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The Impact of Housing and Water Efficiency Policies on Water Supplies to the East of England

Evidence for the Review of the East of England Plan - RSS14

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Contents

	Page
Contents	I
List of Tables, Figures & Appendices	III
1 Introduction	1
1.1 Background	1
1.2 Water supplies - The East of England	1
1.3 Water Resources Management Plans	4
1.4 Regional Plans	5
1.5 Scope of Analysis	5
1.6 Available Datasets	6
1.7 Layout of this Report	6
2 Household Growth	7
2.1 Introduction	7
2.2 Sources of Data	7
2.3 Allocating Housing Growth to Water Resource Zone	8
2.4 Housing Growth Scenarios	12
2.5 Occupancy Rates	13
3 Water Efficiency	15
3.1 Introduction	15
3.2 Water Efficiency Legislation, policy, and Expectations	15
3.2.1 New Building Regulations	15
3.2.2 Code for Sustainable Homes	15
3.2.3 DEFRA Strategy – “Future Water”	15
3.2.4 RSS/RES policies	15
3.2.5 Water Stressed Areas	16
3.2.6 OFWAT water efficiency targets	16
3.3 PCCs within water company plans	16
3.4 Water Efficiency Scenarios	17
3.5 Water Efficiency Measures	18
4 Modelling	19
4.1 Introduction	19
4.2 The COPS Model	19
4.3 Disaggregating measured pcc	19
4.4 Water Resources Planning Scenarios	21
4.5 COPS Scenarios	21
4.6 Scenario Horizons	22
4.7 Modelling Assumptions	22
4.8 Model Output	22

5	Results and Observations.....	23
5.1	Introduction.....	23
5.2	Surplus – Deficit MAPS	23
5.3	Supply-Demand Balance Graphs	23
5.4	Results Commentary	35
5.4.1	Scenario 0: Water Company Housing and Business as Usual – Final Planning	35
5.4.2	Scenario 1: RSS Growth and Business As Usual Water Efficiency, Final Planning.....	36
5.4.3	Scenario 3: RSS Growth and Efficient New Development, Final Planning	36
5.4.4	Scenario 5: RSS Growth and EEIP Aspirations, Final Planning	37
5.4.5	Scenario 6: NHPAU Lower Growth and Business As Usual Water Efficiency, Final Planning	37
5.4.6	Scenario 8: NHPAU Lower Growth and Efficient New Development, Final Planning.....	37
5.4.7	Scenario 10: NHPAU Lower Growth and EEIP Aspirations, Final Planning.....	37
5.4.8	Scenario 11: NHPAU Upper Growth and Business As Usual Water Efficiency, Final Planning	38
5.4.9	Scenario 13: NHPAU Upper Growth and Efficient New Development, Final Planning.....	38
5.4.10	Scenario 15: NHPAU Upper Growth and EEIP Aspirations, Final Planning.....	38
5.5	Modelling Assumptions Sensitivity.....	38
6	Conclusions and Recommendations	41
6.1	Conclusions	41
6.2	Recommendations.....	42
7	References and Bibliography.....	43
8	Glossary and List of Abbreviations	45

LIST OF TABLES

Table 1.	Water Companies and Water Resource Zones in the East of England.....	3
Table 2.	Available study data	6
Table 3.	Sources of Housing Data	7
Table 4.	Policy housing forecast compared to forecast in water company water resource plans (2007/08-2020/21)	10
Table 5.	Average Annual Housing Growth Forecasts (000's) for 2010/11 as proposed for the RSS investigations used in the analysis.....	11
Table 6.	New build occupancy rates and reported occupancy rates	13
Table 7.	Pccs forecast in PR09 dWRMPs.....	16
Table 8.	Pccs forecast in PR04 Final WRPs	17
Table 9.	Calculation of household demand	19
Table 10.	Consideration of disaggregated pcc.....	20
Table 11.	CoPS scenarios for forward look.....	21
Table 12.	Summary of Surplus and Deficits by scenario.....	24

LIST OF FIGURES

Figure 1.	East of England boundary and identified growth centres	2
Figure 2.	Water company resource zones covering the East of England area.....	4
Figure 3.	Cumulative growth for water company plan and scenarios shown in the context of planning horizons.....	11

LIST OF APPENDICES

Appendix A	Housing Source Data
Appendix B	Components of Demand
Appendix C	Surplus-deficit maps
Appendix D	Supply Demand Balances for East of England

1 Introduction

1.1 Background

The Government's Sustainable Communities Plan identified the need for a step change in the building rate for new housing in order to make housing affordable for those on lower incomes, including key public sector workers. This was identified as a particular problem in London and along the commuter transport corridors that serve the capital, including those in the East of England.

During 2005, the East of England's draft Regional Spatial Strategy (RSS14, also known as the draft East of England plan) was published for consultation with draft housing requirements. The Environment Agency produced the report 'An Assessment of the Impacts of Household Growth Proposals on the Water Resources Supply-Demand Balance for the East of England - A Report to Inform the Environment Agency's Response to RSS14 Consultations' (Environment Agency 2005). The basis for the technical analysis in this report was a spreadsheet model used to ensure the impacts of household growth forecasts proposed at that time for the RSS14 (Regional Spatial Strategy 14) were considered consistently across all water companies. During spring 2007, an update but unpublished report (Environment Agency 2007) was prepared using the CoPS model (a development of the original spreadsheet models) and the same water company data, but considering the revised housing numbers as part of the development of the RSS14 consultation response. The work was presented in draft to EERA (East of England Regional Assembly). Since then, EERA published the final East of England Plan in May 2008.

Since this work has been undertaken, there have been the following developments:

- The National Housing and Planning Advice Unit (NHPAU) has published a report (NHPAU, 2008) recommending increased housing construction throughout all regions in England and Wales.
- Water companies have prepared updated draft Water Resources Management Plans (dWRMPs) as part of PR09 (Periodic Review 2009).
- The launch of the East of England Implementation Plan (EEIP) combining water efficiency targets and monitoring in both the RSS and RES (Regional Economic Strategy).

This report compares the RSS housing policy numbers and the suggested lower and upper NHPAU housing growth figures alongside the new East of England Implementation Plan targets against the new draft water resources management plans. This report also uses the CoPS model which is discussed in further detail in section 4.

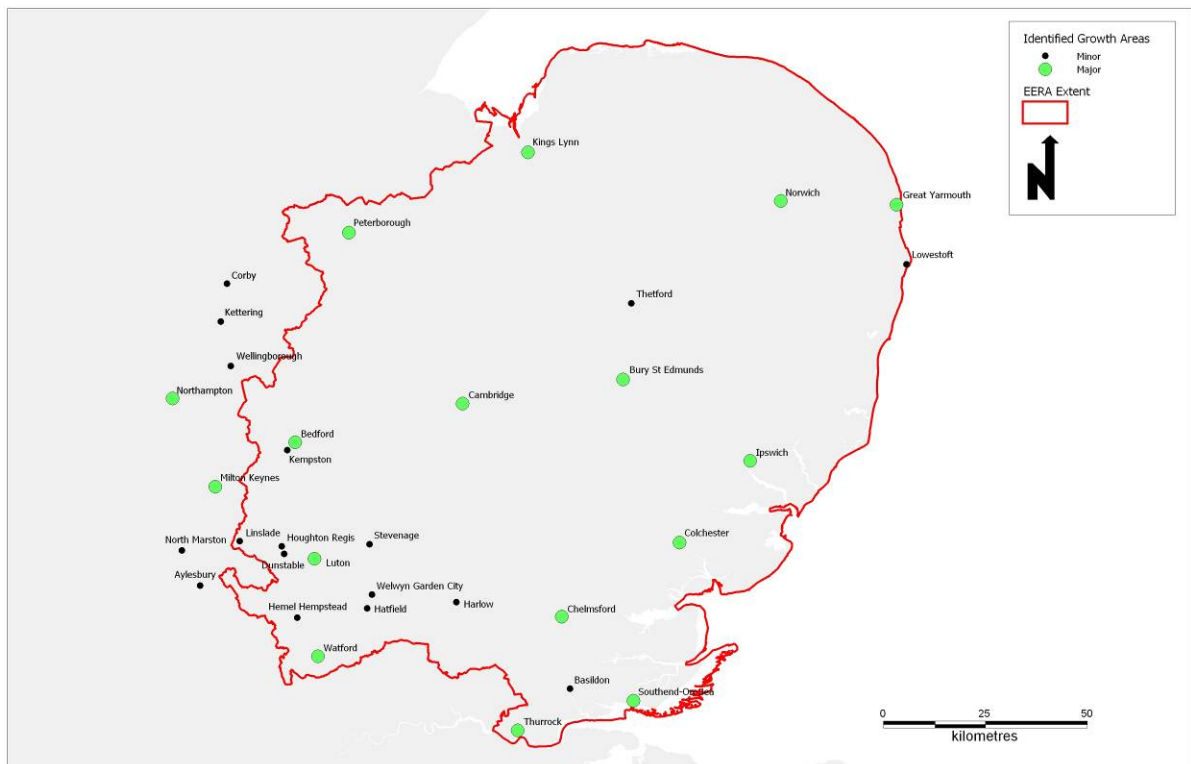
1.2 Water supplies - The East of England

The East of England is the country's driest region yet it has a valuable water environment which a key feature contributing to a high quality of life in the region.

Much of the region's local water resources are fully developed and in some cases over-committed. At the same time, there are increasing pressures on the region's local and strategic water resources driven primarily by climate change, environmental needs and by population growth. The region contains areas that are targeted for significant growth including Cambridge, Peterborough, Bedford, Luton and Harlow. Furthermore, many of the region's resources are shared with neighbouring growth areas such as Milton Keynes, the South Midlands and the Thames Gateway. Key areas of growth are shown in **Figure 1** overleaf.

Consequently, whilst a 'twin track' approach has already been pursued in past plans, increasing emphasis is being placed on demand management to ensure water supplies are provided in the most sustainable way.

Figure 1. East of England boundary and identified growth centres



The water companies and their relevant water resource zones that cover (either in entirety or partly) the East of England area are listed in **Table 1** below and shown in **Figure 2** overleaf. A water resource zone is defined as:

“the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall”

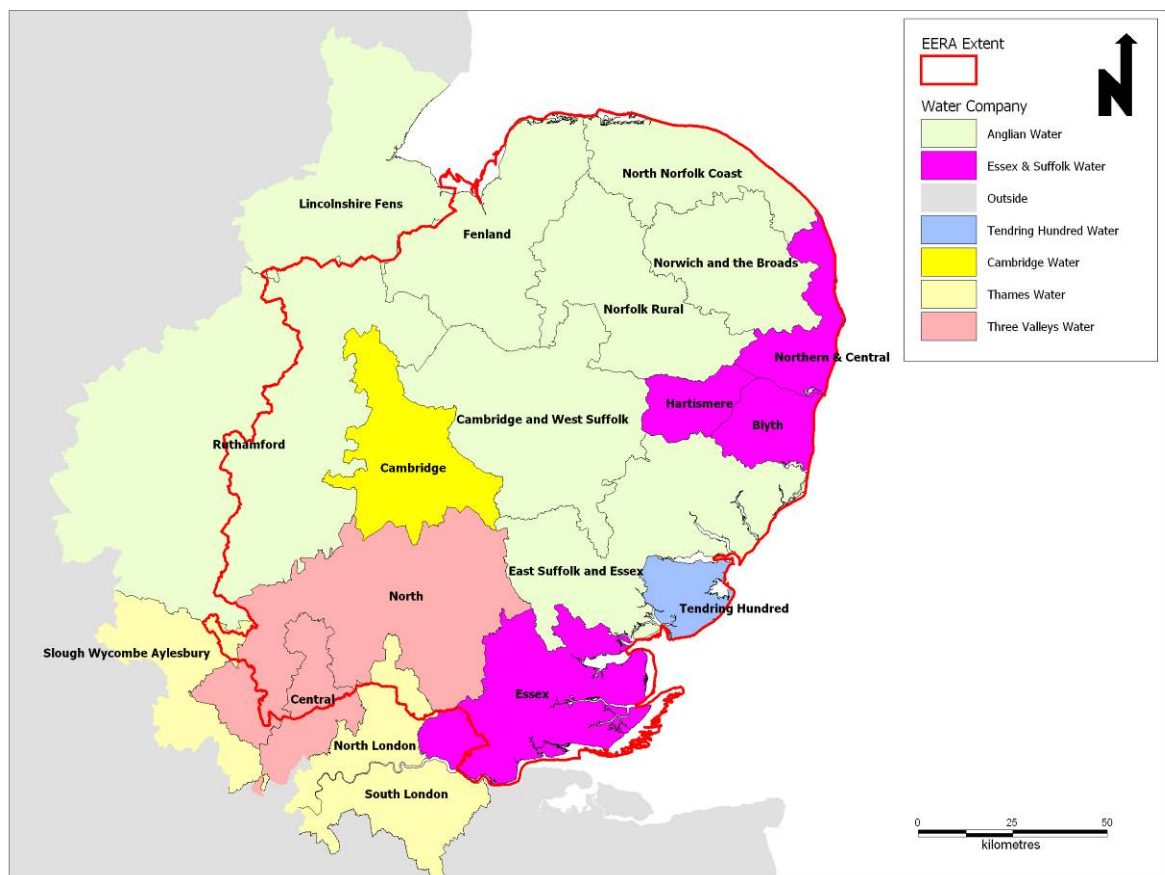
The water resource zone is typically the level at which water companies undertake their supply-demand forecasts which underpin the water resource management plans. This is the most detailed level at which they report to the Environment Agency.

Table 1. Water Companies and Water Resource Zones in the East of England

Water Company (WCo)	WCo Abbreviation	Water Resource Zone
Anglian Water Services	AWS	Ruthamford
Anglian Water Services	AWS	Cambridgeshire & West Suffolk
Anglian Water Services	AWS	East Suffolk & Essex
Anglian Water Services	AWS	Lincolnshire Fens
Anglian Water Services	AWS	Fenland
Anglian Water Services	AWS	North Norfolk Coast
Anglian Water Services	AWS	Norfolk Rural
Anglian Water Services	AWS	Norwich & The Broads
Cambridge Water Company	CWC	Company Area
Essex & Suffolk Water	ESW	Blyth
Essex & Suffolk Water	ESW	Northern/Central
Essex & Suffolk Water	ESW	Essex
Essex & Suffolk Water	ESW	Hartismere
Tendring Hundred Water Services	THWS	Company Area
Thames Water Utilities Limited	TWU	London
Thames Water Utilities Limited	TWU	Slough / Wycombe / Aylesbury (SWA)
Three Valleys Water	TVW	Central
Three Valleys Water	TVW	Northern

Figure 2 overleaf shows that the water resource zone boundaries are not coincident with the East of England boundary. Some water resources serving population within the East of England also serve populations in neighbouring regions. This means that the whole water resource zone should be considered for analysing growth scenarios, including some areas that lie outside of the East of England area.

Figure 2. Water company resource zones covering the East of England area



1.3 Water Resources Management Plans

Water companies have submitted water resources plans on a 5 year basis since 1999 to support the respective Periodic Reviews through which OFWAT set allowable price increases. The current water resources plans (WRP) are those submitted in 2004 and covered the period up to 2030. The Environment Agency audited these plans and produced a written commentary on the findings (Maintaining Water Supply, July 2004).

Water resources management plans have been made a statutory requirement through the Water Act (2003). This requirement was scheduled to start with the third round of water resources plans for the 2009 Periodic Review (PR09). Accordingly, companies have recently submitted draft water resources management plans which have been under consultation during the autumn of 2008. Companies responded to comments received during the consultation via their statement of responses (SoR) in early 2009, and the final plans will follow. The timescale for these will vary depending on the degree to which evidence will need to be heard in Public Inquiries or hearings.

Relevant Environment Agency guidance has been updated since the PR04 plans. Regarding domestic demand, we now expect companies to consider the growth forecasts from Regional Spatial Strategies. Since PR04, there has been considerable development of water efficiency initiatives including the Code for Sustainable Homes, imminent building regulations, increased metering rates in areas of significant water stress, OFWAT's water efficiency targets and the publication of DEFRA's strategy and its long term aspirations for water use. The consideration of these initiatives has been included within Environment Agency guidance and it is expected that companies will consider these within their final water resources management plans for PR09. This means that the demand forecasts presented as part of the PR09 dWRMP (draft Water Resources Management Plans) look considerably different to those in PR04. The Environment Agency expects final PR09 WRMPs to show further development in terms of water efficiency measures.

1.4 Regional Plans

The East of England has two premier strategies, the Regional Spatial Strategy (RSS14 - the East of England Plan) and the Regional Economic Strategy (RES). The East of England implementation plan (EEIP) will set out the region's implementation priorities derived from these two premier strategies and will be produced collectively by EEDA (East of England Development Agency), EERA and GO-East. The policies described within the implementation plan include water efficiency and these are discussed later in this report.

1.5 Scope of Analysis

Like the predecessor RSS14 reports, the analysis in this study has been limited to the dry year annual average scenario of the water company plan, and no analysis has been undertaken for critical period scenarios. Some water resource zones within the East of England do have the need for options which are driven by critical periods (e.g. peak tourist week in summer coinciding with lowest water availability and highest water use) even though these are not apparent within the dry year annual average scenario.

In the 2005 study, scenarios were also included to reflect the loss of yield to sustainability reductions for environmental needs, whilst sustainability reductions included within the 2007 work were considerably less. This was because updates to that work, through the Environment Agency's Restoring Sustainable Abstractions programme now show that this distribution is not appropriate. Where definite sustainability reductions have been identified these have been included within the draft PR09 water resources management plans.

1.6 Available Datasets

The following datasets were available for use in this study:

Table 2. Available study data

Data	Comment
Housing Numbers	See Table 3 and RSS report references Appendix A
Draft Water Resources Management Plans	Submitted to the Environment Agency as part of the PR09 process
GIS layers of <ul style="list-style-type: none">• Unitary authority areas• Districts areas• EERA boundary• Water Resources Zones	Provided by Environment Agency and collated as part of the Environment Agency dWRMP audit

1.7 Layout of this Report

This report has been prepared with the following structure:

- Forecast housing growth, its treatment in water company plans and details of the model scenarios for this report are presented in Section 2
- Water efficiency and its inclusion within the water company plans, regional policies, and the model scenarios for this report are considered in Section 3
- A description of the modelling methodology and supporting assumptions are provided in Section 4
- Section 5 presents and discusses key results
- Recommendations and conclusions are given in Section 6

2 Household Growth

2.1 Introduction

This study is based primarily upon housing growth proposed in the final East of England (EERA) Plan (GOEM, 2008). Household growth projections included in this plan supersede those previously assessed in the 2005 RSS14 report which considered the draft East of England plan. However, the East of England final plan housing forecasts were used in the 2007 review. The study also considers housing growth forecasts from neighbouring Regional Planning Authorities (RPAs) for areas encompassed within water company resource zones that extend beyond the EERA boundary.

In order to understand the degree that housing forecasts within water company plans reflect RSS policy, policy housing projections (supplied at the local authority level) need to be converted to the resource zone level. In the majority of cases, planned household figures have been distributed amongst the water resource zones based upon the proportion of local authority area covered by each water resource zone. In some cases it was not sufficient to take this simple approach. These cases, the approach taken and relevant justification is described in Section 2.3 of this report. This approach is similar to that taken during the preparation of the 2005 and 2007 reports.

2.2 Sources of Data

Housing growth forecasts were taken from the most up to date publications for each RSS. The projection period and data presentation varies on a regional basis. For each region the forecast annual average housing provision figures were taken for the period supplied. These figures were extended by maintaining the same annual average value from the end of the supplied period through until 2030/31.

Where supplied in the relevant RSS, information on houses built and houses still to build through until the report forecast date was included. If the RSS did not distinguish between houses built and those still to build, then no adjustment was made. Note that the 2007 report considered water resources planning data covering the period from 2002/03 to 2029/30, however, in this study, the planning horizon of the new draft WRMP covers 2006/07 to 2034/35. The relevant RSS's used in the preparation of figures are listed below in **Table 3**, including a brief description of data provided and projected housing period. Relevant tables from the papers referenced in **Table 3** are provided in **Appendix A** of this report.

Table 3. Sources of Housing Data

RPA	Report Title	Specific section of report	Data description and data range
EERA	East of England Final Plan, May 2008	Policy H1	2001-06 built figures, 2006-21 projected housing figures
EMRA	East Midlands Draft Plan, September 2006 - Proposed	Policy 14	2001-06 built annual average figures, projected figures provided as annual average broken down by the following

RPA	Report Title	Specific section of report	Data description and data range
	Changes		periods 2006-11, 2011-16, 2017-2026
SEERA	South East Draft Plan – Proposed Changes	Policy H1a, Recommendation 7.3	No figures for built. Housing forecast provided as annual average by local authority for the period 2006-2026.
GLA	The London Plan, Spatial Development Strategy for Greater London. Consolidated with changes, February 2008	Table 3A.1	No completed housing figures provided. 10 year housing projection provided for local authority areas as annual average values for the period 2007/08 – 2016/2017.
WMRA	Communities for the future, January 2008	Table 1 – Housing Proposals 206-2026	No completed housing figures provided. Projected annual average taken from proposed totals for period 2006-2026.

2.3 Allocating Housing Growth to Water Resource Zone

Planned household growth was distributed amongst resource zones based upon geography and area, and with some cases requiring special interpretation and apportioning as described below:

For the entire RSS14 study area housing growth figures were assigned by the following process:

- Using GIS to intersect district and unitary authority areas with water resource zone areas, allowing calculation of each district and unitary authority areas within each water resource zone.
- Review and update area distribution as appropriate taking null areas (coastal areas, estuaries and other geographical inconsistencies)/location of proposed development into account.
- Confirm area allocations by audit of district/unitary authorities ensuring 100% of each region is accounted for across all water resource zones.

The following key issues requiring a distinct approach were noted:

- Proposed development in Aylesbury Vale (projected average annual housing growth of 1345) is focused on Aylesbury Urban area. This means that the majority of development will be in the south of the district, which falls within the Thames Water's Slough Wycombe Aylesbury water resource zone with only a small proportion falling into the Anglian Water Services (AWS) Ruthamford water resource zone. Since some development from Milton Keynes local plan area is planned to occur in the north of the Aylesbury local plan area, the assignment of Aylesbury local plan area to water resource zone has been carried out on the basis of 75% to Thames Water's SWA water resource zone and 25% to AWS Ruthamford water resource zone. This replaces the area calculations showing 43% of Aylesbury local plan area in TW SWA and 57% in

AWS Ruthamford WRZ. This has been the overall effect of decreasing projected housing numbers assigned to the Ruthamford WRZ.

- For Bedfordshire and Luton growth is presented for the Milton Keynes South Midlands (MKSM) sub regional strategy for Luton, Dunstable, Houghton Regis and Leighton Linlade. 1095 of these annual average figures are applied to Luton Unitary District (representing Luton, Dunstable and Houghton Regis) and 365 are applied to South Bedfordshire district (representing Leighton Linlade). Consequently, 75% of Luton Unitary District has been overwritten as the value within TVW Northern water resource zone (as Luton urban area lies within this water resource zone, including Dunstable and Houghton Regis) and 25% as the value accounted for AWS Ruthamford water resource zone.

Future housing projections for all relevant regions as described above have been collated as appropriate. Housing figures are usually presented as an annual average, although these may often vary for different time periods in the planning horizon.

The most up to date information has been used to formulate the Housing Forecast projections, which were then input into the HARZ (Housing and Resource Zone) spreadsheet to calculate housing forecasts at the water resource zone level. A comparison of these values and those presented for the water company resource zones (which is taken from the current water resource plans for the period 2007/08–2020/21) is presented in **Table 4** overleaf.

Analysis of the comparison provided in **Table 4** illustrates the projected housing figures for most of AWS water resource zones have been properly accounted for, all of them being within $\pm 20\%$, with the exception of Lincolnshire Fens which over accounts for projected housing figures by 35.8% in the water resource plans when compared to the plan figures. This is predominantly due to the cut back in the EMRA draft plan figures for East Lindsey and South Holland suggested in the Secretary of State proposed changes.

CWC (Cambridge Water Company) has 27.5% fewer houses for its draft water resource plans figures are compared to the RSS planning figures, and this requires further investigation. The figures for the Suffolk water resource zones of Essex & Suffolk Water (Blyth, Hartismere, Northern/Central) show significant variation between the water company estimates and those derived for this study. However, the sum of the 3 zones from the dWRMPs is within 30% of the estimates generated for this study, while the larger Essex zone includes 17% more houses in the dWRMP as when compared to RSS figures generated for this report. Figures for Tendring Hundred and London water resource zones are consistent, though larger deviations are apparent in the SWA, Central and Northern water resource zones. Of particular note is the Northern water resource zone where Three Valleys Water has underestimated around 35% in the dWRMP compared to figures derived for this study.

Table 4. Policy housing forecast compared to forecast in water company water resource plans (2007/08-2020/21)

Water Resource Zone / Company	Policy housing forecast (000s)	Water Company dWRMP housing forecast (000s)	Percent difference
Ruthamford (AWS)	12.247	11.810	-3.6%
Cambridge & West Suffolk (AWS)	1.546	1.611	4.2%
East Suffolk & Essex (AWS)	2.424	2.529	4.3%
Lincolnshire Fens (AWS)	0.992	1.341	35.1%
Fenland (AWS)	0.797	0.939	17.9%
North Norfolk Coast (AWS)	0.579	0.487	-16.0%
Norfolk Rural (AWS)	0.917	0.859	-6.3%
Norwich & the Broads (AWS)	1.642	1.684	2.6%
Cambridge Water	2.577	1.861	-27.8%
Blyth (ESW)	0.247	0.144	-41.6%
Northern Central (ESW)	0.514	0.963	87.2%
Essex (ESW)	5.066	5.932	17.1%
Hartismere (ESW)	0.186	0.096	-48.4%
Tendring Hundred Water	0.427	0.464	8.7%
London (TWU)	24.402	26.535	8.7%
Slough, Wycombe, Aylesbury	2.010	1.530	-23.9%
Central (TVW)	4.281	5.024	17.4%
Northern (TVW)	6.020	3.958	-34.2%
Company and Regional Totals			
AWS Total of zones above	21.143	21.259	0.5%
CWC Total	2.577	1.861	-27.8%
ESW Total	6.014	7.135	18.6%
THW Total	0.427	0.464	8.7%
TWU Total of zones above	26.412	28.065	6.3%
TVW Total of zones above	10.301	8.982	-12.8%
Total of above resource zones	66.868	67.766	1.3%

At the regional level, the water company forecasts and the estimations derived for this study are consistent as shown in Table 5 overleaf. This figure also shows the periods informed by the various policies and plans beyond which extrapolation have been necessary. Note that these do not include Lincolnshire Fens to ensure consistency between this report and previous versions.

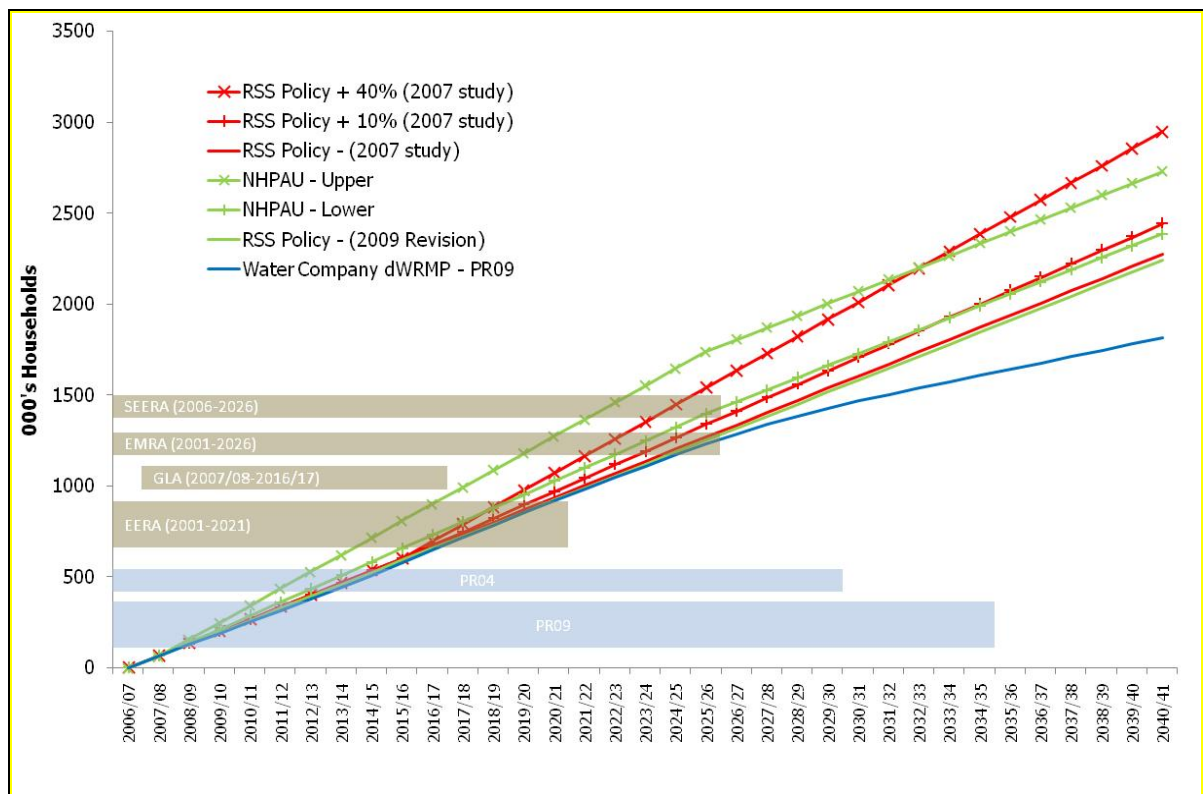
The overall housing growth for all resource zones is presented in **Table 5** below. As above, this does not include Lincolnshire Fens to ensure direct compatibility with the previous report.

