



# Revised 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 in 2021 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
- Local authority need based forecasts
- ONS18 Rebased SNPP central forecasts
- ONS18 Rebased SNPP low forecast
- 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.

Additionally, this report is now supplemented with an updated report from Edge Analytics which covers the 2023 update to the growth forecasts that have been used to produce the adaptive plan. This covers the five forecasts that have been used to prepare supply demand balance scenarios for the adaptive plan, listed above.

Edge Analytics Report



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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.*



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# 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<sup>1</sup>.
- 1.2 Robust evidence on future housing growth and demographic change, are key components of the Water Resources Planning Guidelines (WRPG)<sup>2,3</sup>, 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)<sup>4</sup>, 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)***

<sup>1</sup> [MHCLG, Planning for the Future \(March 2020\)](#)

<sup>2</sup> [Water Resources Planning Guideline \(May 2016\)](#)

<sup>3</sup> [Water Resources Planning Guideline, Interim Update \(July 2018\)](#)

<sup>4</sup> [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.<sup>5</sup> 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.

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<sup>5</sup> [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).

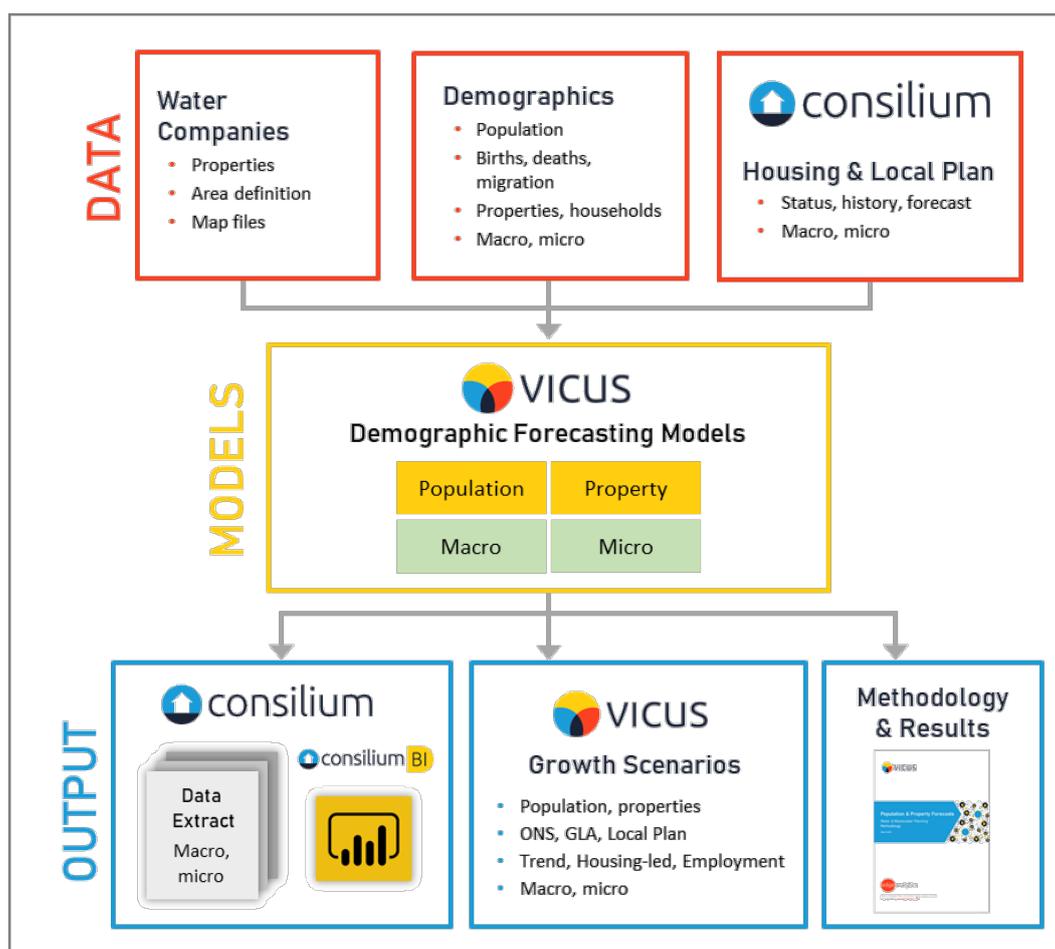


Figure 1: VICUS Forecasting Framework

- 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.

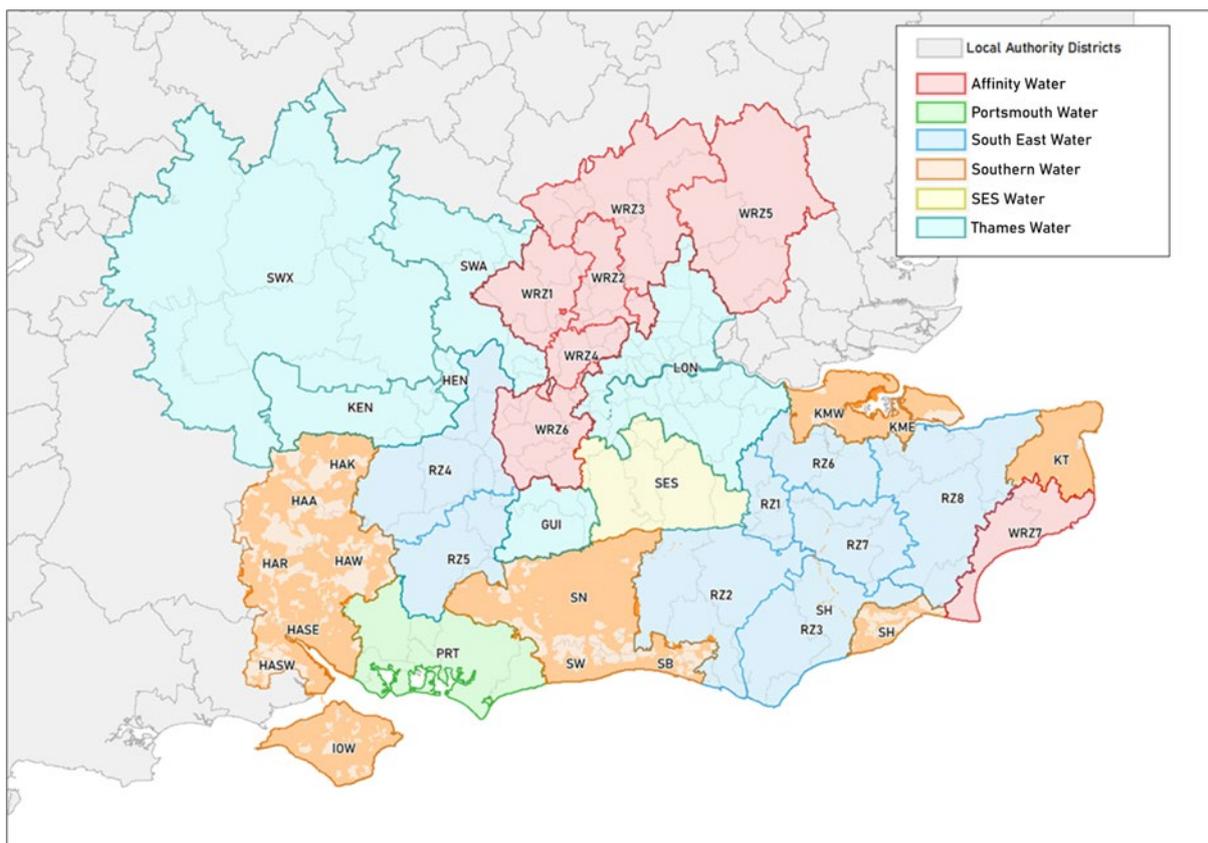


Figure 2: WRSE Water Resource Zone Geography

## 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<sup>6</sup>. 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<sup>7</sup>.
- 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

<sup>6</sup> Communal establishments include prisons, residential care homes, student halls of residence and certain armed forces accommodation.

<sup>7</sup> [OBR, Fiscal Sustainability Report 2018](#)

the size of the resident workforce exceeds the level of employment available in the area, resulting 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.

**Table 1: Consilium - Housing Data Classification**

1	Completions	Historical housing completions (net), sourced from Local Authority data and the MHCLG (Live Table 122).
2	Local Housing Need (LHN)	Minimum housing need, as calculated using the MHCLG 'standard method', which is based on the 2014-based household growth projections, with an adjustment to account for affordability.
3	Objective Assessment of Need (OAN)	A measure of future need, as calculated by the planning authorities (used prior to the introduction of the LHN).
4	Requirement	As set out in the NPPF, the housing requirement (provision target) identifies the extent to which 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 meet the planned housing requirement over the next 5 years.
6	HLA	The land availability assessment is carried out by planning authorities to assess the availability, suitability and achievability of sites and broad locations for potential housing development.
7	Planned Delivery	Planning authorities should produce a trajectory of expected housing delivery over the 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.

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).



