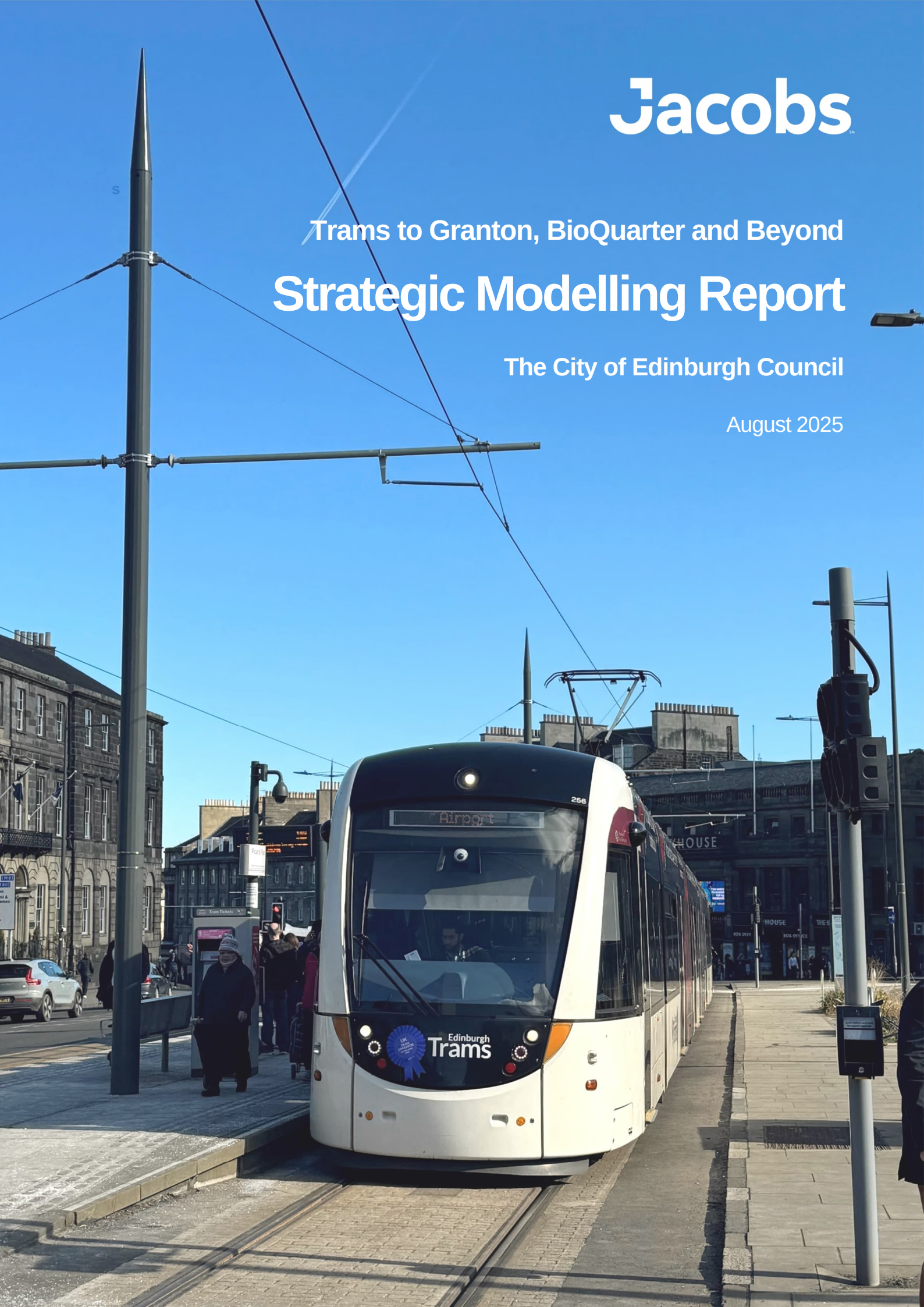

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Trams to Granton, BioQuarter and Beyond

Strategic Modelling Report

The City of Edinburgh Council

August 2025

Trams to Granton, BioQuarter and Beyond Strategic Modelling Report

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Contents

1. Introduction

1.1 Purpose of this Report

This report provides an overview of the updates made to the City of Edinburgh Council's strategic model of Edinburgh required to support the development of a Strategic Business Case (SBC) for Trams to Granton, BioQuarter and Beyond.

The report provides a brief history of model development, a review of the most recent land-use assumptions and the different scenarios modelled to support a comparison of Roseburn versus Orchard Brae corridor options.

Key changes made to the strategic model include:

- Model parameters (values of time, vehicle operating costs, fares)
- Zone connectors and parking charges
- Trip ends and development assumptions
- Do-Minimum, Reference Case and Do-Something bus routes
- Tram route alignment, stop locations and journey time assumptions

1.2 Background

The Council's model suite is based around a strategic VISUM model and associated VISSIM microsimulation models covering the city centre and key arterial corridors. Originally developed in 2005 to support the Airport-Newhaven tram business case, models have subsequently been updated with new traffic survey and planning data.

As part of the Trams to Newhaven project, the strategic model was updated with the latest planning data and re-calibrated with 2016 observed traffic count information. Planning assumptions were updated again in 2021 to support the development of City Plan 2030.

1.3 Proposed Route Options

The Trams to Granton, BioQuarter and Beyond route comprises of three sections.

Two alternative alignments between the city centre and Granton are being considered: one off-street via the Roseburn Path and one on-street via Orchard Brae and Crewe Road South. Both options serve the Western General Hospital and planned major development at Granton Waterfront.

To the south east, between the city centre and the BioQuarter, a single route is proposed via North and South Bridge, Minto Street / Craigmillar Park, Lady Road and Cameron Toll. This provides connectivity to the University of Edinburgh, Cameron Toll shopping centre, the Royal Infirmary and BioQuarter.

Beyond the BioQuarter, a connection to Shawfair railway station has been assumed in all transport modelling / passenger forecasting, although an alternative route / future extension to Queen Margaret University via Craigmillar is also possible.

The rationale for a link to Shawfair is the connectivity to the Borders Railway that this provides. A tram connection provides important regional connectivity, linking the rail network to the Royal Infirmary, the BioQuarter, and south Edinburgh.

A link to Shawfair would require a 1.5km extension into Midlothian. Should this connection not proceed, the strategic case for tram to the BioQuarter is still strong. Bus Rapid Transit could also be implemented beyond the BioQuarter providing a range of strategic public transport connections.

Each tram section is shown in Figure 1.1.

Figure 1.1: Trams to Granton, BioQuarter and Beyond Route

Tram alignments and stop locations are subject to change as candidate designs are refined throughout the later stages of the business case development. For the purposes of the modelling assessment, the following tram stop locations have been assumed from north to south:

Granton (via Roseburn)

- Roseburn
- Craigleith
- Telford Drive (for WGH)
- Crewe Toll - Roseburn Path
- West Pilton
- Caroline Park
- Saltire Square
- Granton Square

**Within Midlothian*

Granton (via Orchard Brae)

- Queensferry Street
- Queensferry Road
- Comely Bank
- Western General Hospital
- Crewe Toll - Telford Road
- West Pilton
- Caroline Park
- Saltire Square
- Granton Square

South East

- North Bridge
- Nicolson Street
- Newington
- Mayfield Gardens
- Cameron Toll
- The Inch
- Royal Infirmary
- BioQuarter
- The Wisp
- *Millerhill Road**
- *Shawfair Station**

2. Strategic Model

2.1 Model Overview

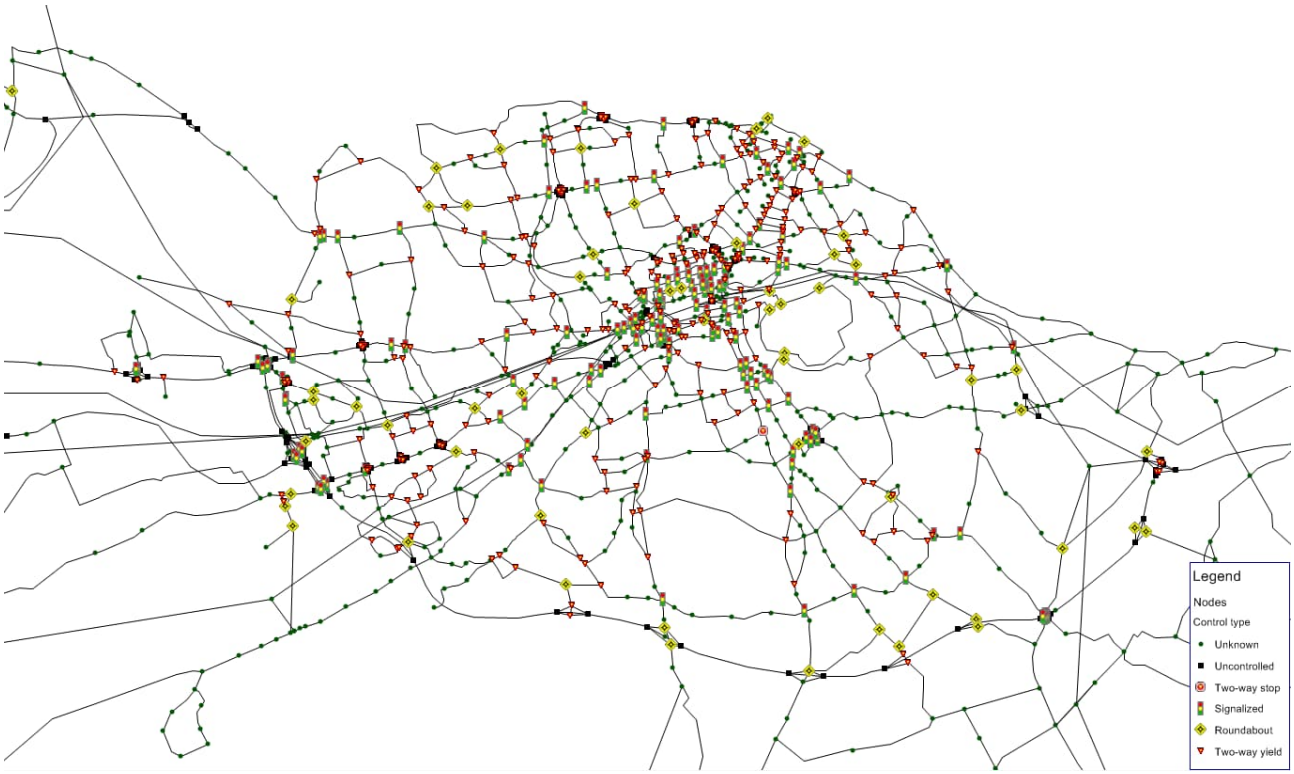
The Edinburgh Strategic Model is a 4-stage multi-modal model, including highway, bus, rail and tram public transport modes. Originally developed between 2006 and 2008, it has subsequently been re-calibrated to a 2016 base year.

Although focused on Edinburgh, the model also covers all major commuting catchments to the city and strategic movements from the rest of Scotland. Road and rail links across the whole of mainland Britain, necessary to allow traffic to travel to/from the study area, are also included. Demand matrices include all traffic to, from and through the study area.

The model is incremental using both observed and demand model matrices. To make best use of observed data, demand models are never applied directly. Instead, the difference between the base demand matrix and the future demand matrix are added to the observed base matrix to create the forecast matrix used in the assignment.

FUTURE YEAR DEMAND = 2016 BASE OBSERVED + (FUTURE YEAR DEMAND MODEL – 2016 DEMAND MODEL)

Figure 2.1: Edinburgh Strategic Model Network



2.1.1 Model Years

The observed model has been re-calibrated to a 2016 base year. Existing forecast years are 2022 and 2032, the latter being consistent with Transport, Economic and Land-Use Model of Scotland (TELMoS) land use data.

2.1.2 Time Periods

The model represents a typical midweek day during a neutral month; it includes the following time periods:

- morning period, 07:00-09:00
- interpeak, 10:00-12:00, and
- evening period, 16:00-18:00

2.1.3 Model Zones

The zoning system covers the whole of the mainland Britain and is based on the Transport Model for Scotland (TMfS) structure. The use of TMfS zoning as a starting point helps maintain consistency with that model and ensures correspondence with existing Census Output Areas and Postcode Districts. TMfS zones have been aggregated outside the study area, where additional detail is not required, and disaggregated in areas close to the route of the tram and where major future development is anticipated.

The zone structure within the City of Edinburgh is shown in Figure 2.2.

Figure 2.2: Strategic Model Zone System

2.2 Network

Within Edinburgh, the modelled network includes representations of all significant through roads. The basis for this network is OS road centre-line data. This dataset represents a de-facto national standard which guarantees a minimum level of geographical and topological accuracy, sufficient for the requirements of the model.

Outside Edinburgh, the highway network has been modelled sufficiently in order to allocate traffic travelling to Edinburgh along the appropriate corridor. The basis for this part of the network is the TMfS network extents. Some degree of generalisation has been carried out to avoid unnecessary detail within other town and city centres.

Junctions have been explicitly modelled where possible, improving route choice through the model. Coding was significantly updated as part of the last model re-calibration.

The public transport network contains an extensive representation of the bus and rail services operating in the region. All local bus and rail services, and long-distance services with either stopping points or terminating points within Edinburgh are included.

Base model bus stops and routes are based on 2016 data. Do-Minimum, Reference Case and Do-Something models reflect December 2024 timetable data.

The full Airport to Newhaven is represented within the Do-Minimum model, peak and off-peak frequency is assumed to be eight trams per hour.

2.3 Observed Model

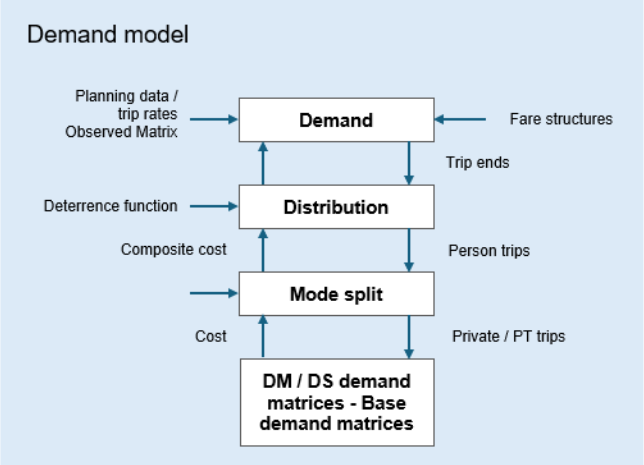
The observed highway model was previously re-calibrated to 2016 SEPA count data. In addition, new public transport count data was collected along the route of the proposed Newhaven tram extension, with public transport flows re-calibrated to both existing and new data sets.

The observed model is unchanged for this study.

2.4 Demand Model

Demand in the model is generated at zone level, with the latest planning and development information assigned to create zone productions and attractions. Zone information includes:

- Housing (units)
- Office / Business (sqm)
- Retail (sqm)
- Commercial / Leisure (sqm)
- Hotels (beds)



2.5 Trams to Newhaven Update

As part of the business case development for Trams to Newhaven, in 2016 the strategic model was re-calibrated with new traffic count information. Additionally, the zoning system was refined to provide more detail in the areas of the city designated for major development. These included: the Airport, A71 Park & Ride, Burdiehouse and development areas within West Edinburgh. The new zone numbers associated with these locations are listed in Table 2.1.

Table 2.1: 2016 Revised Model Zone Numbering

Location	2005 Zone	New 2016 Zones
Burdiehouse	186	1861 and 1862
A71 P&R	223	2231, 2232 and 2233
East of Milburn	226	2261 and 2262
IBG	230	2301, 2302 and 2303
West Craigs	232	2321, 2322, 2323 and 2324
Ratho	235	2351, 2352, 2353, 2354, 2355, 2356, 2357 and 2358
RHASS	240	2401 and 2402
Airport	243	2431 and 2432

Within Edinburgh, development assumptions were updated based on available information, and discussions with council officers. Updates focussed on major sites including: St James Quarter, St Andrew Square, New Waverley, Quartermile, Morrison Street and Edinburgh Park. A comprehensive update of forecast housing completions was undertaken and airport growth was also updated to reflect then current growth rates.

For zones outside Edinburgh, future year development growth was based on relevant TELMoS factors.

2.6 City Plan 2030

In 2021 the strategic model was model was used to assess alternative options identified as part of City Plan 2030. As part of this exercise, an extensive list of proposed development was collated, with productions and attractions updated in the relevant zones within the city. Due to the detailed review of proposed developments, if an Edinburgh city zone did not have any development planned by 2030 then no changes to the zone assumptions were applied (i.e. the TELMoS growth factor was not applied).

For external zones, TELMoS growth factors were used as a proxy for forecast year background growth.

2.7 2025 Trams to Granton, BioQuarter and Beyond

For this workstream, 2030 City Plan assumptions have been refined based on evidence of build out rates over the past four years and known changes (e.g. within West Edinburgh). Development assumptions across neighbouring local authorities are based on respective Local Development Plans (LDPs), namely: East Lothian, Midlothian, West Lothian and south Fife. The detailed review of the LDPs means that TELMoS growth factors have not been applied within the Edinburgh travel to work area.

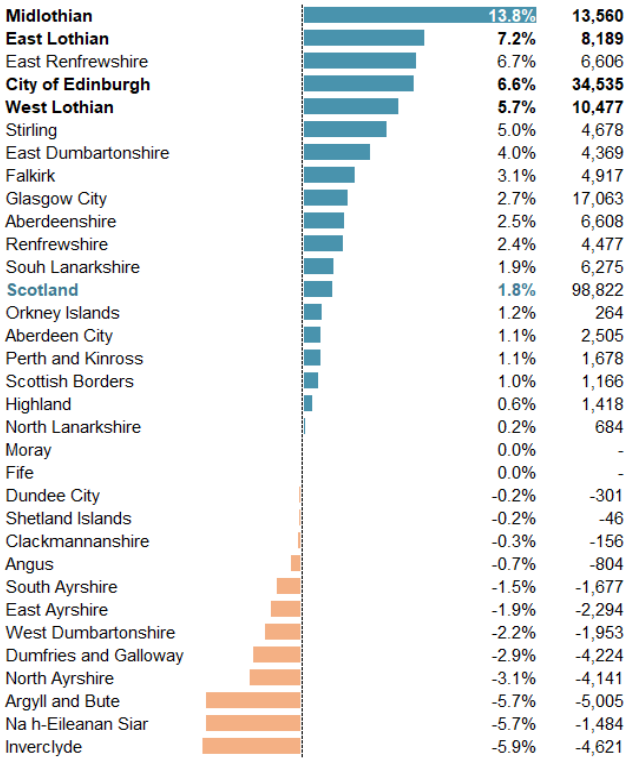
Within the city boundary, key changes to the development assumptions included amendments at: Ocean Terminal, Granton Waterfront, West Edinburgh, Edinburgh Park, Leonardo, Scottish Widows, BioQuarter, Shawfair and Edinburgh's hospitals.

3. Base and Future Year Development Assumptions

3.1 Overview

Tram is a key enabler to future development and economic growth. A significant proportion of Scotland's population growth is anticipated to occur in Edinburgh and the surrounding region. This is shown in the Scottish Government's regional population growth estimates for 2028 (Figure 3.1), noting Midlothian, East Lothian, the City of Edinburgh and West Lothian make up four of the top five regions of growth when net migration is added to natural change.

Figure 3.1: Scottish Forecast Growth by Region
***Source**: Scottish Government*



(https://www.gov.scot/publications/supporting-enabling-sustainable-communities-action-plan-address-depopulation/pages/3/)

Trams to Granton, BioQuarter and Beyond helps connect major developments across Edinburgh, as shown in Figure 3.2. The expanded tram network helps link housing and employment at Granton, BioQuarter and Shawfair to Edinburgh airport, Edinburgh Park and the city centre, with possible future extensions further into Midlothian and towards Queen Margaret University in East Lothian.

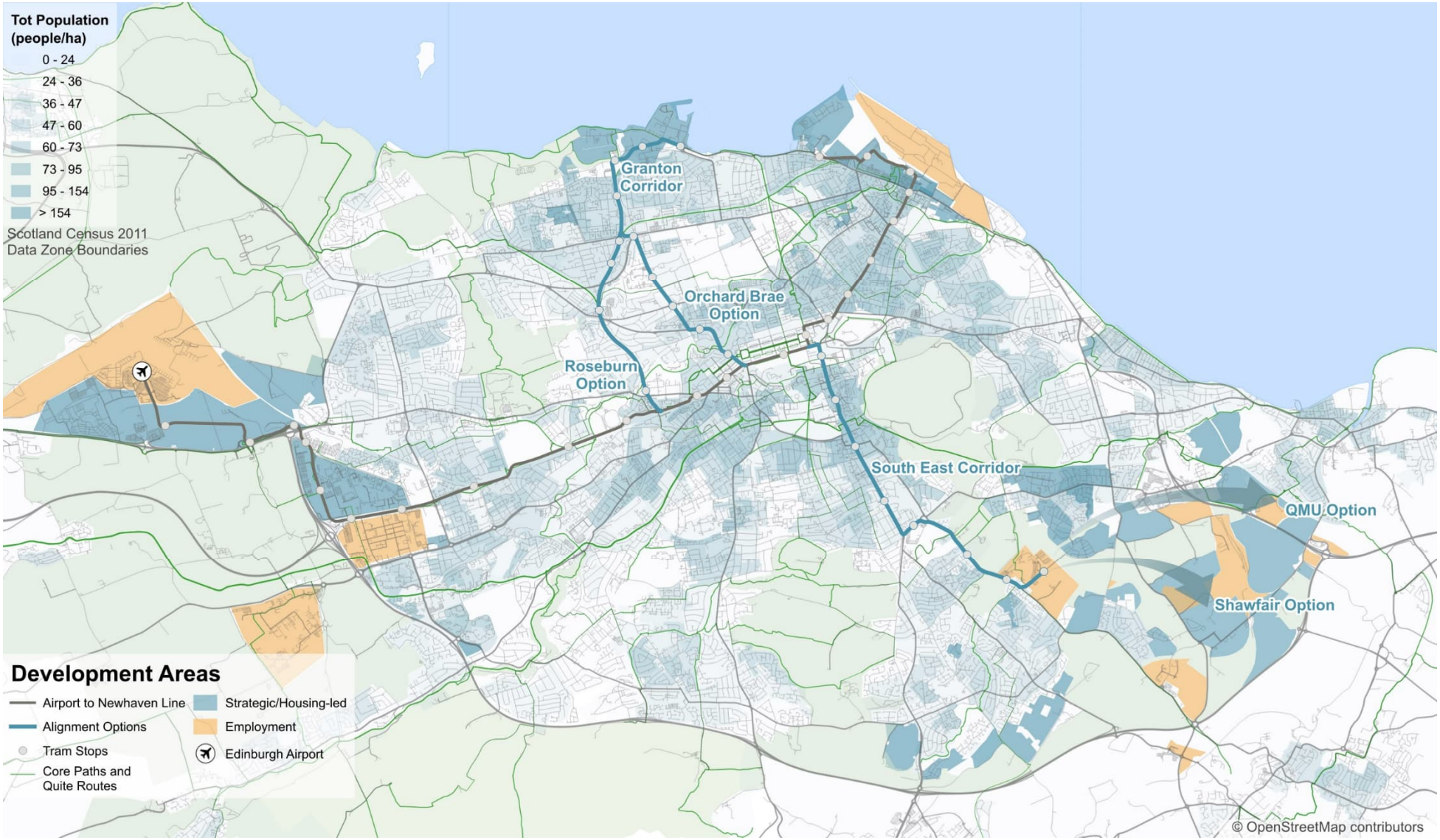
Improved connectivity enables developments to build out more quickly and at higher densities, while encouraging mode shift to sustainable modes.

