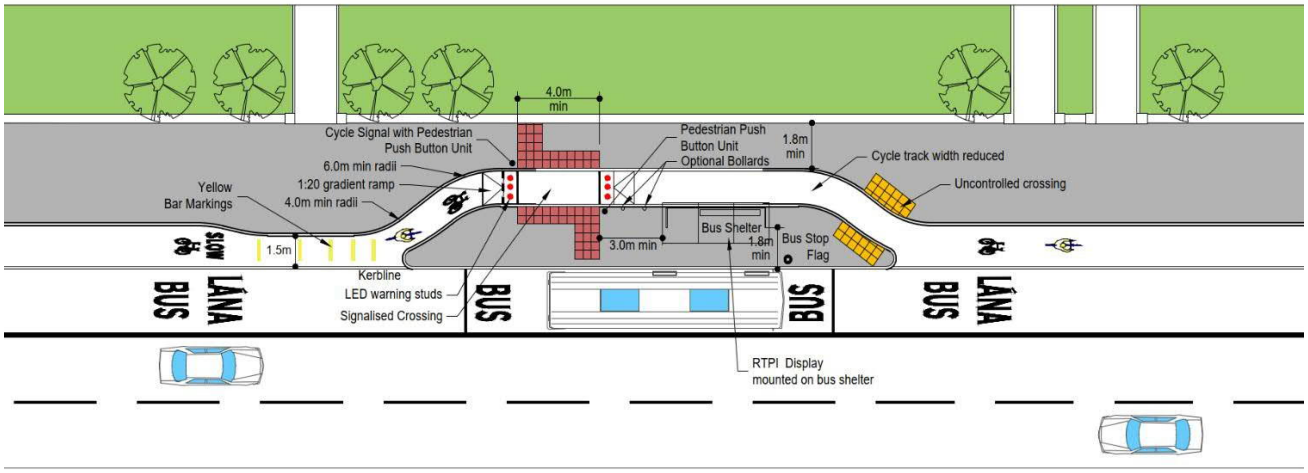


Figure 5.1 Typical Island Bus Stop Arrangement (Bus Connects Design Guideline).

Figure 5.2 Standard 3 Bay Reliance Mark Shelter with full width advertising panel.

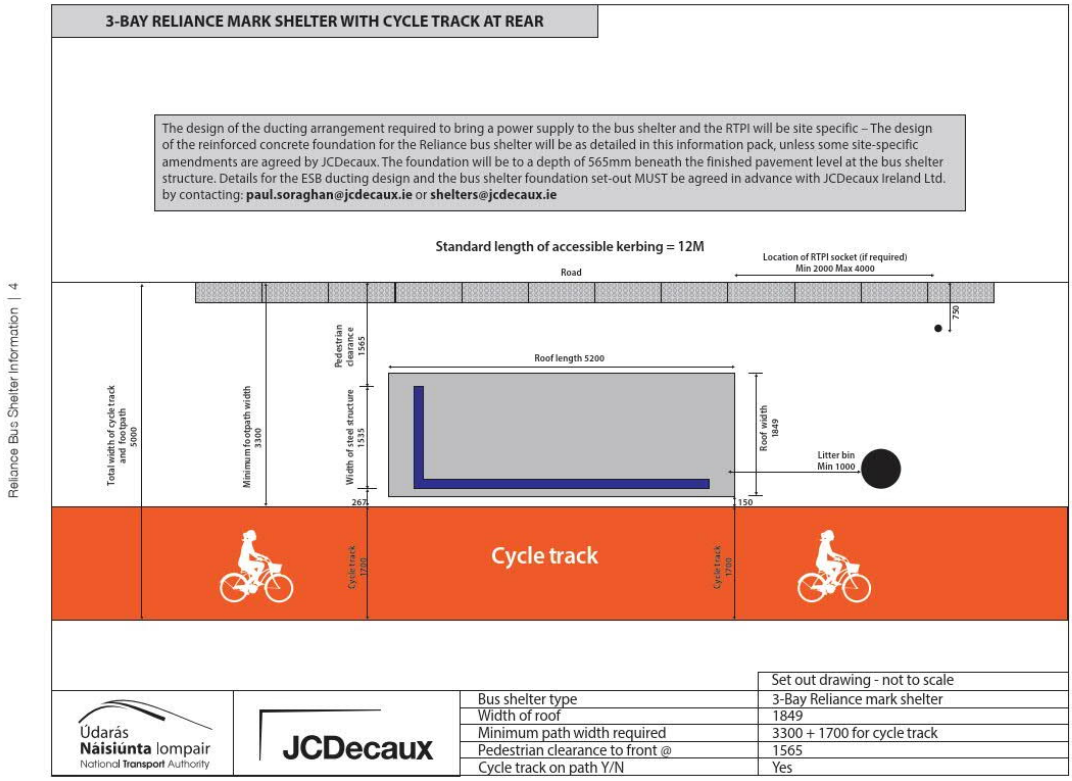


Figure 5.3 Standard layout for a 3 Bay Reliance Mark Shelter with full width advertising panel and cycle lane to the rear (note cycle lane width is to be determined by designers).

For locations where space is constrained an option consisting of a shared bus stop landing zone can be considered. This option is indicated in Figure 5.4 and should only be considered on a case-by-case basis to ensure suitability with particular attention paid to the volume of cyclists and volumes of boarding and alighting passengers. **Using the narrowest non-standard bus shelter this would require a minimum width of approximately 4.0m** (1.9m footpath with shelter + 1.2m cycle track + 0.75m island).

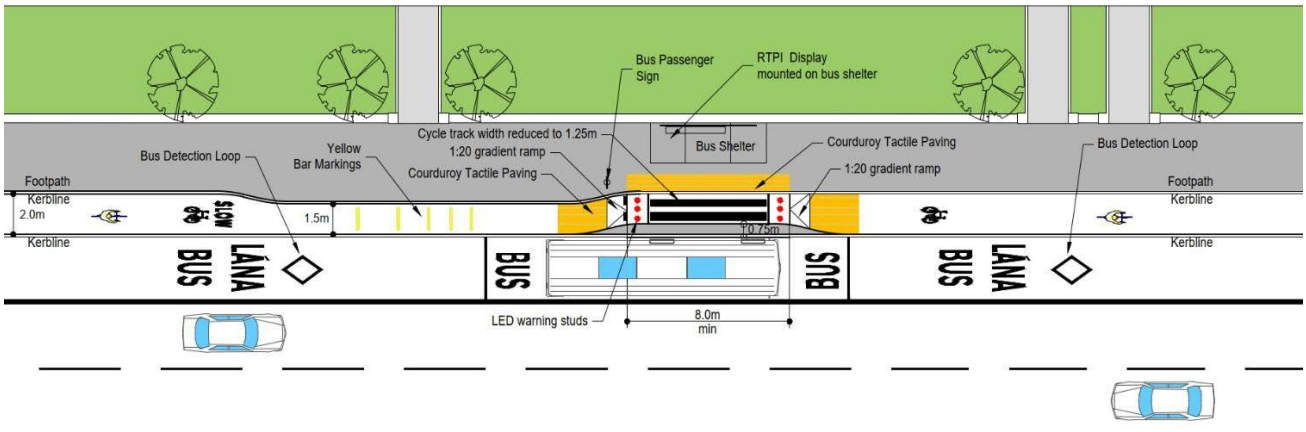


Figure 5.4 Shared Bus Stop Landing Zone Arrangement (Bus Connects Design Guideline).

Figure 5.5 Cantilever narrow roof Bus Shelter

It is important that ED's do not immediately choose the minimum sized shelter as this will impact on the weather protection provided to bus passengers and potentially advertising revenue share received by the NTA. Where there are a substantial number of bus stops using the nonstandard bus shelter it is recommended that the NTA IPO are consulted prior to finalising the proposals.

Providing cycle parking at bus stops has the potential to increase the catchment area of a bus corridor by providing a safe place for cyclists to secure their bike for the duration of their trip. ED's should look to provide cycle parking at all bus stops along the BusConnects Corridors where space permits. The **minimum provision is 3 Sheffield Stands** (accommodating 6 bicycles) in the vicinity of a bus stop. Where larger numbers of cyclists can be expected consideration should be given to providing a larger covered area of approximately 10 Sheffield Stands (accommodating 20 bicycles).

Figure 5.6 Sheffield Bicycle Stands provided at a Bus Stop on the N11.

Figure 5.7 Covered Sheffield Bicycle Stands provided at a Bus Stop on the N11.

5.4 Distance from controlled pedestrian crossing.

Pedestrians by their nature often take the quickest route to their destination rather than the safest route, particularly if they feel the safety risk is low. This results in bus passengers leaving buses stepping out in front of, or behind, buses and crossing the road in a hazardous manner. The placement of bus stops near safe pedestrian crossing points is therefore a critical aspect of bus stop design. Providing a bus stop where there is no, or an indirect, pedestrian crossing will lead to “jaywalking” and pedestrians making higher risk movements.

There are many examples of bus stop located immediately outside a pedestrian opening into a housing estate which makes it easy for passengers to access the bus stop in the morning, however on the return journey the passenger can often be isolated on the other side of the road with no safe crossing point available. While this may be satisfactory on some roads, it may not be on others, and how is a person with a mobility impairment to cross a busy radial route? **All bus stops along the CBC’s should be located within a short distance of a controlled crossing point.**

The optimum location to locate a bus stop is adjacent to junctions which have signalised pedestrian crossings provided on all desire lines. Much research has been undertaken in relation to the optimum location for a bus stop adjacent to a junction, either before (near-side) or after a junction (far-side), while there are advantages and disadvantages of both, all guidance recommends that locating the bus stop on the **far-side of a junction is the optimum solution**. While this may be theoptimum location in terms of the operation of a corridor a near-side bus stop may still be appropriatewhen spatial constraints, routing, or distance from junction are considered.

Figure 5.8 indicates various locations for bus stops at junctions with particular consideration for interchange between Spine and Orbital Core Bus Corridors. This indicates that all options which require passengers to interchange will require passengers to cross at least one arm of a junction (on average over both legs of their journey), emphasizing the importance of locating bus stops at junctions and providing controlled crossings on all desire lines between interchanging bus stops.

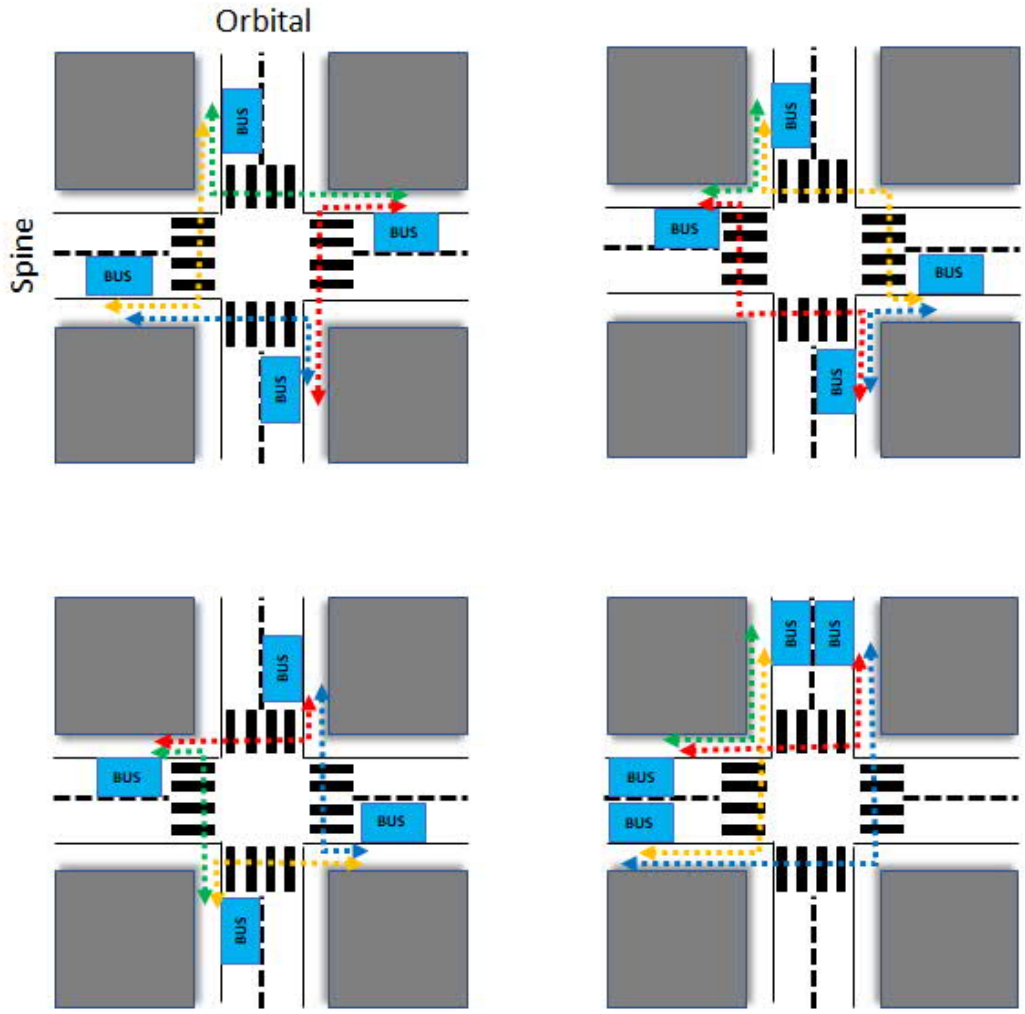


Figure 5.8 Bus stop locations and passenger interchange routes between them.

The DfT document Inclusive Mobility (2005) suggests recommended distance limits without rest for various Mobility Impaired Groups that ranges from 50 to 150m, which limits the distance between interchanging bus stops significantly. It is therefore recommended that the distance between the key interchange bus stops is limited to approximately **100m walking distance** where possible to enable all impaired groups to be able to interchange, consideration must be given to providing a rest spots at approximately 50m between the bus stops to cater for those that will not make this distance without a rest.

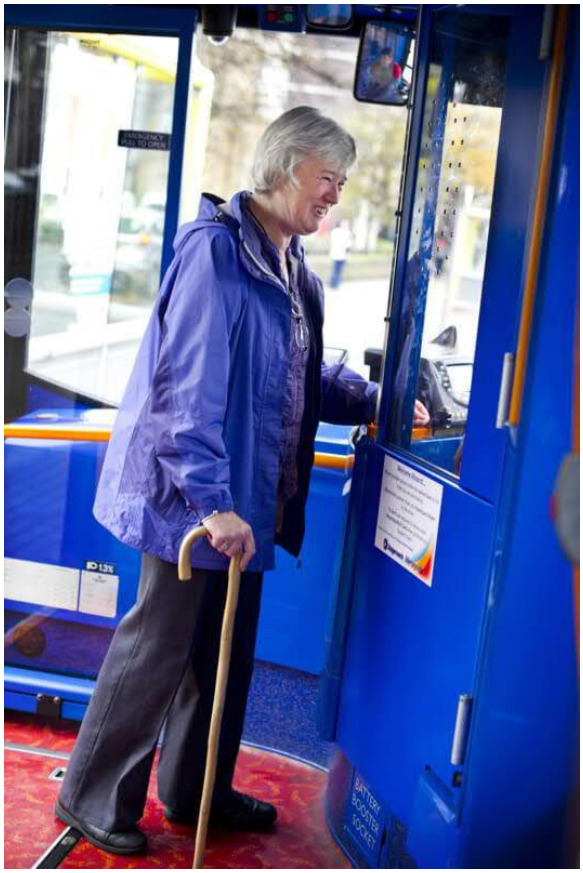


Figure 5.9 Pedestrians using sticks have a limited range of 50m before needing a rest.

For mid-block (between junctions) bus stops it is important that consideration is given to the location of a safe crossing point. It is recommended that a signalised crossing is located in close proximity to these stops to allow all passengers to cross the road safely. It is also recommended that bus stops are positioned upstream of this crossing to avoid buses blocking visibility to the crossing and that passengers walk to the back of the bus where they are more visible to oncoming traffic.

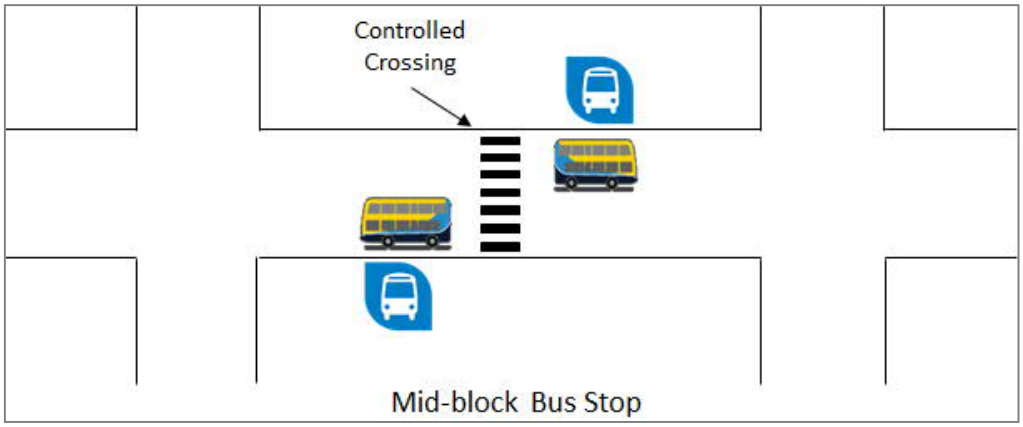


Figure 5.10 Mid-block bus stop optimum layout.

5.5 Impact on Adjacent Junction.

Locating bus stops close to junctions is optimum for pedestrian connectivity and safety, however it clearly can impact on the capacity of a junction and may result in increased congestion. Designers will need to review the location of the bus stops in order to minimise the impact on the operation and capacity of the junctions; things to consider include:

- Distance from the far-side bus stop to the junction. Buses will be running at headways of approximately 2 minutes at peaks on some corridors, while every effort will be made to avoid bunching it is likely that buses will end up meeting each other as they wait for a green signal. As a result, it is important that sufficient space for a bus to wait behind a stopped bus is provided at all junctions. Importantly this offset should start beyond the pedestrian crossing point in order to avoid blocking the crossing. Table 2.2 provides guidance on offset distance from key features.
- For near-side bus stops it is important that the location is reviewed in the context of visibility to the traffic signals for general traffic (bus, or the bus stop infrastructure, impacting on visibility to primary traffic signals) and also interaction with left turning traffic. Reference DMRB DN-GEO-03044 and DTTaS Traffic Signs Manual Chapter 9.
- Where a bus is joining a Spine from a side road it is important that the bus stops are fully accessible by the turning vehicle and sufficient space is provided to allow the bus to pull in flush with the bus stop so as the gap between the kerb and the bus is minimised (both doors). It is also important to ensure that the manoeuvring bus does not require the bus to sweep over the kerb line.

Figure 5.11 Tracking of a turning bus entering a bus stop.

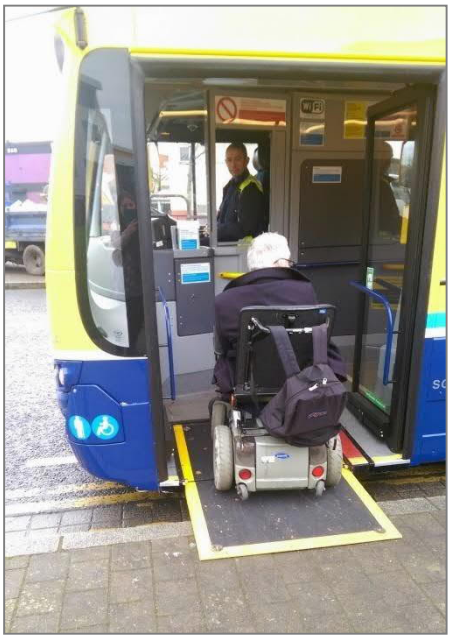


Figure 5.12 Having buses flush with the bus stop is important to allow the ramp to lower correctly, but also to speed up the boarding and alighting of all passengers as gaps slow this down.

Table 5.2 Indicative Distances of Features from Bus Stops

(DRAFT NTA Bus Stop Design Guidance)

Feature	**Distance (m) to bus stop sign**
Prior to isolated pedestrian crossing signals or Zebra	18m
After pedestrian crossing signals or Zebra	10m + bus length*
Prior to signalised junction	20-30m
After signalised junction	20m + bus length*
Prior to or after a side road	20m
After a side road	10m + bus length*
Prior to a roundabout (no diverge)	20-30m
After a roundabout (no merge)	20m + bus length*

***the bus length should be the longest bus using the stop**

6.0 Review Locations relative to Revised Bus Network

The revised BusConnects Network is based on the Connective Network Principle which will rely on some interchange between routes to reduce journey times across the City. This Interchange will primarily occur in the City Centre where the spines overlap rather than along the Spines. However, some interchange will occur between the High Frequency Spines and the Frequent Orbital routes and also between the routes before Branches peel off the spine. Seamless interchange between these bus routes will be critical for the successful operation of this system.