Table 5. Average Annual Housing Growth Forecasts (000's) for 2010/11 as proposed for the RSS investigations used in the analysis

RSS / version	RSS 14 East of England	RSS 9 South East	RSS 8 East Midlands	GLA London Plan	Total
2005 Report	23,896	5,590	4,975	22,070	56,531
2007	26,800	5,376	5,415 (4,925 to 2010/11)	29,421	67,012
2009	26,218	5,905	6,074	28,503	66,701

Differences in WRZ boundary between the 2007 and 2009 studies mean that these figures are not directly comparable

Figure 3. Cumulative growth for water company plan and scenarios shown in the context of planning horizons



2.4 Housing Growth Scenarios

In late June 2008 the NHPAU (National Housing and Planning Advice Unit) provided guidance to ministers stipulating regional housing supply ranges to be tested by Regional Planning Authorities (RPAs) in future RSS reviews. This guidance is provided in a note to ministers entitled “Meeting the housing requirements of an aspiring and growing nation: taking the medium and long-term view” dated 26th June 2008. Whilst these ranges are not applied as targets for RPAs, the Environment Agency is required to assess their impact when compared to housing growth scenarios taken from current regional plans.

This study aims to investigate the impact of three housing growth scenarios over the planning horizon, as described below:

1. **RSS Housing Scenario.** The assumption is made that all projected development in the regional plans is built as planned. Once the end of the informed planning horizon is reached, as described in **Table 2** of this report, the final average annual rates are projected forward through until 2030/31.
2. **NHPAU Lower Housing Supply Range Scenario** for 2008-2026 (period of 17 years) reverting to RSS14 rates to the end of the planning horizon. Average annual net additions up until 2026 are calculated for the RSS Housing Scenario for each RPA. The NHPAU lower average annual net additions figure for the same period (defined in column 2 of Table 1, NHPAU guidance) are then described as a ratio of the RSS housing forecast figures for each RPA and applied individually to all local plan areas for the period 2008-2026. Average annual housing forecasts for local authority areas then revert to those provided in the RSS housing scenario for the period 2026 – 2030.
3. **NHPAU Upper Housing Supply Range Scenario** for 2008-2026 (period of 17 years) reverting to RSS14 rates to the end of the planning horizon. Average annual net additions up until 2026 are calculated for the RSS Housing Scenario for each RPA. The NHPAU upper average annual net additions figure for the same period (defined in column 6 of Table 1, NHPAU guidance) are then described as a ratio of the RSS housing forecast figures for each RPA and applied individually to all local plan areas for the period 2008-2026. Average annual housing forecasts for local authority areas then revert to those provided in the RSS housing scenario for the period 2026 – 2030.

2.5 Occupancy Rates

Occupancy rates are important because they are used to convert housing forecasts to population forecasts. The occupancy rates used by the water companies are presented for both measured and unmeasured households in WRP4 of the dWRMPs. For measured households, this includes both existing housing stock and new builds. As noted in the section on modelling, the assumption is made that new build occupancy rate occurs at the same rates as measured housing. Using table 6 from the water company dWRMPs, cumulative population and properties over the planning horizon were used to derive the cumulative occupancy rate. This was then compared against the reported measured household occupancy rate which is then used within our modelling to apply to new properties. With the exception of Cambridge (and London for a short period) the derived new build rates were higher than the reported measured. A comparison of these occupancy rates is shown in **Table 6** below, which has been assessed over the period 2020/21 to 2034/35. This was on the basis that the relative proportion of these occupancy rates appeared to be fairly static over this period which is also the period where future accumulated growth will have most impact.

Table 6. New build occupancy rates and reported occupancy rates

Water Resource Zone	Derived measured OR for Accumulated New Builds	WCo reported measured OR	Percent difference
Ruthamford (AWS)	2.19	2.07	6%
Cambridge & West Suffolk (AWS)	2.19	2.09	5%
East Suffolk & Essex (AWS)	2.19	2.09	5%
Lincolnshire Fens (AWS)	2.19	2.05	7%
Fenland (AWS)	2.19	1.90	15%
North Norfolk Coast (AWS)	2.19	1.77	24%
Norfolk Rural (AWS)	2.19	2.07	5%
Norwich & the Broads (AWS)	2.19	1.95	12%
Cambridge Water	2.00	2.23	-10%
Blyth (ESW)	2.41	2.09	15%
Northern Central (ESW)	2.41	2.09	15%
Essex (ESW)	2.36	2.30	3%
Hartismere (ESW)	2.41	2.09	15%
Tendring Hundred Water	2.24	2.17	3%
London (TWU)	2.32	2.35	-1%
SWA (TWU)	2.24	2.17	4%
Central (TVW)	2.52	2.41	5%
Northern (TVW)	2.44	2.32	5%

On the basis of this table, the new build rate would introduce an additional 3-15% increase in population using the reported occupancy rates, with North Norfolk Rural zone introducing an additional 24%. The implications of this uncertainty are considered later in this report.

3 Water Efficiency

3.1 Introduction

This section outlines the current political drivers to improve water efficiency in domestic properties, describes how water companies have included water efficiency measures within their draft WRMPs and outlines the scenarios that are considered for the analysis included within this study.

The industry standard for monitoring household water use is through a measure of water use per person, referred to as per capita consumption (pcc). Water company water resource plans make distinctions between water consumption by customers who pay by water volume (metered or measured users) and those who are charged by rateable values (unmetered or unmeasured users). Effective water efficiency measures will either reduce pccs or moderate any continuing increase. Accordingly, the impact of efficiency measures can be considered through varying assumed pccs. Combinations of different measures can be reflected in reducing pccs by different rates for unmeasured and measured households (for both existing housing stock and new builds).

3.2 Water Efficiency Legislation, policy, and Expectations

3.2.1 New Building Regulations

Government has consulted on changes to building regulations (CLG 2006). The outcome of the consultation is the joint DEFRA and CLG statement (2007) which states that a whole building water efficiency of 125 l/h/d will be brought forward into the building regulations for 2008. This has been delayed, but it is expected for 2009. The statement does not state explicitly if this is limited to internal housing use.

3.2.2 Code for Sustainable Homes

The Code for Sustainable Homes (CLG 2006) outlines various target levels for the construction of sustainable homes, one aspect of which is the efficient use of water. All community housing is planned to be constructed to code level 3, which is set at 105 l/h/d for internal use for an average year.

3.2.3 DEFRA Strategy – “Future Water”

In 2008, DEFRA released their strategy ‘Future Water’, (DEFRA 2007). This states that by 2030, DEFRA has an aspiration that average domestic consumption will fall to 130 l/h/d.

3.2.4 RSS/RES policies

The East of England Implementation Plan (EEIP) has policies on all new homes achieving code level 3 of 105l/h/d plus an allowance for external water use, bringing the target for pcc to 115 l/h/d. The plan also has an ambitious target of reducing average pcc (for both measured and unmeasured customers) to 120 l/h/d by 2030.

3.2.5 Water Stressed Areas

Both the Environment Agency (2007) and Defra (2007) have undertaken consultation in parallel on identification of water stressed areas. For water companies which are categorised as “serious water stress”, the Agency expects the installation of meters to be accelerated, achieving full metering by 2015 or at the very latest by 2020.

3.2.6 OFWAT water efficiency targets

In 2008, Ofwat consulted on setting water efficiency targets. Later that year, OFWAT published its intention to set water efficiency targets at two rates:

- Companies with average pcc greater than 130 l/h/d, a reduction of 1litre per property per day.
- Companies with average pcc less than 130 l/h/d, a reduction of 0.5 litres per property per day.

These targets will be incorporated into water company water resources management plans as part of PR09.

3.3 PCCs within water company plans

The range of pccs referred to within the current draft water resources management plans is given below in **Table 7**. This table shows that there is a greater range of pccs in the unmeasured category, with the highest values observed in the AWS water resource zones. The lowest values for measured pccs are also observed in AWS resource zones. Within other companies, the range is not as great. The average pcc for the whole of the East of England is forecast to fall from 153 l/h/d rapidly to 146 l/h/d by 2020/21 and stabilising beyond that. This mostly represents the increase in metering that we expect to see from companies in water stressed areas.

Table 7. Pccs forecast in PR09 dWRMPs

Description		Forecast pcc (l/h/d)		
		2010/11	2020/21	2029/30
Measured	Range across resource zones	115 - 174	115 - 166	117 - 167
	Weighted average	132	130	131
Unmeasured	Range across resource zones	140 - 250	149 - 318	153 - 360
	Weighted average	170	185	197
Average	Range across resource zones	128 - 179	130 - 168	130 - 168
	Weighted average	153	146	145
Note: weighted average only includes population within East of England				

Where companies had not adequately considered the above policies and aspirations as outlined in Section 3.2 within the dWRMP, the Environment Agency has requested that these are considered within the final plans. This means it is likely that the final WRMPs could be significantly different to the draft WRMPs regarding the extent to which water efficiency measures are included as there will be some consolidation of the above measures.

Table 8 shows a comparison between pccs in PR04 and those in PR09. Whilst the PR09 draft plans show a significant increase in the unmeasured pccs, there is also a significant decrease in the measured pccs. It should also be remembered that in line with the expectations for full metering by 2015 / 2020 in areas of serious water stress, it is planned that there should be very few unmetered properties towards the end of the planning horizon within the East of England.

Table 8. Pccs forecast in PR04 Final WRPs

Description		Forecast pcc (l/h/d)		
		2010/11	2020/21	2029/30
Measured	Range across resource zones	113 - 177	117 – 180	116 – 176
	Weighted average	144	150	149
Unmeasured	Range across resource zones	147 - 216	151 – 226	154 – 236
	Weighted average	178	182	186

Note: weighted average only includes population within East of England boundary

3.4 Water Efficiency Scenarios

As part of these developments, policies and aspirations, a range of water efficiency scenarios have been selected to assess the impacts of the various policies, standards and aspirations. The following scenarios have been considered:

- **Business As Usual** - current household consumption based on water company consumption figures in their draft water resource management plans. Currently, these are approximately 150 l/h/d. Companies have made differing assumptions regarding water efficiency measures. For example, some will have included the new building regulations while others will have not. Note that this Business As Usual scenario is different from the BAU scenario from the 2007 report based on the 2004 plans, as there would have been less focus on water efficiency in the earlier plans.
- **New Building Regulations** – This scenario considers the requirement for the standard 125 l/h/d for new homes expected to be introduced to building regulations this year.

- **Efficient New Development** – taken from the East of England Implementation plan. The target is to achieve a consumption of 115 l/h/d in all new homes. This assumes that all homes outperform the new building regulations water efficiency standards. In practical terms, this scenario would adopt all the standards associated with the new building regulations and will assume the Code for Sustainable Homes (CSH) level 3 across all new builds.
- **DEFRA aspiration** - This scenario considers DEFRA's aspiration of 130 l/h/d by 2030 as set out in their strategy, 'Future Water' (DEFRA 12007). In the strategy, DEFRA note that the industry could better 130 l/h/d, going as low as 120 l/h/d. Since the document was published, DEFRA have confirmed that 130 l/h/d relates to the average scenario, so it can be expected that during a dry year this would be approximately 5 l/h/d more. Nevertheless, the scenario has been run with 130 l/h/d representing something which achieves the 130 l/h/d normal year scenario, whilst going some way to meeting the 120 l/h/d noted above. In practice, this would be achieved through efficient new builds and increasing water efficiency in the existing housing stock by metering, tariffs, retrofitting, and behavioural change.
- **EEIP aspiration** - This scenario is taken from the East of England Implementation Plan and the Regional Economic Strategy identifying that the average consumption should be reduced to 120 l/h/d. An allowance of 5 l/h/d is provided to convert the normal year to the dry year annual average scenario. In practice, this would be achieved through efficient new builds, and increasing water efficiency in the existing housing stock by metering, tariffs, retrofitting, and behavioural change.

3.5 Water Efficiency Measures

This report considers the impacts of varying pcc rates on the supply-demand balance. It is not within the remit of this report to discuss ways in which the water efficiency scenario could be delivered.

4 Modelling

4.1 Introduction

This study has used the draft water company water resources management plans to investigate the impact of growth and water efficiency scenarios on the supply-demand balance for the East of England. In line with Environment Agency's 2005 and 2007 work, the CoPS (**Company Plan Scenarios**) model has been used as a tool for analysis. This is based upon the water resources planning tables. An overview of the model is included in the following section of this report.

4.2 The COPS Model

The CoPS model is based on the water resources planning tables. These tables contain the forecasts and information which are used to create the overall demand forecast. A diagram showing the components of demand is presented in **Appendix B** of this report. Within CoPS specific components of demand can be varied and the impact of this variation can then be viewed in the context of supply-demand balance. Water resources planning tables do not distinguish between new build and existing measured housing stock, so a function has been developed within CoPS with the ability to test the interactions between the two. Further useful functionality includes the ability to provide housing growth rates and to audit and record changes that have been made to datasets.

Within CoPS, a new build is defined as any household that is constructed after the start of the planning horizon, meaning that growth rates, population, and consumption are all accumulated from the base year. The method and assumptions of calculating new build consumption are shown below in **Table 9**.

Table 9. Calculation of household demand

Household Consumption =	Properties *	Occupancy *	PCC
Unmeasured	Unmeasured	Unmeasured	Unmeasured
Measured (existing)	Measured - existing	Measured	Measured - existing
Measured (new builds)	Measured - new builds	Measured	Measured - new builds

By varying the number of measured new builds or by varying the pcc rates, a revised household consumption can be calculated. Each scenario can then be tested in the context of the supply-demand balance by accumulating all demand components, including headroom, and comparing against supply. This forms the basis of the supply demand balance results which are presented as the main output of CoPS.

4.3 Disaggregating measured pcc

An important consideration is that as expectations of water efficiency of new builds increase, so water companies have made an increasingly diverse range of assumptions regarding water efficiency in new builds.

As the water resources plans present only measured pccs (i.e. both new build and existing measured housing) within their supply demand balances (tables WRP1 and WRP4 of the dWRMP), these must be disaggregated to ensure no double counting of water efficiency measures in new builds when considering different new build water efficiency scenarios. Water companies have commented on how they have treated new build water efficiency within their plans and have also provided incremental data for new builds and other measured categories of customer within the dWRMP Table 6. Both of these can be used to disaggregate the measured pcc into a measured pcc for existing housing stock and a measured pcc for new builds. This does pose a problem if the two methods provide conflicting results, so consideration is given to both methods, and justification is given regarding the selection of the preferred method for each water company.

The method using dWRMP Table 6 data considered the accumulation of new builds properties and population using the occupancy rate. Using the new build pcc from Table 6, an accumulative consumption was derived. This could then be used to derive a new build pcc for the accumulated new housing and by subtracting the new build consumption from the total measured consumption an existing measured housing stock pcc was derived.

It should be noted that dWRMP Table 6 is a new planning table introduced into the draft water resources management plans. The table does try to capture a number of interactions, and there has been some inconsistency in its completion both from water companies and the Environment Agency. Consequently, this disaggregation should be considered as a provisional estimate and further work will need to be undertaken in liaison with water companies to better understand how companies have used the data. This could be work undertaken following submission of the company's Statements of Response, or on final WRMP. Nevertheless, some consideration of disaggregation is preferable to none, but the uncertainties in undertaking it should be remembered when considering model output.

Table 10 below presents the method used to disaggregate the pccs for each water company.

Table 10. Consideration of disaggregated pcc

WCo	New build pcc assumptions in dWRMP
AWS	In the dWRMP commentary, AWS recognises the importance of new builds. However, the data in Table 6 suggests that pcc rates for new builds increases over time until new build pcc is greater than existing measured housing stock. Whilst this may be appropriate, the commentary was not sufficient for its justification. However, in the absence of further information, no disaggregation was considered necessary as the measured pccs reported by the company are generally low. This means that there is likely to be minimal double counting with water efficient new build scenarios. This applied to all AWS water resource zones.
CWC	CWC have assumed that from 2010/11, new homes will be constructed to the voluntary Code for Sustainable Homes and this will be supported by the proposed changes to the Building Regulations which will also reduce the demand for water in new dwellings. Accordingly, in line with the Code for Sustainable Homes, a normal year per capita consumption of 105 litres per head has been assumed and Cambridge Water has applied a dry year factor which has increased the pcc by 5-6l/h/d. The commentary and the text are consistent.
ESW	ESW's commentary states that one third of new builds will be assumed to be constructed at the code for sustainable homes level 3, with an allowance of 7 l/h/d for external use and 5 l/h/d for the dry year. The remaining 2/3 will be constructed at the new build rate which is presented as part of its micro-components analysis. When compared with the

WCo	New build pcc assumptions in dWRMP
	approach using data solely from table 6, the results were consistent, albeit with a small discrepancy. Table 6 method was selected for consistency with other water resource zones.
THW	THW have reported in their commentary that new builds will be assumed to use 125 l/h/d throughout the planning horizon. This is consistent with Table 6. No growth in new build pcc is reported in the plan.
TVW	TVW report that the new build is equivalent to compulsory metered properties and the disaggregation is based on the Table 6 approach.
TWU	TWU report that they have assumed new properties at 125 l/h/d in a normal year, with growth subsequently applied. The Table 6 method produced measured new build pccs of approximately 10 l/h/d lower than the measured existing. No growth was included in the accumulation of pccs, as it was assumed that pcc growth had already been factored in Table 6 as those at the back end of the planning horizon were considerably above 125 l/h/d starting point.

4.4 Water Resources Planning Scenarios

The basis of the work is undertaken on the final planning scenarios of the draft PR09 water resources management plans. This means that the analysis includes schemes which are selected to close any supply demand deficits within the planning horizon. A number of scenarios have also been undertaken considering the baseline planning scenario. This only contains selected schemes through to 2010 as these are already funded through the current AMP4 period. No further schemes are included beyond 2010.

The water resource planning scenarios are completed for the dry year annual average time period. Some resource zones may have different critical time periods to the dry year annual average, e.g. a peak demand if there is a significant influx of holiday makers. In these cases, these resource zones will be required to complete a scenario representing the critical period. These scenarios are not considered by CoPS. This means that in some instances there is development of new sources within the final planning scenario of the water resource plans which is required to serve the critical period, though when looking at the dry year annual average, it may appear that the scheme is not required. It is important to remember this issue when viewing model output.

4.5 COPS Scenarios

In total 19 model scenarios have been considered as part of the study. These are presented in **Table 11** overleaf. Details of the housing and water efficiency scenarios can be found in Sections 2 and 3 of this report respectively.

Table 11. CoPS scenarios for forward look

Ref	Housing	Water Efficiency	WRP Scenario
0	Water Company Plan	Business As Usual	Final Planning
1	RSS Growth	Business As Usual	
2		New Building Regs	
3		Efficient New Development	
4		DEFRA aspiration	
5		EEIP aspiration	
6	NHPAU Lower	Business As Usual	
7		New Building Regs	
8		Efficient New Development	

Ref	Housing	Water Efficiency	WRP Scenario
9	NHPAU Upper	DEFRA aspiration	
10		EEIP aspiration	
11		Business As Usual	
12		New Building Regs	
13		Efficient New Development	
14		DEFRA aspiration	
15		EEIP aspiration	
16		RSS Growth	
17	NHPAU Lower		
18	NHPAU Upper		

4.6 Scenario Horizons

As in earlier RSS14 reports, this analysis has considered the impact of scenario options through to 2040/41. As water company plans are completed only to 2034/35, the latter years have been extrapolated from 2030/31 to 2034/35. Extrapolation was undertaken for population, properties, non household demands and headroom. Pccs, leakage and unbilled uses remain constant from the final year of the plan. On the supply side only climate change impacts are extrapolated but with no change to options, outage, process losses and imports and exports beyond 2034/35.

4.7 Modelling Assumptions

The flexibility of CoPS means that there are no assumptions inherent in the model which do not appear in the water resources planning tables. However, there are a number of significant assumptions which apply to the preparation of the scenario data used to populate the CoPS model. The main assumptions of the analysis are:

- Proposed development at a local authority level is distributed evenly
- Measured new builds have the same occupancy rate as measured properties. This means that there is a direct relationship between the number of new houses and the population in the resource zone.
- RSS growth rates continue at same rate beyond the informed period (2021/22 for EERA).

The impact of these key assumptions is discussed in the context of the results in Section 5.

4.8 Model Output

Model output is provided in the form of surplus deficit maps and supply demand graphs for the whole region. These are presented in Section 5 of this report.

5 Results and Observations

5.1 Introduction

For each scenario, numerical output consists of surplus / deficits for each water resource zone for every year in the planning horizon. From this the following is derived:

1. Surplus / deficits maps compared with target headroom for every year of the water resources plan for all water resource zones.
2. Graphs showing the supply demand balance for all years. These are accumulated to the regional level.

5.2 Surplus – Deficit MAPS

Actual headroom is presented in mapped form for a series of snapshots for the key years of 2010/11, 2015/15, 2020/21, 2030/31 and 2040/41. A consistent scale is used for all maps to allow direct comparisons to be made. These maps are presented for all scenarios in **Appendix C**. Growth scenarios for the RSS and NHPAU scenarios, and scenarios of Business As Usual, Efficient New Development and East of England Implementation Plan water efficiency are shown within this section to inform the commentary.

A summary of the surplus-deficits for all scenarios across all water resource zones is shown below in **Table 12**. This demonstrates the number of water resource zones showing a deficit for each scenario at key years, the magnitude of those deficits and the sum of all surpluses and deficits regardless of whether a deficit exists or not. These values represent the whole water resource zone, regardless of the proportion that falls into the East of England. In this way, this table is consistent with the maps. Note that **Table 5** shows that around 40% of the growth anticipated for these 18 water resource zones falls within the East of England

5.3 Supply-Demand Balance Graphs

The supply-demand graphs show the accumulations of all the resource zones for each scenario. Unlike the maps and **Table 12**, the data is limited to the proportion of the resource zone that falls within the East of England. These diagrams are included as they illustrate the impact of each scenario on the various components of demand. Because all zones are accumulated, the graphs obscure potential deficits at the resource zone level. Consequently, **they should not** be used to investigate or draw conclusions for the need for and the timing of a particular scheme. For this, the individual water resource zone supply-demand balances should be used. However, this overall surplus at a regional level generally demonstrates the challenges facing water companies. For example, water located in different locations to demand, localised deficits, and transfer options.

Table 12. Summary of Surplus and Deficits by scenario

Scenario	2010/11			2015/16			2020/21			2030/31			2040/41		
	No. Zones in deficit	Total deficits (Ml/d)	Overall Surplus / Deficit (Ml/d)	No. Zones in deficit	Total deficits (Ml/d)	Overall Surplus / Deficit (Ml/d)	No. Zones in deficit	Total deficits (Ml/d)	Overall Surplus / Deficit (Ml/d)	No. Zones in deficit	Total deficits (Ml/d)	Overall Surplus / Deficit (Ml/d)	No. Zones in deficit	Total deficits (Ml/d)	Overall Surplus / Deficit (Ml/d)
0 Wco Plan	2	-54	239	0	0	327	0	0	284	0	0	296	6	-29	89
1 RSS / BAU	2	-48	237	0	0	326	0	0	289	3	-19	272	8	-106	-34
2 RSS / New BR	2	-45	244	0	0	344	0	0	319	2	-8	330	6	-74	62
3 RSS / END	2	-42	250	0	0	357	0	0	340	1	-4	365	5	-56	112
4 RSS / Defra Asp'	2	-39	251	0	0	375	0	0	399	0	0	700	5	-47	427
5 RSS / EEIP Asp'	2	-37	254	0	0	395	0	0	439	0	0	786	5	-31	515
6 NHPAU Lower / BAU	2	-52	229	0	0	305	0	0	255	4	-27	224	8	-146	-81
7 NHPAU Lower / New BR	2	-48	237	0	0	325	0	0	289	3	-14	289	7	-91	22
8 NHPAU Lower / END	2	-45	243	0	0	340	0	0	313	3	-9	328	6	-70	75
9 NHPAU Lower / Defra Asp'	2	-42	243	0	0	353	0	0	365	1	-0.1	658	5	-60	385
10 NHPAU Lower / EEIP Asp'	2	-40	246	0	0	373	0	0	405	0	0	746	5	-44	475
11 NHPAU Upper / BAU	2	-61	211	0	0	256	4	-26	174	5	-52	111	9	-242	-193
12 NHPAU Upper / New BR	2	-55	221	0	0	283	1	-0.1	218	5	-40	193	8	-133	-72
13 NHPAU Upper / END	2	-52	229	0	0	301	1	-0.02	248	5	-26	240	7	-105	-12
14 NHPAU Upper / Defra Asp'	2	-52	223	0	0	302	1	-0.1	284	5	-13	558	5	-88	287
15 NHPAU Upper / EEIP Asp'	2	-50	226	0	0	322	1	-0.1	325	1	-0.2	650	5	-70	381

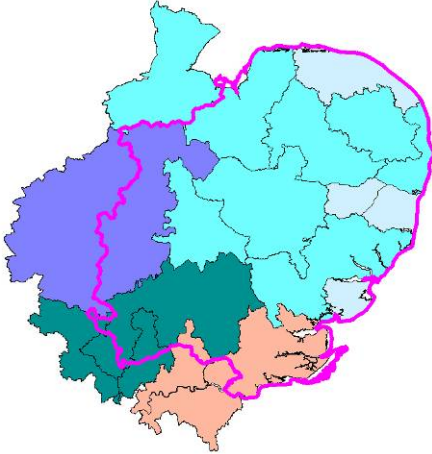
Key

	0 resource zones in deficit
	1 resource zone in deficit
	> 1 resource zone in deficit

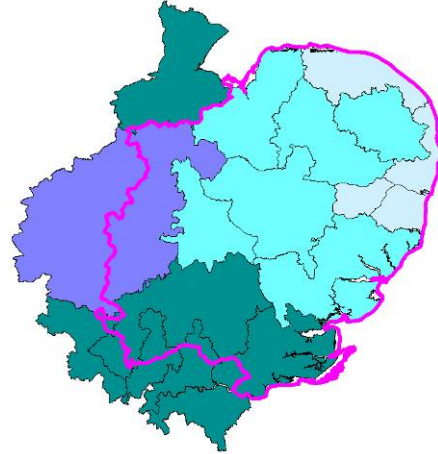
Note that the 'total deficits' column sums only those water resource zone where a deficit is modelled. The 'overall surplus / deficit' column is the sum of all zones regardless if there is a deficit or not. This means that there can be some total deficits even when overall, there is a **regional** surplus. See section 5.3 for further information

Scenario 0: Water Company Housing and Business as Usual - Final Planning

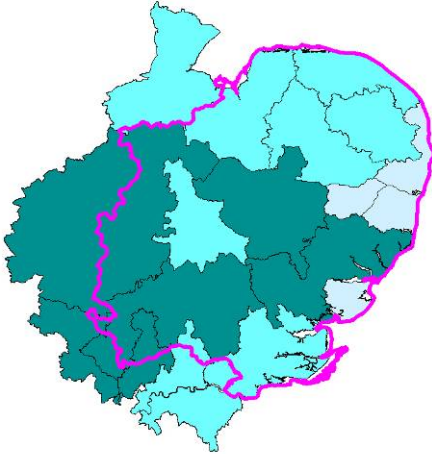
2010 - 2011



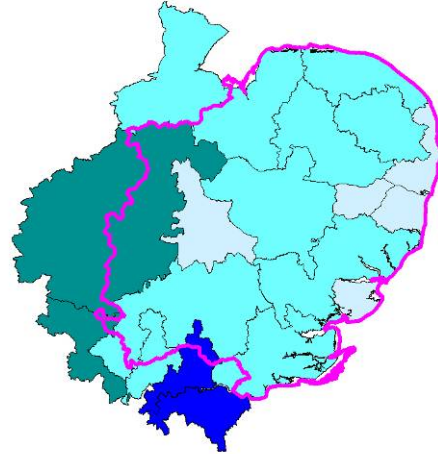
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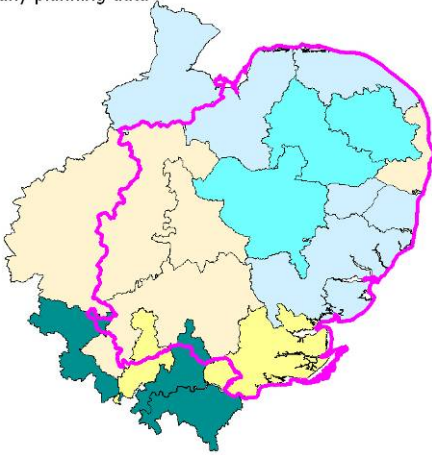
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

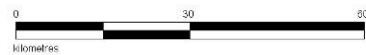
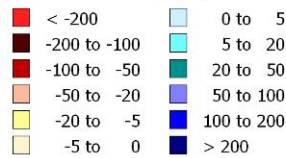


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

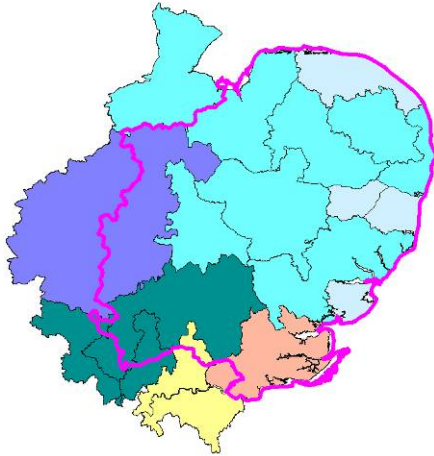
Surplus - Deficit (Ml/d)



