Draft Water Resources Management Plan

Technical Appendix E –

Population and Property Projections

Background and Introduction

Within this Technical Appendix we have published a report written by Edge Analytics on how they have produced population and property forecasts for the water companies that are part of WRSE, to be incorporated into WRMP24.

Edge Analytics is a specialist consultancy providing expertise in demographics data analysis, geography, data science and forecasting methods.

The report from Edge Analytics describes how they have set about producing a number of different forecasts for WRSE and covers the following parts of the process:

- Regulatory framework set out by the Water Resources Planning Guidelines
- Data Inputs for population and property forecasts
- Methodology for producing forecasts
- The forecasts

The project has produced numerous different population and property forecasts. Within the investment modelling the following forecasts have been used:

- Local authority plan based forecasts
- ONS18 SNPP Based forecasts
- Local authority plan based including estimates for the Oxford Cambridge Growth Arc

We have described how we have used the outputs of this project to produce future projections of demand in Section 3, Current and future demand for water. How we have used Edge Analytics forecasts in calculating demand uncertainty for Target Headroom is explained within Section 6, Uncertainty and Baseline Supply Demand Balance.

Edge Analytics Report

VICUS

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Acknowledgements

Demographic statistics used in this report have been derived from data from the Office for National Statistics, licensed under the Open Government Licence v.3.0.

Note: throughout this document the term 'forecast' is used as a generic term to encapsulate the range of trend projections and plan-led forecasts presented in the analysis.

The authors of this report do not accept liability for any costs or consequential loss involved following the use of the data and analysis referred to here; this is entirely the responsibility of the users of the information presented in this report.

Contents

1 Introduction

Context

1.1 The UK is at a watershed moment in its political, economic and demographic history. The country's decision to exit the European Union (EU) and the electoral mandate given to the new government, has been quickly followed by the unprecedented impact of the Coronavirus pandemic. Predicting when and how the UK recovers from the current crisis and the economic and demographic futures that will result, presents a real challenge. Amidst this uncertainty, the UK government has clearly stated its determination to accelerate the rate of house building, introducing targets and incentives to ensure that an aspirational objective of 300,000 new homes per year is achieved[1].

1.2 Robust evidence on future housing growth and demographic change, are key components of the Water Resources Planning Guidelines (WRPG) [2,3], issued by the Environment Agency (EA) and Natural Resources Wales, in collaboration with the Department for Environment, Food and Rural Affairs (Defra), the Welsh Government and Ofwat. These guidelines for the development of Water Resources Management Plans (WRMP) are now accompanied by similar documentation for the development of Drainage and Wastewater Management Plans (DWMP)[4], for which housing and demographic evidence is of equal importance.

1.3 A key enhancement to previous WRMP cycles is the EA's development of a new national framework for water resource management, consisting of five regional water resource planning groups: Water Resources South East (WRSE), Water Resources East (WRE), Water Resources South West (WRSW), Water Resources West (WRW) and Water Resources North (WRN). Evidence on future housing and population growth are critical to the collective business planning process, informing each region's Statement of Regional Resource Position (SRRP) and the WRMP24 statements of each member of the regional alliances.

Regulatory Guidance

1.4 The WRPG provides a framework for water companies to follow when developing and presenting their WRMPs. The guidelines summarise the key requirements for population, property and occupancy forecasts that feed into WRMP evidence, emphasising the importance of using housing growth evidence from Local Plans:

> *"For companies supplying customers wholly or mainly in England you will need to base your forecast population and property figures on local plans published by the local council or unitary authority." (section 5.3)*

[1] MHCLG, Planning for the Future (March 2020)
[2] Water Resources Planning Guideline (May 2016)
[3] Water Resources Planning Guideline, Interim Update (July 2018)
[4] Drainage and Wastewater Management Plans (September 2019)

1.5 The WRPG acknowledges that councils may be at different stages of Local Plan development but states if a local council has:

- *"….a published adopted plan that is not being revised, you must take account of the planned property forecast. You will need to ensure your planned property forecast and resulting supply does not constrain the planned growth by local councils. If you adjust the planned property forecast and select a higher number, you will need to justify why you have selected a higher forecast and provide evidence.*
- *published a draft plan but it has not yet been adopted you must take account and use this as the base of your forecast. You should discuss with your local council whether it expects to make changes to the forecast for the adopted plan*
- *not started or published a draft plan you should use alternative methods such as household projections from Department of Communities and Local Government or derive your own analysis using methodologies outlined in UKWIR (2016) Population, household property and occupancy forecasting" (section 5.3)*

1.6 The WRPG highlights a number of additional requirements concerning the data inputs and assumptions used in the development of population, property and occupancy forecasts. It requests that water companies should:

- *"Clearly describe the assumptions and supporting information used to develop population, property and occupancy forecasts. You should demonstrate you have incorporated local council information (particularly in relation to their published adopted local plans) in England.*
- *explain the methods you have used to forecast property figures after the planning period used by local councils (for example from years 15 to 25 in the planning period).*
- *demonstrate how you have included other sources of information and amended your forecast accordingly" (section 5.3)*

1.7 The WRPG makes explicit reference to the likely uncertainty associated with demographic forecasts, requiring water companies to:

- *"Clearly describe any limitations in your forecast*
- *Demonstrate that you understand the uncertainty associated with your forecasts*
- *Clearly explain the assumptions, risks and uncertainties associated with the results.*
- *If you are using a planning period beyond 25 years and are basing decisions on this forecast, you should explain the range of uncertainties this long-range forecast will have and how your plan will adapt to these." (section 5.3)*

1.8 WRMP demographic evidence must include an indication of the size of the population not captured in published statistics, with the guidance requesting that water companies should:

"explain the assumptions about how you have derived unaccounted population" (sect. 5.3)

1.9 Finally, the WRPG requests that the methodology for allocation of population and property forecasts to Water Resource Zones (WRZs) is made explicit, requesting that water companies:

"describe how you have allocated populations to the geographically different WRZs, e.g. using neighbourhood plans or census data to further subdivide the populations" (sect. 5.3)

1.10 To support the WRPG demographic guidance, UKWIR has produced a suite of documents which provide advice on the development of population, property and occupancy forecasting.[5] The UKWIR documentation is in three forms: a **Guidance Manual**; a **Worked Example**; and a **Supplementary Report**. The latter includes a review of engagement with key industry stakeholders and a technical review of potential forecasting approaches that underpin the WRMP guidance methodology. The UKWIR Guidance Manual is not prescriptive in terms of methodological recommendations. It provides guidance on the issues that should be considered at each stage of development but provides scope for water companies to consider and apply methods they deem to be appropriate.

This Document

1.11 Edge Analytics is a Data Science specialist, applying a combination of research, data, technology and analytical models to generate insight that better informs business planning and decision-making. Edge Analytics has a particular expertise in demographic modelling and forecasting and has developed a suite of products to meet the regulatory requirements for evidence-based planning in the water industry.

1.12 This document provides a guide to the **VICUS** methodology that has been used to configure and deliver housing and population growth evidence to the water industry's new regional planning framework, informing WRMP and DWMP processes for individual water companies.

1.13 Section 2 provides an overview of the **VICUS** framework, plus a summary of the mix of data sources required to inform the forecasting process: a combination of water industry data, Local Plan housing evidence (**Consilium**), plus population and related demographic statistics.

1.14 Section 3 describes the forecasting methodologies employed to derive and present the suite of scenarios, at macro- and micro-level and for a horizon that stretches to 2100.

1.15 Section 4 summarises the format and content of the forecasting output that has been produced to inform the WRMP and DWMP planning process, at regional, WRZ and micro-scales.

[5] WRMP19 - Methods - Population, Household Property and Occupancy Forecasting (December 2015)

2 Framework & Data Inputs

Forecasting Framework

2.1 The VICUS forecasting framework for the configuration and delivery of population and property forecasts is illustrated below (Figure 1).

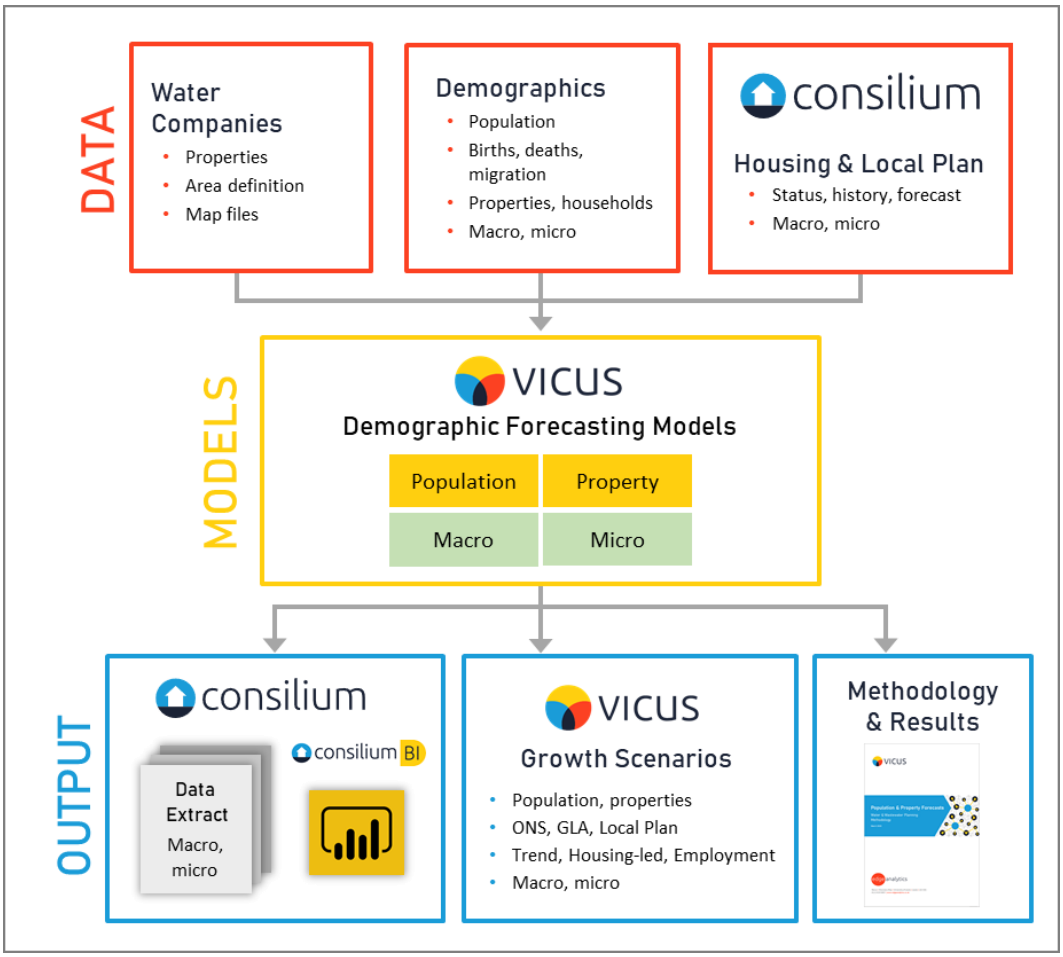


Figure 1: VICUS Forecasting Framework

2.2 Robust and timely data inputs are key to the forecasting process, including precise area definitions for water company geographies; Local Plan evidence from all local authorities; plus, historical and base-year demographic statistics on population, births, deaths, migration and properties.

2.3 The VICUS model combines all data inputs within best practice forecasting methodologies, enabling macro- and micro-level population and property growth scenarios to be derived under a wide range of assumptions, for scenario horizons that stretch to 2100.

2.4 The forecasting framework integrates key housing-led scenarios, alongside complementary evidence produced by the Office for National Statistics (ONS), the Greater London Authority (GLA) and the Welsh Government (WG).

2.5 Outputs from the process are delivered as (Microsoft Power BI) Dashboard summaries to encourage wider consumption; as detailed datasets to enable further scrutiny and analysis; and as documentation to ensure transparency and robustness of methodology.

Water Company Data

2.6 Water company geographies do not conform to the administrative areas for which population and other demographic statistics are typically available (e.g. district, ward, output area), so area-matching is a critical component of the forecasting framework.

2.7 Boundary files have been provided by individual water companies, for Water Resource Zone (WRZ) geographies (Figure 2) and for a variety of other water and wastewater areas. The Royal Mail's Postcode Address File (PAF) has provided the postcode-level property distributions from which the detailed 'lookup' between water industry and administrative geography has been made, enabling population and property growth forecasts to be apportioned for WRMP and DWMP purposes.

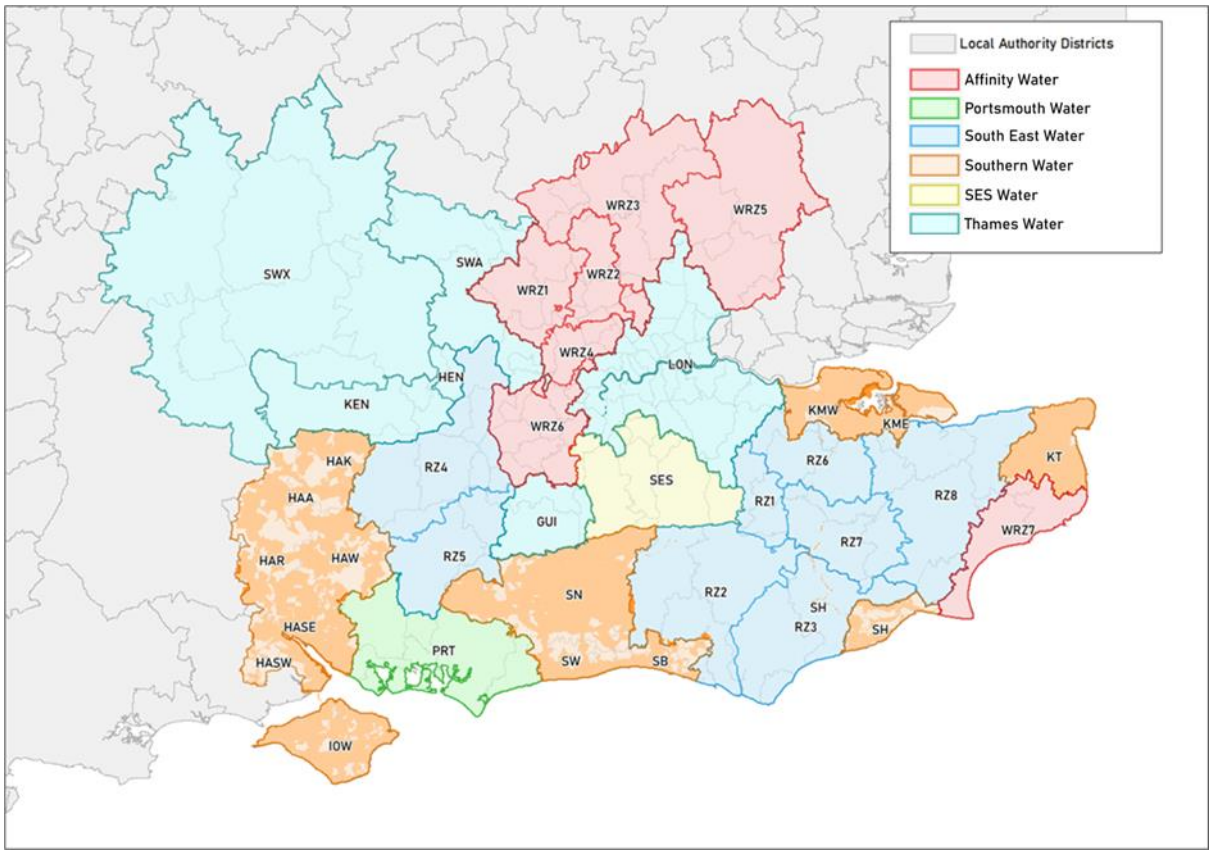


Figure 2: WRSE Water Resource Zone Geography

Demographic Data & Assumptions

Population

2.8 Data on *historical* population change are drawn from ONS mid-year population estimates (MYE). This data records population by single year of age (0–90+) and sex, with 2018 being the latest MYE available.

2.9 Successive ONS sub-national population projections (SNPP) have different base population (e.g. the 2018-based projections have a 2018 base year). For ease of comparison, the scenarios presented within the VICUS framework have been recalibrated to ensure a consistent 2018 base-year population.

2.10 In the formulation of its growth scenarios, the Greater London Authority (GLA) has produced a modified set of MYE for its London boroughs, taking account of issues associated with the incorrect treatment of children in estimated migration flows to and from individual boroughs.

Fertility & Mortality

2.11 Historical statistics on births (by sex) and deaths (by age and sex) are drawn from the ONS MYE dataset. Age-specific fertility rates (ASFR) and age-specific mortality rates (ASMR) are derived from these historical birth and death statistics, in combination with area-specific population data.

2.12 Long term assumptions on changes in age-specific fertility and mortality are determined by the ONS National Population Projection (NPP) series, the latest of which is the 2018-based round of projections.

2.13 Forecasts of future births and deaths are based on the application of ASFR and ASMR schedules (and their associated long-term assumptions) to the changing 'population-at-risk' in an area.

Migration

2.14 Historical statistics on both internal and international migration are drawn from the ONS MYE dataset, providing inflow and outflow data by five-year age group and sex.

2.15 Different scenarios apply different assumptions on the future impact of migration, typically drawn from the 2001–2018 historical time-period (e.g. 5-year history, 10-year history, 18-year history).

2.16 Forecasts of internal migration are based on the application of age-specific migration rate schedules to the changing 'population-at-risk' in an area. International migration is forecast as a fixed annual balance between emigration and immigration effects.

2.17 ONS and GLA scenario assumptions on migration are reproduced within the VICUS framework. Housing-led scenarios use migration as the balancing factor which matches population growth to planned changes to an area's housing stock.

Households & Properties

2.18 The household and dwelling (property) implications of each population growth trajectory are estimated through the application of household representative rates, communal population statistics and a dwelling vacancy rate.