Future development is a key driver of tram patronage alongside existing housing and employment. Future forecasts are based on work previously undertaken to support City Plan 2030. A further Edinburgh-wide review of major development proposals has been undertaken, including housing, office/retail, leisure and hotel facilities. In addition, a review of neighbouring authorities' LDPs has been undertaken. A key focus has been to understand actual build out rates between 2016 and now, taking cognisance of the impact of Covid over previous assumptions.

Within the model, future travel demand is derived from origin and destination trip ends. Origin trips are based on the number of houses in each model zone. Destination trips are derived from the number of employment places in each zone (either direct values or the size of office space (sqm), shopping or commercial space (sqm).

The development of future land use assumptions, supporting each future model year, is outlined in the following sections.

Figure 3.2: Tram Alignment and Edinburgh's Development Areas



3.2 Model Representation of Future Growth

The City of Edinburgh Model is Incremental. This means that future year forecasts pivot off fixed observed trip matrices. The demand calculation is as follows:

FUTURE YEAR = 2016 BASE OBSERVED + (FUTURE YEAR DEMAND MODEL – 2016 DEMAND MODEL)

Future year development forecasts for years 2022, 2032 and 2042 are calculated. These are then subtracted by a 2016 forecast year. This Delta (the difference) is then added to the 2016 observed matrices to create each future year demand. The advantage of this approach, compared with a full Demand Model, is that the base year is more accurately represented. A potential downside is that the model is less flexible in testing very major changes in travel patterns or future growth.

While there has been significant growth across Edinburgh over the last 20 years, the general pattern of travel demand has remained similar. Although there has been significant growth around Edinburgh Park and along the Waterfront, the city centre remains the key driver of public transport demand.

The model has been used to successfully estimate future tram demand, both for the original route and for the completion of Trams to Newhaven.

Given the above, and the updates described below, the model is considered a suitable tool to assess future Trams to Granton, BioQuarter and Beyond demand at this SBC stage. A comprehensive update / rebuild is recommended as part of the development of an Outline Business Case (OBC).

3.3 2016 Planning Baseline and Future Years

The Trams to Newhaven project re-calibrated the 2005 JRC model to a 2016 model year. Therefore, all growth assumptions pivot from 2016.

Historically, future year forecasts were developed for years 2022 and 2032, reflecting available planning data horizons for the city. For this assessment, a further 2042 future year has been developed, primarily based on the council's City Plan 2030 strategy. A summary of assumptions for each forecast year is given in Appendix A.

Previous versions of the model applied TELMoS growth factors to all zones outside Edinburgh. For this update, as explained in Section 2.4, growth across East Lothian, Midlothian, West Lothian and south Fife has been based on available LDP assumptions.

The Incremental process requires that the 2016 Demand Model is consistent with each future year so that correct Delta values are calculated for each. This has therefore been locally updated to reflect the revised forecasting methodology.

3.4 2022 Development Year

Development assumptions for the year 2022 reflect real-world growth and the impact of Covid reducing housing build out rates from previous estimates. Key changes within the city have included:

- a focus on increased employment within the city centre but with reduced employment at Edinburgh Park;
- reduced housing build out rates at Granton, Leith Waterfront and Shawfair;
- slower development around the BioQuarter than previously assumed;
- reduced office and retail development at Ocean Terminal; and
- increased employment and education at Queen Margaret University.

A retrospective review of actual build out rates has also been undertaken for East Lothian, Midlothian, West Lothian and south Fife. This has resulted in greater accuracy as to the location and number of new housing units; previously generic growth rates were spread across multiple zones. A summary is given in Table 3.1, full details are given in Appendix B.

Table 3.1: Neighbouring Local Authority Housing Completions 2016-2022

	East Lothian	Midlothian	West Lothian	South Fife
Completions by 2022	1,850	3,800	4,700	1,950
LDP Total Units	10,250	13,000	23,650	10,150
% Completions	18%	29%	20%	19%

Note that in East Lothian there has been significant housing development around Haddington, North Berwick and Dunbar. Major new housing developments in the vicinity of Queen Margaret University have started more recently, post-2022, reducing the total number of completions within the period.

Changing employment patterns have been harder to determine. The model update reflects increased employment at major university campuses in East and Midlothian; it also reflects reduced employment in Leith resulting from the transition away from light industrial sites around Bonnington to new higher density residential development. But elsewhere, due to limited data availability, employment patterns have been assumed to be largely unchanged.

3.5 2032 and 2042 Future Years

3.5.1 2032 Future Year

Both 2032 and 2042 future year development assumptions were previously created to support the development of City Plan 2030. Year 2032 reflects the then current 2016 Local Development build out (and was effectively the City Plan Do-Minimum).

The 2032 spatial strategy, illustrated in Figure 3.3, aims to meet three key challenges, climate change, demographic change and sustainable economic growth.

Major new development sites include:

- City Centre - shopping and entertainment, offices, transport and housing;
- Waterfront - mixed use regeneration;
- South East - regeneration, housing; and
- West Edinburgh / Edinburgh Park Phase 2 - business and housing.

Seven special economic areas are identified of national or strategic economic importance, with the potential to provide a significant employment, including Edinburgh BioQuarter, Riccarton Campus, Leith Docks, the International Business Gateway and Edinburgh Airport

Major new housing and mixed-use sites include:

- Granton Waterfront
  - Forth Quarter (1,800 units) - housing-led mixed-use regeneration opportunity
  - Central Development Area (2,050 units) housing-led mixed-use development
  - Granton Harbour (1,980 units) - opportunity for housing-led mixed-use development
- Cammo / West Craigs (700 + 2,000 units) - housing led developments
- Brunstane (1,300 units) - housing-led development on land to the south of Brunstane Burn
- Burdiehouse (950 units) - at Broomhills and Burdiehouse
- Queensferry (1,300 units) - housing led development Builyeon Road / Scotstoun

Development build out assumptions have been reviewed and agreed by CEC officers over multiple iterations, reflecting best estimates. Housing build out rates are always more accurate, as these can (COVID-excepted) typically be estimated many years in advance. Office, shopping and leisure developments are more susceptible to changes in market conditions.

3.5.2 2042 Future Year

The 2042 forecast year is based on 2032, but with additional City Plan 2030 growth. City Plan was adopted in November 2024; it is the current local development plan for Edinburgh.

The City Plan strategy is to focus on brownfield development sites across the city, with targeted greenfield expansion in West Edinburgh. Total brownfield capacity is estimated to deliver approximately 13,000 residential units. Additional strategic urban sites include:

- Expansion at BioQuarter;
- Land at Seafield;
- Garden District (Redheughs Village); and
- Maybury Quarter Edinburgh (Land at Turnhouse Road) [formerly Saica].

Further to the above, City Plan 2030 including the reclassification of the International Business Gateway (IBG) site for residential development (West Town) and the densification of other West Edinburgh sites.

The scale of development within West Edinburgh is significant with proposals for over 16,000 new homes. This equates to an increased population of approximately 36,000 – similar to the size of Stirling. With 7,000 units and a potential population of over 14,000, West Town alone is of a similar scale to Linlithgow (population approximately 13,000).

Table 3.2: Scale of West Edinburgh Development

Site	Houses	Population	Cumulative	Similar Population
Cammo	650	1,370		
West Craigs	1,780	3,750		
IBG1	300	630		
West Town	7,000	14,770	<<	Linlithgow
Elements	2,500	5,270	25,790	Elgin
IBG3 / Other	1,000	2,110		
Maybury Quarter Edinburgh	1,000	2,110		
Edinburgh Park	1,800	3,800		
Redheughs Village	1,320	2,780	36,590	Stirling

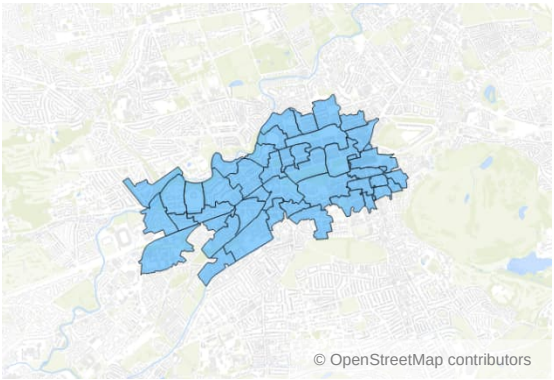
3.6 Summary of Development Growth by City Area

A summary of development growth across key areas of the city is summarised in the sections below.

3.6.1 City Centre

Approximate 10% increase in employment between 2022 and 2032. Continued increase in shopping and leisure floorspace relates to new development proposals in the west of the city centre, e.g. Haymarket and Fountainbridge.

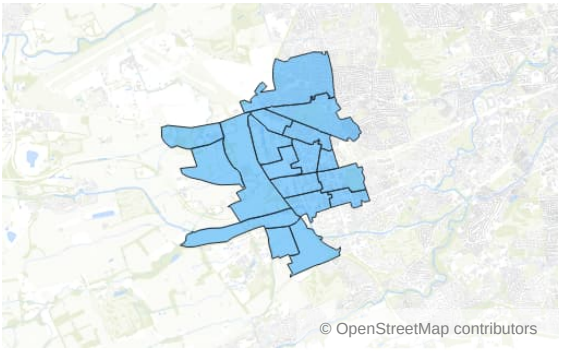
	2016	2022	2032	2042
Households	15,615	15,727	17,884	17,884
Employment	71,282	71,741	80,150	80,526
Education	3,435	3,423	3,523	3,572
Shopping (m^2)	343,469	341,730	440,575	466,184
Leisure (m^2)	300,026	307,645	403,124	446,271



3.6.2 West Edinburgh / Edinburgh Park

Short term reduction in employment between 2016 and 2022 reflects reduced demand at Edinburgh Park. Longer term increase in households and shopping / leisure driven by new development at adjacent to Edinburgh Park Station.

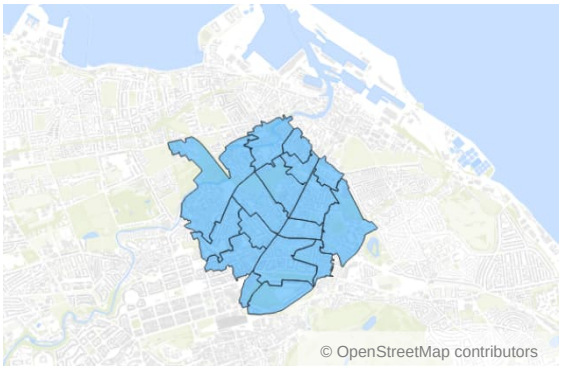
	2016	2022	2032	2042
Households	5,794	5,998	7,451	9,399
Employment	39,883	37,353	44,115	48,627
Education	2,307	2,273	2,332	2,361
Shopping (m^2)	30,728	34,444	43,274	49,117
Leisure (m^2)	15,259	17,340	21,467	23,301



3.6.3 Leith Walk and Bonnington

Reduction in employment is a result of the re-development of light industrial and commercial sites for residential, particularly around Bonnington Road.

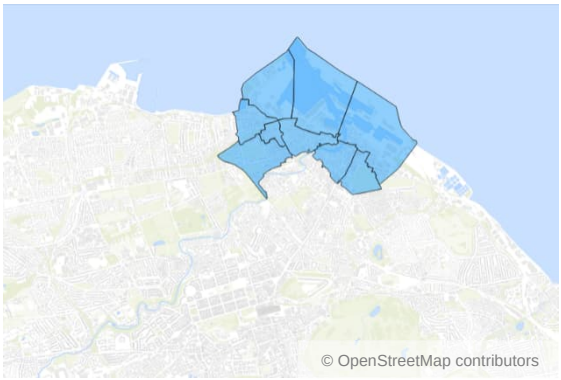
	2016	2022	2032	2042
Households	16,526	17,285	20,933	22,162
Employment	17,661	16,781	16,086	16,086
Education	239	240	250	255
Shopping (m^2)	40,624	36,584	33,281	32,228
Leisure (m^2)	73,574	68,047	70,048	71,118



3.6.4 Leith and Western Harbour

Growth around Leith and Western Harbour is driven by major new housing. Additional shopping and leisure is supporting mixed use development.

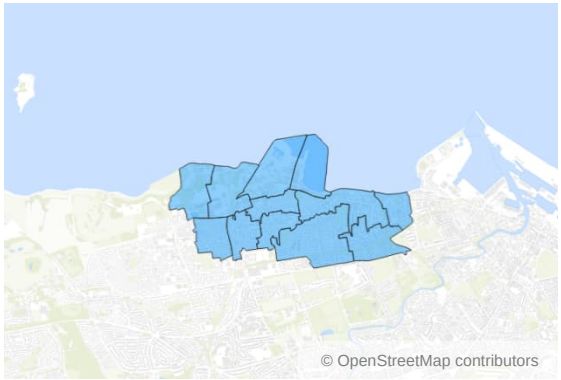
	2016	2022	2032	2042
Households	8,084	9,233	12,543	13,274
Employment	10,870	10,340	9,520	9,520
Education	154	152	155	157
Shopping (m^2)	25,209	24,830	36,883	49,295
Leisure (m^2)	10,453	9,812	20,434	31,145



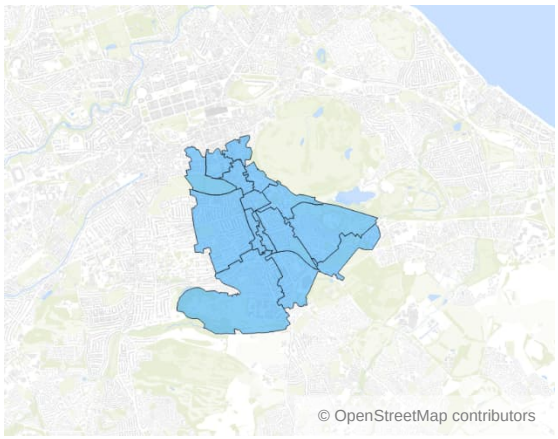
3.6.5 Granton Harbour

As above, growth around Granton and Granton Harbour is driven by major new housing. Additional shopping and leisure is supporting mixed use development.

	2016	2022	2032	2042
Households	9,662	10,116	16,757	16,757
Employment	4,877	4,649	4,669	4,669
Education	-	-	-	-
Shopping (m^2)	2,082	1,781	10,623	10,610
Leisure (m^2)	1,158	981	4,565	4,458



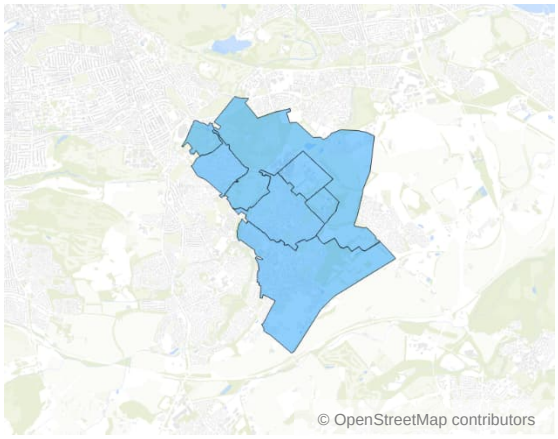
3.6.6 Southside and Newington



Limited development opportunities mean that the number of households and employment in the Southside and Newington are relatively stable across all future years. Retail is anticipated to decline slightly over time as observed in other local centres and high streets.

	2016	2022	2032	2042
Households	13,624	13,727	14,629	15,004
Employment	22,973	22,844	24,179	24,179
Education	18,087	17,977	18,447	18,669
Shopping (m^2)	103,527	95,848	87,613	88,181
Leisure (m^2)	37,048	36,581	40,489	43,102

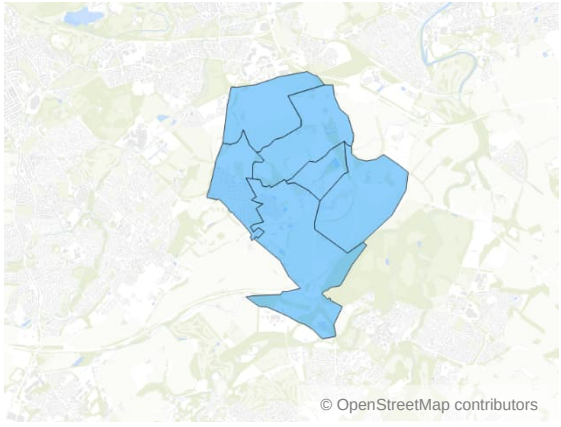
3.6.7 BioQuarter and Craigmillar



Growth in this sector captures the re-development of Craigmillar and Greendykes. But the BioQuarter is the major driver of increased households and employment. Future development assumptions have been informed by discussions with the University of Edinburgh.

	2016	2022	2032	2042
Households	6,433	6,884	9,639	10,889
Employment	6,865	7,655	11,808	14,608
Education	560	608	623	631
Shopping (m^2)	1,485	1,468	1,303	1,205
Leisure (m^2)	928	970	820	695

3.6.8 Shawfair and Millerhill



Shawfair and Millerhill development is focussed around a range of development densities and a local town centre.

	2016	2022	2032	2042
Households	1,402	2,291	4,079	6,064
Employment	931	1,706	2,420	3,753
Education	-	-	-	-
Shopping (m^2)	6,487	8,992	9,216	8,727
Leisure (m^2)	2,542	4,591	4,382	3,986

3.7 Summary of Future Growth

A summary of future household and employment growth by area is given in Tables 3.3 and 3.4 below.

Table 3.3: Future Households

	Prev 2016	Rev 2016	2022	2032	2042
Edinburgh (total)	234,059	219,984	229,274	266,578	279,810
City Centre	16,685	15,615	15,727	17,884	17,884
West Edinburgh & Edinburgh Park	5,721	5,794	5,998	7,451	9,399
Leith Walk & Bonnington	18,686	16,526	17,285	20,933	22,162
Leith Walk & Western Harbour	8,479	8,084	9,233	12,543	13,274
Granton	10,119	9,662	10,116	16,757	16,757
Southside & Newington	15,338	13,624	13,727	14,629	15,004
BioQuarter & Craigmillar	6,925	6,433	6,884	9,639	10,889
Shawfair & Millerhill	1,772	1,402	2,291	4,079	6,064
Midlothian	38,308	31,985	37,301	39,130	39,493
East Lothian	45,558	40,067	41,600	46,697	51,116
West Lothian	71,064	64,941	67,348	79,223	83,453
Fife	156,914	150,295	152,873	157,857	167,877
Borders	49,042	47,378	47,967	50,971	54,571

Table 3.4: Future Employment

	Prev 2016	2016	2022	2032	2042
Edinburgh (total)	289,404	295,697	290,801	321,695	331,240
City Centre	70,313	71,282	71,741	80,150	80,526
West Edinburgh & Edinburgh Park	40,414	39,883	37,353	44,115	48,627
Leith Walk & Bonnington	17,661	17,661	16,781	16,086	16,086
Leith Walk & Western Harbour	10,870	10,870	10,340	9,520	9,520
Granton	5,030	4,877	4,649	4,669	4,669
Southside & Newington	23,164	22,973	22,844	24,179	24,179
BioQuarter & Craigmillar	3,287	6,865	7,655	11,808	14,608
Shawfair & Millerhill	1,659	931	1,706	2,420	3,753
Midlothian	31,026	24,406	26,697	57,682	91,815
East Lothian	27,193	24,172	25,541	26,080	30,580
West Lothian	65,774	64,012	66,731	68,849	68,849
Fife	122,545	124,761	122,495	123,568	123,568
Borders	37,701	34,903	37,585	36,147	36,147

Figures 3.3 and 3.4 illustrate the percentage growth in housing from 2016 for future years 2032 and 2042 by model zone.