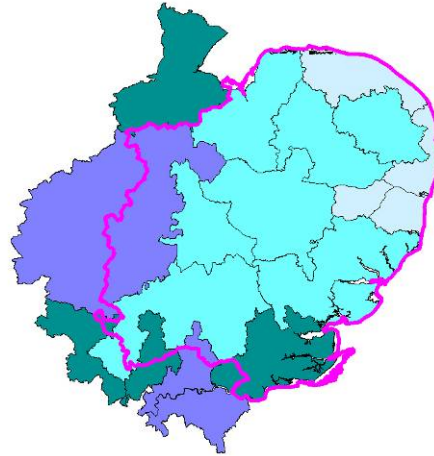
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Scenario 1: RSS Growth and Business as Usual Water Efficiency, Final Planning

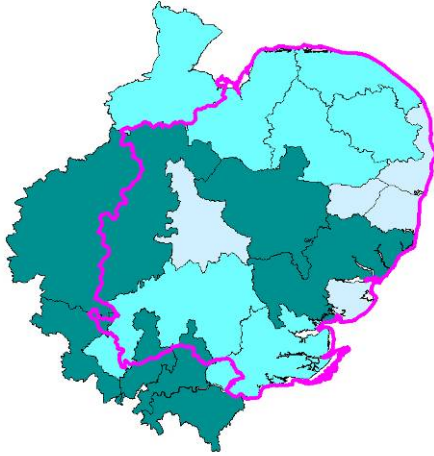
2010 - 2011



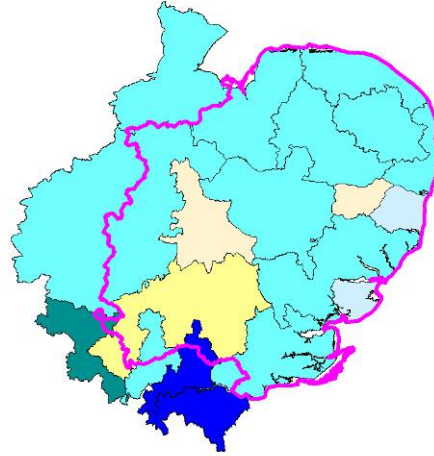
2015 - 2016



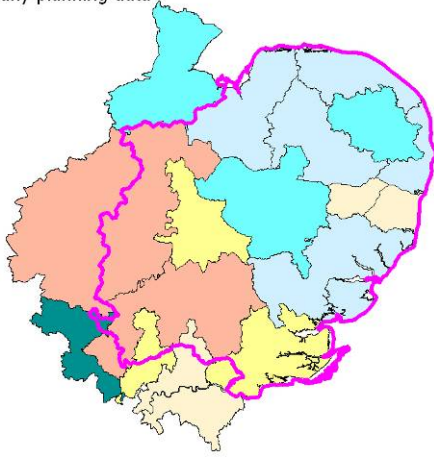
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

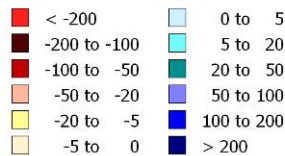


2040 - 2041 - Extrapolation of all housing policies & water company planning data



 East of England Boundary

Surplus - Deficit (Ml/d)



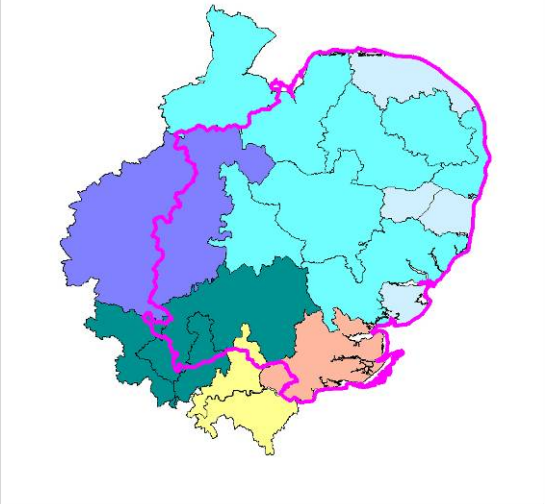
Kilometres



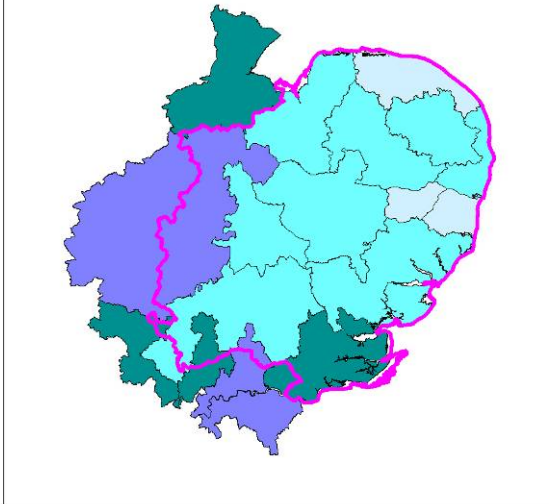
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Scenario 3: RSS Growth and Efficient New Development, Final Planning

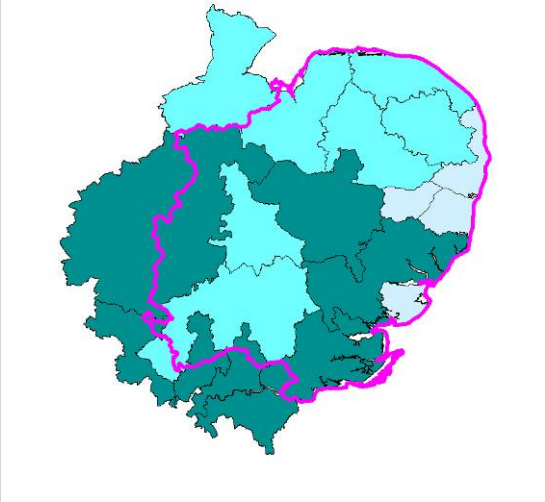
2010 - 2011



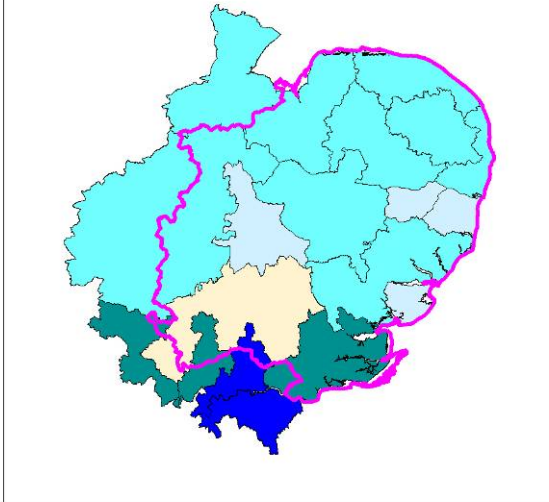
2015 - 2016



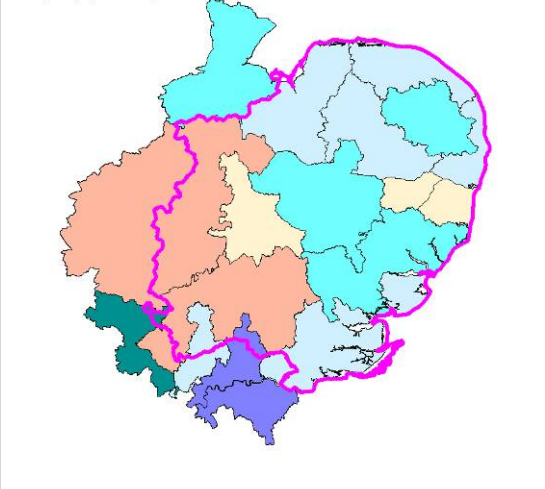
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

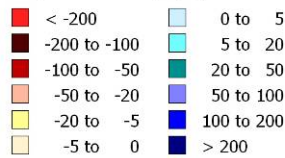


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

Surplus - Deficit (Ml/d)



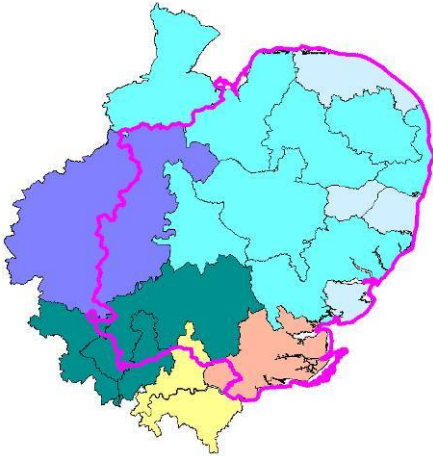
Kilometres



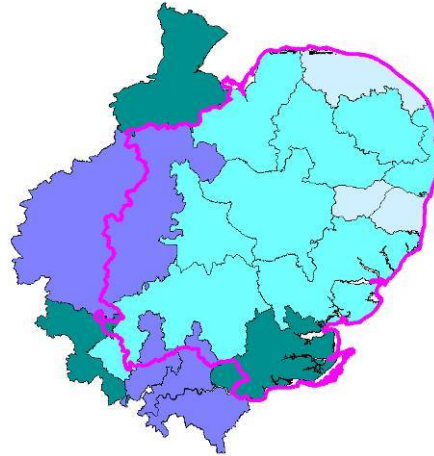
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Scenario 5: RSS Growth and EEIP Aspirations, Final Planning

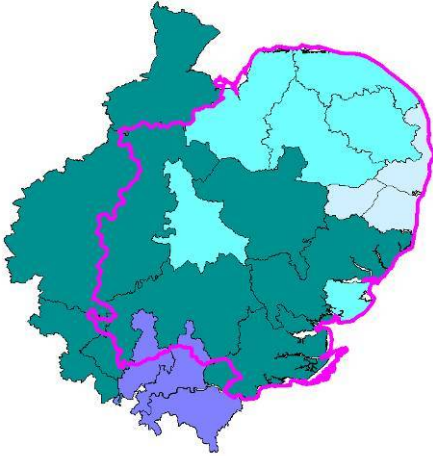
2010 - 2011



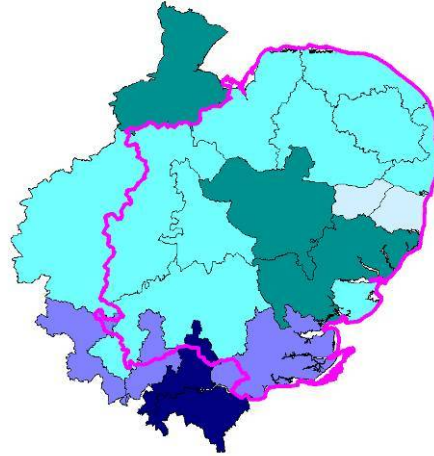
2015 - 2016



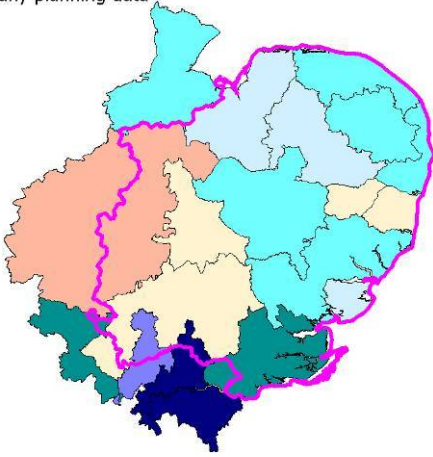
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

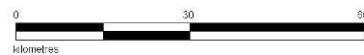
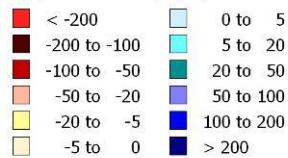


2040 - 2041 - Extrapolation of all housing policies & water company planning data



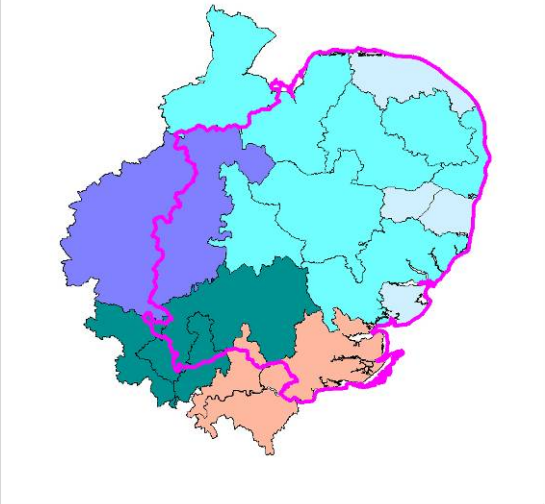
East of England Boundary

Surplus - Deficit (Ml/d)

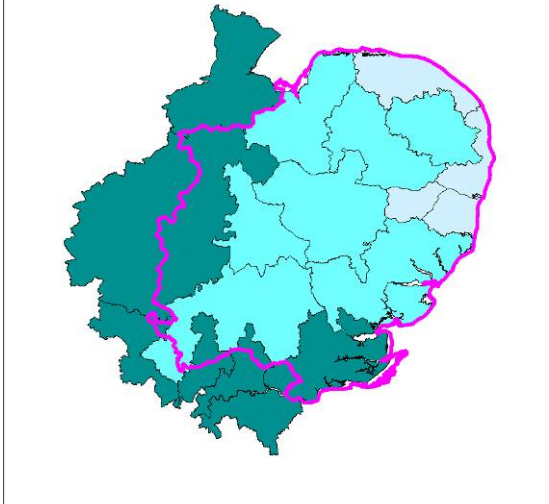


Scenario 6: NHPAU Lower Growth and Business as Usual Water Efficiency, Final Planning

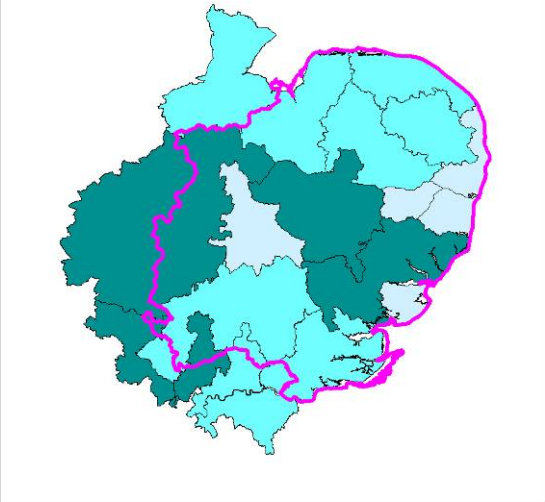
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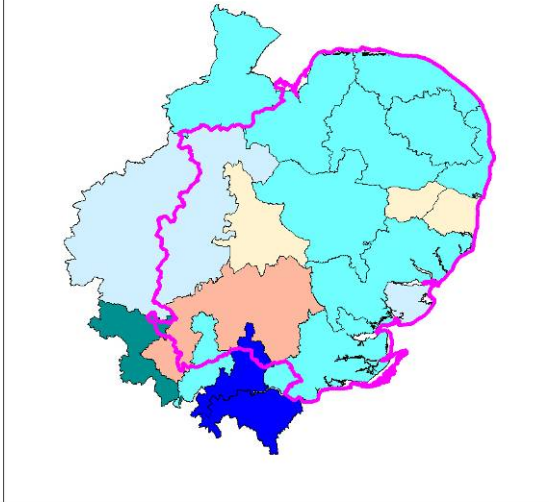
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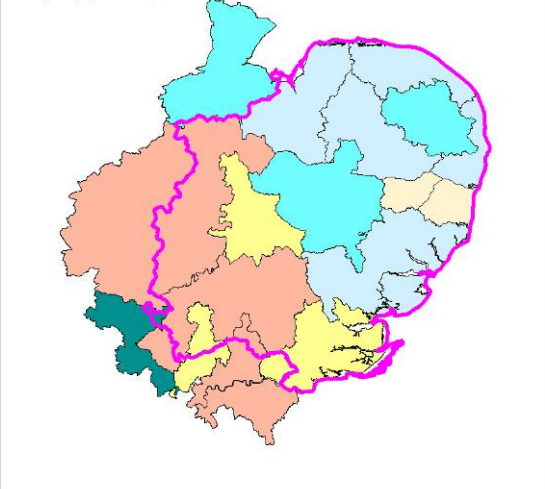
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2030 - 2031 - Extrapolation of all housing policies

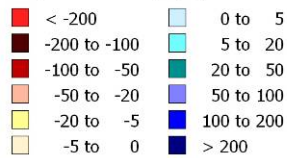


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

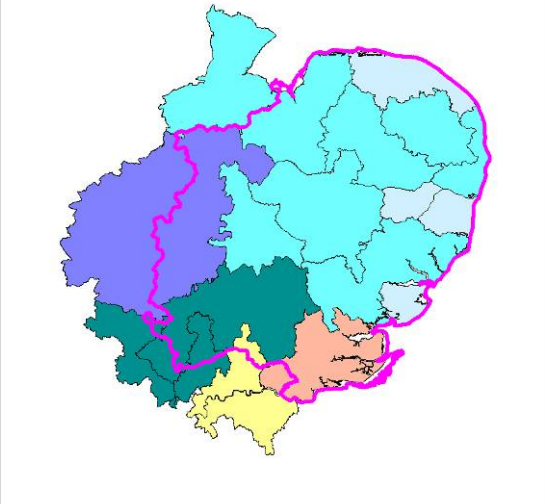
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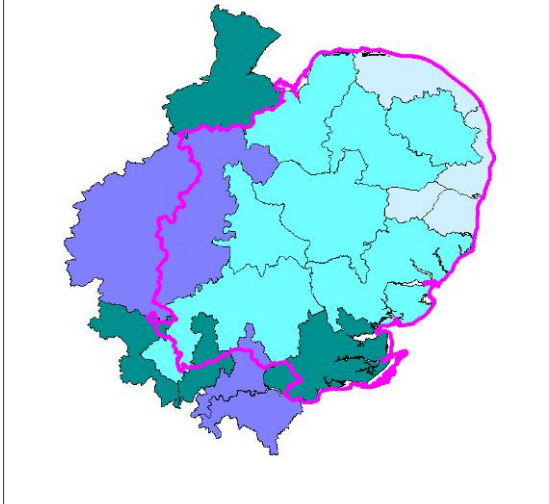
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Scenario 8: NHPAU Lower Growth and Efficient New Development, Final Planning

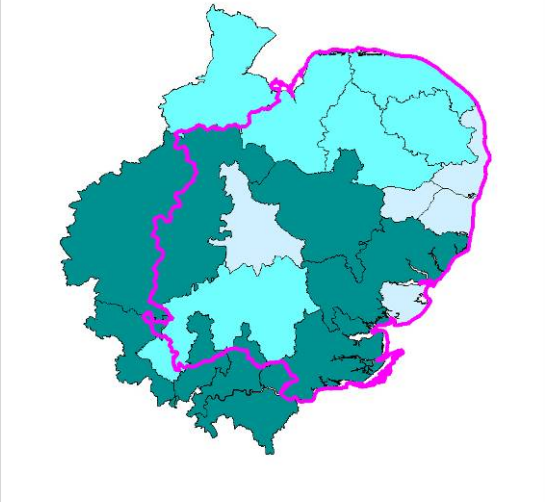
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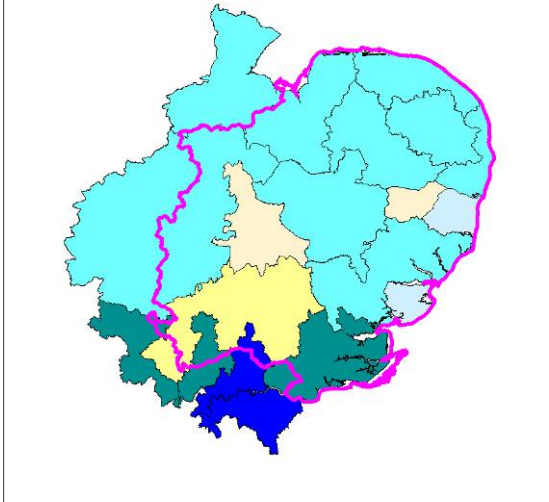
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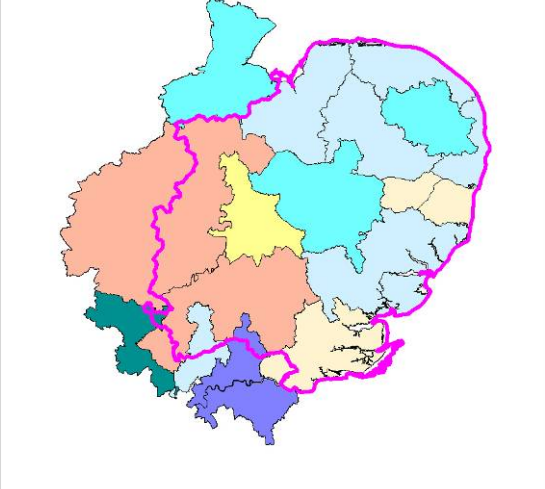
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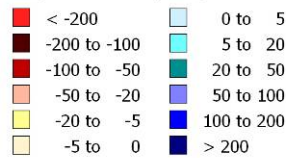


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

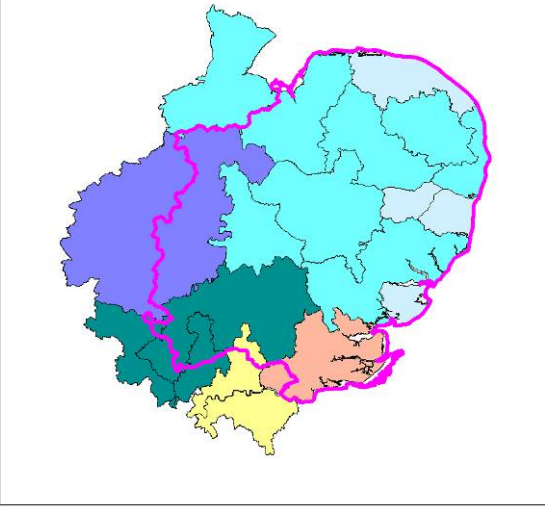
Surplus - Deficit (Ml/d)



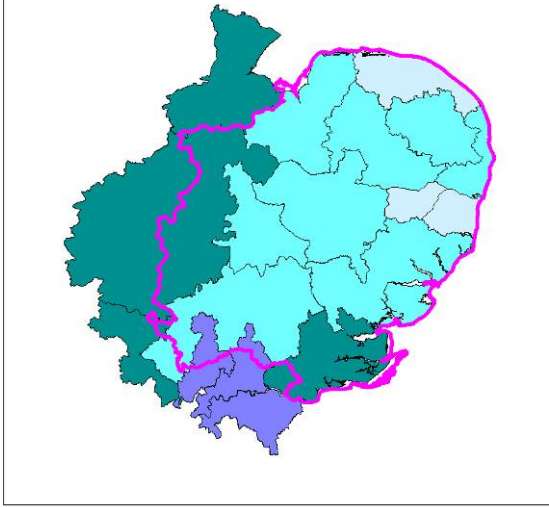
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Scenario 10: NHPAU Lower Growth ad EEIP Aspirations, Final Planning

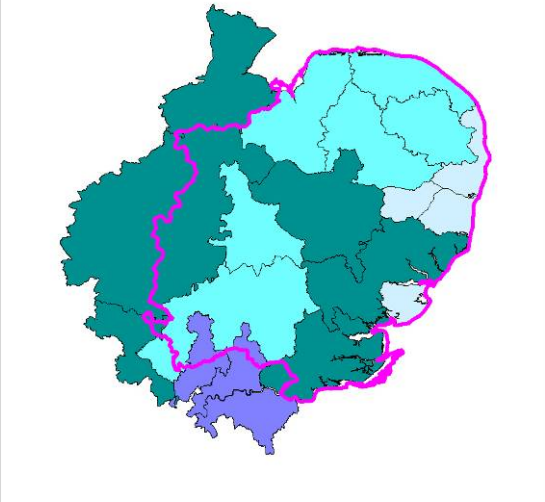
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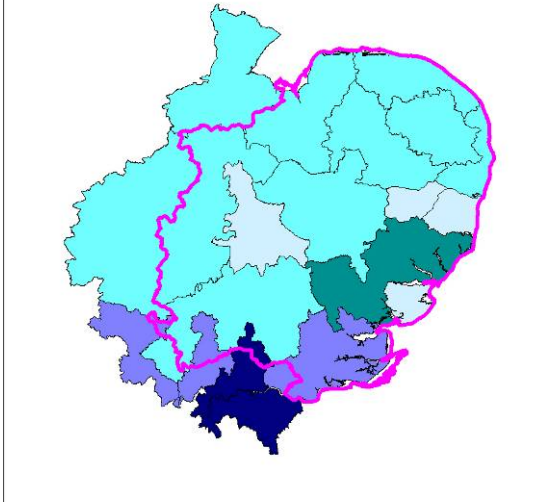
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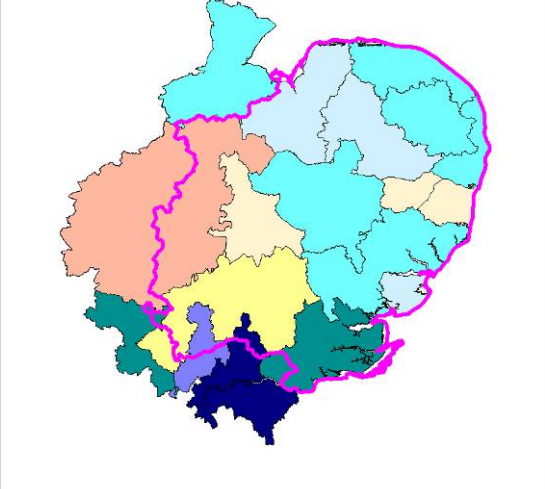
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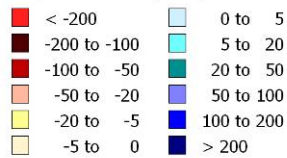


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

Surplus - Deficit (Ml/d)



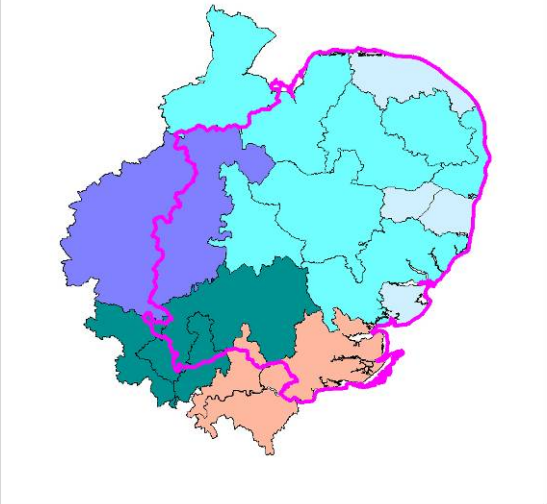
Kilometres



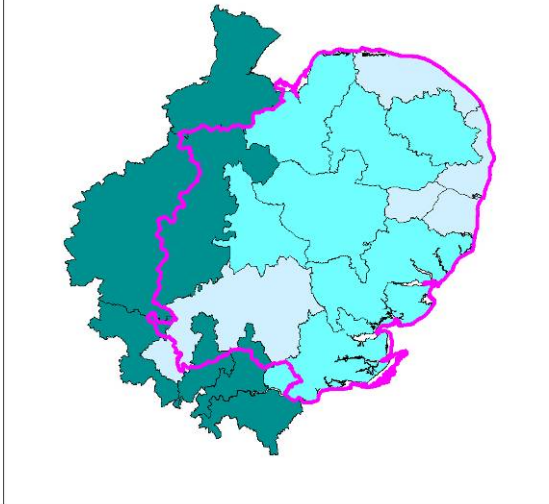
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Scenario 11: NHPAU Upper Growth and Business as Usual Water Efficiency, Final Planning

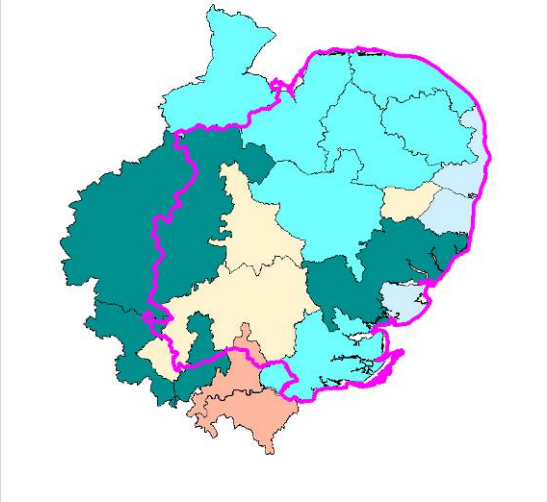
2010 - 2011



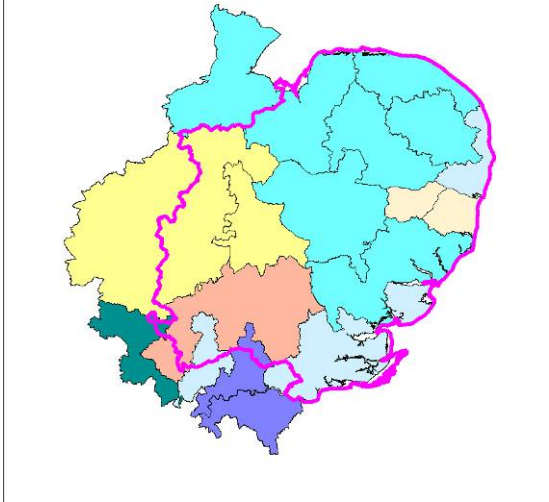
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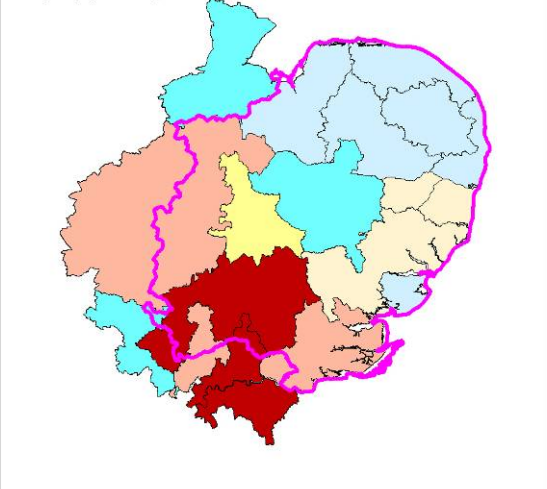
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2030 - 2031 - Extrapolation of all housing policies