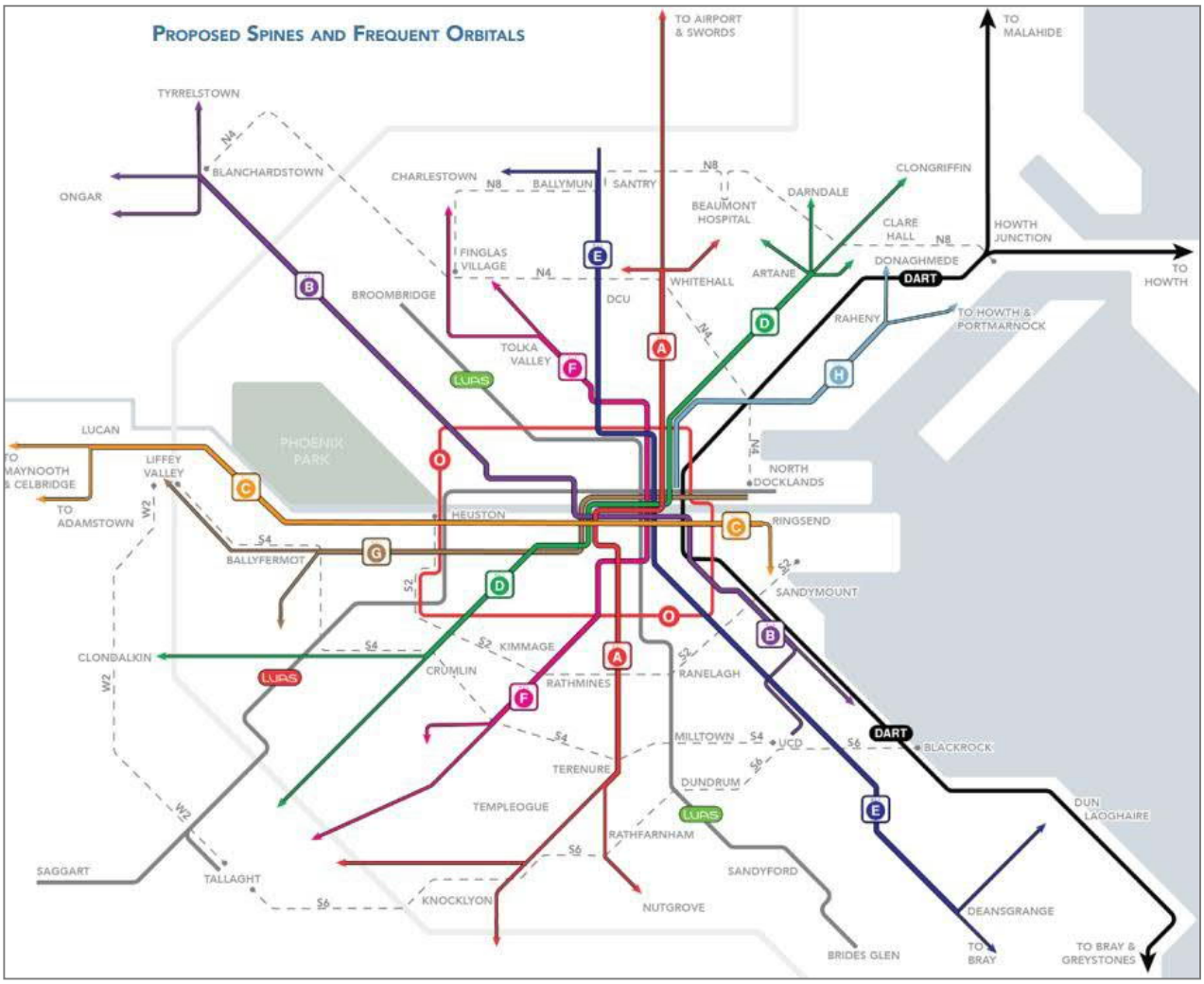


Figure 6.1 Simplified diagram of spines and frequent orbitals in the proposed network

The latest maps need to be obtained by each ED from the NTA IPO. In addition, the ED's can make use of the NTA's Remix system, which is an on-line route and stop information system for the proposed bus network.

6.1 Buses entering and exiting the Spine.

For buses entering and exiting the Spine, consideration should be given to how passengers may switch from one branch to another branch route. While this can happen anywhere along the Spine it will most regularly occur at the last stop before the branch route peels off the Spine. An existing example of this can be seen at Foxrock Church where two high frequency routes (46A/145) deviate at this point. At the last stop before the 46A deviates to Kill Avenue significant numbers switch from one route to the other.

Figure 6.2 Foxrock Church Bus Stop on the N11 QBC

For the Core Bus Corridors consideration should be given to the size and location of the stops before branch routes leave the main Spine. The optimum location of stops at this location will allow all routes to overlap prior to the junction thus removing the necessity for passengers to walk to anotherbus stop.

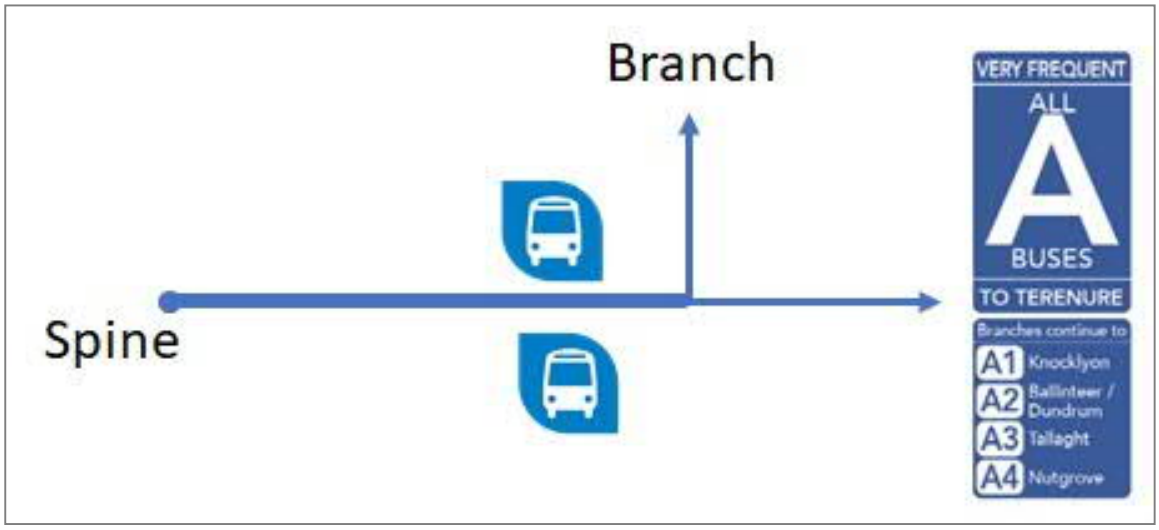


Figure 6.3 Location of Bus Stops Immediately before Branch Route Peels Off Spine

6.2 Interchange between Radial and Orbital routes.

The movement of passengers from one corridor to another is critically important to make Dublin more accessible by public transport. Making this interchange as easy as possible is thus critical to the successful delivery of the BusConnects Programme. Figure 3.4 indicates two typical scenarios that will arise on this project; the crossing movement (D/N4) and the overlapping movement (D/N2).

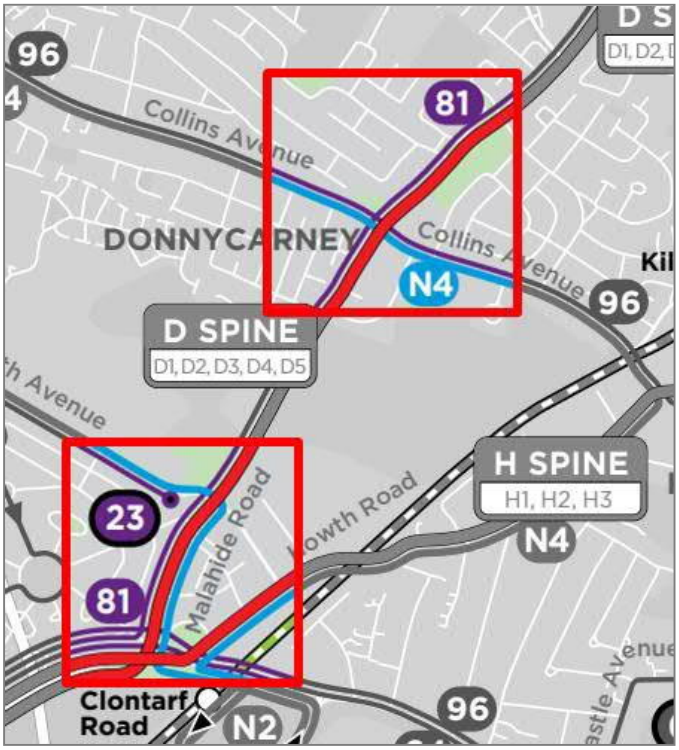


Figure 6.4 Two Different Scenarios for Interchange between orbital and radial corridors.

The optimum solution, but the less likely one, is the overlapping of routes which will allow passengers to leave one route and access another one via the same bus stop (or the opposite pair) making it a very easy interchange. For this option it is important that the designer considers the location of bus stops in a similar manner to the previous section on peeling off of branch lines.

For the more common crossing of routes the location of the bus stops needs to be carefully considered to minimise the distance passengers have to walk and to ensure there is a safe crossing location to facilitate this movements. This was outlined in section 5.4. **For locations where interchange is expected it is recommended that the desirable maximum distance between the interchanging bus stops is 100m,** with rest stops provided at 50m for those with impairments that restrict the maximum walking distance to below 100m.

7.0 Bus Stop Capacity

The capacity of bus stops is a complex and dependent on many variables which may constantly vary throughout a typical peak hour. For this reason it is proposed to undertake a high level assessment of bus stop capacity at this time and a more detailed assessment at a later stage when the Microsimulation Models are available for each corridor which can include the interaction between junctions and bus stops (potential bunching of buses), taxi numbers on the corridor, and the number of express or stopping coaches. Information on the calculation of capacities is available in the TRB, Transit Capacity and Quality of Service Manual, 3rd Edition and for complex locations it is recommended that the designer review applicable sections of this document to gain an understanding of the critical parameters.

7.1 Number of Bus Bays

The TFL Bus Stop Design Guidance states that bus stop capacity is a function of bus length, service frequency, the number of serving routes and their average dwell time. The BusConnects Dublin Corridors will generally carry between 15 to 20 buses per hour at peak times, which equates to a bus every 3 minutes. Assuming a maximum dwell time of 1 minute it could be assumed that one bus stop will be sufficient in most cases. However, the spine corridors will have multiple branches joining at different points with buses running at different frequencies resulting in buses not running at a constant headway. Figure 7.1 below indicates a bus arrival scenario from the TFL Bus Stop Design Guideline which shows how buses may arrive at a stop. This shows the estimated volume of buses at a single bus stop, depending on the frequency of the respective services. For example, Scenario C shows that although there is a frequency of 26 buses per hour, the stop, would theoretically operate well below capacity, however the arrival pattern of buses means that at times more than one bus will be on the stop. For this reason, it would be recommended that this bus stopshould have sufficient space to board and alight two buses at once.

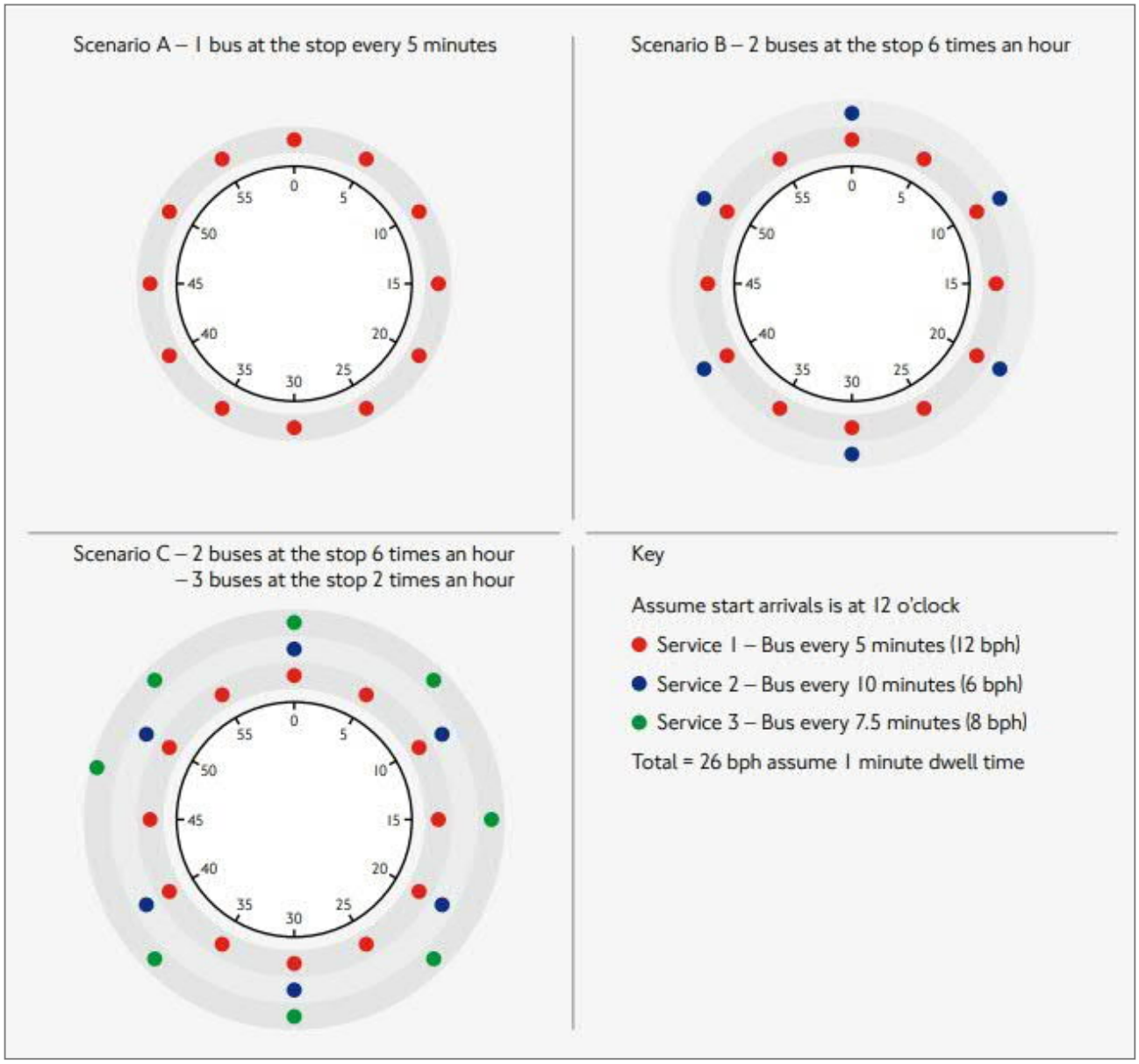


Figure 7.1 Bus Arrival Pattern at a Bus Stop (Source: TFL Bus Stop Design Guidance)

Detail on the buses using each corridor can be obtained from the NTA Remix site (obtain access from NTA IPO), or the frequency information from the BusConnects website. This can be used to make an estimate of the number of bays required at a bus stop by generating scenarios for the stops based on the headways for each route similar to Figure 7.1 above. These assessments will be superseded on completion of the micro-simulation analysis of each route, for this reason it is proposed to undertake this initial assessment based on the assumption that 2 bus bays will likely be required where there are between 25 and 30 buses on the route. This would require a longer bus cage that will accommodate two buses stopped simultaneously, approximately 24m in length (end to end bus), with Kassel Kerbs provided over its length to assist passengers, particularly those with a mobility impairment, to board and alight with ease from both buses.

Number of Bays at a Bus Stop	Where a Corridor is carrying approximately **25 to 30 buses** or more per hour, consideration be given to lengthened the bus stop cage and kerbing to provide space for 2 buses stopping simultaneously. Independent arrival and departure is not required.

Figure 7.2 Where space permits double bus bay should be provided where more than one bus is expected to arrive at a bus stop simultaneously (source: Google)

7.2 Passing Lanes

For corridors with large number of buses, particularly express buses that are not stopping at bus stops it may be necessary to provide a passing lane, or to indent the bus stop in a lay-by, to allow these faster moving buses to overtake the slower ones. This is likely to be particularly important on high capacity corridors where Regional Buses are accessing the City Centre. The TIAR Consultant has undertaken an initial assessment of this and have concluded that where the **hourly bus numbers exceed 40 the addition of a bus stop layby** will help maintain bus capacity and reliability along the corridor. The specific number for each corridor will be obtained from detailed microsimulation analysis at a later date.

Requirements for passing Lanes	Where a section of corridor is carrying approximately **40 to 50 buses** or more an hour**,** consideration should be given to providing passing lanes at bus stops.

Figure 7.3 In-line bus stops on a heavily used bus corridor can lead to express, or non-stopping buses, being delayed or making overtaking manoeuvres. (source: Dublin Bus Stuff).

8.0 Revisit Catchment Analysis

On completion of the review of bus stops along each corridor the catchment analysis for each corridor should be undertaken. The process was detailed in Section 4.0. The analysis should be undertaken and presented on a corridor basis with both Residential and Employment/Education population within 5 and 10 minutes presented.

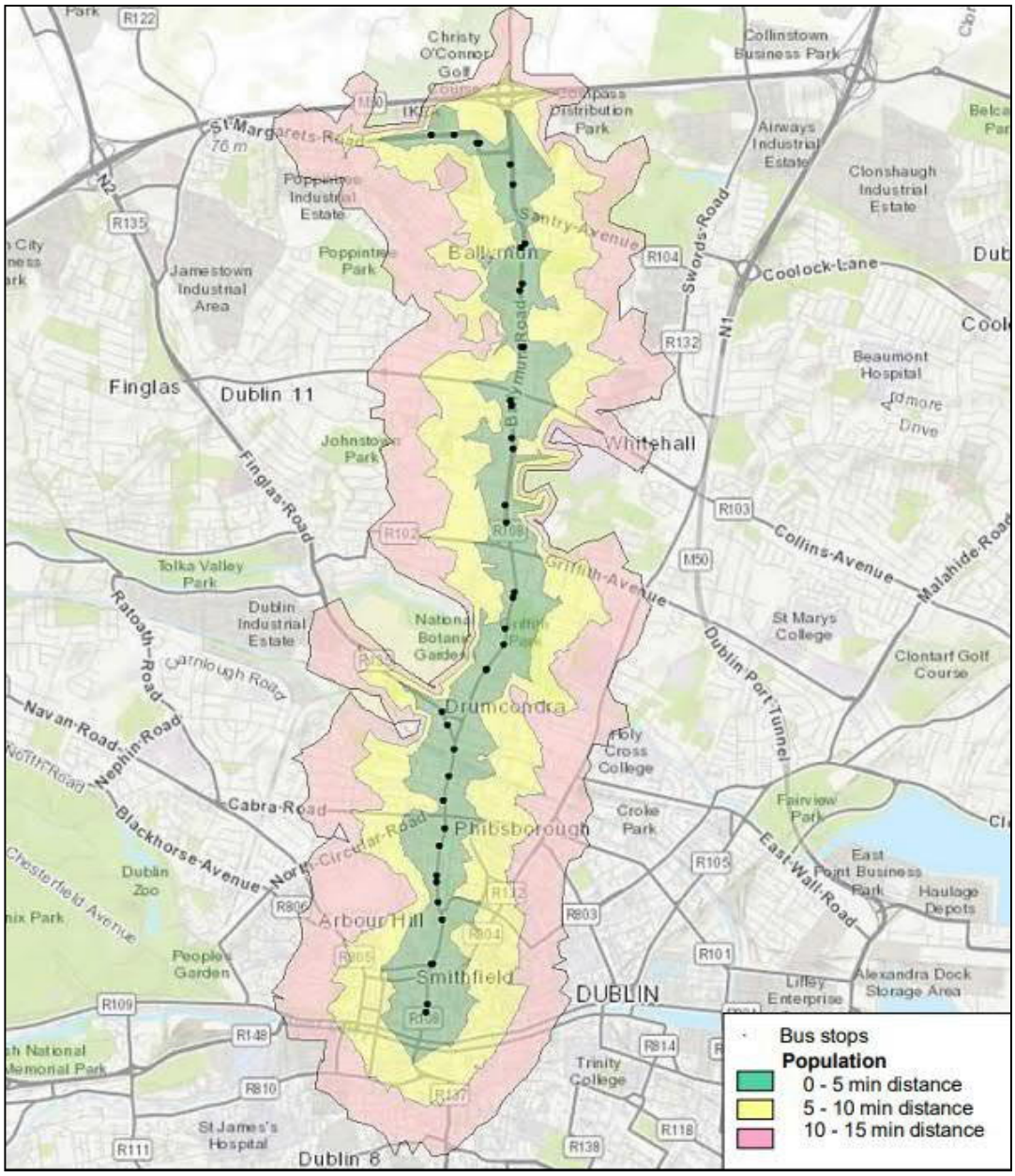


Figure 8.1 Typical map of bus corridor catchment areas

8.1 Presentation of Review

For consistency it is recommended that this review is undertaken, and presented, on the PRO drawings. High-level comments can be listed against each stop with distance between stops also noted (Document 1).

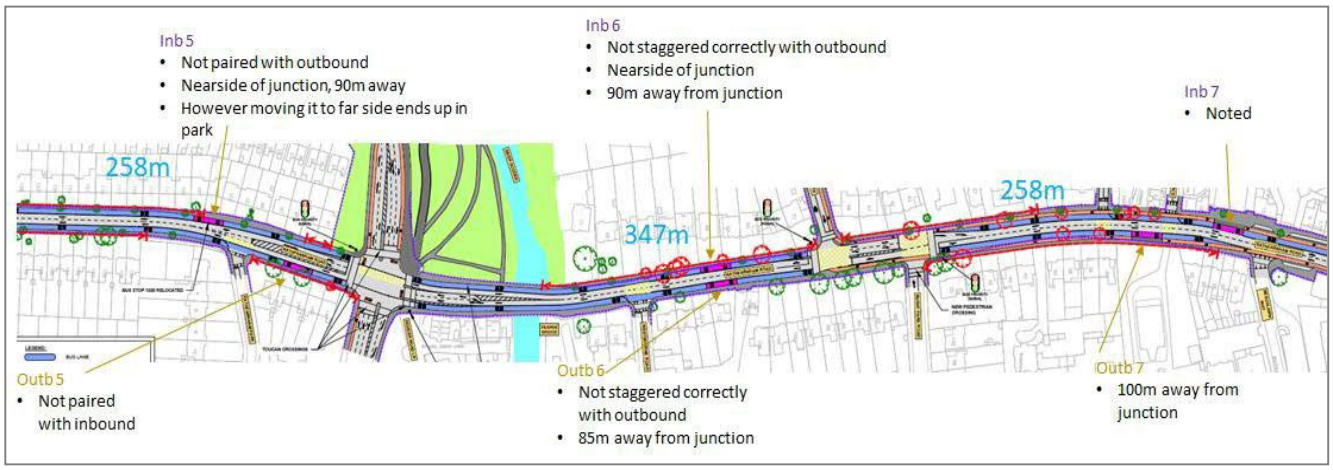


Figure 8.2 Example Review of Bus Stop Locations (Source: ARUP, Rathfarnham CBC).