2.19 A household representative rate is defined as the ***"probability of anyone in a particular demographic group being classified as being a household representative"***. The household representative rates used in the VICUS framework have been drawn from the Ministry for Housing,

Communities and Local Government's (MHCLG) 2014-based household projection model, which is underpinned by the ONS 2014-based sub-national population projection.

2.20 Following the financial crash of 2007/08, there has been a reduction in the rate of household formation amongst young adults. In the housing-led scenarios presented within the VICUS framework, the potential for a return to higher rates of household formation amongst young adults is considered, returning household representative rates to their 2001 levels by 2039.

2.21 Forecasts of household and property numbers exclude the population 'not-in-households', i.e. those living in communal establishments[6]. These data are drawn from the MHCLG 2014-based household projections, using statistics from the 2011 Census. For ages 0–74, the number of people not-in-households in each age group is fixed throughout the forecast period. For ages 75–85+, the proportion of the population not-in-households is recorded, so the population not-in-households for ages 75–85+ varies across the forecast period depending on the size of the age-group population.

2.22 The relationship between household and properties is modelled using a 'vacancy rate', sourced from the 2011 Census.

2.23 All scenarios have been calibrated to ensure a consistent 2020 property total. The base year property total for each individual output area (OA) has been drawn from the Royal Mail's PAF. As a validation step and to avoid inappropriately small property numbers, 494 OAs (out of a total of 181,408 in England & Wales) had their PAF address count total replaced with a 2011 Census dwelling count.

Labour Force & Jobs

2.24 The relationship between population change and employment is modelled using key assumptions on economic activity, unemployment and commuting.

2.25 Economic activity (participation) rates are the proportion of the population that are actively involved in the labour force, either employed or unemployed and looking for work. For each area, economic activity rates by five-year age group (ages 16–89) and sex have been derived from Census statistics, with forecast adjustments made in line with the Office for Budget Responsibility's (OBR) analysis of labour market trends in its 2018 Fiscal Sustainability Report[7].

2.26 The unemployment rate is the proportion of unemployed people within the total economically active population. For each local authority area, historical unemployment rates are sourced from ONS model-based estimates, utilising data on unemployment benefit claimant counts.

2.27 A commuting ratio indicates the balance between the level of employment and the number of resident workers within a local authority area. A commuting ratio greater than 1.00 indicates that the size of the resident workforce exceeds the level of employment available in the area, resulting

[6] Communal establishments include prisons, residential care homes, student halls of residence and certain armed forces accommodation.
[7] OBR, Fiscal Sustainability Report 2018

in a net out-commute. A commuting ratio less than 1.00 indicates that employment in the area exceeds the size of the labour force, resulting in a net in-commute.

Consilium Local Plan Data

2.28 The development of growth forecasts to inform WRMP24 plans must be underpinned by evidence on Local Plan housing growth for those Local Planning Authorities (LPA) that overlap the WRZ geography. The Local Plan development process is often lengthy and complex, with each LPA at a different stage of plan development. MHCLG and Homes England continue to apply pressure to accelerate housing delivery, whilst the UK's exit from the EU and the current pandemic crisis, create considerable uncertainty regarding future economic and demographic change.

2.29 Edge Analytics' **Consilium** database has been developed to enable the collection, processing, organisation and delivery of Local Plan evidence, for all LPAs across the UK (including National Parks and Development Corporations). Data is collected at a macro level, providing Local Plan evidence for individual LPAs, and at micro level, providing site-specific housing growth locations.

2.30 Local Plan evidence comes in a variety of forms, with considerable variation between LPAs. The Consilium database has sought to bring order, coherence and consistency to the evidence, with a classification of housing documentation and statistics detailed below (Table 1). This classification reflects the format and content of LPA evidence and includes historical **completions**, housing **need**, housing **requirement**, housing **supply** and planned **delivery**.

2.31 For each LPA that falls within WRZ boundaries, Consilium provides a summary of all Local Plan housing evidence, presenting information on: Local Plan status; historical and planned housing growth trajectories (including LPA and MHCLG completion statistics); housing need; housing requirements and targets; plus housing growth locations (site data). Also included within Consilium is the MHCLG's Housing Delivery Test and the latest LPA 5-year land supply calculations.

2.32 The site data provides geocoded information on housing growth locations, the number of planned units and the likely phasing (timing) of development. This information is key to the configuration and calibration of the micro-level, 'bottom-up' forecasts.

2.33 A 'Status Log' indicating the date at which Local Plan information was last accessed for each LPA is provided in Appendix B.

E.1

Table 1: Consilium – Housing Data Classification

1	mpletions	torical housing completions (net), sourced from Local Authority data and the MHCLG (Live ble 122).
2	al Housing Need N)	imum housing need, as calculated using the MHCLG 'standard method', which is based on 2014-based household growth projections, with an adjustment to account for affordability.
3	ective essment of Need AN)	A measure of future need, as calculated by the planning authorities (used prior to the oduction of the LHN).

4	Requirement	As set out in the NPPF, the housing requirement (provision target) identifies the extent to ch the identified need can be met over the plan period.
5	5 Year Supply	The 5-year land supply is a calculation of whether there is a deliverable supply of homes to et the planned housing requirement over the next 5 years.
6	HLA	The land availability assessment is carried out by planning authorities to assess the ilability, suitability and achievability of sites and broad locations for potential housing elopment.
7	Planned ivery	Planning authorities should produce a trajectory of expected housing delivery over the plan iod, with the anticipated rate of development for specific sites (where appropriate). Housing ectories are often published as part of the Local Plan and are updated annually in nitoring/land supply reports.

2.34 Consilium data is sourced from published documentation/statistics or directly from Councils, if not readily available. All site data is converted to a standard Consilium format, with all housing growth sites given a geocode (if not provided by the original source information).

2.35 Accompanying the forecasting outputs, the following Consilium data is provided:

- **MS Excel spreadsheets / database extracts**
- **All relevant Local Plan documentation**
- **GIS files of housing growth sites (where available)**
- **Consilium-BI Dashboard powered by Microsoft's Power BI technology.**

2.36 Examples of the macro- and micro-level Consilium data extracts are provided (Figure 3, Figure 4), together with an example of the Consilium-BI area reports: 'Housing & Population Growth History' and 'Local Plan Status & Housing Growth' (Figure 5, Figure 6).