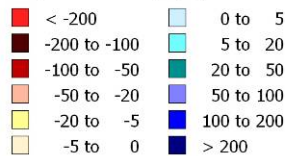


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

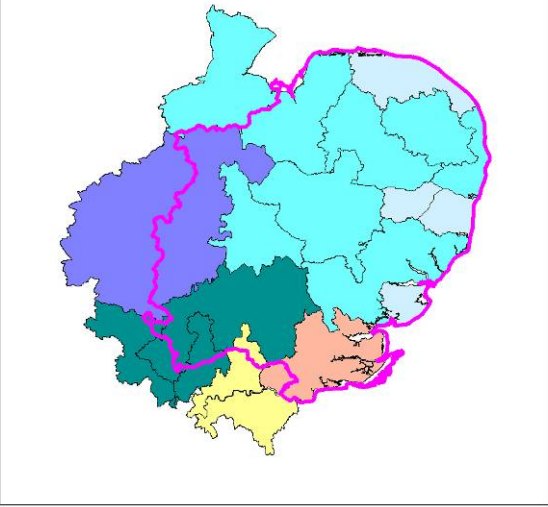
Surplus - Deficit (Ml/d)



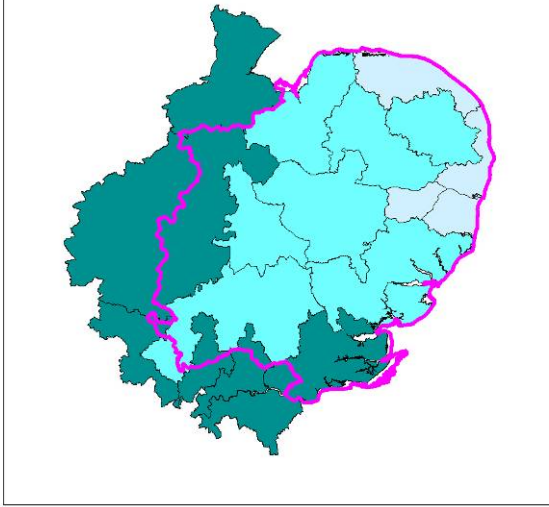
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Scenario 13: NHPAU Upper Growth and Efficient New Development, Final Planning

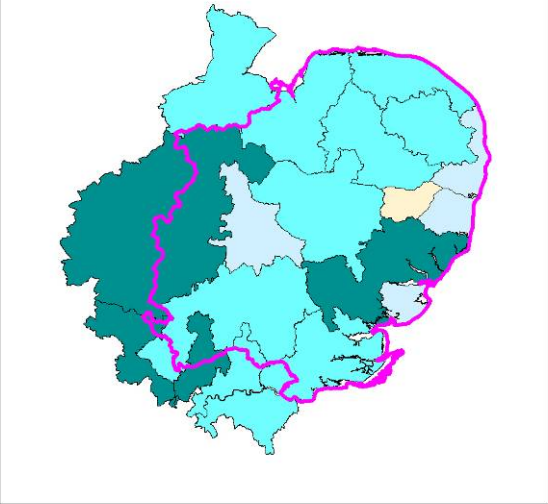
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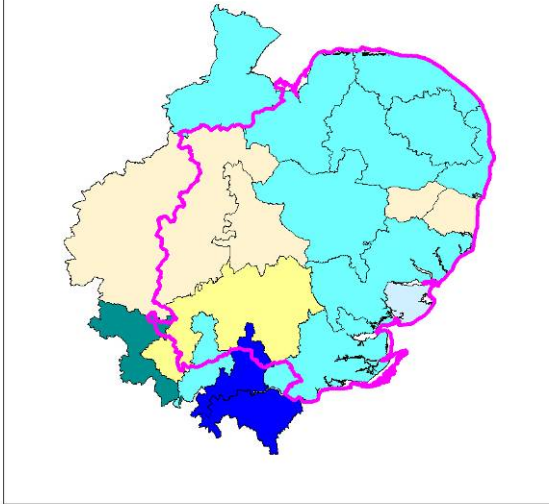
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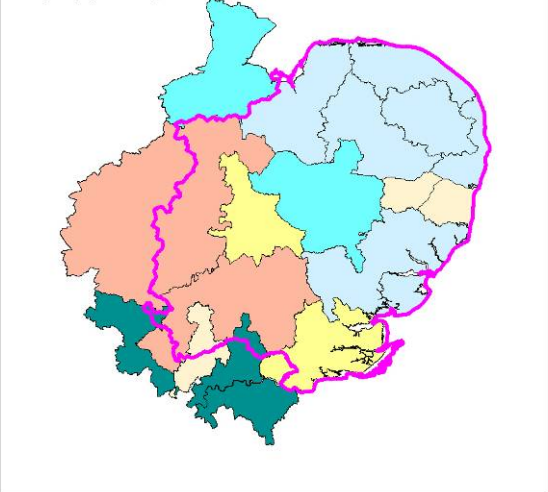
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

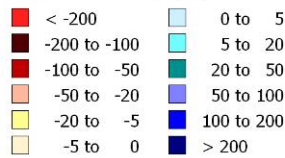


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

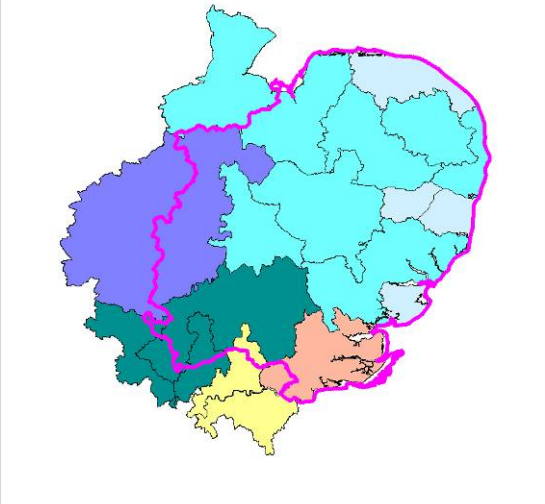
Surplus - Deficit (Ml/d)



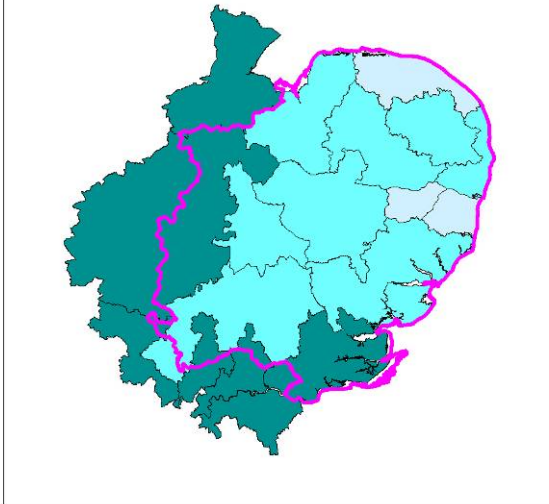
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Scenario 15: NHPAU Upper Growth and EEIP Aspirations, Final Planning

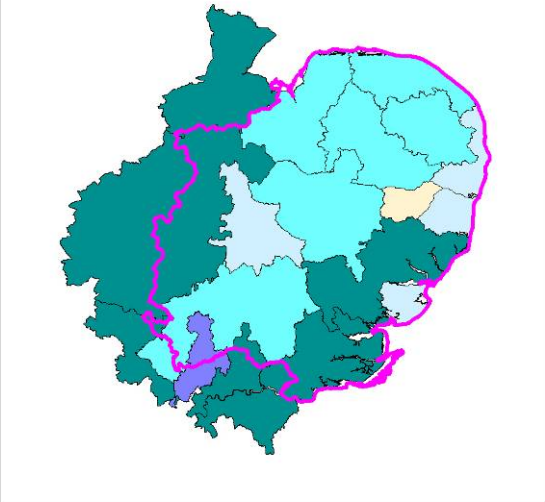
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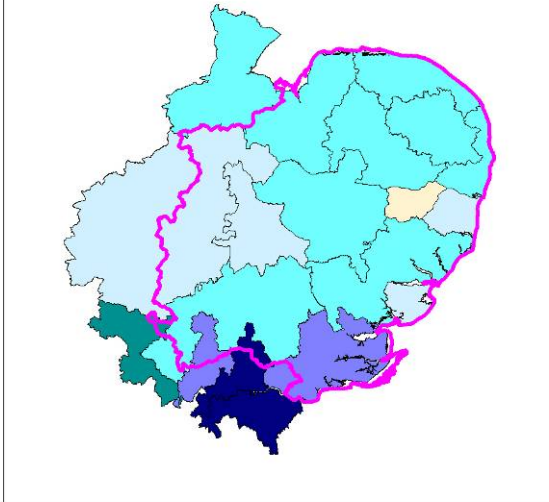
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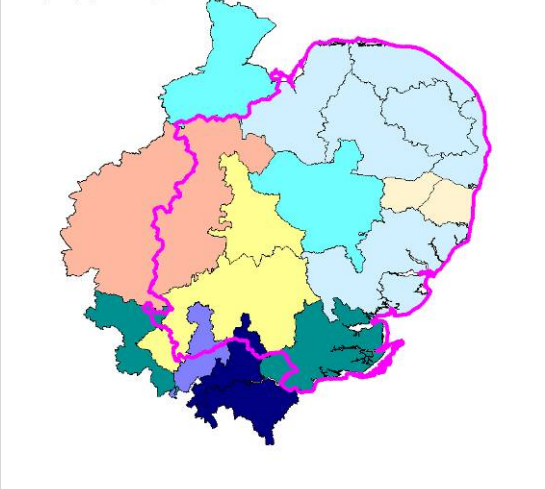
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

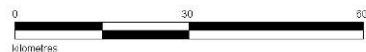
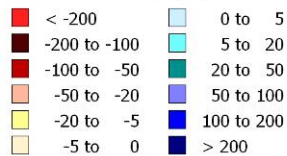


2040 - 2041 - Extrapolation of all housing policies & water company planning data



 East of England Boundary

Surplus - Deficit (Ml/d)



Model Run 02 Feb 09 09: 28

5.4 Results Commentary

A complete set of output maps and graphs are included in **Appendices C** and **D** respectively.

Results for the following key scenarios (including maps and graphs) have been provided in this section to provide a broad overview of the study findings, in particular focussing on the upper and lower end extremes:

- Scenario 0: Water Company Housing and Business as Usual – Final Planning
- Scenario 1: RSS Growth and Business As Usual, Final Planning
- Scenario 3: RSS Growth and Efficient New Development, Final Planning
- Scenario 5: RSS Growth and EEIP Aspirations, Final Planning
- Scenario 6: NHPAU Lower Growth and Business As Usual, Final Planning
- Scenario 8: NHPAU Lower Growth and Efficient New Development, Final Planning
- Scenario 10: NHPAU Lower Growth and EEIP Aspirations, Final Planning
- Scenario 11: NHPAU Upper Growth and Business As Usual, Final Planning
- Scenario 13: NHPAU Upper Growth and Efficient New Development, Final Planning
- Scenario 15: NHPAU Upper Growth and EEIP Aspirations, Final Planning

5.4.1 Scenario 0: Water Company Housing and Business as Usual – Final Planning

Initial deficits are shown during 2010/11 in both Essex and London water resource zones. By 2015/16, these deficits are removed by the inclusion of new schemes as detailed in the water resources management plans. Between 2015/16 and the end of the water resources planning horizon, all zones remain in surplus and the impacts of future growth, impacts of climate change and expected sustainability reductions are addressed through 'twin track' schemes. The mapped period of 2040/41 shows some deficits in six zones, but totalling only 29 Ml/d. However, this is beyond the end of the water resources planning horizon, meaning the companies have not reported on demands beyond 2035. However, it does give an indication of what may occur due to the continuing pressures of climate change, population growth assuming that no further water is made available.

5.4.2 Scenario 1: RSS Growth and Business As Usual Water Efficiency, Final Planning

The difference between scenario 1 and scenario 0 is the assumed growth that is built into the forecasts. Figure 3 shows that through to 2025/26, total water company estimates of housing growth for the 18 water resource zones considered here are consistent with the policy housing growth estimated from this project. This is demonstrated in **Table 12** with total surplus / deficits which are at most only 5 MI/d different between these two scenarios in 2020/21. Beyond 2025/26, at the regional level, water companies have tapered the growth rates while this study has assumed a continued rate and this explains deviations between these two scenarios in 2030/31 and 2040/41 of 24 MI/d and 123 MI/d respectively.

For the individual resource zones, the map shows that in 2010/11, the London zone has a greater deficit under policy growth rates in this scenario compared with those built into the water company plan (scenario 0). However, this change is only marginal and happens to coincide with a change in threshold. Otherwise, the map shows all resource zones in surplus through to 2030/31 when there are 3 resource zones in deficit, with a combined deficit of 19 MI/d. These are Northern (TVW), Hartismere (ESW) and Cambridge Water Company with deficits of 16 MI/d, 0.2 MI/d and 2.8 MI/d respectively. **Table 4** provides the explanation of these deficits; that the high level modelling undertaken for this study has calculated housing forecasts greater than those undertaken by the water company. As discussed in section 2.4, it is expected that the water companies have calculated housing numbers based on output areas rather than local authority level and would be expected to be more accurate. This should be remembered when considering all other scenarios. Elsewhere, this scenario shows the surplus in the large Ruthamford zone beginning to fall, and reflects Anglian Water's assumptions that housing construction rate falls away after 2025/26. By 2040/41, a further five resource zones have predicted deficits with a combined deficit of 106 MI/d. The presence of these deficits reflects continued growth at policy rates and extrapolation beyond the period covered by the water company plans.

5.4.3 Scenario 3: RSS Growth and Efficient New Development, Final Planning

Within this scenario of policy housing rates with efficient new development of 115 l/h/d for all new builds, the maps show that no deficits are anticipated by 2020/21. By 2030/31, only Northern resource zone has a deficit and this has been reduced to -4MI/d from -16 MI/d in scenario 1. The small deficits predicted in scenario 1 for Cambridge and Hartismere have both been removed due to the assumed impacts of greater water efficiency in scenario 1. By 2040/41, this scenario predicts there will be 5 resource zones in deficit with a combined deficit of 56MI/d.

For all 18 resource zones combined (i.e. including any over spilling into neighbouring regional planning authorities), **Table 12** shows the impact of introducing the efficient new development scenario over Business As Usual is estimated to be able to remove 50 MI/d of deficits by 2040/41.

5.4.4 Scenario 5: RSS Growth and EEIP Aspirations, Final Planning

By adopting the most rigorous water efficiency aspiration with average pccs falling to 125 l/h/d by 2030, all deficits are removed through to 2030/31. By 2040/41, five resource zones are in deficit with a combined deficit of 31 MI/d. The majority of this deficit falls within Ruthamford zone with a deficit of 29 MI/d. This deficit is not significantly reduced from the Business As Usual Scenario (scenario 1) with a deficit of 31 MI/d and reflects the already low average pcc's within the company plan.

For all 18 resource zones (i.e. including any over spilling into neighbouring regional planning authorities), Table 12 shows that the impact of introducing the EEIP aspiration scenario would be to remove 75 MI/d of deficits whilst saving 549 MI/d of water by 2040/41 given the assumed RSS growth as derived in this study.

5.4.5 Scenario 6: NHPAU Lower Growth and Business As Usual Water Efficiency, Final Planning

Adopting the NHPAU Lower housing growth and the Business As Usual water efficiency scenario, the surplus / deficit map shows there are no additional deficits introduced through to 2020/11 over the policy growth rate, with the exception of the marginal increase in London in 2010/11. In 2030/31, there are four resource zones with a combined deficit of 27 MI/d and this increased to eight resource zones with a combined deficit of 146 MI/d. A comparison with the policy growth rate in scenario 1 shows that the impact of the NHPAU Lower housing growth rates would introduce additional deficits of 8MI/d and 40 MI/d in 2030/31 and 2040/41 respectively.

5.4.6 Scenario 8: NHPAU Lower Growth and Efficient New Development, Final Planning

In this scenario, the impact of the Efficient New Development mostly more than compensates for the increased housing growth in the NHPAU Lower growth rate. This is shown in the surplus deficits maps where the majority of resource zones through to 2030/31 are within the same category as scenario 1, policy growth and business as usual water efficiency. This is shown in **Table 12** where this scenario has combined deficits of 9 MI/d and 70 MI/d in 2030/31 and 2040/41, which outperform the equivalent deficits in scenario 1 of 19MI/d and 106 MI/d respectively.

5.4.7 Scenario 10: NHPAU Lower Growth and EEIP Aspirations, Final Planning

As shown in the surplus / deficit maps, with the exception of the initial deficits in 2010/11, all deficits are removed through to 2030/31. This includes the deficits in Cambridge, Northern and Hartismere water resource zones introduced by the housing distribution derived in this study. These are assumed to be less accurate as they are undertaken on a more coarse resolution to those determined by the water companies. **Table 12** shows that this water efficiency scenario when applied to the NHPAU Lower growth rate saves 102 MI/d of deficits within the 18 resource zones by 2040/41. This scenario also provides a reduction of 62 MI/d of deficits compared with scenario 1 (business as usual and RSS policy growth rates).

5.4.8 Scenario 11: NHPAU Upper Growth and Business As Usual Water Efficiency, Final Planning

This scenario considers the impact of the NHPAU Upper Growth Rate. The impact is to introduce deficits in four zones in 2020/21 totalling 26 MI/d which do not occur existing under RSS Housing policy growth rates. By 2030/31, a total of five resource zones are in deficit with a combined total of 52 MI/d, compared with 3 resource zones and 19 MI/d of deficit for policy growth rates. For the 2040/41, 42 MI/d of deficits in nine resource zones are modelled, compared with 106 MI/d in eight resource zones for policy growth rates.

5.4.9 Scenario 13: NHPAU Upper Growth and Efficient New Development, Final Planning

Under the efficient New Development scenario, for the NHPAU Upper growth there is one zone in marginal deficit by 2020/21. By 2030/31, as with Business As Usual, there are still five zones in deficit, with the magnitude of these deficits are reduced to 26 MI/d. By 2040/41 there are seven zones in deficit with a total magnitude of deficits of 105 MI/d.

5.4.10 Scenario 15: NHPAU Upper Growth and EEIP Aspirations, Final Planning

With the EEIP aspirational scenario, with the exception of the initial deficits in 2010/11 in Essex and London resource zones and the marginal deficits in Hartismere resulting from the resolution of the housing data used in this study, all deficits are removed. In 2040/41, there remain five resource zones in deficit with combined deficits of 70 MI/d. This scenario then offsets any increase in demand resulting from the Upper NHPAU housing numbers, and further reduces the deficits in policy growth housing from scenario 1 by 36 MI/d.

5.5 Modelling Assumptions Sensitivity

Section 4.7 considers the three major assumptions in the modelling. Whilst the impact of the assumption of extrapolated growth rates and limitations of data resolution for generating resource zone growth rates are discussed in the commentary for each scenario, this section considers the impact of the assumptions regarding occupancy rates.

As noted in the methodology, the assumption in CoPS is that all new build growth has the same occupancy rate as the reported combined (existing and new build) measured occupancy rate in the water resources planning table WRP4. This means that additional housing growth (at whatever rate) will reflect an inward migration into the region, rather than a reduction in occupancy rates in the existing household stock.

This is a significant assumption and is tested by considering data presented in the water company plans in **Table 6**. As reported in section 2.5, further work was not possible for all resource zones due to the limitations of the data most notably that this data had been presented at a company level by Anglian Water rather than at the resource zone level.

This table also shows that in nearly all resource zones, the occupancy rates of new houses are forecast to be greater than those of existing and new houses combined. This means that for the periods where water companies' forecasts of household growth are consistent with the policy rates used here, and for the Business As Usual, Defra's Aspirations and EEIP Aspirations water efficiency scenarios, there will be no impact. For the New Building Regulations and Efficient New Development scenarios, this assumption will have the effect of reducing the savings from the new development. This is because this assumption will underestimate the population allocated to new builds with a corresponding overestimation of population in existing housing stock and in these two scenarios, the increased water efficiency measures only apply to the new build population.

There could also be an impact where growth rates within the company plan vary from those in the policy or NHPAU growth scenarios. The assumption in this study is that varying new build growth rates will not impact upon existing housing stock. This assumption is untested. New builds are assumed to be populated with the lower combined occupancy rate (as shown in **Table 6**) as opposed to the higher new build occupancy rates. This will go some way to offsetting an arguably required but unmodelled reduction in existing housing growth rates.

6 Conclusions and Recommendations

6.1 Conclusions

The following conclusions have been drawn from the analysis carried out for this report:

- At the regional level, water companies have mostly accounted for East of England Plan housing forecasts as identified in the RSS policy H1 within their draft water resource management plans. Water companies have also made appropriate allowance for growth within the neighbouring regions.
- At the water resource zone level, there remains some discrepancy between water company housing estimates and RSS policy requirements generated for this study. The larger percentage differences coincide with the smaller resource zones and in areas with less growth required by RSS policy. This may be due to limitations in assigning growth at local authority level (method adopted here) rather than at output area (method adopted by water companies). The output area method is more accurate as it is at a greater resolution, though at the regional level water company and estimates from this study are broadly consistent.
- There are a range of assumptions regarding housing growth beyond the range of policy H1 (2020/21). In this study it has been assumed that housing growth continues at the RSS policy end rate through until 2030. However, water companies have generally assumed a reducing rate beyond 2020/21.
- A significant assumption behind this modelling is the selection of the occupancy rate and how this varies with the new build growth rate. This study has used measured household occupancy rates as reported in the draft water resources management plans. Modelled scenario demands would be increased if the derived occupancy rates for new builds were used as reported in the draft water resources management plans. However, these were not used due to data limitations.
- Any increase in consumption due to growth over and above the RSS housing rates (e.g. those defined by the NHPAU scenarios) may be mostly offset by increased water efficiency such as the Efficient New Development scenario, and the more stringent East of England Implementation Plan aspiration scenario. On this basis alone, these water efficiency scenarios should be endorsed as a 'least regrets' approach.
- The water company final plans are likely to promote further water efficiency in order to meet expectations from Defra, Ofwat and the Environment Agency following the consultations on the draft water resources management plans.

- As forecast pcc becomes more stringent, extra care should be made to ensure that housing growth forecasts are as accurate as possible. This is because as pccs become lower, there is less opportunity for further savings.

6.2 Recommendations

The following recommendations are made:

- Further work is undertaken to explain the inconsistencies between the housing growth represented in the water company plans and those derived for this study from RSS policy. This is expected to be an issue regarding data resolution and distribution of assumed growth within the local authority.
- It is expected that there will be considerable change to demand forecasts following submission of the water company final water resource plans, and also from submission of the statement of responses. This study should be updated upon significant changes to the supply demand balance.
- Further work is undertaken to establish robust disaggregated pccs. This may require liaison with water companies and would be best undertaken as part of the audit process of resubmitted water resource management plans.
- Further thought should be given to the interaction between projected housing growth rates beyond the informed policy period and respective expected population growth.

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8 Glossary and List of Abbreviations

Actual Headroom	The difference between water available for use and demand at any given point
AMP	Asset Management Plan
AWS	Anglian Water Services
Baseline Planning	A water company's supply demand balance forecast based on existing demand management and water resources schemes. As opposed to Final Planning
BAU	Business As Usual
BREEAM	Building Research Establishment Environmental Assessment Method
CoPS	Company Plan Scenarios model
CWC	Cambridge Water Company
DCLG	Department for Communities and Local Government
Defra	Department for Environment, Food and Rural Affairs
Dry Year Annual Average	The level of demand, which is just equal to the maximum annual average which, can be met without the introduction of water company demand restrictions at anytime during the year.
dWRMP	Draft Water Resources Management Plan, submitted as part of PR09
EA	Environment Agency
EcoTown	EcoTowns will offer the opportunity to achieve high standards of sustainable living while also maximising the potential for affordable housing. EcoTowns will be designed to meet the highest standards of sustainability, including low and zero carbon technologies and good public transport, and will lead the way in design, facilities and services, and community involvement. It is expected that there will be up to 5 EcoTowns by 2016 and ten by 2020, each ranging in size between 5,000 - 20,000 homes.
EEDA	East of England Development Agency
EERA	East of England Regional Assembly
EMRA	East Midlands Regional Assembly
ESW	Essex & Suffolk Water
Final Planning	A water company's supply demand balance forecast based on its favoured approach to demand management and implementation of water resources schemes. As opposed to Baseline Planning
GLA	Greater London Assembly
l/h/d	Litres per head per day (the standard unit of measurement for per capita consumption, pcc)
MKSM	Milton Keynes South Midlands growth area
MI/d	Megalitres per day, i.e. 1000,000 litres per day. Sufficient to supply about 2000-3000 homes
NHPAU	National Housing and Planning Advice Unit
Ofwat	Water Services Regulation Authority
pcc	Per capita consumption, expressed in l/h/d
PR04, PR09	Periodic Review 2004, 2009 etc – the Ofwat review of prices
RES	Regional Economic Strategy

RSA	Restoring Sustainable Abstraction
RSS	Regional Spatial Strategy
RSS14	East of England RSS
RSS8	East Midlands RSS
RSS9	South East RSS
SEERA	South East England Regional Assembly
Surplus/deficit Sustainability reductions	Actual headroom less target headroom in a water resource zone Reductions in the output (yield) of a water company's water resources as a result of statutory and or environmental duties including the Habitats Directive legislation. This typically involves a change to an abstraction licence(s)
Target Headroom	The threshold of minimum acceptable Headroom, which would trigger the need for water resources options to increase water available for use or a reduction in demand. The target headroom can be regarded as a built in buffer to future uncertainties in such factors as climate change and pollution Impacts.
THWS	Tending Hundred Water Services
TVW	Three Valleys Water
TWU	Thames Water Utilities
WAFU	Water available for use – the value in Ml/d calculated by the deduction from deployable output of allowable outages in a resource zone
WCo	Water Company
WRP	Water Resource Plan All water companies submit water resources plans as part of the periodic review of water company prices. These plans show how they intend to manage water supply and demand for the next 25 years. The Agency analyses these plans and provides advice to Ministers.
WRMP	Water Resource Management Plan
WRZ	Water resource zone – the largest possible zone in which all resources, including external transfers, can be shared and hence the area in which all customers experience the same risk of supply failure from a resource shortfall.

APPENDIX A Housing Source Data

Source: East of England Plan, May2008 – Table H1				
Area / District	Minimum Dwelling Provision, 2001 to 2021 (net increase, with annual average rates in brackets ¹)			Comments
	Minimum to build April 2001 to March 2021	<i>Of which already built April 2001 to March 2006</i>	Minimum still to build April 2000 to March 2021	
MKSM Strategy Area: Bedford/ Kempston/ Northern Marston Vale	19,500	2,380 (480)	17,120	See footnote ²
MKSM Strategy Area: Luton/ Dunstable/ Houghton Regis together with Leighton Linlade	26,300	4,400 (880)	21,900	
Rest of Bedford BC	1,300	1,020 (200)	280 (20)	
Rest of Mid Beds	11,000	3,120 (620)	7,880 (530)	
Rest of South Beds	1,000	170 (30)	830 (60)	
Bedfordshire & Luton	59,100	11,090 (2,220)	48,010 (3,200)	
Cambridge	19,000	2,300 (460)	16,700 (1,110)	
East Cambs	8,600	3,240 (650)	5,360 (360)	
Fenland	11,000	3,340 (670)	7,660 (510)	
Huntingdonshire	11,200	2,890 (580)	8,310 (550)	
South Cambs	23,500	3,520 (700)	19,980 (1,330)	
Peterborough UA	25,000	3,620 (730)	21,380 (1,420)	
Cambridgeshire & Peterborough	98,300	18,910 (3,780)	79,390 (5,290)	

Continued

Area / District	Minimum Dwelling Provision, 2001 to 2021 (net increase, with annual average rates in brackets ¹)			Comments
	Minimum to build April 2001 to March 2021	Of which already built April 2001 to March 2006	Minimum still to build April 2000 to March 2021	
Basildon	10,700	1,220 (240)	9,480 (630)	Figures include an indicative allowance for 2,200 outside Essex Thames Gateway.
Braintree	7,700	3,360 (670)	4,340 (290)	
Brentwood	3,500	920 (180)	2,580 (170)	
Castle Point	4,000	1,010 (200)	2,990 (200)	
Chelmsford	16,000	3,570 (720)	12,430 (830)	
Colchester	17,100	4,640 (930)	12,460 (830)	
Epping Forest	3,500	1,210 (240)	2,290 (150)	Figures exclude provision in urban extensions to Harlow, which is included within the figures for Harlow.
Harlow	16,000	810 (160)	15,190 (1,010)	Figures are for total housing growth at Harlow, including urban extensions in Epping Forest and East Hertfordshire Districts, the split between the districts to be determined through development plan documents.
Maldon	2,400	750 (150)	1,650 (110)	
Rochford	4,600	810 (160)	3,790 (250)	
Tendring	8,500	2,110 (420)	6,390 (430)	
Uttlesford	8,000	1,610 (320)	6,390 (430)	
Southend UA	6,500	2,130 (430)	4,370 (290)	
Thurrock UA	18,500	4,250 (850)	14,250 (950)	Figures apply to the part of the district within Essex Thames Gateway, but does not imply a moratorium on housing development outside Thames Gateway through re-use of previously developed land.
Essex, Thurrock and Southend	127,000	28,380 (5,670)	98,620 (6,580)	Includes Harlow urban extensions in East Hertfordshire.