This document should then be followed by a recommended bus stop strategy (Document 2) for each corridor indicating where bus stop are to be located and that all variables have been considered for each stop. This should be in a similar drawing to the review drawing in Figure 8.2, but focused on those stops that have been altered from the original PRO drawings. A summary table for each corridor should be placed on the front drawing of the recommendations summarising the existing and proposed bus stop strategy:

Corridor Name			
Number of Existing Bus Stops		**Length (KM)**	
	Existing	**Proposed**	**Comment**
Average Spacing of Bus Stops (m)			
All stops located adjacent to a controlled crossing?	Y/N	Y/N	
Have all accessibility / spatial requirements and consultation suggestion been accommodated?	-	Y/N	

Document 2 shall include a report providing specific details of each bus stop along a corridor and detailing the results of the catchment analysis for the optimised bus stops.

Appendix H2
Bus Stop Review Report

BusConnects Dublin Core Bus Corridor Infrastructure Works – Package B

Bus Stop Review

01/06/22

BCIDB

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Contents

List of Acronyms

Acronym	Definition
CBC	Core Bus Corridor
CBC's	Core Bus Corridors
GIS	Geographical Information System

1. Introduction

This report presents a summary of the Bus Stop Review process which was conducted for the Proposed Scheme.

The purpose of the process was to review the location of the existing Bus Stops to determine whether a stop should be removed, relocated, or remain where it is. This exercise was carried out to optimize the performance of the bus services travelling along the route by reducing the journey time of the bus service, to increase the walking catchment of the bus stops and to ensure key trip attractors located along the route is sufficiently covered within the catchment of bus stops.

Existing bus stops were therefore rationalised based on best practice principles related to bus stop placement. The outcome of this study was to develop a more efficient route which would attract more passengers by creating a wider population catchment and offer a shorter journey time to destinations.

2. Methodology

The methodology followed as part of this review is set out in the 'Bus Stop Review Methodology Working Draft Report' produced by AECOM which is attached in Appendix C. It outlines the methodology to be followed for the bus stop reviews, the various considerations to be made when assessing a stop location, and the background reasoning for those considerations.

Figure 2.1 presents a flowchart which outlines the methodology proposed.

Each of the study components as outlined below are discussed in more detail in the remainder of this report and applied to the Proposed Scheme.

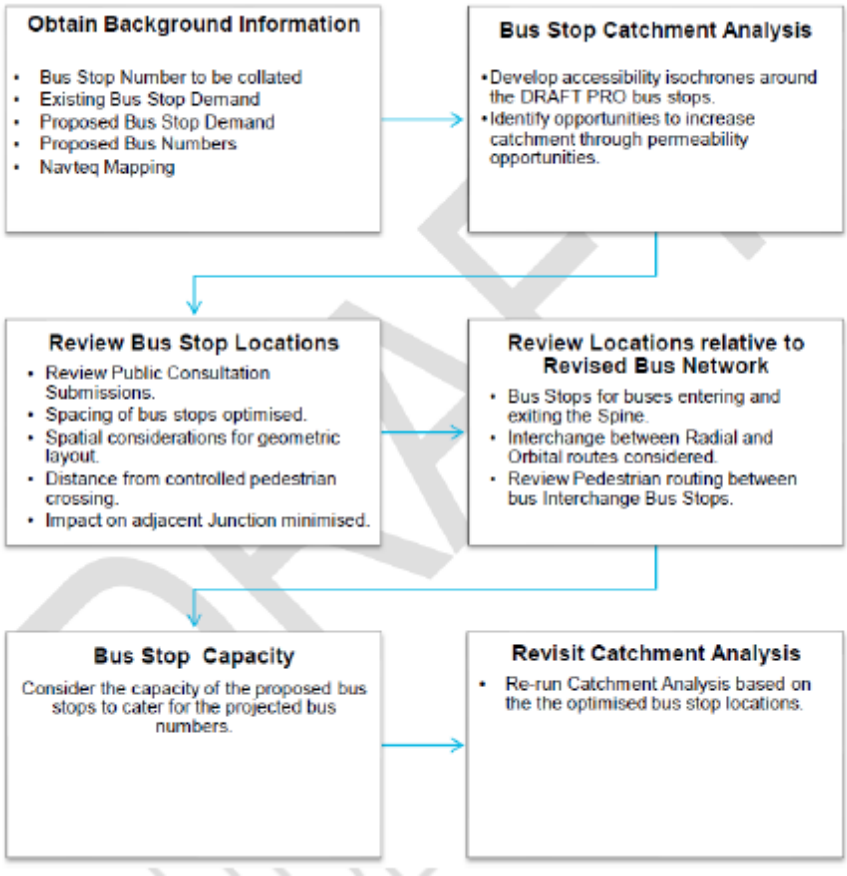


Figure 2.1: Bus Stop Review Methodology Flowchart

2.1 Obtain Background Information

In order to assess the bus stop locations with a variety of considerations in mind, certain key data was acquired, measured, or calculated. This information was compiled in a spreadsheet which can be found in **Appendix A.**

The background information obtained for the study along with the source of the information in **Table 2.1.**

Information	Source
Stop Numbers for all inbound and outbound stops along the route	Dublin Bus Automatic Vehicle Location (AVL) Data
Stop Names	Dublin Bus AVL Data
Current Stop Location Coordinates	Google Maps (MyMaps .kml export)
Current distance to previous stop	Google Maps and Topographical Surveys (Measured)
Stop location as per PRO (relative to existing location)	PRO Design Drawings
PRO Distance to previous stop	PRO Design Drawings and Google Maps
Peak Boarding and alighting volumes and times	NTA
Future Buses per hour	SYSTRA
Current distance to junction / pedestrian crossing	Google Maps and Topographical Surveys (Measured)
PRO distance to junction / pedestrian crossing	PRO Design Drawings and Google Maps
Potential for interchange with Orbital Routes	BusConnects Revised Network Layout

Table 2.1: Background information and sources

2.2 Bus Stop Catchment Analysis

To develop a baseline against which any bus stop relocation recommendations can be tested, catchment analysis was conducted on both existing and proposed populations living and working within a 15-minute walk of existing bus stops. This analysis was carried out in GIS using Navteq mapping as the network dataset, along with the coordinates of the existing bus stop locations. The current and proposed catchment of both the inbound and the outbound bus stops are shown in 5-minute walking intervals up to 15 minutes in **Figures 2.2 to 2.7** below.

2.3 Review Bus Stop Locations

The locations of the bus stops were reviewed in accordance with the 'Bus Stop Review Methodology Working Draft Report' produced by AECOM.

Appendix A provides a table of features for each bus stop which was used to consider the possible relocation of each bus stop.

The main principles considered as part of the review are as follows:

- Aim to achieve a bus stop spacing of 400m in suburban locations, and 250m in urban centres
- Locate bus stop to nearest junction/pedestrian crossing;
- Locate stop downstream of junction rather than upstream;
- Consider space requirements to provide bus stop including shelter, waiting area, cycle lane and footpath provision and information displays;
- Review existing and proposed boarding & alighting volumes to determine the size of the bus stop;
- Potential interchange orbital bus services proposed as part of BusConnects with revised network

The above principles were considered in conjunction with examination of maps and aerial photography to determine whether a bus stop should remain where it is, relocated or removed.

If a bus stop was found to be spaced at an acceptable interval, located optimally in relation to a junction or pedestrian crossing, frequently used, and serving key land uses sufficiently, the decision was usually made to maintain it in its current position.

If it was found that access to a bus stop could be improved by relocating it to a better proximity to local features, the decision was made to move it. This would typically include cases where bus stops are currently upstream from a junction or crossing, or when the stop is not located optimally in terms of a catchment area or key land use access.

When a bus stop was found to be too close to a previous or following stop, the decision was made to either remove the bus stop or to consolidate it with another stop to obtain better spacing intervals.

2.4 Catchment Review

Following the review of the bus stop locations, the catchment analysis helped us to understand the impact of the changes on the bus network. The catchment population comparison tables present the number of residents and employees within each catchment zone for the existing and proposed bus stop locations, along with the difference between them. The catchment over the whole route was analysed as one zone, as assessing each stop individually would lead to much of the population being double counted.

Catchment maps were also generated for the route were also generated so that a visual review could be done to identify areas of improvement and areas that are serviced with no attraction or trip origin locations. This can be an iterative process to ensure as many of the population are within the catchment, while also trying to improve the efficiency of the stops to potentially reduce the number of stops along the route. The comparative maps give a good understanding of the improvement, as seen in **Figures 2.2 to 2.7.**

2.4.1.1 Liffey Valley to City Centre – 5min Catchments (Inbound and Outbound)

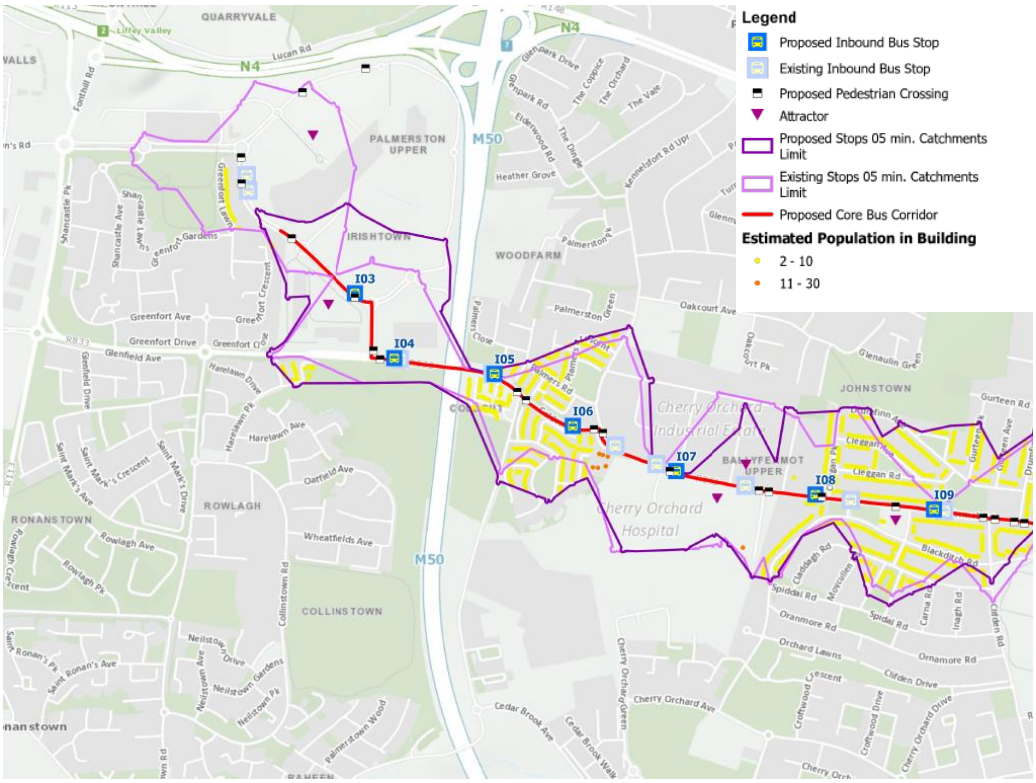


Figure 2.2a : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 5min Catchment

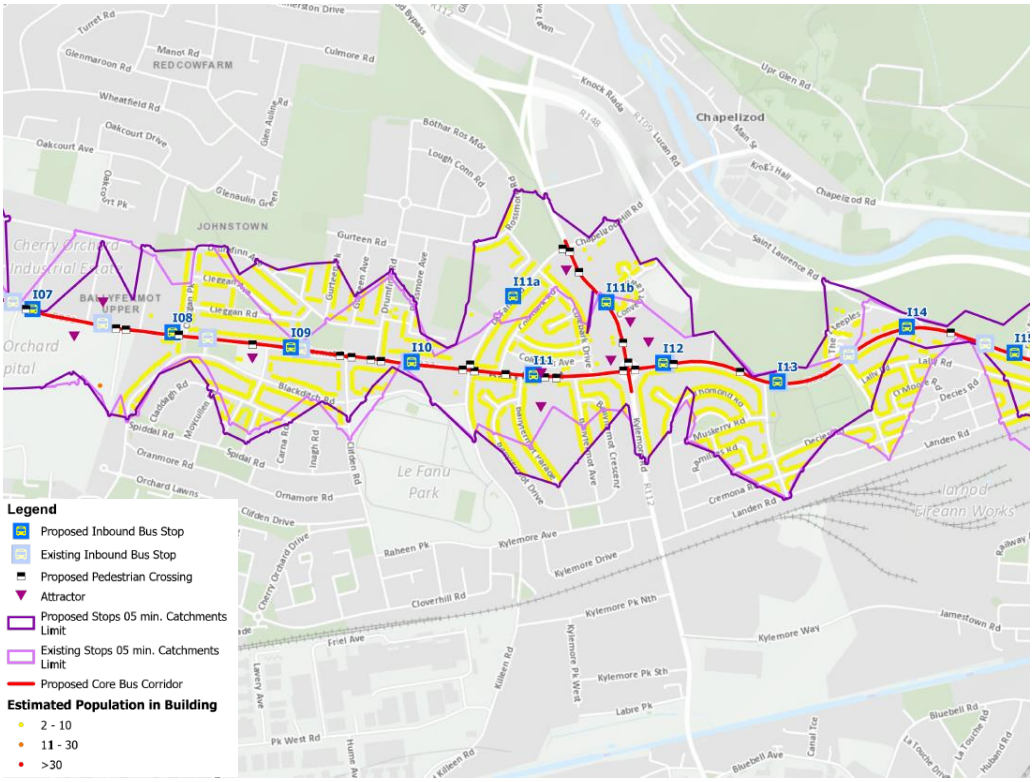


Figure 2.2b : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 5min Catchment

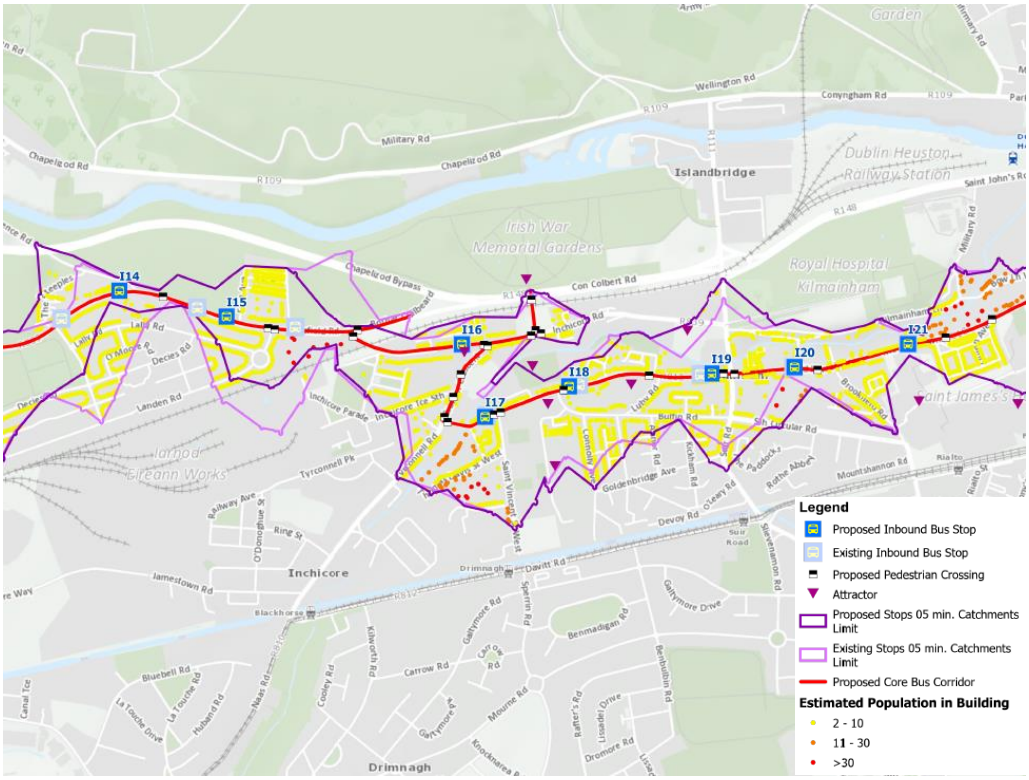


Figure 2.2c : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 5min Catchment

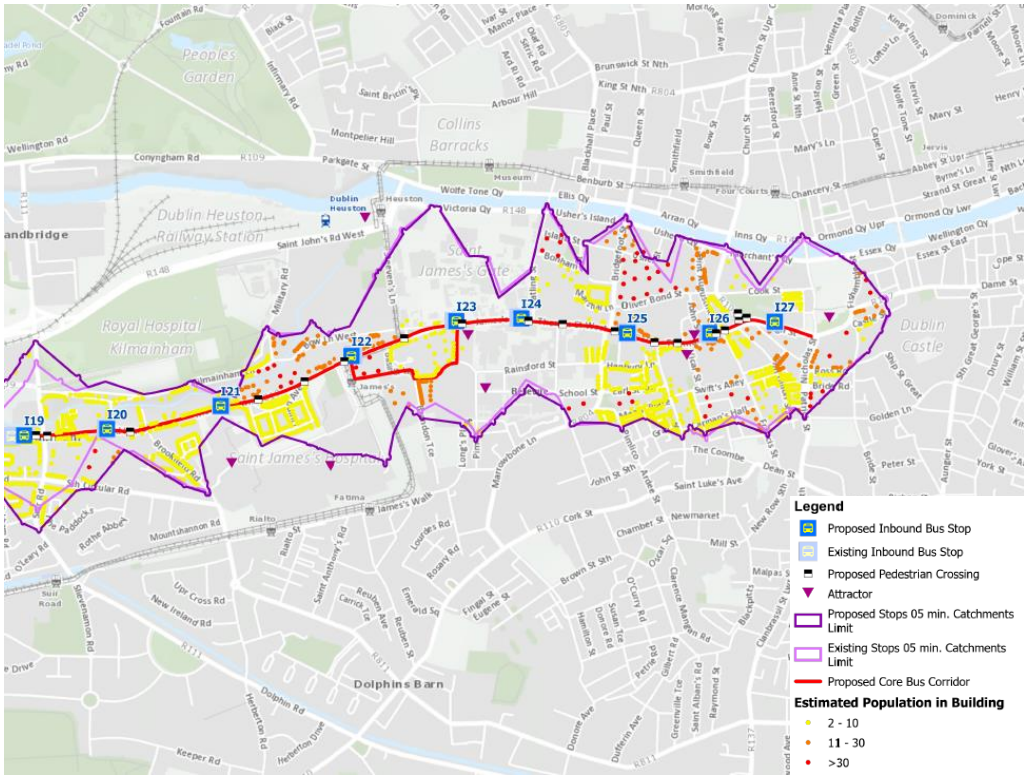


Figure 2.2d : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 5min Catchment

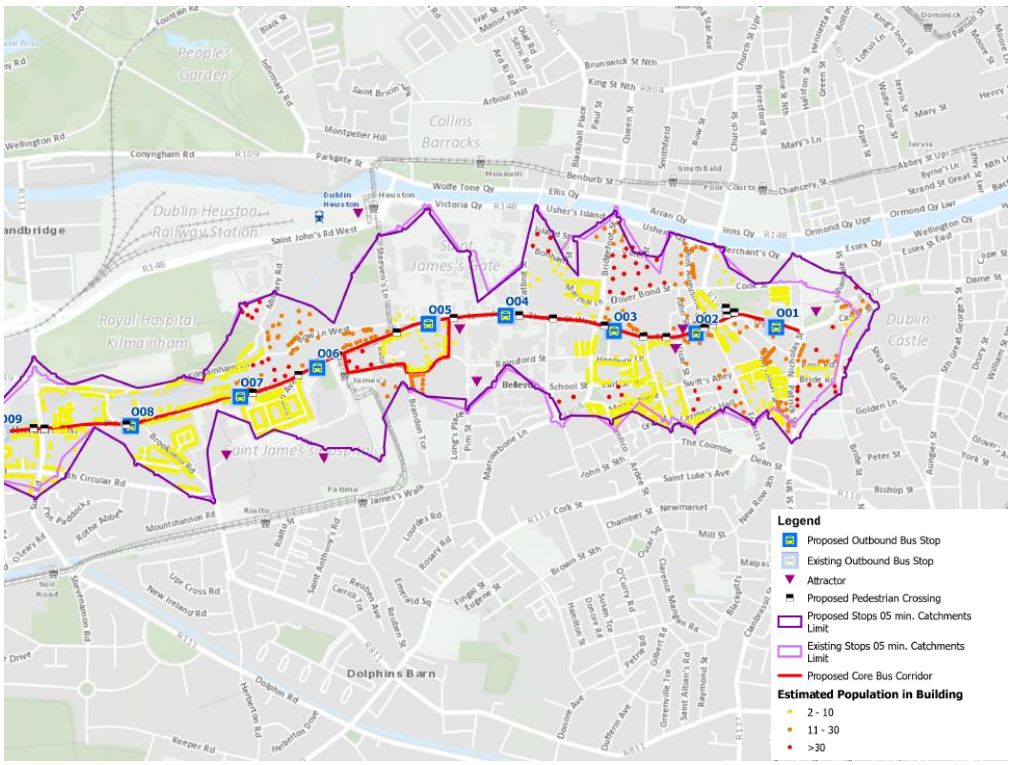


Figure 2.3a : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 5min Catchment