Figure 3.3: 2032-2016 Household Growth (%)

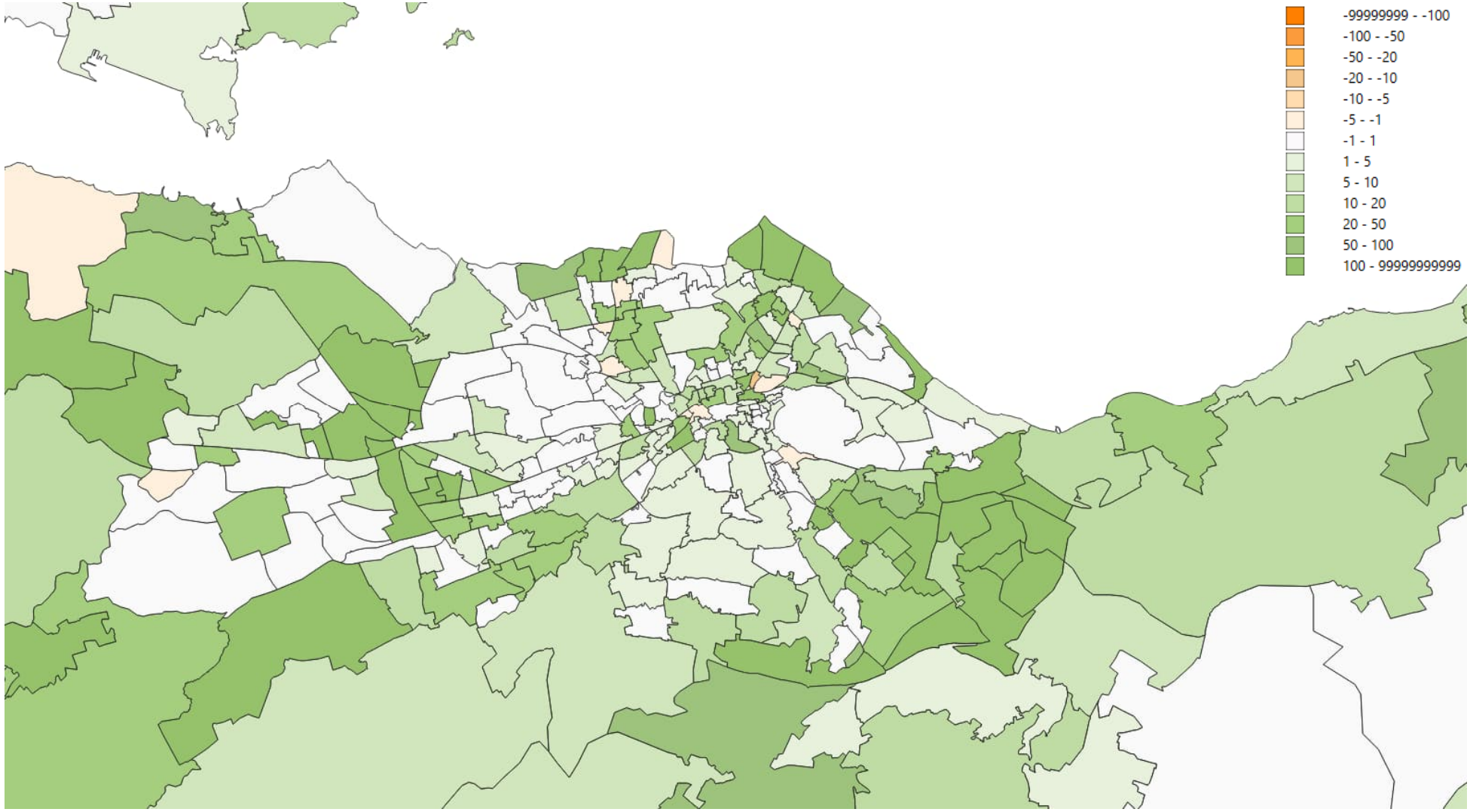
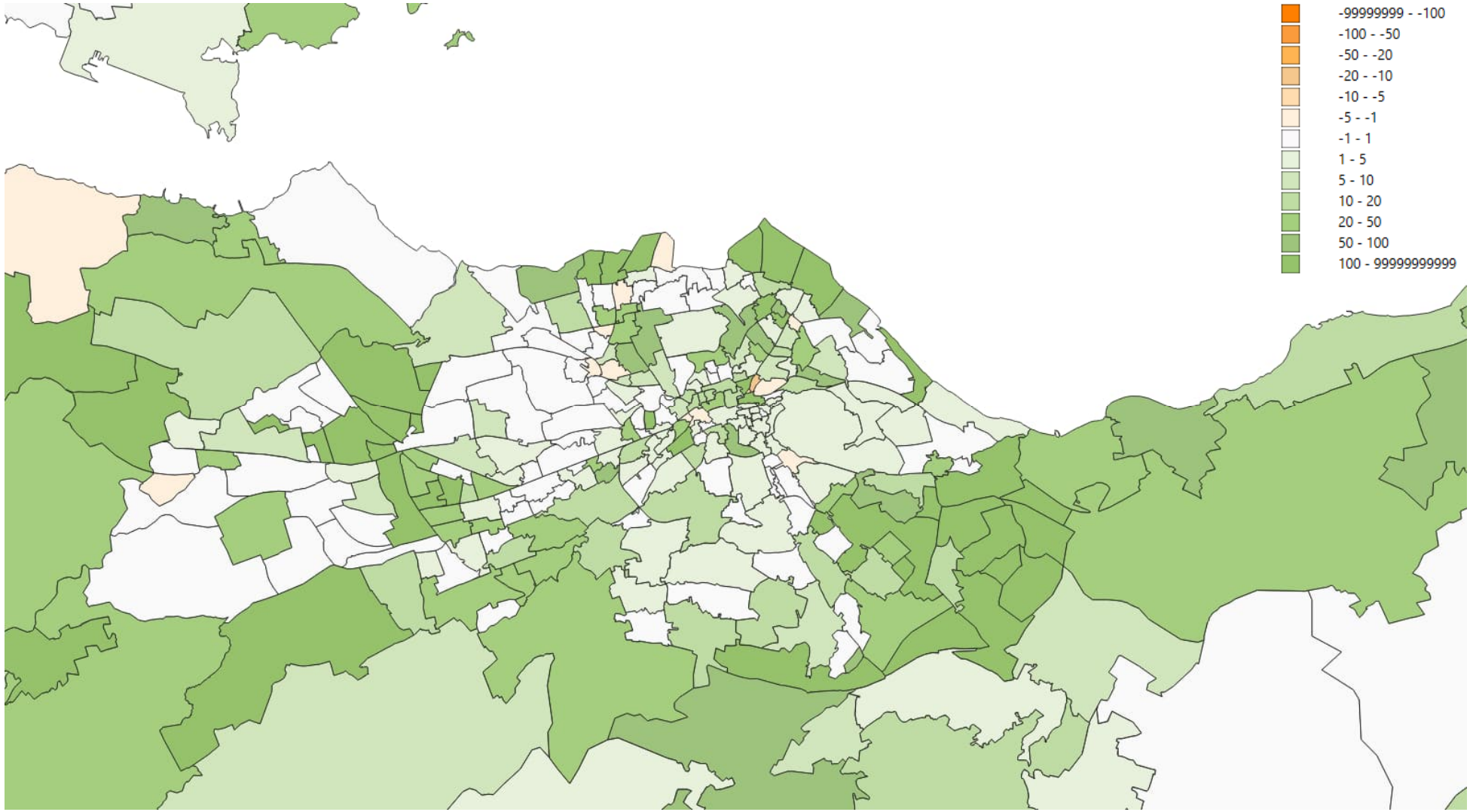


Figure 3.4: 2042-2016 Household Growth (%)



3.8 Development of Future Year Matrices

Future year demand matrices are derived from planning data in a three-step process:

- trip generation;
- trip distribution; and
- mode choice.

A brief summary of the process is given below for information; further detail is provided in Appendix C.

Trip Generation

The generation of trip ends is undertaken outside of the strategic model; this is so that calibration factors can be applied to the demand trip ends (a procedure that was not available within the model suite at the time of development). The trip ends are calculated by multiplying the above planning data by a trip rate. The planning data used differs by one of four trip purposes: Home Based Work (HBW), Home Based Education (HBE), Home based Other (HBO) and Non Home Based (NHB).

For household data, housing is disaggregated into socio-economic groupings based on household size and economic activity; this allows for higher trip rates and car-ownership levels to be applied to larger homes with more economically active residents.

The production trip rates for HBW, HBE and HBO trips are based on socio-economic category. Attraction trip ends are factored so that the total number of attraction trips is equal to the total number of production trip rates.

For non-homebased trips, both the origin and destination trip ends are calculated by multiplying each of four planning datasets (employees, students, leisure and shopping GFA) by appropriate trip rates.

Trip ends are aggregated to remove socio-economic groups, leaving the data segmented by trip purpose and car-ownership only, which is used throughout the rest of the process. The demand model trip ends are then subjected to calibration trip factors. They are applied to adjust for geographic variability of trip generation rates and other factors which cannot be fully captured in the trip-end * trip rate process.

Trip Distribution

The trip distribution is undertaken within the strategic model uses a logit equation:

$U = \exp(-\lambda * \text{cost})$

The lambda (λ) parameter used in the equation differs by trip purpose and time period.

The cost matrix used in the distribution is the composite cost of car and public transport, including all access times, waiting and in-vehicle times.

For the interpeak and evening peaks, cost matrices are expressed in terms of origin and destination (O-D) and these must be converted into production and attraction (P-A) format to match the demand matrices.

In the AM, it is assumed that O-D and P-A are directly comparable, for the PM model a simple transposition is used, the interpeak model is an average of the two.

For HBW and HBE trips, the distribution is doubly-constrained; it is assumed that there is a balance between employees / students and employment / education places. For the other two purposes the distribution is singly constrained so that only the production trip ends match.

Mode Choice

Mode choice is also undertaken within the strategic model and similarly uses a logit equation:

Pcar = 1 / (1 + exp (λ * (Upt – Ucar – K))

Separate values of lambda and the mode-constant have been calibrated for each time period, otherwise applicable across all segments.

The order in which distribution and mode choice are undertaken in the model is dependent on the relative size of the lambda parameters. The larger (more sensitive) parameter should be second in the choice hierarchy.

The values of lambda derived for the distribution and mode choice functions in this study suggest that, in the morning period, mode choice should occur before distribution in the demand model. However, in the interpeak and evening periods the mode choice parameter is larger suggesting it is more sensitive. Consequently, distribution choice has been placed before mode choice in the demand model.

The relatively low mode constant for home based work and education trips is likely to be reflective of the strong culture for public transport use in Edinburgh, as evidenced by large observed mode shares.

Highway matrices have been converted from person trips to vehicle trips prior to assignment, based on car occupancy values determined from the observed matrix.

4. Modelled Scenarios

4.1 Overview

This chapter summarises the scenarios considered as part of the strategic modelling assessment, and how they are applied within the model.

Sufficient information is available to model route options to an appropriate level of detail at this stage in the project. Nevertheless, some issues can only be fully resolved at detail design stage, as part of an OBC. In the meantime, where necessary assumptions have been made based on our experience in the design of the original Airport to Newhaven route, and best practice elsewhere.

4.1.1 Do-Minimum, Reference Case and Do-Something Models

Do-Minimum models reflect each future year assuming no significant changes to road and public transport networks. Reference Case models have been developed from the Do-Minimum, primarily reflecting the introduction of key Circulation Plan interventions.

Do-Something models include proposed tram options, and supporting bus service optimisation, but are otherwise identical to the Reference Case.

Model scenarios are summarised in Table 4.1 below.

Table 4.1: Model Scenarios

	Base year	Do-Minimum	Reference	Do-Something
Airport-Newhaven	**Y**	**Y**	**Y**	**Y**
2024 Bus Network Update	N	**Y**	**Y**	**Y**
Zone Connectors Update	N	**Y**	**Y**	**Y**
Circulation Plan	N	N	**Y**	**Y**
Trams to Granton, BioQuarter and Beyond	N	N	N	**Y**
Sheriffhall Roundabout	N	N	N	N

Do-Minimum models have been developed for 2022, 2032 and 2042; Reference and Do-Something models have been created for 2032 and 2042 only.

4.1.2 Roseburn and Orchard Brae Route Options

At this stage, the aim of the modelling analysis is to compare the performance of the Roseburn corridor against Orchard Brae, focussing on patronage and wider connectivity differences. Therefore, each Do-Something option is identical, except for the coding of tram on each corridor. The South East section from Princes Street is the same for both options, as discussed below.

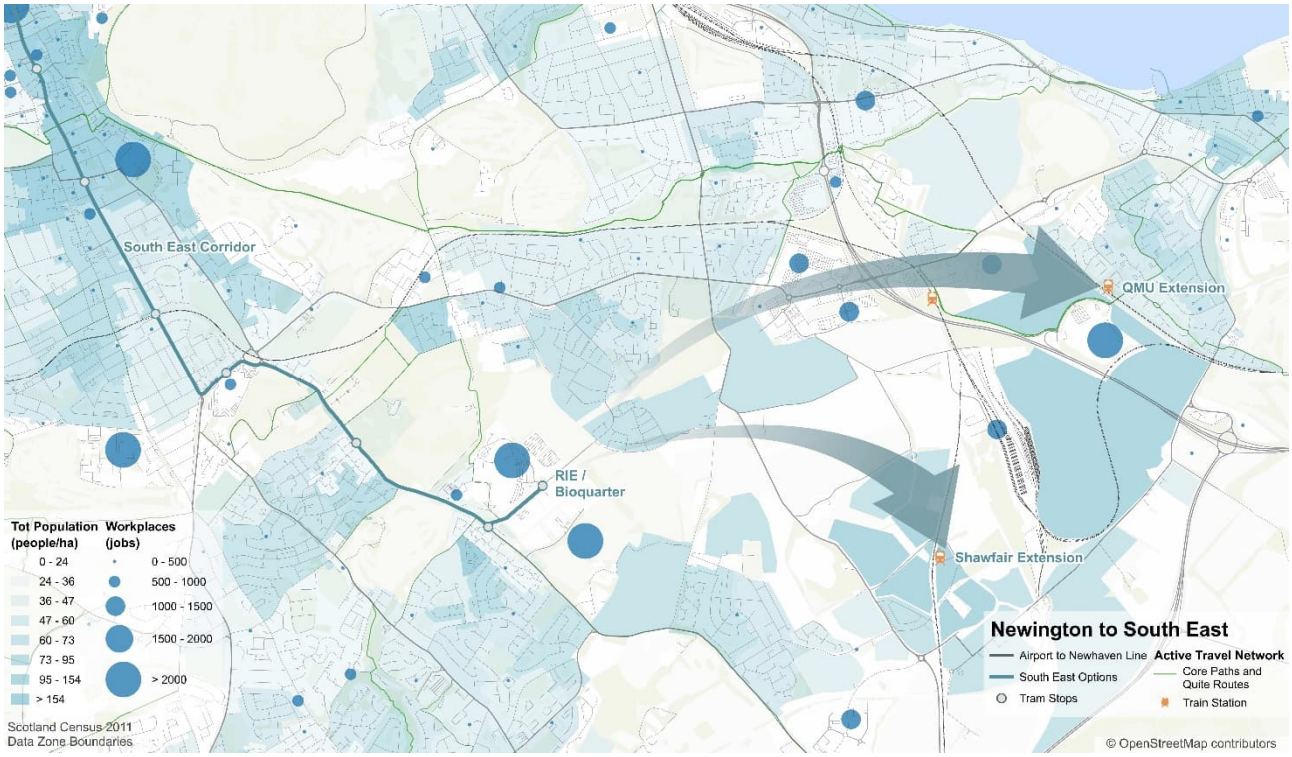
4.1.3 South East Route Options

A single route option has been identified between Princes Street and the BioQuarter. This follows the Bridges Corridor, Lady Road, and Old Dalkeith Road to Little France Drive.

Beyond the BioQuarter, a number of route options are being considered, as shown in Figure 4.1. For the purposes of this assessment, a route to Shawfair is assumed. The route continues along Little France Drive and then to turns right, running parallel and south of Tobias Street; it then follows Millerhill Road and Harelaw to Shawfair.

A route to Shawfair has been assumed at this stage. This provides interchange with the Borders Railway and supports wider regional connectivity. Nevertheless, an eastern route via Craigmillar remains part of the longer-term strategy to expand the tram network and could be delivered at a later stage. Both options are subject to further discussion with Midlothian and East Lothian Councils, and the Craigmillar option may need to be considered in the context of recent work by Network Rail on future options for the South Suburban Line.

Figure 4.1: Potential Tram Extensions in the South East



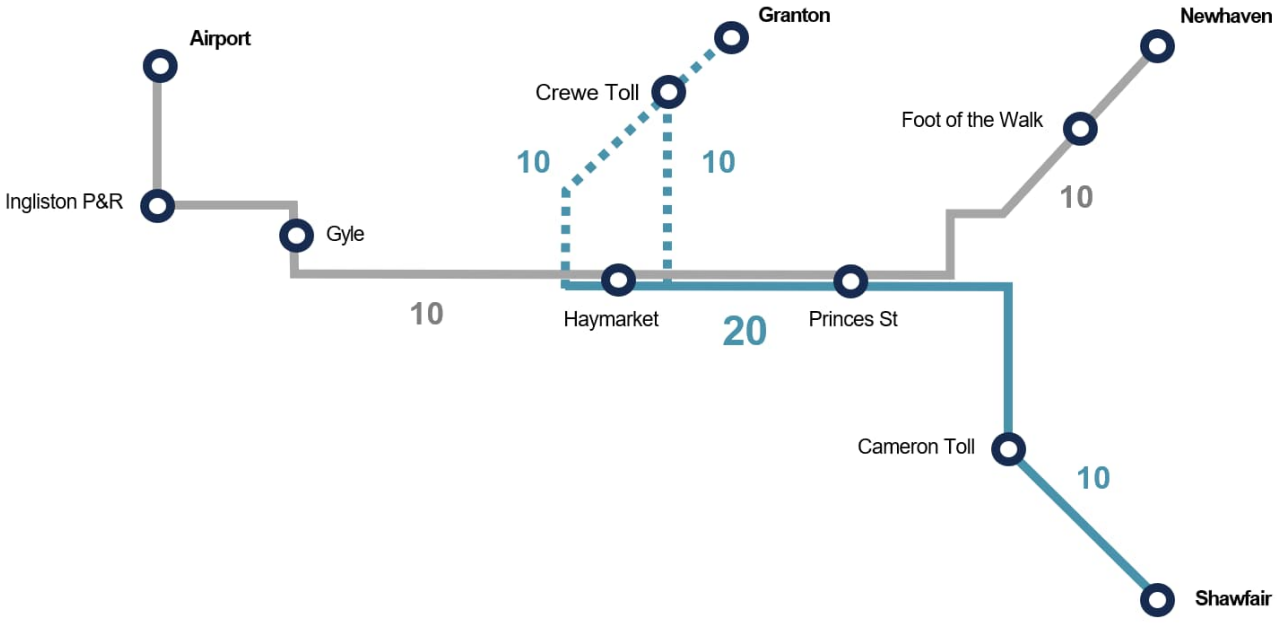
4.1.4 Tram Service Pattern

The current Edinburgh Trams service pattern is eight trams per hour, per direction and this is reflected in the 2022 Do-Minimum model. The intention of Edinburgh Trams is to increase the service to a six-minute headway, and so a ten trams per hour frequency is assumed in the 2032 and 2042 Do-Minimum models.

Trams to Granton, BioQuarter and Beyond will increase the number of trams on the core city centre section; at this stage, a maximum of 20 trams per hour per direction has been assumed on Princes Street.

For the purposes of this modelling assessment, the proposed Do-Something service pattern is shown in Figure 4.2.

Figure 4.2: Do-Something Tram Service Pattern



In practice, a more complex service pattern can be operated, with direct connections between Newhaven and the South East, and between Granton and Newhaven. But the use of a simpler service pattern makes the comparison of Roseburn and Orchard Brae options more robust.

4.1.5 Tram Model Runs

Table 4.2 summarises the model runs undertaken, by scenario, time period, route and service pattern.

Table 4.2: Tram Model Runs

Year	Scenario	Time Periods	Route	Service Pattern
2016	Demand Model	AM and IP	-	-
2022	Do-Minimum	AM and IP	-	8 trams per hour
2032	Do-Minimum	AM and IP	-	10 trams per hour
	Reference Case	AM and IP	-	10 trams per hour
	Do-Something	AM and IP	Roseburn	10+10 trams per hour
	Do-Something	AM and IP	Orchard Brae	10+10 trams per hour
2042	Do-Minimum	AM and IP	-	10 trams per hour
	Reference Case	AM and IP	-	10 trams per hour
	Do-Something	AM and IP	Roseburn	10+10 trams per hour
	Do-Something	AM and IP	Orchard Brae	10+10 trams per hour

4.2 Do-Minimum

Key changes from the Base to create the Do-Minimum scenario are outlined below. All amendments are also included in the Reference Case and Do-Something models.

4.2.1 Zone Connectors

Zone connectors determine where demand (car, public transport, walking, etc.) loads onto the transport network and how long it takes to do so. The inclusion of Trams to Granton, BioQuarter and Beyond requires new connections to tram stops. These have also been coded in the Do-Minimum and Reference Cases so that walking connectivity is identical across each scenario.

New connectors have been required to connect zones with the proposed tram stops at the southern end of the South East section of the route.

4.2.2 2024 Bus Network Update

An exercise has been undertaken to re-code Edinburgh's bus network to reflect late 2024 services. This reflects post-COVID service patterns within the city. It also captures the expansion of East Coast services in East Lothian and the development of the Lothian Country network across West Lothian.

Bus journey times have been updated to current timetables. These generally reflect current network congestion but do not capture the impact of future network changes or development growth. Do-Something tram journey times do capture this additional delay and so potentially underestimate the time savings that could result from the scheme. Further work is proposed to develop journey times that are as consistent as possible between bus and tram modes.

Bus fares have been updated in all Do-Minimum, Reference Case and Do-Something models.

4.3 Reference Case

The Reference Case models take cognisance of the Council's future plans for the city centre but which have not yet been implemented. Plans evolve but the Reference Case models assume the most likely future network based on our current understanding of proposals.

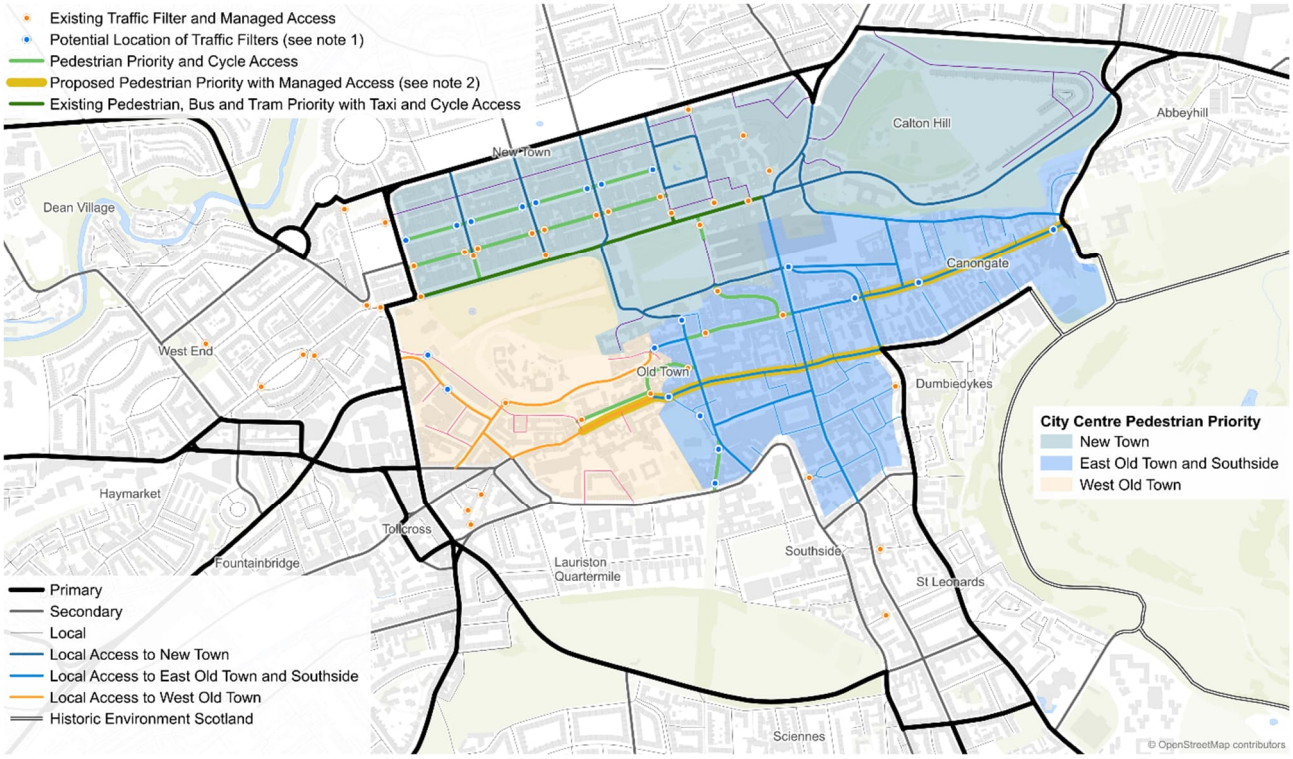
The most significant impact will be the delivery of the Council's Circulation Plan; interventions could have both positive and negative impacts on tram performance. Circulation Plan Option C was approved by Councillors and includes the network changes described in Table 4.3 and shown in Figure 4.3.