Consilium: Local Plan Summary

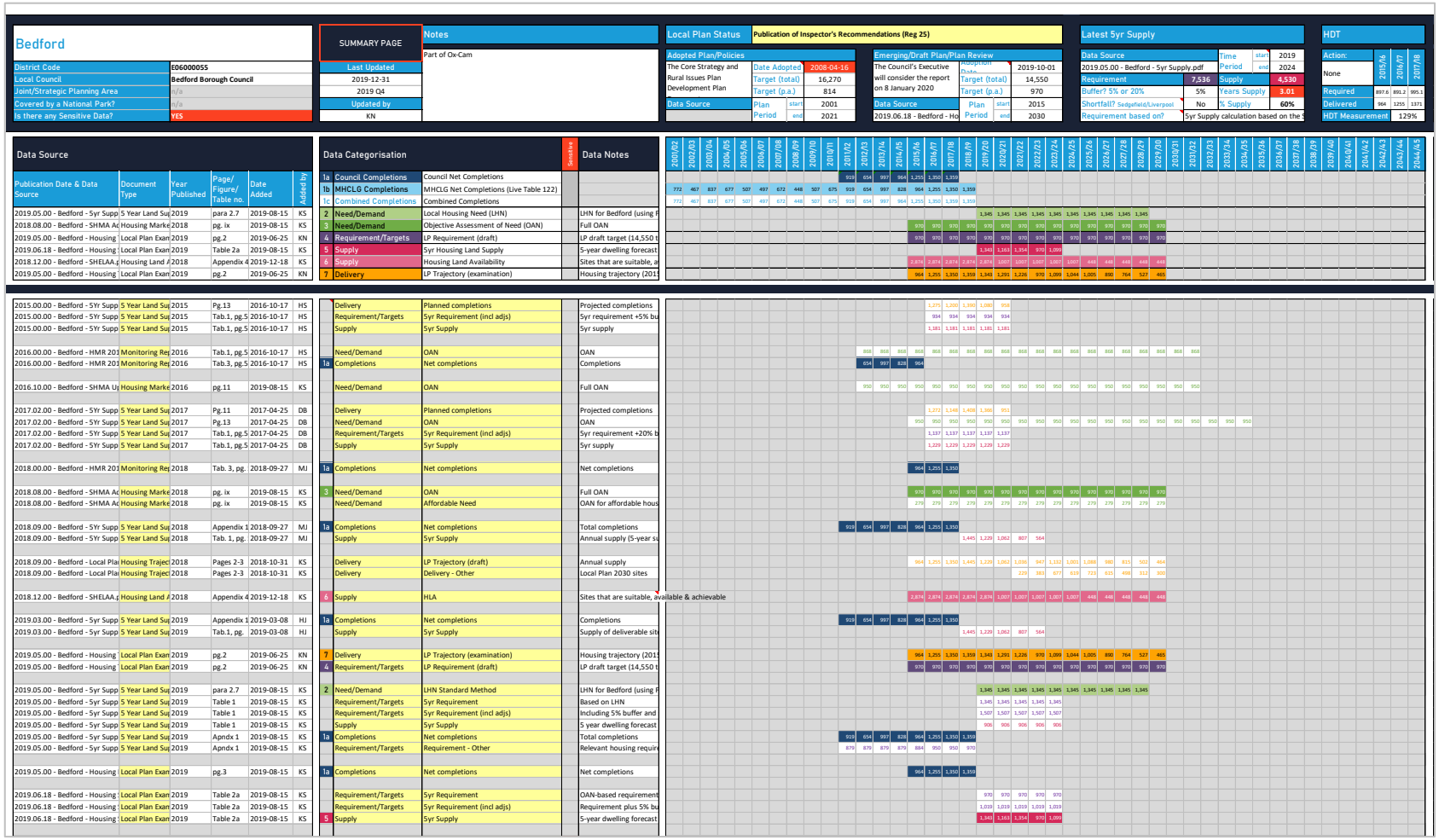


Figure 3: Consilium – Local Plan Summary – Example Only

Consilium: Housing Growth Locations

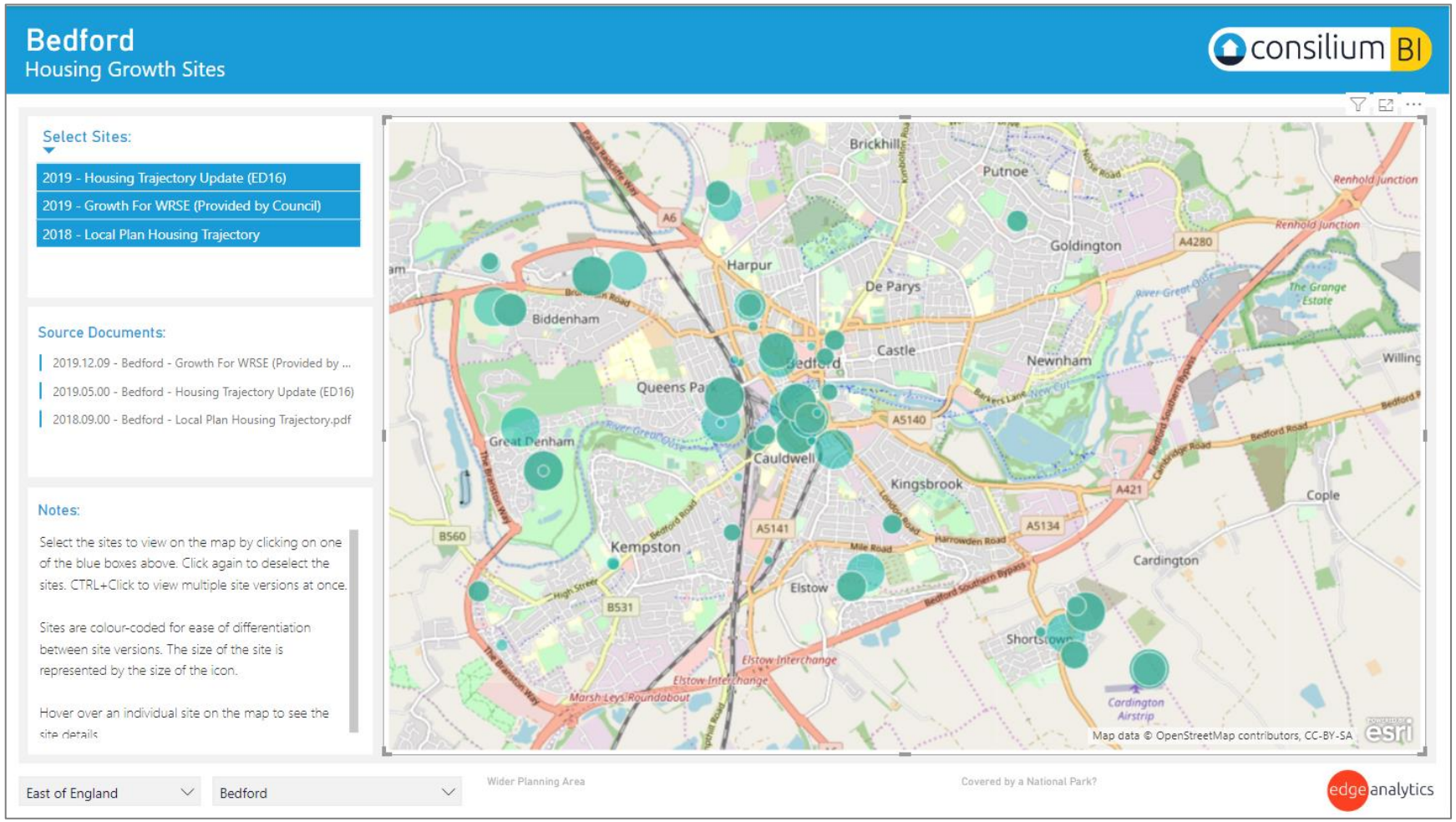


Figure 4: Consilium – Site Data – Example Only

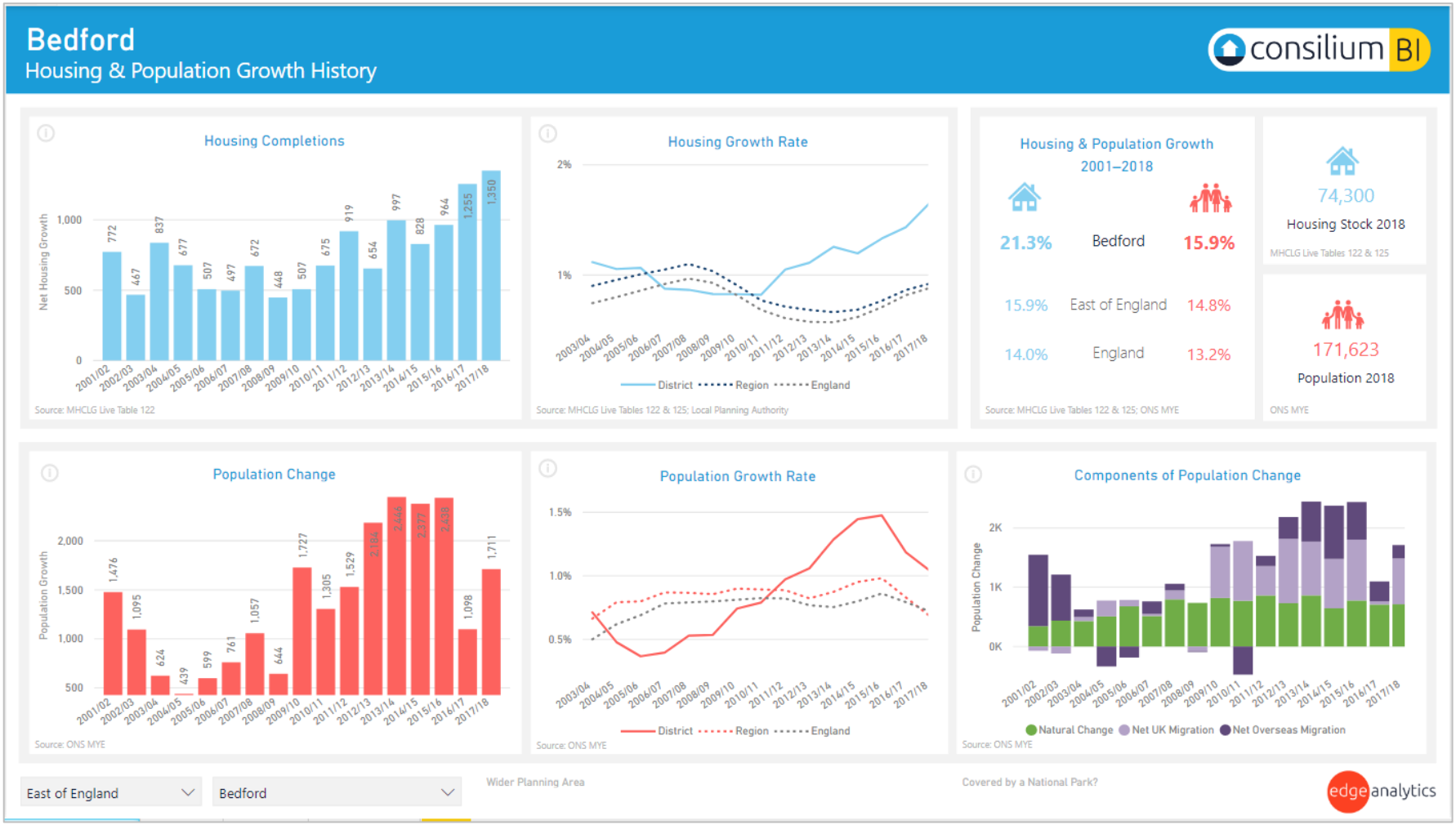


Figure 5: Consilium-BI Dashboard - Area History – Example Only

E.23

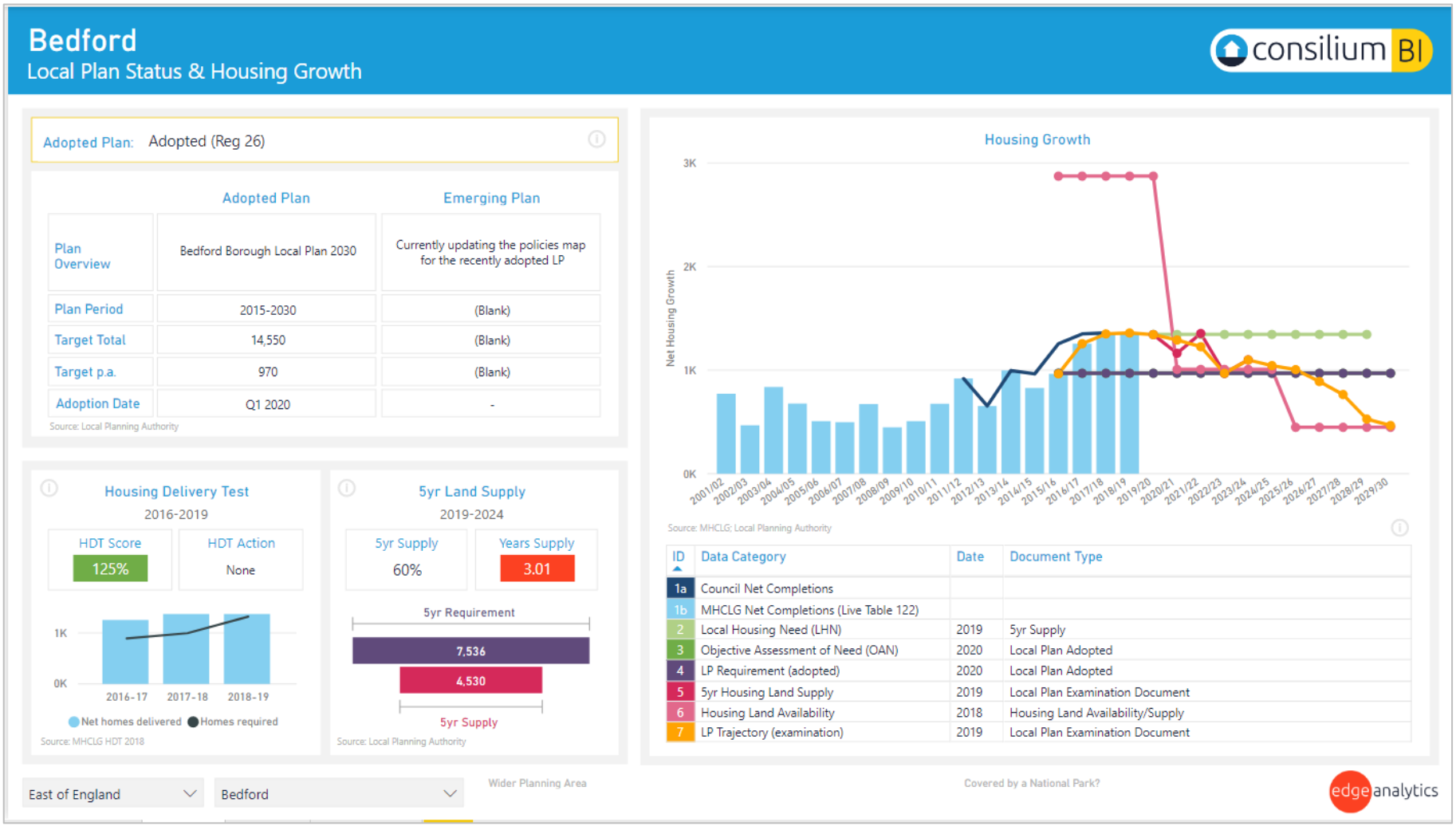


Figure 6: Consilium B- Dashboard – Local Plan Status – Example Only

3 Methodology

Forecasting Models

3.1 The VICUS modelling framework combines a database of data inputs with a suite of forecasting software, enabling macro- and micro-level population and property growth scenarios to be derived under a wide range of assumptions, for scenario horizons that stretch to 2100 (Figure 1). The forecasting framework integrates housing-led scenarios, alongside trend projections which include published output from ONS, GLA and WG.

3.2 The key element of the framework is the cohort-component model, which uses fertility, mortality and migration components to derive population projections by single year of age, for each year of a (flexible) forecast period. The cohort-component method has a long and established history in demography and is widely used by national statistical agencies and the research community.

3.3 The household model and labour force models are separate software components, but they have a high degree of dependency upon population outputs from the cohort component model, enabling the derivation of property and employment forecasts.

3.4 The household model uses a combination of household representative rates, communal population statistics and a dwelling vacancy rate to estimate the household and dwelling (property) implication of each population growth trajectory.

3.5 The labour force model uses key assumptions on age-specific rates of economic activity (participation), unemployment and commuting, to estimate the relationship between population change and employment.

3.6 Importantly, the household and labour force models can be run in 'housing-led' or 'employment-led' mode, using pre-determined forecasts of housing or employment to estimate the likely population growth associated with each. Migration provides the balancing factor, altering population growth to meet annual housing or employment growth targets.

3.7 The 'housing-led' approach is particularly important in the evaluation of alternative trajectories of housing growth derived from the range of Local Plan evidence published by LPAs. A 'housing-led' scenario is also an important element of the suite of output published by the GLA.

3.8 Where data on site-level housing developments is available from an LPA, the 'housing-led' approach reverts to a combined 'top-down' and 'bottom-up' methodology, aligning macro and micro forecasts of population change to the location and phasing (timing) of planned additions to the dwelling stock.

3.9 The use of micro-geographies in the forecasting methodology enables accurate aggregation of all scenario output to water company planning areas.

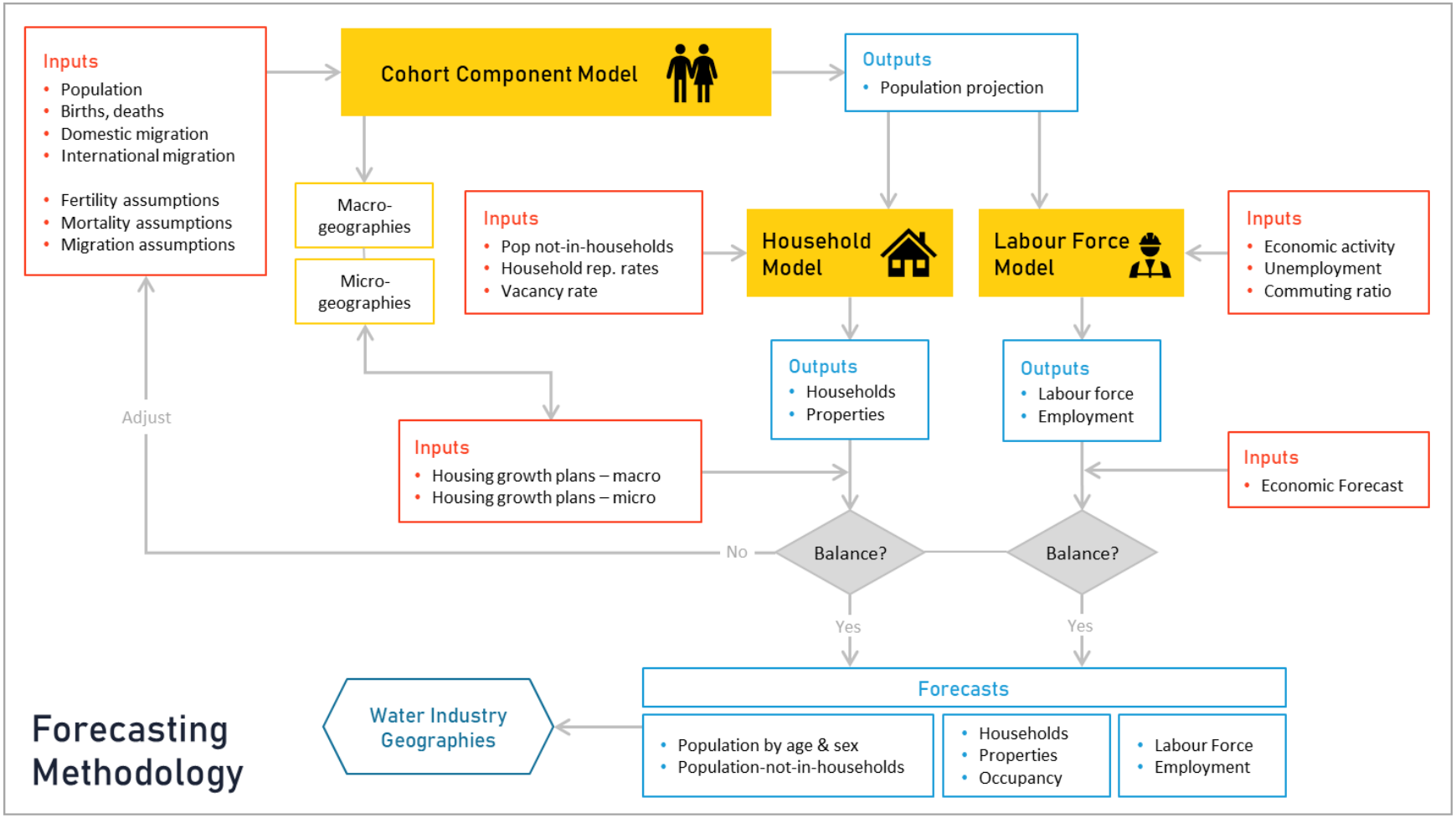


Figure 7: VICUS – Forecasting Methodology

Scenario Development

3.10 The VICUS framework has been used to configure and calibrate a range of scenarios, for both the 2020–2050 WRMP plan-period, plus the long-term 2020–2100 outlook. Each scenario has a growth trajectory for 2020–2050, coupled with three alternative growth scenarios for 2050–2100.

3.11 The range of outcomes is necessary to enable consideration of the uncertainty associated with the demographic components of population change, the effects of different scales and phasing of future housing growth, plus the impact of alternative data inputs and assumptions applied by ONS and GLA.

3.12 The 2020–2050 scenarios can be broadly classified into three groups (Table 2):

- **Trend projections (ONS, GLA)**
- **Housing-led forecasts (Local Plan, GLA, OxCam)**
- **Employment-led forecasts**

3.13 Growth scenarios for 2050–2100 are underpinned by fertility, mortality and migration assumptions from the ONS 2018-based NPP, configuring a principal, low and high growth outcome (Table 3).

3.14 For ease of comparison, the scenarios presented within the VICUS framework have been recalibrated to ensure a consistent 2018 base-year population (the latest MYE available from ONS). In addition, all scenarios have been calibrated to ensure a consistent 2020 property total, with base year property totals aligning to the Royal Mail's PAF statistics.

3.15 All scenarios produce statistics on population, households, population not-in-households and dwellings (properties) and occupancy. In addition, all 2020–2050 scenarios can produce output on estimated labour force and employment outcomes. A more detailed description of each of the scenarios follows, preceding an illustration of the range of growth outcomes for the WRSE area of operations.

ONS & GLA Trend Projections

ONS Projections

3.16 ONS produces its sub-national population projections (SNPP) every two-years, following publication of the 'national' population projection (NPP)[8]. The NPP provides the constraining total for the SNPP. A cohort-component methodology underpins the formulation of the population projections.

3.17 ONS projections are classified by their base-date, with the latest round of projections being the 2018-based scenarios. At each successive round of the ONS projections, revisions to key assumptions on fertility, mortality and international migration are made, with the support of an expert panel of advisors[9]. The impact of these assumptions on the UK national projections in the 2014-based, 2016-based and 2018-based round of projections is illustrated in Appendix D.

[8] ONS Subnational Population Projections for England: 2018-based
[9] National population projections, how the assumptions are set: 2018-based

Table 2: VICUS – Scenario Definition, 2020–2050

.24	ID	Scenario	Description	URL
E.28 Trend Projections	1	ONS-14	ONS 2014-based sub-national population projection (SNPP), using a six-year ory (2008–2014) to derive local fertility, mortality and internal migration mptions, with a long-term UK net international migration assumption of +185k p.a.	ONS 2014
	2	ONS-16	ONS 2016-based Principal sub-national population projection (SNPP), using a year history (2011–2016) to derive local fertility, mortality and internal migration mptions, and a long-term UK net international migration assumption of +165k. In with the ONS 2016-based national population projection (NPP), this round of ections includes a reduced UK fertility outlook compared to ONS-14 and a pened rate of improvement in life expectancy compared to ONS-14.	ONS 2016
	3	ONS-18	ONS 2018-based Principal sub-national population projection (SNPP), using a year history (2013–2018) to derive local fertility & mortality assumptions and a -term UK net international migration assumption of +190k. Unlike earlier rounds NPP, the 2018-based Principal projection uses a two-year history (2016–2018) of rnal migration assumptions, following recent changes to the methodology used for stimation, which have only covered the latest 2 years. In line with the ONS 2018- d national population projection (NPP), this round of projections includes a ced UK fertility outlook compared to ONS-16 and a dampened rate of rovement in life expectancy compared to ONS-16.	ONS 2018
	4	ONS-18-Alt	ONS 2018-based Alternative Internal Migration sub-national population ection (SNPP), produced by ONS as a comparison with the Principal projection. It a five-year average of internal migration (2013–2018), combining 3 years of data d on the old methodology and 2 years based on the new methodology. All other mptions are consistent with ONS-18.	
	5	ONS-18-High	ONS 2018-based High International Migration sub-national population projection PP), incorporating a High long-term UK net international migration assumption of 0k p.a., with all other assumptions consistent with ONS-18.	
	6	ONS-18-Low	ONS 2018-based Low International Migration sub-national population projection PP), incorporating a Low long-term UK net international migration assumption of k p.a., with all other assumptions consistent with ONS-18.	
	7	ONS-18-10Y	ONS 2016-based 10yr Migration (all types) sub-national population projection, g a ten-year history (2008–2018) to derive internal migration assumptions, with all r assumptions consistent with ONS-18.	
	8	GLA-18-Central	Greater London Authority (GLA) 2018-based Central population projection, rporating: GLA's own adjustments to the mid-year population estimates of London oughs; local fertility and mortality assumptions, trended in line with the ONS 2018- d NPP assumptions; internal and international migration assumptions derived a 10-year history (2008–2018). This scenario includes projections for London oughs and for all other local authority areas.	GLA
	9	GLA-18-15Y	GLA 2018-based long-term trend projection, incorporating internal and rnational migration assumptions derived from a 15-year history (2003–2018), with ther assumptions consistent with the Central scenario. This scenario includes ections for London Boroughs and for all other local authority areas.	
	10	GLA-18-5Y	GLA 2018-based short-term trend projection, incorporating internal and rnational migration assumptions derived from a 5-year history (2013–2018), with ther assumptions consistent with the Central scenario. This scenario includes ections for London Boroughs and for all other local authority areas.	
Housing-led Forecasts	11	GLA-Housing	GLA 2018-based Housing-led projection, based on data from the 2016 Strategic sing Land Availability Assessment (SHLAA). Beyond 2041, housing growth is ed to the 2035–2041 average. Whilst the housing-led approach is applied to each don Borough, the population projection for Greater London, in total, remains istent with the Central scenario. This scenario includes projections for London oughs only and is combined with the Central scenario for all other local authority s when aggregated to WRZ geographies.	GLA sing

.24	ID	Scenario	Description	URL
Housing-led Forecasts E.68	12	Completions-18Y	A Housing-led scenario, with population growth underpinned by a continuation he rate of housing growth recorded in each local authority's 18-year completions ory (2001–2019).	MHCLG Table 122
	13	Completions-5Y	A Housing-led scenario, with population growth underpinned by a continuation he rate of housing growth recorded in each local authority's 5-year completions ory (2014–2019).	
	14	Housing-Need	A Housing-led scenario, with population growth underpinned by the trajectory of sing growth associated with each local authority's Local Housing Need (LHN) or ctively Assessed Housing Need (OAHN). Following the final year of data, projected sing growth in non-London areas returns to the ONS-14 & ONS-16 long-term ual growth average by 2050. For London Boroughs, housing growth returns to the Central scenario long-term annual average by 2050.	
	15	Housing-Need-r	A Housing-led scenario, consistent with the Housing-Need scenario, but with sehold representative rates for young adults returning to (higher) 2001 levels by 9, remaining fixed thereafter.	
	16	Housing-Req	A Housing-led scenario, with population growth underpinned by the trajectory of sing growth associated with each local authority's housing Requirement. Following final year of data, projected housing growth in non-London areas returns to the -14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, sing growth returns to the GLA Central scenario long-term annual average by 2050.	
	17	Housing-Req-r	A Housing-led scenario, consistent with the Housing-Req scenario, but with sehold representative rates for young adults returning to (higher) 2001 levels by 9, remaining fixed thereafter.	
	18	Housing-Plan	A Housing-led scenario, with population growth underpinned by each local ority's Local Plan housing growth trajectory. Following the final year of data, ected housing growth in non-London areas returns to the ONS-14 & ONS-16 long- annual growth average by 2050. For London Boroughs, housing growth returns he GLA Central scenario long-term annual average by 2050.	
	19	Housing-Plan-r	A Housing-led scenario, consistent with the Housing-Plan scenario, but with sehold representative rates for young adults returning to (higher) 2001 levels by 9, remaining fixed thereafter.	
Employment-Led Forecasts	4 20	Employment-1	An Employment-led scenario with 1.0% pa growth in London to 2030 and 0.5% hereafter; 0.8% pa growth in the South East and East of England to 2030, 0.4% eafter.	
	9 21	Employment-2	An Employment-led scenario with 0.5% pa growth in London to 2030 and 0.25% hereafter; 0.4% pa growth in the South East and East of England to 2030, 0.2% eafter.	
OxCam Housing-Led Forecasts E.113	4 22	OxCam-1a-r	'New Settlement' 23k dpa scenario, with c.4.2k dpa above Housing Plan ibuted between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire %), South Cambridgeshire (20%). Household representative rates for young adults rning to (higher) 2001 levels by 2039, remaining fixed thereafter.	
	1 23	OxCam-1b-r	'Expansion' 23k dpa scenario, with c 4.2k dpa distributed between: Milton es: (30%) Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), hampton (10%), and Peterborough (10%). Household representative rates for g adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.	
	5 24	OxCam-2a-r	'New Settlement' 30k dpa scenario, with c.11.2k dpa above Housing Plan ibuted between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire %), South Cambridgeshire (20%). Household representative rates for young adults rning to (higher) 2001 levels by 2039, remaining fixed thereafter.	
	9 25	OxCam-2b-r	'Expansion' 30k dpa scenario, with c 11.2k dpa distributed between: Milton es: (30%) Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), hampton (10%), and Peterborough (10%). Household representative rates for g adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.	