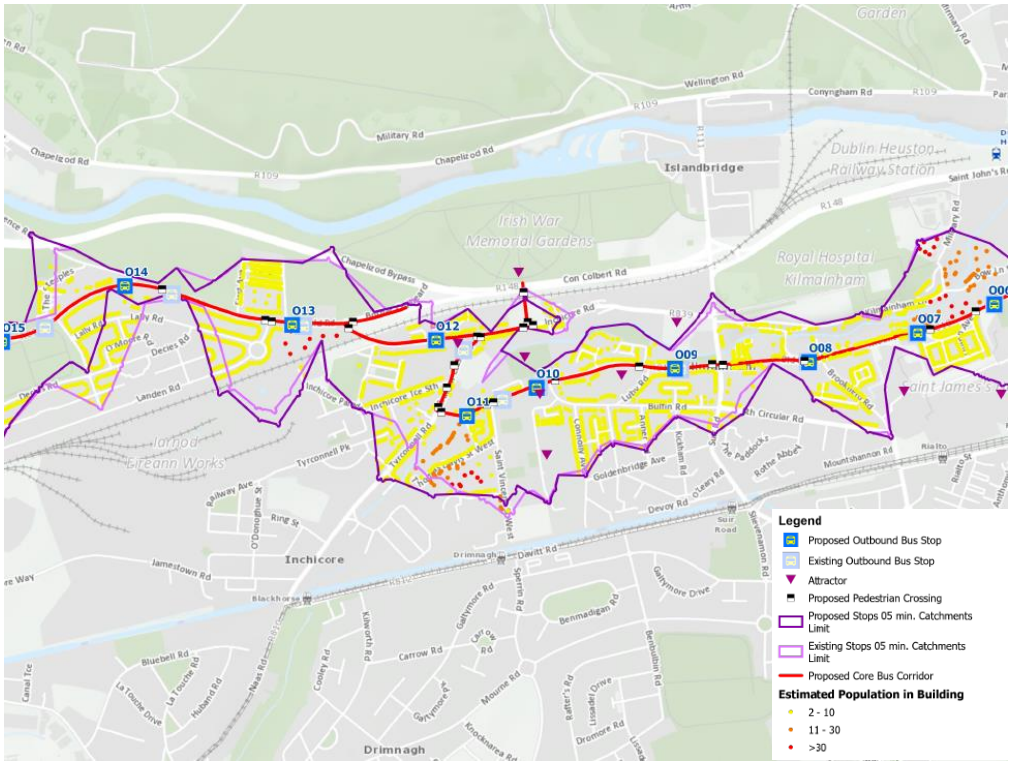


Figure 2.3b : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 5min Catchment

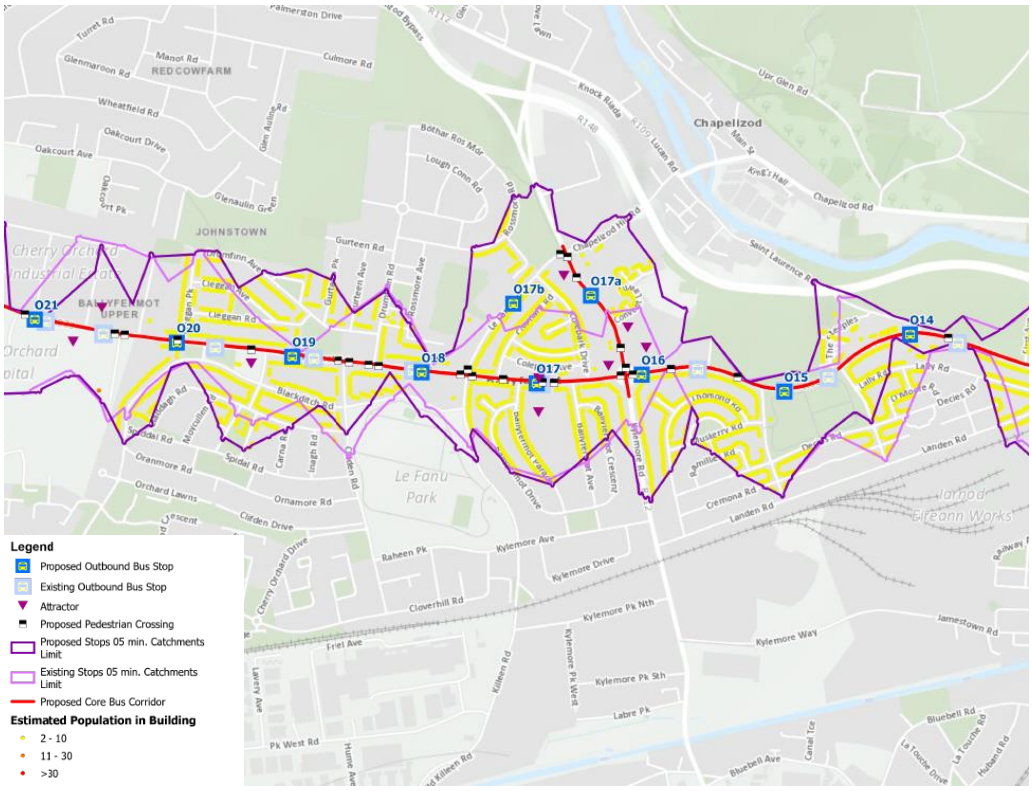


Figure 2.3c : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 5min Catchment

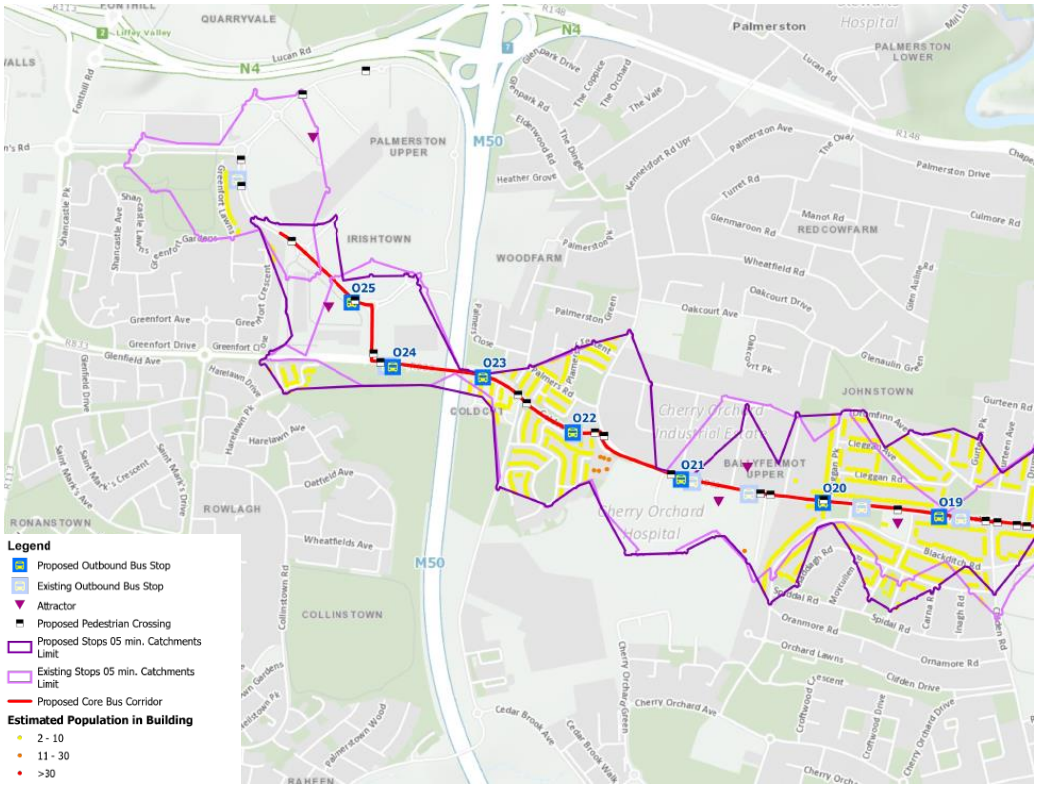


Figure 2.3d : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 5min Catchment

2.4.1.2 Liffey Valley to City Centre – 10min Catchments (Inbound and Outbound)

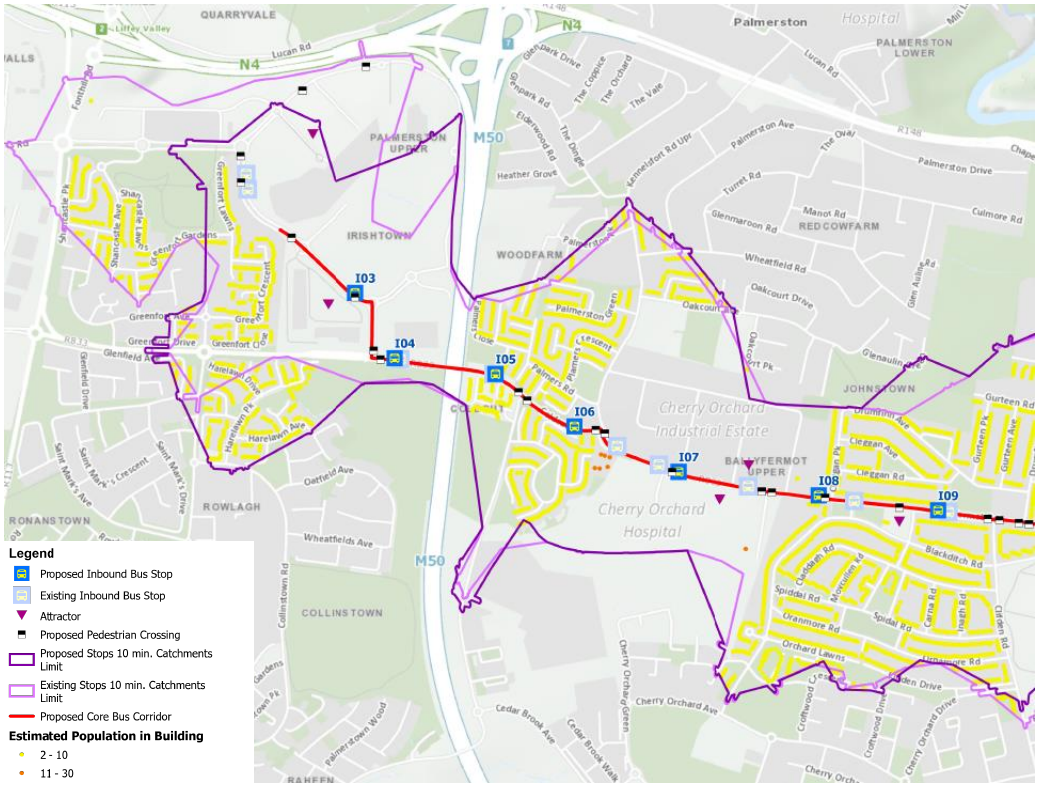


Figure 2.4a : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 10min Catchment

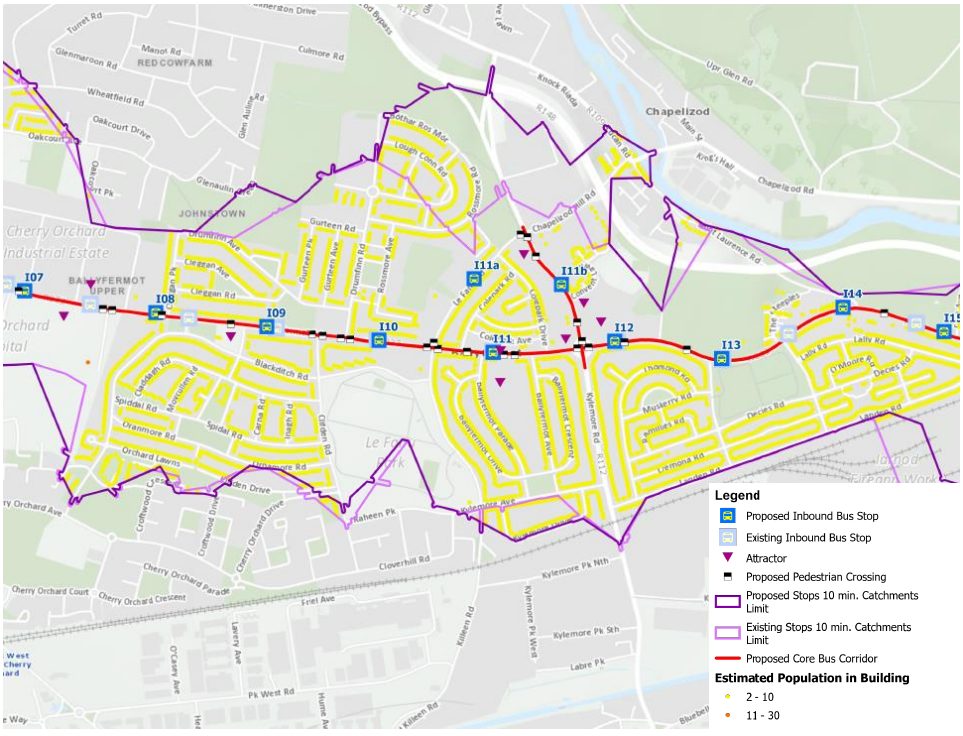


Figure 2.4b : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 10min Catchment

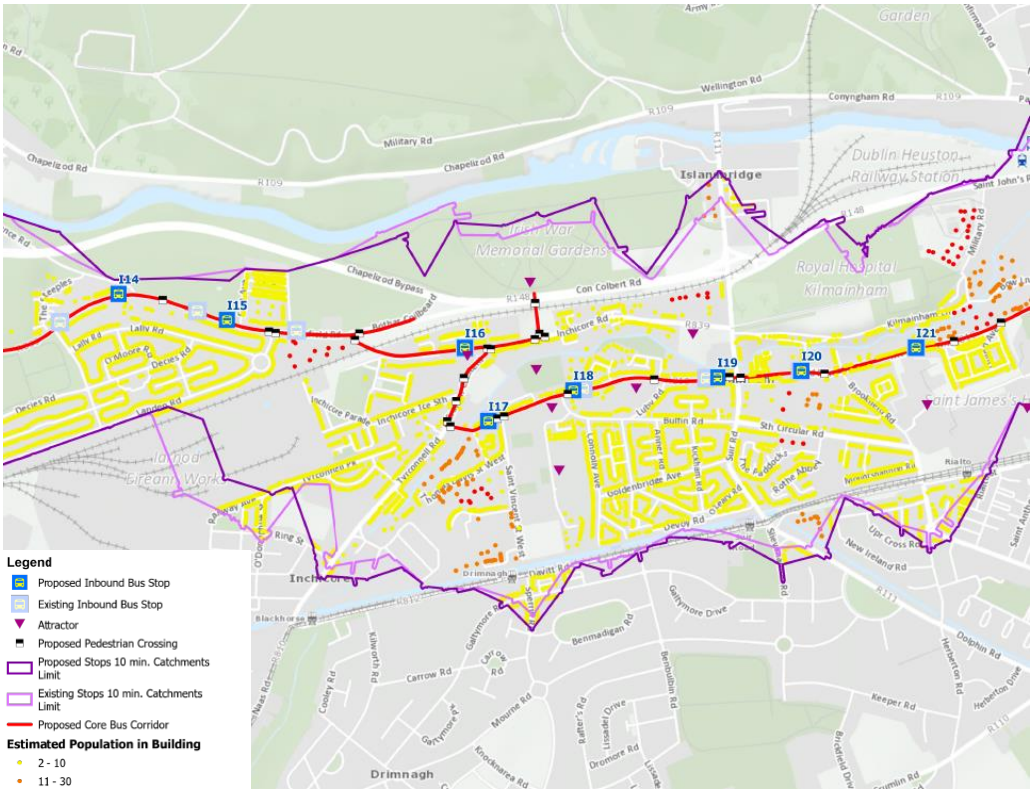


Figure 2.4c : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 10min Catchment

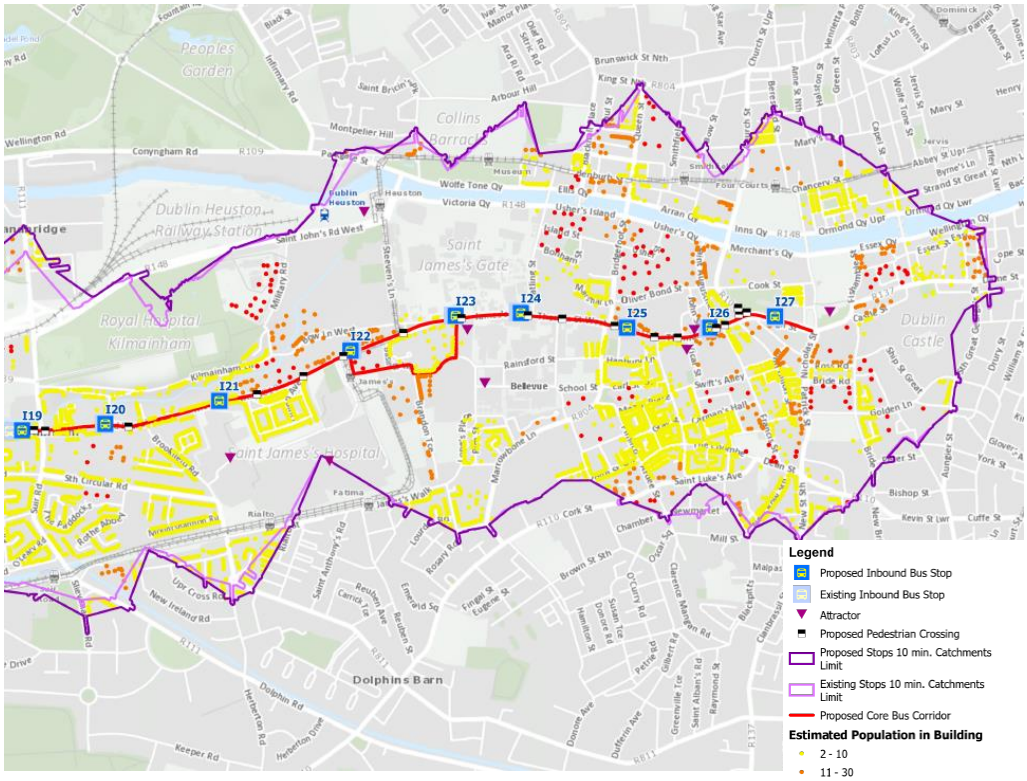


Figure 2.4d : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 10min Catchment

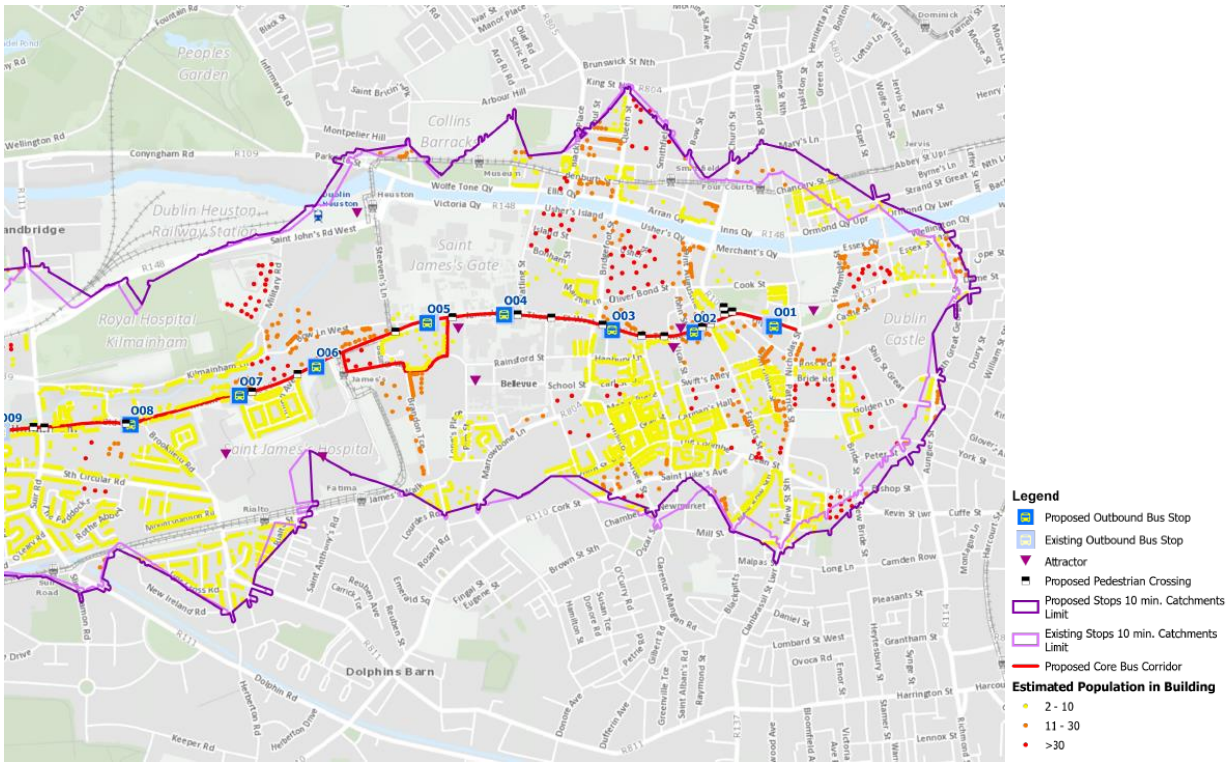


Figure 2.5a : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 10min Catchment