The changes listed in the table were coded in the future Reference Case and Do-Something models and primarily focus on road network alterations such as capacity changes or restrictions at junctions / road links. No other knock-on changes have been assumed as part of these interventions, e.g. zones / zone connectors have not been modified and there have been no changes made to public transport timetables / frequencies.

Table 4.3: SBC Tram Journey Time Assumptions

Intervention	Description
Existing restrictions:	Princes Street – no general traffic Rose Street – loading only Johnston Terrace westbound only High Street closed Victoria Street closed Cockburn Street closed Waverley Bridge closed
Meadows to George Street project:	Closes Bank Street preventing north / south access Closes Forrest Road with northbound access via Bristo Place Bus gate on Market Street
George Street project:	No through traffic
Johnston Terrace closure:	Johnston Terrace closed westbound
The Bridges - public transport priority corridor:	Removes general traffic through access (local access / deliveries only) Bus gate(s) on South Bridge Bus gate at the Princes Street / Waterloo Place junction
Lothian Road project:	Optimised general traffic capacity Removal of filter lanes at Western Approach Road and Castle Terrace Removal of hatching north of Tollcross
Cowgate closure at Candlemaker Row:	Removes general traffic through access
Canongate modal filter	Reduced general traffic permeability
Waverley Station access:	East Market Street / Jeffrey Street no through access New Street no access to Canongate

Figure 4.3: Circulation Plan Option C



1: Traffic filter locations are indicative. They represent streets that would be subject to restrictions rather than specific locations, which would be subject to further detailed work if the relevant option is approved

2. Categories of vehicle and times of day subject to further detailed work

4.4 Do-Something

The Do-Something With-Tram models pivot from the Reference Case with the changes summarised below.

4.4.1 Trams to Granton, BioQuarter and Beyond Scheme + Coding

Network Coding

New tram links and stops are coded in the same way as all other network elements. As explained in Section 4.2.1, new zone connectors are coded in the Do-Minimum so that walking connectivity is identical in that scenario, the Reference Case and the Do-Something.

Zone Connectors at the Western General Hospital

The Western General Hospital is a major attractor on both the Roseburn and Orchard Brae corridors. Although a stop on Crewe Road South (Orchard Brae option) is closest to the main hospital entrance, many ward facilities are located as close to Telford Road.

With the Orchard Brae option a tram stop would be located adjacent to the main hospital entrance. New placemaking and wayfinding would seek to integrate the stop with the hospital campus. Reflecting this, the zone connector walk time has been reduced from three and half minutes to two minutes.

With Roseburn, the nearest tram stop would be at Telford Drive. It is proposed that new placemaking and wayfinding, and an enhanced crossing at Telford Road would improve connectivity between the tram stop and hospital. Working with NHS Lothian, an upgraded and more prominent hospital entrance would be delivered, providing better access to major facilities.

Walk times to/ from the Telford Drive stop have been adjusted to reflect connectivity improvements and an enhanced western entrance - from eight-and-a-half minutes to five minutes.

Public Transport Timetables

Strategic model public transport services are timetable-based, meaning that travel times between stops are fixed and are not impacted by external factors such as traffic congestion. Tram journey times have been developed from separate microsimulation modelling which does take account of traffic congestion, traffic signal timings and vehicle acceleration/ deceleration. Stop dwell times have been assumed to be 35 seconds in the city centre and 20-25 seconds at quieter locations.

Coded tram routes and stops are shown in Figure 4.5 overleaf. As explained in Section 4.1.1, the coding of the South East alignment is identical for both the Roseburn and Orchard Brae route options.

Figure 4.4: Strategic Model Tram Routes and Stop Locations

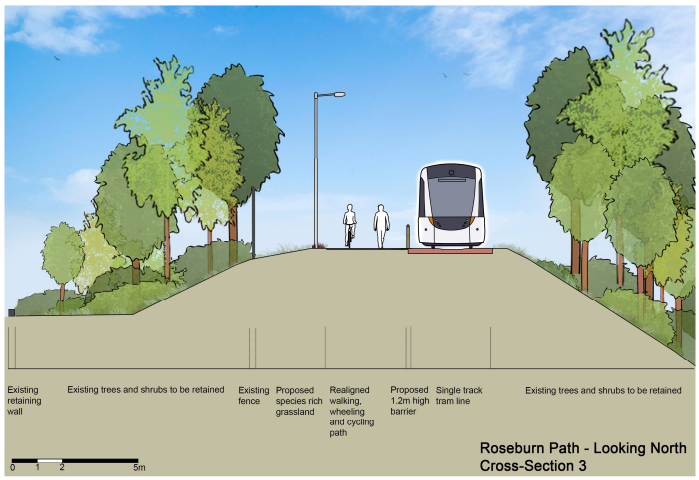
4.4.2 Roseburn

The tram route leaves the existing line at the Roseburn Junction, adjacent to Russell Road, and runs off-street following the Roseburn Path to Crewe Toll. There is no interaction with traffic over this section.

Between Craigleith and Roseburn it is proposed that this section would be single track to minimise land take and the impact of the scheme on landscape and ecology (Figure 4.5). A previously proposed stop at Ravelston Dykes is also omitted for this reason.

The tram route leaves the Roseburn Path and crosses Ferry Road to run west of and parallel to a the West Granton Access. It then crosses West Granton Road and runs parallel to Waterfront Broadway, Waterfront Avenue and West Harbour Road to Granton Square.

Figure 4.5: Roseburn Single Track Cross-Section



A Delta Junction layout will be provided at the Roseburn junction with the existing route, enabling trams to operate directly between the depot and Granton, increasing the flexibility of out-of-service movements. A direct passenger service between Granton and the airport is therefore feasible, although demand is unlikely to warrant this.

The Western General Hospital would be served by a stop at Telford Drive; improved streetscape and wayfinding would be designed to reduce the perceived walking time, as outlined in Section 4.4.1.

The Roseburn alignment will serve the Haymarket and West End stops prior to Princes Street. As a result, this route provides improved interchange with stops towards the airport - interchange is at Haymarket rather than Princes Street, reducing total journey times. The Roseburn corridor also better serves major office locations in the Haymarket / West End area.

4.4.3 Orchard Brae

The Orchard Brae alignment diverges from the existing network at Queensferry Street. Geometric constraints mean that only an east facing junction can be delivered. Interchange between the Orchard Brae route and all stops between the West End and the airport requires interchange at Princes Street. Operations are complicated by trying to merge two tram routes at the busy Princes Street / Lothian Road / South Charlotte Street junction. It has not been possible to develop a robust signal strategy for tram that does not significantly impact on wider traffic movements, including bus.

Orchard Brae and Crewe Road South are surrounded by residential properties and so local patronage is higher than on the Roseburn Path. The route is also closer to the main entrance to the Western General Hospital, although various major wards are located closer to Telford Road.

At Crewe Toll, the alignment would cross Ferry Road. Beyond, the route connects into the West Granton Access Road, where it then follows the same route to Granton as the Roseburn alignment.

4.4.4 South East

A Candidate Design has been developed for the majority of the South East tram corridor, with tram running on-street between Princes Street and Little France Drive.

A Delta Junction would be created at Princes Street / South St Andrew Street, providing an all-movements connection to the existing network. The tight radii mean that tram speeds will be limited to a maximum of 10kph. Multiple conflicting tram movements and the need to provide sufficient pedestrian and general traffic green time means that this junction is a potential constraint on tram capacity.

Between the city centre and Cameron Toll roundabout, traffic signal junctions are assumed to operate on a 112.5 second cycle time, providing 32 tram paths per hour in each direction. This design philosophy is consistent with the existing on-street section of tram corridor between Haymarket and the Foot of the Walk.

A tram stop would be provided on North Bridge; it is assumed that direct lift access would be provided between the tram stop and Waverley Station, delivering a high-quality interchange. This feature was a key element of City Centre Transformation. It would improve access between the station and the Old Town, which is currently difficult, especially for passengers with reduced mobility or with luggage.

On the South Bridge / Nicholson Street / Clerk Street section, the design seeks to improve pedestrian provision, with widened footways. This is achieved by reducing the number of traffic lanes from four to three (or two where bus stops and loading is provided). Doing so helps address width constraints in the vicinity of bus stops, where it is almost impossible for pedestrians to pass waiting passengers without stepping into the roadway.

Between Minto / Salisbury Place and Lady Road / Craigmillar Park, a single shared traffic and tram lane would be provided in each direction, together with right turn filter lanes as required. All buses and loading would be in bays, minimising potential delays to tram.

Liberton Road / Craigmillar Park / Lady Road, Cameron Toll Car Park Access and Cameron Toll are a complex series of junctions. The route adjacent to the Cameron Toll shopping centre was previously agreed with the site owner. Due to the subsequent construction of a fast-food restaurant, the route has been amended to pass through the centre of Cameron Toll roundabout rather than to the south. Otherwise, delivery of tram through this junction is simpler than at Liberton Road / Craigmillar Park / Lady Road.

Beyond Cameron Toll, the route is largely on-street along Old Dalkeith Road, mitigating potential impacts at Bridgend Farm, and wider tree loss. The Candidate Design takes cognisance of active travel proposals along the corridor. However, it has been agreed that the materials used in that scheme should reflect the fact it will likely be more cost effective to rebuild cycle provision as part of the construction of tram at a point in the future.

Little France Drive includes a segregated corridor for tram. The route then turns right to run adjacent to Tobias Street and then right again to follow the A6106 and Harelaw to Shawfair. These sections are also assumed to be largely off-street although the detail of this section of the alignment will be agreed with Midlothian Council at a future stage.

4.4.5 Service Frequency

Airport-Newhaven and Granton-Shawfair routes have both been coded with a service frequency of ten trams per hour. The Airport-Newhaven journey time, frequency and stop pattern has been kept the same across Do-Minimum, Reference Case and Do-Something models. The Granton-Shawfair timetable has been offset from Princes Street to provide the same timetable on the southern section of the corridor. This ensures consistency and the same level of interchange opportunity between the Roseburn and Orchard Brae options.

4.4.6 Journey Times

The Roseburn, Orchard Brae and South East tram routes have been modelled in the microsimulation software VISSIM to establish journey times based on the current candidate designs. These take cognisance of tram acceleration and deceleration, stop dwell times, and delays caused by traffic signals and congestion.

Both average and maximum journey times are shown in Table 4.4 for information; average times have been coded in the strategic model. As above, Princes Street to Shawfair journey times have been identically coded in both options.

Table 4.4: SBC Tram Journey Time Assumptions

	AM Peak			Interpeak Peak		
via Roseburn	**Roseburn**	**South East**	**Total**	**Roseburn**	**South East**	**Total**
Granton to Shawfair (ave)	26 mins	34 mins	1 hr	25 mins	34 mins	59 mins
Shawfair to Granton (ave)	25 mins	38 mins	1 hr 4 mins	25 mins	34 mins	59 mins
Granton to Shawfair (max)	27 mins	34 mins	1 hr 1 min	27 mins	34 mins	1 hr 1 min
Shawfair to Granton (max)	26 mins	45 mins	1 hr 11 mins	26 mins	34 mins	1 hr
via Orchard Brae	**Orchard Brae**	**South East**	**Total**	**Orchard Brae**	**South East**	**Total**
Granton to Shawfair (ave)	34 mins	34 mins	1 hr 38 mins	27 mins	34 mins	1 hr 1 min
Shawfair to Granton (ave)	32 mins	38 mins	1 hr 11 mins	27 mins	34 mins	1 hr 1 min
Granton to Shawfair (max)	37 mins	34 mins	1 hr 11 mins	28 mins	34 mins	1 hr 2 mins
Shawfair to Granton (max)	33 mins	45 mins	1 hr 18 mins	30 mins	34 mins	1 hr 4 mins

During the morning peak, via Roseburn is typically 7-8 minutes faster than Orchard Brae on average and 7-10 minutes when maximum travel times are compared. The differential between the two routes is less severe in the IP with only around 2 minutes additional travel time modelled. The exception to this in the IP maximum journey time via Orchard Brae which is over 4 minutes longer.

The greatest reliability concern for the Shawfair section of the route is travelling towards the city centre in the AM where the maximum modelled journey time is over 7 minutes longer than the average.

4.4.7 Future Bus Network

It has been assumed that the number of buses on the Granton and South East corridors will be reduced in response to new tram capacity. Tram capacity is more than three times greater than a double decker bus (approximately 250 vs 80) and at ten trams per hour, tram could potentially cater for passenger levels equivalent to 30 buses.

Currently, there are approximately 90 buses per hour per direction on the South East corridor. This has been reduced to around 60 bus per hour per direction in the Do-Something model.

Targeted service reductions have also been assumed on Orchard Brae with approximately 35 bus per hour in each direction in the Do-Minimum reduced to around 22 in the Do-Something.

These changes reduce the bus peak vehicle requirement (PVR). For the purposes of the scheme business case, the resulting operating cost savings are a benefit to the project.

The above frequency adjustments are a modelling assumption. In practice, buses would be redeployed elsewhere across the network, helping improve public transport across the city and region. Furthermore, the bus network will continue to expand to cater for an increasing population and to help address the challenges of climate change and inequality.

4.4.8 Parking Charges

Future development at the BioQuarter assumes high non-car mode shares. To reflect the proposed limited level of parking provision, parking charges have been applied in the model; these are assumed to be 50% of city centre values.

5. Patronage Forecasts

5.1 Model Outputs and Annualisation

The strategic model has been used to forecast tram patronage; forecasts are based on the AM Peak (07:00-09:00) and interpeak (10:00-12:00) models only. Full year patronage is determined from the annualisation factors below:

- AM Factor: 622
- IP Factor: 1,823

Tram boardings and alightings for each modelled period are multiplied by the above factors and combined to establish annual tram patronage forecasts for each model year.

5.2 2022 Do-Minimum

The 2022 Do-Minimum year has been developed as part of the SBC as a proxy for Trams to Newhaven opening in 2023 and to gauge the model's accuracy for predicting tram patronage.

Actual tram patronage on the existing route was approximately 12.1 million passengers in 2024.

The Trams to Newhaven business case assumed a ramp-up phase with opening year demand being 80% of forecast patronage. This would then increase by 10% per annum with 100% of demand achieved by 2026. Based on this assumption, tram patronage in 2026 is anticipated to be approximately 14.6 million.

Tram models reflect full passenger demand (100% patronage) and the 2022 Do-Minimum model forecasts approximately 16.7 million passengers per annum. This is 14% higher than the 14.6 million value above, as shown in Table 5.1.

Table 5.1: Model vs Actual Annual Tram Patronage

Location	Passengers	Percentage
2024 Actual Patronage	12.1 million	80%
2025 Uplift	13.3 million	90%
2026 Uplift	14.6 million	100%
Modelled Patronage	16.7 million	+14%

Although a 14% overestimation is slightly high, the shortfall is primarily the result of reduced demand on the existing route, specifically the impact of reduced occupancy at Edinburgh Park. Passenger numbers on the extension to Newhaven are similar to model forecasts. In addition, the tram route is still being optimised to improve journey times and reliability. Most notably, traffic signals on the Leith Walk section have only recently been brought under UTC control. At the time of writing, work is ongoing to migrate the existing on-street route traffic signals to a new UTC system. These improvements, together with a targeted programme of additional measures, will help improve network reliability.

5.3 Total Tram Patronage

5.3.1 2032 Future Year

Annual tram patronage is shown in Table 5.2 for the 2032 Do-Minimum and Do-Something options via Roseburn and Orchard Brae (rounded to the nearest 1,000). Total passenger boardings (both directions) have been disaggregated by section to help analyse route performance. The difference between the Roseburn and Orchard Brae options is provided together with the total increase in patronage across the combined tram network.

Table 5.2: Annual Tram Patronage Comparison (2032)

Route Section	Do-Minimum	Roseburn	Orchard Brae	Roseburn - Orch Brae	
Airport-Murrayfield	6,607,000	6,573,000	6,567,000	6,000	+0%
Granton-City Centre west	-	4,019,000	3,666,000	353,000	+9%
Haymarket-Newhaven	14,950,000	17,091,000	15,985,000	1,106,000	+6%
City Centre east-South East	-	6,139,000	5,204,000	935,000	+15%
Total	**21,556,000**	**33,822,000**	**31,422,000**	**2,400,000**	**+7%**
Granton-Shawfair Patronage		**12,266,000**	**9,866,000**		

Increasing the Do-Minimum tram frequency to ten trams per hour and the additional growth forecast in 2032 has increased tram patronage in the Do-Minimum from 16.7 million in 2022 to 21.6 million in 2032.

Implementation of Trams to Granton, BioQuarter and Beyond, via the Roseburn corridor, results in a total of 33.8 million passengers on the tram network, an additional 12.3 million per annum.

Routing trams via Orchard Brae results in a total patronage of 31.4 million. Annual patronage on the full new line is 9.9 million, approximately 2.4 million fewer than via Roseburn (~20% lower).

The main driver of the increased demand via Roseburn is the enhanced connectivity at Haymarket and West End stops that deliver better connectivity to these areas and from these areas to the airport and South East.

Boardings on the Granton section of the route are around 4 million per annum (4.0 million via Roseburn / 3.7 million via Orchard Brae) and on the South East section 5-6 million. However, there is also a notable uplift in patronage on the existing route, around 1-2 million, when the network is expanded. Indicating a greater net benefit of the expanded network than directly attributed to the two new sections listed in the table.

There is a slight decrease in boardings on the Airport-Murrayfield section of the existing route. This is likely attributed to the reduced bus frequency in the Do-Something reducing public transport connectivity to the airport. Although the reductions are considered minor, specific details on this will be analysed as part of the OBC.

5.3.2 2042 Future Year

Modelled tram patronage for 2042 is shown in Table 5.3. The results broadly follow similar trends to 2032 but the patronage benefits of the Roseburn route are increasing at a greater rate than via Orchard Brae.

Table 5.3: Annual Tram Patronage Comparison (2042)

Route Section	Do-Minimum	Roseburn	Orchard Brae	Roseburn - Orch Brae	
Airport-Murrayfield	8,132,000	8,037,000	8,060,000	-23,000	-0%
Granton-City Centre west	-	4,131,000	3,713,000	418,000	+10%
Haymarket-Newhaven	16,116,000	18,447,000	17,248,000	1,199,000	+6%
City Centre east-South East	-	6,657,000	5,642,000	1,015,000	+15%
Total	**24,248,000**	**37,272,000**	**34,663,000**	**2,609,000**	**+7%**
Granton-Shawfair Patronage		**13,024,000**	**10,415,000**		

5.3.3 Factors Impacting Tram Patronage

There are a range of factors that impact tram patronage and these will be explored in greater detail as part of the full OBC. Initial sensitivity testing of a revised service pattern (Appendix D) indicates a potential uplift of 18% on the north-south corridor. Conversely, a review of the 2022 Do-Minimum against actual tram demand, and subsequent annual bus patronage data provided by Lothian Buses suggests that the strategic model overestimates public transport demand by 14%. Nevertheless, taking account of these two variables only, possible patronage ranges for tram would be as follows in Table 5.4:

Table 5.4: Adjusted Annual Tram Patronage Comparison

Year	Low (-14%)	Modelled	High (+18%)
2032 via Roseburn	10,549,000	12,266,000	14,515,000
2042 via Roseburn	11,201,000	13,024,000	15,412,000

Other changes that could impact forecast patronage include:

Positively
- Improved tram journey times on South East corridor
- Improved representation of bus versus tram journey times

Neutral / Unknown
- Updated annualisation factors
- Revised development assumptions (e.g. BioQuarter)

Negatively
- Model overestimation of tram demand

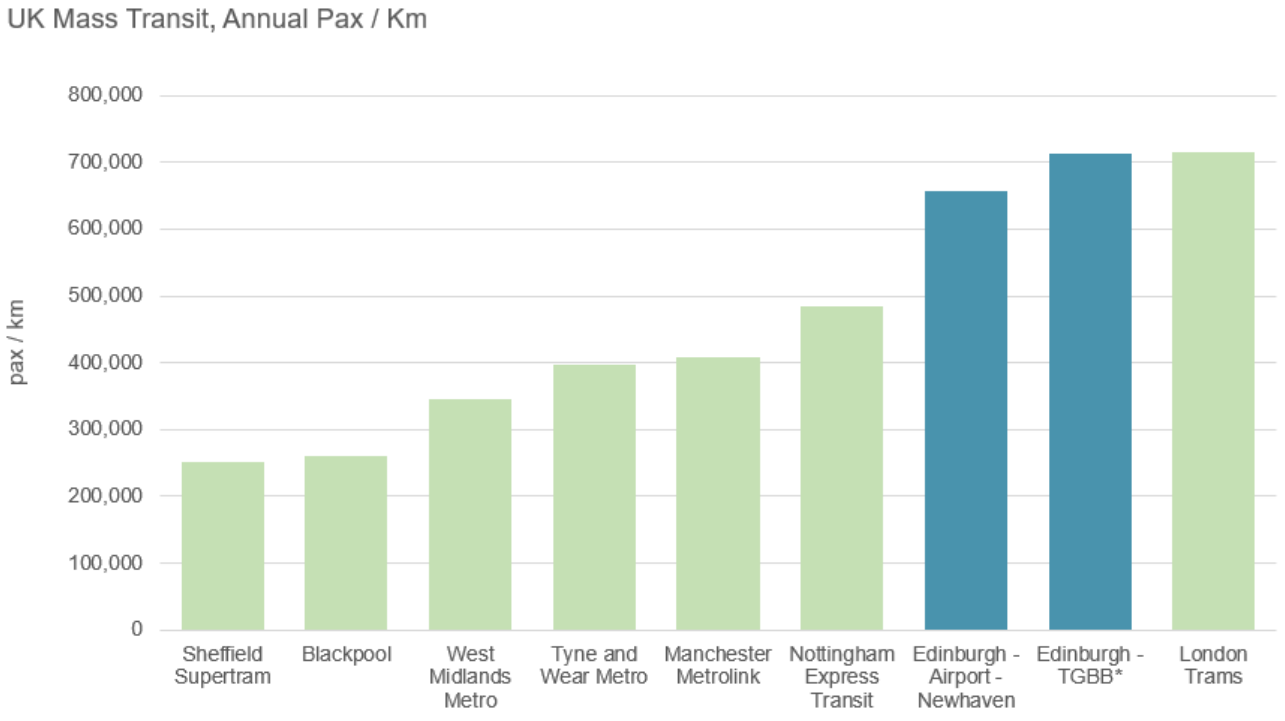
5.4 Benchmarking

A central patronage forecast of 12.27 million in 2032 compares favourably with other systems based on a passenger per kilometre basis. Table 5.5 lists the length and annual patronage for other UK tram systems and highlights that both the existing route and Trams to Granton, BioQuarter and Beyond perform strongly. Information is also shown graphically in Figure 5.1.