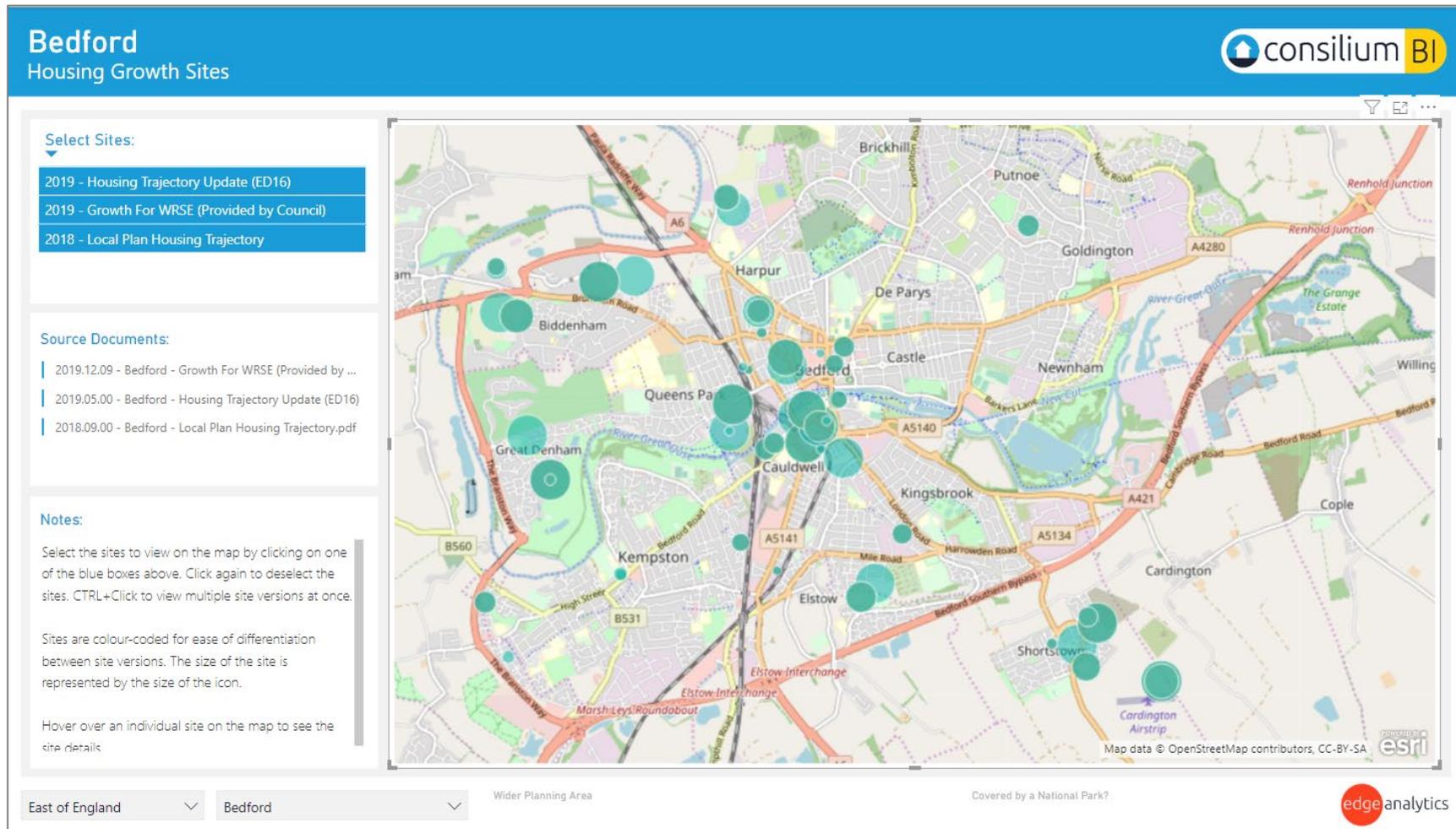


Figure 4: Consilium – Site Data – Example Only



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

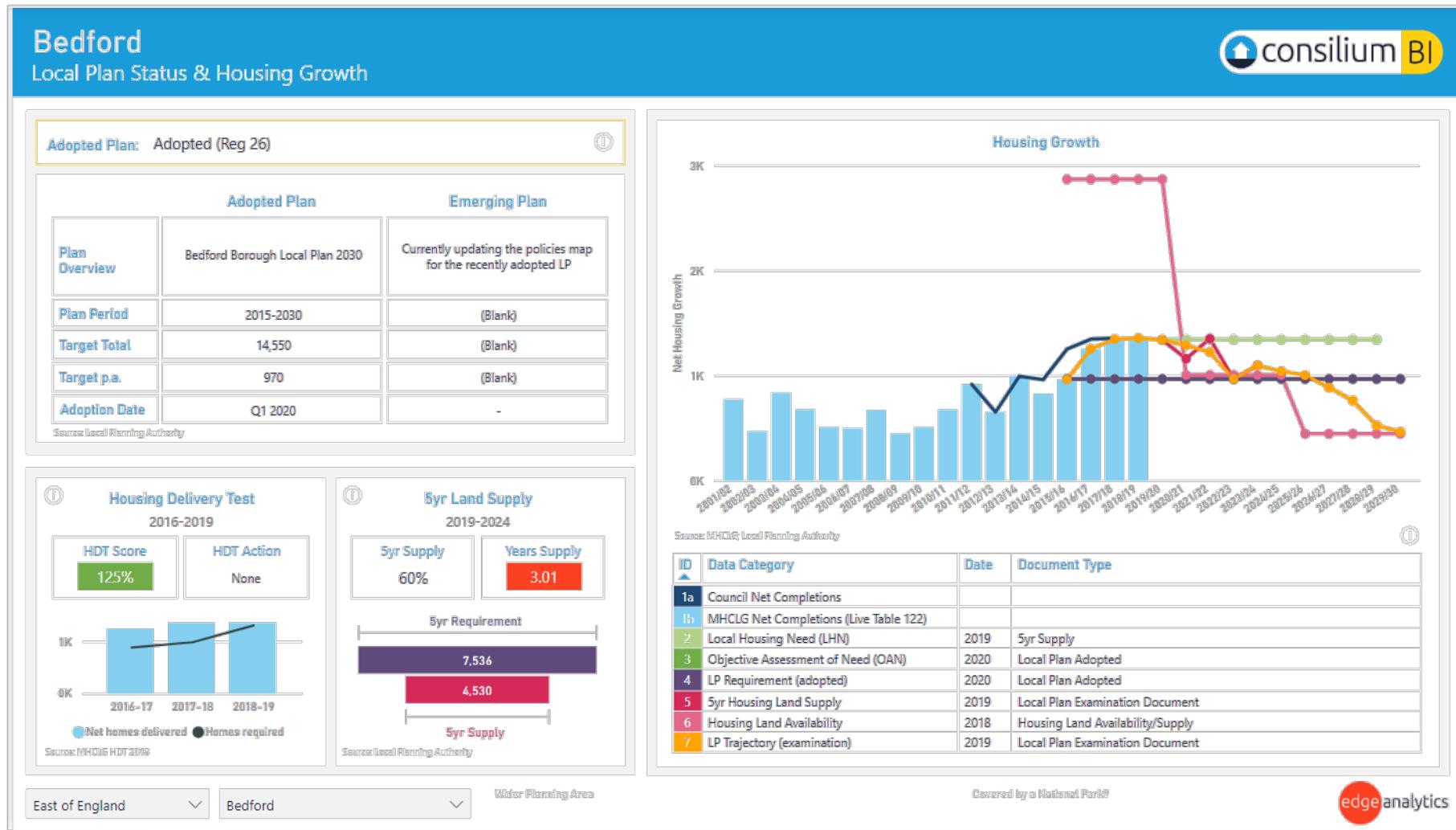


Figure 6: Consilium B- Dashboard – Local Plan Status – Example Only

# 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.

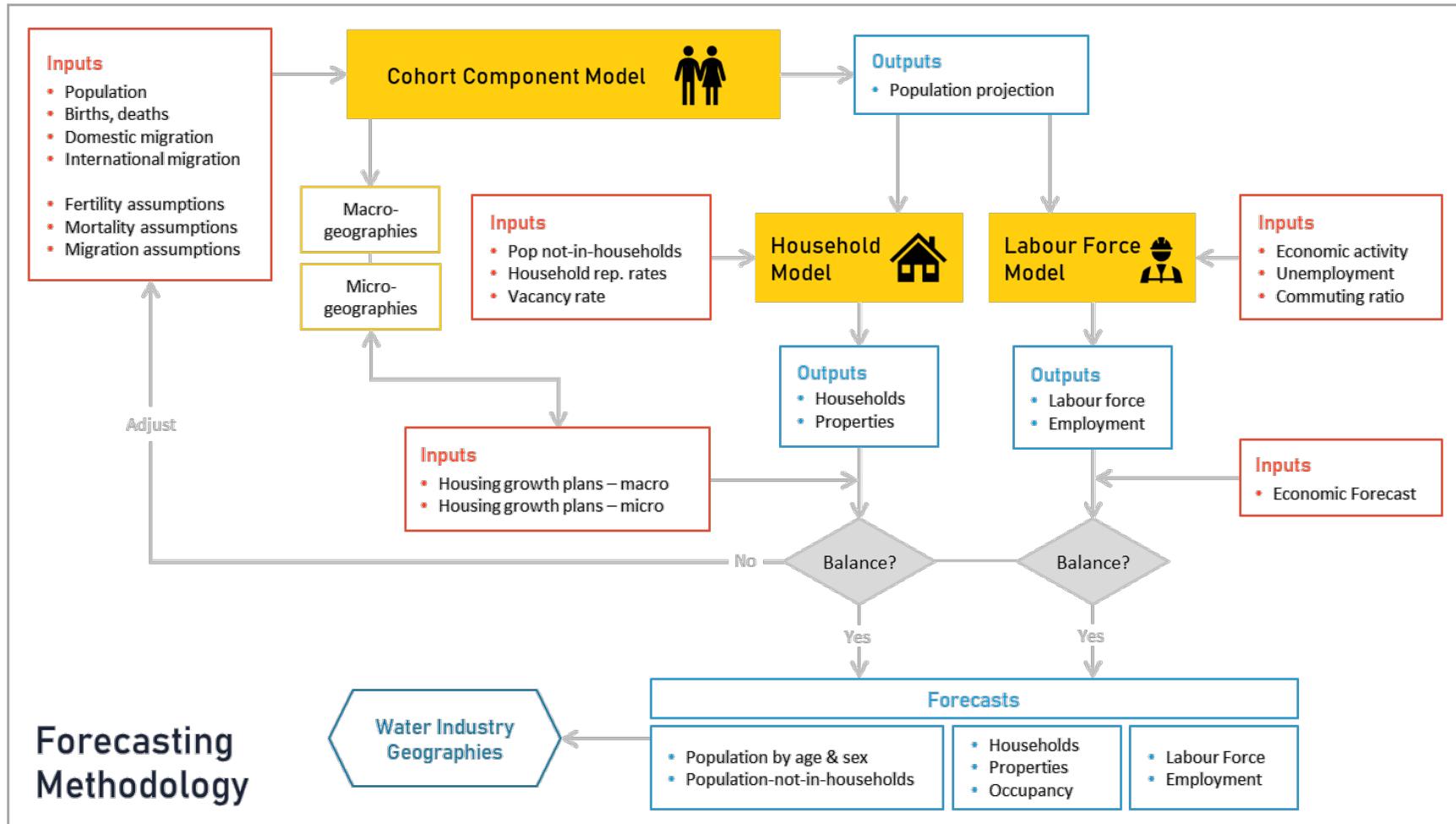


Figure 7: VICUS – Forecasting Methodology

## 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)<sup>8</sup>. 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<sup>9</sup>. 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.

<sup>8</sup> [ONS Subnational Population Projections for England: 2018-based](#)

<sup>9</sup> [National population projections, how the assumptions are set: 2018-based](#)

Table 2: VICUS – Scenario Definition, 2020–2050

ID	Scenario	Description	URL	
Trend Projections	1	ONS-14	ONS 2014-based sub-national population projection (SNPP), using a six-year history (2008–2014) to derive local fertility, mortality and internal migration assumptions, with a long-term UK net international migration assumption of +185k p.a.	<a href="#">ONS 2014</a>
	2	ONS-16	ONS 2016-based Principal sub-national population projection (SNPP), using a five-year history (2011–2016) to derive local fertility, mortality and internal migration assumptions, and a long-term UK net international migration assumption of +165k. In line with the ONS 2016-based national population projection (NPP), this round of projections includes a reduced UK fertility outlook compared to ONS-14 and a dampened rate of improvement in life expectancy compared to ONS-14.	<a href="#">ONS 2016</a>
	3	ONS-18	ONS 2018-based Principal sub-national population projection (SNPP), using a five-year history (2013–2018) to derive local fertility & mortality assumptions and a long-term UK net international migration assumption of +190k. Unlike earlier rounds of SNPP, the 2018-based Principal projection uses a two-year history (2016–2018) of internal migration assumptions, following recent changes to the methodology used for its estimation, which have only covered the latest 2 years. In line with the ONS 2018-based national population projection (NPP), this round of projections includes a reduced UK fertility outlook compared to ONS-16 and a dampened rate of improvement in life expectancy compared to ONS-16.	
	4	ONS-18-Alt	ONS 2018-based Alternative Internal Migration sub-national population projection (SNPP), produced by ONS as a comparison with the Principal projection. It uses a five-year average of internal migration (2013–2018), combining 3 years of data based on the old methodology and 2 years based on the new methodology. All other assumptions are consistent with ONS-18.	<a href="#">ONS 2018</a>
	5	ONS-18-High	ONS 2018-based High International Migration sub-national population projection (SNPP), incorporating a High long-term UK net international migration assumption of +290k p.a., with all other assumptions consistent with ONS-18.	
	6	ONS-18-Low	ONS 2018-based Low International Migration sub-national population projection (SNPP), incorporating a Low long-term UK net international migration assumption of +90k 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, using a ten-year history (2008–2018) to derive internal migration assumptions, with all other assumptions consistent with ONS-18.	
	8	GLA-18-Central	Greater London Authority (GLA) 2018-based Central population projection, incorporating: GLA's own adjustments to the mid-year population estimates of London Boroughs; local fertility and mortality assumptions, trended in line with the ONS 2018-based NPP assumptions; internal and international migration assumptions derived from a 10-year history (2008–2018). This scenario includes projections for London Boroughs and for all other local authority areas.	
	9	GLA-18-15Y	GLA 2018-based long-term trend projection, incorporating internal and international migration assumptions derived from a 15-year history (2003–2018), with all other assumptions consistent with the Central scenario. This scenario includes projections for London Boroughs and for all other local authority areas.	<a href="#">GLA</a>
	10	GLA-18-5Y	GLA 2018-based short-term trend projection, incorporating internal and international migration assumptions derived from a 5-year history (2013–2018), with all other assumptions consistent with the Central scenario. This scenario includes projections for London	

ID	Scenario	Description	URL	
		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 Housing Land Availability Assessment (SHLAA). Beyond 2041, housing growth is aligned to the 2035–2041 average. Whilst the housing-led approach is applied to each London Borough, the population projection for Greater London, in total, remains consistent with the Central scenario. This scenario includes projections for London Boroughs only and is combined with the Central scenario for all other local authority areas when aggregated to WRZ geographies.	<a href="#">GLA Housing</a>
	12	Completions-18Y	A Housing-led scenario, with population growth underpinned by a continuation of the rate of housing growth recorded in each local authority's 18-year completions history (2001–2019).	<a href="#">MHCLG Live Table 122</a>
	13	Completions-5Y	A Housing-led scenario, with population growth underpinned by a continuation of the rate of housing growth recorded in each local authority's 5-year completions history (2014–2019).	
Housing-led Forecasts	14	Housing-Need	A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority's Local Housing Need (LHN) or Objectively Assessed Housing Need (OAHN). Following the final year of data, projected housing growth in non-London areas returns to the ONS-14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, housing growth returns to the GLA Central scenario long-term annual average by 2050.	
	15	Housing-Need-r	A Housing-led scenario, consistent with the Housing-Need scenario, but with household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.	
	16	Housing-Req	A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority's housing Requirement. Following the final year of data, projected housing growth in non-London areas returns to the ONS-14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, housing 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 household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.	
	18	Housing-Plan	A Housing-led scenario, with population growth underpinned by each local authority's Local Plan housing growth trajectory. Following the final year of data, projected housing growth in non-London areas returns to the ONS-14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, housing growth returns to the 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 household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.	
	Employment-Led Forecasts	20	Employment-1	An Employment-led scenario with 1.0% pa growth in London to 2030 and 0.5% pa thereafter; 0.8% pa growth in the South East and East of England to 2030, 0.4% thereafter.
21		Employment-2	An Employment-led scenario with 0.5% pa growth in London to 2030 and 0.25% pa thereafter; 0.4% pa growth in the South East and East of England to 2030, 0.2% thereafter.	