Continued

Area / District	Minimum Dwelling Provision, 2001 to 2021 (net increase, with annual average rates in brackets ¹)			Comments
	Minimum to build April 2001 to March 2021	<i>Of which already built April 2001 to March 2006</i>	Minimum still to build April 2000 to March 2021	
Broxbourne	5,600	1,950 (390)	3,650 (240)	
Dacorum	12,000	1,860 (370)	10,140 (680)	Figures include provision (the amount to be determined through Development Plan Documents) for any expansion of Hemel Hempstead within St Albans District
East Hertfordshire	12,000	2,140 (430)	9,860 (660)	Figures exclude provision in urban extensions to Harlow, which is included within the figures for Harlow.
Hertsmere	5,000	1,080 (220)	3,920 (260)	
North Hertfordshire	6,200	1,900 (380)	4,300 (290)	Figures exclude provision for 9,600 as urban extensions to Stevenage included in the Stevenage figure ² and any urban extensions to Luton, reflecting the Milton Keynes South Midlands Sub-Regional Strategy.
St Albans	7,200	1,830 (370)	5,370 (360)	Figures exclude provision (the amount to be determined through Development Plan Documents) for any expansion of Hemel Hempstead within St Albans District, which is included in the Dacorum total.
Stevenage	16,000	1,570 (310)	14,430 (960)	Figures include provision for 9,600 outside the Borough boundary in North Hertfordshire
Three Rivers	4,000	1,010 (200)	2,990 (200)	
Watford	5,200	1,410 (280)	3,790 (250)	
Welwyn Hatfield	10,000	2,730 (550)	7,270 (480)	
Hertfordshire	83,200	17,480 (3,500)	65,720 (4,380)	Excludes Harlow urban extensions in East Hertfordshire and any urban extensions to Luton, reflecting the Milton Keynes South Midlands Sub-Regional Strategy.

Continued

Area / District	Minimum Dwelling Provision, 2001 to 2021 (net increase, with annual average rates in brackets ¹)			Comments
	Minimum to build April 2001 to March 2021	<i>Of which already built</i> <i>April 2001 to March 2006</i>	Minimum still to build April 2000 to March 2021	
Breckland	15,200	3,460 (690)	11,740 (780)	Figures include 6,000 at Thetford
Great Yarmouth	6,000	1,190 (240)	4,810 (320)	
King's Lynn & W Norfolk	12,000	2,540 (510)	9,460 (630)	
North Norfolk	8,000	1,720 (340)	6,280 (420)	
Norwich	14,100	3,490 (700)	10,610 (710)	
				Figures for Broadland and South Norfolk include provision related to Norwich as part of the Norwich policy area, for which there is a total of 33,000. District totals for Norwich, Broadland and South Norfolk are indicative only and may be varied by mutual agreement provided they sum to 37,500.
Broadland	12,200	1,680 (340)	10,520 (700)	
South Norfolk	11,200	2,280 (460)	8,920 (590)	
Norfolk	78,700	16,360 (3,270)	62,340 (4,160)	
Babergh	5,600	1,340 (270)	4,260 (280)	Figures include about 600 on the edge of Ipswich as part of the Ipswich policy area
Forest Heath	6,400	810 (160)	5,590 (370)	
Ipswich	15,400	2,880 (580)	12,520 (830)	Figures are for Ipswich Borough only. Total in Ipswich Policy Area will be at least 20,00 including development in Babergh, Mid Suffolk and Suffolk Coastal.
Mid Suffolk	8,300	1,900 (380)	6,400 (430)	Figures include about 800 on the edge of Ipswich as part of the Ipswich policy area
St Edmundsbury	10,000	1,960 (390)	8,040 (540)	
Suffolk Coastal	10,200	2,560 (510)	7,640 (510)	Figures include about 3,200 on the edge of Ipswich as part of the Ipswich policy area
Waveney	5,800	2,160 (430)	3,640 (240)	
Suffolk	61,700	13,600 (2,720)	48,100 (3,210)	
East of England	508,000	105,550 (21,120)	402,450 (26,830)	

EMRA Housing Forecasts

Source: East Midlands Regional Plan – Secretary of State’s Proposed Changes, Policy 13, July 2008

Policy 13

Regional Housing Provision

Housing provision in each district and unitary authority area should be made at the average annual rates set out below:

District / HMA	2001-06	2006-11	2011-16	2016-26	Total Provision (2001-26)
Central Lincs HMA	1,790	1,880	1,980	2,140	49,650
Lincoln *	400	640	870	1,230	21,850
N Kesteven	550	550	560	570	14,000
West Lindsey	840	690	550	340	13,800
Coastal Lincs HMA	950	880	820	20	13,450
Boston **	370	300	240	-	4,550
East Lindsey**	580	580	580	20	8,900
Peterborough Partial HMA	1,480	1,350	1,310	1,080	31,500
Rutland	230	150	150	160	4,250
S Holland **	610	550	490	220	10,450
S Kesteven	640	650	670	700	16,800
Nottingham Outer HMA	1,350	1,540	1,740	2,030	43,450
Ashfield	440	490	540	610	13,450
Mansfield	300	390	490	630	12,200
Newark & Sherwood	610	660	710	790	17,800
Northern HMA	1,250	1,360	1,470	1,630	36,700
Bolsover	260	320	380	460	9,400
Chesterfield	400	390	390	370	9,600
NE Derbyshire	230	290	350	450	8,850
Bassetlaw	360	360	350	350	8,850
Peak, Dales & Park HMA	500	500	500	500	12,500
Derbyshire Dales	160	170	190	220	4,800
High Peak	340	330	310	280	7,700
PDNPA	-	-	-	-	-
Derby HMA	1,650	2,150	1,930	1,610	44,750
Derby	670	1,120	850	450	17,700
Amber Valley	330	400	470	580	11,800

<i>S Derbyshire</i>	<i>650</i>	<i>630</i>	<i>610</i>	<i>580</i>	<i>15,250</i>
<i>Leicester & Leics HMA</i>	<i>3,230</i>	<i>4,060</i>	<i>4,050</i>	<i>4,030</i>	<i>97,000</i>
<i>Leicester</i>	<i>850</i>	<i>1,520</i>	<i>1,370</i>	<i>1,130</i>	<i>30,000</i>
<i>Blaby</i>	<i>210</i>	<i>260</i>	<i>340</i>	<i>460</i>	<i>8,650</i>
<i>Charnwood</i>	<i>670</i>	<i>810</i>	<i>800</i>	<i>790</i>	<i>19,300</i>
<i>Harborough</i>	<i>340</i>	<i>440</i>	<i>380</i>	<i>300</i>	<i>8,800</i>
<i>Hinckley & Bosworth</i>	<i>540</i>	<i>330</i>	<i>410</i>	<i>530</i>	<i>11,700</i>
<i>Melton</i>	<i>150</i>	<i>240</i>	<i>190</i>	<i>120</i>	<i>4,100</i>
<i>NW Leicestershire</i>	<i>380</i>	<i>370</i>	<i>470</i>	<i>610</i>	<i>12,200</i>
<i>Oadby & Wigston</i>	<i>90</i>	<i>90</i>	<i>90</i>	<i>90</i>	<i>2,250</i>
<i>Nottingham Core HMA</i>	<i>2,060</i>	<i>2,460</i>	<i>2,820</i>	<i>3,380</i>	<i>70,500</i>
<i>Erewash</i>	<i>290</i>	<i>320</i>	<i>340</i>	<i>390</i>	<i>8,650</i>
<i>Nottingham</i>	<i>1,010</i>	<i>1,080</i>	<i>1,130</i>	<i>1,200</i>	<i>28,100</i>
<i>Broxtowe</i>	<i>230</i>	<i>280</i>	<i>320</i>	<i>390</i>	<i>8,050</i>
<i>Gedling</i>	<i>230</i>	<i>300</i>	<i>370</i>	<i>470</i>	<i>9,200</i>
<i>Rushcliffe</i>	<i>300</i>	<i>480</i>	<i>660</i>	<i>930</i>	<i>16,500</i>
<i>North Northamptonshire</i>	<i>2,225</i>	<i>2,605</i>	<i>2,795</i>	<i>2,795</i>	<i>66,075</i>
<i>Corby *</i>	<i>560</i>	<i>680</i>	<i>1,060</i>	<i>1,060</i>	<i>22,100</i>
<i>Kettering</i>	<i>550</i>	<i>810</i>	<i>630</i>	<i>630</i>	<i>16,250</i>
<i>East Northamptonshire</i>	<i>520</i>	<i>520</i>	<i>420</i>	<i>420</i>	<i>11,500</i>
<i>Wellingborough</i>	<i>595</i>	<i>595</i>	<i>685</i>	<i>685</i>	<i>16,225</i>
<i>West Northamptonshire</i>	<i>2,170</i>	<i>2,320</i>	<i>2,640</i>	<i>2,650</i>	<i>62,150</i>
<i>Daventry</i>	<i>540</i>	<i>540</i>	<i>540</i>	<i>540</i>	<i>13,500</i>
<i>Northampton *</i>	<i>1,300</i>	<i>1,450</i>	<i>1,770</i>	<i>1,780</i>	<i>40,400</i>
<i>South Northamptonshire</i>	<i>330</i>	<i>330</i>	<i>330</i>	<i>330</i>	<i>8,250</i>
<i>East Midlands</i>	<i>18,655</i>	<i>21,105</i>	<i>22,055</i>	<i>21,865</i>	<i>527,725</i>

**Figures for Lincoln, Corby and Northampton include any provision made in urban extensions which may need to extend across local authority boundaries, or be located on the edge of the existing built up areas related to these local authorities, including sites which may be wholly located in adjacent authorities. Such provision would be subject to agreement by all relevant local planning authorities and would be additional to the original figures for the 'receiving authorities' in the above table.*

***All figures for 2006-2026 are minima except those for East Lindsey, Boston and South Holland which are maxima pending the agreement of a Lincolnshire Coast Strategy.*

SEERA Housing Forecasts

Source: SEERA Secretary of State's Proposed Changes: Policy H1
<http://gose.limehouse.co.uk/portal/rss/pcc/consult?pointId=1201122891581#section-1201122891581>, accessed 27/01/2009)

District / Strategic Development Area	Annual Average	Total
		2600
Adur ¹	130 <u>105</u>	<u>2100</u>
Shoreham Harbour ¹	<u>500</u>	<u>10000</u>
		9300
Arun	465 <u>565</u>	<u>11300</u>
Ashford	<u>1135</u>	<u>22,700</u>
		21200
Aylesbury Vale ²	1060 <u>1345</u>	<u>26900</u>
		16500
Basingstoke & Deane	825 <u>945</u>	<u>18900</u>
		10780
BracknellForest	539 <u>639</u>	<u>12780</u>
		11000
Brighton & Hove	550 <u>620</u>	<u>12400</u>
		7200
Canterbury	360 <u>510</u>	<u>10200</u>
		11800
Cherwell	590 <u>670</u>	<u>13400</u>
		8600
Chichester	430 <u>480</u>	<u>9600</u>
		2400
Chiltern	120 <u>145</u>	<u>2900</u>
Crawley	350 <u>375</u>	7000 <u>7500</u>
Dartford	785 <u>867</u>	15700 <u>17340</u>
Dover	305 <u>505</u>	<u>6400</u>

		<u>10100</u>
East Hampshire ³	260	5200
<u>East Hampshire ³ (Whitehill / Bordon)</u>	<u>275</u>	<u>5500</u>
Eastbourne	240	4800
Eastleigh	354	7080
		4620
Elmbridge	231 <u>281</u>	<u>5620</u>
Epsom & Ewell	481 <u>199</u>	3620 <u>3980</u>
Fareham ⁴	186	3720
Fareham SDA	500	10000
Gosport	125	2500
Gravesham	465	9300
		6440
Guildford	322 <u>422</u>	<u>8440</u>
Hart	200 <u>220</u>	4000 <u>4400</u>
Hastings	210	4200
Havant	315	6300
Horsham	620 <u>650</u>	12400 <u>13000</u>
Isle of Wight	520	10400
Lewes	220	4400
Maidstone	410 554	8200 <u>11080</u>
Medway	815	16300
Mid Sussex	705 <u>855</u>	14100 <u>17100</u>
		48800
Milton Keynes ⁵	2440 <u>2348</u>	<u>46960</u>
MoleValley	471 <u>188</u>	3420 <u>3760</u>
		4140
New Forest ⁶	207 <u>196</u>	<u>3920</u>
<u>New Forest National Park</u>	<u>11</u>	<u>220</u>

North East / North of		
Hedge End SDA ⁷	300	6000
		7000
Oxford	350 <u>400</u>	<u>8000</u>
South Oxford SDA	<u>200</u>	<u>4000</u>
Portsmouth	735	14700
Reading	521 <u>611</u>	10420 <u>12220</u>
Reigate & Banstead	387 <u>562</u>	7740 <u>11240</u>
Rother	280	5600
Runnymede ⁸	146 <u>286</u>	2920 <u>5720</u>
Rushmoor	310	6200
Sevenoaks	155 <u>165</u>	3100 <u>3300</u>
Shepway	255 <u>290</u>	5100 <u>5800</u>
		4700
Slough	235 <u>315</u>	<u>6300</u>
South Bucks	90 <u>94</u>	1800 <u>1880</u>
South Oxfordshire ⁹	510 <u>547</u>	10200 <u>10940</u>
Southampton	815	16300
Spelthorne	151 <u>166</u>	3020 <u>3320</u>
Surrey Heath	187	3740
Swale	415 <u>540</u>	8300 <u>10800</u>
Tandridge	112 <u>125</u>	2240 <u>2500</u>
		8920
TestValley	446 <u>501</u>	<u>10020</u>
		6500
Thanet	325 <u>375</u>	<u>7500</u>
		8500
Tonbridge & Malling	425 <u>450</u>	<u>9000</u>
Tunbridge Wells	250 <u>300</u>	<u>5000</u>

		<u>6000</u>
		<u>11500</u>
Vale of White Horse	575 <u>578</u>	<u>11560</u>
Waverley	230 <u>250</u>	4600 <u>5000</u>
Wealden	400 <u>550</u>	8000 <u>11000</u>
West Berkshire	525	10500
		<u>6700</u>
West Oxfordshire	335 <u>365</u>	<u>7300</u>
		<u>10440</u>
Winchester	522 <u>637</u>	<u>12740</u>
		<u>5620</u>
Windsor & Maidenhead	281 <u>346</u>	<u>6920</u>
Woking	242 <u>292</u>	4840 <u>5840</u>
Wokingham ¹⁰	523 <u>623</u>	10460 <u>12460</u>
Worthing	200	4000
		<u>6600</u>
Wycombe	330 <u>390</u>	<u>7800</u>
	28904	578080
SOUTHEAST TOTAL ¹¹	<u>33,125</u>	<u>662,500</u>

London Housing Forecasts

Source: London Plan, Feb 2008 – Table 3A.1

table 3A.1 Housing provision

Targets for additional homes 2007/8 to 2016/17

Areas	Ten year target	Annual monitoring target	Areas	Ten year target	Annual monitoring target
North sub-region			South West sub-region		
Barnet	20,550	2,055	Croydon	11,000	1,100
Camden	5,950	595	Kingston upon Thames	3,850	385
Enfield	3,950	395	Lambeth	11,000	1,100
Hackney	10,850	1,085	Merton	3,700	370
Haringey	6,800	680	Richmond upon Thames	2,700	270
Islington	11,600	1,160	Sutton	3,450	345
City of Westminster	6,800	680	Wandsworth	7,450	745
North sub-total	66,500	6,650	South West sub-total	43,150	4,315
North East sub-region			West sub-region		
Barking and Dagenham	11,900	1,190	Brent	11,200	1,120
Corporation of London	900	90	Ealing	9,150	915
Havering	5,350	535	Hammersmith and Fulham	4,500	450
Newham	35,100	3,510	Harrow	4,000	400
Redbridge	9,050	905	Hillingdon	3,650	365
Tower Hamlets	31,500	3,150	Hounslow	4,450	445
Waltham Forest	6,650	665	Kensington and Chelsea	3,500	350
North East sub-total	100,450	10,045	West sub-total	40,450	4,045
South East sub-region			London total		
Bexley	3,450	345		305,000	30,500
Bromley	4,850	485			
Greenwich	20,100	2,010			
Lewisham	9,750	975			
Southwark	16,300	1,630			
South East sub-total	54,450	5,445			

source Mayor of London. Early Alterations to the London Plan. GLA, 2007

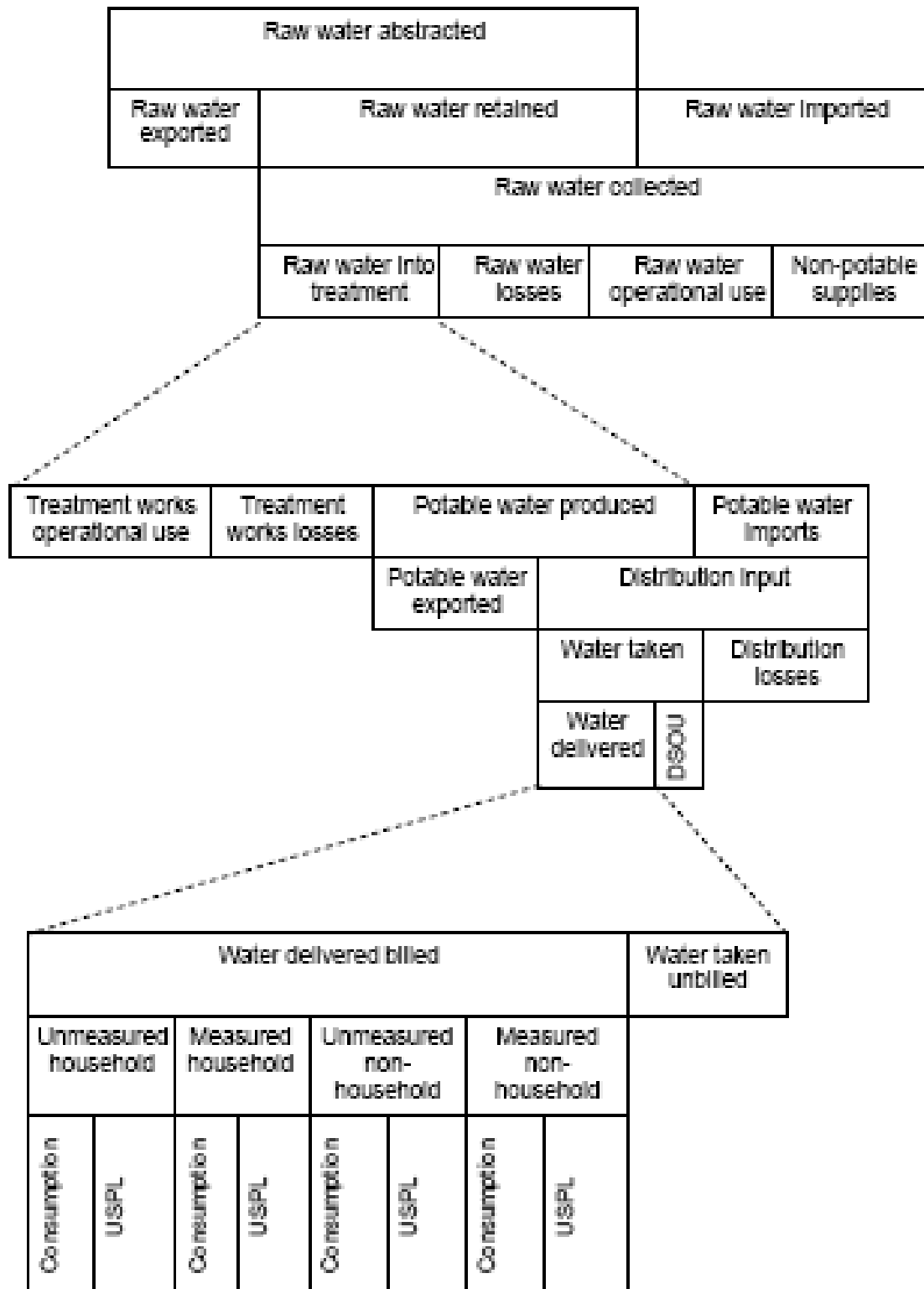
WMRA Housing Forecasts

Source: Communities for the Future - WMRA - RSS Jan 08: Table 1

Table 1 – Housing Proposals 2006 - 2026

Planning Area	Proposal Total (Net) 2006 - 2026	Indicative Annual Average 2006 - 2026
Birmingham ^(a)	50,600	2,530
Coventry ^(b)	33,500	1,675
Black Country	61,200	3,060
Solihull	7,600	380
Metropolitan Area Total	152,900	7,645
Shropshire	25,700	1,285
Bridgnorth	2,500	125
North Shropshire	6,100	305
Oswestry	4,000	200
Shrewsbury and Atcham	8,200	410
of which Shrewsbury	6,200	310
South Shropshire	4,900	245
Telford & Wrekin	26,500	1,325
of which Telford	25,000	1,250
Staffordshire	54,900	2,745
Cannock Chase	5,800	290
East Staffordshire	12,900	645
of which Burton upon Trent	11,000	550
Lichfield ^(c)	8,000	400
Newcastle-under-Lyme	5,700	285
of which Newcastle urban area	4,800	240
South Staffordshire	3,500	175
Stafford	10,100	505
of which Stafford town ^(d)	7,000	350
Staffordshire Moorlands	6,000	300
Tamworth	2,900	145
Stoke-on-Trent	11,400	570
Warwickshire	41,000	2,050
North Warwickshire	3,000	150
Nuneaton and Bedworth	10,800	540
Rugby	10,800	540
of which Rugby town	9,800	490
Stratford-on-Avon ^(e)	5,600	280
Warwick	10,800	540
Worcestershire	36,600	1,830
Bromsgrove ^(a)	2,100	105
Redditch ^(a)	6,600	330
Malvern Hills ^(f)	4,900	245
Worcester City ^(g)	10,500	525
Wychavon ^(g)	9,100	455
Wyre Forest	3,400	170
Herefordshire	16,600	830
of which Hereford City	8,300	415
Shire and Unitary Authorities Total	212,700	10,635
Major Urban Areas ^(h)	169,100	8,455
Other Areas	196,500	9,825
West Midlands Region	365,600	18,280

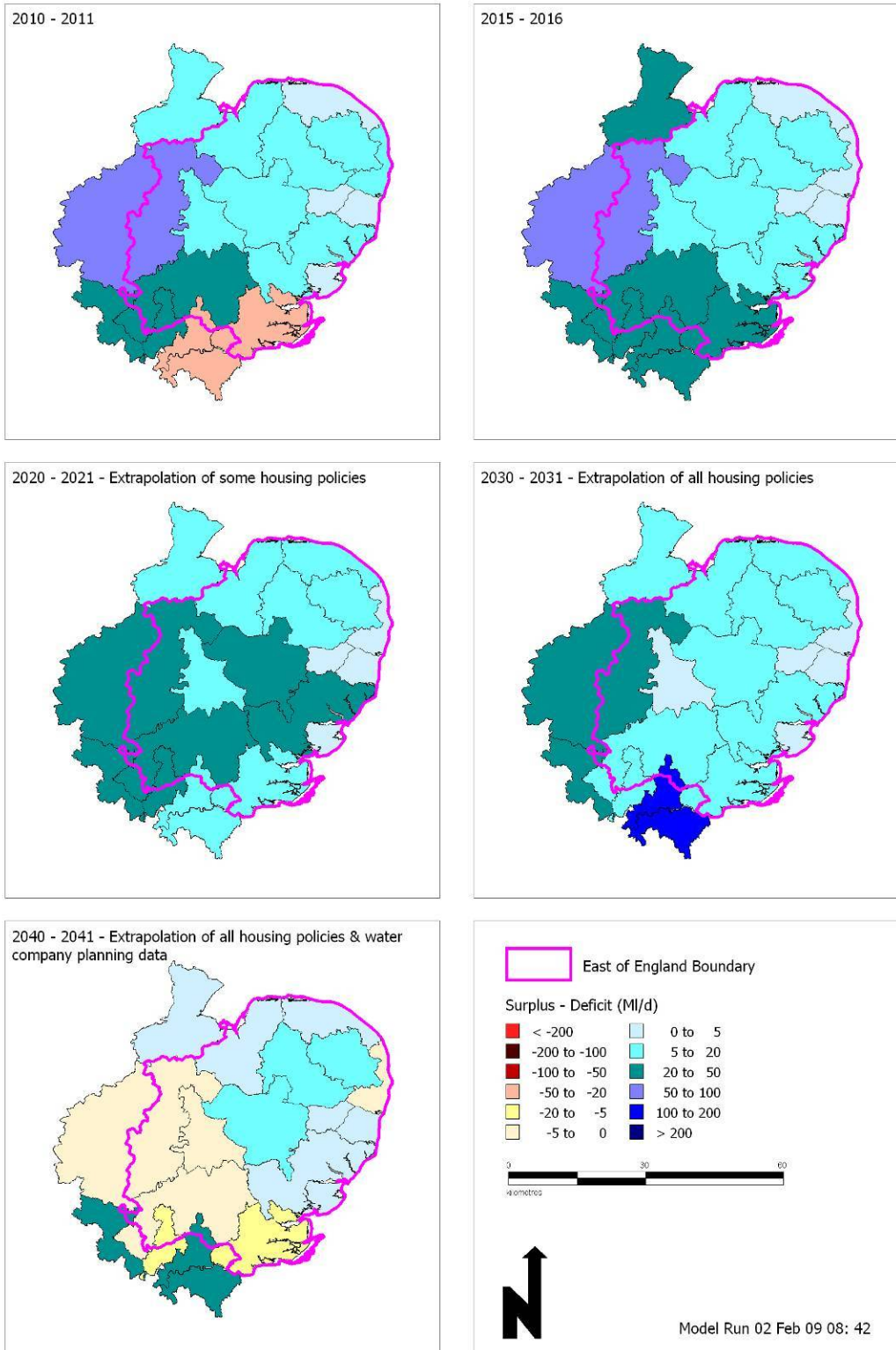
APPENDIX B Components of Demand



DSOU – distribution system operational use
 USPL – underground supply pipe losses

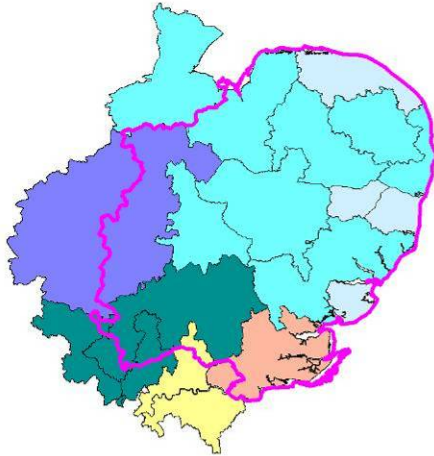
APPENDIX C Surplus-deficit maps

Scenario 0: Water Company Housing and Business as Usual - Final Planning

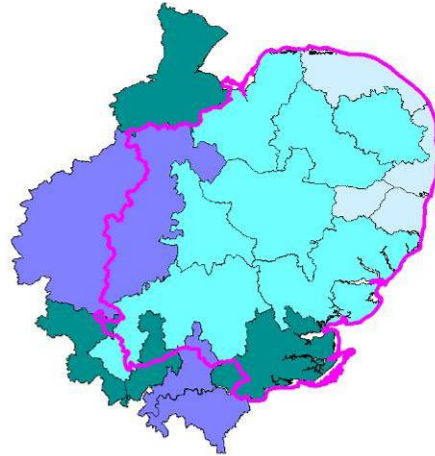


Scenario 1: RSS Growth and Business as Usual Water Efficiency, Final Planning

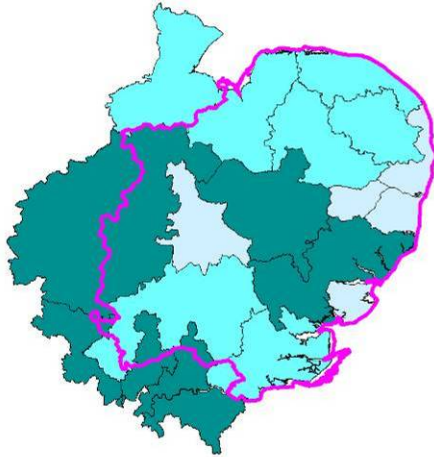
2010 - 2011



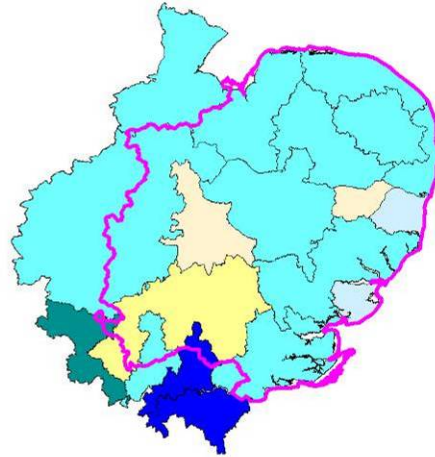
2015 - 2016



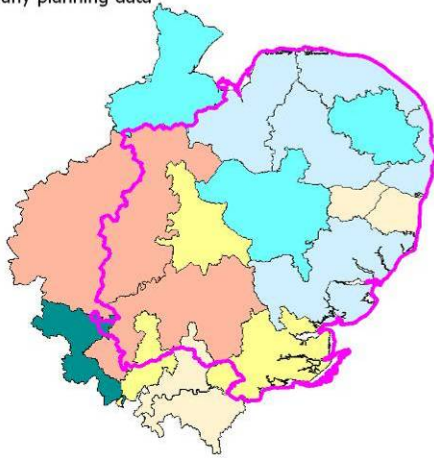
2020 - 2021 - Extrapolation of some housing policies