Table 5.5: Annual Tram Patronage Benchmarking

Location	System Length (Km)	Year	Pax	Pax / Km
Sheffield Supertram	34.6	2023/24	8,700,000	251,445
Blackpool	18.0	2023/24	4,700,000	261,111
West Midlands Metro	24.0	2023/24	8,300,000	345,833
Tyne and Wear Metro	77.5	2023/24	30,700,000	396,129
Manchester Metrolink	103.0	2023/24	42,000,000	407,767
Nottingham Express Transit	32.0	2023/24	15,500,000	484,375
Edinburgh: Airport – Newhaven	18.4	2024	12,100,000	657,609
Edinburgh: Granton – South East	17.2	2032 (forecast)	12,266,000	713,140
London Trams	28.0	2023/24	20,000,000	714,286

Figure 5.1: Annual Tram Patronage Benchmarking (Passengers per Km)



* 2032 Forecast

5.5 Patronage by Stop

Annualised boardings and alightings by stop are listed in Table 5.6 for 2032 and Table 5.7 for 2042. Values are the average of boardings plus alightings to better illustrate how well used each stop will be.

Table 5.6: Annual Tram Patronage by Stop (2032 Average Boardings & Alightings)

Stop	Do-Min	Roseburn	Orchard Brae	Roseburn-Orchard Brae	
Edinburgh Airport	987,000	922,000	936,000	-14,000	-2%
Ingliston P&R	901,000	902,000	899,000	3,000	0%
West Town	75,000	75,000	75,000	0	0%
Gogarburn	202,000	203,000	203,000	0	0%
Edinburgh Gateway	140,000	141,000	141,000	0	0%
Gyle Centre	975,000	979,000	967,000	12,000	1%
Edinburgh Park Central	347,000	348,000	341,000	7,000	2%
Edinburgh Park Station	371,000	370,000	365,000	5,000	1%
Bankhead	539,000	557,000	550,000	7,000	1%
Saughton	1,024,000	1,050,000	1,045,000	5,000	0%
Balgreen	572,000	546,000	557,000	-11,000	-2%
Murrayfield	406,000	412,000	392,000	20,000	5%
Granton Square	-	92,000	37,000	55,000	60%
Saltire Square	-	716,000	550,000	166,000	23%
Caroline Park	-	504,000	446,000	58,000	12%
West Pilton	-	373,000	236,000	137,000	37%
Crewe Toll - Roseburn Path	-	682,000	-	-	-
Crewe Toll - Telford Road	-	-	380,000	-	-
Telford Drive - Western General	-	288,000	-	-	-
Crewe Road S - Western General	-	-	311,000	-	-
Craigleith	-	292,000	-	-	-
Comely Bank	-	-	72,000	-	-
Queensferry Road	-	-	587,000	-	-
Roseburn	-	275,000	-	-	-
Queensferry Street	-	-	590,000	-	-
Haymarket	1,029,000	2,020,000	1,043,000	977,000	48%
West End Princes Street	2,329,000	3,098,000	2,329,000	769,000	25%
Princes Street	831,000	1,524,000	1,555,000	-31,000	-2%
St Andrew Square	1,865,000	1,955,000	1,962,000	-7,000	0%
Picardy Place	1,917,000	1,811,000	1,807,000	4,000	0%
McDonald Road	844,000	927,000	948,000	-21,000	-2%
Balfour Street	1,167,000	1,223,000	1,221,000	2,000	0%
Foot of the Walk	1,204,000	1,224,000	1,225,000	-1,000	0%
The Shore	321,000	339,000	336,000	3,000	1%
Port of Leith	824,000	819,000	819,000	0	0%
Ocean Terminal	1,977,000	2,045,000	2,047,000	-2,000	0%
Newhaven	709,000	738,000	744,000	-6,000	-1%
North Bridge	-	2,090,000	2,095,000	-5,000	0%
Nicolson Street	-	848,000	788,000	60,000	7%
Newington Road	-	354,000	303,000	51,000	14%
Mayfield	-	350,000	278,000	72,000	21%
Cameron Toll	-	1,018,000	862,000	156,000	15%
The Inch	-	319,000	219,000	100,000	31%
The Royal Infirmary	-	835,000	692,000	143,000	17%
BioQuarter	-	201,000	167,000	34,000	17%
The Wisp	-	81,000	64,000	17,000	21%
Millerhill	-	21,000	21,000	0	0%
Shawfair Station	-	256,000	217,000	39,000	15%

Table 5.7: Annual Tram Patronage by Stop (2042 Average Boardings & Alightings)

Stop	Do-Min	Roseburn	Orchard Brae	Roseburn-Orchard Brae	
Edinburgh Airport	1,192,000	1,101,000	1,128,000	-27,000	-2%
Ingliston P&R	885,000	885,000	883,000	2,000	0%
West Town	392,000	389,000	390,000	-1,000	0%
Gogarburn	332,000	334,000	334,000	0	0%
Edinburgh Gateway	271,000	272,000	272,000	0	0%
Gyle Centre	1,071,000	1,069,000	1,061,000	8,000	1%
Edinburgh Park Central	495,000	494,000	489,000	5,000	1%
Edinburgh Park Station	449,000	442,000	443,000	-1,000	0%
Bankhead	577,000	591,000	590,000	1,000	0%
Saughton	1,060,000	1,085,000	1,081,000	4,000	0%
Balgreen	629,000	591,000	607,000	-16,000	-3%
Murrayfield	428,000	415,000	410,000	5,000	1%
Granton Square	-	103,000	39,000	64,000	62%
Saltire Square	-	723,000	554,000	169,000	23%
Caroline Park	-	513,000	445,000	68,000	13%
West Pilton	-	365,000	240,000	125,000	34%
Crewe Toll - Roseburn Path	-	701,000	-	-	-
Crewe Toll - Telford Road	-	-	378,000	-	-
Telford Drive - Western General	-	305,000	-	-	-
Crewe Road S - Western General	-	-	315,000	-	-
Craigleith	-	304,000	-	-	-
Comely Bank	-	-	74,000	-	-
Queensferry Road	-	-	587,000	-	-
Roseburn	-	288,000	-	-	-
Queensferry Street	-	-	597,000	-	-
Haymarket	1,178,000	2,288,000	1,194,000	1,094,000	48%
West End Princes Street	2,580,000	3,385,000	2,574,000	811,000	24%
Princes Street	953,000	1,649,000	1,738,000	-89,000	-5%
St Andrew Square	2,006,000	2,113,000	2,116,000	-3,000	0%
Picardy Place	2,118,000	1,990,000	1,982,000	8,000	0%
McDonald Road	873,000	967,000	976,000	-9,000	-1%
Balfour Street	1,202,000	1,267,000	1,256,000	11,000	1%
Foot of the Walk	1,235,000	1,252,000	1,255,000	-3,000	0%
The Shore	333,000	349,000	348,000	1,000	0%
Port of Leith	1,023,000	1,021,000	1,019,000	2,000	0%
Ocean Terminal	2,178,000	2,255,000	2,255,000	0	0%
Newhaven	787,000	813,000	820,000	-7,000	-1%
North Bridge	-	2,219,000	2,198,000	21,000	1%
Nicolson Street	-	923,000	815,000	108,000	12%
Newington Road	-	321,000	319,000	2,000	1%
Mayfield	-	357,000	282,000	75,000	21%
Cameron Toll	-	1,081,000	936,000	145,000	13%
The Inch	-	323,000	218,000	105,000	33%
The Royal Infirmary	-	893,000	736,000	157,000	18%
BioQuarter	-	317,000	271,000	46,000	15%
The Wisp	-	103,000	83,000	20,000	19%
Millerhill	-	39,000	38,000	1,000	3%
Shawfair Station	-	376,000	317,000	59,000	16%

The 2032 AM Peak boardings and alightings are shown diagrammatically for Roseburn and Orchard Brae options in Figure 5.2 and 5.3. Equivalent diagrams for all modelled years, peaks and options can be found in Appendix E.

Comparing Roseburn and Orchard Brae stops, there is a significant uplift at Haymarket and the West End in the Roseburn option due to the increased service frequency (20 trams per hour versus 10), enhanced interchange opportunities and proximity to major office development. This explains the additional patronage on the Granton and South East corridors.

Most stops between The Gyle and Murrayfield benefit from a slight increase in patronage under the Roseburn option due to the ability to interchange at Haymarket. The Orchard Brae option requires interchange at Princes Street (and there is additional usage at this stop); however, the additional travel time is less attractive compared with Haymarket. Beyond The Gyle, the additional travel time is less significant between options.

Between St Andrews Square and Newhaven, patronage is fairly consistent between the two Granton options, typically fluctuating between -2% and +2% across all stops.

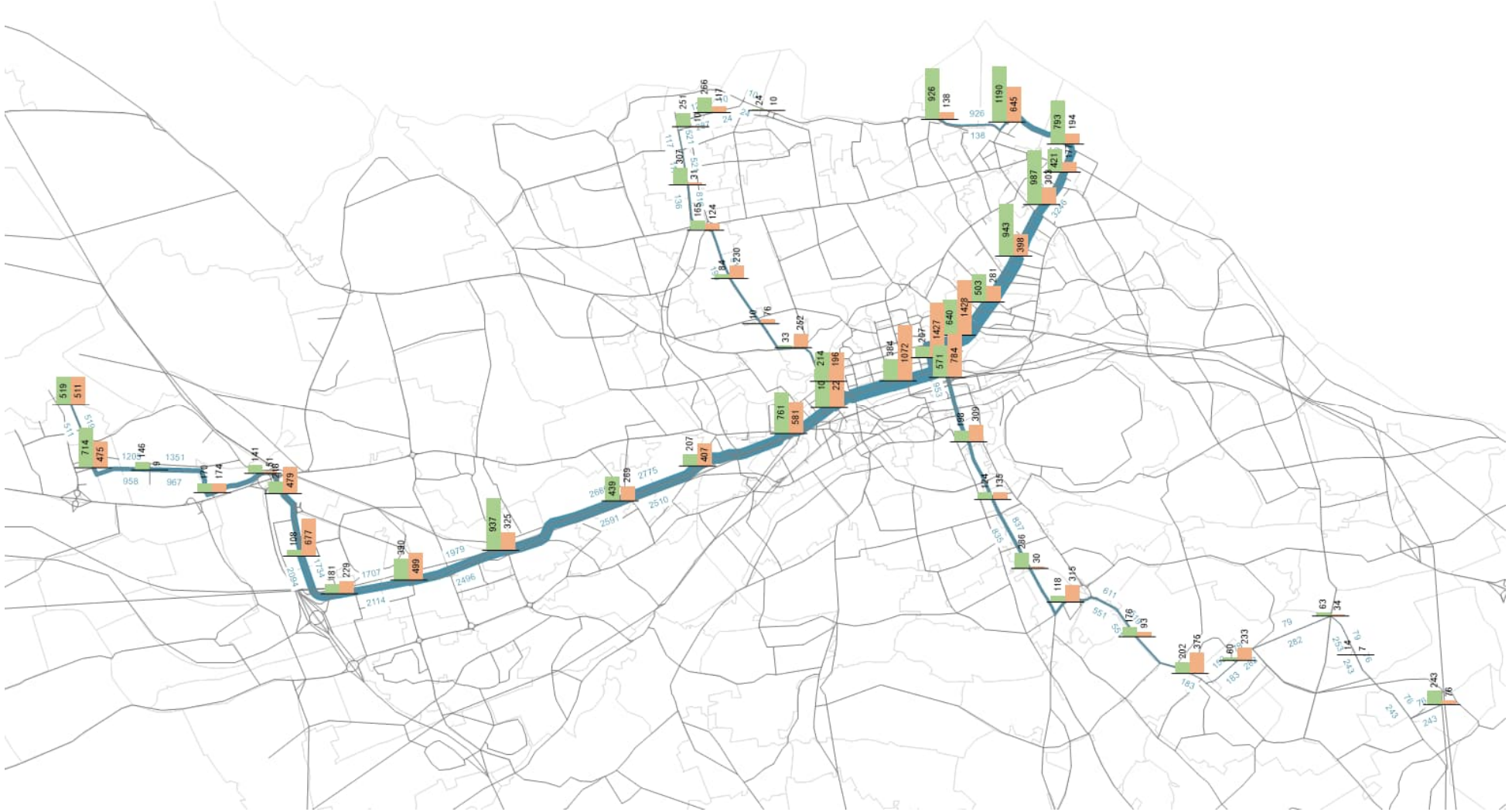
5.6 Model Skims

Strategic model skims are output to support further detailed analysis of scheme performance, and which in turn informs a multi-criteria assessment and the SBC. The skims exported are:

- Car OD Matrix = CAR
- LGV OD Matrix = LGV
- HGV OD Matrix = HGV
- PuT OD Matrix = PUT
- Car Journey Time Skim = TTC
- Car Distance Skim = DIS
- PuT Perceived Journey Times = PJT
- PuT Journey Time = JRTA
- PuT Number of Transfers = NTR
- PuT Service Frequency = SFQ
- PuT In-Vehicle Distance = IVD
- PuT Fare = FAR
- PuT Number of Operator Changes = NOC
- Bus In-Vehicle Distance = IVTD(B)
- Rail In-Vehicle Distance = IVTD(R)
- Tram In-Vehicle Distance = IVTD(T)
- PuT Path Leg Attributes = att
- All Zones Network Statistics = AllZonessta
- Detailed Area Zones Network Statistics = DetailedAreaZonessta

Figure 5.2: 2032 Roseburn Patronage by Stop (AM)

Figure 5.3: 2032 Orchard Brae Patronage by Stop (AM)



6. Summary and Next Steps

6.1 Summary

This report provides an overview of the updates made to the City of Edinburgh Council's strategic model of Edinburgh required to support the development of a Strategic Business Case (SBC) for Trams to Granton, BioQuarter and Beyond.

The report provides a brief history of model development, a review of the most recent land-use assumptions and the different scenarios modelled to support a comparison of Roseburn versus Ochard Brae corridor options.

Key changes to the strategic model made for the SBC include:

- Model parameters (values of time, vehicle operating costs, fares)
- Zone connectors and parking charges
- Trip ends and development assumptions
- Do-Minimum, Reference Case and Do-Something bus routes, and
- Tram route alignment, stop locations and journey time assumptions

Future Year Development Assumptions

Future development is a key driver of tram patronage alongside existing housing and employment. Future forecasts are based on work previously undertaken to support City Plan 2030. A further Edinburgh-wide review of major development proposals has been undertaken, including housing, office/retail, leisure and hotel facilities. In addition, a review of neighbouring authorities' LDPs has been undertaken.

A key focus has been to understand actual build out rates between 2016 and 2022, taking cognisance of the impact of Covid over previous assumptions.

The 2032 forecast year reflects the Council's then current 2016 Local Development build out, with a focus on development across the City Centre, Waterfront, South East and West Edinburgh.

The 2042 forecast year is as 2032, but with additional City Plan 2030 growth. The City Plan strategy is to focus on brownfield development sites across the city, with targeted greenfield expansion in West Edinburgh.

Strategic Model Enhancements

The strategic model was last updated and calibrated to a 2016 Base Year. This remains unchanged for this assessment.

Do-Minimum models reflect each future year (2022, 2032 and 2042). A number of new zone connectors have been coded in the Do-Minimum and Reference Cases so that walking connectivity is identical across all scenarios. In addition, bus routes have been fully updated to reflect autumn 2024 service patterns. Changes capture amendments within the city, but also significant changes across East, Mid and West Lothian.

Reference Case models have been developed from the Do-Minimum, primarily reflecting the introduction of key Circulation Plan interventions.

Do-Something models include proposed tram options, and supporting bus service optimisation, but are otherwise identical to the Reference Case.

Forecast Patronage

Increasing the Do-Minimum tram frequency to ten trams per hour and the additional growth forecast in 2032 increases tram patronage in the Do-Minimum from 16.7 million in 2022 to 21.6 million in 2032.

Implementation of Trams to Granton, BioQuarter and Beyond, via the Roseburn corridor, results in a total of 33.8 million passengers on the tram network, an additional 12.3 million per annum. Routing trams via

Orchard Brae results in a total patronage of 31.4 million. Annual patronage on the full new line is 9.9 million, approximately 2.4 million fewer than via Roseburn (~20% lower).

Forecast 2032 patronage is summarised in Table 6.1.

Table 6.1: Annual Tram Patronage Comparison (2032)

Route Section	Do-Minimum	Roseburn	Orchard Brae
Airport-Murrayfield	6,607,000	6,573,000	6,567,000
Granton-City Centre west	-	4,019,000	3,666,000
Haymarket-Newhaven	14,950,000	17,091,000	15,985,000
City Centre east-South East	-	6,139,000	5,204,000
Total	**21,556,000**	**33,822,000**	**31,422,000**
Granton-Shawfair Patronage		**12,266,000**	**9,866,000**

The main driver of the increased demand via Roseburn is the enhanced connectivity at Haymarket and West End stops that deliver better connectivity to these areas and from these areas to the airport and South East.

Boardings on the Granton section of the route are around 4 million per annum (4.0 million via Roseburn / 3.7 million via Orchard Brae) and on the South East section 5-6 million. However, there is also a notable uplift in patronage on the existing route, around 1-2 million, when the network is expanded. Indicating a greater net benefit of the expanded network than directly attributed to the two new route sections alone.

There is a slight decrease in boardings on the Airport-Murrayfield section of the existing route. This is likely attributed to the reduced bus frequency in the Do-Something reducing public transport connectivity to the airport. Although the reductions are considered minor, specific details on this will be analysed as part of the OBC.

Potential for Additional Patronage

Patronage forecasts have been based a range of central assumptions, appropriate to this stage in the study. Nevertheless, there is the potential for an uplift in passenger forecasts (and some downside) based on improved assumptions as the project develops.

A tram service pattern has been developed which enables direct comparison between the Roseburn and Orchard Brae corridors. A more complex pattern has the potential to increase demand by approximately 18%. There is the potential to optimise peak period tram journey times on the South East corridor; further work is also required to better reflect tram versus bus journey times. Timetabled bus journey times typically omit peak reliability impacts and so underestimate journey times relative to tram (for which a more detailed analysis has been undertaken).