ID	Scenario	Description	URL
OxCam Housing-Led Forecasts	22	OxCam-1a-r	'New Settlement' 23k dpa scenario, with c.4.2k dpa above Housing Plan distributed between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
	23	OxCam-1b-r	'Expansion' 23k dpa scenario, with c 4.2k dpa distributed between: Milton Keynes: (30%) Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), Northampton (10%), and Peterborough (10%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
	24	OxCam-2a-r	'New Settlement' 30k dpa scenario, with c.11.2k dpa above Housing Plan distributed between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
	25	OxCam-2b-r	'Expansion' 30k dpa scenario, with c 11.2k dpa distributed between: Milton Keynes: (30%) Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), Northampton (10%), and Peterborough (10%). Household representative rates for young 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<sup>10</sup>. 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 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

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<sup>10</sup> [GLA Population and Household Projections](#)

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<sup>11</sup>. 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 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<sup>12,13</sup>. 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<sup>14</sup>, 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,

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<sup>11</sup> [GLA Housing-led Population Projections](#)

<sup>12</sup> Savills (2019) The Oxford-Cambridge Innovation Arc [Savills](#)

<sup>13</sup> MHCLG (2019) The Oxford-Cambridge Arc, Government ambition and joint declaration between Government and local partners [OxCam Arc](#)

<sup>14</sup> Edge Analytics (2020) OxCam Housing & Population Growth, draft v1

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.
- 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<sup>15</sup>. 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

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<sup>15</sup> OBR (2018) Fiscal Sustainability Report [OBR July 2018](#)

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:
- **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 the ONS 2018-based NPP Principal scenario, plus its Principal net international migration assumption of +190k p.a. for the UK in total.
Low ('-L')	The Low long-term scenario incorporates the mortality and fertility assumptions of the ONS 2018-based NPP Principal scenario, plus a Low net international migration assumption of +90k p.a. for the UK in total.
High ('-H')	The High long-term scenario incorporates the mortality and fertility assumptions of the ONS 2018-based NPP Principal scenario, plus a High net international migration assumption of +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<sup>16</sup>. 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)).
- 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,

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<sup>16</sup> [ONS - Long-Term International Migration estimates methodology](#)

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)<sup>17</sup>.
- 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 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-

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<sup>17</sup> 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

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<sup>18</sup>. 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 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.
- 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

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<sup>18</sup> The DPI analysis has been provided to WRSE members as an accompaniment to the main population and property forecast outputs.

dwelling 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

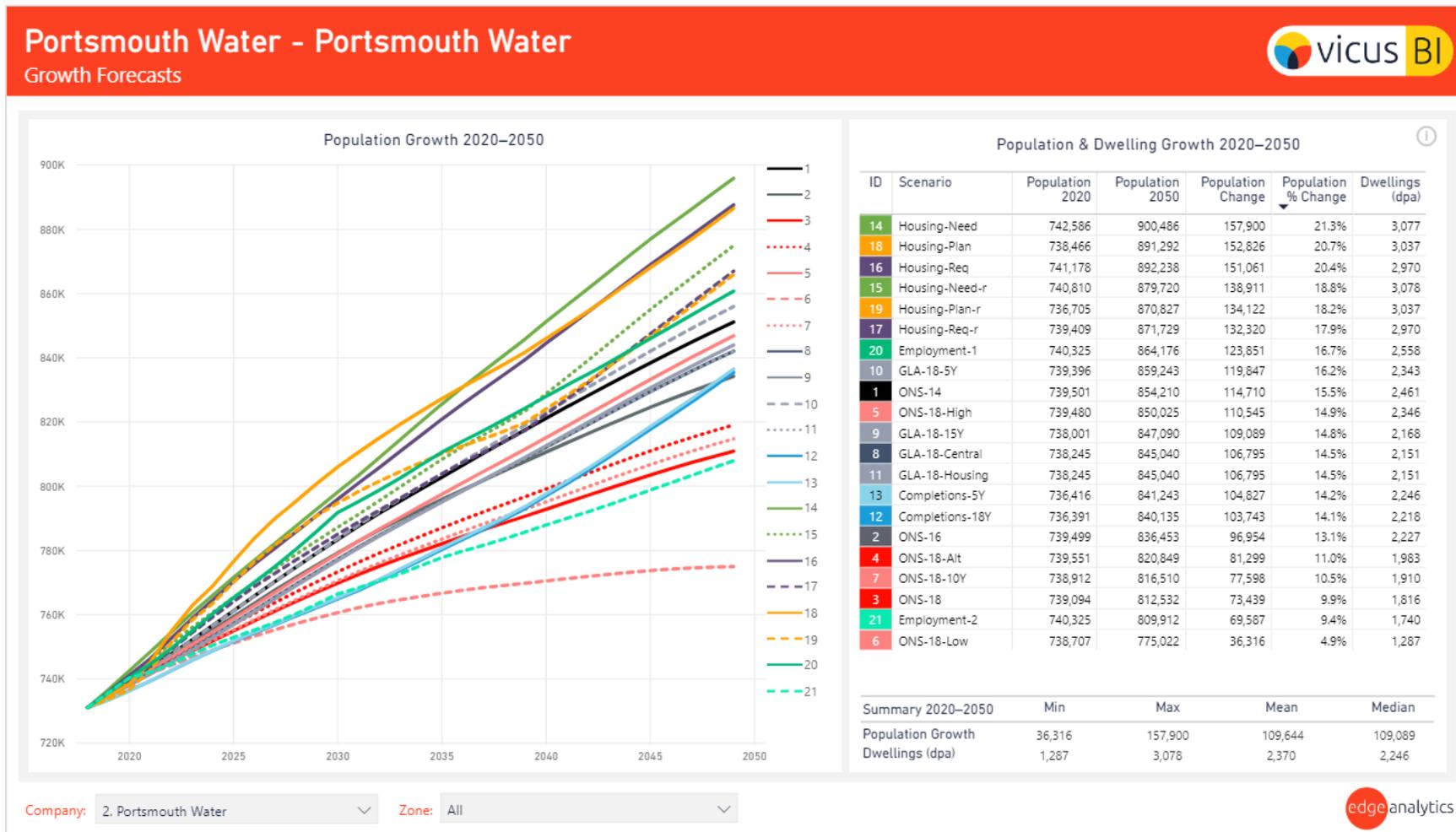


Figure 10: VICUS-BI – Scenario Summary – Portsmouth Water



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



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



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

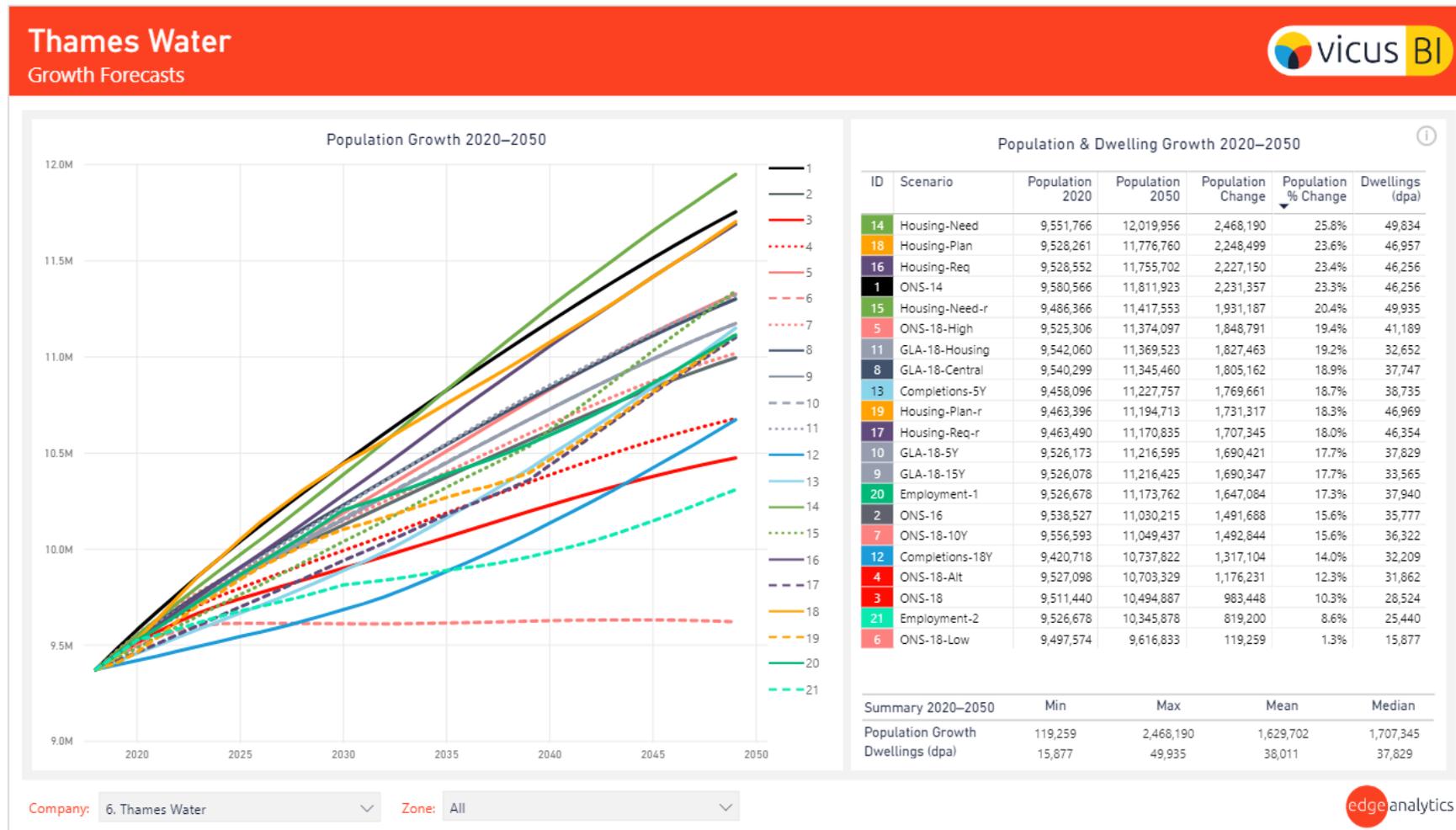


Figure 14: VICUS-BI – Scenario Summary – Thames Water

## 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

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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.