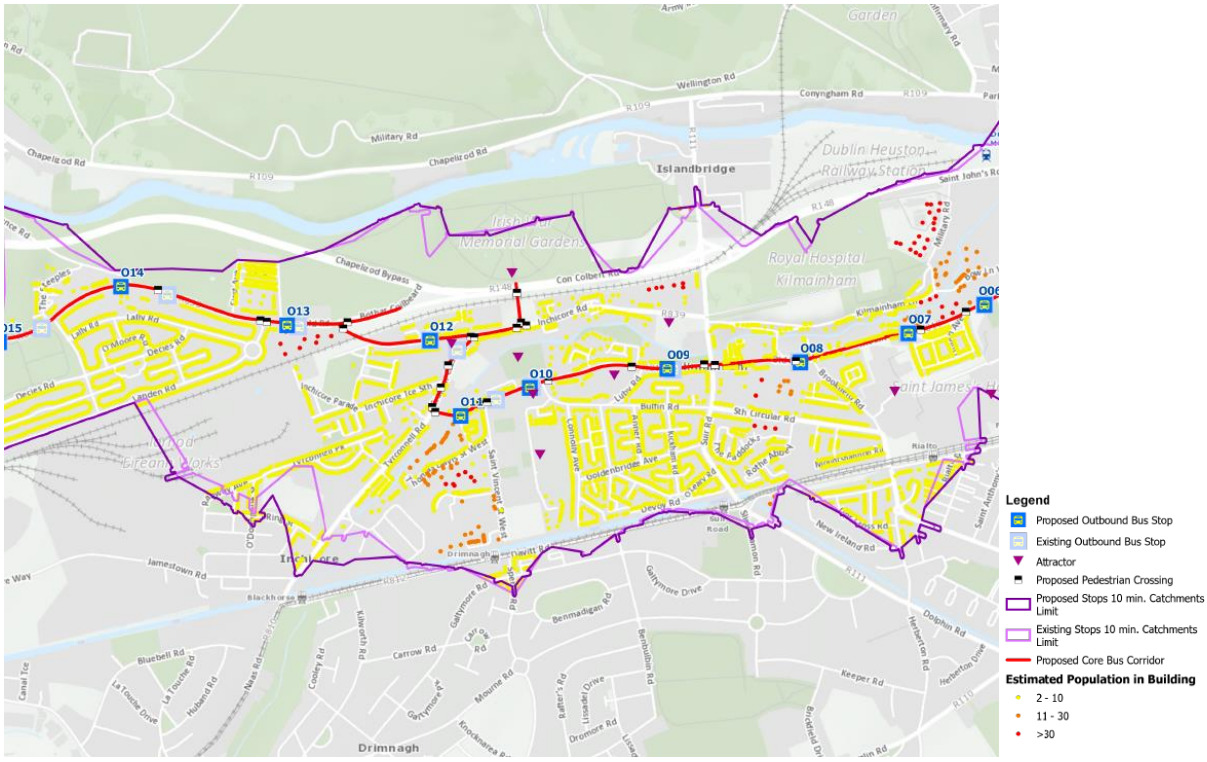


Figure 2.5b : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 10min Catchment

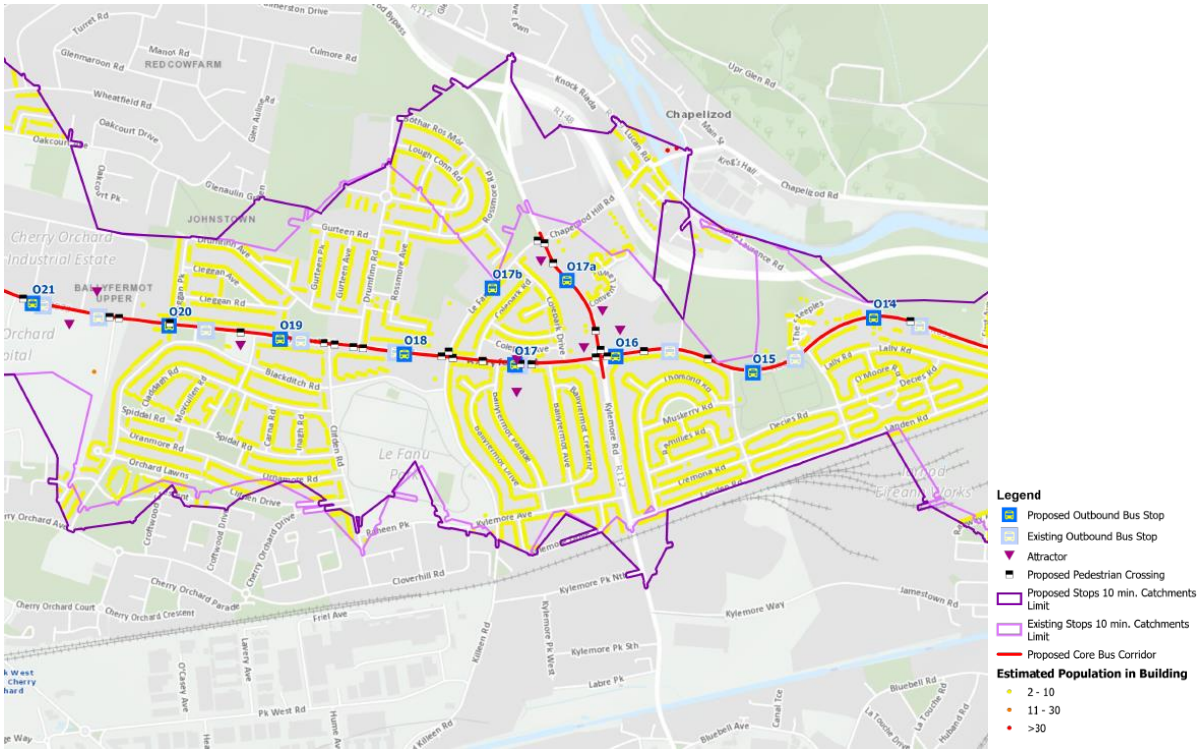


Figure 2.5c : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 10min Catchment

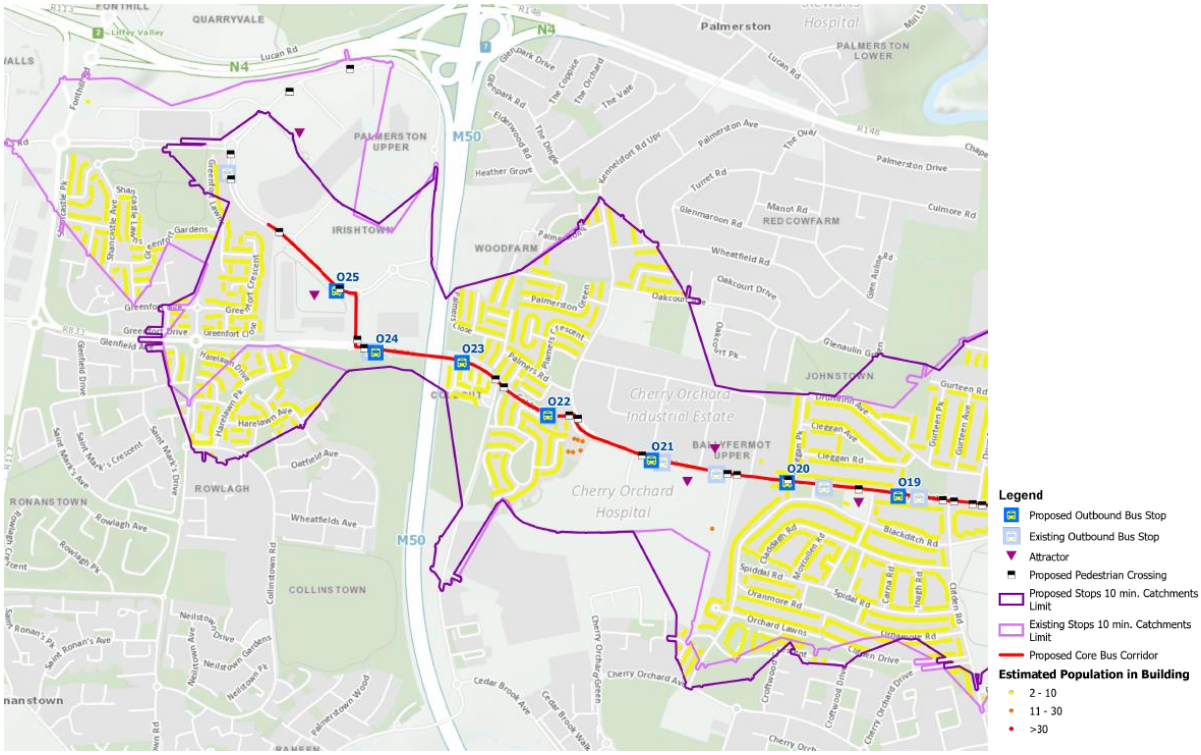


Figure 2.5d : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 10min Catchment

2.4.1.3 Liffey Valley to City Centre – 15min Catchments (Inbound and Outbound)

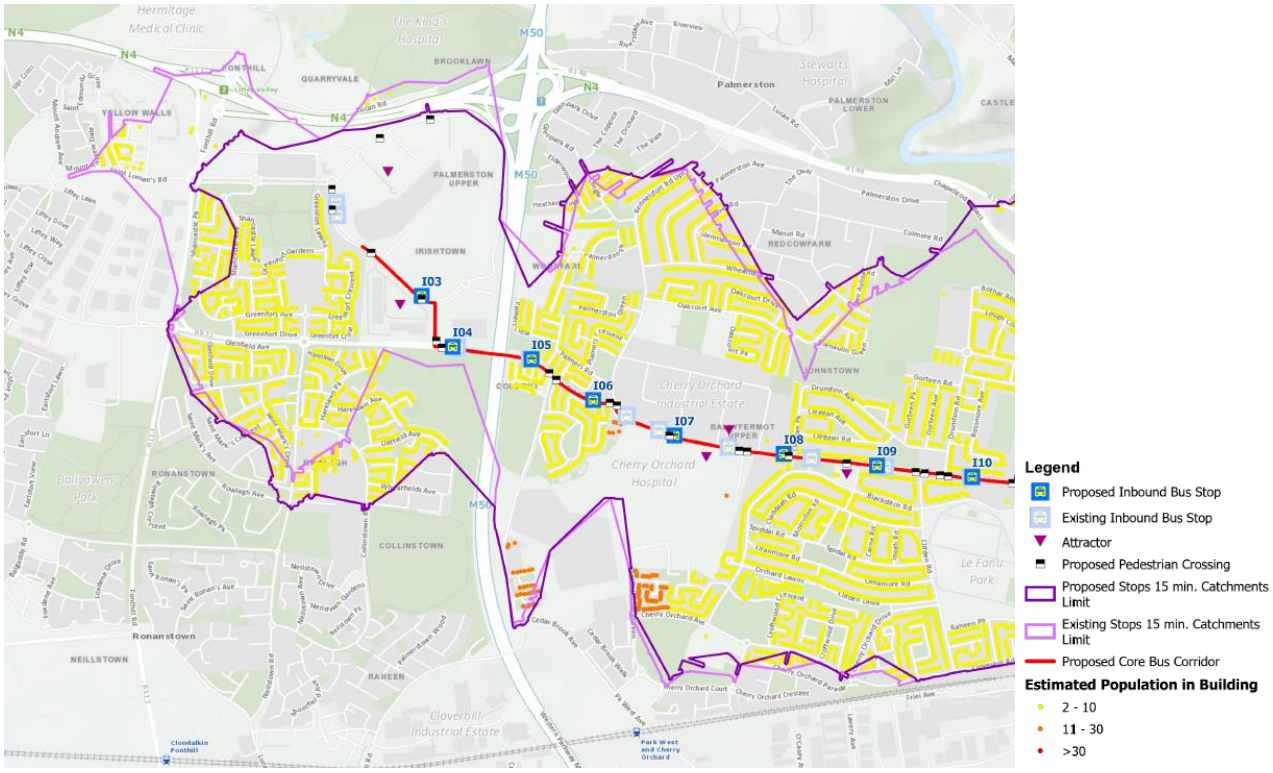


Figure 2.6a : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 15min Catchment

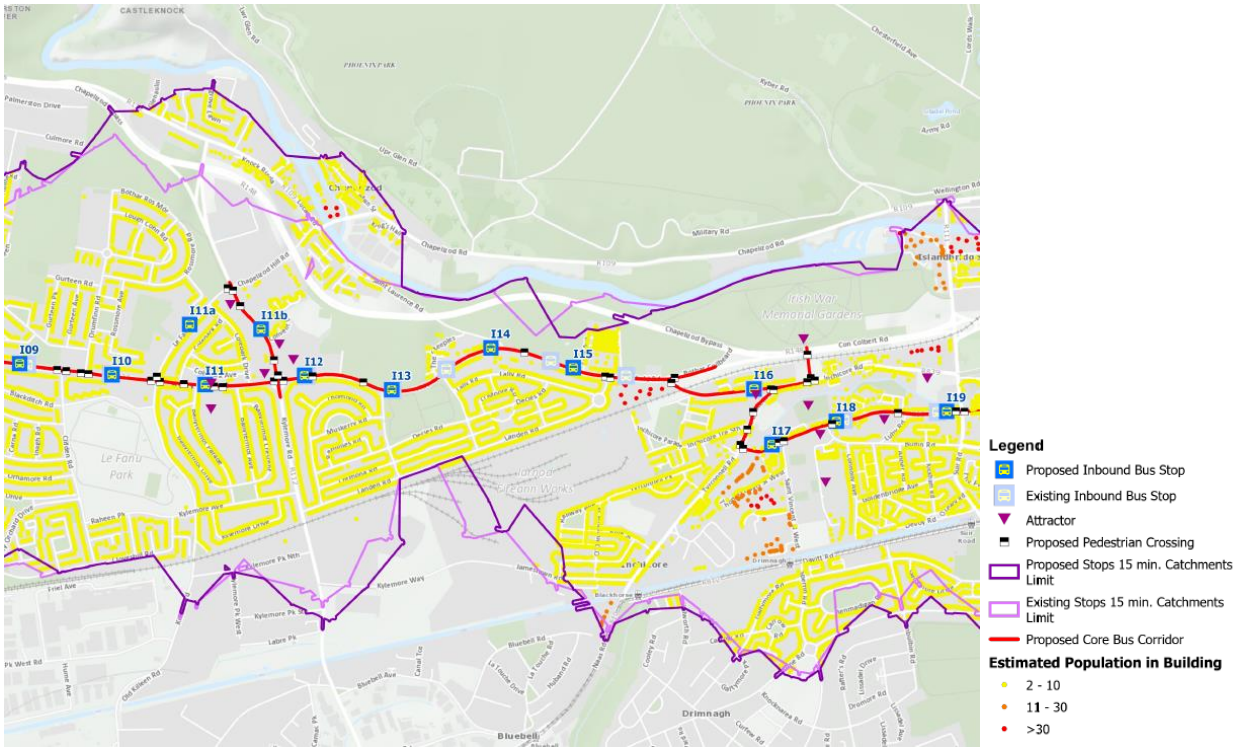


Figure 2.6b : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 15min Catchment

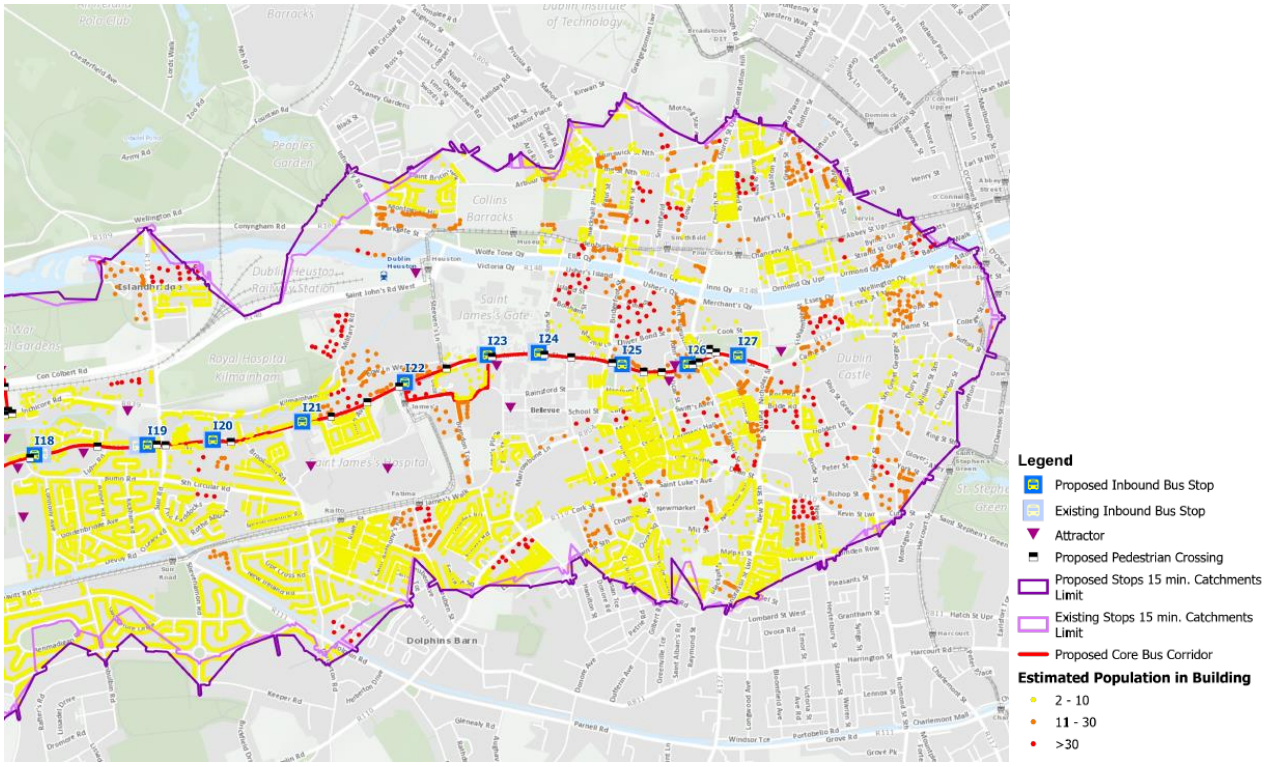


Figure 2.6c : Liffey Valley to City Centre Existing and Proposed Inbound Bus Stop Catchment – 15min Catchment

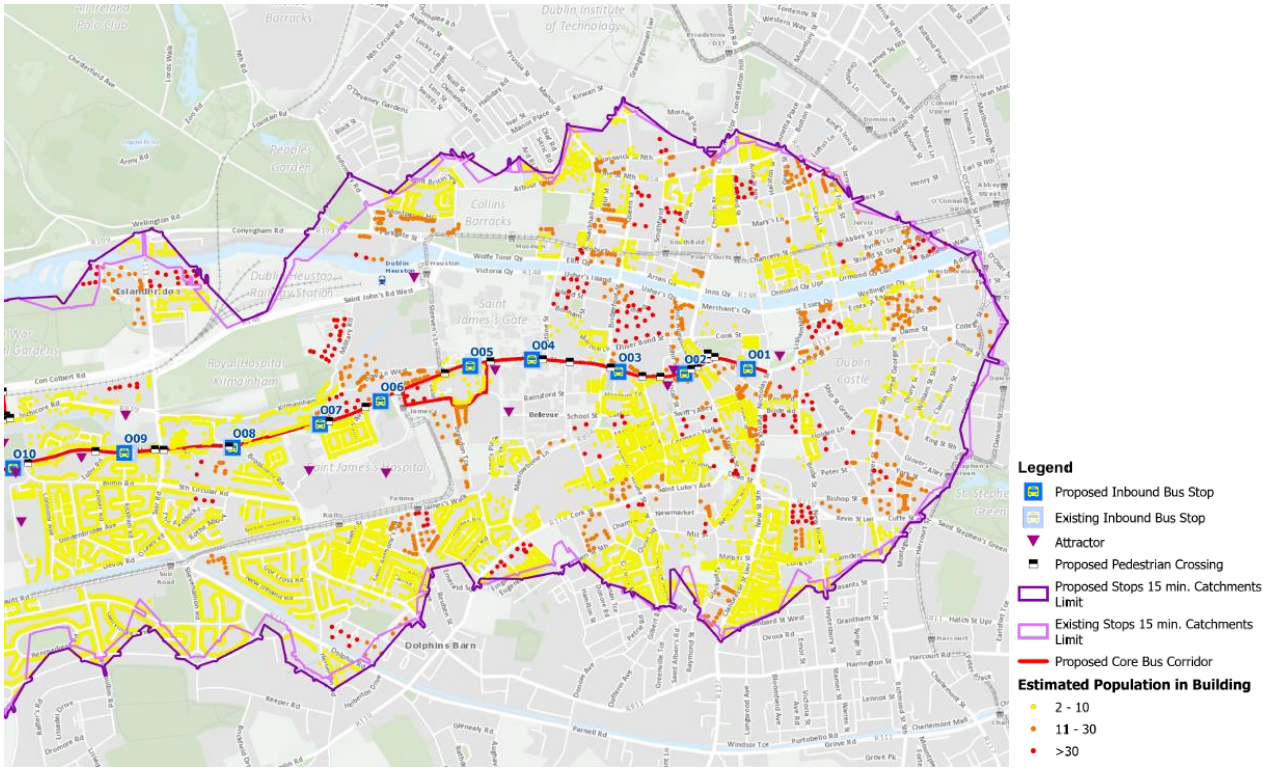


Figure 2.7a : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 15min Catchment

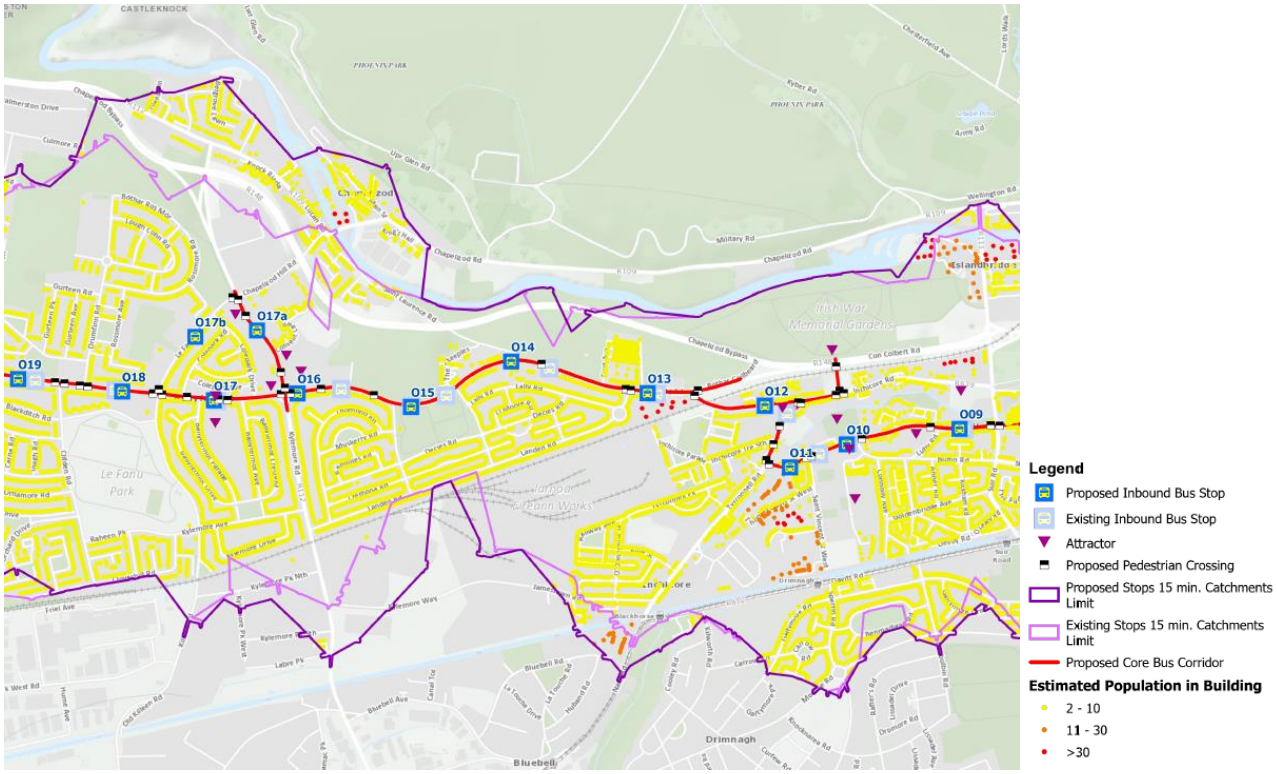


Figure 2.7b : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 15min Catchment