3.18 To illustrate the impact of the 2018-based set of assumptions on growth outcomes, the 2014-based and 2016-based ONS projections are included in the VICUS scenario suite, for comparison.

- **ONS-14**
- **ONS-16**
- **ONS-18**

3.19 The inclusion of the 2014-based projection is important, as a considerable portion of the Local Plan evidence published by LPAs across England has been formulated using this growth scenario as a starting point in the housing need calculation.

3.20 Whilst the local variations in the relative contribution of international migration and natural change (births minus deaths) are influenced by the *national* assumptions applied, the *internal* migration variations have been influenced by a methodological change introduced in the 2018-based projections. ONS has implemented an improved process for recording student moves, post-graduation. As a result, internal migration profiles (particularly in local authorities with a University) have altered since 2016. The 2018-based 'Principal' projection has therefore used a two-year history (only) to calibrate its internal migration assumptions for each LPA, rather than the customary five-year history that has routinely been used in previous SNPP rounds.

3.21 To consider the effect of this methodological change upon population growth outcomes and to evaluate the potential for lower or higher assumptions on future growth through international migration, ONS has published four variant scenarios to accompany the ONS-18 Principal outcome. Given the uncertainty associated with international migration (in particular) in the post-Brexit and post-coronavirus world, each of these scenarios is presented for consideration within the VICUS suite:

- **ONS-18-Alt** (5-year internal migration history)
- **ONS-18-10Y** (10-year migration history)
- **ONS-18-High** (High international migration)
- **ONS-18-Low** (Low international migration)

3.22 At a national (England) level, the ONS-18-Alt and ONS-18-10Y scenarios have identical outcomes to the ONS-18 Principal scenario, they only differ in the impact of the different internal migration assumptions at local authority level. Comparison between the ONS-18 suite of output and the equivalent GLA scenarios, is presented below.

GLA Population Projections

3.23 Alongside the ONS projections, the GLA also publishes its own suite of projections[10]. The latest round of scenarios is 2018-based and includes a 'Central' scenario, plus variants which consider both a short-term (5-year) and a long-term (15-year) history for the formulation of migration

[10] GLA Population and Household Projections

assumptions. Once again, a 'cohort-component' methodology underpins the formulation of the population projections.

- **GLA-18-Central**
- **GLA-18-15Y**
- **GLA-18-5Y**

3.24 These scenarios include projections not only for the 33 London Boroughs (LB) but also for all other local authority areas. The GLA methodology differs from the ONS approach in a number of key areas.

3.25 In formulating its own demographic analysis, the GLA has made adjustments to the ONS mid-year estimates for London Boroughs, primarily to account for what it has identified as over-inflation of individual cohorts of children aged 0–14. This results in a base-year (2018) population that differs from the ONS total for all London Boroughs. The VICUS methodology has rebased all scenarios to a common (ONS) base population in 2018, to facilitate a consistent comparison of growth trajectories.

3.26 With regard to migration, the GLA uses a 5-, 10- (Central) and 15-year history from which to derive scenario assumptions, compared to 2- (Principal), 5- and 10-year histories for the ONS projections. The GLA also derives its own area-specific fertility and mortality assumptions, but these follow the ONS trend throughout the projection period.

Housing-led Forecasts

3.27 Housing-led forecasts provide a different perspective on future population growth. Under these scenarios, the population impact of a pre-determined trajectory of housing growth is considered.

3.28 The starting point for a housing-led scenario is a trend projection, which is modified year-on-year to ensure reconciliation between population change and the capacity of the housing stock. The relationship between housing growth and population change is determined by the changing age-structure of the population, projected household representative rates (occupancy), a vacancy rate, plus the changing size of the population not-in-households.

3.29 In a housing-led forecast, if the demographic trend does not match the capacity of the housing stock, then the trend is altered, through higher or lower migration. If the capacity of the housing stock exceeds the population growth trend, then additional growth through migration will result. Likewise, if the capacity of the housing stock does not meet the requirements of the population growth trend, then growth is reduced through out-migration.

3.30 The VICUS framework incorporates a suite of housing-led forecasts, recognising the uncertainty associated with the future scale, distribution and phasing of growth across all English local authority areas. This suite of scenarios is designed to illustrate the likely population growth impact of different levels of housing growth and how these compare to the trend outcomes of the ONS and GLA scenarios.

3.31 A key component of any housing-led scenario is the average 'occupancy' associated with the changing housing stock. The general 'ageing' of the UK population results in a reduction in average household size, with the older population typically having smaller household sizes compared to the younger population. Since the financial crash of 2007/08, a counter trend brought about by both financial constraints and a mismatch between demand and supply of new homes, has seen a reduction in the speed at which young adults are able to form new households, resulting in a dampening of the rate of occupancy reduction. These factors are considered in the housing-led scenario analysis.

3.32 The simplest housing-led scenario is one in which past rates of housing growth are continued. Using MHCLG's published data tables, in combination with Council statistics, the Consilium database has compiled a history of housing growth for each individual local authority. From this information, two VICUS scenarios have been configured. The first, a housing-led scenario based on a continuation of the rate of growth recorded in each local authority's 18-year housing completions history (2001–2019); the second, a housing-led scenario based on a 5-year completions history (2014–2019).

- **Completions-18Y**
- **Completions-5Y**

3.33 Under each of these scenarios the average annual housing growth calculated from the completions histories continues for the full duration of the 2020–2050 forecast period.

3.34 WRMP guidance has mandated that water companies need to consider population and property forecasts derived from the Local Plans published by LPAs. Local Plan development encompasses a complex mix of processes, documents and data. Consilium collates evidence from all LPAs, enforcing a consistent classification on the derived data (Table 1), enabling the formulation of scenarios that consider housing need, housing requirement and planned delivery.

3.35 The Planning Advisory Service (PAS) defines housing need as ***"total housing that would be provided… if land supply was not constrained by planning"***. The 'Objective Assessment of Need' (OAN) was the original process established to formulate each local authority's housing need. To simplify the planning process, MHCLG introduced a 'standard method' for calculating a minimum local housing need (LHN), based on the 2014-based household growth projections, with an adjustment to account for affordability. Modifications to the LHN methodology are due for publication in 2020.

3.36 A housing requirement is defined in the National Planning Policy Framework (NPPF) and Planning Policy Guidance (PPG) as a 'policy target' (what policy requires), as opposed to housing need (what people or the market requires). A housing requirement identifies the extent to which an identified need can be met over the designated plan period.

3.37 Planned delivery of housing is also defined in the NPPF. All LPAs are required to produce a trajectory of expected housing delivery over a plan period, with the anticipated rate of development for specific sites (where appropriate). Housing trajectories are often published as part of the Local Plan and are updated annually in monitoring/land supply reports. It can be the

case that these trajectories are supply-based and may be similar to the housing land *supply* figures.

3.38 Whilst LHN is deemed to be a 'minimum' housing need, the general trend is for housing need to present higher housing growth than the requirement, which in turn is often higher than the planned delivery. These rules do not hold in all cases. Three housing-led scenarios are presented:

- **Housing-Need**
- **Housing-Req**
- **Housing-Plan**

3.39 Local Plan evidence on future housing growth is typically formulated for 10–15-year period, shorter than the 2020–2050 outlook required by the WRMP. Under each scenario, following the final year of plan data available, projected housing growth in non-London local authority areas returns to a long-term annual growth average by 2050. This annual growth average has been derived from a combination of the ONS-14 and ONS-16 scenarios. For London Boroughs, housing growth returns to the GLA Central scenario long-term annual average by 2050.

3.40 With all housing-led scenarios, household representative rates, drawn from the MHCLG's 2014-based household model, determine the relationship between the changing age structure of the population and the number of households. However, these rates are based on time-period when household formation amongst young adults (in particular) was subject to both financial and supply constraints.

3.41 A key objective of all Local Plans is to redress the imbalance in the demand and supply of new homes and thus lift the rate of household formation amongst affected groups. To model the potential for a return to higher rates of household growth amongst young adults, household representative rates for 25–44 year-olds have been returned to their 2001 levels by 2039, remaining fixed thereafter. Three additional scenarios have been formulated to test the sensitivity of the household representative rate adjustments:

- **Housing-Need-r**
- **Housing-Req-r**
- **Housing-Plan-r**

3.42 The GLA includes its own housing-led outcome in its suite of scenarios[11]. Its scenario is based on data from the 2016 Strategic Housing Land Availability Assessment (SHLAA) providing housing growth totals, with phasing, for each London Borough. Beyond 2041, housing growth is aligned to the 2035–2041 average.

- **GLA-Housing**

3.43 The GLA-Housing scenario adopts an alternative method for determining occupancy rates in the changing housing stock, setting upper and lower bounds for average household size in each local authority. Plus, whilst the housing-led approach is applied to each London Borough, the

[11] GLA Housing-led Population Projections

population projection for Greater London, in total, remains consistent with the GLA-18-Central scenario.

3.44 This scenario includes projections for London Boroughs only and is combined with the GLA-18-Central scenario for all other local authority areas when aggregated to WRZ geographies.

OxCam Arc Scenarios

3.45 The OxCam 'Arc' covers 26 Local Authority Districts (Appendix E), extending between Oxford, Milton Keynes and Cambridge. It has been identified as an area of huge economic potential[12,13]. To support the Arc's economic growth potential, a requirement for up to one million new homes has been estimated to 2050, together with improvements to the transport infrastructure of the region. However, with the UK's exit from the European Union and the unprecedented, short-term effects of the COVID-19 crisis, there is considerable uncertainty around the timing of infrastructure and housing delivery.

3.46 Councils within the Arc are already seeking to manage significant increases in the rate of house building to meet targets set out in current Local Plans. Achievement of one million homes by 2050 would present a further step-change in housing delivery requirements.

3.47 An accompanying report[14], presents housing-led scenarios for OxCam local authorities that are underpinned by current Local Plan evidence. In addition, the report examines the potential impact of higher housing growth across the OxCam Arc, achieving close to 1 million homes by 2050.

3.48 The OxCam *Housing & Population Growth* report focuses on the development of the Arc and identifies how different levels and distribution of new housing might impact upon population growth in both WRSE and WRE geographies.

Employment-led Scenarios

3.49 Demographic and economic change are intertwined and whilst fertility, mortality, migration and household occupancy effects can be modelled very effectively over long-term horizons, forecasting economic growth is more problematic and typically such forecasts have a much shorter, 1–5-year outlook horizon.

3.50 Economic forecasting within the current political and social environment is particularly challenging. There are a multitude of organisations that are engaged in the derivation of forecasts of short-term economic change. HM Treasury publishes a regular review of forecasts for the UK economy, with the latest release in April 2020, in the midst of COVID-19 lockdown. Short-term forecasts of GDP growth (and other variables) are 'averaged' from up to 40 financial and economic institutions. The latest average indicates -5.8% decline in UK GDP in 2020, with a +5% recovery in 2021. In both years, there is a 5 percentage-point range around the average, indicating the very uncertain economic outlook within a very short-term horizon.

[12] Savills (2019) The Oxford-Cambridge Innovation Arc Savills
[13] MHCLG (2019) The Oxford-Cambridge Arc, Government ambition and joint declaration between Government and local partners OxCam Arc
[14] Edge Analytics (2020) OxCam Housing & Population Growth, draft v1

3.51 The Office for Budget Responsibility (OBR) is the UK's official financial watchdog, providing ***"independent and authoritative analysis of the UK's public finances".*** Biannually, the OBR publishes 5-year forecasts for the UK economy to inform spring and autumn Budget Statements, accompanied by the annual publication of its Economic and Fiscal Outlook (EFO). The March 2020 EFO estimated average GDP growth of 1.4% to 2024, with an annual average employment growth of 0.5% between 2019–2024, plus a 1.5% annual rise in the unemployment rate.

3.52 The COVID-19 crisis has prompted the development of a coronavirus reference scenario, reflecting the HM Treasury evidence but with a sharper GDP decline and recovery in 2020/21, reverting to a 1.4% annual average, 2022–2024.

3.53 The current social and economic conditions have created an unprecedented but relatively short-term, interruption to normal life. Water resource planning needs to consider a much longer-term perspective on economic and demographic change. The GLA has previously published its own long-term projections of growth in employment across the 33 London Boroughs. The latest round of projections, published in 2017 estimated an average annual growth of 0.9% in workplace-based employment to 2030, declining to a 0.5% average to 2050.

3.54 In addition to its EFO output, the OBR also publishes its Fiscal Sustainability Report (FSR), providing a long-term outlook on economic change and its impact upon public debt[15]. Its long-term employment growth projections vary depending upon the degree to which international migration (and therefore the speed of population ageing) affects the UK economy. High migration outcomes estimate a 0.5% pa employment growth nationally to 2030, 0.4% to 2050. Under low-migration outcomes a 0.3% pa growth is projected across the UK to 2030, declining to 0.1% pa thereafter.

3.55 These forecasts of economic change are underpinned by a range of survey statistics which record historical change in employment, unemployment and business counts. These sources include: regional counts of workforce jobs by industry; Annual Population Survey (APS) workplace and labour force statistics; Business Register & Employment (BRES) survey; UK Business Count survey; and the 2011 Census. Achieving a consistent perspective on historical change from these datasets is challenging, particularly when drilling down to local areas, where sample surveys can produce large annual fluctuations.

3.56 Within the VICUS framework, the labour force model uses key assumptions on age-specific rates of economic activity, unemployment and commuting, to estimate the relationship between population change and employment. An employment-led scenario requires a trajectory of future employment growth, from which a population growth impact can be estimated.

3.57 Two employment-led scenarios have been derived for the WRSE region, using a combination of: historical evidence, to determine growth ratios between England, London, the South East and the East of England; GLA projections, to benchmark London growth rates; and OBR forecasts, to provide a high and low outcome to long-term growth:

[15] OBR (2018) Fiscal Sustainability Report OBR July 2018

- **Employment-1**
- **Employment-2**

3.58 Under the Employment-1 scenario, employment growth in each London borough grows at 1.0% per year to 2030, declining to 0.5% per year to 2050. At the same time, employment growth in all local authority districts outside London grows at a lower rate of 0.8% per year to 2030, reducing to 0.4% per year thereafter.

3.59 Lower growth is modelled under the Employment-2 scenario, with employment growth in each London borough growing at 0.5% per year to 2030, declining to 0.25% per year to 2050. At the same time, employment growth in all local authority districts outside London grows at a lower rate of 0.4% per year to 2030, reducing to 0.2% per year thereafter.

Long-term Scenarios

3.60 For each of the 25 scenarios presented in Table 2, a long-term growth outlook is considered, extending the scenario horizon to 2100. Growth scenarios for the 2050–2100 period are aligned to the ONS 2018-based NPP, configuring a principal, low and high growth outcome (Table 3).

Table 3: VICUS – Scenario Definition, 2050–2100

Scenario	Description
Principal ('-P')	The Principal long-term scenario incorporates the mortality and fertility assumptions of ONS 2018-based NPP Principal scenario, plus its Principal net international migration umption of +190k p.a. for the UK in total.
Low ('-L')	The Low long-term scenario incorporates the mortality and fertility assumptions of the S 2018-based NPP Principal scenario, plus a Low net international migration assumption of k p.a. for the UK in total.
High ('-H')	The High long-term scenario incorporates the mortality and fertility assumptions of the S 2018-based NPP Principal scenario, plus a High net international migration assumption +290k p.a. for the UK in total.

3.61 The key determinants of growth rates under these scenarios are assumptions relating to fertility, mortality and international migration. In each of the three long-term outcomes, fertility and mortality rates trends are consistent with the NPP Principal scenario. For international migration, the Principal scenario is based on an assumption of +190k annual net growth through international migration, with the High and Low variants assuming +290k and +90k per year respectively.

Macro- and Micro-level Alignment

3.62 Where data on site level housing developments is available, the housing-led forecasting approach is able to utilise both a combined 'top-down' and 'bottom-up' methodology. This means that micro-level forecasts of population change can be directly linked to the location of planned housing growth and the phasing over time of that growth.

3.63 A 'top-down' forecast is produced providing an indication of population and property growth for an aggregate area (local authority district). This is used as a constraint for a 'bottom-up' forecast which takes account of micro-level housing intelligence. The Consilium data provides information on the extent of new housing growth and its likely spatial and temporal distribution.

3.64 Housing allocations typically have a location and a likely phasing over time combined with information on site area and density. Used in combination with estimates of new dwelling occupancy this allows the population forecasts to reflect, at a micro scale, the impact of new housing developments.

3.65 For new housing allocations where specific geographical location detail is not provided the model allocates these sites across aggregate areas in proportion to the existing property distribution.

3.66 The Consilium site data is used in conjunction with digital map data and existing micro-level housing stock data for the proportional assignment of micro-level forecasts to various water planning geographies. These proportions are modified over time to take account of the revised distribution of properties resulting from planned new development sites.

3.67 Typically, site level trajectories are provided for a relatively short-term period. When site level data is no longer available the modelling approach reverts to a 'top-down' approach.

4 Scenario Output

Understanding Limitations

4.1 The UK is at a watershed moment in its political, economic and demographic history. The country's exit from the EU and the unprecedented global impact of the current pandemic, presents a significant challenge for predicting demographic futures for water resource planning. However, as the virus situation improves and the country returns to a new normal, the UK government will continue its objective of building up to 300,000 new homes per year. This will have important effects upon the growth and distribution of population in the WRSE communities.