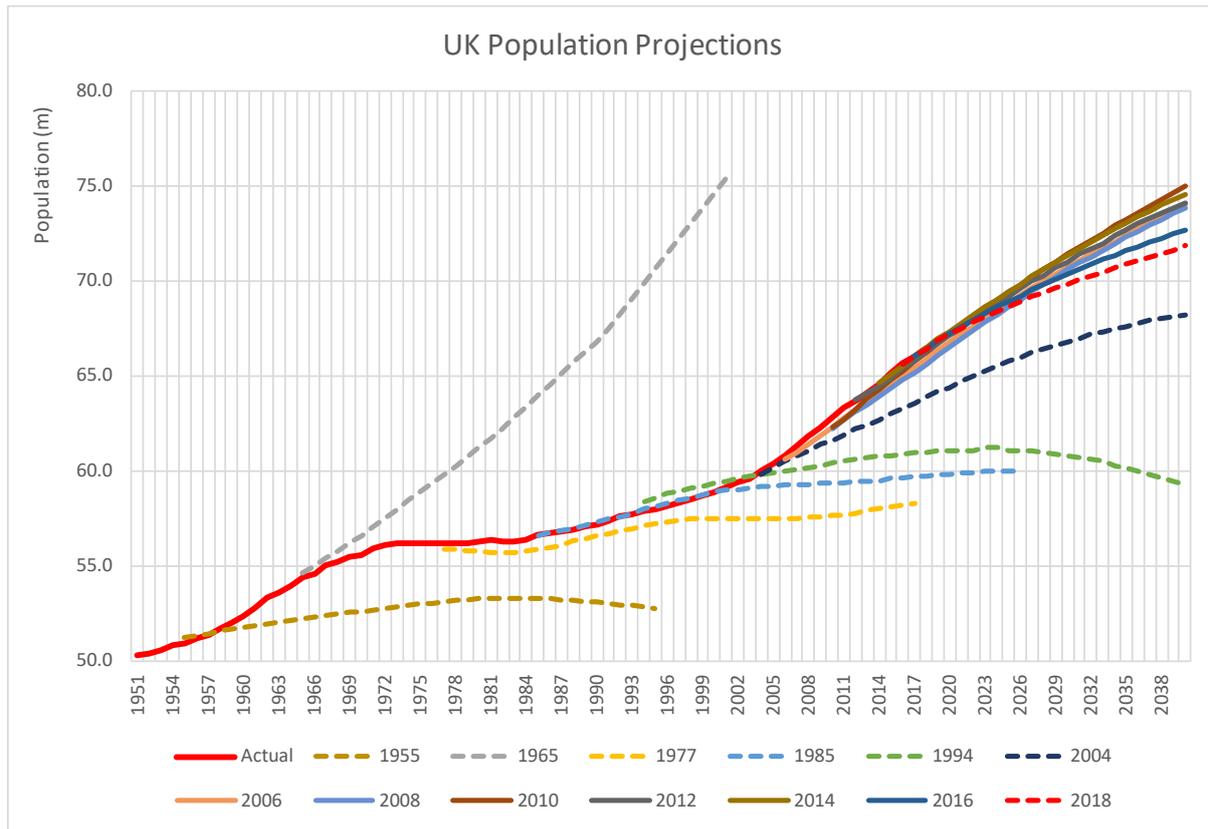
Area Name	Area Code	Region	WRSE	OxCam	Last Updated
Adur	E07000223	South East	WRSE		02/04/2020
Arun	E07000224	South East	WRSE		02/04/2020
Ashford	E07000105	South East	WRSE		17/03/2020
Aylesbury Vale	E07000004	South East	WRSE	OxCam	17/03/2020
Barnet	E09000003	London	WRSE		30/03/2020
Basingstoke and Deane	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.



- 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

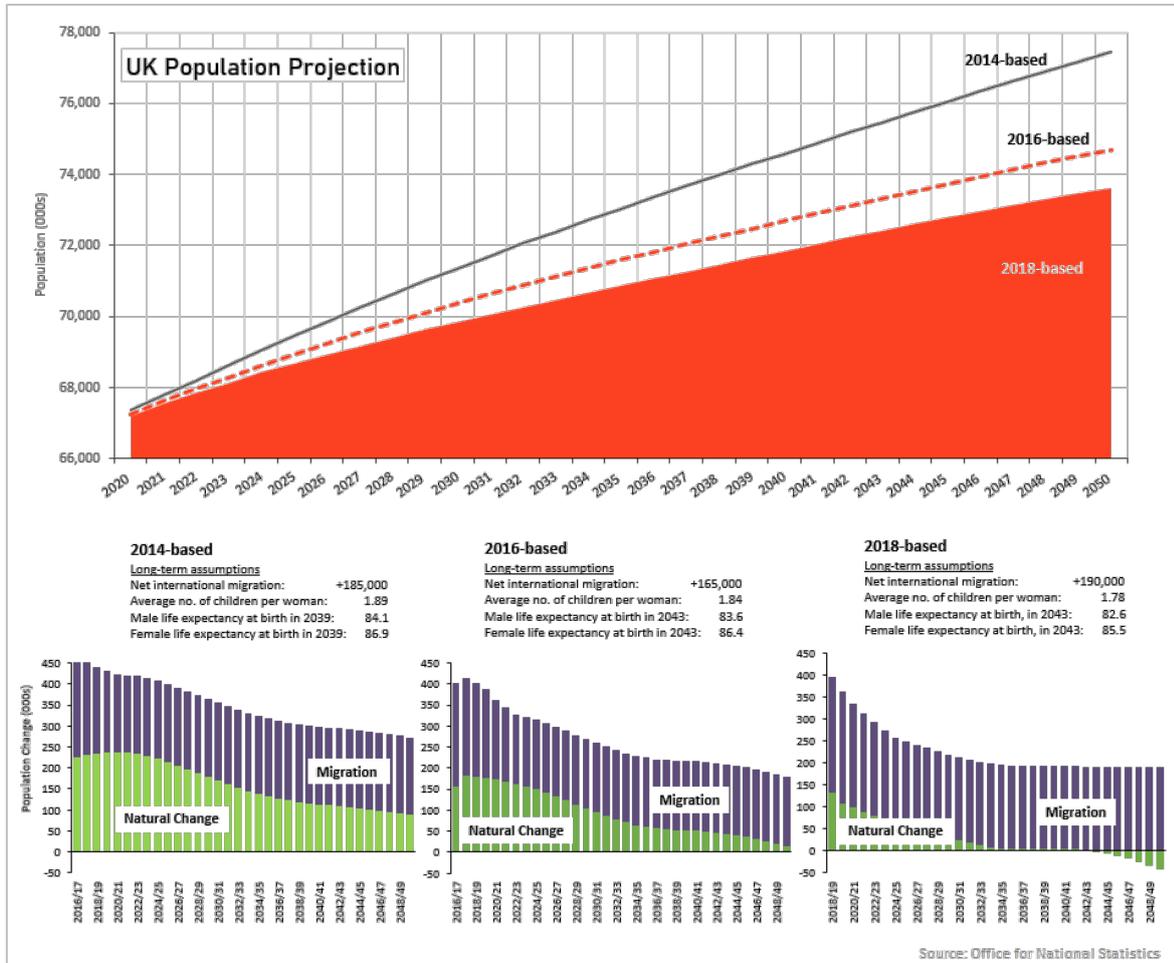
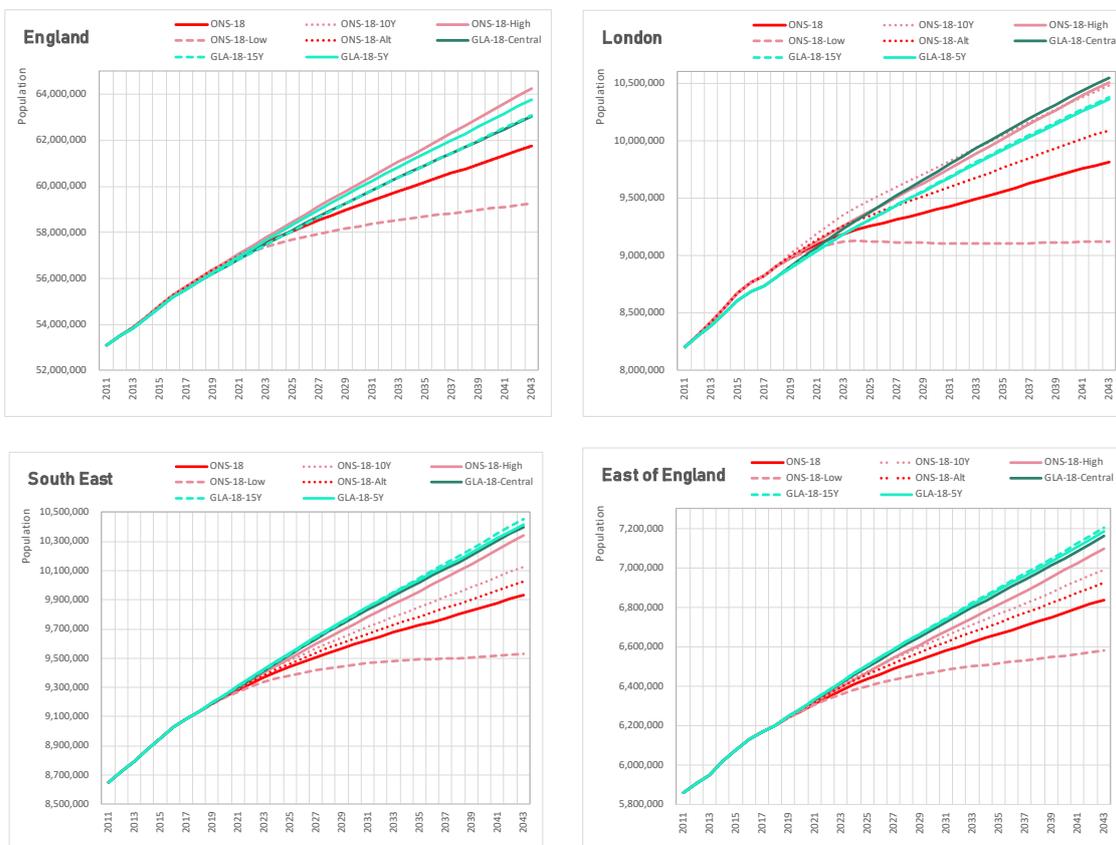


Figure 15: UK Population Projections

(ii) ONS vs GLA Projections Compared



Source: ONS, GLA

Figure 16: ONS & GLA 2018-based Projections Compared

# Appendix E OxCam Geography

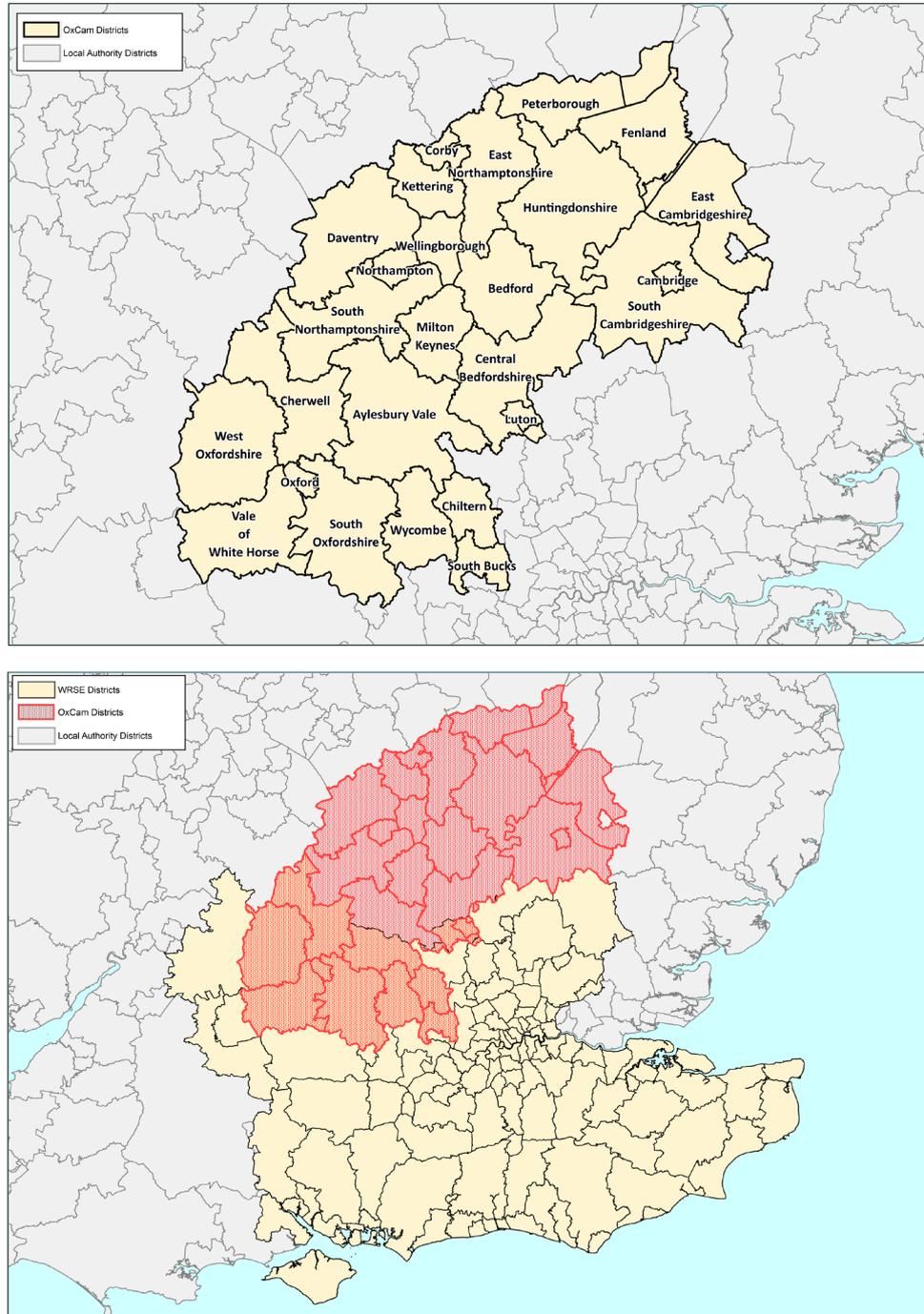
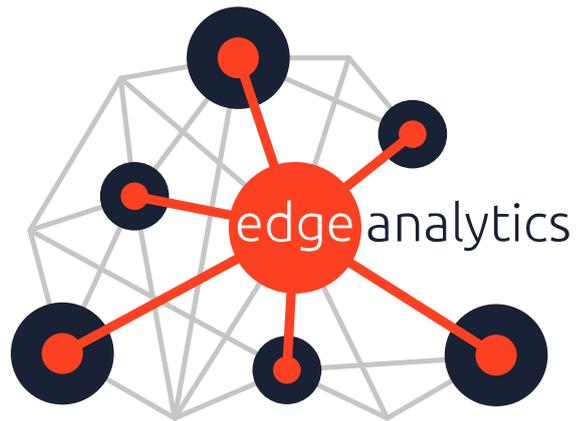