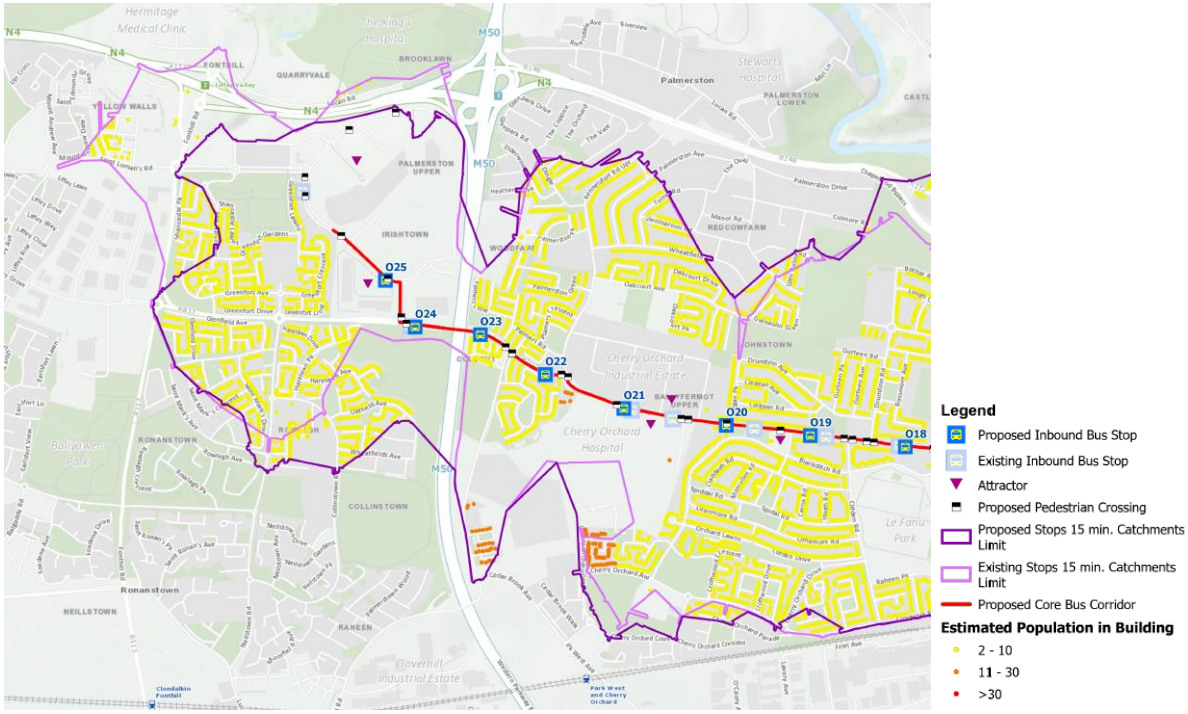


Figure 2.7c : Liffey Valley to City Centre Existing and Proposed Outbound Bus Stop Catchment – 15min Catchment

Catchment Population Comparison Tables

The catchment comparison tables for the final locations can be seen in **Tables 2.2 and 2.3**

	ESTIMATED POPULATION		
STOPS	WITHIN 5 MIN.	WITHIN 10 MIN.	WITHIN 15 MIN.
Jacobs' Proposed Stops	23884	51886	87494
Existing Stops	19946	50227	79582
Difference	3938	1659	7912

Table 2.2: Inbound Catchment Population Comparison

	ESTIMATED POPULATION		
STOPS	WITHIN 5 MIN.	WITHIN 10 MIN.	WITHIN 15 MIN.
Jacobs' Proposed Stops	24572	53022	88421
Existing Stops	20536	50440	79756
Difference	4036	2582	8665

Table 2.3: Outbound Catchment Population Comparison

As can be seen in the tables above, there have been gains in population across the whole route. This is also done using less stops along the scheme. Areas where there were losses, were accepted as they were serviced by off scheme bus stops or forms of public transport, such as the LUAS.

3. Route Summary

Table 3.1 and 3.2 below provides an overview of the key changes to the locations for bus stops along the route. During the assessment, bus stops were removed in areas where they were too close and underutilised. Also, new stops were added to poorly serviced areas and attractions.

Number of Existing Stops	28
Number of Stops Moved	11
Number of Stops Removed	4
Number of Stops Added	2

Table 3.1: Liffey Valley to City Centre Inbound Bus Stop Summary

Number of Existing Stops	27
Number of Stops Moved	11
Number of Stops Removed	3
Number of Stops Added	2

Table 3.2: Liffey Valley to City Centre Outbound Bus Stop Summary

On the inbound route, eleven of the 28 bus stops are proposed to be moved. Four bus stops are proposed to be removed from the route, and two to be added, reducing the total number of inbound bus stops from 28 to 26.

On the outbound route, eleven of the 27 bus stops are proposed to be moved. Three bus stops are proposed to be removed, and two to be added, reducing the total number of outbound bus stops from 27 to 26.

In both cases, the number of stops was reduced while improving the catchment populations.

4. Conclusion

A bus stop review was carried out for the Proposed Scheme. The purpose of the exercise was to rationalise the bus stop locations to reduce the total journey duration of the route and to improve the catchment of the bus stops.

The study was carried out by reviewing key features of the inbound and outbound bus stops including location, proximity to junctions, road crossings and major land use attractions next to the route, existing and projected passenger volumes and local considerations such as space to provide shelters, waiting areas, footpath, and cycle routes.

As part of the exercise catchment analyses have been carried out to demonstrate the impact of the proposed recommendations. The results show that the catchment footprints along the routes have increased to some extent to include larger residential and employment populations. This is largely due to the improved spacing of the stops, and the fact that stops are positioned closer to intersections, causing the catchment area to spread further along the orbital roads.

It is recommended to relocate 11 of the 28 inbound and 11 of the 27 outbound bus stops along the route. In addition, it is proposed to remove 4 of the inbound bus stops and 3 of the outbound bus stops, but to add 2 new stops in both directions, such that in this case the number of stops on the Proposed Scheme will reduce from 55 to 52.

It is expected that the overall journey time along these routes will reduce as a result of these changes. The removal of stops will lead to less time lost due to dwell times at stops and the associated time lost due to deceleration and acceleration before and after the stops. Additionally, operational improvement such as the placement of stops after junctions should serve to reduce journey times.

Appendix A. Bus Stop Review Table

Inbound								
Existing					Proposed			
No.	Bus Stop No.	Chainage		Distance from next Stop (m)	No.	Bus Stop No.	Chainage	New Distance (between Stops)
1	1937	B	8970	276	1	1937	B 8970	276
2	1938	B	8694	257	2	1938	B 8694	257
3	1939	B	8437	347	3	1939	B 8437	347
4	1940	B	8090	243	4	1940	B 8090	243
5	1941	B	7847	381	5	1941	B 7847	381
6	1942	B	7466	266	6	1942	B 7466	266
7	1943	B	7200	358	7	1943	B 7200	358
8	1944	B	6842	400	8	1944	B 6842	420
9	1945	B	6442	459	9	1945	B 6422	439
10	1946	B	5983	113	10	1946	B 5983	243
11	1947	B	5870	434	11	1947	B 5740	325
12	2642	B	5436	200	12	2643	E 310	669
13	2643	E	310	430	13	2644	B 4360	550
14	2644	B	4387	425	14	2709	B 3810	425
15	2709	B	3962	445	15	2711	B 3385	455
16	2710	B	3517	137	16	2712	B 2930	325
17	2711	B	3380	280	17	4414	D 280	
18	2712	B	3100	500	18	2655	B 2605	380
19	4414	D	225	780	19	2656	B 2225	380
20	2655	B	2600	379	20	2668	B 1845	355
21	2656	B	2221	311	21	2672	B 1490	440
22	2668	B	1910	303	22	2206	B 1050	385
23	2672	B	1607	339	23	4798	B 665	315
24	2673	B	1268	179	24	New	B 350	290
25	2206	B	1089	424	25	2674	B 60	290
26	4798	B	665	605	26	New	A 230	
27	2674	B	60	390			Average Distance:	**339**
		Average Distance:		**358**				

Outbound								
Existing					Proposed			
No.	Bus Stop No.	Chainage		Distance from next Stop (m)	No.	Bus Stop No.	Chainage	New Distance (between Stops)
1	2686	B	88	297	1	New	A 220	291
2	7510	B	385	445	2	2686	B 71	314
3	4799	B	830	138	3	7510	B 385	290
4	2205	B	968	285	4	New	B 675	365
5	2687	B	1253	325	5	2205	B 1040	430
6	2688	B	1578	288	6	2688	B 1470	370
7	2689	B	1866	344	7	2689	B 1840	370
8	2696	B	2210	380	8	2696	B 2210	380
9	5007	D	220	300	9	5007	D 220	
10	2697	B	2590	400	10	2697	B 2590	400
11	2713	B	2990	360	11	2713	B 2990	325
12	2714	B	3350	240	12	2714	B 3315	480
13	2715	B	3590	450	13	2716	B 3795	345
14	2716	B	4040	320	14	2718	B 4140	730
15	2718	B	4360	536	15	2719	E 371	523
16	2719	E	371	531	16	1989	B 5789	271
17	1989	B	5789	298	17	1990	B 6060	440
18	1990	B	6087	388	18	1992	B 6500	257
19	1992	B	6475	282		1024841		
	1024841				19	1993	B 6757	365
20	1993	B	6757	365	20	1994	B 7122	463
21	1994	B	7122	453	21	1995	B 7585	315
22	1995	B	7575	316	22	1996	B 7900	200
23	1996	B	7891	209	23	1997	B 8100	326
24	1997	B	8100	326	24	1998	B 8426	263
25	1998	B	8426	263	25	1999	B 8689	236
26	1999	B	8689	236	26	2001	B 8925	
27	2001	B	8925				Average Distance:	**337**
		Average Distance:		**325**				

			EXISTING																	
			Existing Information														Interaction with Junctions and Ped Crossings			Network Redesign
New or Existing Bus Stop	Inbound/Outbound	Bus Stop Name	Bus Stop No.	Chainage		Frequency between 6am-8am	Frequency between 8am-10am	No. of Buses/ Hr	Distance from next Stop (m)	Dwell Time (sec) - from AVL Data	Number of Passengers Boarding (Peak Hr)	Number of Passengers Alighting (Peak Hr)	Total (Boarding + Alighting)	Time to next stop (Peak) sec	Run Time with Dwell time (AM Peak Sec)	Run Time with Dwell time (PM Peak Sec)	Average Time to next stop (Off-Peak) sec	Before/ After the Junction (in the direction of travel)	Bus Stop Distance from nearest Junction (m)	Distance to Pedestrian Crossing (m)	Routes that stop at each bus stop
New	Inbound	Liffey Valley Retail Park																		
Existing	Inbound	Sports Club	2686	B	88	7.21	6.29	3.38	297	7.64	10	8	18	25.75	33.39	31.55	24.4	After	89	66.5	G2, S4. 80
Existing	Inbound	Cloverhill Road	7510	B	385	4.4	4.61	2.25	445	9.36	10	10	20	74.4	83.76	87.65	57.92	Before	110	121.1	G2, S4. 80
New	Inbound	Coldcut Road																			
Existing	Inbound	Ballyfermot Road	4799	B	830	7.22	6.48	3.43	138	20.16	21	8	29	20.9	41.06		14.05	After	69	70.5	S4, G2
Existing	Inbound	Cherry Orchard Hospital	2205	B	968	7.22	6.49	3.43	285	10.33	8	6	14	32.1	42.43	29.85	27.87	After	212	45.8	S4, G2
Existing	Inbound	Cherry Orchard Industrial Estate	2687	B	1253	6.76	6.8	3.39	325	5.50	5	4	9	40.85	46.35	34.85	27.23	Before	55	75.5	S4, G2
Existing	Inbound	Cleggen Park	2688	B	1578	6.81	6.74	3.39	288	12.60	11	9	20	65.08	77.68	51.69	41.6		0	86.5	S4, G2
Existing	Inbound	Blackditch Drive	2689	B	1866	6.81	6.71	3.38	344	14.64	25		25	79.25	93.89	71.59	50.06	After	106	123	S4, G2
Existing	Inbound	Ballyfermot Road	2696	B	2210	4.49	4.46	2.24	380	26.52	26	21	47	77.46	103.98	100.94	59.04	After	103	34.3	S4, G1, G2, 60
Existing	Inbound	Convent Lawns	5007	D	220				300				0		0						60
Existing	Inbound	Ballyfermot Parade	2697	B	2590	5.25	5.88	2.78	400	32.37	58	38	96	130.76	163.13	186.09	60.76	After	42	46.5	S4, G1, G2
Existing	Inbound	St. Raphael's National School	2713	B	2990	10.17	9.64	4.95	360	20.94	12	12	24	40.8	61.74	45.41	31.46	After	121	30	G1, G2
Existing	Inbound	Markiewicz Park	2714	B	3350	10.17	9.64	4.95	240	11.78	7	14	21	30.33	42.11	37.59	24.79	After	43	122	G1, G2
Existing	Inbound	O'Hogan Road	2715	B	3590	10.17	9.71	4.97	450	14.65	11	10	21	53.08	67.73	51.21	37.06	After	34.6	13.5	G1, G2
Existing	Inbound	Sarsfield Road	2716	B	4040	10.17	9.71	4.97	320	16.30	11	6	17	46.02	62.32	44.12	32.06	Before	135	267	G1, G2
Existing	Inbound	St. Mary's Avenue	2718	B	4360	4.94	6.12	2.77	536	30.33	37	10	47	96.81	127.14	120.89	58.88	Before	32	51	G1, G2, 60
Existing	Inbound	Woodfield Place	2719	E	371	6.42	7.11	3.38	531	21.64	11	12	23	135.9	157.54	160.88	82.23	After	65	71	G1, G2, 60
Existing	Inbound	Camac Close	1989	B	5789	6.39	4.89	2.82	298	49.13	70	11	81	39.14	88.27	64.22	33.62	Before	34	17.4	G1, G2, 58
Existing	Inbound	Myra Cottages	1990	B	6087	7.88	8.64	4.13	388	18.31	12	11	23	55.35	73.66	52.02	34.5	After	73	50.5	G1, G2
Existing	Inbound	Inchicore Library	1992	B	6475	7.56	8.93	4.12	282	45.04	28	14	42	92.92	137.96	108.43	57.56	After	90	75	G1, G2
Existing	Inbound	Emmet Road	1024841			0.83	1.07	0.48					0	85.49	85.49						
Existing	Inbound	Old Kilmlainham	1993	B	6757	7.56	8.93	4.12	365	12.39	9	8	17	119.07	131.46	51.49	32.27	Before	31	184	G1, G2
Existing	Inbound	Mount Brown	1994	B	7122	7.52	8.96	4.12	453	13.06	9	9	18	103.26	116.32	65.96	40.67	Before	240	116	G1, G2
Existing	Inbound	Basin Street Lower	1995	B	7575	7.24	9.25	4.12	316	33.50	34	27	61	32.72	66.22	115.53	48.62	After	58	158.6	G1, G2, 73, S2, LUAS
Existing	Inbound	James Street	1996	B	7891	7.24	9.25	4.12	209	18.82	15	11	26	68.13	86.95	47.85	22.85		0	20	G1, G2, 73
Existing	Inbound	Thomas Street	1997	B	8100	7.24	9.25	4.12	326	12.29	14	10	24		12.29	84.41	48.19	After	39	31.7	G1, G2, 73
Existing	Inbound	Bridgefoot Street	1998	B	8426	7.12	9	4.03	263	31.43	28	28	56	85.95	117.38	114.8	52.75	Before	55	33	G1, G2, 73
Existing	Inbound	Francis Street Junction	1999	B	8689	7.04	8.29	3.83	236	22.96	14	19	33	71.28	94.24	106.2	45.54	After	38	30.1	G1, G2, 73
Existing	Inbound	High Street	2001	B	8925	6.7	9	3.93		11.26	21	9	30	114.42 (AM) / 128.49 (PM)	125.68	140.19		Before	80	79	G1, G2, 23, 24, 87, 73

		Inbound Bus Stop Review Outcome						
Inbound/Outbound	Bus Stop Name	Bus Stop Treatment	No. Bus Bays	Catchment	Permeability	Bus Shelter	Type of Bus Stop Island or Shared Bus Stop Landing	Design Rational
Inbound	Liffey Valley Retail Park	New	Single	N/A	Improves permeability to Retail Park	New Standard bus shelter proposed	Island Bus Stop	New stop needed to reduce distance between stops and improve connection to the Liffey Valley Retail Park
Inbound	Sports Club	Relocated	Single	No Change	No change	Standard bus shelter	Island Bus Stop	No Issue with existing stop location
Inbound	Cloverhill Road	Retain	Single	No Change	A path to Palmers Drive would increase permeability	New Standard bus shellter proposed	Island Bus Stop	No Issue with existing stop location
Inbound	Coldcut Road	New	Single	No Change	No change	New Standard bus shellter proposed	Island Bus Stop	New stop needed to improve stop spacing
Inbound	Ballyfermot Road	Removed	Single	No Change	No change	Bus Shelter with no end panels	Island Bus Stop	Stop to be removed to improve spacing between stops, due to the proximity of adjacent stops on at Cherry Orchard Hospital
Inbound	Cherry Orchard Hospital	Relocated	Single	No Change	No change	Standard bus shelter	Island Bus Stop	Stop moved to improve spacing due to the removal of adjacent stops
Inbound	Cherry Orchard Industrial Estate	Removed	Single	No Change	No change	Standard bus shelter	Island Bus Stop	Stop to be removed to improve spacing between stops, due to the proximity of adjacent stops on at Cherry Orchard Hospital
Inbound	Cleggen Park	Relocated	Single	Increased	No change	Standard bus shelter	Shared bus stop landing	Move stop down stream of the junction
Inbound	Blackditch Drive	Relocated	Single	No Change	No change	Standard bus shelter	Island Bus Stop	Pedestrian crossing may be moved closer to improve permeability
Inbound	Ballyfermot Road	Retain	Single	No Change	No change	Standard bus shelter	Shared Bus StopLanding	No Issue with existing stop location
Inbound	Convent Lawns	Retain	Single	No Change	Improves access to bus services from Rossmore Road	Standard bus shelter	Shared bus stop landing	No Issue with existing stop location
Inbound	Ballyfermot Parade	Retain	Single	Increased	No change	Standard bus shelter	Island Bus Stop	No Issue with existing stop location
Inbound	St. Raphael's National School	Retain	Single	No Change	No change	Standard bus shelter	Island Bus Stop	No Issue with existing stop location
Inbound	Markiewicz Park	Relocated	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	Relocated to facilitate future development
Inbound	O'Hogan Road	Removed	Single	Increased	No change	Standard bus shelter		Stop Removed to improve spacing
Inbound	Sarsfield Road	Relocated	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	Stop Moved to St. Laurence Road to improve spacing
Inbound	St. Mary's Avenue	Relocated	Single	No Change	No change	Standard bus shelter	Island Bus Stop	Stop Moved to opposite side of First Avenue to improve spacing. Increased distance to next stop acceptable due to lack of attractors or trip origins
Inbound	Woodfield Place	Retain	Single	No Change	No change	No Shelter	Inline Bus Stop	No Issue with existing stop location. Not enough room on the footway to locate a shelter. Private garden with low wall also located directly behind the footway.
Inbound	Camac Close	Retain	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	No Issue with existing stop location
Inbound	Myra Cottages	Relocated	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	No Issue with existing stop location
Inbound	Inchicore Library	Relocated	Single	No Change	No change	Standard Bus shelter	Inline Bus Stop	Stop moved to facilitate residential parking
Inbound	Emmet Road	Removed	Single	No Change	No change	Standard Bus shelter	Inline Bus Stop	Stop to be removed to improve spacing between stops
Inbound	Old Kilmlainham	Retain	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	No Issue with existing stop location
Inbound	Mount Brown	Retain	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	No Issue with existing stop location
Inbound	Basin Street Lower	Relocated	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	Relocated to avoid accesses
Inbound	James Street	Relocated	Single	Slight reduction, lost users are on Greenhills route	No change	Standard Bus shelter	Shared bus stop landing	No Issue with existing stop location
Inbound	Thomas Street	Retain	Single	No Change	No change	Standard Bus shelter	Shared bus stop landing	No Issue with existing stop location
Inbound	Bridgefoot Street	Retain	Single	No Change	No change	Bus Shelter with no end panels	Shared bus stop landing	No Issue with existing stop location
Inbound	Francis Street Junction	Retain	Single	No Change	No change	Standard Bus shelter	Shared bus stop landing	No Issue with existing stop location
Inbound	High Street	Retain	Single	No Change	No change	Bus Shelter with no end panels	Shared bus stop landing	No Issue with existing stop location