4.2 The analysis detailed in this report and in accompanying data deliverables, has presented a *suite* of trend projections, housing-led and employment-led forecasts which estimate the potential scale and distribution of future demographic change. In the interpretation of these outputs, it is important to recognise some of the methodological and data differences that exist between scenarios and therefore the challenge of producing the consistency required for effective comparison.

4.3 In all trend projections and housing-led forecasts, the future population of an area is strongly influenced by its base population. Projections of the number of adults, particularly the older-age population, are usually more reliable than those for children because of the challenges associated with the estimation of future levels of fertility and working-age migration.

4.4 The WRMP scenario horizon stretches to 2100. As the process of population change is cumulative, the reliability of growth scenarios will reduce over time. Furthermore, growth scenarios for areas with small populations will generally be less reliable than those for areas with large populations, because the former will typically be affected more by migration.

4.5 The ONS and GLA *projections* provide an illustration of what will happen if a pre-determined combination of assumptions on fertility, mortality and migration are met. Projections are trend-based and are, therefore, not policy-based forecasts of what local or national government expects to happen. There are many economic, political and social factors that could influence population change, including policies adopted by both national and local government, or factors that are outside of any government's control (e.g. coronavirus).

4.6 Appendix C illustrates the UK's national population projection accuracy since 1950. Historically, the UK population has risen more than projected, due to one or other of: under-estimation of international migration; a failure to anticipate higher fertility rates; or a failure to anticipate continued improvements in life expectancy. More recently, successive projections have demonstrated greater convergence, compared to earlier years.

4.7 The effects of dampened fertility and mortality assumptions upon population change are very evident in the successively lower growth outcomes of the ONS-14, ONS-16 and ONS-18 projections (Appendix D (i)). A return to higher rates of fertility and/or an upturn in the rate of improvement in life expectancy, would reverse the trend towards lower growth suggested by the ONS-18 outcomes.

4.8 The size of migration flows (both internal and international) and the uncertainty of future trends, means that migration assumptions have a greater influence upon growth outcomes than fertility and mortality assumptions.

4.9 In the absence of a population register, the estimation of international migration (into and out of the UK) has long presented a real challenge to ONS[16]. Estimating *base-year* immigration and emigration effects, both nationally and locally, requires a complex mix of data inputs and assumptions, and is subject to estimation methodologies that are under constant review. This methodological uncertainty in the base data, coupled with the considerable uncertainty that now exists around future population exchanges with the EU and other countries, makes the international migration assumption the most sensitive in all trend scenarios.

4.10 The UK government had originally hinted at a +100k per year target for net international migration but this has never been established as policy. The +190k per year within the ONS-18 principal scenario, is a more reasonable assumption of future international migration to the UK, ensuring the necessary replenishment of its workforce to compensate for the accelerating process of demographic ageing in the resident population.

4.11 In relation to *internal* migration flows, the financial crash of 2007/08 resulted in constraints on movement due to lending restrictions, acute housing affordability issues and an under-supply of new homes. This had a particular impact upon the net outflow of migrants from London, a situation that has now begun to reverse itself with the renaissance in house building. This should mean that later trend projections are a more reliable indicator of future internal migration outcomes. However, the ONS-18 projections incorporate the effects of a methodological change to the estimation of internal migration, which makes comparison with other scenarios more difficult.

4.12 There are also methodological differences between the ONS and GLA trend projections presented here, which make a direct comparison of growth outcomes a challenge. The GLA has modified its base year populations, has calculated its own base fertility and mortality parameters (although following the long-term ONS trend) and its own migration assumptions.

4.13 To improve comparability, the VICUS framework has sought to align base year population and property totals to ensure consistency of growth comparison across scenarios. This alignment reveals that, despite the ONS and GLA each presenting a 2018-based scenario configuration, the GLA trend scenarios result in higher growth outcomes for the UK standard regions which overlap WRSE geographies (Appendix D (ii)).

[16] ONS - Long-Term International Migration estimates methodology

4.14 Whilst projections provide an illustration of growth under a given set of fertility, mortality and migration assumptions, local planning policies can modify past trends. To illustrate how Local Plans have been formulated to meet particular local needs/requirements for new housing growth, the housing-led scenarios are presented as a direct contrast to the trend outcomes. But there is inevitable inconsistency and uncertainty with regard to the evidence which underpins these scenarios.

4.15 Local Plans are at different stages of development and completeness. There is limited consistency of timing or content of Council Local Plan publications and data. And whilst some areas have plan data for 5 years, others for up to 15 years, the majority of Local Plan housing growth is weighted more heavily towards the short-term horizon. It has been necessary to fill the data gaps required for the WRMP 2050 planning horizon, using trend scenario evidence to estimate housing growth for the period after which plan data expires. These factors are reflected in the shape of the growth curves associated with the Housing-Plan scenarios.

4.16 The use of household representative rates as a determinant of occupancy is a key component of the modelling approach, applied across all scenarios, trend, housing-led and employment-led. These rates, drawn from MHCLG's 2014-based household model are available to 2039 only, remaining constant thereafter. Modification of these rates ('r' scenarios in the analysis that follows) has enabled the estimation of population impacts resulting from higher rates of household formation amongst young adults, dampening the housing-led population growth in all cases. The 'r' scenario is an attempt to illustrate how lower average occupancy (and therefore lower population growth) might result from the higher Local Plan trajectories. This is achieved by allowing household representative rates for young adult age-groups to 'return' to their 2001 position (prior to the financial crash of 2008)[17].

4.17 In all cases, the housing-led growth outcomes detailed below are substantially *higher* than the latest, 2018-based trend projections published by the ONS. The amalgamated WRSE Local Plan evidence suggests an unprecedented level of housing growth to 2030. Some of this growth is to meet a 'backlog' from previous under-supply but the majority is designed to satisfy a housing 'need', meeting the requirements of future population growth.

4.18 The ONS 2014-based population projections (and accompanying household projections) have been a key input to MHCLG's housing need policies and the formulation of Local Plan housing requirements. For the WRSE in total, the population growth profile estimated by the ONS 2014-based projections, reveals an expectation of continued population growth through a mixture of natural change (higher births than deaths), internal migration and international migration. The housing-led scenarios, coupled with the 'r' assumption of higher rates of household formation amongst young adults, return an overall population growth that is higher, but not too dissimilar to, the ONS 2014-based outcome.

4.19 Contrast the ONS 2014-based outcome, to that of its 2018-based variant. With revised demographic inputs which assume falling fertility and lower life expectancies, natural change has

[17] Whilst using a similar approach, the GLA has applied borough-specific rules to the control of occupancy in its housing-led scenario and has constrained the overall population growth total in this scenario to its Central trend outcome for London

a much smaller impact upon population change, quickly reverting to a population decline in parts of the WRSE. Whilst international migration is projected to remain at a higher level in the 2018-based projections, the dampened growth outcomes suggest a lower housing requirement over the WRMP horizon.

4.20 To aid consideration of the accelerated housing growth that is planned to 2030, a separate analysis has provided supplementary information on housing growth outlook, using a combination of (Consilium) Local Plan sources to produce a 'Delivery Performance Indicator' (DPI) for each local authority[18]. This DPI is designed to indicate those areas where current housing plans are more or less likely to be delivered, based upon: (i) historical delivery rates; (ii) planned completions; and (iii) available capacity. This DPI is of most use in the consideration of the higher housing growth evident in Local Plans to 2030 and its likelihood for delivery during this, short-term, WRMP horizon.

4.21 The development of employment-led forecasts is particularly challenging within the current political and social environment. And even within 'normal' conditions, economic forecasts typically have a have a much shorter, 1–5-year outlook horizon, compared to demographic scenarios. Nevertheless, two employment-led scenarios have been formulated, not as a definitive indication of likely economic trajectories, but to benchmark other demographic and housing-led scenarios against a higher and lower employment growth outcome.

4.22 The VICUS framework is able to configure employment-led scenarios, but it does so from a demographic perspective, balancing the relationship between employment growth and the size of the resident labour force using higher or lower migration. The methodology incorporates important projections of age-specific labour force participation rates, especially important for modelling higher female participation and the effects of state pension age (SPA) adjustments. However, it combines these with static measures of unemployment and commuting ratios, a necessary simplification of a complex modelling process.

Outcomes 2020–2050

4.23 Despite the methodological and data challenges detailed above, the VICUS framework provides a rigorous and robust basis for the configuration and comparison of a suite of WRSE growth scenarios. Given the challenges of presenting a single, definitive outcome on future population and housing growth, the transparency of the VICUS approach is designed to encourage consideration of a 'range' of outcomes to support water resource planning.

4.24 A summary illustration of the suite of 2020–2050 growth scenarios is presented, for WRSE in aggregate (Figure 8) and for each water company (Figure 9 – Figure 14).

4.25 The accompanying VICUS-BI dashboard provides further detail for individual WRZs, plus scenario output for the extended 2020–2100 forecast period. An additional Microsoft Excel workbook provides full detail on the data outputs from each scenario.

[18] The DPI analysis has been provided to WRSE members as an accompaniment to the main population and property forecast outputs.

4.26 The range of 2020–2050 growth outcomes for the WRSE, in total, suggests population growth in the range of 402,000 to 5.1 million, with accompanying dwelling growth of 31,700–99,500 dwellings per annum (dpa). This gives an average of approximately 3.3 million population growth (c. 17%) and 73,000 dpa over the 30-year plan period.

4.27 This is a wide range of outcomes but at the lower end of the spectrum, the ONS-18-Low scenario presents an unrealistic growth projection. The ONS-18 *principal* projection presents an uncertain outcome itself, given the methodological differences in its approach to measuring internal migration. For this reason, a low variant on the principal outcome, which assumes a +90k per year international migration impact, should be disregarded.

4.28 In contrast, the ONS-14, Housing-Need and Housing-Plan scenarios present higher growth outcomes. The three are relatively consistent to 2030, deviating thereafter, with the Housing-Plan aligning more closely with ONS-14. The Housing-Need scenario with its continuation of an LPA's need assessment, albeit with a return to a trend value by 2050 and no modifications to account for higher household growth in young adults, produces a high growth outcome that is also likely to be unrealistic.

4.29 The inclusion of scenarios which consider future housing growth linked to past completion rates, provides a useful benchmark against the housing growth derived in the Housing-Plan trajectory. For the combined WRSE geography, the Housing-Plan dwelling growth total is approximately 23% higher than that associated with a continuation of the completion rate from the last five years of evidence and 45% higher than a continuation of the completion rate averaged over the extended 2001–2019 period.

4.30 The Housing-Plan scenario suggests high growth to 2030 (typically the limit of robust Local Plan evidence), reducing thereafter as the annual housing growth returns to a level derived from trend projections. The reduction in the household representative rates of young adults over the plan period (Housing-Plan-r), enforces a lower occupancy to the housing stock, reducing the population growth associated with the same level of housing growth. The requirement for higher housing growth in Local Plans is underpinned by a drive to make new homes more affordable and accessible to young adults, so the modification to household representative rates provides a legitimate dampening of the population growth, reducing housing stock average occupancies in the process.

4.31 The GLA scenarios project higher growth than the ONS-16 and ONS-18 outcomes, due to higher natural change and international migration, combined with a lower net outflow through internal migration. The Housing-Plan-r population growth aligns more closely with the GLA outcomes, albeit with a higher average dpa across the plan period, with the GLA assuming higher occupancies for the housing stock.

4.32 The employment-led scenarios estimate population growth of 8.4%–16.6%, with the higher growth of the Employment-1 scenario relatively consistent with the average over all scenarios. Dwelling growth associated with these scenarios is 48k–72k dpa to 2050, with a potential 20% uplift on the dpa if higher rates of household formation amongst young adults is considered.

4.33 The trends evident in the WRSE aggregate outcomes and the relationship between the different scenario outcomes, is generally replicated in the growth profiles presented for each of the water companies, with the Housing-Need and ONS-18-Low scenario sitting at the extremes of the growth spectrum.

4.34 For Affinity Water, an average population growth of approximately 605,000 (c. 17%) is estimated to 2050, coupled with a housing growth of 13,351 dpa. The Housing-Plan-r scenario aligns quite closely to the GLA population outcomes, albeit with a higher annual average housing growth estimated from the Local Plan evidence.

4.35 For Portsmouth Water an average population growth of approximately 110,000 (c. 15%) is combined with a 2,370 dpa housing growth to 2050. The short-term (2020–2030) impact of higher housing growth in the Local Plan evidence is noticeable, particularly when compared to the scenarios based upon past housing completion rates.

4.36 Of a similar size to Portsmouth Water, SES Water has an average population growth outcome of approximately 111,000 (c. 16%) to 2050, with a housing growth of 2,525 dpa. ONS-14 and Housing-Need scenarios are associated with particularly high population growth when compared to past completion rates and to the Housing-Plan growth trajectory.

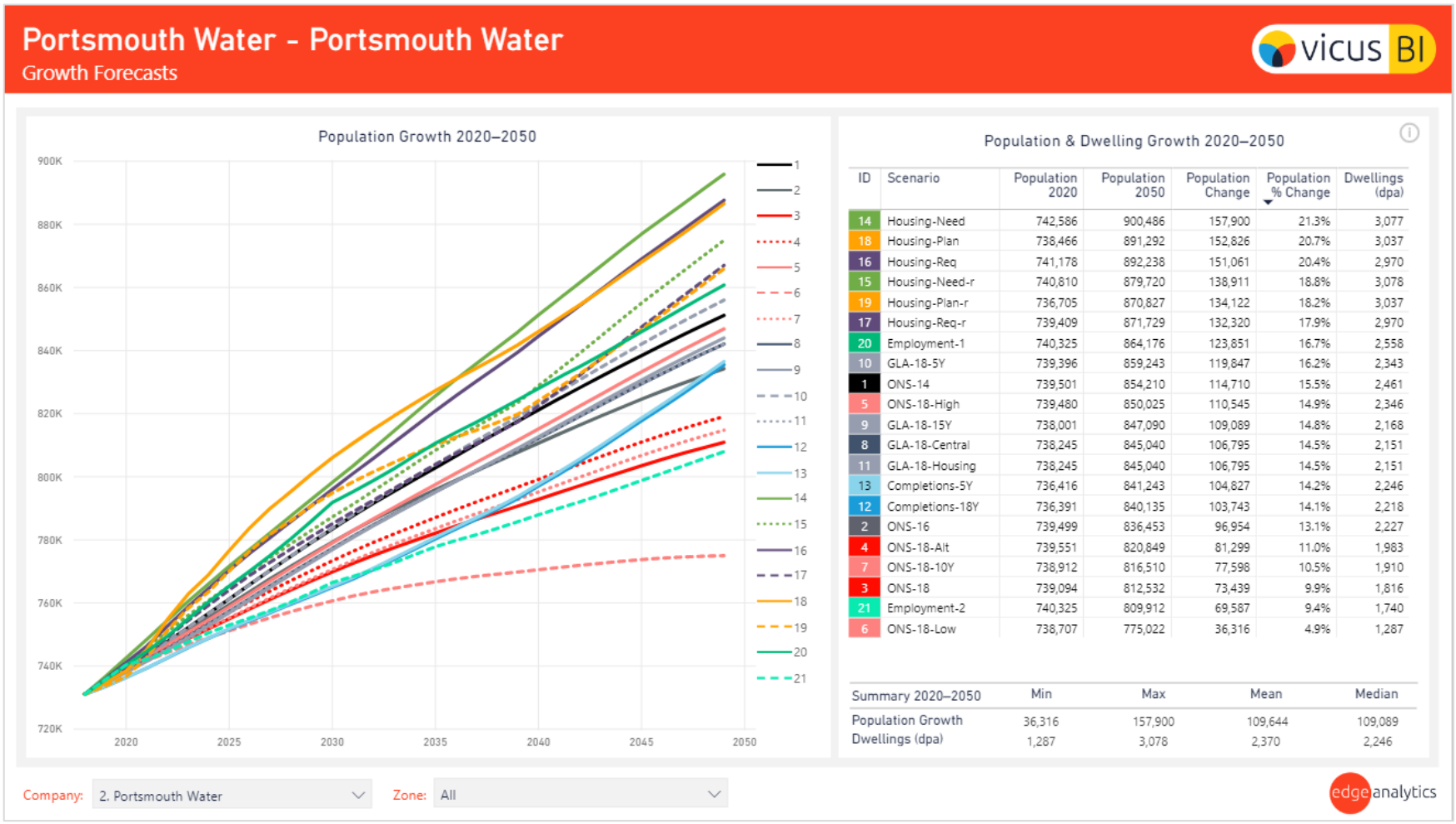
4.37 For South East Water, an average 2020–2050 population growth of approximately 389,000 (18%) is associated with an average annual housing growth figure of 7,925 dpa. Large scale housing growth detailed in Local Plans is reflected in the Housing-Plan trajectories for the 2020–2030 plan period.

4.38 It is a similar case for Southern Water, with high Local Plan housing totals fuelling the 2020–2030 population growth of the Housing-Plan scenarios. Across all scenarios, an average population growth of approximately 413,000 (c. 16%) is estimated, coupled with an average annual housing growth of 8,602 dpa.

4.39 Thames Water covers the largest and most diverse geography, with the low growth trajectory of the Completions-18Y scenario being particularly noticeable reflecting a history of under-supply of homes relative to population growth. Across all scenarios, an average population growth of 1.63 million (c. 17%) to 2050 is estimated, in combination with an annual average housing growth of 38,011 dpa.