Figure 17: OxCam Area Definition



Edge Analytics Ltd  
Nexus | Discovery Way | University of Leeds | Leeds | LS2 3AA  
[www.edgeanalytics.co.uk](http://www.edgeanalytics.co.uk)





# WRS

FORECAST COMPARISON

June



## 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.

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*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.*

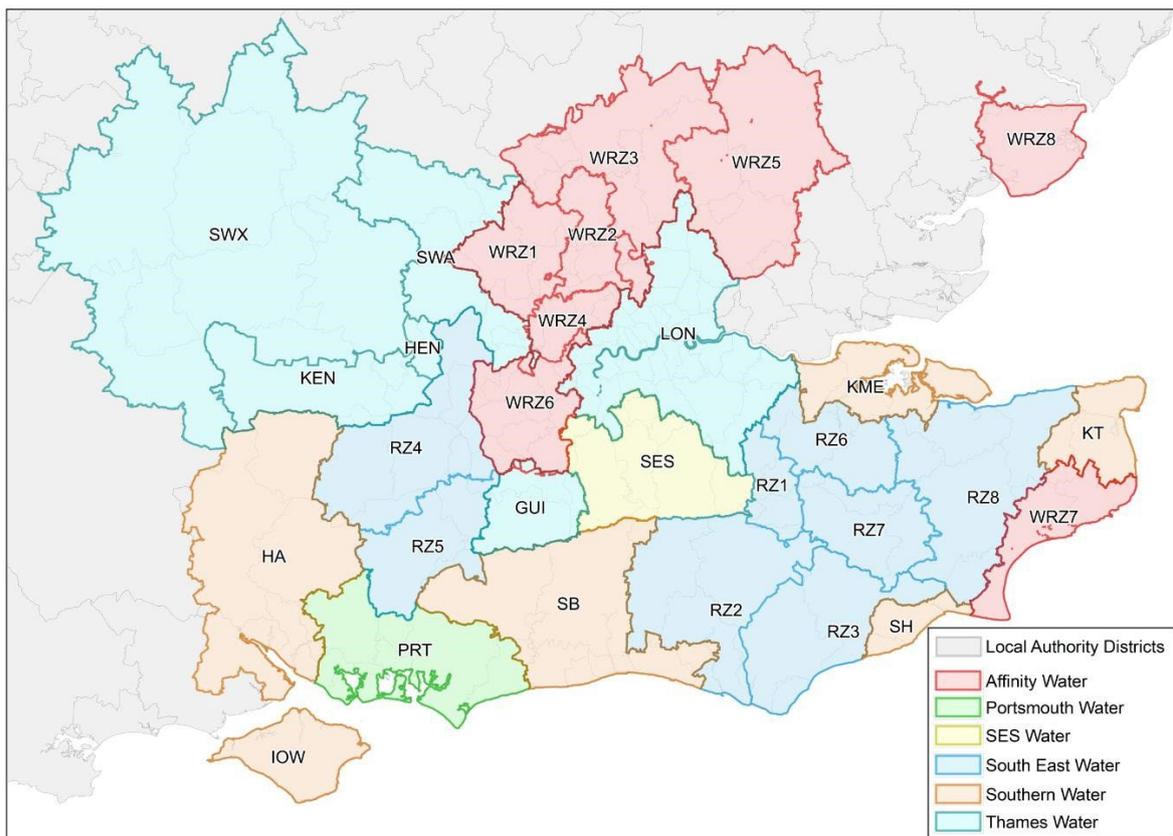
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# INTRODUCTION

1.1 The Water Resources South East (WRSE) group is an alliance of the six water companies that cover the South East region of England: Affinity Water, Portsmouth Water, SES Water, South East Water, Southern Water, and Thames Water.



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Figure 1: WRSE Area Definition

1.2 In spring and summer 2020, Edge Analytics delivered a suite of demographic and housing evidence to WRSE to inform the development of their Water Resource Management Plans (WRMP). The deliverables included (amongst other items):

Local Plan Housing Growth information, from the Edge Analytics Consilium database

Population and housing forecasts generated using Edge Analytics' VICUS forecasting technology (for a forecast period 2020–2100 and a range of trend-based, housing-led and employment-led scenarios)<sup>19</sup>.

---

1.3 Since the 2020 delivery, there have been a number of important data releases (e.g., Census 2021 results, more up-to-date Local Plan Housing Growth information), which highlighted the need to revisit the forecasts and update them in light of this new information.

1.4 In February 2023, WRSE commissioned Edge Analytics to produce updated population and property forecasts, taking account of the latest demographic and housing statistics<sup>20</sup>. The outputs were produced for a 2021–2101 forecast period and for a sub-set of the 2020 scenarios, including:

ONS-18-Rebased-P

ONS-18-Rebased-L

Housing-Plan-P

Housing-Need-H

OxCam-1a-r-P.

1.5 An additional scenario was also produced, which was not included in the 2020 forecasts:

OxCam-1a-P.

1.6 A detailed description of each of the scenarios is provided in Section 3 of this document.

1.7 This concise report aims to help in understanding how the 2023 forecasts compare to those produced in 2020, summarising the key differences in terms of methods, data inputs and assumptions (Section 2). A side-by-side comparison of the forecast outcomes is also presented at regional and company level in Section 3. Section 4 of the document provides a timeline of expected

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<sup>19</sup> For the full list of scenarios refer to Appendix A.

<sup>20</sup> Note that the latest Local Plan Housing Growth data was used to inform the scenario forecast development in February 2023, but it did not form part of the 2023 deliverable to WRSE.

future data releases which will provide additional intelligence which can feed into future updated population and housing forecasts.

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## METHODS, DATA INPUTS & ASSUMPTIONS

2.1 The overall approach for the development of the 2023 forecasts remains the same as in 2020. A detailed description of the forecasting framework can be found in the earlier Edge Analytics' report:

VICUS - Methodology - Final - 31.07.2020.

2.2 This section focuses on the key changes to the methods, data inputs and assumptions that were required for the 2023 update.

2.3 The main drivers of the differences between the 2020 and 2023 forecasts are different base years and changes to the housing growth evidence informing the Housing-Need and Housing-Plan scenarios. Other methodological/data changes have also had an impact on the forecast outcomes but to a lesser extent. All are discussed in more detail below.

### Base Year

2.4 In the 2020 forecasts, the 2018 mid-year population estimates (MYE) provided the forecast base year. In the 2023 forecasts, the base year was updated to the 2021 MYEs, which were published by the Office for National Statistics (ONS) in December 2022. Importantly, the 2021 MYEs are the first MYEs to be underpinned by the Census 2021.

2.5 In the years in between the decennial Census, the population is estimated via an annual ONS MYE. This estimate takes account of registered births and deaths and estimates of domestic and international migration.

2.6 The output from the Census 2021 and the subsequent 2021 MYEs derived from it have shown differences in both the *population total* and the underlying *structure of the population* (its composition by age and sex) when compared to the MYEs that preceded it.

## Local Plan Housing Growth Data

2.7 Local Plan Housing Growth data provides the housing growth trajectories that drive population growth under the Housing-Need and Housing-Plan scenarios. In addition, it is the source of the housing development site information that further enhances the Housing-Plan scenario, ensuring that the growth forecasts are distributed in line with the location and phasing of future housing developments.

2.8 In both sets of the forecasts (2020 and 2023), the ‘Need’ and ‘Plan’ housing trajectories were drawn from the Edge Analytics Consilium Local Plan Housing Growth database. However, the information used in the 2020 forecasts was last updated in March–April 2020, whereas in the 2023 forecasts this data was last updated in January–February 2023.

## Other Changes

2.9 A number of other methodological/data changes were required for the 2023 update, including:

- Coercion of historical demographic inputs (population, households, population not-inhouseholds, etc.) to a Census 2021 Output Area (OA21) geography.
- Alignment of the Census 2021 population, households and population not-inhouseholds at district and small area level.
- Use of the Census/2021 MYE data to devise population by single year of age and sex constraints at OA21 level (not available from official releases).
- Modelling of population not-in-households data by age groups and sex from available partial Census 2021 data, aligning it with 2021 MYE.
- Updating/estimating other model inputs, such as household, vacancy, and properties to an OA21 basis, utilising Census 2021 where available.
- Rescaling Sub-National Population Projection (SNPP) trajectories to a 2021 MYE starting point and extending them to 2050.
- Rescaling of household headship rates to a rebased Census 2021 value.
- Reformulation of all models to accept the new Census/2021 MYE data.

# SCENARIO OUTCOMES

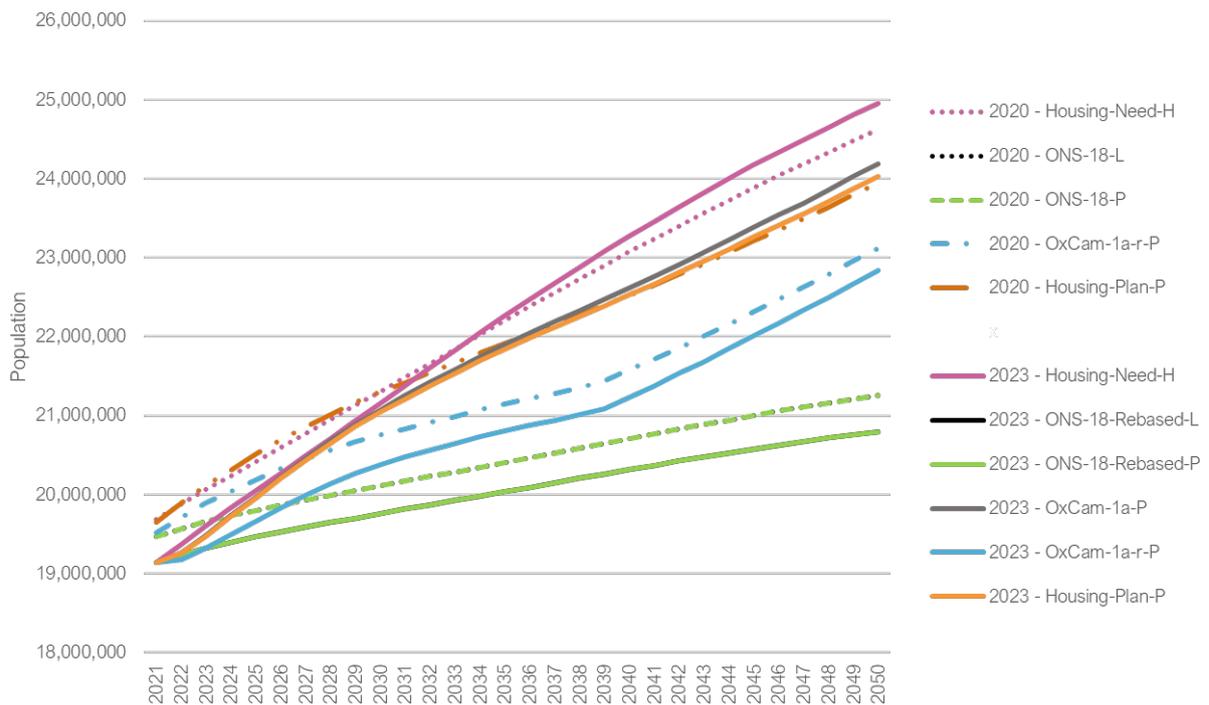
3.1 The 2023 forecasts were produced for the following scenarios:

ID	SCENARIO	DESCRIPTION
1a	ONS-18-Rebased-P	<p>ONS 2018-based <i>Principal</i> sub-national population projection (SNPP), using a five-year history (2013–2018) to derive local fertility &amp; mortality assumptions and a long-term UK net international migration assumption of +190k. Unlike earlier rounds of SNPP, the 2018-based <i>Principal</i> projection uses a two-year history (2016–2018) of internal migration assumptions, following recent changes to the methodology used for its estimation, which have only covered the latest 2 years. This scenario has been rebased to the 2021 MYE.</p> <p>From 2050 to 2101, growth under this scenario is trended in line with the <i>Principal</i> (-P) 2018-based national population projection (NPP) from ONS.</p>
1b	ONS-18-Rebased-L	<p>ONS 2018-based <i>Principal</i> SNPP using a five-year history (2013–2018) to derive local fertility &amp; mortality assumptions and a long-term UK net international migration assumption of +190k. Unlike earlier rounds of SNPP, the 2018-based <i>Principal</i> projection uses a two-year history (2016–2018) of internal migration assumptions, following recent changes to the methodology used for its estimation, which have only covered the latest 2 years. This scenario has been rebased to the 2021 MYE.</p> <p>From 2050 to 2101, growth under this scenario is trended in line with the <i>Low migration</i> (-L) variant of the ONS 2018-based NPP.</p>
2	Housing-Need-H	<p>A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority’s Local Housing Need (LHN) or Objectively Assessed Housing Need (OAHN). Following the final year of data, projected housing growth in non-London areas returns to the average of ONS-14 &amp; ONS-16 long-term annual growth average by 2050. For London Boroughs, housing growth returns to the GLA Central scenario long-term annual average by 2050.</p> <p>From 2050 to 2101, growth under this scenario is trended in line with the <i>High migration</i> (-H) variant of the ONS 2018-based NPP.</p>
3	Housing-Plan-P	<p>A Housing-led scenario, with population growth underpinned by each local authority’s Local Plan housing growth trajectory. Following the final year of data, projected housing growth in non-London areas returns to the average of ONS-14 &amp; ONS-16 long-term annual growth average by 2050. For London Boroughs, housing growth returns to the GLA Central scenario long-term annual average by 2050.</p> <p>From 2050 to 2101, growth under this scenario is trended in line with the <i>Principal</i> (-P) 2018-based NPP from ONS.</p>
4	OxCam-1a-P	<p>'New Settlement' 23k dpa scenario, with c.3.8k dpa above Housing-Plan distributed between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%).</p> <p>From 2050 to 2101, growth under this scenario is trended in line with the <i>Principal</i> (-P) 2018-based NPP from ONS.</p>
5	OxCam-1a-r-P	<p>A Housing-led scenario, consistent with the OxCam-1a scenario, but with household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.</p> <p>From 2050 to 2101, growth under this scenario is trended in line with the <i>Principal</i> (-P) 2018-based NPP from ONS.</p>

3.2 Scenario outcomes for these scenarios, compared to the equivalent scenarios from the 2020 forecasts, are presented below. Note that an additional OxCam scenario was included in the 2023 projections (OxCam-1a-P) that was not delivered as part of the 2020 scenarios.

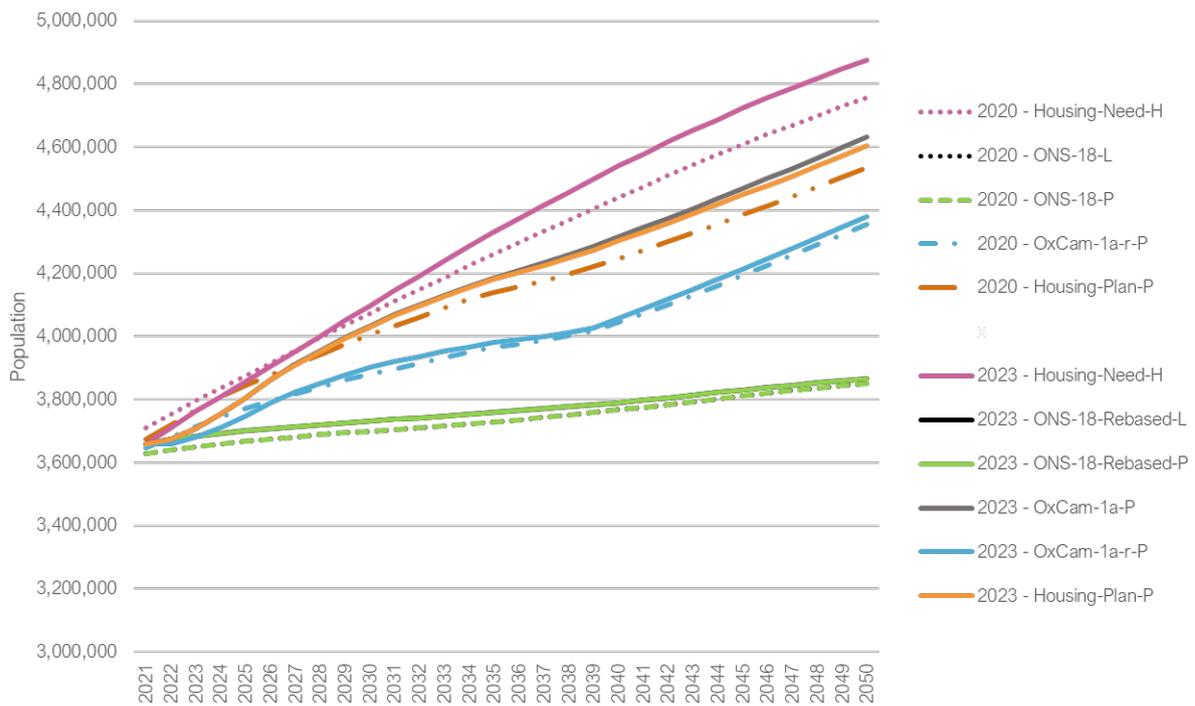
3.3 For WRSE in total and each constituent water company, the summaries include a chart showing population growth between 2021 and 2050 and two tables contrasting population change and average dwellings per annum for the medium- (2021–2050) and long-term (2021–2100) forecast periods.

## WRSE



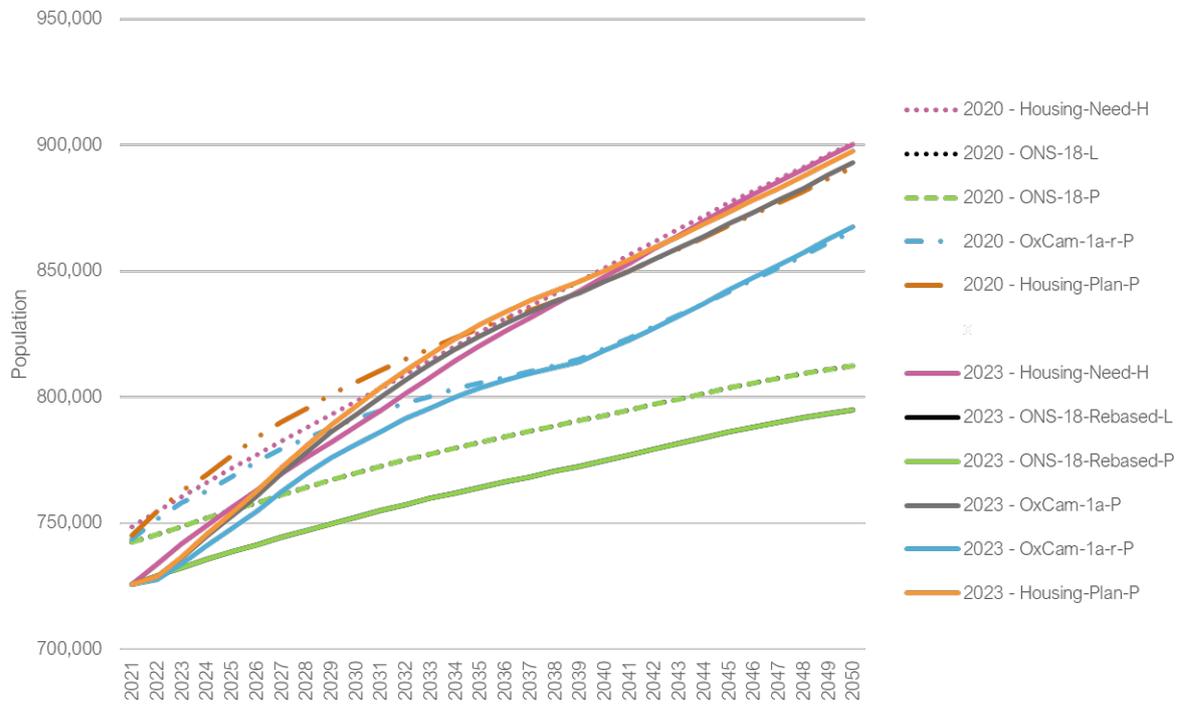
2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	19,692,433	24,628,751	4,936,318	25.1%	99,131	19,692,433	29,805,795	10,113,361	51.4%	75,819
Housing-Plan-P	19,648,395	23,945,684	4,297,290	21.9%	89,688	19,648,395	27,011,856	7,363,461	37.5%	58,558
ONS-18-L	19,473,684	21,251,483	1,777,798	9.1%	51,770	19,473,684	22,074,570	2,600,886	13.4%	29,409
ONS-18-P	19,473,684	21,251,483	1,777,798	9.1%	51,770	19,473,684	24,031,005	4,557,320	23.4%	42,021
OxCam-1a-r-P	19,514,665	23,117,138	3,602,473	18.5%	91,761	19,514,665	26,092,542	6,577,877	33.7%	59,484
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	19,136,248	24,959,131	5,822,883	30.4%	105,433	19,136,248	29,243,867	10,107,619	52.8%	69,438
Housing-Plan-P	19,136,298	24,028,276	4,891,978	25.6%	91,840	19,136,298	25,884,596	6,748,298	35.3%	49,432
ONS-18-Rebased-L	19,136,248	20,799,731	1,663,482	8.7%	46,074	19,136,248	20,231,861	1,095,613	5.7%	17,364
ONS-18-Rebased-P	19,136,248	20,799,731	1,663,482	8.7%	46,074	19,136,248	22,442,699	3,306,451	17.3%	30,832
OxCam-1a-P	19,136,248	24,193,687	5,057,439	26.4%	94,542	19,136,248	26,060,611	6,924,363	36.2%	50,562
OxCam-1a-r-P	19,136,248	22,842,472	3,706,224	19.4%	94,469	19,136,248	24,629,081	5,492,833	28.7%	50,533

## Affinity Water (WRZ 1–7)



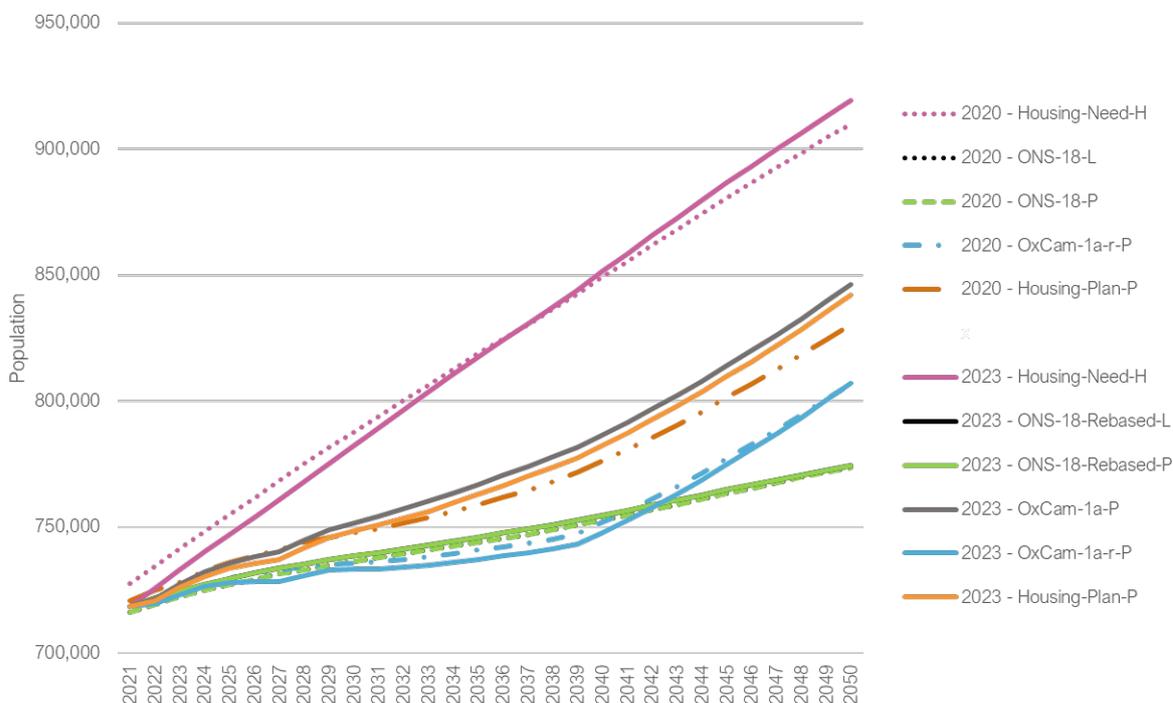
2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	3,712,322	4,756,450	1,044,128	28.1%	20,185	3,712,322	5,757,125	2,044,803	55.1%	14,996
Housing-Plan-P	3,675,735	4,534,814	859,079	23.4%	21,776	3,675,735	5,108,527	1,432,793	39.0%	13,576
ONS-18-L	3,627,846	3,851,581	223,735	6.2%	7,979	3,627,846	3,988,751	360,905	9.9%	4,814
ONS-18-P	3,627,846	3,851,581	223,735	6.2%	7,979	3,627,846	4,352,547	724,701	20.0%	7,087
OxCam-1a-r-P	3,645,711	4,356,258	710,547	19.5%	17,418	3,645,711	4,912,389	1,266,677	34.7%	11,232
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	3,659,990	4,876,354	1,216,364	33.2%	21,484	3,659,990	5,675,305	2,015,315	55.1%	13,517
Housing-Plan-P	3,659,509	4,603,991	944,483	25.8%	17,540	3,659,509	4,923,200	1,263,692	34.5%	9,113
ONS-18-Rebased-L	3,659,990	3,867,145	207,156	5.7%	7,115	3,659,990	3,730,791	70,801	1.9%	2,478
ONS-18-Rebased-P	3,659,990	3,867,145	207,156	5.7%	7,115	3,659,990	4,140,910	480,920	13.1%	4,914
OxCam-1a-P	3,659,990	4,633,982	973,992	26.6%	18,169	3,659,990	4,955,098	1,295,109	35.4%	9,389
OxCam-1a-r-P	3,659,990	4,381,606	721,617	19.7%	18,108	3,659,990	4,689,747	1,029,757	28.1%	9,365