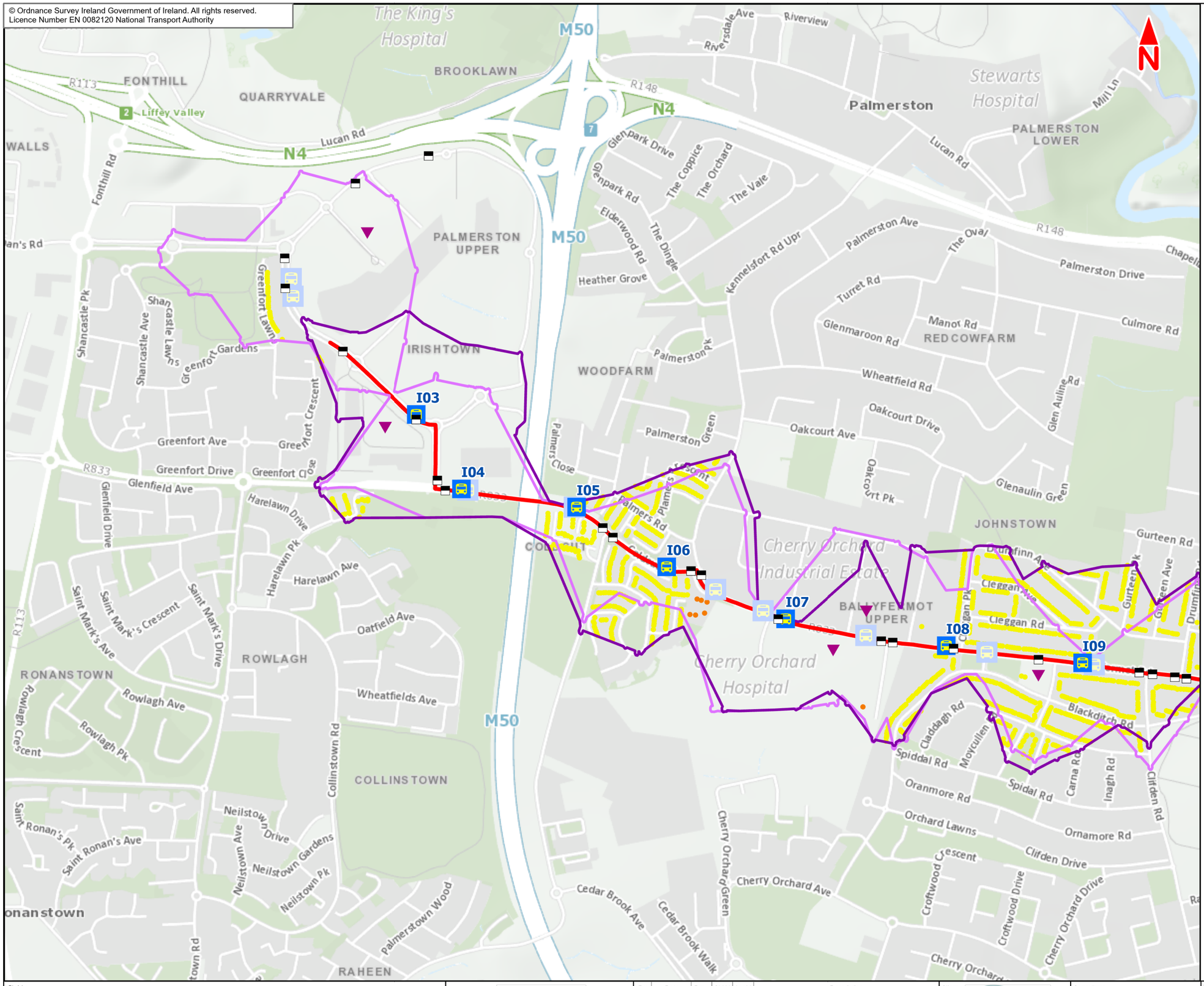
		Propsoed Inbound Bus Stops									
			Distance		Interaction with Junctions and Ped Crossings			Network Redesign			
Inbound/Outbound	Bus Stop Name	New or Existing Bus Stop	New Distance (between Stops)	Chainage	Before/ After the Junction (in the direction of travel)	Bus Stop Distance from nearest Junction (m)	Distance to Pedestrian Crossing (m)	Routes that stop at each bus stop	Trip attactor	Cycle Parking	Lay-by or Onstreet Bus Stop
Inbound	Liffey Valley Retail Park	New	291	A 220	After	50	40	S4, W2, 80	Liffey Valley ShoppingCentre	Yes	Onstreet
Inbound	Sports Club	Existing	314	B 71	After	71	40	G2, S4. 80	Sports Club	Yes	Onstreet
Inbound	Cloverhill Road	Existing	290	B 385	Before	90	80	G2, S4. 80		Yes	Onstreet
Inbound	Coldcut Road	New	365	B 675	Before	70	48	G2, S4. 80		Yes	Onstreet
Inbound	Ballyfermot Road	Existing								Yes	Onstreet
Inbound	Cherry Orchard Hospital	Existing	430	B 1040	After	52	20	S4, G2	Cherry Orchard Hospital, Cherry Orchard Inductrial Estate	Yes	Onstreet
Inbound	Cherry Orchard Industrial Estate	Existing	N/A		Before	55				Yes	Onstreet
Inbound	Cleggen Park	Existing	370	B 1470	Before	40	54	S4, G2		TBC	Onstreet
Inbound	Blackditch Drive	Existing	370	B 1840	After	75	30	S4, G2	Ballyfermot Community Centre	Yes	Onstreet
Inbound	Ballyfermot Road	Existing	380	B 2210	After	95	95	S4, G1, G2, 60	Local Shops	TBC	Onstreet
Inbound	Convent Lawns	Existing		D 220			>100	60		TBC	Onstreet
Inbound	Ballyfermot Parade	Existing	400	B 2590	After	35	35	S4, G1, G2	Ballyfermot village centre	Yes	Onstreet
Inbound	St. Raphael's National School	Existing	325	B 2990	After	94	30	G1, G2	St. Raphael's National School	Yes	Onstreet
Inbound	Markiewicz Park	Existing	480	B 3315	After	0	40	G1, G2	Markiewicz Park	TBC	Onstreet
Inbound	O'Hogan Road	Existing	N/A							TBC	Onstreet
Inbound	Sarsfield Road	Existing	345	B 3795	Before	42	25	G1, G2	Longmeadows Pitch and Putt	TBC	Onstreet
Inbound	St. Mary's Avenue	Existing	730	B 4140	Before	40	>100	G1, G2	Longmeadows GAA Club	Yes	Onstreet
Inbound	Woodfield Place	Existing	523	E 371	After	65	70	G1, G2, 60	Inchicore National School	TBC	Onstreet
Inbound	Camac Close	Existing	271	B 5789	Before	40	10	G1, G2, 58		TBC	Onstreet
Inbound	Myra Cottages	Existing	440	B 6060	After	50	45	G1, G2	Richmond Park	TBC	Onstreet
Inbound	Inchicore Library	Existing	257	B 6500	Before	90	36	G1, G2	Inchicore Library, Kilmainham Goal	TBC	Onstreet
Inbound	Emmet Road									TBC	Onstreet
Inbound	Old Kilmlainham	Existing	365	B 6757	Before	31	70	G1, G2		TBC	Onstreet
Inbound	Mount Brown	Existing	463	B 7122	Before	78	>100	G1, G2		TBC	Onstreet
Inbound	Basin Street Lower	Existing	315	B 7585	After	58	25	G1, G2, 73, O, S2, LUAS	St. James's Hospital	TBC	Onstreet
Inbound	James Street	Existing	200	B 7900	After	74	13	G1, G2, 73	Guinness Store House	TBC	Onstreet
Inbound	Thomas Street	Existing	326	B 8100	After	35	20	G1, G2, 73		TBC	Onstreet
Inbound	Bridgefoot Street	Existing	263	B 8426	After	47	30	G1, G2, 73		TBC	Onstreet
Inbound	Francis Street Junction	Existing	236	B 8689	Before	30	15	G1, G2, 73		TBC	Onstreet
Inbound	High Street	Existing		B 8925	After	87	85	G1, G2, 23, 24, 87, 73		TBC	Onstreet

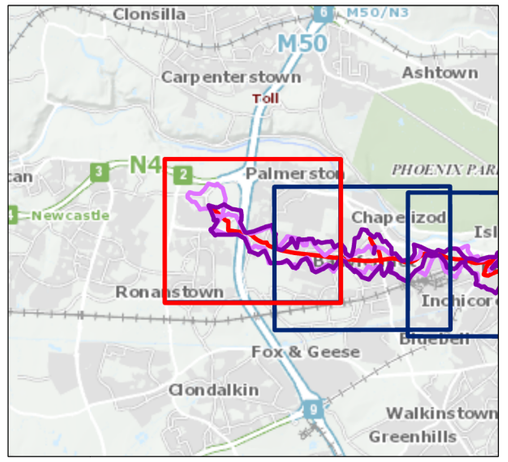
			EXISTING																	
			Existing Information													Interaction with Junctions and Ped Crossings			Network Redesign
New or Existing Bus Stop	Inbound/Out bound	Bus Stop Name	Bus Stop No.	Chainage	Frequency between 6am-8am	Frequency between 8am-10am	No. of Buses/ Hr	Distance from next Stop (m)	Dwell Time (sec) - from AVL Data	Number of Passengers Boarding (Peak Hr)	Number of Passengers Alighting (Peak Hr)	Total (Boarding + Alighting)	Time to next stop (Peak) sec	Run Time with Dwell time (AM Peak Sec)	Run Time with Dwell time (PM Peak Sec)	Average Time to next stop (Off-Peak) sec	Before/ After the Junction (in the direction of travel)	Bus Stop Distance from nearest Junction (m)	Distance to Pedestrian Crossing (m)	Routes that stop at each bus stop
Existing	Outbound	High Street	1937	B 8970	2	2.25	1.06	276	12.49	14	10	24	40.83 (AM)	50.55		37.16	Before	93	67.4	G1, G2, 23, 24, 87, 73
Existing	Outbound	Thomas Street	1938	B 8694	9.04	9.25	4.57	257	21.27	15	55	70	70.06	79.22	91.33	52.3	Before	44	22.1	G1, G2, 73
Existing	Outbound	Bridgefoot Street	1939	B 8437	9.32	8.93	4.56	347	29.87	30	17	47	80.1	91.97	109.97	50.55	After	43	34.7	G1, G2, 73
Existing	Outbound	James Street	1940	B 8090	8.95	8.69	4.41	243	10.23	5	10	15	38.89	43.55	49.12	27	After	38	40	G1, G2, 73
Existing	Outbound	Steven's Lane	1941	B 7847	8.81	8.95	4.44	381	15.44	5	12	17	76.34	90.93	91.78	51.97	After	52	67	G1, G2, 73
Existing	Outbound	St. James Hospital	1942	B 7466	9.29	8.89	4.55	266	26.19	21	17	38	42.05	56.06	68.24	30.38	After	43	67	G1, G2, 73, S2, LUAS
Existing	Outbound	Mount Brown	1943	B 7200	9.57	8.89	4.62	358	10.51	4	7	11	173.23	43.3	183.74	35.47	After	48	43.4	G1, G2
Existing	Outbound	Old Kilmlainham	1944	B 6842	9.57	8.89	4.62	400	30.09	5	8	13	234.14	104.33	264.23	76.11	After	93	265	G1, G2
Existing	Outbound	Emmet Road	1945	B 6442	9.14	9.68	4.71	459	17.82	13	16	29	58.97	67.37	76.79	49.8	Before	41	107.5	G1, G2
Existing	Outbound	Richmond Park	1946	B 5983	6.81	6.79	3.40	113	17.37	17	8	25	24.09	29.87	41.46	18.04	After	37	39	G1, G2, 58
Existing	Outbound	Camac Close	1947	B 5870	6.79	6.6	3.35	434	25.7	19	24	43	138.51	145.3	164.21	85.39	After	54	77.5	G1, G2, 58
Existing	Outbound	Grattan Crescent	2642	B 5436	5.61	5.75	2.84	200	12.13	10	6	16	34.53	48.56	46.66	30.95	Before	130	70	G1, G2
Existing	Outbound	Sarsfield Road	2643	E 310	6.75	6.61	3.34	430	12.6	4	10	14	53.12	63.99	65.72	48.31	After	53	115	G1, G2, 60
Existing	Outbound	Sarsfield Medical Centre	2644	B 4387	5.83	5.31	2.79	425	20.74	7	19	26	52.96	63.95	73.7	45.13	After	118	88	G1, G2, 60
Existing	Outbound	Longmeadows	2709	B 3962	9.29	9.71	4.75	445	10.91	4	10	14	48.9	53.27	59.81	41.64	Before	47	377	G1, G2
Existing	Outbound	Ballyfermot Road	2710	B 3517	8.57	10.43	4.75	137	12.9	8	8	16	18.14	26.84	31.04	14.7	After	65	57.3	G1, G2
Existing	Outbound	Markiewicz Park	2711	B 3380	8.57	10.36	4.73	280	9.66	4	9	13	38.35	39.18	48.01	30.34	After	221	147	G1, G2
Existing	Outbound	St. Raphael's National School	2712	B 3100	8.57	10.36	4.73	500	10.28	7	14	21	104.78	97.4	115.06	67.27	Before	33	125	G1, G2
Existing	Outbound	Convent Lawns	4414	D 225				780				0			0					60
Existing	Outbound	Ballyfermot Parade	2655	B 2600	3.86	4.33	2.05	379	33.58	54	30	84	159.98	106.43	193.56	69.97	After	122	12.5	S4, G1, G2
Existing	Outbound	Ballyfermot	2656	B 2221	4.74	5.06	2.45	311	32.14	38	23	61	135.43	80.56	167.57	41.76	After	100	135.6	S4, G1, G2, 60
Existing	Outbound	Ballyfermot Community Centre	2668	B 1910	9.29	10.5	4.95	303	19.18	4	13	17	178.25	54.42	197.43	43.99	After	35	154.5	S4, G1, G2
Existing	Outbound	Cleggan Park	2672	B 1607	6.58	7.23	3.45	339	22.44	7	11	18	81.5	64.71	103.94	34.91	Before	53	126.6	S4, G1, G2
Existing	Outbound	Cherry Orchard Industrial Estate	2673	B 1268	6.26	7.55	3.45	179	7.79	5	14	19	65.17	63.23	72.96	32.5	Before	128	64	S4, G1, G2
Existing	Outbound	Cherry Orchard Hospital	2206	B 1089	6.2	7.25	3.36	424	4.24	2	17	19	95.78	34.74	100.02	31.19	After	87	65.5	S4, G1, G2
Existing	Outbound	Coldcut Road	4798	B 665	2.77	2.75	1.38	605	22.15	14	11	25	292.93	91.39	315.08	65.45	After	87	82.7	S4, G1, G2, 80
New	Outbound	Cloverhill Road										0			0					
Existing	Outbound	Dublin Bus Sports	2674	B 60	8.64	10.71	4.84	390	15.49	3	11	14	80.05		95.54		After	68	54.7	S4, G1, G2, 80
New	Outbound											0			0					

		Outbound Bus Stop Review Outcome						
Inbound/Outbound	Bus Stop Name	Bus Stop Treatment	No. Bus Bays	Catchment	Permeability	Bus Shelter	Type of Bus Stop Island or Shared Bus Stop Landing	Design Rational
Outbound	High Street	Retain	Single	Increased	No change	Bus Shelter with no end panels	Shared bus stop landing	No Issue with existing stop location
Outbound	Thomas Street	Retain	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	No Issue with existing stop location
Outbound	Bridgefoot Street	Retain	Single	No Change	No change	Bus Shelter with no end panels	Shared bus stop landing	No Issue with existing stop location
Outbound	James Street	Retain	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	No Issue with existing stop location
Outbound	Steven's Lane	Retain	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	No Issue with existing stop location
Outbound	St. James Hospital	Retain	Single	No Change	No change	Standard bus shelter	Inline Bus Stop	No Issue with existing stop location
Outbound	Mount Brown	Retain	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	No Issue with existing stop location
Outbound	Old Kilmlainham	Retain	Single	Slight reduction, lost users are closer to LUAS Rialto stop	No change	Standard bus shelter	Inline Bus Stop	No Issue with existing stop location
Outbound	Emmet Road	Relocated	Single	No Change	No change	Standard bus shelter	Inline Bus Stop	Relocated to front of library to allow parking outside private residences
Outbound	Richmond Park	Retain	Single	No Change	No change	Standard bus shelter	Inline Bus Stop	No Issue with existing stop location
Outbound	Camac Close	Relocated	Single	Reduction, lost users are closer to Drimnagh LUAS Stop	No change	Standard bus shelter	Inline Bus Stop	Relocated to provide interchange between routes
Outbound	Grattan Crescent	Removed	Single	Increased	No change	Standard bus shelter	Inline Bus Stop	Stop to be removed to improve spacing between stops
Outbound	Sarsfield Road	Retain	Single	No Change	No change	Bus Shelter with no end panels	Inline Bus Stop	No Issue with existing stop location.
Outbound	Sarsfield Medical Centre	Relocated	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	Stop moved to improve spacing. Increased distance to last stop acceptable due to lack of trip origins and destination in the area
Outbound	Longmeadows	Relocated	Single	No Change	No change	Bus Shelter with no end panels	Shared bus stop landing	Stop moved to improve spacing
Outbound	Ballyfermot Road	Removed	Single	Increased	No change	Standard bus shelter	Island Bus Stop	Stop to be removed to improve spacing between stops
Outbound	Markiewicz Park	Relocated	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	No Issue with existing stop location
Outbound	St. Raphael's National School	Relocated	Single	Increased	No change	Bus Shelter with no end panels	Shared bus stop landing	Stop moved to improve spacing
Outbound	Convent Lawns	Relocated	Single	No Change	No change	New Standard bus shelter proposed	Island Bus Stop	To prevent buses stopping on both sides blocking traffic
Outbound	Ballyfermot Parade	Relocated	Single	No Change	No change	Standard bus shelter	Shared bus stop landing	No Issue with existing stop location
Outbound	Ballyfermot	Retain	Single	No Change	No change	Standard bus shelter	Island Bus Stop	No Issue with existing stop location
Outbound	Ballyfermot Community Centre	Relocated	Single	No Change	No change	Standard bus shelter	Island Bus Stop	Stop moved to improve spacing and avoid accesses to private residences
Outbound	Cleggan Park	Relocated	Single	Increased	No change	Standard bus shelter	Shared bus stop landing	Stop moved to improve spacing
Outbound	Cherry Orchard Industrial Estate	Removed	Single	No Change	No change	Standard bus shelter	Island Bus Stop	Stop to be removed to improve spacing between stops, due to the proximity of adjacent stops on at Cherry Orchard Hospital
Outbound	Cherry Orchard Hospital	Relocated	Single	No Change	No change	New Standard bus shelter proposed	Island Bus Stop	Relocated to improve distance to pedestrian crossing and inbound stop
Outbound	Coldcut Road	Retain	Single	No Change	No change	Standard bus shelter	Island Bus Stop	No Issue with existing stop location
Outbound	Cloverhill Road	New	Single	No Change	A path linking palmers drive would improve permeability	Bus Shelter with no end panels	Shared bus stop landing	New stop to improve spacing
Outbound	Dublin Bus Sports	Retain	Single	No Change	No change	Standard bus shelter	Island Bus Stop	No Issue with existing stop location
Outbound		New	Single	No Change	No change	New Standard bus shelter proposed	Island Bus Stop	New stop needed to reduce distance between stops and improve connection to the Liffey Valley Retail Park

		Propsoed Outbound Bus Stops									
			Distance		Interaction with Junctions and Ped Crossings			Network Redesign			
Inbound/Outbound	Bus Stop Name	New or Existing Bus Stop	New Distance (between Stops)	Chainage	Before/ After the Junction (in the direction of travel)	Bus Stop Distance from nearest Junction (m)	Distance to Pedestrian Crossing (m)	Routes that stop at each bus stop	Trip attactor	Cycle Parking	Lay-by or Onstreet Bus Stop
Outbound	High Street	Existing	276	B 8970	After	60	60	G1, G2, 23, 24, 87, 73		TBC	Onstreet
Outbound	Thomas Street	Existing	257	B 8694	Before	44	28	G1, G2, 73		TBC	Onstreet
Outbound	Bridgefoot Street	Existing	347	B 8437	Before	50	35	G1, G2, 73		TBC	Onstreet
Outbound	James Street	Existing	243	B 8090	Before	50	35	G1, G2, 73	Guinness Store House	TBC	Onstreet
Outbound	Steven's Lane	Existing	381	B 7847	Before	45	70	G1, G2, 73		TBC	Onstreet
Outbound	St. James Hospital	Existing	266	B 7466	After	43	60	G1, G2	St. James's Hospital	TBC	Onstreet
Outbound	Mount Brown	Existing	358	B 7200	After	150	40	G1, G2		TBC	Onstreet
Outbound	Old Kilmlainham	Existing	420	B 6842	After	38	10	G1, G2	National Childrens Hospital	TBC	Onstreet
Outbound	Emmet Road	Existing	439	B 6422	Before	83	>100	G1, G2		TBC	Onstreet
Outbound	Richmond Park	Existing	243	B 5983	After	37	45	G1, G2, 58	Richmond Park	TBC	Onstreet
Outbound	Camac Close	Existing	325	B 5740	Before	20	50	G1, G2, 58		TBC	Onstreet
Outbound	Grattan Crescent	Existing								TBC	Onstreet
Outbound	Sarsfield Road	Existing	669	E 310	After	53	>100	G1, G2, 60	Inchicore National School	TBC	Onstreet
Outbound	Sarsfield Medical Centre	Existing	550	B 4360	Before	30	60	G1, G2, 60	Longmeadoews GAA Club	TBC	Onstreet
Outbound	Longmeadows	Existing	425	B 3810	After	25	20	G1, G2	Longmeadows Pitch and Putt	TBC	Onstreet
Outbound	Ballyfermot Road	Existing	N/A							Yes	Onstreet
Outbound	Markiewicz Park	Existing	455	B 3385	Before	60	20	G1, G2	Markiewicz Park	TBC	Onstreet
Outbound	St. Raphael's National School	Existing	325	B 2930	Before	50	25	G1, G2	St. Rapheals National School	TBC	Onstreet
Outbound	Convent Lawns	Existing		D 280			63	60		Yes	Onstreet
Outbound	Ballyfermot Parade	Existing	380	B 2605	After	34	30	S4, G1, G2	Ballyfermot Village Centre	TBC	Onstreet
Outbound	Ballyfermot	Existing	380	B 2225	After	135	>100	S4, G1, G2, 60	Local Shops	Yes	Onstreet
Outbound	Ballyfermot Community Centre	Existing	355	B 1845	After	85	30	S4, G2, 60	Ballyfermot Community Centre	Yes	Onstreet
Outbound	Cleggan Park	Existing	440	B 1490	After	20	30	S4, G2		TBC	Onstreet
Outbound	Cherry Orchard Industrial Estate	Existing	N/A					S4, G2		Yes	Onstreet
Outbound	Cherry Orchard Hospital	Existing	385	B 1050	Before	58	33	S4, G2	Cherry Orchard Hospital, Cherry Orchard Induatrial Estate	Yes	Onstreet
Outbound	Coldcut Road	Existing	315	B 665	After	87	55	S4, G2, 80		Yes	Onstreet
Outbound	Cloverhill Road	New	290	B 350	After	119	>100	S4, G2, 80		TBC	Onstreet
Outbound	Dublin Bus Sports	Existing	290	B 60	Before	72	50	S4, G2, 80		Yes	Onstreet
Outbound		New		A 230	After	70	35	S4, W2, 80	Liffey Valley Shopping Centre	Yes	Onstreet