Figure 8: VICUS-BI – Scenario Summary – WRSE

Figure 9: VICUS-BI – Scenario Summary – Affinity Water

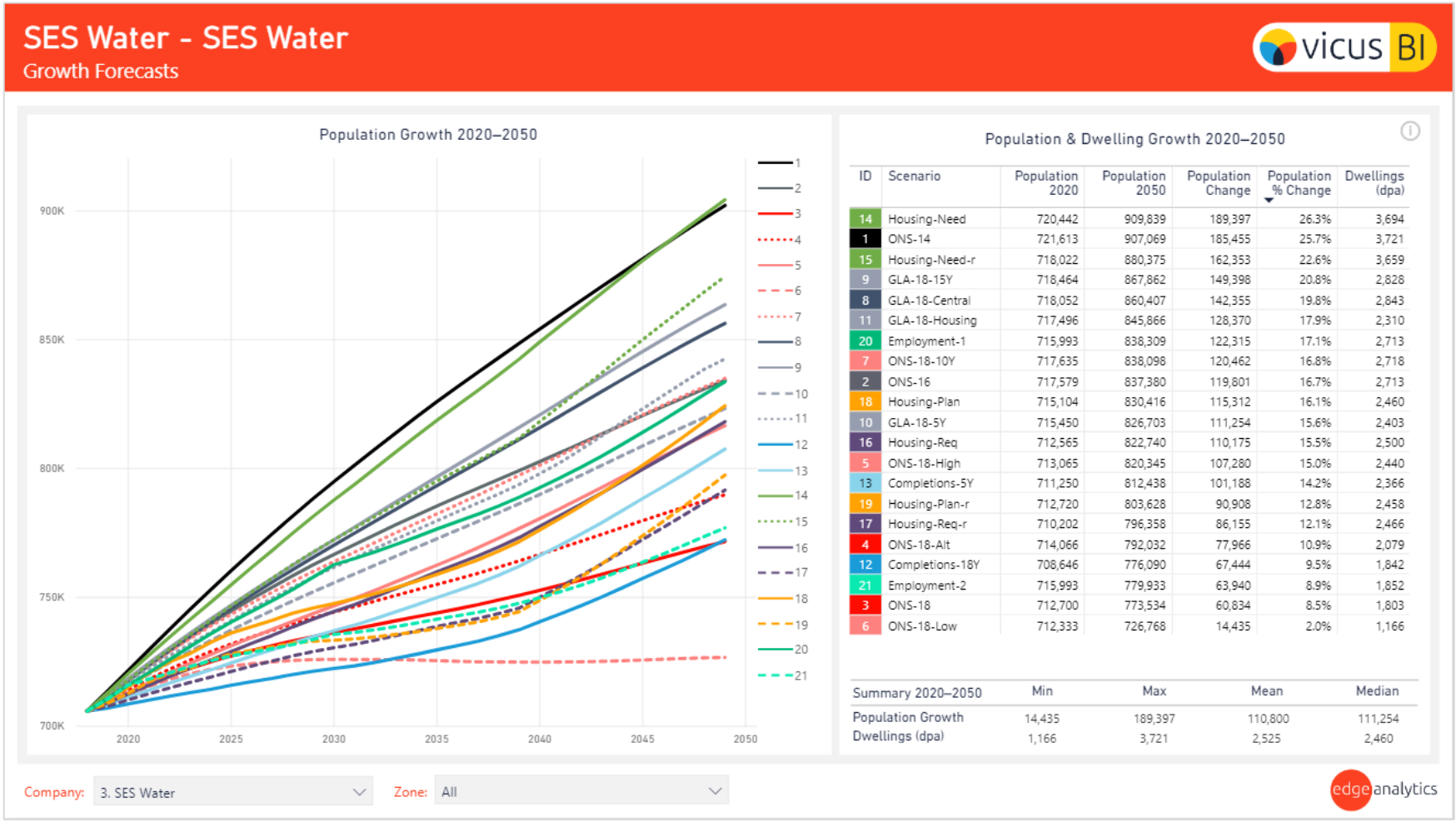


Population & Dwelling Growth 2020–2050

ID	Scenario	Population 2020	Population 2050	Population Change	Population % Change	Dwellings (dpa)
14	Housing-Need	742,586	900,486	157,900	21.3%	3,077
18	Housing-Plan	738,466	891,292	152,826	20.7%	3,037
16	Housing-Req	741,178	892,238	151,061	20.4%	2,970
15	Housing-Need-r	740,810	879,720	138,911	18.8%	3,078
19	Housing-Plan-r	736,705	870,827	134,122	18.2%	3,037
17	Housing-Req-r	739,409	871,729	132,320	17.9%	2,970
20	Employment-1	740,325	864,176	123,851	16.7%	2,558
10	GLA-18-5Y	739,396	859,243	119,847	16.2%	2,343
1	ONS-14	739,501	854,210	114,710	15.5%	2,461
5	ONS-18-High	739,480	850,025	110,545	14.9%	2,346
9	GLA-18-15Y	738,001	847,090	109,089	14.8%	2,168
8	GLA-18-Central	738,245	845,040	106,795	14.5%	2,151
11	GLA-18-Housing	738,245	845,040	106,795	14.5%	2,151
13	Completions-5Y	736,416	841,243	104,827	14.2%	2,246
12	Completions-18Y	736,391	840,135	103,743	14.1%	2,218
2	ONS-16	739,499	836,453	96,954	13.1%	2,227
4	ONS-18-Alt	739,551	820,849	81,299	11.0%	1,983
7	ONS-18-10Y	738,912	816,510	77,598	10.5%	1,910
3	ONS-18	739,094	812,532	73,439	9.9%	1,816
21	Employment-2	740,325	809,912	69,587	9.4%	1,740
6	ONS-18-Low	738,707	775,022	36,316	4.9%	1,287

Summary 2020–2050	Min	Max	Mean	Median
Population Growth	36,316	157,900	109,644	109,089
Dwellings (dpa)	1,287	3,078	2,370	2,246

Figure 10: VICUS-BI – Scenario Summary – Portsmouth Water

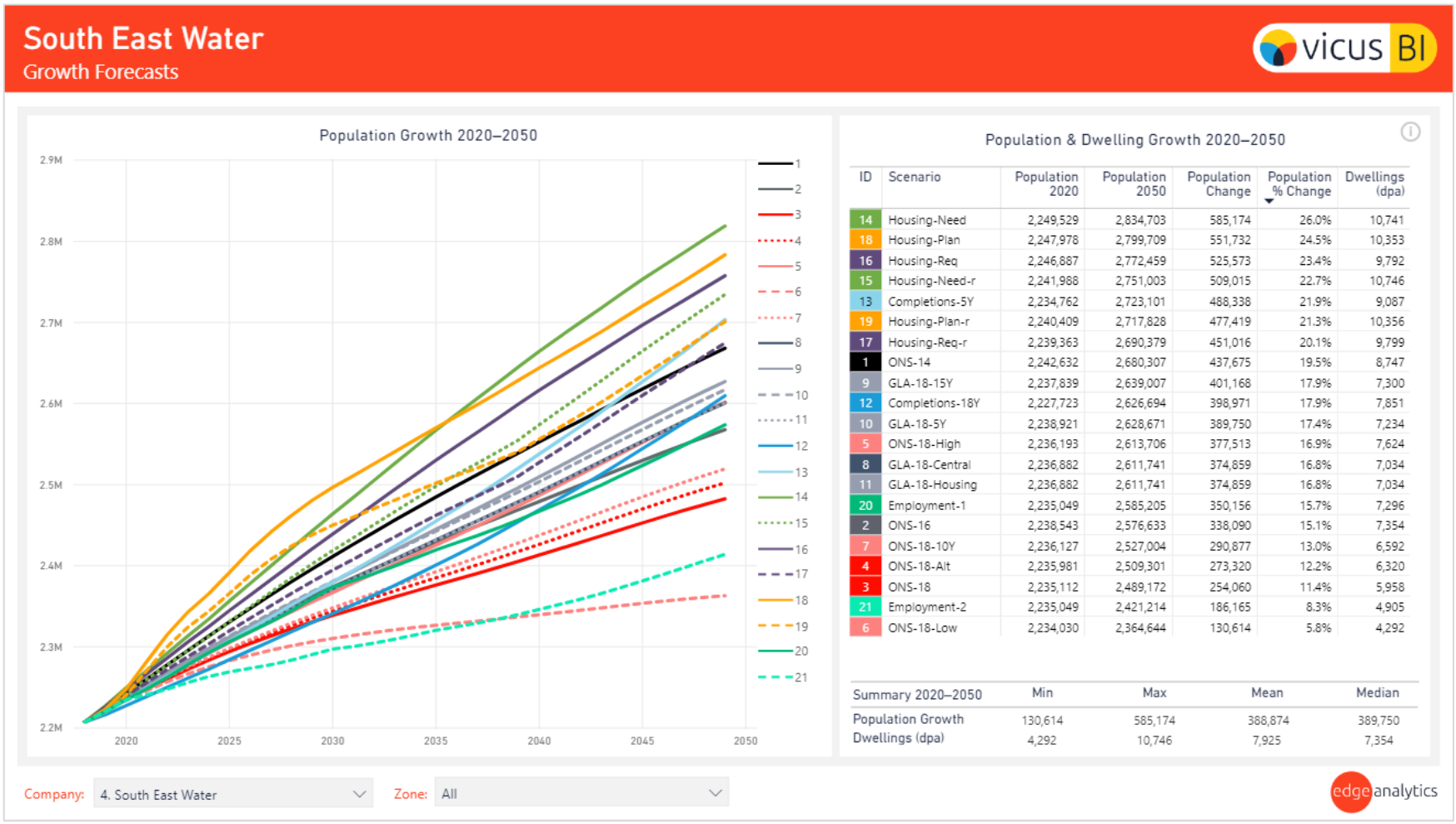


Population & Dwelling Growth 2020–2050

ID	Scenario	Population 2020	Population 2050	Population Change	Population % Change	Dwellings (dpa)
14	Housing-Need	720,442	909,839	189,397	26.3%	3,694
1	ONS-14	721,613	907,069	185,455	25.7%	3,721
15	Housing-Need-r	718,022	880,375	162,353	22.6%	3,659
9	GLA-18-15Y	718,464	867,862	149,398	20.8%	2,828
8	GLA-18-Central	718,052	860,407	142,355	19.8%	2,843
11	GLA-18-Housing	717,496	845,866	128,370	17.9%	2,310
20	Employment-1	715,993	838,309	122,315	17.1%	2,713
7	ONS-18-10Y	717,635	838,098	120,462	16.8%	2,718
2	ONS-16	717,579	837,380	119,801	16.7%	2,713
18	Housing-Plan	715,104	830,416	115,312	16.1%	2,460
10	GLA-18-5Y	715,450	826,703	111,254	15.6%	2,403
16	Housing-Req	712,565	822,740	110,175	15.5%	2,500
5	ONS-18-High	713,065	820,345	107,280	15.0%	2,440
13	Completions-5Y	711,250	812,438	101,188	14.2%	2,366
19	Housing-Plan-r	712,720	803,628	90,908	12.8%	2,458
17	Housing-Req-r	710,202	796,358	86,155	12.1%	2,466
4	ONS-18-Alt	714,066	792,032	77,966	10.9%	2,079
12	Completions-18Y	708,646	776,090	67,444	9.5%	1,842
21	Employment-2	715,993	779,933	63,940	8.9%	1,852
3	ONS-18	712,700	773,534	60,834	8.5%	1,803
6	ONS-18-Low	712,333	726,768	14,435	2.0%	1,166

Summary 2020–2050	Min	Max	Mean	Median
Population Growth	14,435	189,397	110,800	111,254
Dwellings (dpa)	1,166	3,721	2,525	2,460

Figure 11: VICUS-BI – Scenario Summary – SES Water

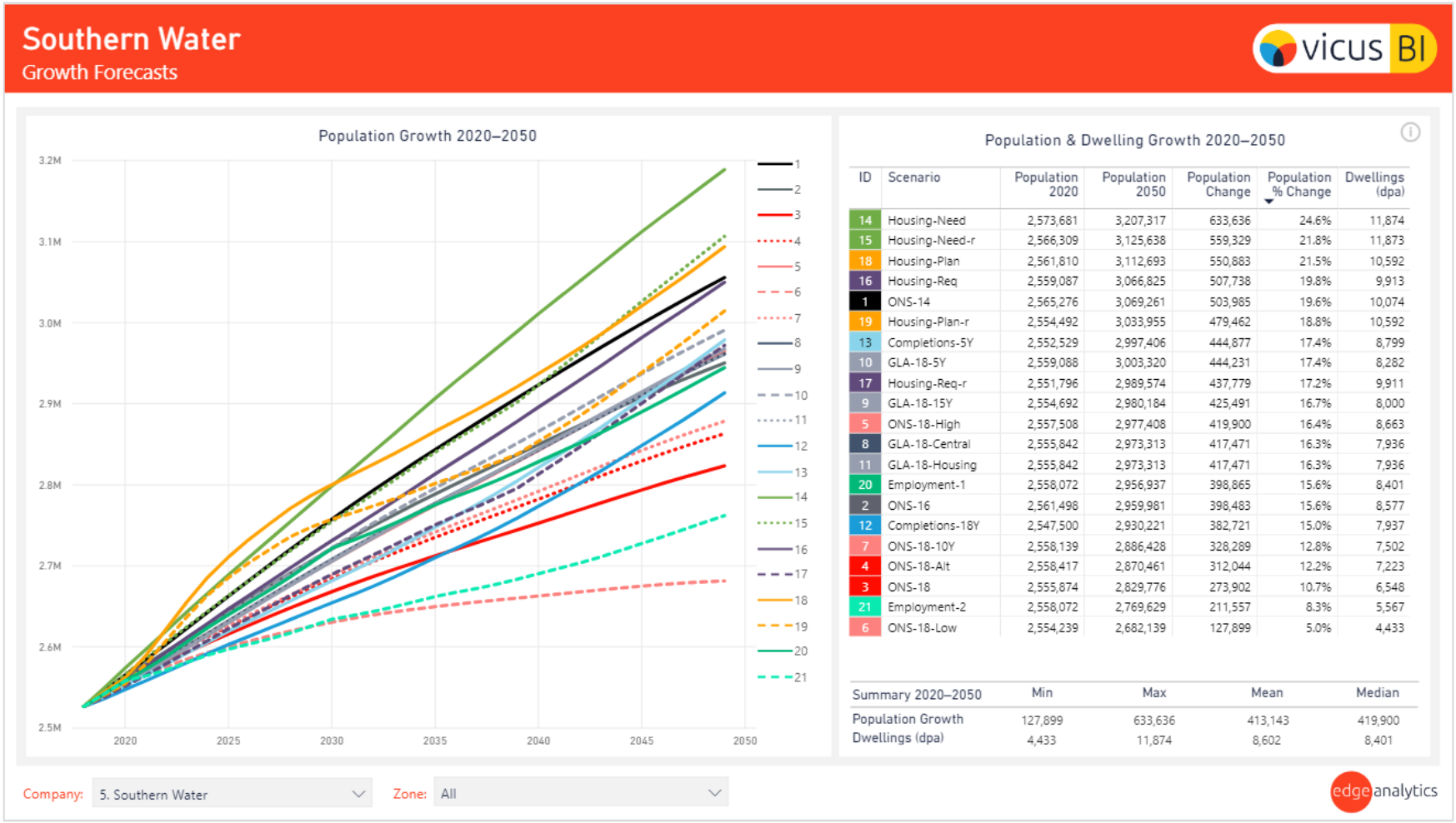


Population & Dwelling Growth 2020–2050

ID	Scenario	Population 2020	Population 2050	Population Change	Population % Change	Dwellings (dpa)
14	Housing-Need	2,249,529	2,834,703	585,174	26.0%	10,741
18	Housing-Plan	2,247,978	2,799,709	551,732	24.5%	10,353
16	Housing-Req	2,246,887	2,772,459	525,573	23.4%	9,792
15	Housing-Need-r	2,241,988	2,751,003	509,015	22.7%	10,746
13	Completions-5Y	2,234,762	2,723,101	488,338	21.9%	9,087
19	Housing-Plan-r	2,240,409	2,717,828	477,419	21.3%	10,356
17	Housing-Req-r	2,239,363	2,690,379	451,016	20.1%	9,799
1	ONS-14	2,242,632	2,680,307	437,675	19.5%	8,747
9	GLA-18-15Y	2,237,839	2,639,007	401,168	17.9%	7,300
12	Completions-18Y	2,227,723	2,626,694	398,971	17.9%	7,851
10	GLA-18-5Y	2,238,921	2,628,671	389,750	17.4%	7,234
5	ONS-18-High	2,236,193	2,613,706	377,513	16.9%	7,624
8	GLA-18-Central	2,236,882	2,611,741	374,859	16.8%	7,034
11	GLA-18-Housing	2,236,882	2,611,741	374,859	16.8%	7,034
20	Employment-1	2,235,049	2,585,205	350,156	15.7%	7,296
2	ONS-16	2,238,543	2,576,633	338,090	15.1%	7,354
7	ONS-18-10Y	2,236,127	2,527,004	290,877	13.0%	6,592
4	ONS-18-Alt	2,235,981	2,509,301	273,320	12.2%	6,320
3	ONS-18	2,235,112	2,489,172	254,060	11.4%	5,958
21	Employment-2	2,235,049	2,421,214	186,165	8.3%	4,905
6	ONS-18-Low	2,234,030	2,364,644	130,614	5.8%	4,292

Summary 2020–2050	Min	Max	Mean	Median
Population Growth	130,614	585,174	388,874	389,750
Dwellings (dpa)	4,292	10,746	7,925	7,354