2030 - 2031 - Extrapolation of all housing policies

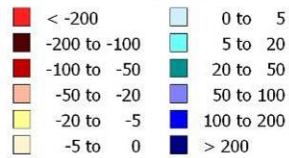


2040 - 2041 - Extrapolation of all housing policies & water company planning data



 East of England Boundary

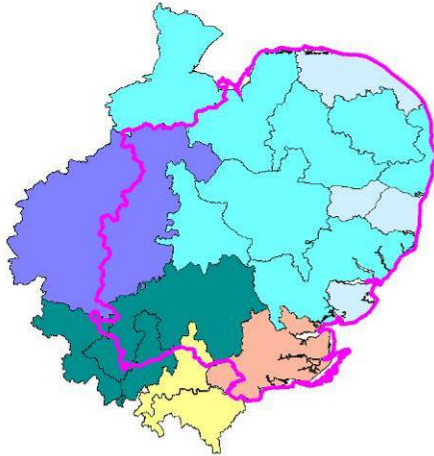
Surplus - Deficit (M/d)



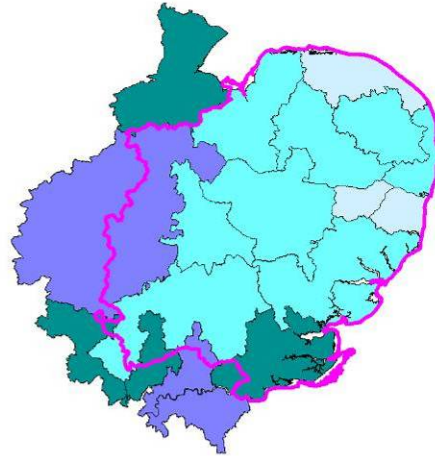
Model Run 02 Feb 09 08: 54

Scenario 2: RSS Growth and Business as New Building Regulations, Final Planning

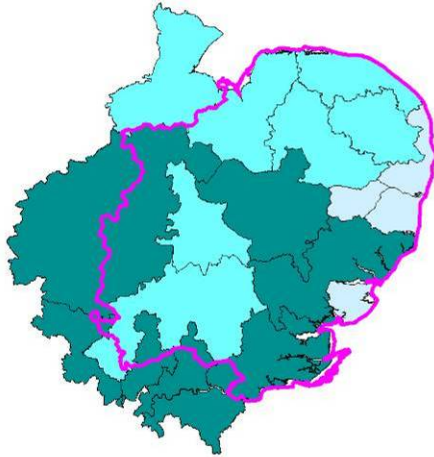
2010 - 2011



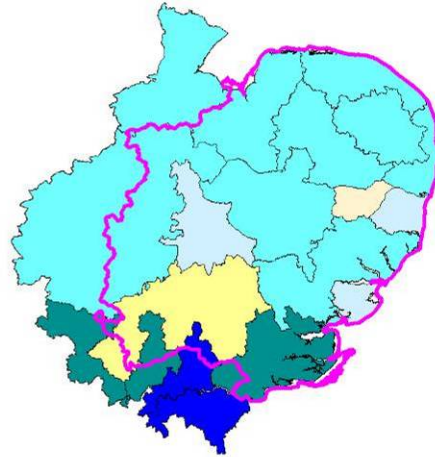
2015 - 2016



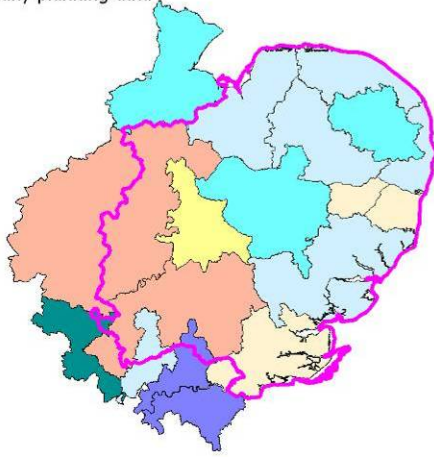
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

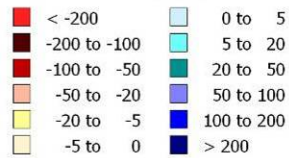


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

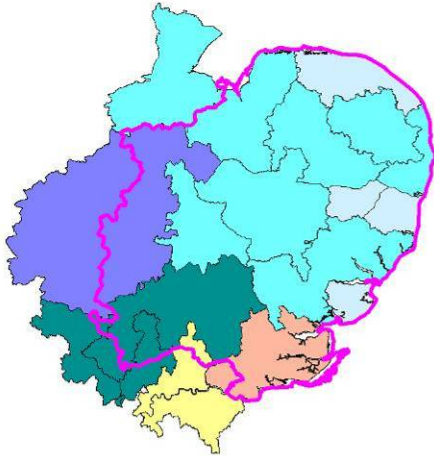
Surplus - Deficit (M/d)



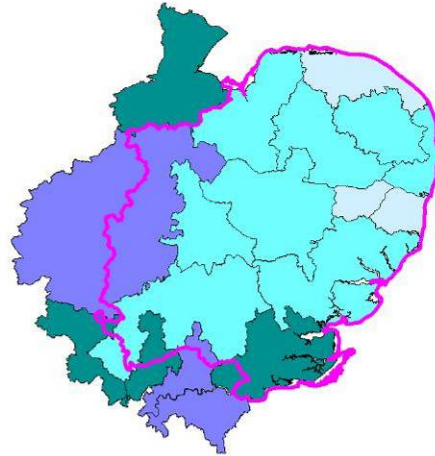
Model Run 02 Feb 09 08: 56

Scenario 3: RSS Growth and Efficient New Development, Final Planning

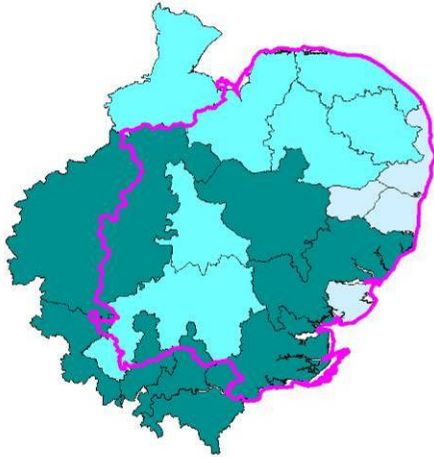
2010 - 2011



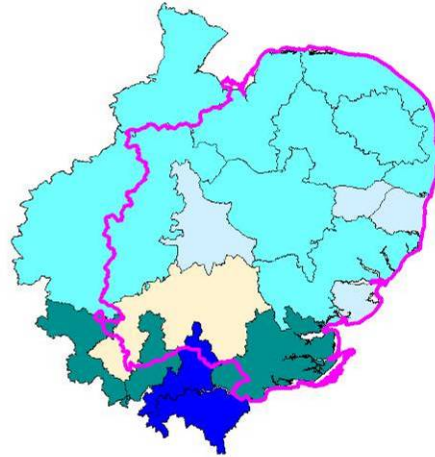
2015 - 2016



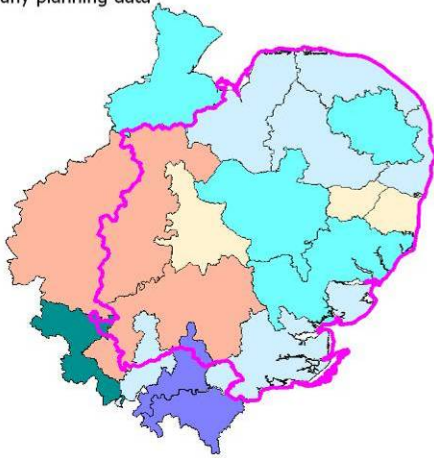
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

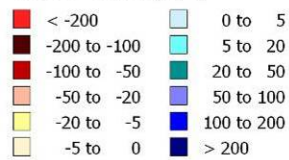


2040 - 2041 - Extrapolation of all housing policies & water company planning data



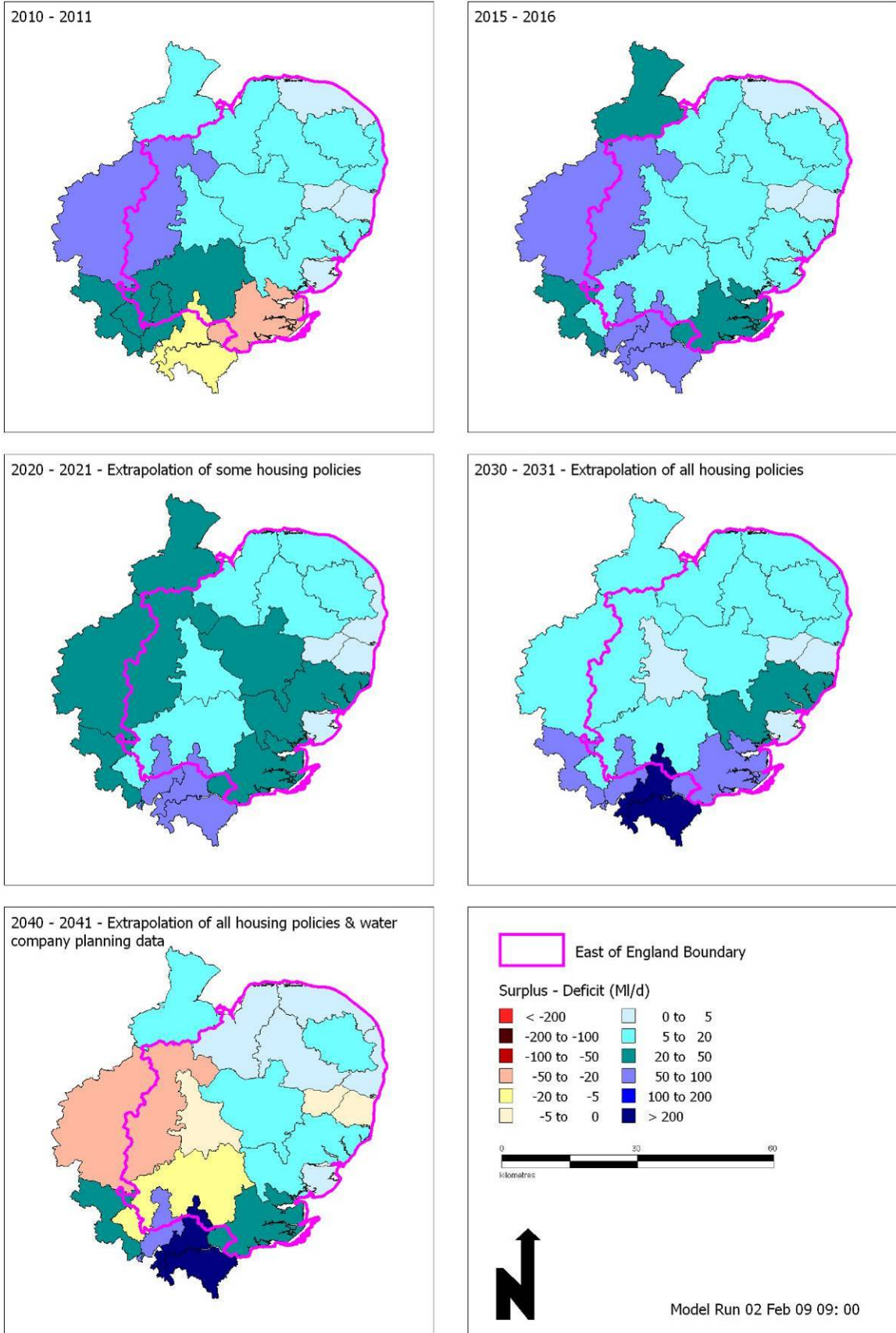
East of England Boundary

Surplus - Deficit (M/d)

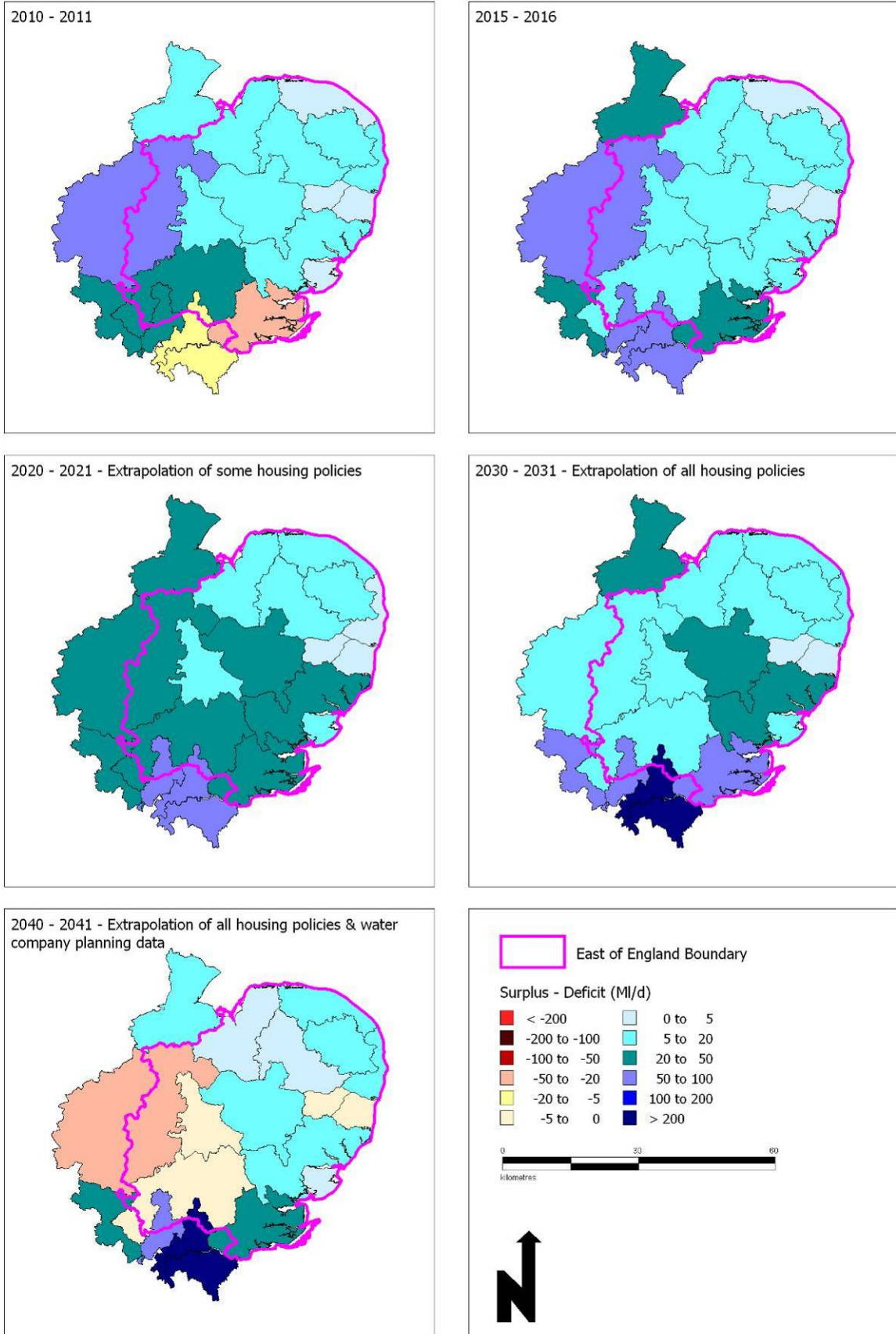


Model Run 02 Feb 09 08: 58

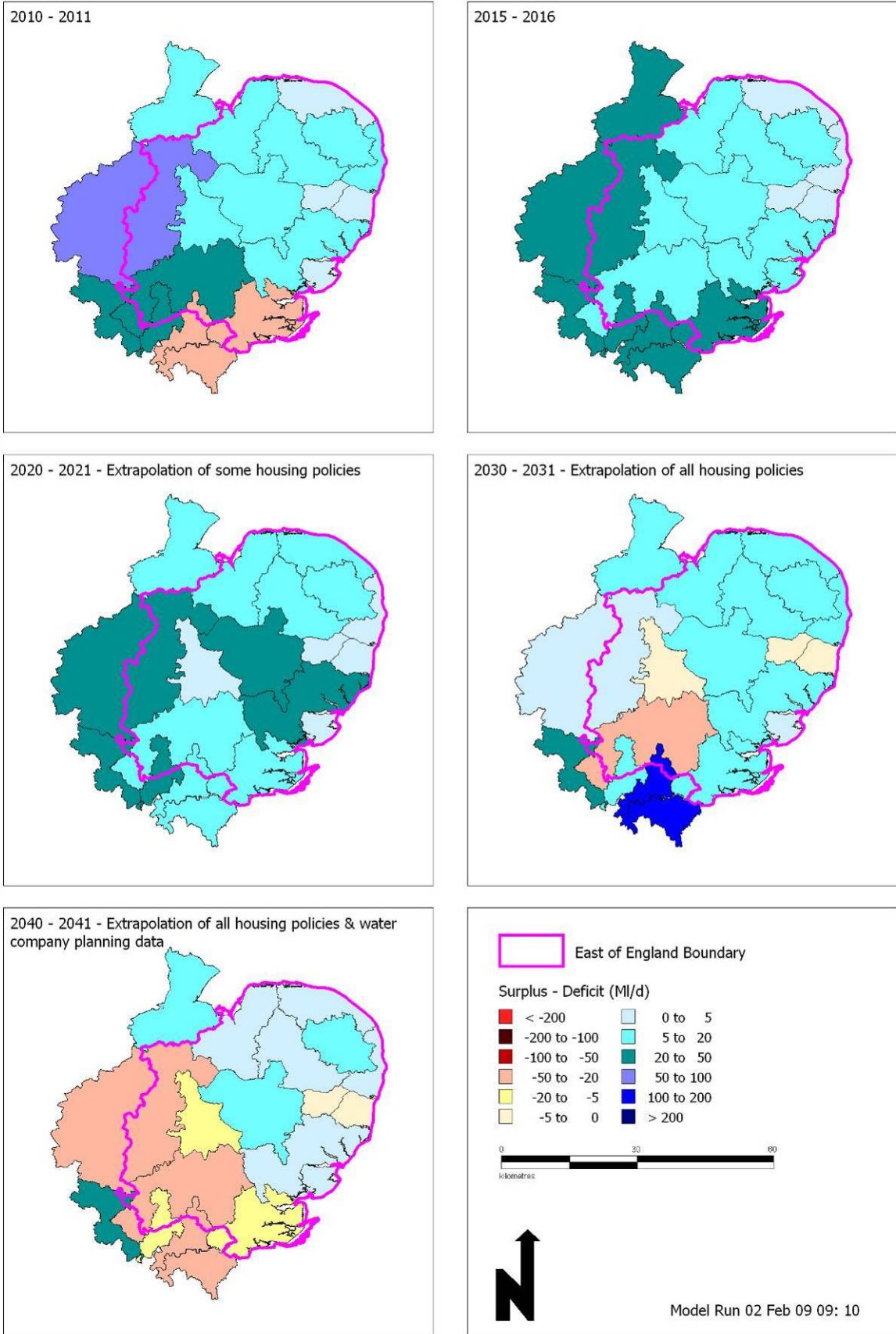
Scenario 4: RSS Growth and DEFRA Aspirations, Final Planning



Scenario 5: RSS Growth and EEIP Aspirations, Final Planning

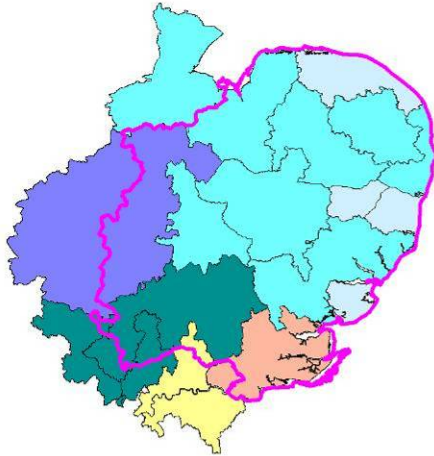


Scenario 6: NHPAU Lower Growth and Business as Usual Water Efficiency, Final Planning

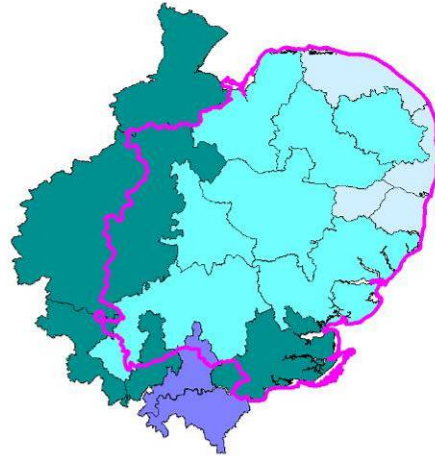


Scenario 7: NHPAU Lower Growth & Business as New Building Regulations, Final Planning

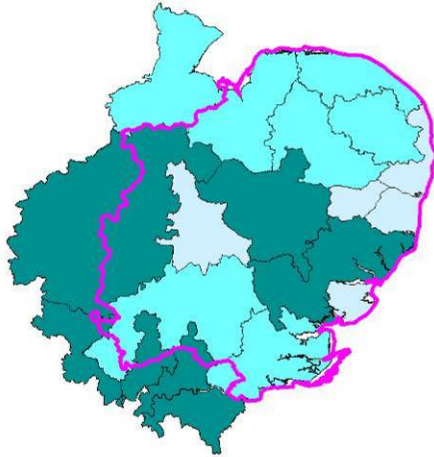
2010 - 2011



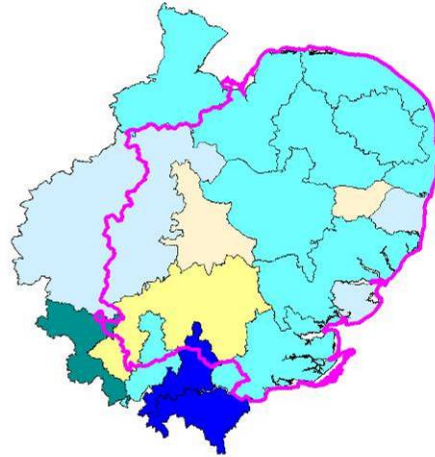
2015 - 2016



2020 - 2021 - Extrapolation of some housing policies




2030 - 2031 - Extrapolation of all housing policies

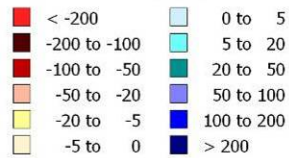


2040 - 2041 - Extrapolation of all housing policies & water company planning data



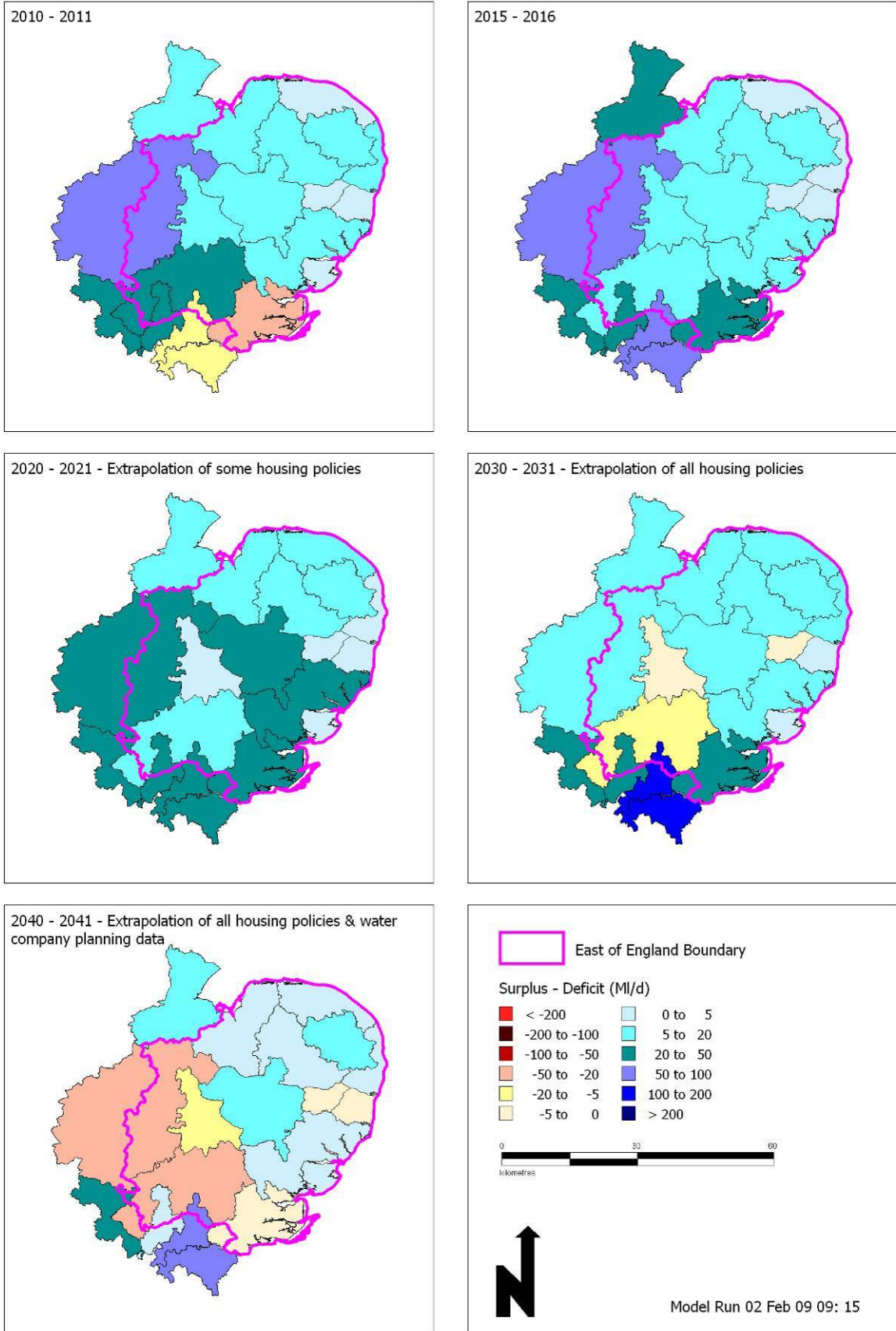
 East of England Boundary

Surplus - Deficit (Ml/d)