## Portsmouth Water



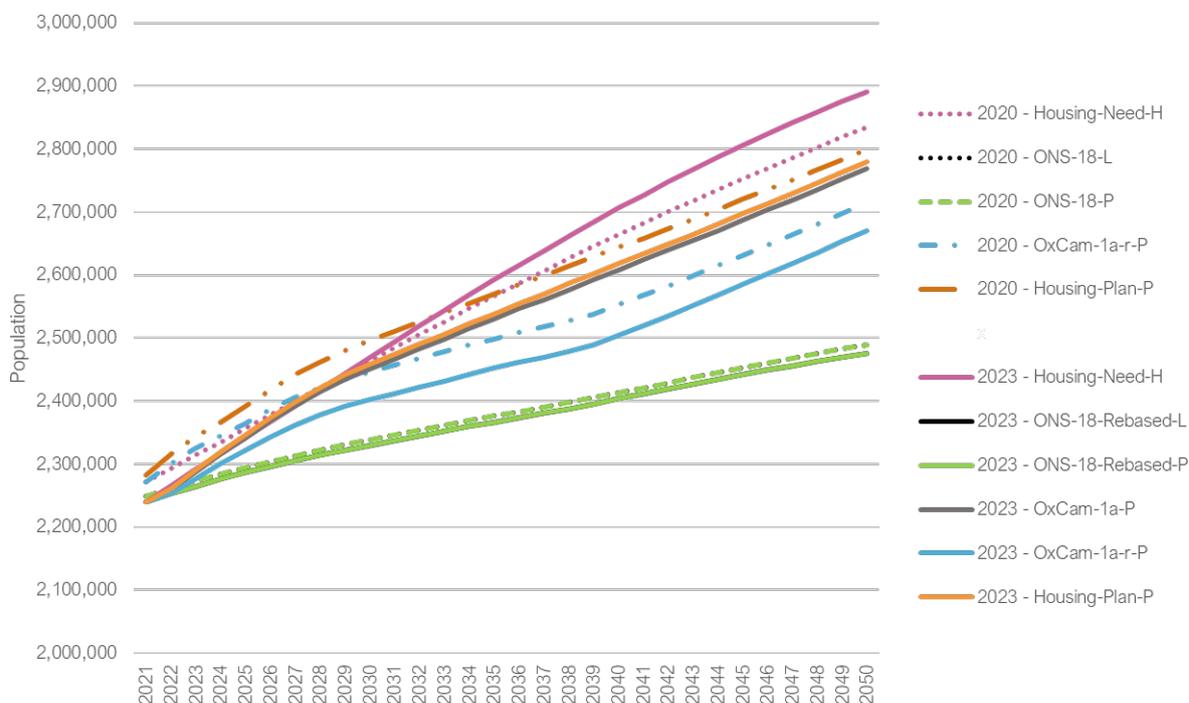
2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	748,387	900,486	152,099	20.3%	3,066	748,387	1,085,645	337,258	45.1%	2,532
Housing-Plan-P	745,237	891,292	146,055	19.6%	3,880	745,237	1,008,361	263,124	35.3%	2,721
ONS-18-L	742,427	812,532	70,105	9.4%	1,794	742,427	853,492	111,065	15.0%	1,111
ONS-18-P	742,427	812,532	70,105	9.4%	1,794	742,427	920,393	177,966	24.0%	1,542
OxCam-1a-r-P	743,456	865,817	122,361	16.5%	2,881	743,456	979,714	236,258	31.8%	2,014
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	725,553	900,343	174,789	24.1%	3,127	725,553	1,075,251	349,698	48.2%	2,406
Housing-Plan-P	725,539	897,778	172,239	23.7%	3,140	725,539	985,527	259,988	35.8%	1,872
ONS-18-Rebased-L	725,553	795,045	69,492	9.6%	1,704	725,553	790,037	64,484	8.9%	752
ONS-18-Rebased-P	725,553	795,045	69,492	9.6%	1,704	725,553	874,172	148,619	20.5%	1,276
OxCam-1a-P	725,553	892,887	167,333	23.1%	3,022	725,553	980,087	254,533	35.1%	1,824
OxCam-1a-r-P	725,553	867,562	142,009	19.6%	3,023	725,553	952,748	227,194	31.3%	1,825

## SES Water



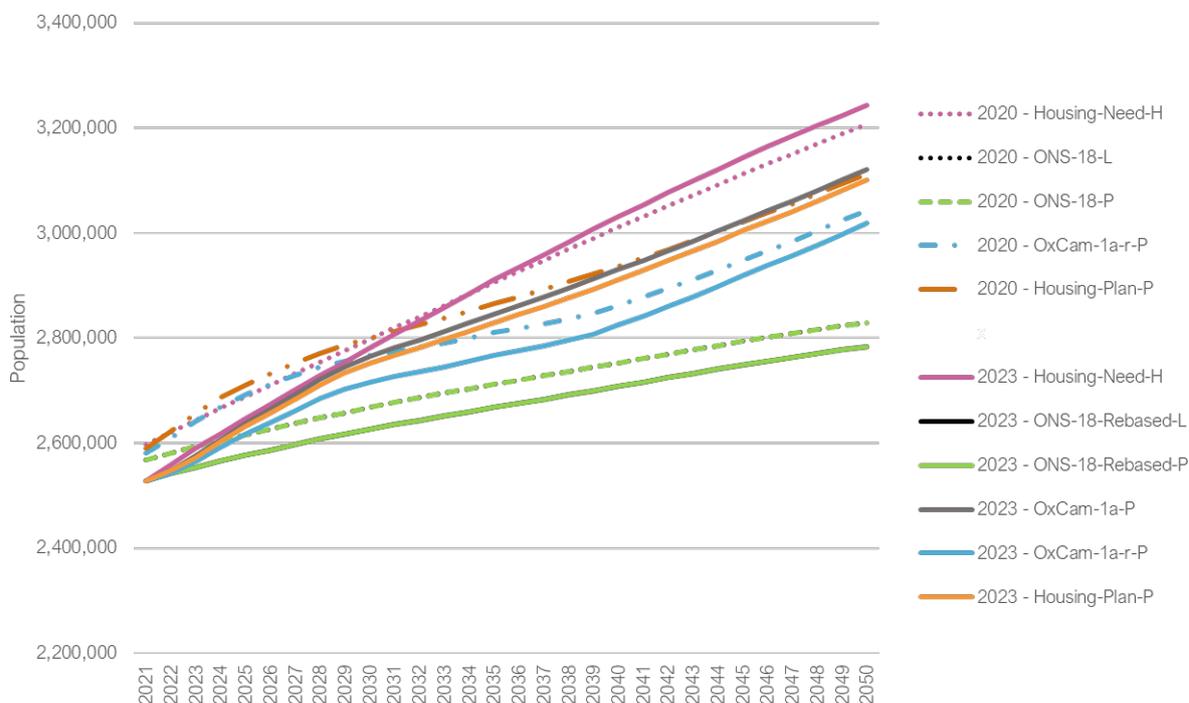
2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	727,523	909,839	182,316	25.1%	3,682	727,523	1,113,103	385,581	53.0%	2,872
Housing-Plan-P	720,607	830,416	109,809	15.2%	2,432	720,607	943,989	223,382	31.0%	1,797
ONS-18-L	716,189	773,534	57,344	8.0%	1,772	716,189	805,858	89,669	12.5%	1,052
ONS-18-P	716,189	773,534	57,344	8.0%	1,772	716,189	880,331	164,142	22.9%	1,520
OxCam-1a-r-P	718,493	806,816	88,323	12.3%	2,564	718,493	917,366	198,873	27.7%	1,875
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	718,414	919,290	200,876	28.0%	3,822	718,414	1,082,268	363,854	50.6%	2,569
Housing-Plan-P	718,411	841,948	123,537	17.2%	2,561	718,411	908,215	189,804	26.4%	1,490
ONS-18-Rebased-L	718,414	774,239	55,825	7.8%	1,647	718,414	750,752	32,338	4.5%	615
ONS-18-Rebased-P	718,414	774,239	55,825	7.8%	1,647	718,414	835,422	117,008	16.3%	1,122
OxCam-1a-P	718,414	846,313	127,899	17.8%	2,766	718,414	912,751	194,337	27.1%	1,582
OxCam-1a-r-P	718,414	807,012	88,598	12.3%	2,726	718,414	870,926	152,512	21.2%	1,566

## South East Water



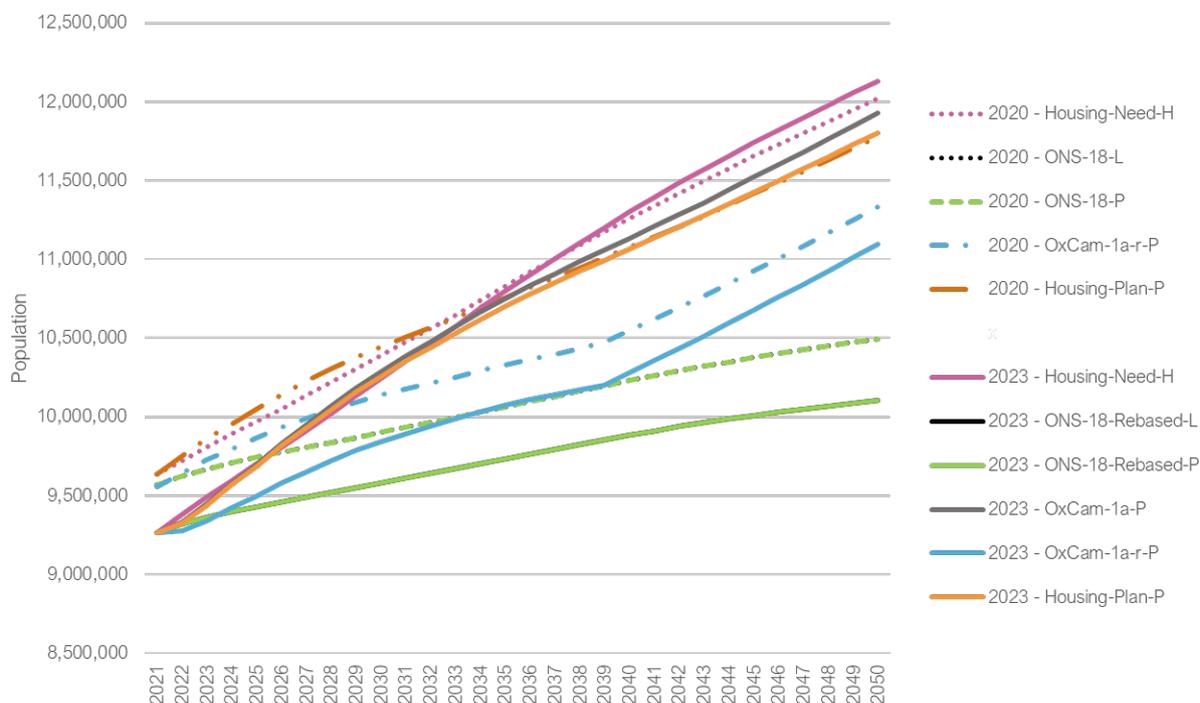
2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	2,271,042	2,834,703	563,661	24.8%	10,703	2,271,042	3,456,943	1,185,901	52.2%	8,592
Housing-Plan-P	2,282,131	2,799,709	517,578	22.7%	9,479	2,282,131	3,192,214	910,083	39.9%	6,473
ONS-18-L	2,248,224	2,489,172	240,948	10.7%	5,863	2,248,224	2,629,952	381,728	17.0%	3,730
ONS-18-P	2,248,224	2,489,172	240,948	10.7%	5,863	2,248,224	2,845,650	597,426	26.6%	5,064
OxCam-1a-r-P	2,271,558	2,714,652	443,094	19.5%	10,041	2,271,558	3,097,239	825,681	36.3%	6,915
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	2,239,920	2,891,603	651,683	29.1%	11,689	2,239,920	3,436,782	1,196,862	53.4%	8,237
Housing-Plan-P	2,239,978	2,779,534	539,556	24.1%	10,040	2,239,978	3,034,274	794,296	35.5%	5,846
ONS-18-Rebased-L	2,239,920	2,475,501	235,580	10.5%	5,573	2,239,920	2,444,097	204,177	9.1%	2,429
ONS-18-Rebased-P	2,239,920	2,475,501	235,580	10.5%	5,573	2,239,920	2,706,523	466,603	20.8%	4,002
OxCam-1a-P	2,239,920	2,769,517	529,597	23.6%	9,852	2,239,920	3,023,315	783,394	35.0%	5,771
OxCam-1a-r-P	2,239,920	2,670,687	430,767	19.2%	9,858	2,239,920	2,917,194	677,274	30.2%	5,773