Figure 12: VICUS-BI – Scenario Summary – South East Water

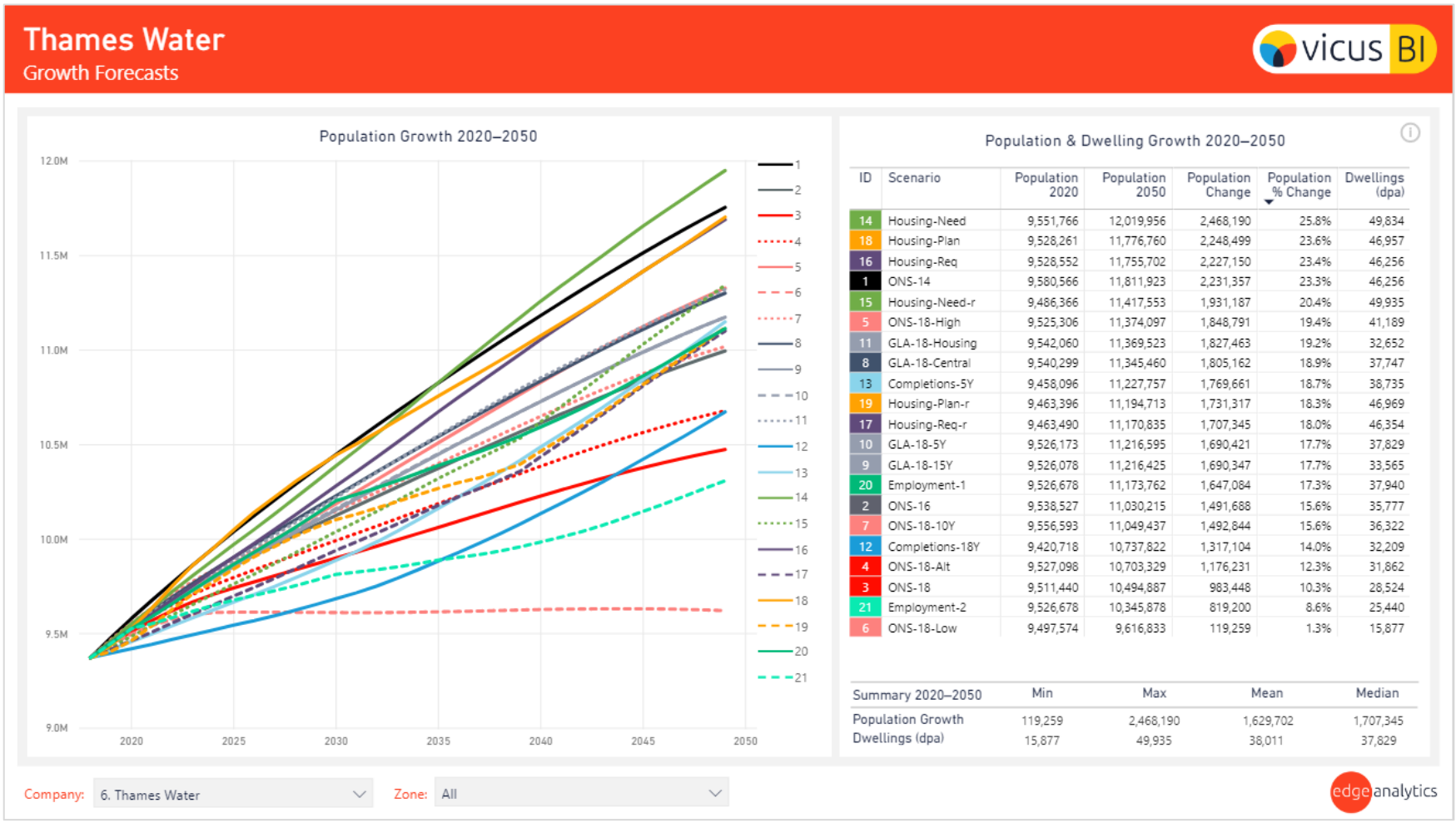


Population & Dwelling Growth 2020–2050

ID	Scenario	Population 2020	Population 2050	Population Change	Population % Change	Dwellings (dpa)
14	Housing-Need	2,573,681	3,207,317	633,636	24.6%	11,874
15	Housing-Need-r	2,566,309	3,125,638	559,329	21.8%	11,873
18	Housing-Plan	2,561,810	3,112,693	550,883	21.5%	10,592
16	Housing-Req	2,559,087	3,066,825	507,738	19.8%	9,913
1	ONS-14	2,565,276	3,069,261	503,985	19.6%	10,074
19	Housing-Plan-r	2,554,492	3,033,955	479,462	18.8%	10,592
13	Completions-5Y	2,552,529	2,997,406	444,877	17.4%	8,799
10	GLA-18-5Y	2,559,088	3,003,320	444,231	17.4%	8,282
17	Housing-Req-r	2,551,796	2,989,574	437,779	17.2%	9,911
9	GLA-18-15Y	2,554,692	2,980,184	425,491	16.7%	8,000
5	ONS-18-High	2,557,508	2,977,408	419,900	16.4%	8,663
8	GLA-18-Central	2,555,842	2,973,313	417,471	16.3%	7,936
11	GLA-18-Housing	2,555,842	2,973,313	417,471	16.3%	7,936
20	Employment-1	2,558,072	2,956,937	398,865	15.6%	8,401
2	ONS-16	2,561,498	2,959,981	398,483	15.6%	8,577
12	Completions-18Y	2,547,500	2,930,221	382,721	15.0%	7,937
7	ONS-18-10Y	2,558,139	2,886,428	328,289	12.8%	7,502
4	ONS-18-Alt	2,558,417	2,870,461	312,044	12.2%	7,223
3	ONS-18	2,555,874	2,829,776	273,902	10.7%	6,548
21	Employment-2	2,558,072	2,769,629	211,557	8.3%	5,567
6	ONS-18-Low	2,554,239	2,682,139	127,899	5.0%	4,433

Summary 2020–2050	Min	Max	Mean	Median
Population Growth	127,899	633,636	413,143	419,900
Dwellings (dpa)	4,433	11,874	8,602	8,401

Figure 13: VICUS-BI – Scenario Summary – Southern Water



Population & Dwelling Growth 2020–2050

ID	Scenario	Population 2020	Population 2050	Population Change	Population % Change	Dwellings (dpa)
14	Housing-Need	9,551,766	12,019,956	2,468,190	25.8%	49,834
18	Housing-Plan	9,528,261	11,776,760	2,248,499	23.6%	46,957
16	Housing-Req	9,528,552	11,755,702	2,227,150	23.4%	46,256
1	ONS-14	9,580,566	11,811,923	2,231,357	23.3%	46,256
15	Housing-Need-r	9,486,366	11,417,553	1,931,187	20.4%	49,935
5	ONS-18-High	9,525,306	11,374,097	1,848,791	19.4%	41,189
11	GLA-18-Housing	9,542,060	11,369,523	1,827,463	19.2%	32,652
8	GLA-18-Central	9,540,299	11,345,460	1,805,162	18.9%	37,747
13	Completions-5Y	9,458,096	11,227,757	1,769,661	18.7%	38,735
19	Housing-Plan-r	9,463,396	11,194,713	1,731,317	18.3%	46,969
17	Housing-Req-r	9,463,490	11,170,835	1,707,345	18.0%	46,354
10	GLA-18-5Y	9,526,173	11,216,595	1,690,421	17.7%	37,829
9	GLA-18-15Y	9,526,078	11,216,425	1,690,347	17.7%	33,565
20	Employment-1	9,526,678	11,173,762	1,647,084	17.3%	37,940
2	ONS-16	9,538,527	11,030,215	1,491,688	15.6%	35,777
7	ONS-18-10Y	9,556,593	11,049,437	1,492,844	15.6%	36,322
12	Completions-18Y	9,420,718	10,737,822	1,317,104	14.0%	32,209
4	ONS-18-Alt	9,527,098	10,703,329	1,176,231	12.3%	31,862
3	ONS-18	9,511,440	10,494,887	983,448	10.3%	28,524
21	Employment-2	9,526,678	10,345,878	819,200	8.6%	25,440
6	ONS-18-Low	9,497,574	9,616,833	119,259	1.3%	15,877

Summary 2020–2050	Min	Max	Mean	Median
Population Growth	119,259	2,468,190	1,629,702	1,707,345
Dwellings (dpa)	15,877	49,935	38,011	37,829

Figure 14: VICUS-BI – Scenario Summary – Thames Water

Outcomes 2020–2100

4.40 To support the requirement for a long-term outlook for water resource planning across the WRSE region, the WRMP scenario horizon stretches to 2100. The accompanying VICUS-BI dashboard and Microsoft Excel workbook provide a full illustration and data detail on the range of growth outcomes for this extended outlook.

4.41 Inevitably, as the process of population change is cumulative, the reliability of growth scenarios will reduce over time. The long-term horizon, stretching from 2050–2100 is the period with greatest uncertainty. It is a period during which the large birth cohorts of the 1950s and 1960s will leave the population. Without a significant and continuing input from international migration, the UK's population and that of its local communities would quickly decline.

4.42 However, the 2020–2100 scenarios have been configured to first take account of the range of outcomes for the 2020–2050 plan period and then to consider longer-term growth aligned to ONS national population projections. For each of the scenarios presented for 2020–2050, a long-term growth outlook is considered, extending the scenario horizon to 2100, in alignment with the ONS 2018-based national population projection for the UK.

4.43 Three long-term trajectories are presented for each of the 2020–2050 scenarios: a principal, low and high growth outcome. The high and low variants of the long-term scenarios illustrate the potential extremes of growth under different assumptions of fertility, mortality and international migration.

4.44 In each of the three long-term outcomes, fertility and mortality rates trends are consistent with the NPP principal scenario. For international migration, the principal scenario assumes a +190k annual net growth through international migration, with the High and Low variants assuming +290k and +90k per year respectively. Whilst the robust prediction of likely growth through international migration post-2050 presents a significant challenge, the principal scenario is presented as the most prudent outlook for consideration in the long-term water resource planning process.

4.45 For the WRSE region in total, the 17% average growth in population 2020–2050, is accompanied by a 13% average growth for 2050–2100 under the principal long-term outcome. This is equivalent to an average population growth of approximately 32% over the 2020–2100 plan period, an additional 6.2 million people on the base year total. The Low and High population growth averages for the full 2020–2100 horizon, range from 21–42%.

4.46 In terms of estimated housing growth, the average annual growth under the suite of Principal scenarios for the long-term horizon is approximately 51,432 dpa, ranging from 38,194 dpa to 63,403 dpa under the Low and High scenarios respectively.

4.47 Similar long-term outcomes for each water company and each WRZ are contained within the accompanying VICUS-BI and Microsoft Excel output.

Appendix A Glossary of Terms

APS	Annual Population Survey
ASFR	Age-specific fertility rate
ASMR	Age-specific mortality rate
BRES	Business Register & Employment survey
Defra	Department for Environment, Food and Rural Affairs
DWMP	Drainage and Wastewater Management Plan
DWP	Department for Works and Pensions
EA	Environment Agency
EFO	Economic and Fiscal Outlook
EU	European Union
GDP	Gross Domestic Product
GLA	Greater London Authority
H&T	Hidden and transient
LHN	Local Housing Need
LPA	Local Planning Authority
MHCLG	Ministry for Housing, Communities and Local Government
MYE	Mid-year population estimate
NPP	National Population Projection
NPPF	National Planning Policy Framework
OAN	Objective Assessment of Need
OBR	Office for Budget Responsibility
ONS	Office for National Statistics
OxCam	Oxford Cambridge Arc
PAF	Postcode Address File

PAS	Planning Advisory Service
PPG	Planning Policy Guidance
SHLAA	Strategic Housing Land Availability Assessment
SNPP	Sub-national Population Projection
SPA	State Pension Age
SRRP	Statement of Regional Resource Position
UK	United Kingdom
WG	Welsh Government
WRE	Water Resources East
WRMP	Water Resources Management Plan
WRN	Water Resources North
WRSE	Water Resources South East
WRSW	Water Resources South West
WRW	Water Resources West
WRZ	Water Resource Zone

Appendix B Local Authority Status Log

B.1 The activity log indicates the date at which Local Plan evidence was last accessed from each LPA and added to the Consilium database.

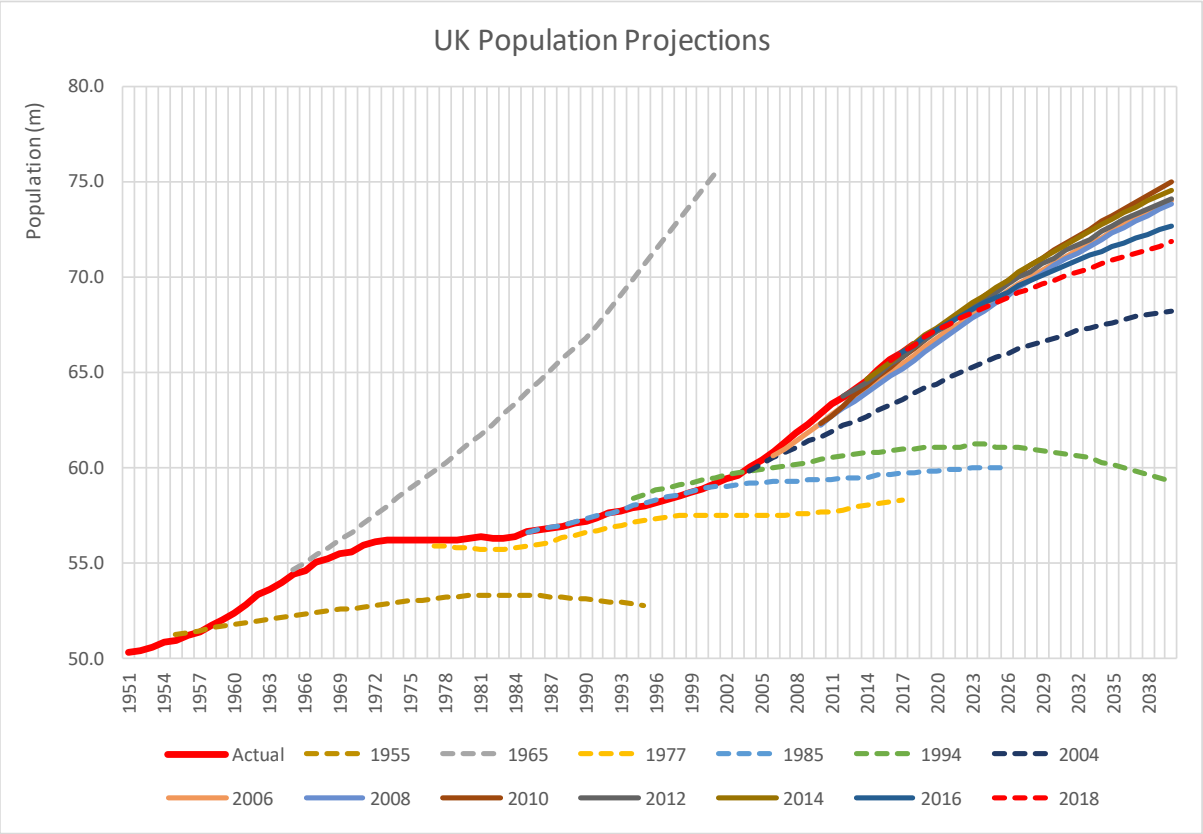
Area Name	Area Code	Region	WRSE	OxCam	Last Updated
Adur	E07000223	South East	WRSE		02/04/2020
Arun	E07000224	South East	WRSE		02/04/2020
Ashford	E07000105	South East	WRSE		17/03/2020
Aylesbury Vale	E07000004	South East	WRSE	OxCam	17/03/2020
Barnet	E09000003	London	WRSE		30/03/2020
Basingstoke and Deane	E07000084	South East	WRSE		02/04/2020
Bedford	E06000055	East of England		OxCam	26/03/2020
Bexley	E09000004	London	WRSE		31/03/2020
Bracknell Forest	E06000036	South East	WRSE		02/04/2020
Brent	E09000005	London	WRSE		31/03/2020
Brentwood	E07000068	East of England	WRSE		25/03/2020
Brighton and Hove	E06000043	South East	WRSE		02/04/2020
Bromley	E09000006	London	WRSE		30/03/2020
Broxbourne	E07000095	East of England	WRSE		27/03/2020
Cambridge	E07000008	East of England		OxCam	27/03/2020
Camden	E09000007	London	WRSE		30/03/2020
Canterbury	E07000106	South East	WRSE		17/03/2020
Central Bedfordshire	E06000056	East of England	WRSE	OxCam	27/03/2020
Cherwell	E07000177	South East	WRSE	OxCam	16/03/2020
Chichester	E07000225	South East	WRSE		16/03/2020
Chiltern	E07000005	South East	WRSE	OxCam	18/03/2020
City of London	E09000001	London	WRSE		30/03/2020
Corby	E07000150	East Midlands		OxCam	29/03/2020
Cotswold	E07000079	South West	WRSE		18/03/2020
Crawley	E07000226	South East	WRSE		02/04/2020
Croydon	E09000008	London	WRSE		30/03/2020
Dacorum	E07000096	East of England	WRSE		27/03/2020
Dartford	E07000107	South East	WRSE		17/03/2020
Daventry	E07000151	East Midlands		OxCam	29/03/2020
Dover	E07000108	South East	WRSE		18/03/2020
Ealing	E09000009	London	WRSE		31/03/2020
East Cambridgeshire	E07000009	East of England		OxCam	27/03/2020
East Hampshire	E07000085	South East	WRSE		18/03/2020
East Hertfordshire	E07000242	East of England	WRSE		27/03/2020
East Northamptonshire	E07000152	East Midlands		OxCam	30/03/2020
Eastbourne	E07000061	South East	WRSE		18/03/2020
Eastleigh	E07000086	South East	WRSE		18/03/2020
Elmbridge	E07000207	South East	WRSE		18/03/2020
Enfield	E09000010	London	WRSE		31/03/2020
Epping Forest	E07000072	East of England	WRSE		29/03/2020
Epsom and Ewell	E07000208	South East	WRSE		18/03/2020
Fareham	E07000087	South East	WRSE		02/04/2020
Fenland	E07000010	East of England		OxCam	26/03/2020
Folkestone and Hythe	E07000112	South East	WRSE		19/03/2020