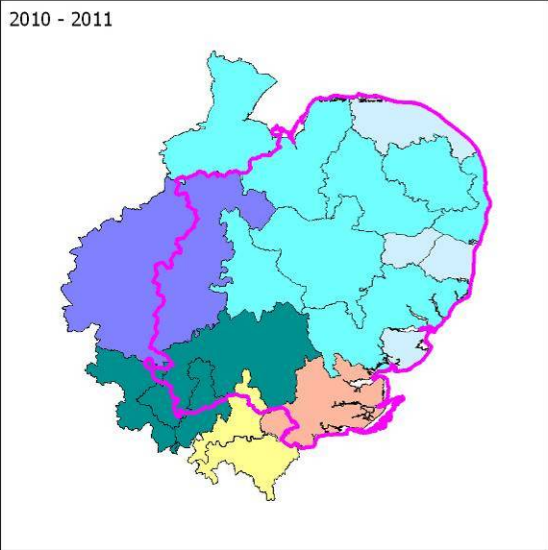
Model Run 02 Feb 09 09: 14

Scenario 8: NHPAU Lower Growth and Efficient New Development, Final Planning

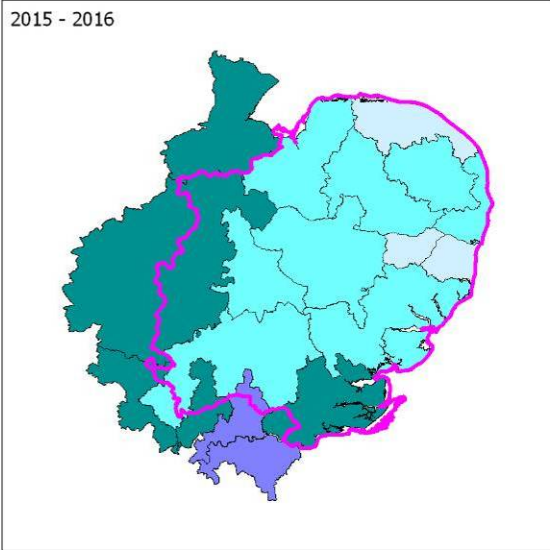


Scenario 9: NHPAU Lower Growth and DEFRA Aspirations, Final Planning

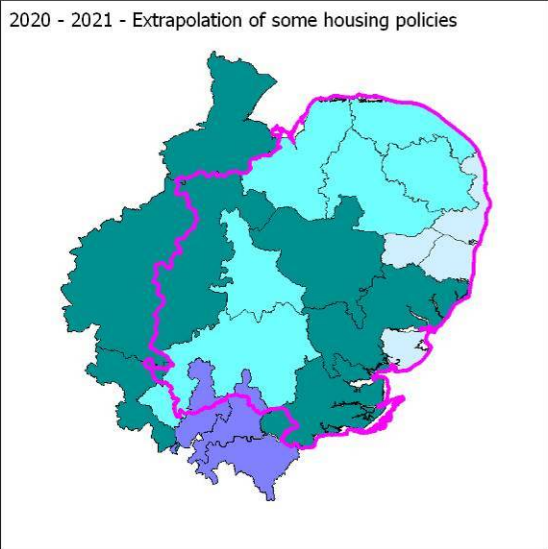
2010 - 2011



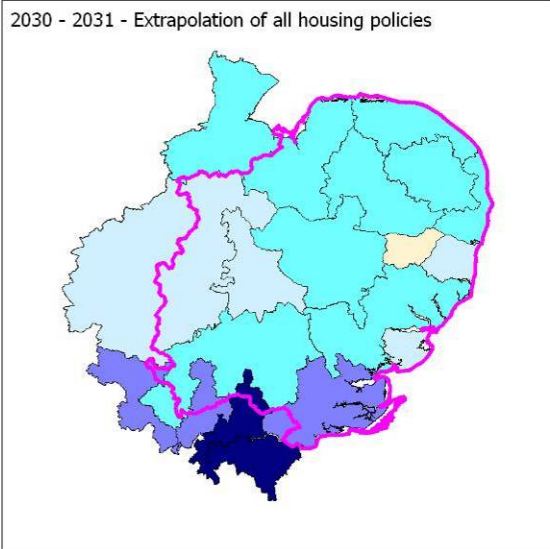
2015 - 2016



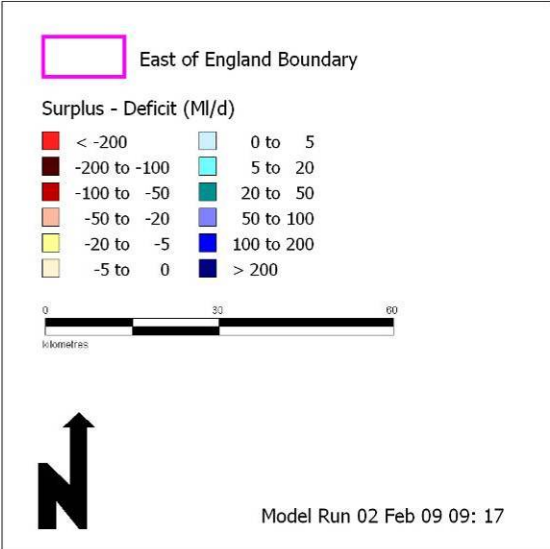
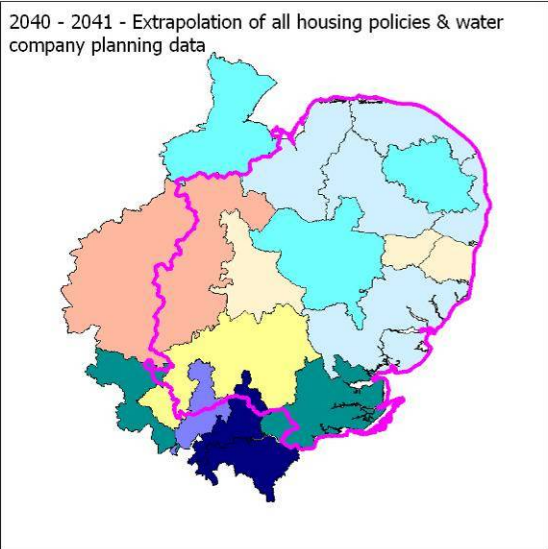
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

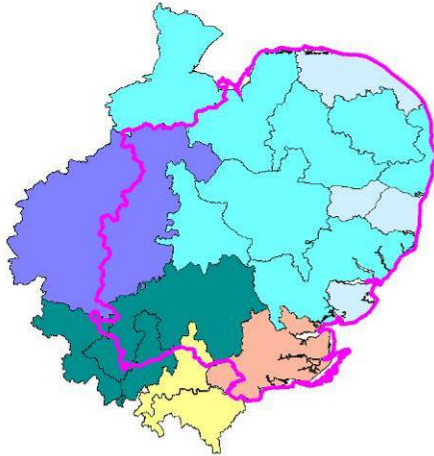


2040 - 2041 - Extrapolation of all housing policies & water company planning data

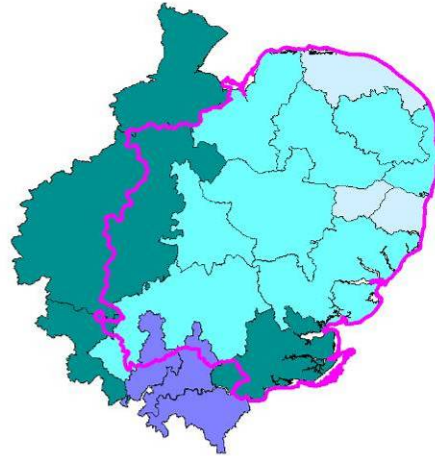


Scenario 10: NHPAU Lower Growth ad EEIP Aspirations, Final Planning

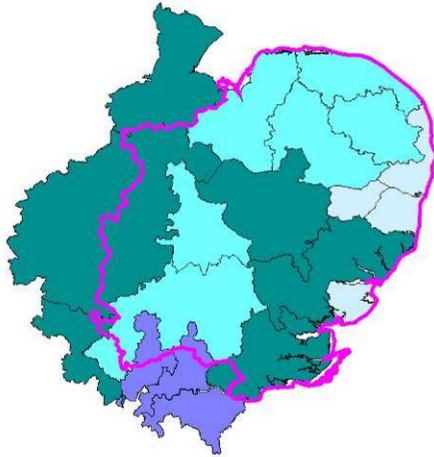
2010 - 2011



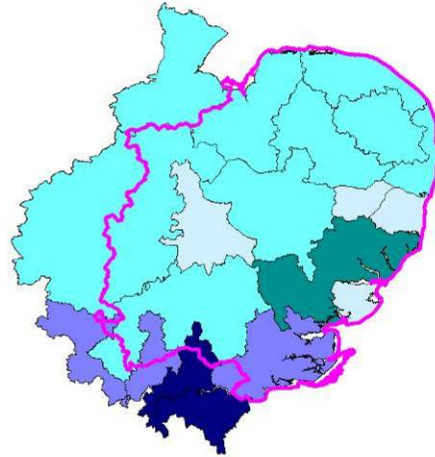
2015 - 2016



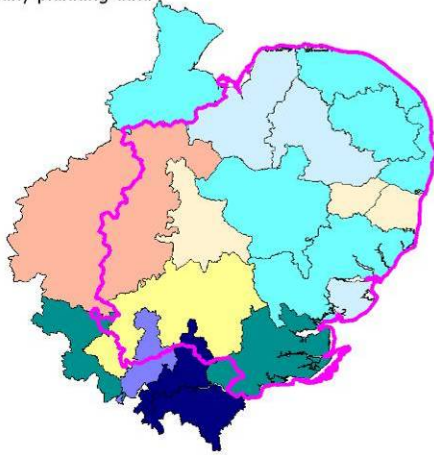
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

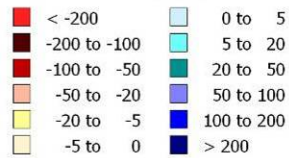


2040 - 2041 - Extrapolation of all housing policies & water company planning data



East of England Boundary

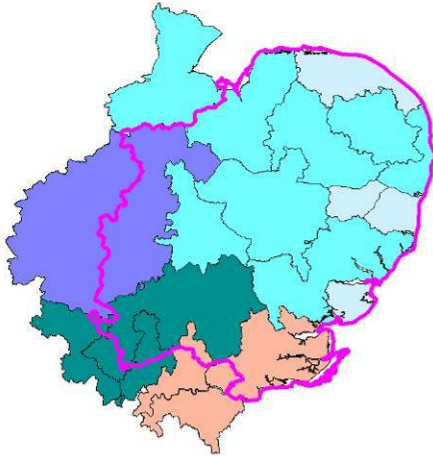
Surplus - Deficit (M/d)



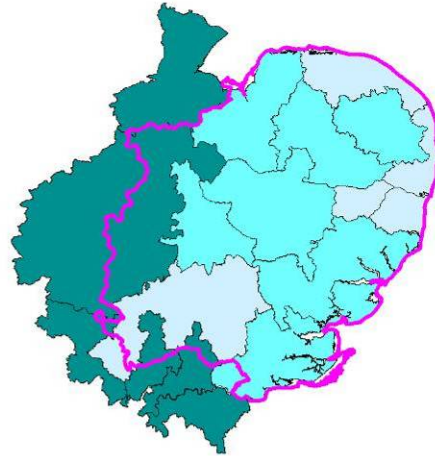
Model Run 02 Feb 09 09: 19

Scenario 11: NHPAU Upper Growth and Business as Usual Water Efficiency, Final Planning

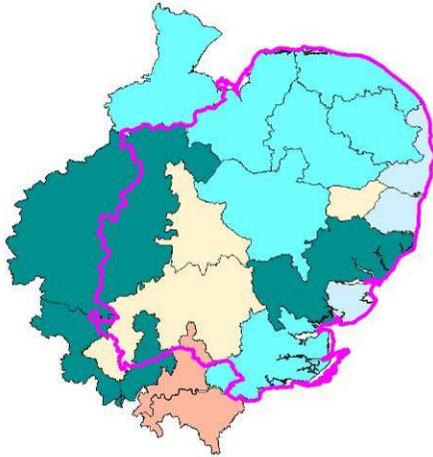
2010 - 2011



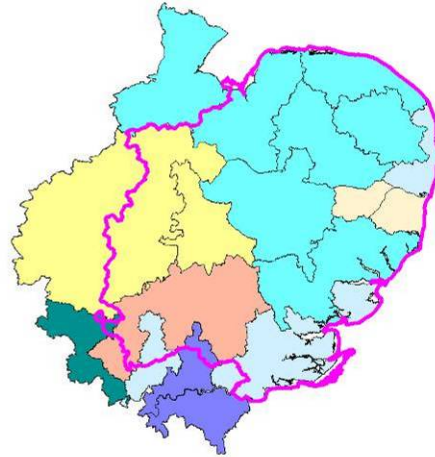
2015 - 2016



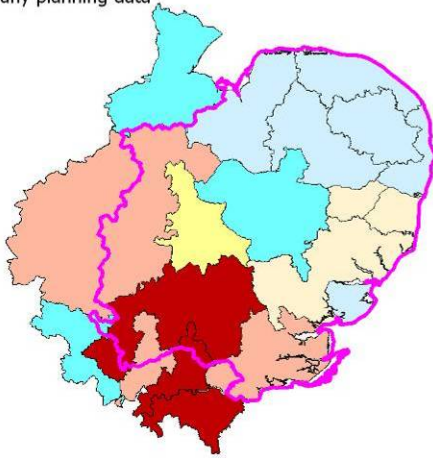
2020 - 2021 - Extrapolation of some housing policies




2030 - 2031 - Extrapolation of all housing policies















2040 - 2041 - Extrapolation of all housing policies & water company planning data



 East of England Boundary

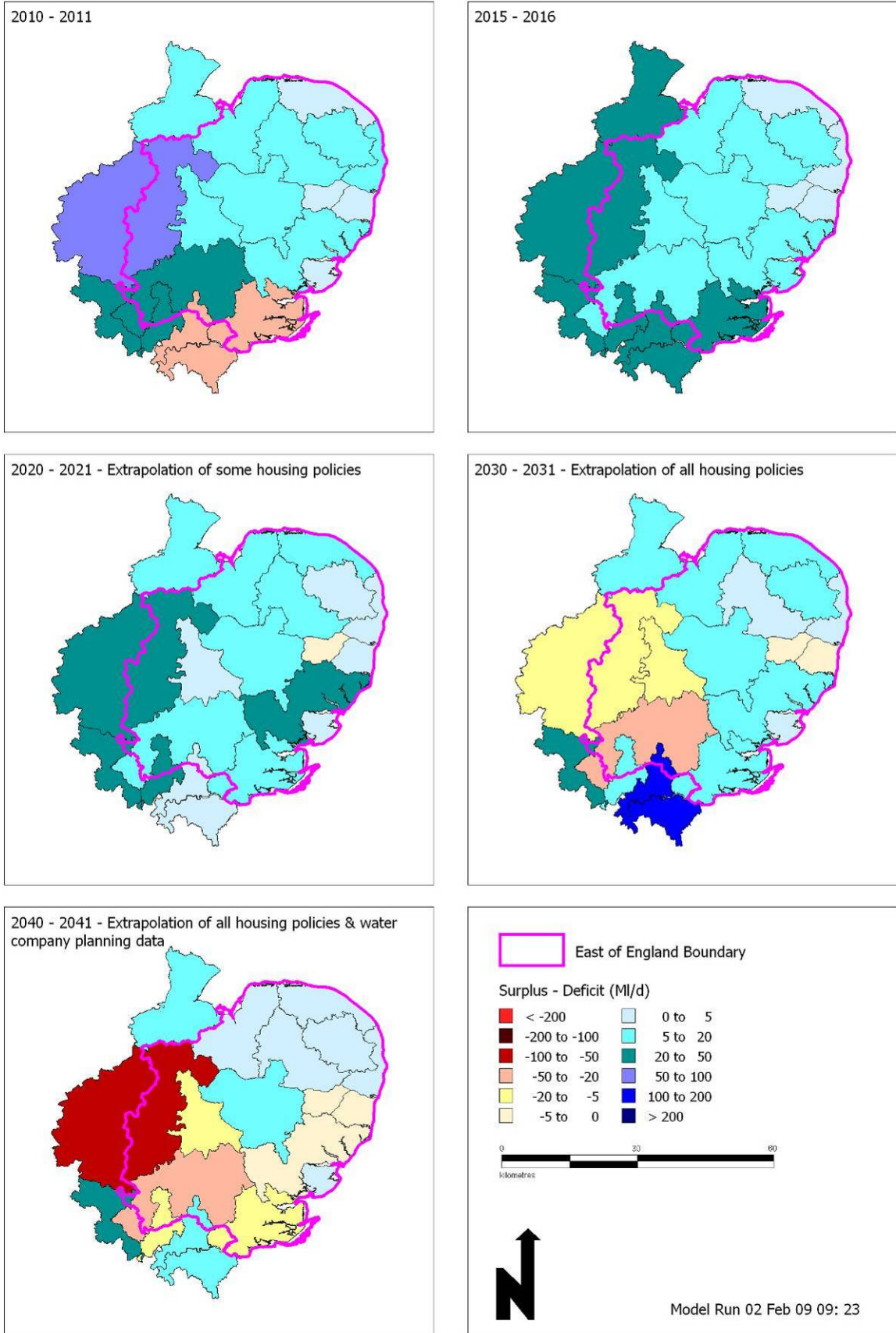
Surplus - Deficit (M/d)

- | | |
|--|--|
|  < -200 |  0 to 5 |
|  -200 to -100 |  5 to 20 |
|  -100 to -50 |  20 to 50 |
|  -50 to -20 |  50 to 100 |
|  -20 to -5 |  100 to 200 |
|  -5 to 0 |  > 200 |



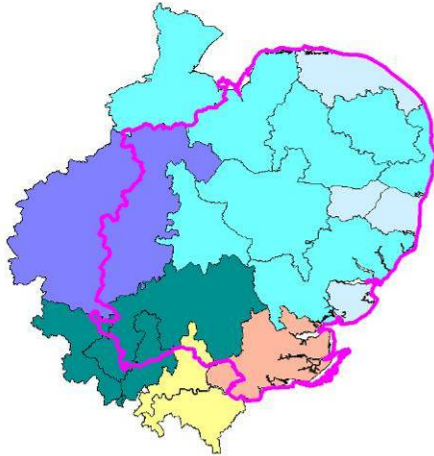
Model Run 02 Feb 09 09: 22

Scenario 12: NHPAU Upper Growth and New Building Regulations, Final Planning

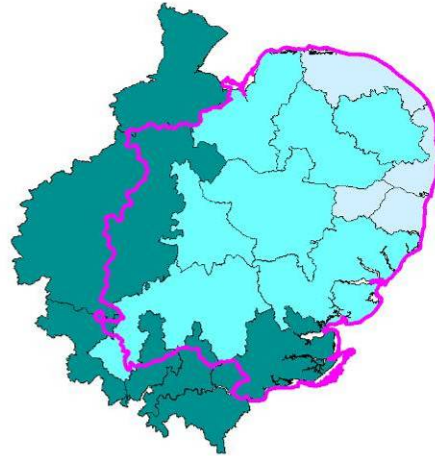


Scenario 13: NHPAU Upper Growth and Efficient New Development, Final Planning

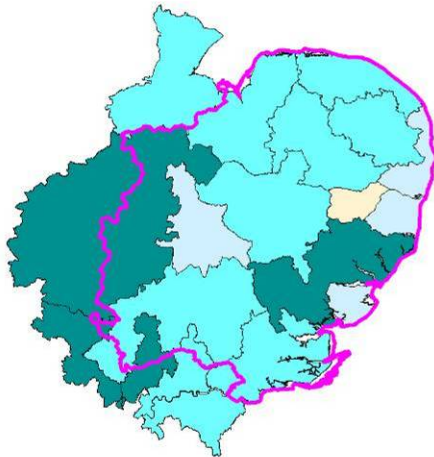
2010 - 2011



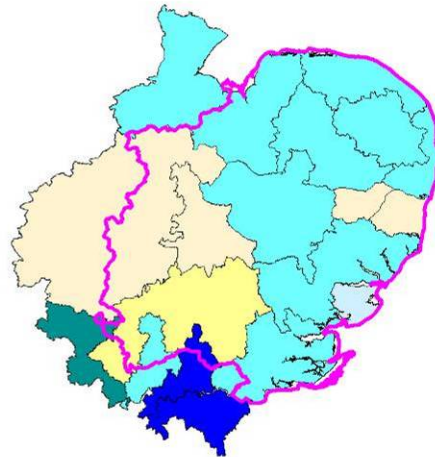
2015 - 2016



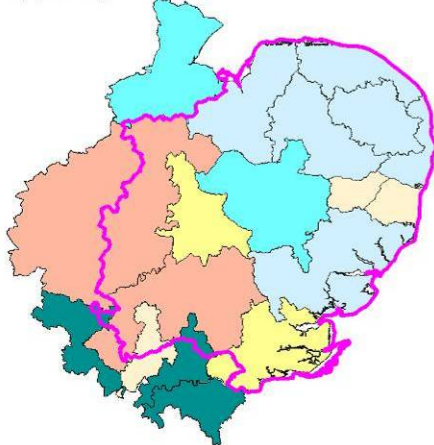
2020 - 2021 - Extrapolation of some housing policies



2030 - 2031 - Extrapolation of all housing policies

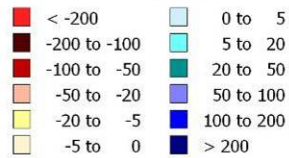


2040 - 2041 - Extrapolation of all housing policies & water company planning data



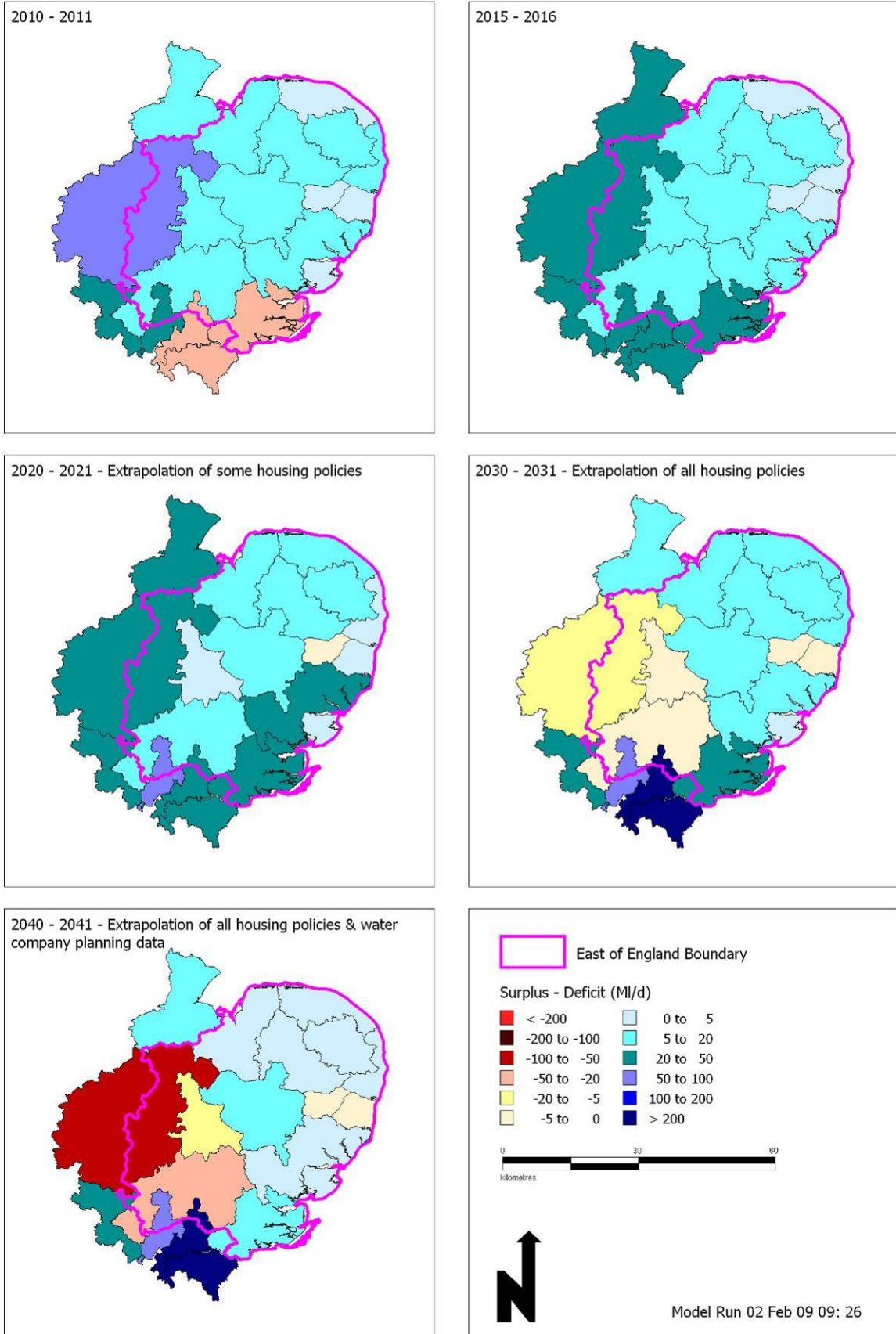
East of England Boundary

Surplus - Deficit (M/d)

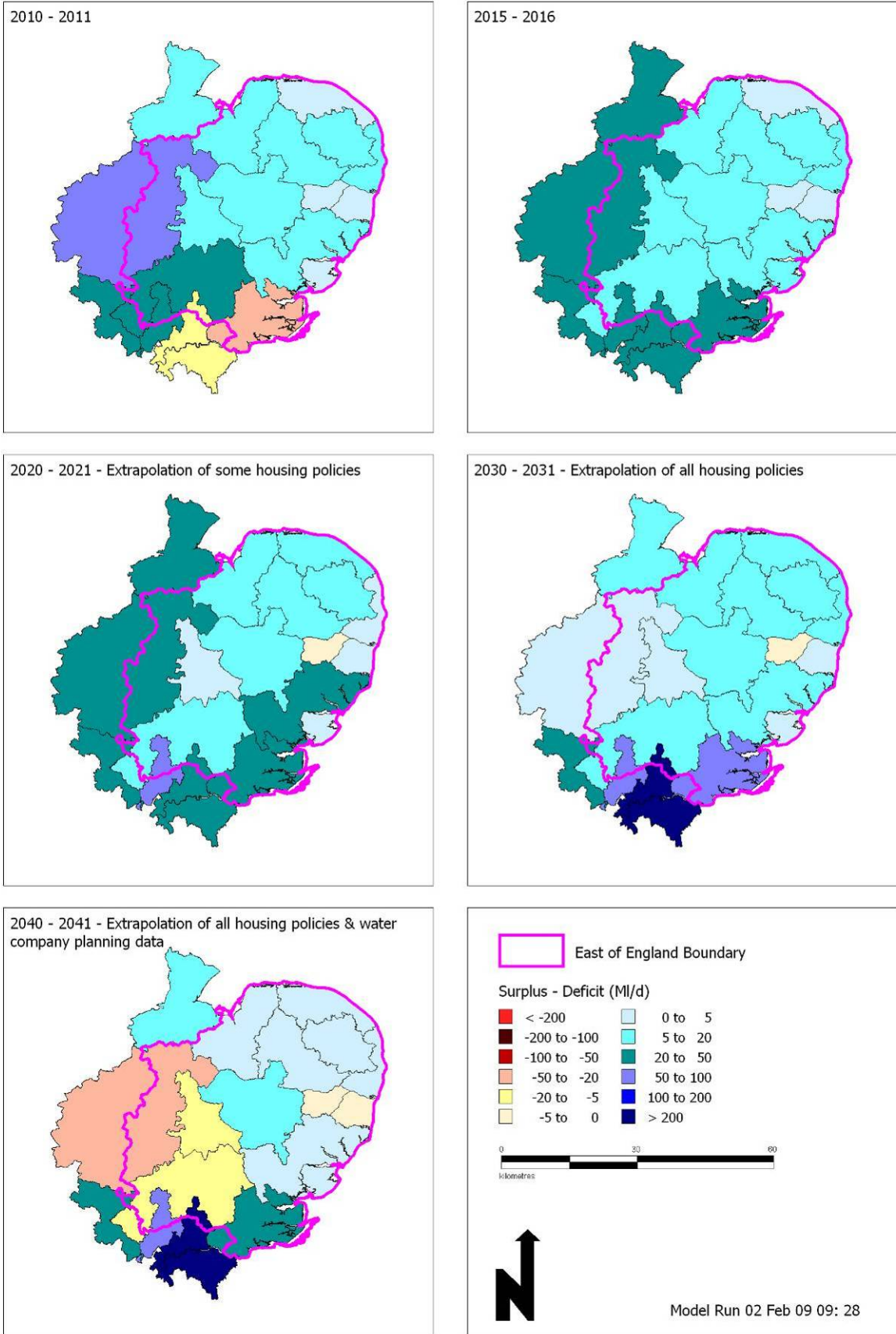


Model Run 02 Feb 09 09: 25

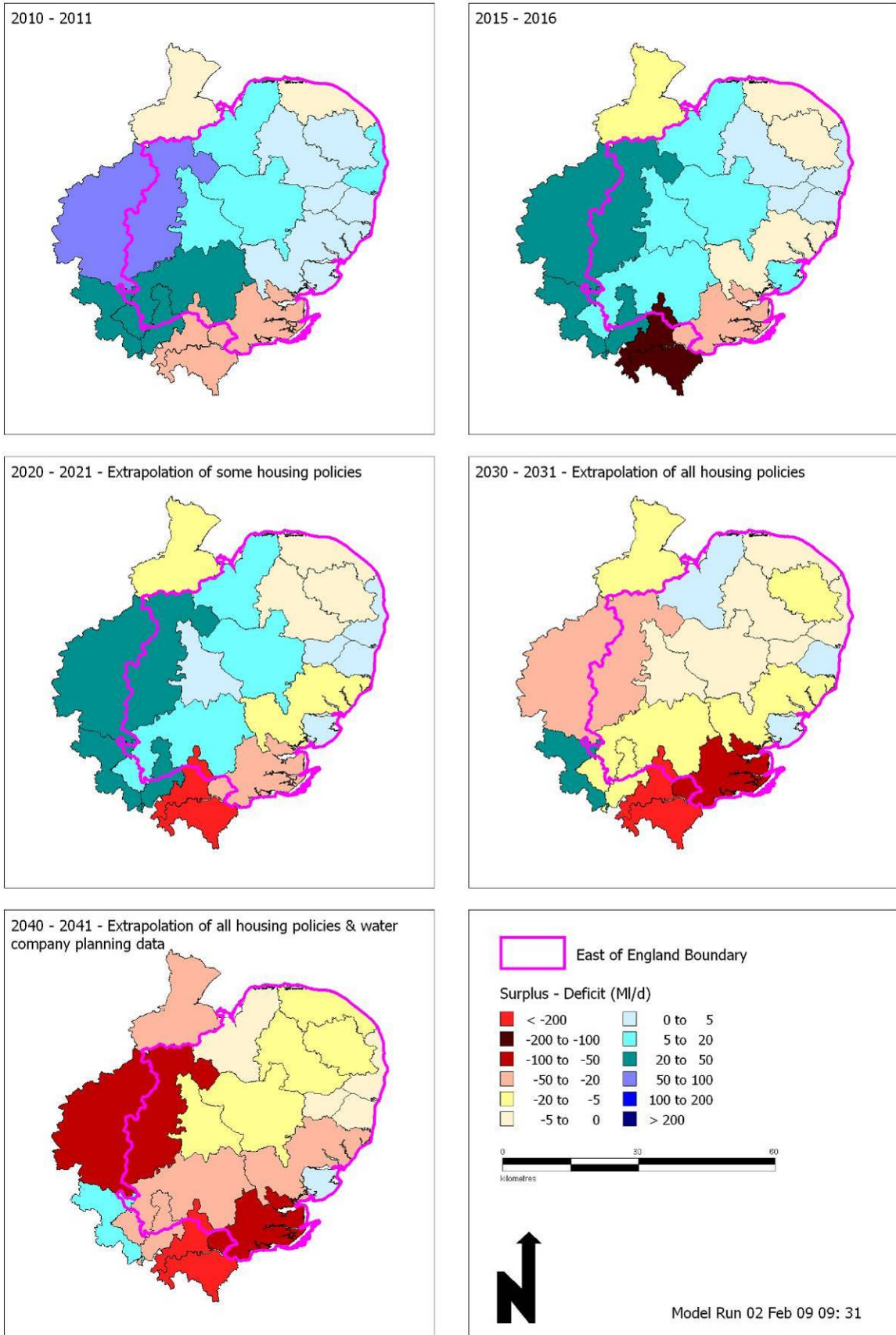
Scenario 14: NHPAU Upper Growth and DEFRA Aspirations, Final Planning