6.2 Next Steps

Based on initial model outputs, further optimisation is proposed in advance of completion of the SBC. Key refinements include:

- a review of non-housing / employment city-wide development assumptions
- a review of development proposals adjacent to the tram route tram, including latest Waterfront and BioQuarter proposals, also options for the densification of the Cameron Toll site
- improved representation of Western General Hospital and Royal Infirmary Edinburgh travel demand
- further optimisation of tram journey times, and a review of tram journey times relative to future bus journey times
- an optimised tram service pattern
- optimised bus rationalisation proposals which help maximise overall transport benefits
- further model validation against current bus and tram patronage, and
- a review of annualisation factors

Appendix A. Edinburgh Trip End Assumptions

Table A.1: Edinburgh Trip End Assumptions

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
Numbers carried forward from Newhaven Tram FBC development assumptions largely representing developments at late stage of construction or completed & numbers for partly complete development sites										
2	City Centre	City Centre Retailing	St Andrew Sq	Office/Business	Sq m	17,130	50%	50%	50%	50%
7	City Centre	City Centre Retailing	St Andrew Sq	Office/Business	Sq m	17,130	50%	50%	50%	50%
2	City Centre	City Centre Retailing	St Andrew Sq	Retail	Sq m	7,900	50%	50%	50%	50%
7	City Centre	City Centre Retailing	St Andrew Sq	Retail	Sq m	7,900	50%	50%	50%	50%
13	City Centre	New St/ Sibbald Walk	New Waverly	Office/Business	Sq m	16,678	50%	100%	100%	100%
13	City Centre	New St/ Sibbald Walk	New Waverly	Retail	Sq m	5,000	50%	100%	100%	100%
13	City Centre	New St/ Sibbald Walk	New Waverly	Leisure	Sq m	1,500	50%	100%	100%	100%
13	City Centre	New St/ Sibbald Walk	New Waverly	Hotel	Units	403	50%	100%	100%	100%
19	City Centre	Lauriston	Quartermile	Residential	Units	103	75%	100%	100%	100%
19	City Centre	Lauriston	Quartermile	Office/Business	Sq m	19,631	75%	100%	100%	100%
22	City Centre	Morrison St	Capital Square	Office/Business	Sq m	15,834	50%	100%	100%	100%
31		Warriston/ Newhaven Rd	Newhaven Road	Residential	Units	127	50%	100%	100%	100%
31		Warriston/ Newhaven Rd	Beaverhall Road	Residential	Units	80	50%	100%	100%	100%
33		Leith Walk	LDP HSG 11: Shrub Place	Residential	Units	201	50%	100%	100%	100%
37		Brunswick	Brunswick Rd	Residential	Units	121	50%	100%	100%	100%
59		West Coates	Donaldson's	Residential	Units	110	50%	100%	100%	100%
71		Bonnington	Bonnington Rd Lane	Residential	Units	135	50%	100%	100%	100%
71		Bonnington	West Bowling Green St	Residential	Units	91	50%	100%	100%	100%
80		Meadowbank	Albion Rd	Residential	Units	137	50%	100%	100%	100%
81		Abbeyhill	Abbey Lane	Residential	Units	139	50%	100%	100%	100%
107		Craigleith	ECLP HSG12: Telford College (South)	Residential	Units	351	100%	100%	100%	100%
108		Pilton	LDP HSG9 Pilton/ Ferry Rd	Residential	Units	203	50%	100%	100%	100%
113		Newhaven/ Western Harbour	LDP EW1a	Residential	Units	530	100%	100%	100%	100%
114		Ocean Terminal	CALA LDP EW1B	Residential	Units	38	50%	100%	100%	100%
115		Leith	Fort House & Madeira St	Residential	Units	102	50%	100%	100%	100%
116		Leith Docks	Salamnder St/ The Ropeworks	Residential	Units	477	75%	100%	100%	100%
118		Seafield	LDP HSG 13	Residential	Units	155	50%	100%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
122		Portobello	Fishwives Causeway	Residential	Units	143	50%	100%	100%	100%
126		Craigmillar	LDP HSG 14: Niddrie Mains Rd	Residential	Units	115	50%	100%	100%	100%
127		Greendykes	LDP 16, 17 & 18	Residential	Units	465	75%	100%	100%	100%
130		Greendykes	LDP 41 & part of LDP 18	Residential	Units	276	75%	100%	100%	100%
141		Chesser	ECLP HSG2: Chesser Avenue	Residential	Units	114	50%	100%	100%	100%
164		Muihouse	Pennywell Rd Developments	Residential	Units	193	50%	100%	100%	100%
166		Pilton	Arneil Drive	Residential	Units	118	50%	100%	100%	100%
172		Granton	LDP EW2b - Saltire Sq Dev	Residential	Units	447	50%	100%	100%	100%
178		Newcraighall	Fort Kinaird	Retail	Sq m	9,946	13%	25%	25%	25%
178		Newcraighall	LDP HSG26	Residential	Units	220	50%	100%	100%	100%
179		Dudingston	Duddingston Park South	Residential	Units	186	50%	100%	100%	100%
184		Gilmerton	LDP HSG 23, 24 & 25	Residential	Units	171	50%	100%	100%	100%
187		Gracemount	Gracemount Drive	Residential	Units	206	50%	100%	100%	100%
188		Burdiehouse	LDP HSG 21 & 22	Residential	Units	533	50%	100%	100%	100%
190		Fairmilehead	LDP HSG 10	Residential	Units	275	50%	100%	100%	100%
194		Longstone	Longstone Rd	Residential	Units	107	50%	100%	100%	100%
197		Sighthill	Calder Road	Residential	Units	122	50%	100%	100%	100%
201		South Gyle	LDP HSG6 South Gyle Wynd	Residential	Units	203	50%	100%	100%	100%
204		South Gyle	South Gyle Broadway	Residential	Units	200	50%	100%	100%	100%
212		Crammond	Crammond Rd N	Residential	Units	155	50%	100%	100%	100%
220		Wester Hailes	LDP HSG30 Harvester Way	Residential	Units	348	50%	100%	100%	100%
229		Gogarburn	RBS	Office/Business	Sq m	18,000	90%	100%	100%	100%
234		Balerno/ Currie	LDP HSG 37 & 38	Residential	Units	234	50%	100%	100%	100%
241		Newbridge	Newbridge North Car Showrooms	Retail	Sq m	3,352	25%	50%	75%	100%
241		Newbridge	Newbridge North	Office/Business	Sq m	47,703	10%	10%	10%	10%
241		Newbridge	Newbridge North Park Inn/ Premier Inn	Hotel	Units	273	50%	100%	100%	100%
242		Kirkliston	Kirkliston Distillery	Residential	Units	122	50%	100%	100%	100%
244		Kirkliston	LDP HSG3	Residential	Units	155	50%	100%	100%	100%
246		South Queensferry	Ferrymuir	Residential	Units	100	50%	100%	100%	100%
247		South Queensferry	LDP HSG2	Residential	Units	450	50%	100%	100%	100%
1862		Lasswade Rd	LDP HSG39	Residential	Units	110	50%	100%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
2321	West Edinburgh	Turnhouse		Commercial	Sq m	16,550	25%	50%	100%	100%
2351	West Edinburgh	Ratho	Craigpark Quarry & Freelands Way	Residential	Units	250	50%	100%	100%	100%
Assumptions from City Plan Reference Case Trip Generation Spreadsheet										
1	City Centre		Multiple small developments	Residential	Units	28	0%	0%	100%	100%
7	City Centre	Queen St	Glenmorison Group	Residential	Units	7	0%	0%	100%	100%
9	City Centre	York Pl	S1 Developments	Residential	Units	6	0%	0%	100%	100%
10	City Centre	St James Centre		Residential	Units	150	0%	0%	100%	100%
10	City Centre	St James Centre		Retail	Sq m	79,196	0%	0%	100%	100%
10	City Centre	St James Centre		Hotel	Units	315	0%	0%	100%	100%
10	City Centre	St James Centre		Office/Business	Sq m	7,207	0%	0%	100%	100%
13	City Centre	New Street	LDP CC2	Residential	Units	167	0%	0%	100%	100%
26	City Centre	Randolph Crescent	Multiple small developments	Residential	Units	23	0%	0%	100%	100%
31		Warriston Rd	2 sites	Residential	Units	191	0%	0%	100%	100%
31		Broughton	Beaverbank Pl	Residential	Units	44	0%	0%	100%	100%
33		Shrubhill	LDP HSG 11	Residential	Units	175	0%	0%	100%	100%
34		Broughton St/ Gayfield	Multiple small developments	Residential	Units	33	0%	0%	100%	100%
35		Annandale	Hopetoun Crescent	Residential	Units	6	0%	0%	100%	100%
41		Canongate	179 Canagate	Office/Business	Sq m	1,858	0%	0%	100%	100%
44		Dumbiedykes	Dumbiedykes Rd	Residential	Units	19	0%	0%	100%	100%
45		Southside	Simon Square	Residential	Units	6	0%	0%	100%	100%
51		Leven St	Scotmid store development	Residential	Units	8	0%	0%	100%	100%
52		Viewforth	Former High School development	Residential	Units	104	0%	0%	100%	100%
54		Fountainbridge	New Fountainbridge	Office/Business	Sq m	11,621	0%	0%	100%	100%
54		Fountainbridge	New Fountainbridge	Retail	Sq m	4,476	0%	0%	100%	100%
54		Fountainbridge	New Fountainbridge	Hotel	Units	140	0%	0%	100%	100%
54		Fountainbridge	New Fountainbridge	Leisure	Sq m	11,858	0%	0%	100%	100%
54		Fountainbridge	New Fountainbridge (Vastint)	Residential	Units	234	0%	0%	100%	100%
54		Fountainbridge (North)	Fountain North/ Moda Springside	Residential	Units	125	0%	0%	100%	100%
54		Fountainbridge (North)	Moda Springside	Residential	Units	205	0%	0%	100%	100%
54		Fountainbridge (North)	Moda Springside	Residential	Units	140	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
54		Fountainbridge (South)	CEC site	Residential	Units	64	0%	0%	100%	100%
54		Fountainbridge (South)	CEC site	Residential	Units	113	0%	0%	100%	100%
54		Fountainbridge (South)	CEC site	Residential	Units	258	0%	0%	100%	100%
57		Haymarket	Haymarket Gap site	Office/Business	Units	50,413	0%	0%	100%	100%
57		Haymarket	Haymarket Gap site	Retail	Units	2,893	0%	0%	100%	100%
57		Haymarket	Haymarket Gap site	Hotel	Units	365	0%	0%	100%	100%
57		Exchange 2	Exchange 2 Dewar Place	Office/Business	Units	4,559	0%	0%	100%	100%
57		Exchange 2	Exchange 2 Dewar Place	Retail	Units	206	0%	0%	100%	100%
57		Exchange 2	Exchange 2 Dewar Place	Hotel	Units	550	0%	0%	100%	100%
57		Morrison Crescent	Fountain North	Residential	Units	19	0%	0%	100%	100%
57		Shandwick Pl		Residential	Units	11	0%	0%	100%	100%
59		West Coates	Donaldson's	Residential	Units	93	0%	0%	100%	100%
62		West End	Melville St	Residential	Units	11	0%	0%	100%	100%
65		South Learmonth Gardnes		Residential	Units	6	0%	0%	100%	100%
67		Inverlieth	Kinnear Rd	Residential	Units	16	0%	0%	100%	100%
68		Cannonmills	2 sites	Residential	Units	20	0%	0%	100%	100%
68		Fettes Row	New Town Quarter	Residential	Units	349	0%	0%	100%	100%
68		Fettes Row	New Town Quarter	Office/Business	Sq m	9,348	0%	0%	100%	100%
68		Fettes Row	New Town Quarter	Hotel	Units	116	0%	0%	100%	100%
68		Fettes Row	New Town Quarter	Leisure	Sq m	940	0%	0%	100%	100%
69		Bonnington	Newhaven Rd (Queensberry Prop)	Residential	Units	52	0%	0%	100%	100%
69		Bonnington	Pitt St	Residential	Units	8	0%	0%	100%	100%
71		Bonnington	Ashley Place	Residential	Units	40	0%	0%	100%	100%
71		Bonnington	Bonnington Road Lane (3 sites)	Residential	Units	300	0%	0%	100%	100%
71		Bonnington	South Fort St	Residential	Units	122	0%	0%	100%	100%
71		Bonnington	West Bowling Green St (3 sites)	Residential	Units	107	0%	0%	100%	100%
74		Leith Walk	Stead's Pl (McGregor MOT Site)	Residential	Units	11	0%	0%	100%	100%
75		Leith	Multiple small developments	Residential	Units	34	0%	0%	100%	100%
76		Easter Rd		Residential	Units	5	0%	0%	100%	100%
78		Lochend	Lochend Butterfly Way	Residential	Units	24	0%	0%	100%	100%
79		Meadowbank	Marionville Rd	Residential	Units	113	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
80		Meadowbank	LDP HSG 12: Albion Rd	Residential	Units	66	0%	0%	100%	100%
80		Meadowbank	Meadowbank Stadium	Residential	Units	300	0%	0%	100%	100%
80		Meadowbank	2 sites	Residential	Units	41	0%	0%	100%	100%
81		Meadowbank	Sunnybank	Residential	Units	35	0%	0%	100%	100%
81		Abbeyhill	Abbeymount	Residential	Units	11	0%	0%	100%	100%
90		Morningside	Canaan Lane	Residential	Units	10	0%	0%	100%	100%
94		Gorgie	Ardmillan Junction	Residential	Units	48	0%	0%	100%	100%
102		Queensferry Rd		Residential	Units	2	0%	0%	100%	100%
103		Craigleith	Former BP station	Residential	Units	8	0%	0%	100%	100%
110		Trinity	East Trinity Rd	Residential	Units	5	0%	0%	100%	100%
113		Western Harbour	LDP EW1a	Residential	Units	938	0%	0%	50%	100%
113		Western Harbour	Sandpiper Dr (ASDA site)	Residential	Units	40	0%	0%	100%	100%
114		Ocean Terminal	Skyliner	Residential	Units	338	0%	0%	100%	100%
114		Ocean Terminal	CALA (LDP EW1B)	Residential	Units	352	0%	0%	100%	100%
114		Ocean Drive	2 sites	Residential	Units	62	0%	0%	100%	100%
115		Leith	2 sites	Residential	Units	41	0%	0%	100%	100%
116		Salamander Place	LDP EW1C Phases 3 to 7	Residential	Units	505	0%	0%	100%	100%
116		Bath Rd	2 sites	Residential	Units	218	0%	0%	100%	100%
117		Leith Links	2 sites	Residential	Units	41	0%	0%	100%	100%
122		Portobello	Fishwives Causeway	Residential	Units	397	0%	0%	100%	100%
124		Meadowbank	Meadowbank House	Residential	Units	116	0%	0%	100%	100%
125		Milton Road West		Residential	Units	11	0%	0%	100%	100%
126		Craigmillar	Niddrie Mains Rd (Former B&Q Site)	Retail	Sq m	164	0%	0%	100%	100%
126		Craigmillar	LDP HSG 14: Niddrie Mains Rd	Residential	Units	228	0%	0%	100%	100%
127		Craigmillar	Niddrie Mains Rd (Former LIDL Site)	Residential	Units	136	0%	0%	100%	100%
127		Greendykes	LDP HSG16	Residential	Units	71	0%	0%	100%	100%
127		Greendykes	LDP HSG17	Residential	Units	304	0%	0%	100%	100%
127		Greendykes	LDP HSG18	Residential	Units	401	0%	0%	100%	100%
127		Craigmillar	Duddingston Road West	Residential	Units	120	0%	0%	100%	100%
128		Prestonfield Avenue		Residential	Units	9	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
129		Peffermill Road		Residential	Units	30	0%	0%	100%	100%
130		Edmonstone	LDP HSG40: Wisp	Residential	Units	696	0%	0%	100%	100%
133		Liberton	LDP HSG28: Ellens Glen Rd	Residential	Units	240	0%	0%	100%	100%
135		Morningside	Braid Road	Residential	Units	7	0%	0%	100%	100%
137		Craiglockhart	Craighouse Rd	Residential	Units	145	0%	0%	100%	100%
138		Oxgangs	Oxgangs Green	Residential	Units	85	0%	0%	100%	100%
140		Craiglockhart	2 sites	Residential	Units	62	0%	0%	100%	100%
142		Gorgie	Site of Luckies Pub	Residential	Units	11	0%	0%	100%	100%
157		Davidson Mains	Main St	Residential	Units	7	0%	0%	100%	100%
158		Craigleith	2 sites	Residential	Units	17	0%	0%	100%	100%
161		Muirhouse	Pennywell Rd (3 Sites)	Residential	Units	507	0%	0%	100%	100%
166		Pilton	Crewe Rd Gardens	Residential	Units	26	0%	0%	100%	100%
167		Granton	LDP EW2a: West Shore Rd	Residential	Units	444	0%	0%	100%	100%
171		Granton	West Granton Rd	Residential	Units	11	0%	0%	100%	100%
172		Granton	LDP EW2c: Granton Harbour/ Marina	Residential	Units	1,043	0%	0%	100%	100%
172		Granton	LDP EW2c: Granton Harbour/ Marina	Retail	Sq m	8,120	0%	0%	100%	100%
172		Granton	LDP EW2c: Granton Harbour/ Marina	Office/Business	Sq m	1,816	0%	0%	100%	100%
172		Granton	LDP EW2c: Granton Harbour/ Marina	Leisure	Sq m	3,755	0%	0%	100%	100%
172		Granton	LDP EW2b: Central Development	Hotel	Units	200	0%	0%	100%	100%
172		Granton	LDP EW2b: Central Development	Retail	Sq m	817	0%	0%	100%	100%
172		Granton	LDP EW2b: Central Development	Office/Business	Sq m	1,237	0%	0%	100%	100%
172		Granton	LDP EW2b: Central Development	Residential	Units	1,640	0%	0%	100%	100%
173		Trinity	Trinity Rd	Residential	Units	5	0%	0%	100%	100%
175		Figgate St		Residential	Units	6	0%	0%	100%	100%
176		Brunstane Rd	Brunstane Rd South	Residential	Units	4	0%	0%	100%	100%
178		Newcraighall East	LDP HSG27	Residential	Units	102	0%	0%	100%	100%
178		Brunstane	LDP HSG29	Residential	Units	1,330	0%	0%	100%	100%
179		Duddingston	Duddingston Row	Residential	Units	40	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
180		The Wisp	Site North of LDP HSG41	Residential	Units	139	0%	0%	100%	100%
182		Bio Quarter	Life Sciences	Office/Business	Sq m	20,000	0%	0%	100%	100%
183		Moredun	LDP HSG30	Residential	Units	200	0%	0%	100%	100%
184		Lasswade Rd	Bellway/ Miller Site	Residential	Units	335	0%	0%	100%	100%
184		Gilmerton	Newtoft St	Residential	Units	6	0%	0%	100%	100%
184		Gilmerton	LDP HSG 24	Residential	Units	673	0%	0%	100%	100%
184		Gilmerton	LDP HSG 25	Residential	Units	112	0%	0%	100%	100%
188		Burdiehouse	LDP HSG21: Broomhills	Residential	Units	331	0%	0%	100%	100%
188		Burdiehouse	LDP HSG22: Burdiehouse Rd	Residential	Units	17	0%	0%	100%	100%
192			Lanark Rd	Residential	Units	9	0%	0%	100%	100%
193		Clovenstone	LDP HSG31: Curriemuirend	Residential	Units	188	0%	0%	100%	100%
194		Longstone	Longstone Rd	Residential	Units	50	0%	0%	100%	100%
195		Wester Hailes	Drumbryden Dr	Residential	Units	49	0%	0%	100%	100%
197		Sighthill	Calder Road	Residential	Units	194	0%	0%	100%	100%
209		Corstorphine	St John's Road	Residential	Units	36	0%	0%	100%	100%
210		Drum Brae	Ardshiel Ave	Residential	Units	6	0%	0%	100%	100%
212		Barnton	Barnton Ave West	Residential	Units	22	0%	0%	100%	100%
225		Edinburgh Park	Edinburgh Park South	Office/Business	Sq m	43,000	0%	0%	25%	50%
225		Edinburgh Park	Edinburgh Park South	Leisure	Sq m	1,695	0%	0%	25%	50%
225		Edinburgh Park	Edinburgh Park South	Health	Sq m	1,063	0%	0%	25%	50%
225		Edinburgh Park	Edinburgh Park South	Residential	Units	1,737	0%	0%	25%	50%
234		Balerno/ Currie	Lanark Rd West	Residential	Units	53	0%	0%	100%	100%
234		Balerno/ Currie	LDP HSG 37 & 38	Residential	Units	112	0%	0%	100%	100%
238		Ratho	LDP HSG 5: Hilwood Rd	Residential	Units	124	0%	0%	100%	100%
244		Kirkliston	2 sites	Residential	Units	119	0%	0%	100%	100%
246		South Queensferry	Ferrymuir Gait	Residential	Units	108	0%	0%	100%	100%
246		South Queensferry	LDP HSG 32: Builyeon Rd	Residential	Units	840	0%	0%	100%	100%
246		South Queensferry	LDP HSG 1: Springfield	Residential	Units	150	0%	0%	100%	100%
247		South Queensferry	LDP HSG 33: South Scotstoun	Residential	Units	339	0%	0%	100%	100%
247		South Queensferry	Ferrymuir Gait	Residential	Units	44	0%	0%	100%	100%
1862		Lasswade Rd	LDP HSG 39	Residential	Units	150	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
2301		IBG1		Office/Business	Sq m	122,000	0%	0%	100%	100%
2301		IBG1		Hotel	Units	1,415	0%	0%	100%	100%
2301		IBG1		Leisure	Sq m	800	0%	0%	100%	100%
2301		IBG1		Retail	Sq m	5,400	0%	0%	100%	100%
2301		IBG1		Residential	Units	312	0%	0%	100%	100%
2322		Cammo	LDP HSG 20: Cammo Meadows	Residential	Units	656	10%	10%	100%	100%
2323		West Craigs	LDP HSG 19	Residential	Units	1,530	10%	10%	100%	100%
2324		West Craigs	LDP HSG 19: Maybury East	Residential	Units	250	10%	10%	100%	100%
2358		Balerno/ Currie	Long Dalmohoy Rd	Residential	Units	7	0%	0%	100%	100%
2402		Ingliston	Fairview Mill	Hotel	Units	180	0%	0%	100%	100%
2402		Ingliston	Fairview Mill	Retail	Sq m	845	0%	0%	100%	100%
2402		Ingliston	Showground	Hotel	Units	373	0%	0%	100%	100%
2402		Ingliston	Showground - conference facilities	Office/Business	Sq m	3,300	0%	0%	100%	100%
Midlothian and East Lothian Assumptions (Shawfair & Queen Margaret Uni)										
249		Midlothian	LDP h44 Danderhall North	Residential	Units	190	0%	50%	100%	100%
250		Midlothian	LDP Hs0 Caldcots	Residential	Units	320	0%	0%	25%	100%
251		Midlothian	LDP h43: Shawfair North	Residential	Units	1,000	0%	0%	25%	75%
252		Midlothian	LDP h43: Shawfair Central	Residential	Units	1,500	0%	0%	25%	75%
254		Midlothian	LDP h45: Danderhall South	Residential	Units	300	0%	100%	100%	100%
254		Midlothian	LDP e27: Shawfair Park Extension	Office/Business	Sq m	200,000	0%	5%	10%	20%
255		Midlothian	LDP h43: Shawfair South / Millerhill	Residential	Units	1,000	0%	25%	75%	100%
255		Midlothian	LDP Hs1: Old Craighall Rd	Residential	Units	982	0%	25%	75%	100%
263		East Lothian	LDP MH1 & MH4	Residential	Units	500	0%	50%	100%	100%
263		East Lothian	LDP MH1 & MH4	Office/Business	Sq m	200,000	0%	0%	10%	25%
264		East Lothian	LDP MH1, MH2 & MH3	Residential	Units	1,100	0%	50%	100%	100%
264		East Lothian	LDP MH1, MH2 & MH3	Office/Business	Sq m	250,000	0%	0%	10%	25%
Assumptions from City Plan 2030 Trip Generation Spreadsheet - Brownfield Sites										
9	EoCC	York Place East	Broughton Market	Residential	Units	41	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
20	Fountainbridge	Lauriston Gardens	Chalmers Street (Eye Pavilion)	Residential	Units	68	0%	0%	100%	100%
28	EoCC	New Town West End	India Place	Residential	Units	8	0%	0%	100%	100%
31	Leith	Warriston - Broughton Rd	Beaverhall Road	Residential	Units	83	0%	0%	100%	100%
31	Leith	Warriston - Broughton Rd	Broughton Road	Residential	Units	262	0%	0%	50%	100%
31	Leith	Warriston - Broughton Rd	Broughton Road	Residential	Units	23	0%	0%	100%	100%
31	Leith	Warriston - Broughton Rd	Stewartfield	Residential	Units	207	0%	0%	50%	100%
31	Leith	Warriston - Broughton Rd	Newhaven Road (C)	Residential	Units	193	0%	0%	50%	100%
32	EoCC	Broughton - Bellevue St	Eyre Place	Residential	Units	69	0%	0%	100%	100%
33	Leith	Broughton/Pilrig - Rossly	McDonald Road (B)	Residential	Units	158	0%	0%	100%	100%
34	EoCC	Broughton - East London S	East London Street	Residential	Units	41	0%	0%	100%	100%
35	EoCC	Hopetoun Crescent	McDonald Place	Residential	Units	152	0%	0%	100%	100%
36	Leith	Albert St	Albert Street	Residential	Units	28	0%	0%	100%	100%
36	Leith	Albert St	Iona Street	Residential	Units	83	0%	0%	100%	100%
46	EoCC	St Leonards St	St Leonard's Street (car park)	Residential	Units	24	0%	0%	100%	100%
47	EoCC	South Clerk St	Cowans Close	Residential	Units	55	0%	0%	100%	100%
52	Fountainbridge	Viewforth	Gillspie Crescent	Residential	Units	166	0%	0%	100%	100%
55	Fountainbridge	Fountainbridge - Western	Dalry Road	Residential	Units	45	0%	0%	100%	100%
65	Fountainbridge	Comely Bank	Orchard Brae	Residential	Units	124	0%	0%	100%	100%
67	Leith	Inverleith	Royston Terrace	Residential	Units	28	0%	0%	100%	100%
68	EoCC	Tanfield House	Eyre Terrace	Residential	Units	245	0%	0%	0%	0%
68	EoCC	Tanfield House	Glenogle Road	Residential	Units	83	0%	0%	0%	0%
71	Leith	Anderson Place	Newhaven Road (B)	Residential	Units	90	0%	0%	100%	100%
71	Leith	Anderson Place	Bangor Road (James Pringle)	Residential	Units	138	0%	0%	50%	100%
71	Leith	Anderson Place	Pitt Street	Residential	Units	48	0%	0%	100%	100%
71	Leith	Anderson Place	West Bowling Green Street	Residential	Units	83	0%	0%	100%	100%
71	Leith	Anderson Place	South Fort Street	Residential	Units	414	0%	0%	50%	100%
72	Leith	Bonnington Rd East End	Corunna Place	Residential	Units	24	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
72	Leith	Bonnington Rd East End	Bangor Road (Swanfield Industrial Estate)	Residential	Units	290	0%	0%	50%	100%
73	Leith	Pilrig W	Bonnington Road	Residential	Units	56	0%	0%	100%	100%
74	Leith	Pilirg - Tenant St	Jane Street	Residential	Units	580	0%	0%	50%	100%
74	Leith	Pilirg - Tenant St	Steads Place	Residential	Units	193	0%	0%	100%	100%
77	Leith	Lorne St	Leith Walk /Halmyre Street	Residential	Units	235	0%	0%	100%	100%
78	Leith	Albion Place	St Clair Street	Residential	Units	373	0%	0%	50%	100%
80	Leith	Marionville Road W	London Road (B)	Residential	Units	113	0%	0%	100%	100%
80	Leith	Marionville Road W	Norton Park	Residential	Units	69	0%	0%	100%	100%
87	EoCC	The Grange	Ratcliffe Terrace	Residential	Units	97	0%	0%	100%	100%
89	EoCC	Nether Liberton / Blackfo	Watertoun Road	Residential	Units	72	0%	0%	100%	100%
90	West	Churchill	Falcon Road West	Residential	Units	28	0%	0%	100%	100%
90	EoCC	Churchill	Astley Ainslie Hospital	Residential	Units	500	0%	0%	25%	100%
91	Fountainbridge	Merchiston	Temple Park Crescent	Residential	Units	28	0%	0%	100%	100%
93	Fountainbridge	North Merchiston	Dundee Street	Residential	Units	45	0%	0%	100%	100%
93	Fountainbridge	North Merchiston	Watson Crescent Lane	Residential	Units	8	0%	0%	100%	100%
95	Fountainbridge	Dalry W	Dundee Terrace	Residential	Units	45	0%	0%	100%	100%
96	West	Tynecastle	Murieston Lane	Residential	Units	69	0%	0%	100%	100%
99	EoCC	Roseburn E	Russell Road (Royal Mail)	Residential	Units	69	0%	0%	100%	100%
99	EoCC	Roseburn E	Roseburn Street	Residential	Units	152	0%	0%	100%	100%
104	Fountainbridge	Orchard Brae E	Orchard Brae Avenue	Residential	Units	55	0%	0%	100%	100%
106	EoCC	Craigleith S	Royal Victoria Hospital	Residential	Units	360	0%	0%	50%	100%
108	Leith	Craigleith - Telford Coll	Ferry Road	Residential	Units	14	0%	0%	100%	100%
108	Granton	Craigleith - Telford Coll	Crewe Road South	Residential	Units	320	0%	0%	50%	100%
112	Leith	Newhaven E	North Fort Street	Residential	Units	8	0%	0%	100%	100%
115	Leith	South Leith	Coburg Street	Residential	Units	152	0%	0%	100%	100%
115	Leith	South Leith	Commercial Street	Residential	Units	45	0%	0%	100%	100%
116	Leith	Leith Harbour	Salamander Place	Residential	Units	113	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
116	Leith	Leith Harbour	Baltic Street (B)	Residential	Units	14	0%	0%	100%	100%
116	CC	Leith Harbour	Timberbush	Residential	Units	28	0%	0%	100%	100%
122	East	Groynes	Sir Harry Lauder Road	Residential	Units	104	0%	0%	100%	100%
122	Leith	Groynes	Westbank Street	Residential	Units	144	0%	0%	100%	100%
123	Leith	Northfield	Portobello Road	Residential	Units	41	0%	0%	100%	100%
125	East	Duddingston	Willowbrae Road	Residential	Units	24	0%	0%	100%	100%
127	SE	Greendykes	Niddrie Mains Road (A)	Residential	Units	104	0%	0%	100%	100%
127	SE	Greendykes	Niddrie Mains Road (B)	Residential	Units	136	0%	0%	100%	100%
127	SE	Greendykes	Peffer Bank	Residential	Units	120	0%	0%	100%	100%
129	SE	Craigmillar	Peffermill Road	Residential	Units	16	0%	0%	100%	100%
129	SE	Craigmillar	Old Dalkeith Road	Residential	Units	24	0%	0%	100%	100%
133	SE	Moredun W	Liberton Hospital	Residential	Units	120	0%	0%	100%	100%
140	West	Craiglockhart	Lanark Road (D)	Residential	Units	80	0%	0%	100%	100%
140	West	Craiglockhart	Craiglockhart Avenue	Residential	Units	24	0%	0%	100%	100%
141	West	Slateford	West Gorgie Park	Residential	Units	110	0%	0%	100%	100%
141	West	Slateford	Gorgie Road (Caledonian Packaging)	Residential	Units	138	0%	0%	100%	100%
141	West	Slateford	Gorgie Park Close	Residential	Units	110	0%	0%	100%	100%
142	West	Factors Park S	Westfield Road (A)	Residential	Units	28	0%	0%	0%	50%
142	West	Factors Park S	Stevenson Road	Residential	Units	290	0%	0%	0%	50%
142	West	Factors Park S	Gorgie Road (east)	Residential	Units	469	0%	0%	0%	50%
146	West	Factors Park W	Balgreen	Residential	Units	152	0%	0%	0%	50%
147	West	Saughton E	Broomhouse Terrace	Residential	Units	320	0%	0%	0%	0%
164	Granton	West Pilton S	West Pilton Grove	Residential	Units	40	0%	0%	100%	100%
175	East	Portobello	Craigentinny Depot	Residential	Units	400	0%	0%	0%	0%
175	Leith	Portobello	Joppa Road	Residential	Units	8	0%	0%	100%	100%
175	Leith	Portobello	Eastfield	Residential	Units	40	0%	0%	100%	100%
179	SE	Cleikimin	Duddingston Park South	Residential	Units	24	0%	0%	100%	100%
183	SE	Moredun E	Moredun Park Loan	Residential	Units	32	0%	0%	100%	100%
183	SE	Moredun E	Moredun Park View	Residential	Units	24	0%	0%	100%	100%
184	SE	Gilmerton N	Gilmerton Dykes Street	Residential	Units	24	0%	0%	100%	100%
184	SE	Gilmerton N	Morrisons at Gilmerton Road	Residential	Units	32	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
187	SE	Gracemount	Rae's Crescent	Residential	Units	32	0%	0%	100%	100%
189	SE	Liberton	Alnwickhill Road	Residential	Units	96	0%	0%	100%	100%
192	West	Kingsknowe	Lanark Road (A)	Residential	Units	72	0%	0%	100%	100%
193	West	Wester Hailes	Clovenstone House	Residential	Units	97	0%	0%	100%	100%
194	West	Longstone	Peatville Gardens	Residential	Units	10	0%	0%	100%	100%
194	West	Longstone	Murrayburn Road	Residential	Units	384	0%	0%	50%	100%
194	West	Longstone	Inglis Green Road	Residential	Units	152	0%	0%	100%	100%
195	West	Parkhill	Dumbryden Drive	Residential	Units	124	0%	0%	100%	100%
195	West	Parkhill	Murrayburn Gate	Residential	Units	135	0%	0%	100%	100%
205	West	Corstorphine S	St John's Road (A)	Residential	Units	14	0%	0%	100%	100%
205	West	Corstorphine S	Kirk Loan	Residential	Units	16	0%	0%	100%	100%
205	West	Corstorphine S	Corstorphine Road (A)	Residential	Units	16	0%	0%	100%	100%
205	West	Corstorphine S	Corstorphine Road (B)	Residential	Units	8	0%	0%	100%	100%
207	West	South Gyle N	Gylemuir Road	Residential	Units	124	0%	0%	100%	100%
209	West	Drumbrae	St John's Road (B)	Residential	Units	72	0%	0%	100%	100%
215	Granton	Muirhouse North	Silverlea	Residential	Units	144	0%	0%	100%	100%
216	SE	Gilmerton S	Gilmerton Gateway	Residential	Units	304	0%	0%	50%	100%
217	SW	Colinton	Redford Barracks	Residential	Units	800	0%	0%	25%	100%
221	West	East Hermiston	Calder Estate (H)	Residential	Units	28	0%	0%	100%	100%
180	SE	Newcraighall	Land at The Wisp	Residential	Units	304	0%	0%	50%	100%
245	NW	Dundas Castle	Land at Ferrymuir	Residential	Units	88	0%	0%	100%	100%
Assumptions from City Plan 2030 Trip Generation Spreadsheet - Strategic Sites & West Edinburgh										
114	Leith	Leith Docks	Port Activities	Commercial	Sq m	12,120	0%	0%	25%	50%
114	Leith	Leith Docks	Retail - Local shops	Retail	Sq m	18,844	0%	0%	25%	50%
114	Leith	Leith Docks	Bars/Restaurants	Retail	Sq m	6,750	0%	0%	25%	50%
114	Leith	Leith Docks	Leisure	Leisure	Sq m	9,913	0%	0%	25%	50%
114	Leith	Leith Docks	Education	Education	Sq m	5,620	0%	0%	25%	50%
116	Leith	Leith Docks	Port Activities	Commercial	Sq m	12,120	0%	0%	25%	50%
116	Leith	Leith Docks	Retail - Local shops	Retail	Sq m	18,844	0%	0%	25%	50%
116	Leith	Leith Docks	Bars/Restaurants	Retail	Sq m	6,750	0%	0%	25%	50%
116	Leith	Leith Docks	Leisure	Leisure	Sq m	9,913	0%	0%	25%	50%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
116	Leith	Leith Docks	Education	Education	Sq m	5,620	0%	0%	25%	50%
122	Leith	Seafield	Housing	Residential	Units	800	0%	0%	10%	100%
181	SE	Bio Quarter	Commercial/ Life Sciences	Office/Business	Sq m	300,000	9%	11%	18%	25%
182	SE	Bio Quarter	Commercial/ Life Sciences	Office/Business	Sq m	300,000	9%	11%	18%	25%
182	SE	Bio Quarter	Residential	Residential	Units	2,500	0%	0%	25%	75%
2261	West	Garden District	Housing	Residential	Units	1,350	0%	0%	20%	100%
2302	West	West Town	Office	Office/Business	Sq m	22,297	0%	0%	10%	50%
2302	West	West Town	Industrial	Commercial	Sq m	3,716	0%	0%	10%	50%
2302	West	West Town	Residential	Residential	Units	7,000	0%	0%	10%	50%
2303	West	Elements Edin	Housing	Residential	Sq m	2,500	0%	0%	10%	50%
2303	West	Elements Edin	Office	Office/Business	Sq m	45,000	0%	0%	10%	50%
2303	West	Elements Edin	Industrial	Commercial	Sq m	13,500	0%	0%	10%	50%
2323	West	Saico (Land at Turnhouse Road)	Housing	Residential	Units	1,000	0%	0%	10%	100%
2401	West	RH Showground	Extended Showground	Leisure	Sq m	13,370	50%	100%	100%	100%
2401	West	RH Showground	Retail	Retail	Sq m	2,475	0%	0%	25%	25%
2402	West	RH Showground	Hotel	Hotel	Units	124	0%	0%	100%	100%
2402	West	RH Showground	Office	Office/Business	Sq m	29,000	0%	0%	0%	0%
170	Granton	Post 2030 Granton Masterplan	Residential	Residential	Units	3,500	0%	0%	100%	100%
Assumptions from Neighbouring Local Development Plans										
265		East Lothian	Musselburgh	Residential	Units	1,830	0%	35%	75%	100%
266		East Lothian	Musselburgh	Residential	Units	1,830	0%	10%	50%	100%
267		East Lothian	Tranent	Residential	Units	1,321	0%	10%	50%	100%
268		East Lothian	Prestonpans	Residential	Units	590	0%	25%	50%	100%
269		East Lothian	Pencaitland	Residential	Units	170	0%	30%	100%	100%
270		East Lothian	Longniddry	Residential	Units	4,800	0%	5%	20%	35%
271		East Lothian	Gullane and Aberlady	Residential	Units	0.1	0%	10%	50%	100%
272		East Lothian	Haddington	Residential	Units	1,548	0%	30%	50%	100%
273		East Lothian	North Berwick	Residential	Units	1,035	0%	30%	75%	100%
274		East Lothian	Dunbar	Residential	Units	1,355	0%	35%	75%	100%
253		Midlothian	Loanhead	Residential	Units	41	0%	100%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
256		Midlothian	Eskbank	Residential	Units	0.1	0%	0%	0%	0%
257		Midlothian	Roslin and Bilston	Residential	Units	1,453	0%	30%	75%	100%
258		Midlothian	Dalkeith E	Residential	Units	650	0%	100%	100%	100%
259		Midlothian	Bonnyrigg and Rosewell	Residential	Units	1,817	25%	50%	100%	100%
260		Midlothian	Penicuik	Residential	Units	1,345	0%	100%	100%	100%
261		Midlothian	Pathhead	Residential	Units	0.1	0%	0%	0%	0%
262		Midlothian	Gorebridge and Newtongran	Residential	Units	2,662	0%	90%	100%	100%
288		West Lothian	East Calder	Residential	Units	2,210	0%	23%	100%	100%
289		West Lothian	Hopetoun	Residential	Units	0.1	0%	0%	0%	0%
290		West Lothian	Winchburgh	Residential	Units	3,173	0%	20%	94%	100%
291		West Lothian	Uphall and Broxburn	Residential	Units	1,700	0%	0%	65%	100%
292		West Lothian	Pumpherston	Residential	Units	569	0%	24%	100%	100%
293		West Lothian	Kirknewton & District	Residential	Units	301	0%	40%	100%	100%
294		West Lothian	Almondvale	Residential	Units	0.1	0%	0%	0%	0%
295		West Lothian	Livingston	Residential	Units	4,562	0%	14%	58%	100%
296		West Lothian	Deans	Residential	Units	0.1	0%	0%	0%	0%
297		West Lothian	Bridgend	Residential	Units	183	0%	0%	100%	100%
298		West Lothian	Blackburn/Boghall	Residential	Units	42	0%	12%	100%	100%
299		West Lothian	Linlithgow	Residential	Units	266	0%	0%	100%	100%
300		West Lothian	West Calder	Residential	Units	834	0%	33%	100%	100%
301		West Lothian	Harburn	Residential	Units	0.1	0%	0%	0%	0%
302		West Lothian	Bathgate	Residential	Units	503	0%	0%	100%	100%
303		West Lothian	Torphicen	Residential	Units	560	0%	1%	62%	100%
304		West Lothian	Armadale	Residential	Units	444	0%	0%	100%	100%
305		West Lothian	Fauldhouse and Whitburn	Residential	Units	2,515	0%	2%	51%	100%
306		West Lothian	Breich	Residential	Units	377	0%	0%	73%	100%
307		West Lothian	Blackridge	Residential	Units	292	0%	10%	100%	100%
275		Fife	Dalgety and Aberdour	Residential	Units	1,650	0%	20%	50%	100%
276		Fife	North Queensferry	Residential	Units	0.1	0%	0%	0%	0%
277		Fife	Burntisland and Kinghorn	Residential	Units	1,000	0%	20%	50%	100%
278		Fife	Dunfermline South	Residential	Units	1,200	0%	5%	25%	75%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
279		Fife	Cowdenbeath	Residential	Units	0.1	0%	0%	0%	0%
280		Fife	Halbeath	Residential	Units	3,000	0%	5%	25%	75%
281		Fife	Crossford	Residential	Units	0.1	0%	0%	0%	0%
282		Fife	Dunfermline North	Residential	Units	2,850	0%	20%	50%	100%
283		Fife	Cardennan	Residential	Units	2,550	0%	0%	10%	50%
284		Fife	Kirkaldy-Sinclairtown	Residential	Units	5,810	0%	20%	50%	100%
285		Fife	Oakley and Saline	Residential	Units	0.1	0%	0%	0%	0%
286		Fife	Kincardine and Culross	Residential	Units	0.1	0%	0%	0%	0%
287		Fife	St Andrews	Residential	Units	2,490	0%	5%	25%	75%
316		The Borders	370 houses per year Borders commitment	Residential	Units	400	0%	2%	50%	100%
317		The Borders	370 houses per year Borders commitment	Residential	Units	1,200	0%	10%	50%	100%
318		The Borders	370 houses per year Borders commitment	Residential	Units	1,200	0%	5%	50%	100%
319		The Borders	370 houses per year Borders commitment	Residential	Units	2,800	0%	10%	50%	100%
320		The Borders	370 houses per year Borders commitment	Residential	Units	1,200	0%	10%	50%	100%
321		The Borders	370 houses per year Borders commitment	Residential	Units	400	0%	2%	50%	100%
166		Pilton	Leonardos	Office/Business	Sq m	18,000	100%	100%	100%	100%
258		Midlothian	Ec2 Salter's Park Extension, Dalkeith	Office/Business	Sq m	120,000	0%	0%	50%	100%
257		Midlothian	Ec3 West Straiton	Office/Business	Sq m	600,000	0%	0%	50%	100%
253		Midlothian	Ec4 Ashgrove North, Loanhead	Office/Business	Sq m	115,000	0%	0%	50%	100%
257		Midlothian	Ec5 Oatslie, Roslin	Office/Business	Sq m	45,000	0%	0%	50%	100%
257		Midlothian	Bt1 Easter Bush North	Office/Business	Sq m	64,000	0%	20%	50%	100%
257		Midlothian	Bt2 Easter Bush South	Office/Business	Sq m	58,000	0%	20%	50%	100%
257		Midlothian	Bt3 Technopole North West	Office/Business	Sq m	22,000	0%	10%	50%	100%
106	EoCC	Craigleith S	Royal Victoria Hospital	Office/Business	Sq m	60,000	20%	22%	23%	25%
19	City Centre	Lauriston	Quartermile	Office/Business	Sq m	20,000	0%	0%	100%	100%