Area Name	Area Code	Region	WRSE	OxCam	Last Updated
Gosport	E07000088	South East	WRSE		29/03/2020
Gravesham	E07000109	South East	WRSE		17/03/2020
Greenwich	E09000011	London	WRSE		31/03/2020
Guildford	E07000209	South East	WRSE		20/03/2020
Hackney	E09000012	London	WRSE		30/03/2020
Hammersmith and Fulham	E09000013	London	WRSE		30/03/2020
Haringey	E09000014	London	WRSE		31/03/2020
Harlow	E07000073	East of England	WRSE		27/03/2020
Harrow	E09000015	London	WRSE		31/03/2020
Hart	E07000089	South East	WRSE		20/03/2020
Hastings	E07000062	South East	WRSE		20/03/2020
Havant	E07000090	South East	WRSE		20/03/2020
Hertsmere	E07000098	East of England	WRSE		27/03/2020
Hillingdon	E09000017	London	WRSE		31/03/2020
Horsham	E07000227	South East	WRSE		20/03/2020
Hounslow	E09000018	London	WRSE		31/03/2020
Huntingdonshire	E07000011	East of England		OxCam	27/03/2020
Isle of Wight	E06000046	South East	WRSE		23/03/2020
Islington	E09000019	London	WRSE		30/03/2020
Kensington and Chelsea	E09000020	London	WRSE		30/03/2020
Kettering	E07000153	East Midlands		OxCam	30/03/2020
Kingston upon Thames	E09000021	London	WRSE		30/03/2020
Lambeth	E09000022	London	WRSE		30/03/2020
Lewes	E07000063	South East	WRSE		23/03/2020
Lewisham	E09000023	London	WRSE		29/03/2020
Luton	E06000032	East of England	WRSE	OxCam	26/03/2020
Maidstone	E07000110	South East	WRSE		23/03/2020
Medway	E06000035	South East	WRSE		23/03/2020
Merton	E09000024	London	WRSE		28/03/2020
Mid Sussex	E07000228	South East	WRSE		23/03/2020
Milton Keynes	E06000042	South East		OxCam	23/03/2020
Mole Valley	E07000210	South East	WRSE		18/03/2020
New Forest	E07000091	South East	WRSE		23/03/2020
New Forest National Park	E26000009	National Park	WRSE		30/03/2020
Newham	E09000025	London	WRSE		28/03/2020
North Hertfordshire	E07000099	East of England	WRSE		29/03/2020
Northampton	E07000154	East Midlands		OxCam	18/03/2020
Oxford	E07000178	South East	WRSE	OxCam	16/03/2020
Peterborough	E06000031	East of England		OxCam	29/03/2020
Portsmouth	E06000044	South East	WRSE		23/03/2020
Reading	E06000038	South East	WRSE		23/03/2020
Redbridge	E09000026	London	WRSE		27/03/2020
Reigate and Banstead	E07000211	South East	WRSE		23/03/2020
Richmond upon Thames	E09000027	London	WRSE		27/03/2020
Rother	E07000064	South East	WRSE		25/03/2020
Runnymede	E07000212	South East	WRSE		25/03/2020
Rushmoor	E07000092	South East	WRSE		25/03/2020
Sevenoaks	E07000111	South East	WRSE		25/03/2020

Area Name	Area Code	Region	WRSE	OxCam	Last Updated
Slough	E06000039	South East	WRSE		25/03/2020
South Bucks	E07000006	South East	WRSE	OxCam	25/03/2020
South Cambridgeshire	E07000012	East of England		OxCam	27/03/2020
South Downs National Park	E26000010	National Park	WRSE		02/04/2020
South Northamptonshire	E07000155	East Midlands	WRSE	OxCam	18/03/2020
South Oxfordshire	E07000179	South East	WRSE	OxCam	29/03/2020
Southampton	E06000045	South East	WRSE		25/03/2020
Southwark	E09000028	London	WRSE		27/03/2020
Spelthorne	E07000213	South East	WRSE		26/03/2020
St Albans	E07000240	East of England	WRSE		27/03/2020
Stevenage	E07000243	East of England	WRSE		23/03/2020
Stratford-on-Avon	E07000221	West Midlands	WRSE		12/03/2020
Surrey Heath	E07000214	South East	WRSE		27/03/2020
Sutton	E09000029	London	WRSE		24/03/2020
Swale	E07000113	South East	WRSE		27/03/2020
Swindon	E06000030	South West	WRSE		18/03/2020
Tandridge	E07000215	South East	WRSE		27/03/2020
Test Valley	E07000093	South East	WRSE		27/03/2020
Tewkesbury	E07000083	South West	WRSE		18/03/2020
Thanet	E07000114	South East	WRSE		27/03/2020
Three Rivers	E07000102	East of England	WRSE		23/03/2020
Tonbridge and Malling	E07000115	South East	WRSE		27/03/2020
Tower Hamlets	E09000030	London	WRSE		24/03/2020
Tunbridge Wells	E07000116	South East	WRSE		27/03/2020
Uttlesford	E07000077	East of England	WRSE		23/03/2020
Vale of White Horse	E07000180	South East	WRSE	OxCam	16/03/2020
Waltham Forest	E09000031	London	WRSE		23/03/2020
Wandsworth	E09000032	London	WRSE		23/03/2020
Watford	E07000103	East of England	WRSE		23/03/2020
Waverley	E07000216	South East	WRSE		27/03/2020
Wealden	E07000065	South East	WRSE		27/03/2020
Wellingborough	E07000156	East Midlands		OxCam	18/03/2020
Welwyn Hatfield	E07000241	East of England	WRSE		20/03/2020
West Berkshire	E06000037	South East	WRSE		28/03/2020
West Oxfordshire	E07000181	South East	WRSE	OxCam	16/03/2020
Westminster	E09000033	London	WRSE		23/03/2020
Wiltshire	E06000054	South West	WRSE		18/03/2020
Winchester	E07000094	South East	WRSE		28/03/2020
Windsor and Maidenhead	E06000040	South East	WRSE		29/03/2020
Woking	E07000217	South East	WRSE		29/03/2020
Wokingham	E06000041	South East	WRSE		29/03/2020
Worthing	E07000229	South East	WRSE		16/03/2020
Wychavon	E07000238	West Midlands	WRSE		12/03/2020
Wycombe	E07000007	South East	WRSE	OxCam	29/03/2020

Appendix C Projection Accuracy

C.1 The illustration below provides a summary of official UK population projections and their relationship to the actual trajectory of population change.



Source: ONS, OBR

C.2 Historically, the UK population has risen more than projected, with one exception. The 1965-based population growth trajectory was based upon the continuation of the high fertility rates experienced in the early 1960s, which peaked in 1964, falling to a record low in 1977.

C.3 In subsequent years, projections have typically under-estimated future population growth due to one or more of three factors: (i) the allocation of insufficient growth through international migration; (ii) a failure to anticipate a return to higher fertility rates; and (iii) a failure to anticipate the continued improvements in life expectancy (longevity).

C.4 More recently, projections have demonstrated greater convergence, with lower international migration, plus reduced assumptions on long-term fertility rates and improvements in life expectancy, having a dampening effect upon population growth outcomes.

Appendix D ONS & GLA Projections

(i) ONS National Projections

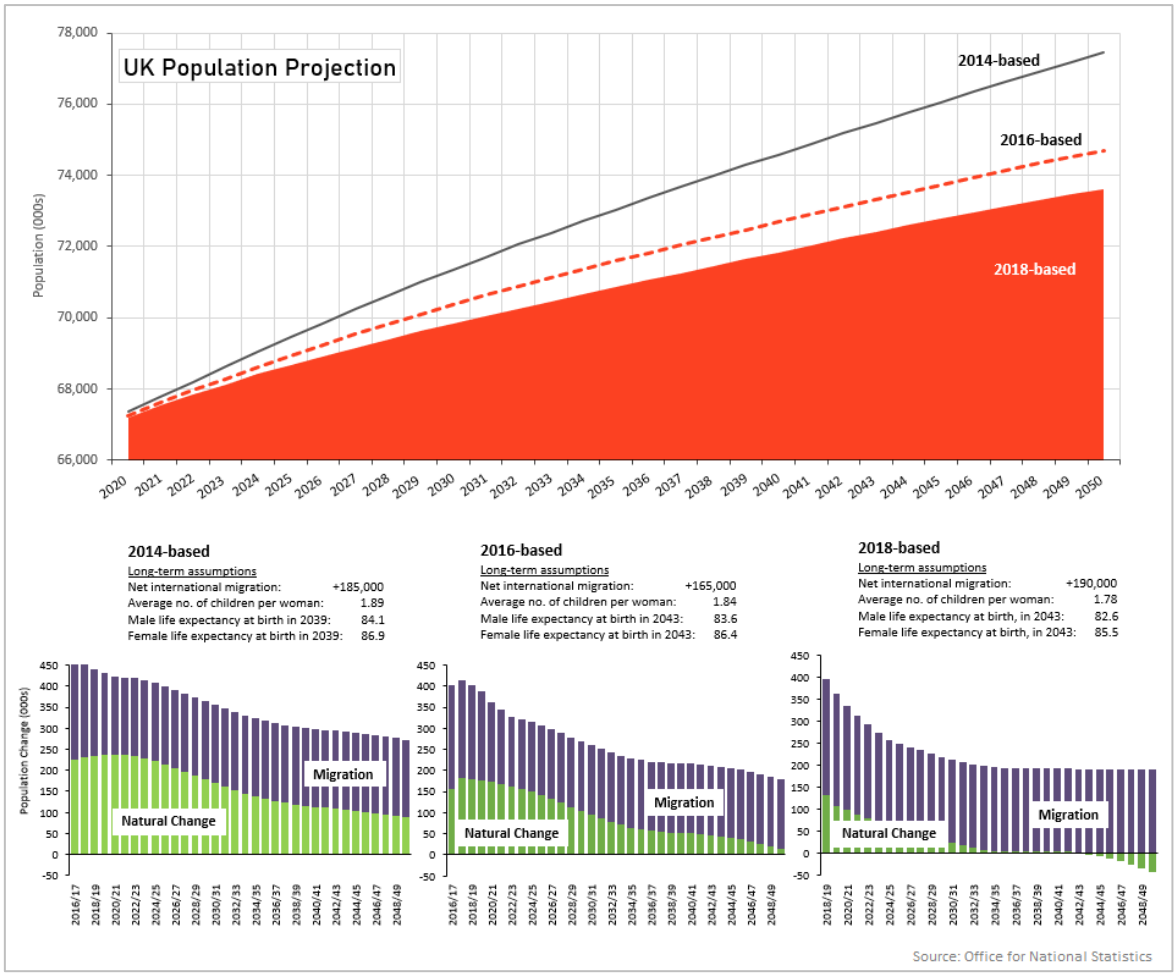
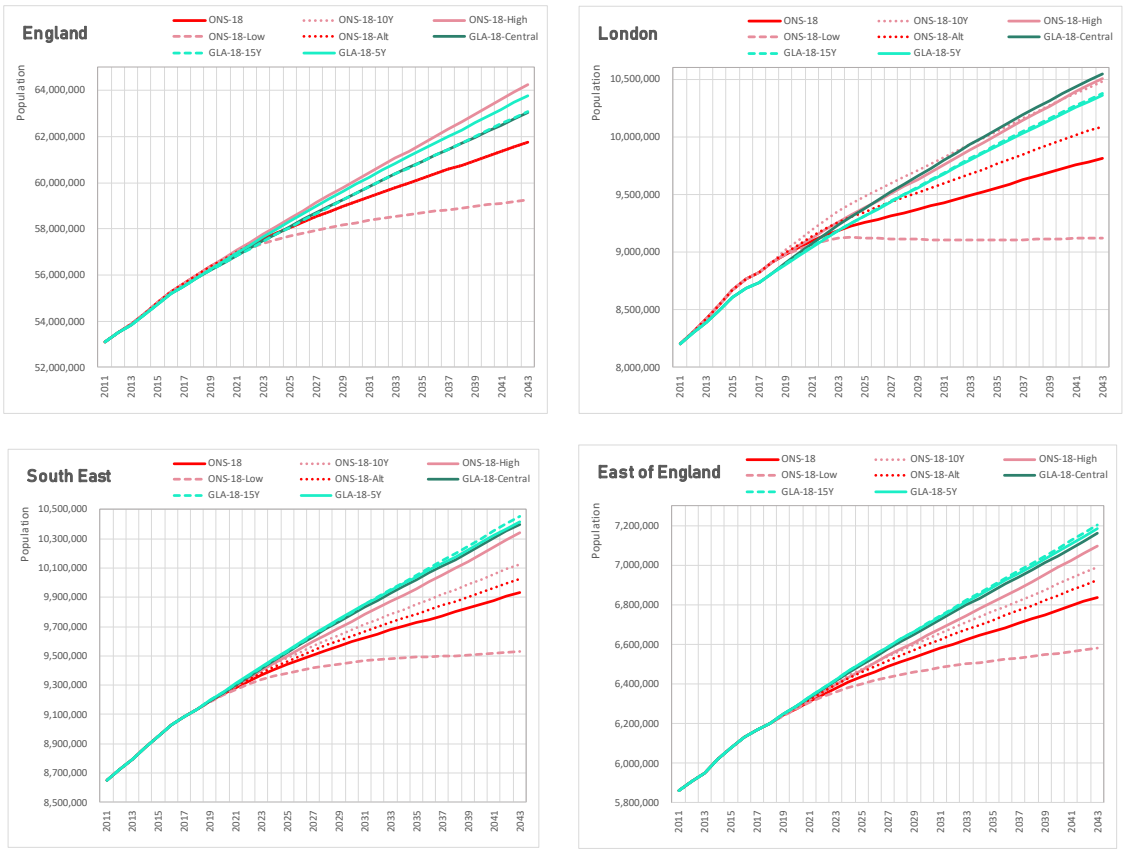


Figure 15: UK Population Projections

(ii) ONS vs GLA Projections Compared



Source: ONS, GLA

Figure 16: ONS & GLA 2018-based Projections Compared

Appendix E OxCam Geography

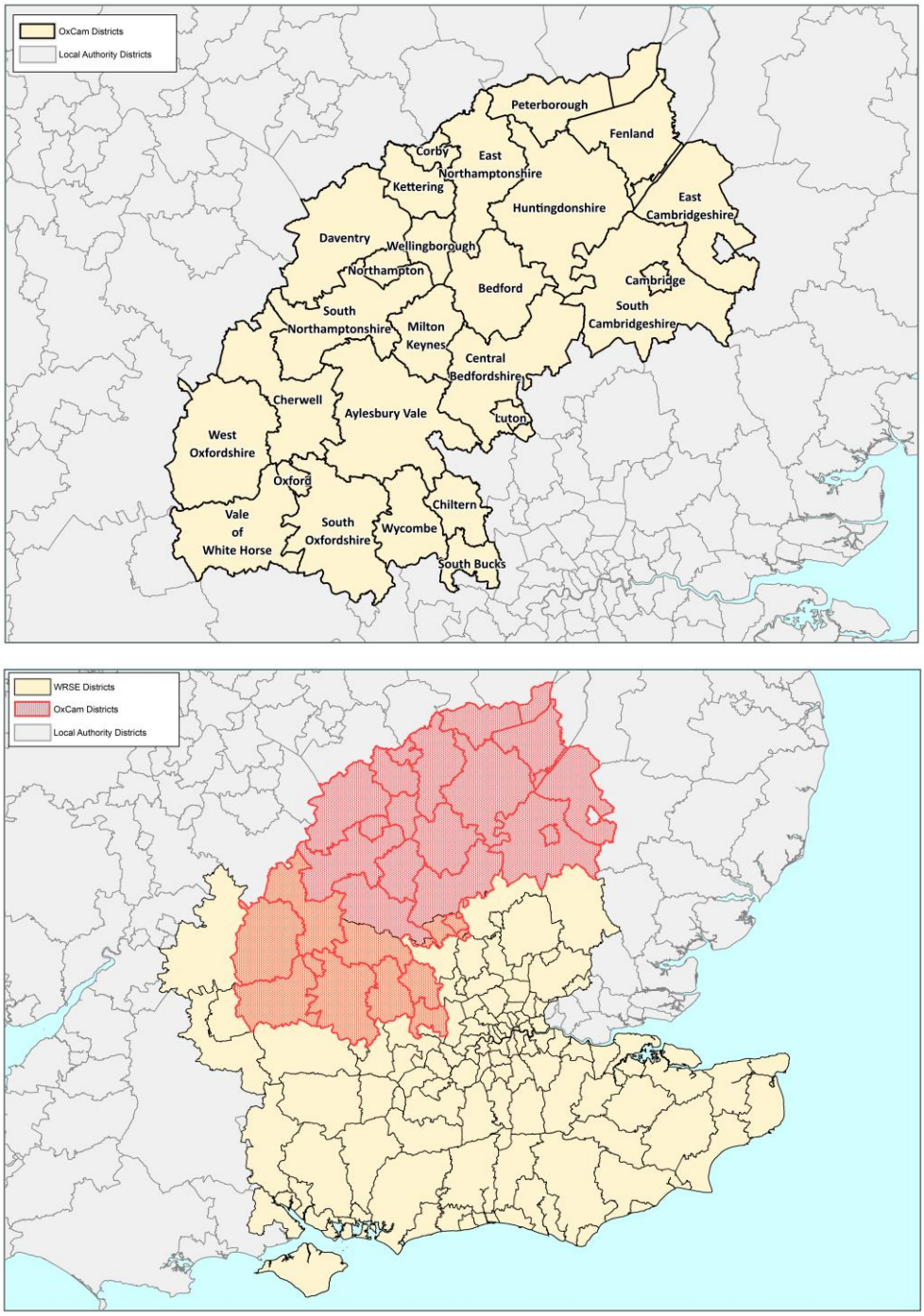
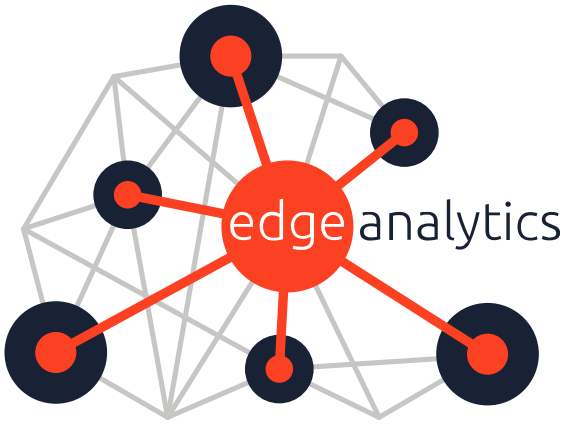


Figure 17: OxCam Area Definition



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Thames
Water