## Southern Water



2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	2,596,809	3,207,317	610,509	23.5%	11,837	2,596,809	3,934,210	1,337,401	51.5%	9,825
Housing-Plan-P	2,589,291	3,112,693	523,402	20.2%	10,330	2,589,291	3,578,632	989,341	38.2%	7,477
ONS-18-L	2,568,914	2,829,776	260,862	10.2%	6,459	2,568,914	3,014,022	445,108	17.3%	4,265
ONS-18-P	2,568,914	2,829,776	260,862	10.2%	6,459	2,568,914	3,256,305	687,392	26.8%	5,817
OxCam-1a-r-P	2,580,275	3,043,213	462,938	17.9%	10,648	2,580,275	3,499,841	919,565	35.6%	7,699
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	2,528,359	3,243,223	714,864	28.3%	12,541	2,528,359	3,851,253	1,322,894	52.3%	8,952
Housing-Plan-P	2,528,327	3,100,327	572,000	22.6%	10,358	2,528,327	3,385,798	857,471	33.9%	6,147
ONS-18-Rebased-L	2,528,359	2,783,869	255,511	10.1%	6,170	2,528,359	2,748,969	220,610	8.7%	2,588
ONS-18-Rebased-P	2,528,359	2,783,869	255,511	10.1%	6,170	2,528,359	3,044,246	515,888	20.4%	4,411
OxCam-1a-P	2,528,359	3,120,341	591,983	23.4%	10,746	2,528,359	3,407,774	879,416	34.8%	6,306
OxCam-1a-r-P	2,528,359	3,018,091	489,732	19.4%	10,741	2,528,359	3,298,060	769,701	30.4%	6,305

## Thames Water



2020 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	9,636,351	12,019,956	2,383,605	24.7%	49,658	9,636,351	14,458,769	4,822,417	50.0%	37,003
Housing-Plan-P	9,635,394	11,776,760	2,141,366	22.2%	41,790	9,635,394	13,180,132	3,544,738	36.8%	26,513
ONS-18-L	9,570,084	10,494,887	924,804	9.7%	27,903	9,570,084	10,782,495	1,212,411	12.7%	14,437
ONS-18-P	9,570,084	10,494,887	924,804	9.7%	27,903	9,570,084	11,775,778	2,205,694	23.0%	20,991
OxCam-1a-r-P	9,555,172	11,330,382	1,775,210	18.6%	48,209	9,555,172	12,685,994	3,130,822	32.8%	29,749
2023 Scenarios	Population		Population Change	Population Change %	Dwellings p.a.	Population		Population Change	Population Change %	Dwellings p.a.
	2021	2050				2021	2100			
Housing-Need-H	9,264,012	12,128,318	2,864,306	30.9%	52,770	9,264,012	14,123,008	4,858,996	52.5%	33,757
Housing-Plan-P	9,264,534	11,804,698	2,540,164	27.4%	48,201	9,264,534	12,647,581	3,383,048	36.5%	24,964
ONS-18-Rebased-L	9,264,012	10,103,932	839,920	9.1%	23,865	9,264,012	9,767,215	503,203	5.4%	8,502
ONS-18-Rebased-P	9,264,012	10,103,932	839,920	9.1%	23,865	9,264,012	10,841,426	1,577,414	17.0%	15,107
OxCam-1a-P	9,264,012	11,930,647	2,666,635	28.8%	49,987	9,264,012	12,781,586	3,517,574	38.0%	25,689
OxCam-1a-r-P	9,264,012	11,097,513	1,833,500	19.8%	50,012	9,264,012	11,900,407	2,636,395	28.5%	25,699

## FUTURE DATA RELEASES

4.1 All forecasts are dependent on the data inputs and assumptions used in their configuration, so it is important to monitor future data releases to understand when it may be needed to revisit and update the forecasts in the light of more up-to-date evidence.

4.2 The following table details the key forthcoming data from ONS which will provide additional intelligence to inform future forecasts:

Data release	Release date
Revised official 2021 MYE for the UK, its constituent countries and local authority districts.	<a href="#">September 2023 (provisional)</a>
Rebasing of MYEs following Census 2021, England and Wales This release contains the rebased MYEs for the period 2012 to 2020 to align with Census 2021 results.	<a href="#">September 2023 (provisional)</a>
Population estimates for England and Wales: mid-2022 National and sub-national mid-year population estimates for England and Wales by administrative area, age and sex.	<a href="#">September 2023 (provisional)</a>
National population projections: 2021-based	<a href="#">December 2023 (provisional)</a>
Sub-national population projections: 2021-based	Will follow on from 2021based national population projections in 2024, but release timescale unknown
Household projections: 2021-based	Unknown

4.3 Due to uncertainty around the 2021 Census estimates and the intercensal MYEs, it is recommended that, once the updated MYEs are released in September 2023, a refresh of the scenario evidence is considered.

## Appendix A

# SCENARIO DEFINITION 2020

A.1 The table below provides a list of all 2020–2050 scenarios that were delivered to WRSE in 2020:

ID	SCENARIO	DESCRIPTION
1	ONS-14	ONS 2014-based sub-national population projection (SNPP), using a six-year history (2008–2014) to derive local fertility, mortality and internal migration assumptions, with a long-term UK net international migration assumption of +185k p.a.
2	ONS-16	ONS 2016-based Principal sub-national population projection (SNPP), using a five-year history (2011–2016) to derive local fertility, mortality and internal migration assumptions, and a long-term UK net international migration assumption of +165k. In line with the ONS 2016-based national population projection (NPP), this round of projections includes a reduced UK fertility outlook compared to ONS-14 and a dampened rate of improvement in life expectancy compared to ONS-14.
3	ONS-18	ONS 2018-based Principal sub-national population projection (SNPP), using a five-year history (2013–2018) to derive local fertility & mortality assumptions and a long-term UK net international migration assumption of +190k. Unlike earlier rounds of SNPP, the 2018-based Principal projection uses a two-year history (2016–2018) of internal migration assumptions, following recent changes to the methodology used for its estimation, which have only covered the latest 2 years. In line with the ONS 2018-based national population projection (NPP), this round of projections includes a reduced UK fertility outlook compared to ONS-16 and a dampened rate of improvement in life expectancy compared to ONS-16.
4	ONS-18-Alt	ONS 2018-based Alternative Internal Migration sub-national population projection (SNPP), produced by ONS as a comparison with the Principal projection. It uses a five-year average of internal migration (2013–2018), combining 3 years of data based on the old methodology and 2 years based on the new methodology. All other assumptions are consistent with ONS-18.
5	ONS-18-High	ONS 2018-based High International Migration sub-national population projection (SNPP), incorporating a High long-term UK net international migration assumption of +290k p.a., with all other assumptions consistent with ONS-18.
6	ONS-18-Low	ONS 2018-based Low International Migration sub-national population projection (SNPP), incorporating a Low long-term UK net international migration assumption of +90k 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, using a ten-year history (2008–2018) to derive internal migration assumptions, with all other assumptions consistent with ONS-18.
8	GLA-18-Central	Greater London Authority (GLA) 2018-based Central population projection, incorporating: GLA's own adjustments to the mid-year population estimates of London Boroughs; local fertility and mortality assumptions, trended in line with the ONS 2018-based NPP assumptions; internal and international migration assumptions derived from a 10-year history (2008–2018). This scenario includes projections for London Boroughs and for all other local authority areas.

9	GLA-18-15Y	GLA 2018-based long-term trend projection, incorporating internal and international migration assumptions derived from a 15-year history (2003–2018), with all other assumptions consistent with the Central scenario. This scenario includes projections for London Boroughs and for all other local authority areas.
10	GLA-18-5Y	GLA 2018-based short-term trend projection, incorporating internal and international migration assumptions derived from a 5-year history (2013–2018), with all other assumptions consistent with the Central scenario. This scenario includes projections for London Boroughs and for all other local authority areas.

ID	SCENARIO	DESCRIPTION
11	GLA-Housing	GLA 2018-based Housing-led projection, based on data from the 2016 Strategic Housing Land Availability Assessment (SHLAA). Beyond 2041, housing growth is aligned to the 2035–2041 average. Whilst the housing-led approach is applied to each London Borough, the population projection for Greater London, in total, remains consistent with the Central scenario. This scenario includes projections for London Boroughs only and is combined with the Central scenario for all other local authority areas when aggregated to WRZ geographies.
12	Completions-18Y	A Housing-led scenario, with population growth underpinned by a continuation of the rate of housing growth recorded in each local authority's 18-year completions history (2001–2019).
13	Completions-5Y	A Housing-led scenario, with population growth underpinned by a continuation of the rate of housing growth recorded in each local authority's 5-year completions history (2014–2019).
14	Housing-Need	A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority's Local Housing Need (LHN) or Objectively Assessed Housing Need (OAHN). Following the final year of data, projected housing growth in non-London areas returns to the ONS-14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, housing growth returns to the GLA Central scenario long-term annual average by 2050.
15	Housing-Need-r	A Housing-led scenario, consistent with the Housing-Need scenario, but with household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
16	Housing-Req	A Housing-led scenario, with population growth underpinned by the trajectory of housing growth associated with each local authority's housing Requirement. Following the final year of data, projected housing growth in non-London areas returns to the ONS-14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, housing 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 household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
18	Housing-Plan	A Housing-led scenario, with population growth underpinned by each local authority's Local Plan housing growth trajectory. Following the final year of data, projected housing growth in non-London areas returns to the ONS-14 & ONS-16 long-term annual growth average by 2050. For London Boroughs, housing growth returns to the 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 household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.

20	Employment-1	An Employment-led scenario with 1.0% pa growth in London to 2030 and 0.5% pa thereafter; 0.8% pa growth in the South East and East of England to 2030, 0.4% thereafter.
21	Employment-2	An Employment-led scenario with 0.5% pa growth in London to 2030 and 0.25% pa thereafter; 0.4% pa growth in the South East and East of England to 2030, 0.2% thereafter.
22	OxCam-1a-r	'New Settlement' 23k dpa scenario, with c.4.2k dpa above Housing Plan distributed between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
23	OxCam-1b-r	'Expansion' 23k dpa scenario, with c 4.2k dpa distributed between: Milton Keynes: (30%) Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), Northampton (10%), and Peterborough (10%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.
24	OxCam-2a-r	'New Settlement' 30k dpa scenario, with c.11.2k dpa above Housing Plan distributed between Cherwell (20%), Aylesbury Vale (20%), Central Bedfordshire (40%), South Cambridgeshire (20%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.

ID	SCENARIO	DESCRIPTION
25	OxCam-2b-r	'Expansion' 30k dpa scenario, with c 11.2k dpa distributed between: Milton Keynes: (30%) Luton (15%), Bedford (15%), Oxford (10%), Cambridge (10%), Northampton (10%), and Peterborough (10%). Household representative rates for young adults returning to (higher) 2001 levels by 2039, remaining fixed thereafter.



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