Zone	Area	Sub-area	Development	Land Use	Units	Size	2016	2022	2032	2042
106	Orchard Brae	Craigleith S	Finance House	Residential	Units	106	0%	0%	100%	100%
83		Commonwealth Pool	Scottish Widows	Residential	Units	194	0%	0%	100%	100%
132		Cameron Toll		Residential	Units	750	0%	0%	50%	100%
114		Ocean Terminal	ocean point 2	Residential	Units	524	0%	0%	50%	100%
114		Ocean Terminal		Residential	Units	530	0%	0%	100%	100%

Appendix B. Regional Housing Buildout Rates

Table B.1 East Lothian Housing Completions 2016-2022

Musselburgh		Tranent		Pencaitland		Haddington		Prestonpans		North Berwick		Dunbar	
MH1	1500	TT1	550	TT13	115	HN1	800	PS1	450	NK1	420	DR1	500
MH2	100	TT4	120	TT14	55	HN2	275	PS2	120	NK3	120	DR2	250
MH6	450	TT5	80		170	HN3	193		570	NK4	125	DR4	50
MH7	130		750			HN4	80			NK5	140	DR5	250
MH9	1450					HN5	112			NK6	100	DR6	90
MH10	600					HN7	89			NK7	130	DR8	100
MH12	94						1549				1035	DR12	115
MH13	300												1355
MH14	200												
	4824												
By 2022	450		0		50		489		0		345		500
Total	4824		750		170		1549		570		1035		1355
% Complete	9%		0%		29%		32%		0%		33%		37%
	Grand Tot												
By 2022	**1834**												
Total	**10253**												
% Complete	**18%**												

https://www.eastlothian.gov.uk/downloads/file/27791/local_development_plan_2018_adopted_270918

Table B.2 Midlothian Housing Completions 2016-2022

Danderhall / Shawfair		A7 / A68		Bonnyrigg / Lasswade		Mayfield / Easthouses		Newtongrange		Gorebridge	
H43	3990	H12	173	H28	246	H38	439	H34	109	H23	211
H44		H29	62			H41	63	H35	137	H24	76
H45		H32	49	HS9	56	H48	65	H37	137	H36	271
		H33	92	HS10	300	H49	50			H39	23
HS0	350	H46	100	HS11	360				383	H40	46
HS1	480	H47	140	HS12	375		617			H50	700
				HS13	18					H51	55
	4820	HS2	60								
		HS3	35		1355					HS7	200
		HS4	82							HS8	80
		HS5	30								
											1662
			823								
By 2022	1083		476		246		65		137		551
Total	4820		823		1355		617		383		1662
% Complete	22%		58%		18%		11%		36%		33%
	Grand Tot										
By 2022	3779										
Total	12964										
% Complete	29%										

https://www.midlothian.gov.uk/downloads/file/4893/midlothian_local_development_plan

Table B.3 Midlothian Housing Completions 2016-2022 (Continued)