Appendix B. Bus Stop Catchment Maps





Legend

- Proposed Inbound Bus Stop
- Existing Inbound Bus Stop
- Proposed Pedestrian Crossing
- Attractor
- Proposed Stops 05 min. Catchments Limit
- Existing Stops 05 min. Catchments Limit
- Proposed Core Bus Corridor

Estimated Population in Building

- 2 - 10
- 11 - 30

0 50 100 200 300 400 500 m
BAR SCALE

Project Ireland 2040 Building Ireland's Future

Rev	Date	Drn	Chk'd	App'd	Description
00	24/09/2021	MCh	PT	JB	

Client: NTA Údarás Náisiúnta Iompair National Transport Authority

Consultant: Jacobs

Date	Scale @ A3	Drawn	Checked	Approved
27/09/2021	1:10 000	MCh	PT	JB

Project Code	Originator Code	QMS Code
32110900	JAC	

Project Title: BUSCONNECTS Core Bus Corridors

Drawing Title: Proposed Inbound Stops 05min. Catchment

Drawing File Reference	Sheet Number	Status	Rev
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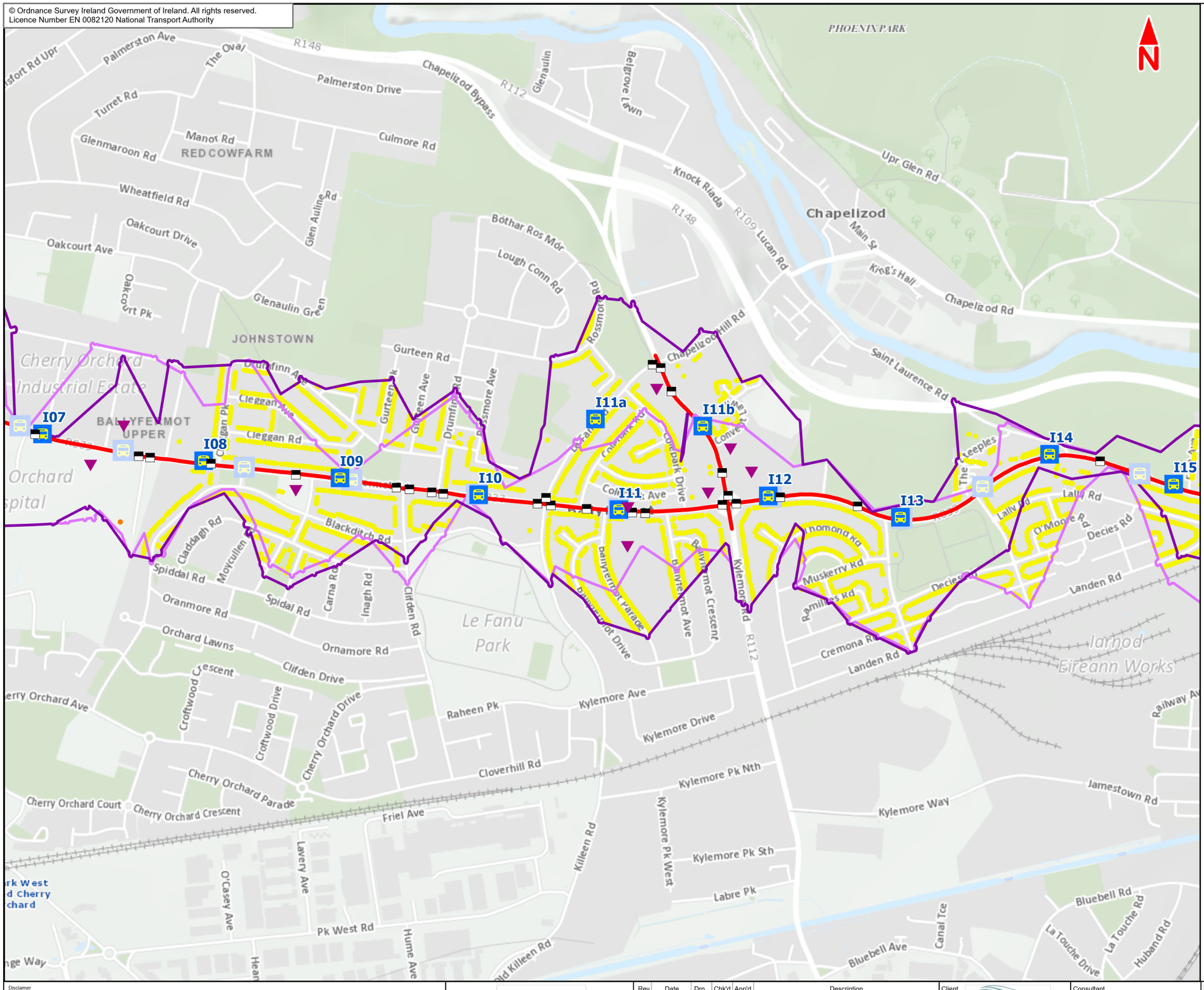

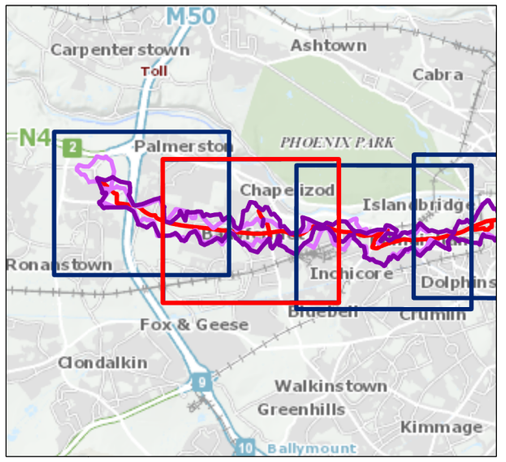

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32110900	JAC	

Project Title: BUSCONNECTS Core Bus Corridors

Drawing Title: Proposed Inbound Stops 05min. Catchment

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Sheet Number	Status	Rev
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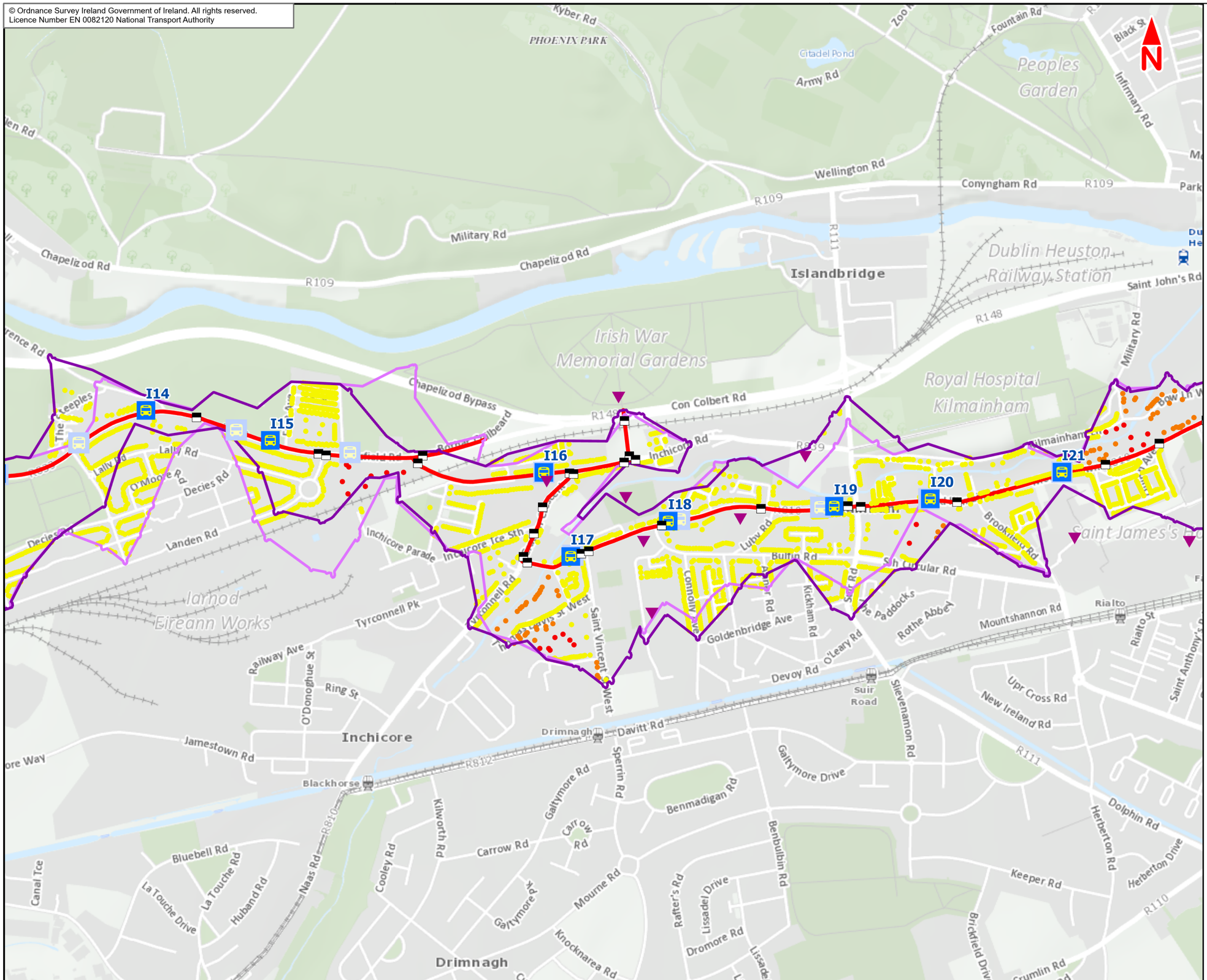

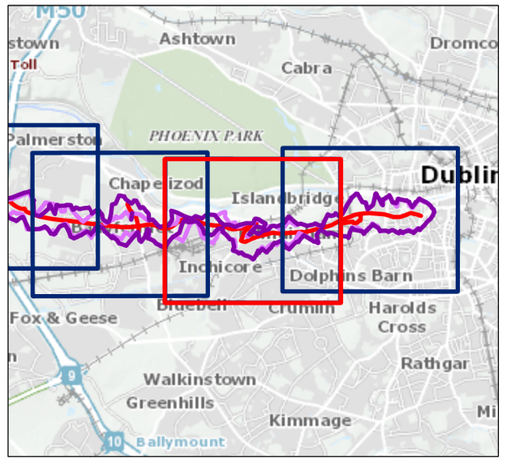

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32110900	JAC	

Project Title: BUSCONNECTS Core Bus Corridors

Drawing Title: Proposed Inbound Stops 05min. Catchment

Drawing File Reference	Sheet Number	Status	Rev
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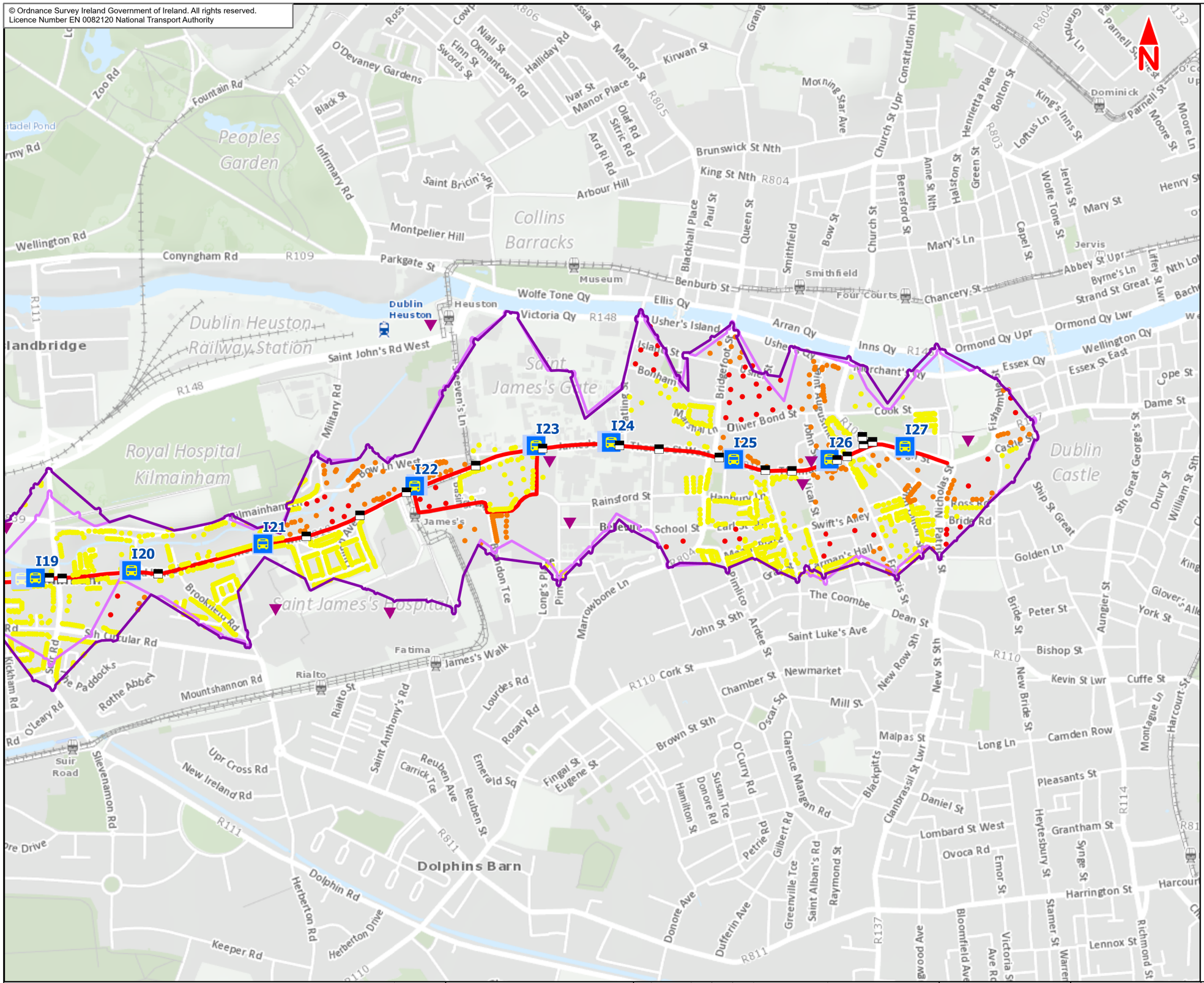

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BAR SCALE

Project Ireland 2040 Building Ireland's Future

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Client: NTA — Údarás Náisiúnta Iompair, National Transport Authority

Consultant: Jacobs

Date	Scale @ A3	Drawn	Checked	Approved
27/09/2021	1:10 000	MCh	PT	JB

Project Code	Originator Code	QMS Code
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Project Title: BUSCONNECTS Core Bus Corridors

Drawing Title: Proposed Inbound Stops 05min. Catchment

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Sheet Number	Status	Rev
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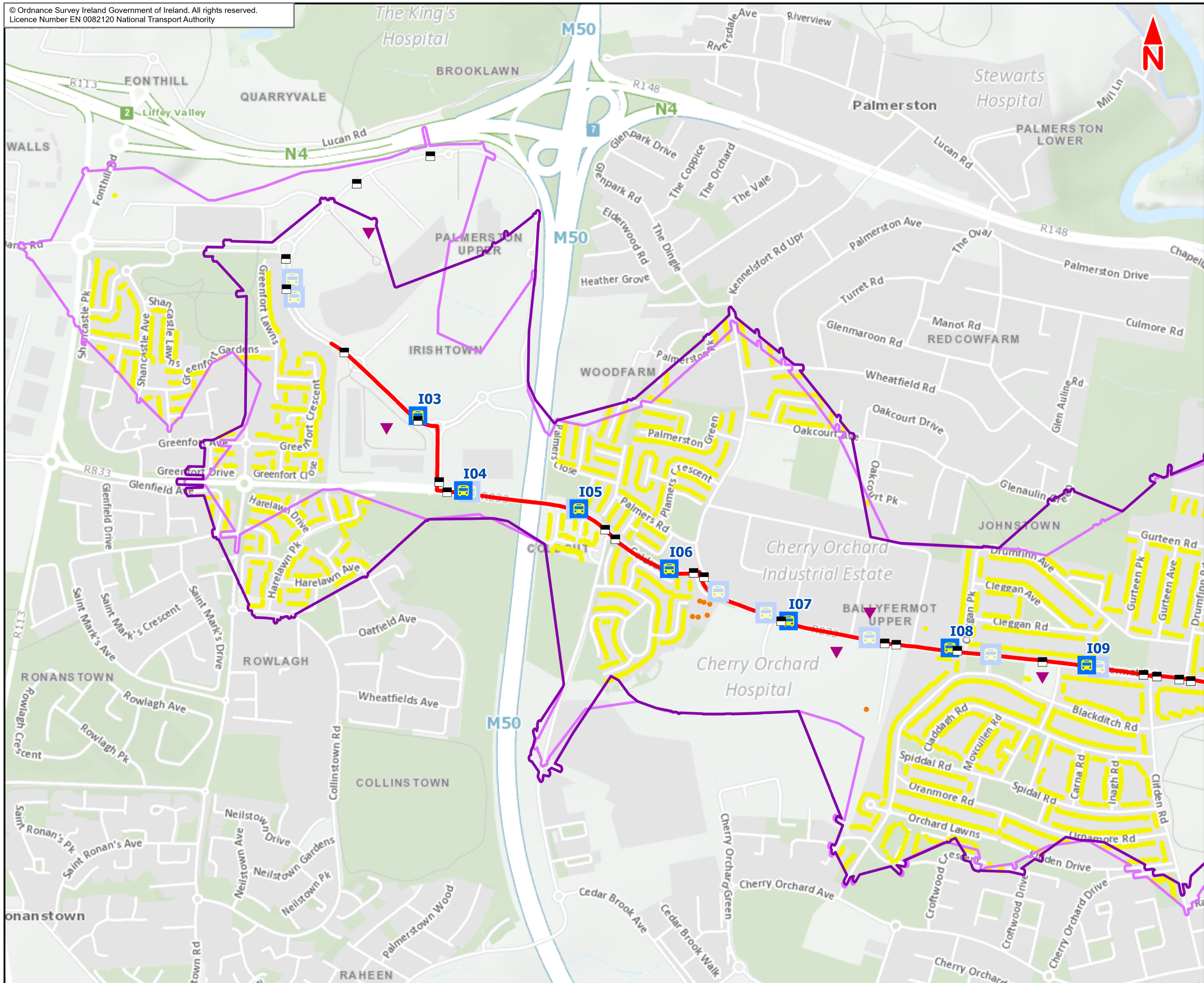

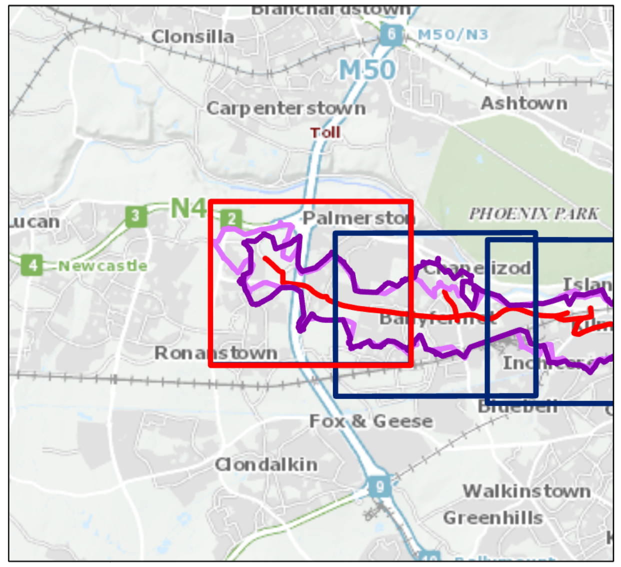

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Building Ireland's Future

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Client: NTA Údarás Náisiúnta Iompair National Transport Authority		Consultant: Jacobs			Project Title: BUSCONNECTS Core Bus Corridors
					Drawing Title: Proposed Inbound Stops 10min. Catchment
Date 27/09/2021	Scale @ A3 1:10 000	Drawn MCh	Checked PT	Approved JB	
Project Code 32110900	Originator Code JAC	QMS Code			Drawing File Reference \\gblon0vs01\GISProj\B3111200_BusConnects\10 - GIS\Working\MCh\BusCatchments Liffey Valley Jacobs\BusCatchments Liffey Valley Jacobs.aprx

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