Rosewell		A701 Loanhead / Straiton		A701 Bilston		A701 Roslin		A701 Penicuik / Auchendinny	
H22	150	H54	268	H55	150	H57	79	H9	11
H52	125			H56	71			H25	458
H53	20	HS15	41			HS18	200	H26	109
H69	26			HS16	350	HS19	260	H58	385
H70	84		309	HS17	75				
							539	HS20	350
HS14	60				646			HS21	12
								HS22	20
	465								
									1345
By 2022	170		100		238		279		434
Total	465		309		646		539		1345
% Complete	37%		32%		37%		52%		32%

Table B.4 West Lothian Housing Completions 2016-2022

Armadale		Bathgate		Blackburn		Blackridge		Briech		Bridgend	
H-AM 5	135	H-BA 2	70	H-BB 7	74	H-BL 1	58	H-BR 3	70	H-BD 1	40
H-AM 6	135	H-BA 3	177			H-BL 4	210	H-BR 6	30	H-BD 2	90
H-AM 7	85	H-BA 6	298		74	H BL 5	30			H-BD 3	40
H-AM 8	131	H-BA 8	76						100	H-BD 5	30
H-AM 11	85	H-BA 9	61				298				
H-AM 12	300	H-BA 10	121								200
H-AM 13	100	H-BA 11	86								
H-AM 14	254	H-BA 13	53								
H-AM 15	400	H-BA 15	46								
H-AM 19	320	H-BA 18	170								
		H-BA 23	50								
	1945	H-BA 24	100								
		H-BA 27	100								
		H-BA 29	53								
			1461								
By 2022	385		414		74		58		0		0
Total	1945		1461		74		298		100		200
% Complete	20%		28%		100%		19%		0%		0%
	Grand Tot										
By 2022	4713										
Total	23662										
% Complete	20%										

Table B.5 West Lothian Housing Completions 2016-2022 (Continued)

Broxburn		Dechmont		East Calder		Fauldhouse		Kirknewton		Linlithgow	
H-BU 1	40	H-DE 1	550	H-EC 3	50	H-FA 1	68	H-KN 2	90	H-LL 1	41
H-BU 4	100	H-DE 2	120	H-EC 4	117	H-FA 3	30	H-KN 4	30	H-LL 3	50
H-BU 5	100			H-EC 5	553	H-FA 4	30			H-LL 11	200
H-BU 8	590		670	H-EC 6	63	H-FA 5	61		120	H-LL 12	60
H-BU 9	135			H-EC 7	107	H-FA 6	48			H-LL 13	210
H-BU 10	825			H-EC 8	110	H-FA 7	30				
H-BU 13	230			H-EC 9	2020	H-FA 10	30				561
H-BU 14	200			H-EC 10	120	H-FA 11	90				
	2220				3140		387				
By 2022	430		0		801		0		0		110
Total	2220		670		3140		387		120		561
% Complete	19%		0%		26%		0%		0%		20%

Table B.6 West Lothian Housing Completions 2016-2022 (Continued)

Livingston		Longridge		Midcalder		Polbeth		Pumpherston		Stoneyburn / Bents	
H-LV 2	59	H-LR 2	30	H-MC 1	57	H-PB 1	120	H-PU 1	600	H-SB 1	50
H-LV 9	45							H-PU 4	60	H-SB 2	60
H-LV 11	170		30		57		120			H-SB 4	35
H-LV 13	1900								660	H-SB 6	30
H-LV 14	80									H-SB 7	150
H-LV 18	62										
H-LV 22	120										325
H-LV 23	130										
H-LV 24	30										
H-LV 25	50										
H-LV 27	165										
H-LV 29	36										
H-LV 33	150										
H-LV 34	125										
H-LV 34	280										
	3402										
By 2022	785		30		57		0		150		0
Total	3402		30		57		120		660		325
% Complete	23%		100%		100%		0%		23%		0%

Table B.7 West Lothian Housing Completions 2016-2022 (Continued)

West Calder & Harburn		Westfield		Whitburn		Wilkieston		Winchburgh	
H-WC 1	120	H-WF 1	550	H-WH 1	68	H-WI 1	50	H-WB 3	470
H-WC 2	173			H-WH 2	88			H-WB 4	166
H-WC 3	58		550	H-WH 3	2683		50	H-WB 5	153
H-WC 4	189			H-WH 4	49			H-WB 6	267
								H-WB 7	77
	540				2888			H-WB 8	50
								H-WB 9	32
								H-WB 10	932
								H-WB 11	111
								H-WB 12	977
								H-WB 13	410
								H-WB 16	189
								H-WB 18	30
									3864
By 2022	278		0		473		0		667
Total	540		550		2888		50		3864
% Complete	52%		0%		16%		0%		17%

www.westlothian.gov.uk/media/38765/West-Lothian-Local-Development-Plan-Adopted-2018/pdf/West_Lothian_Local_Development_Plan_-__Adopted_final_Web_Version_Amended_-_2020-01-08.pdf

Table B.8 South Fife Housing Completions 2016-2022 (Continued)

West Calder & Harburn		Westfield		Whitburn		Wilkieston	
DGB 001	125	DUN 005	170	INV 003	50	ROS 003	54
DGB 002	50	DUN 006	184	INV 004	42	ROS 004	175
		DUN 008	84	INV 005	295		
	175	DUN 009	139				229
		DUN 010	110		387		
		DUN 011	80				
		DUN 012	105				
		DUN 013	80				
		DUN 014	54				
		DUN 017	180				
		DUN 018	274				
		DUN 019	35				
		DUN 020	35				
		DUN 022	60				
		DUN 024	131				
		DUN 028	90				
		DUN 029	200				
		DUN 030	45				
		DUN 031	30				
		DUN 035	4200				
		DUN 037	220				
		DUN 038-046	2850				
By 2022	125		1586		236		0
Total	175		9356		387		229
% Complete	71%		17%		61%		0%
	Grand Tot						
By 2022	1947						
Total	10147						
% Complete	19%						

Appendix C. Development of Future Year Demand Matrices

Trip Generation

The generation of trip ends is undertaken outside of VISUM; this is so that calibration factors can be applied to the demand trip ends (a procedure currently not available within VISUM). The trip ends are calculated by multiplying planning data by a trip rate; the planning data used differs by trip purpose which is illustrated in Table 8.1 along with the source of the data.

Trip purpose

Trip purpose	Production / origin planning data	Production / origin data source	Attraction / destination planning data	Attraction / destination data source
HBW	Household data	Census	Number of employees	Census
HBE	Household data	Census	Number of pupils	CEC / Scottish Executive
HBO	Household data	Census	Shopping GFA	CEC
NHB	Employment, Education, Shopping / Leisure GFA	Census, CEC, Scottish Executive	Employment, Education, Shopping / Leisure GFA	Census / CEC / Scottish Executive

For household data, housing is disaggregated into socio-economic groupings based on household size and economic activity; this allows for higher trip rates and car-ownership levels to be applied to larger homes with more economically active residents. The method used for calculating the number of households in each group is to apply statistical distributions to the data for each zone; this enables the probability of a household being in each socio-economic groups (and hence the numbers in each group) to be calculated in future scenarios.

The production trip rates for HBW, HBE and HBO trips are calculated from the household interview data by socio-economic category. The attraction trip ends are factored so that the total number of attraction trips is equal to the total number of production trip rates. The production trip rates are shown below in Table 8.2.

Production trip rates

Peak / Trip Purpose	SE Cat 1 (n=1, e=0)	SE Cat 2 (n>1, e=0)	SE Cat 3 (n<=2, e=1)	SE Cat 4 (n>2, e=1)	SE Cat 5 (n<=3, e>1)	SE Cat 6 (n>3, e>1)
AM HBW	0.0891	0.0694	0.4291	0.4160	0.7988	0.8941
AM HBE	0.0304	0.0893	0.0104	0.0848	0.0000	0.0616
AM HBO	0.1350	0.1430	0.1141	0.1200	0.1086	0.1079
IP HBW	0.0071	0.0055	0.0340	0.0330	0.0634	0.0709
IP HBE	0.0084	0.0246	0.0029	0.0234	0.0000	0.0170
IP HBO	0.4491	0.4756	0.3796	0.3993	0.3613	0.3590
PM HBW	0.0604	0.0471	0.2910	0.2821	0.5416	0.6062
PM HBE	0.0163	0.0479	0.0056	0.0455	0.0000	0.0330
PM HBO	0.3056	0.3236	0.2583	0.2716	0.2458	0.2443

n=household size, e=number of employed residents

For non-homebased trips, both the origin and destination trip ends are calculated by multiplying each of four planning data by appropriate trip rates. The planning data are employees, students, leisure and shopping GFA. The trip rates are calculated from the household interview data. These rates are shown in Table 8.3 below.

Non-homebased trip rates

	Employment	Education	Shopping	Leisure
AM origin	0.00536	0.06070	0.00034	0.00082
AM destination	0.01427	0.00975	0.00051	0.00045
IP origin	0.03323	0.01957	0.00901	0.00431
IP destination	0.02199	0.02297	0.01227	0.00622
PM origin	0.03855	0.01276	0.00355	0.00459
PM destination	0.00677	0.04223	0.01115	0.01065

At this stage the trip ends are segmented by purpose and by household type; they are then further disaggregated by car-ownership. The proportion of households with each level of car-ownership is calculated from the household interview data and is different for each socio-economic group. This ensures that larger households (or those with more employed residents) are more likely to have a car. The car-ownership rates are shown in Table 8.4.

Car ownership rates

SE category	Number of cars owned		
	0	1	2+
1	64%	34%	3%
2	27%	49%	24%
3	26%	52%	22%
4	16%	34%	50%
5	14%	51%	35%
6	0%	41%	59%

The trip ends are then aggregated to remove the socio-economic groups, leaving the data segmented by trip purpose and car-ownership only, which is used throughout the rest of the process. The demand model trip ends are then subjected to calibration trip factors. They are applied to adjust for geographic variability of trip generation rates and other factors which cannot be fully captured in the trip-end * trip rate process.

Trip Distribution

The trip distribution is undertaken within VISUM, using a logit equation:

$U = \exp(-\lambda * \text{cost})$

The lambda (λ) parameter used in the equation differs by trip purpose and the values used are given in Table 8.5 below.

Trip distribution logit parameters

Purpose	AM	IP	PM
HBW	-0.0345	-0.0531	-0.0338
HBE	-0.0193	-0.0258	-0.0163
HBO	-0.0227	-0.0148	-0.0146
NHB	-0.0160	-0.0144	-0.0110

The cost matrix used in the distribution is the composite cost of the PT and Car skims. PT costs skims are derived from the generalised time of travel including all access times, waiting and in-vehicle time, weighted according to the results of the stated-preference surveys

For the IP and PM peaks, the cost matrices are expressed in terms of origin and destination (O-D) and these must be converted into production and attraction (P-A) format to match the demand matrices. For the interpeak model, the translation of the matrices involves taking the average of the upper- and lower-triangles; for the PM model a simple transposition is used. In the AM, it is assumed that O-D and P-A are directly comparable.

For HBW and HBE trips, the distribution is doubly-constrained; this means that a Furness process is applied to the distributed matrix so that both production and attraction trip ends are correct. For the other two purposes the distribution is singly constrained so that only the production trip ends match.

As with the input cost matrices, the output distributed matrix must be converted from its PA form to an OD form which can be assigned. The translations used are the same as for the input, i.e. average upper- and lower-triangles for IP, and transposing for the PM.

Mode Choice

Mode choice is also undertaken within VISUM and similarly uses a logit equation:

Pcar = 1 / (1 + exp (λ * (Upt – Ucar – K))

Separate values of lambda and the mode-constant have been calibrated for each time period, otherwise applicable across all segments. A future development of the model, given sufficient confidence in the detail of the supporting data, would be to calibrate these parameters separately for more model segments.

Values of lambda and the mode constant are given in Table 8.6 and 8.7 respectively.

Lambda (λ)

Purpose	AM	IP	PM
HBW1	-0.0243	-0.0579	-0.0647
HBW2	-0.0157	-0.0535	-0.0604
HBE1	-0.0126	-0.0767	-0.0485
HBE2	-0.0097	-0.0271	-0.0476
HBO1	-0.0268	-0.0571	-0.0401
HBO2	-0.0152	-0.0542	-0.0396
NHB1	-0.0118	-0.0343	-0.0443
NHB2	-0.0098	-0.0273	-0.0301

1 = 1 car, 2 = 2 or more cars

Mode constant (K)

Purpose	AM	IP	PM
HBW1	31	24	17
HBW2	41	29	22
HBE1	1	1	1
HBE2	3	14	11
HBO1	34	36	36
HBO2	47	42	42
NHB1	32	33	20
NHB2	37	43	21

1 = 1 car, 2 = 2 or more cars

The order in which distribution and mode choice are undertaken in the model is dependent on the relative size of the lambda parameters. The larger (more sensitive) parameter should be second in the choice hierarchy.

The values of lambda derived for the distribution and mode choice functions in this study suggest that, in the morning period, mode choice should occur before distribution in the demand model. However, in the interpeak and evening periods the mode choice parameter is larger suggesting it is more sensitive. Consequently, distribution choice has been placed before mode choice in the demand model.

The relatively low mode constant for home based work and education trips is likely to be reflective of the strong culture for public transport use in Edinburgh, as evidenced by large observed mode shares.

The matrices representing trips made by 0 car households are not subjected to the mode split and are added directly to the public transport matrices.

Highway matrices have been converted from person trips to vehicle trips prior to assignment, based on car occupancy values determined for the observed matrix.

Appendix D. Tram Patronage with Network Service Pattern

Tram Patronage with Revised Network Service Pattern

Forecast tram patronage within the main report has been based on the following network service:

- 10 trams per hour, per direction, Airport to Newhaven, and
- 10 trams per hour per direction, Granton to the BioQuarter and Beyond

This pattern has enabled a direct comparison of the performance between Roseburn and Orchard Brae options.

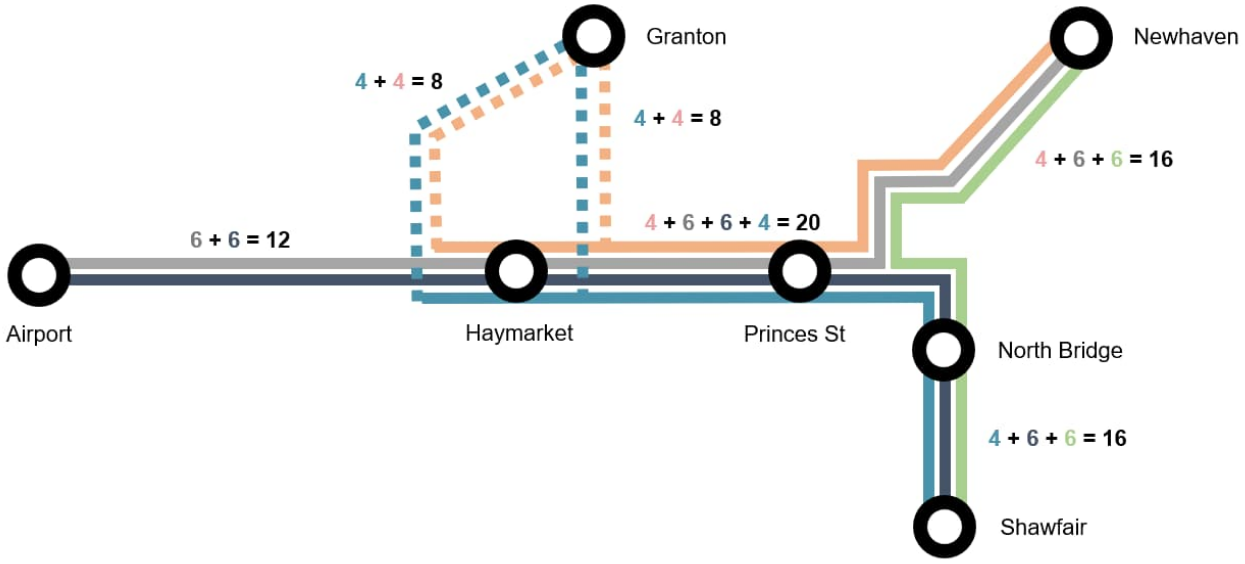
In practice, a new north-south tram route enables a range of services linking the various origins and destinations on the expanded network. In addition to the above, additional direct connections are possible between the:

- Airport and the RIE / BioQuarter
- Granton and Newhaven, and
- Newhaven and RIE / BioQuarter

Improved cross-city connectivity has the potential to significantly increase tram patronage by reducing the need for interchange. Nevertheless, options are constrained by available capacity on Princes Street which has been assumed to remain at 20 trams per hour per direction.

To capitalise on the benefits of a larger network, an alternative tram service pattern has been developed, as shown in Figure D.1.

Figure D.1: Expanded Future Tram Network Service Pattern



The service pattern by origin and destination is also given in Table D.1.

Table D.1: Service Pattern by Origin / Destination

Origin \ Destination	Airport	Granton	Newhaven	BioQuarter and Beyond	Total
Airport		-	6	6	12
Granton	-		4	4	8
Newhaven	6	4		6	16
BioQuarter and Beyond	6	4	6		16
Total	12	8	16	16	

Based on the revised service pattern above, implementation of Trams to Granton, BioQuarter and Beyond, via the Roseburn corridor, results in an unadjusted total of 38.8 million passengers on the network, an increase of 5.0 million over the simpler service pattern. Annual patronage on the north-south corridor is 17.3 million passengers.

Adjusting patronage for potential model overestimation gives values of 32.6 million passengers on the full network and 14.5 million on the Granton to BioQuarter and Beyond corridor only, an 18% increase from the simplified service pattern.

Forecast 2032 patronage is summarised in Table D.2.

Table D.2: Annual Tram Patronage with Network Service Pattern (2032)

	Do-Minimum	Roseburn	Do-Minimum (-14%)	Roseburn (-14%)
Airport-Murrayfield	6,607,000	7,965,000	5,549,000	6,691,000
Granton-City Centre west		4,062,000		3,412,000
Haymarket-Newhaven	14,950,000	17,948,000	12,558,000	15,076,000
City Centre east-South East		8,861,000		7,443,000
Total	**21,556,000**	**38,836,000**	**18,107,000**	**32,622,000**
Granton-Shawfair Patronage		**17,280,000**		**14,515,000**

Appendix E. 2032 and 2042 Tram Patronage

Figure E.1: 2032 Roseburn Patronage by Stop (AM)

Figure E.2: 2032 Orchard Brae Patronage by Stop (AM)

Figure E.3: 2042 Roseburn Patronage by Stop (AM)

Figure E.4: 2042 Orchard Brae Patronage by Stop (AM)

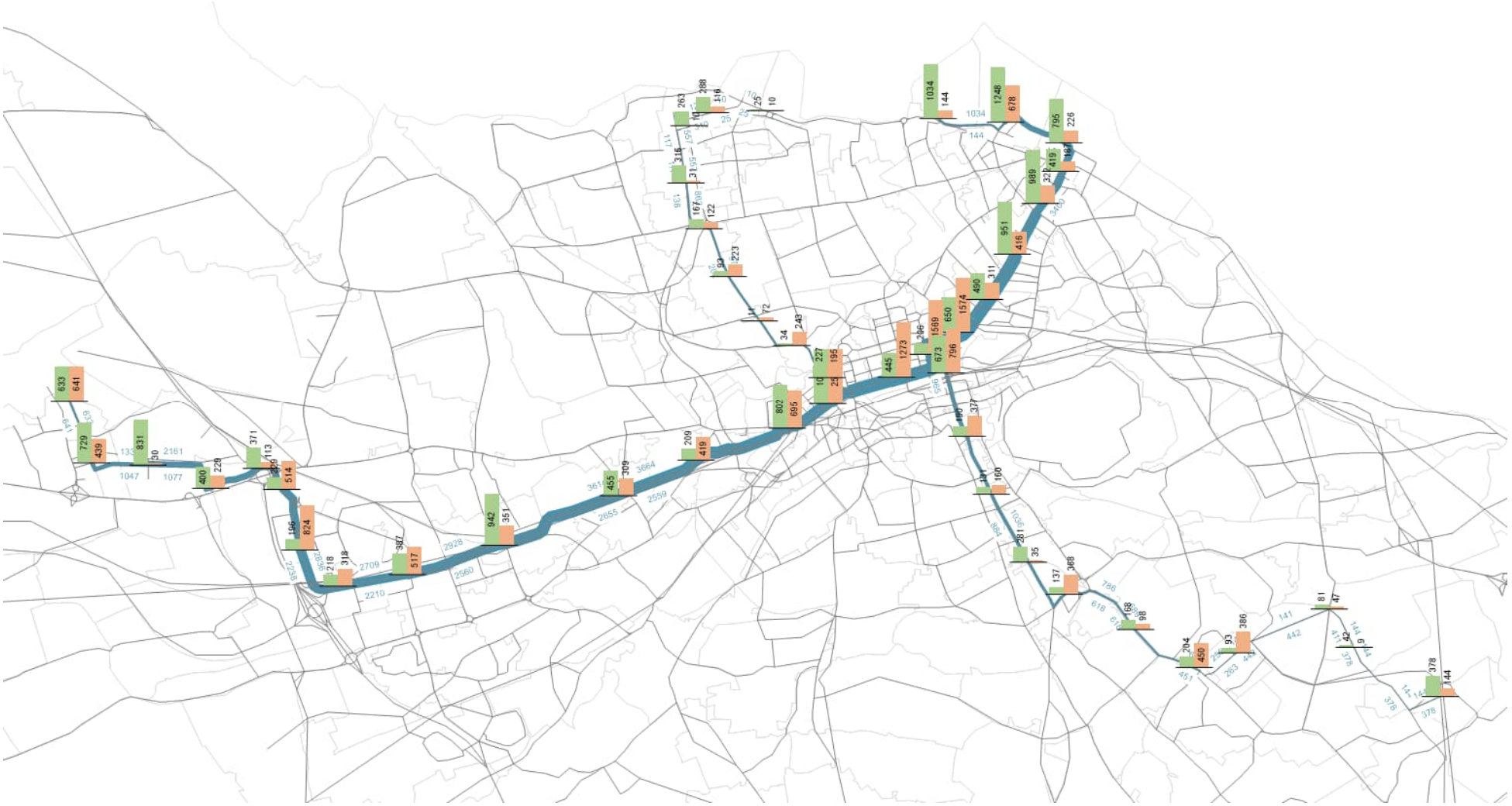


Figure E.5: 2032 Roseburn Patronage by Stop (IP)

Figure E.6: 2032 Orchard Brae Patronage by Stop (IP)

Figure E.7: 2042 Roseburn Patronage by Stop (IP)

Figure E.8: 2042 Orchard Brae Patronage by Stop (IP)