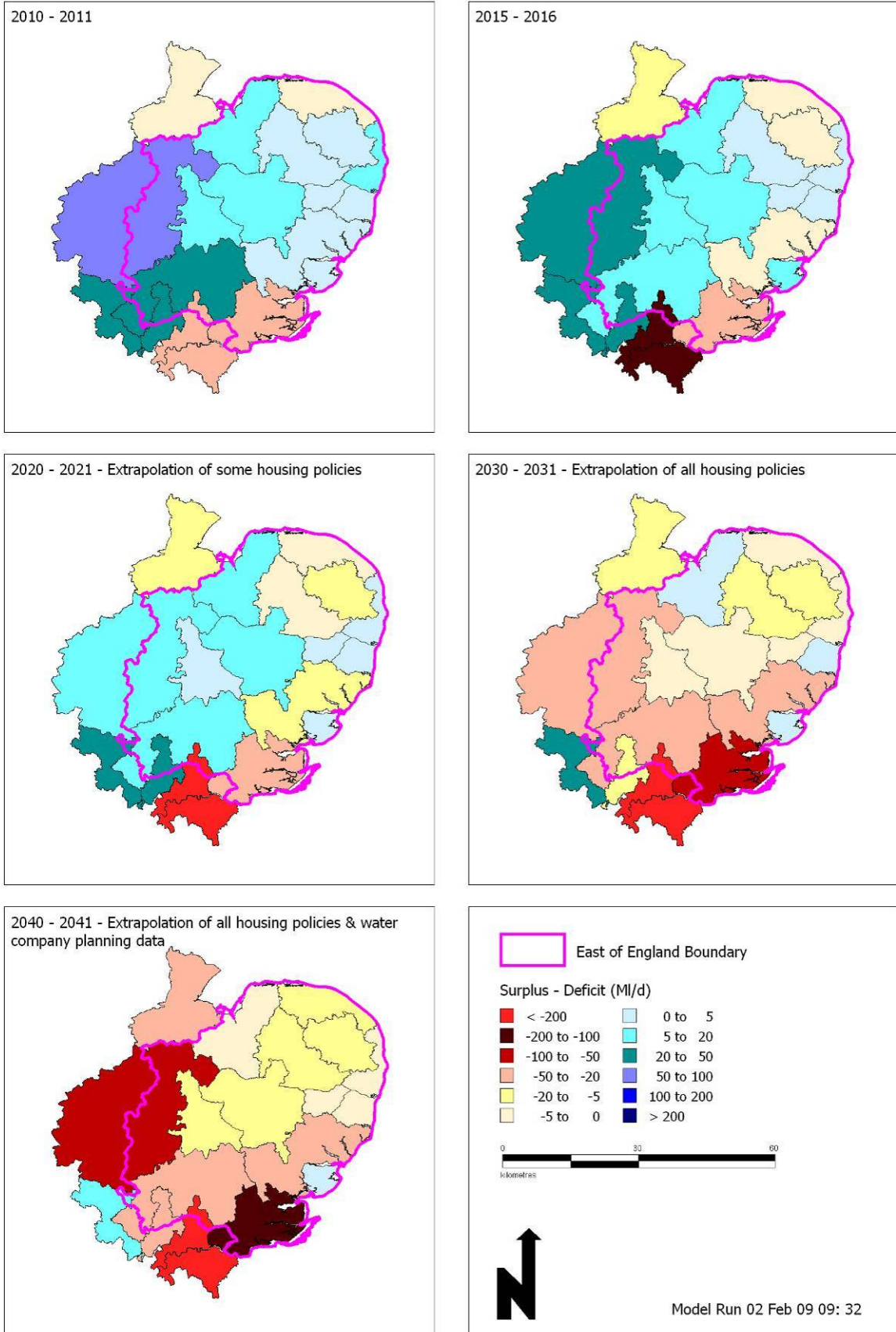
Scenario 15: NHPAU Upper Growth and EEIP Aspirations, Final Planning



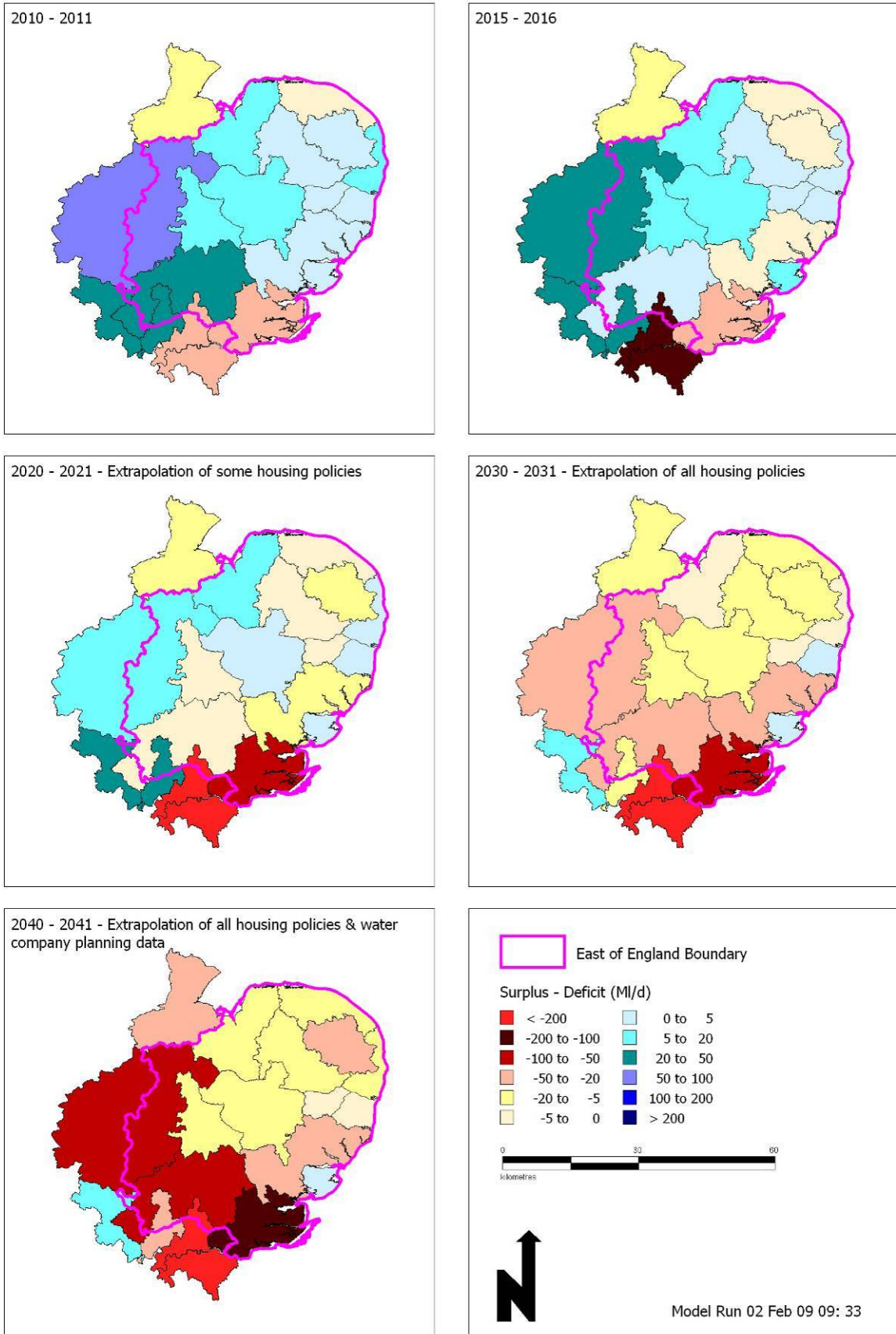
Scenario 16: RSS Growth and Business as Usual Water Efficiency, Baseline



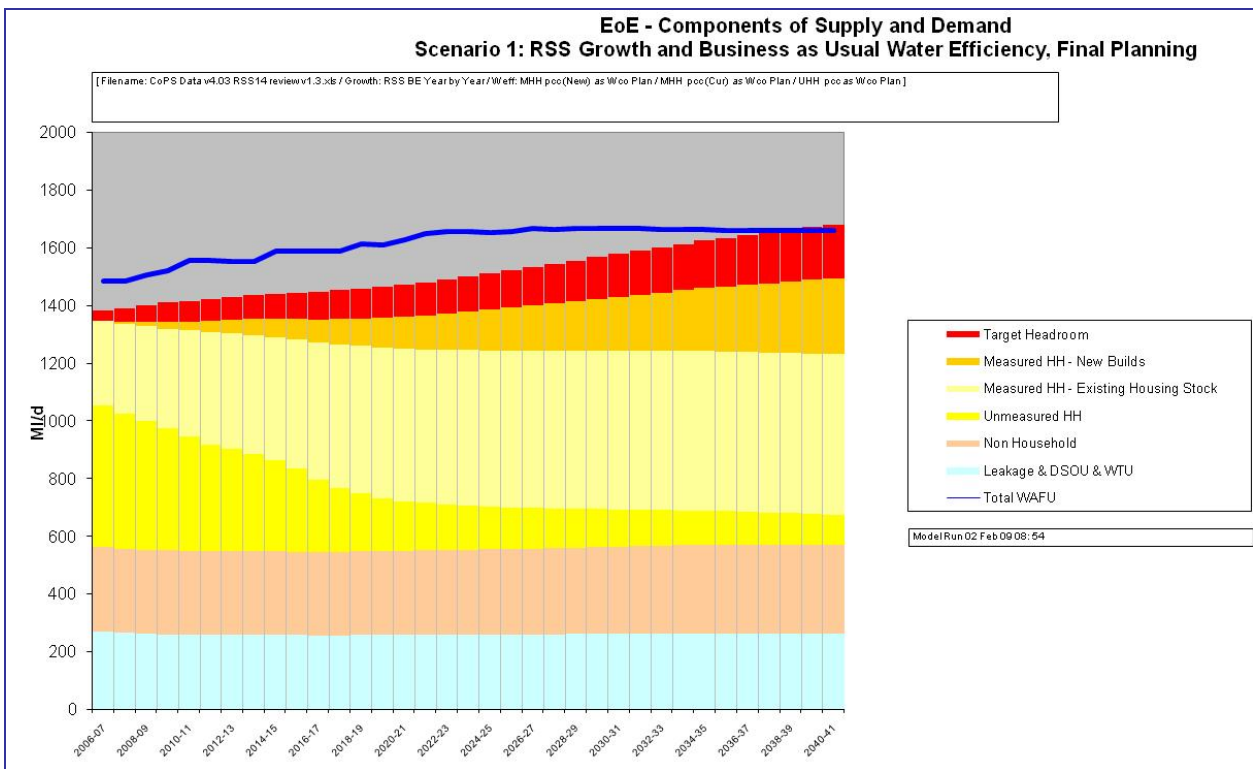
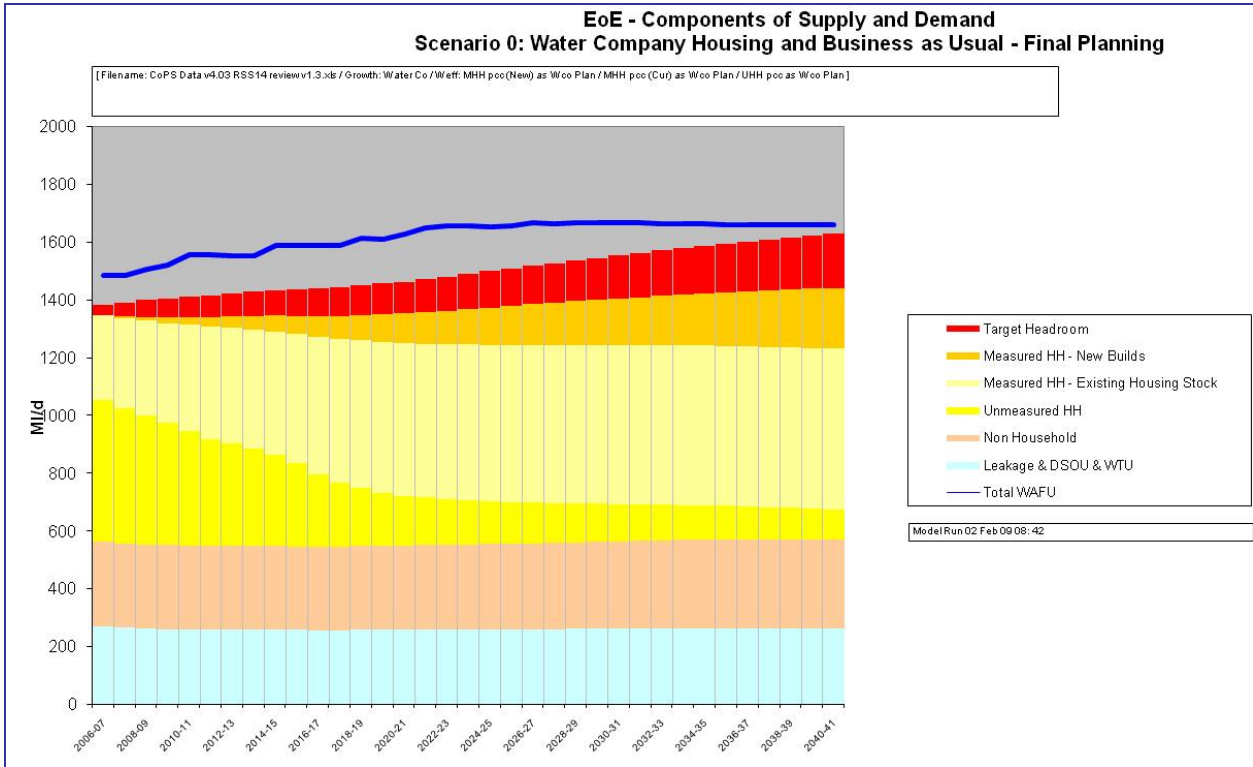
Scenario 17: NHPAU Lower Growth and Business as Usual Water Efficiency, Baseline



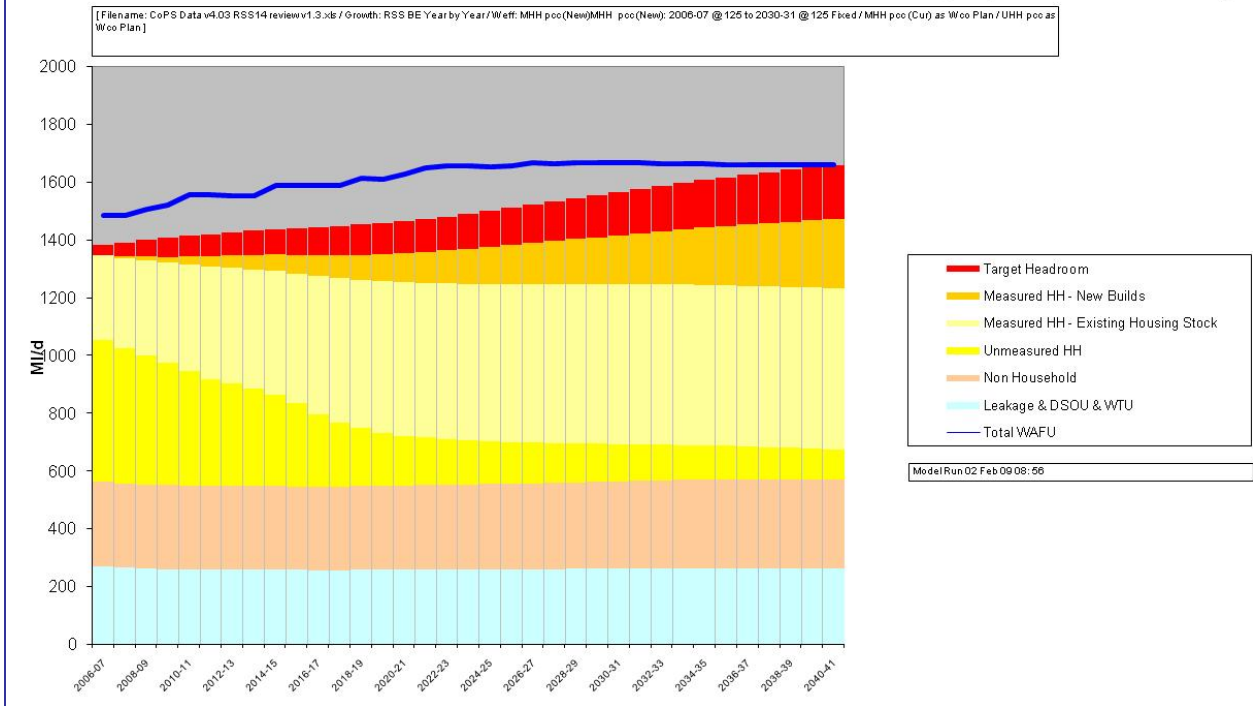
Scenario 18: NHPAU Upper Growth and Business as Usual Water Efficiency, Baseline



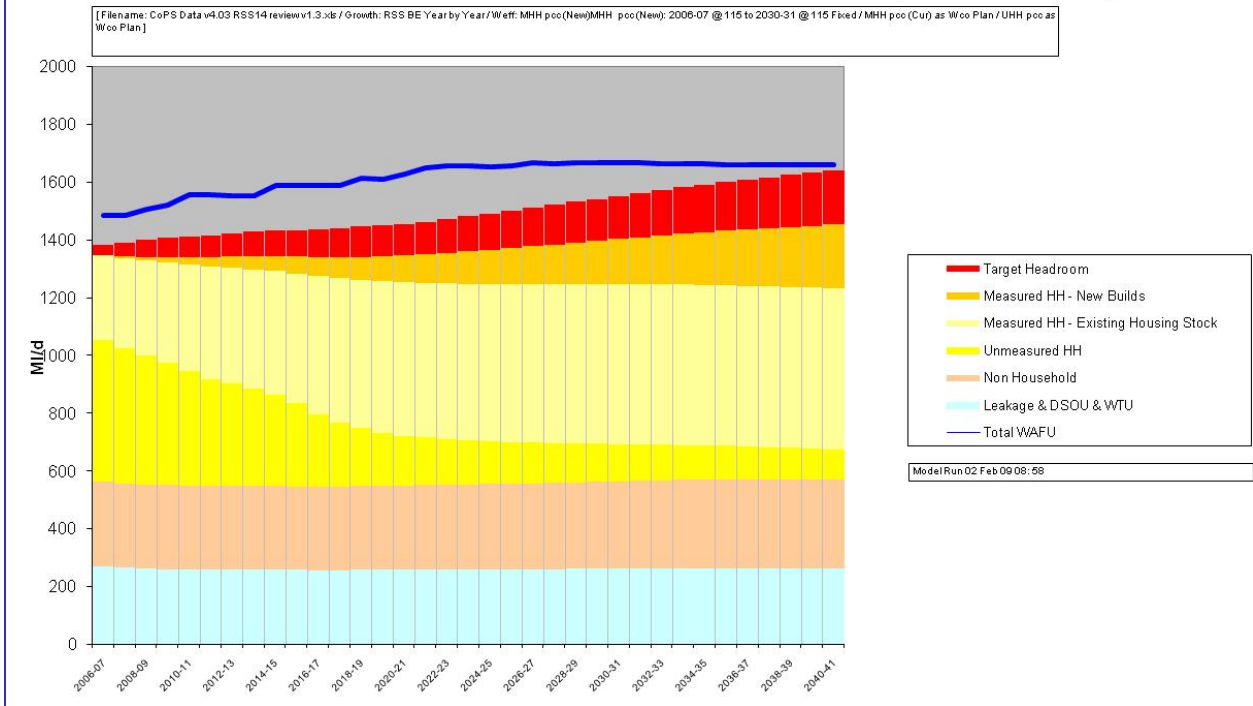
APPENDIX D Supply demand balances for East of England



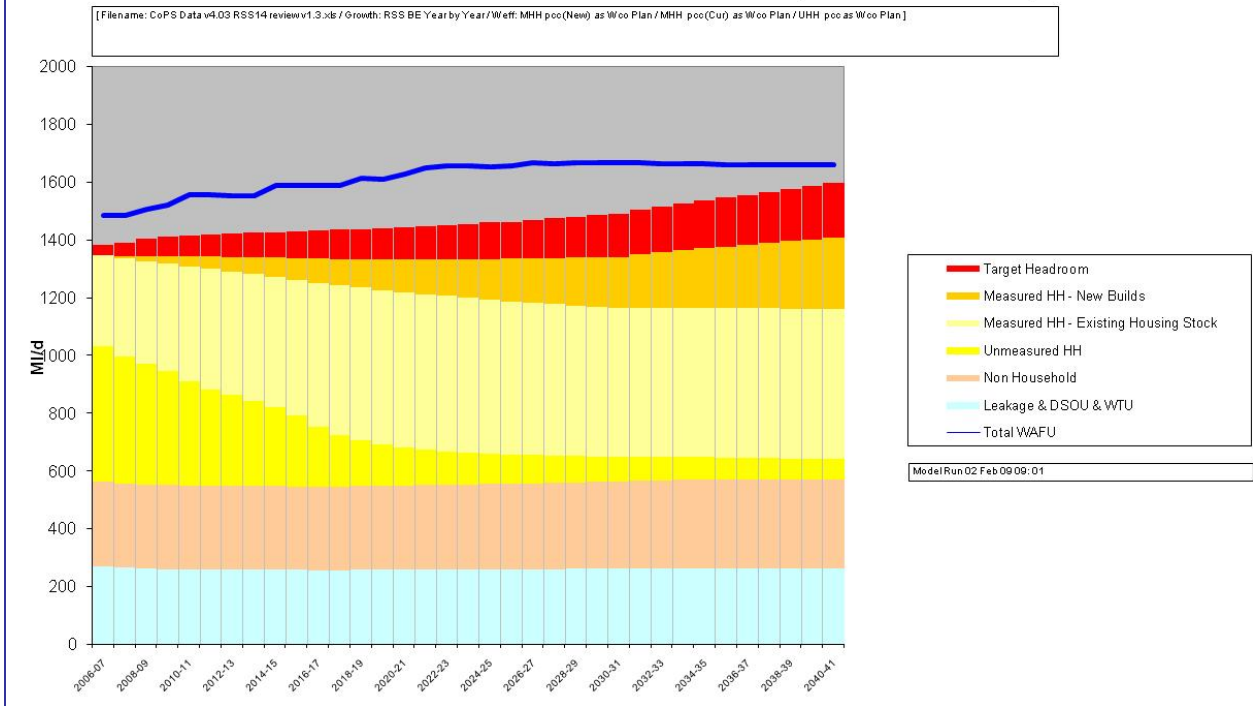
EoE - Components of Supply and Demand Scenario 2: RSS Growth and Business as New Building Regulations, Final Planning



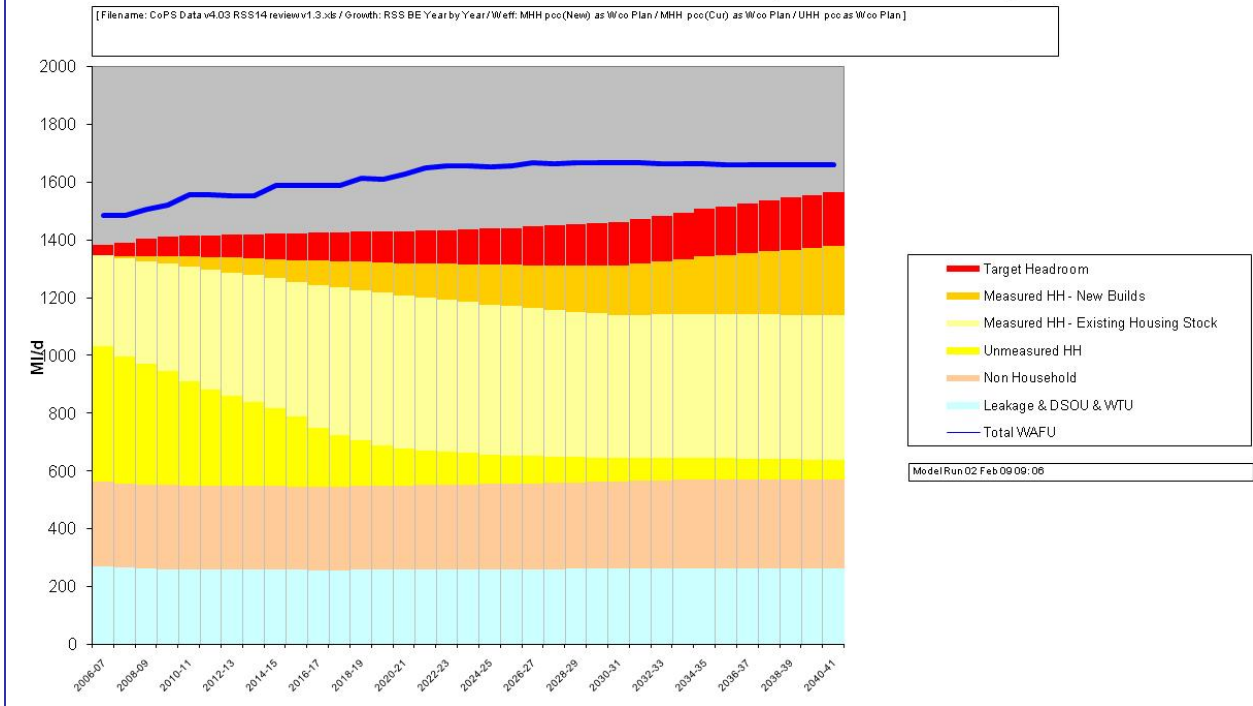
EoE - Components of Supply and Demand Scenario 3: RSS Growth and Efficient New Development, Final Planning



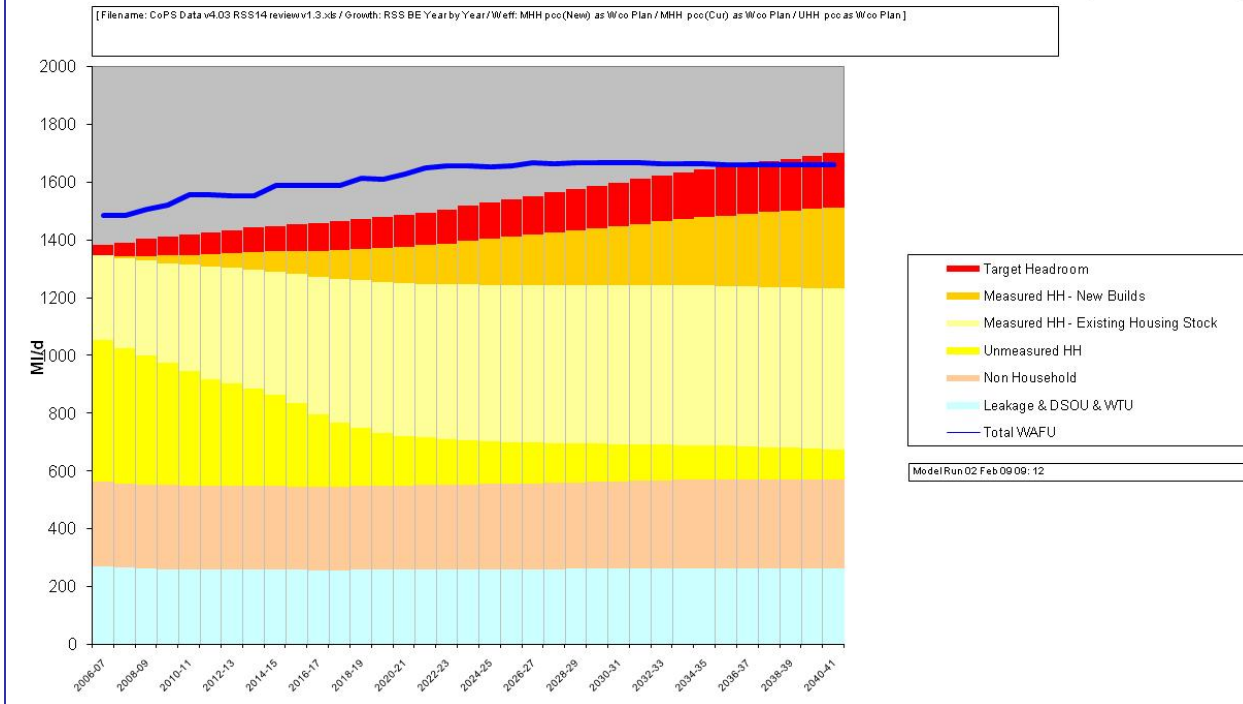
EoE - Components of Supply and Demand Scenario 4: RSS Growth and DEFRA Aspirations, Final Planning



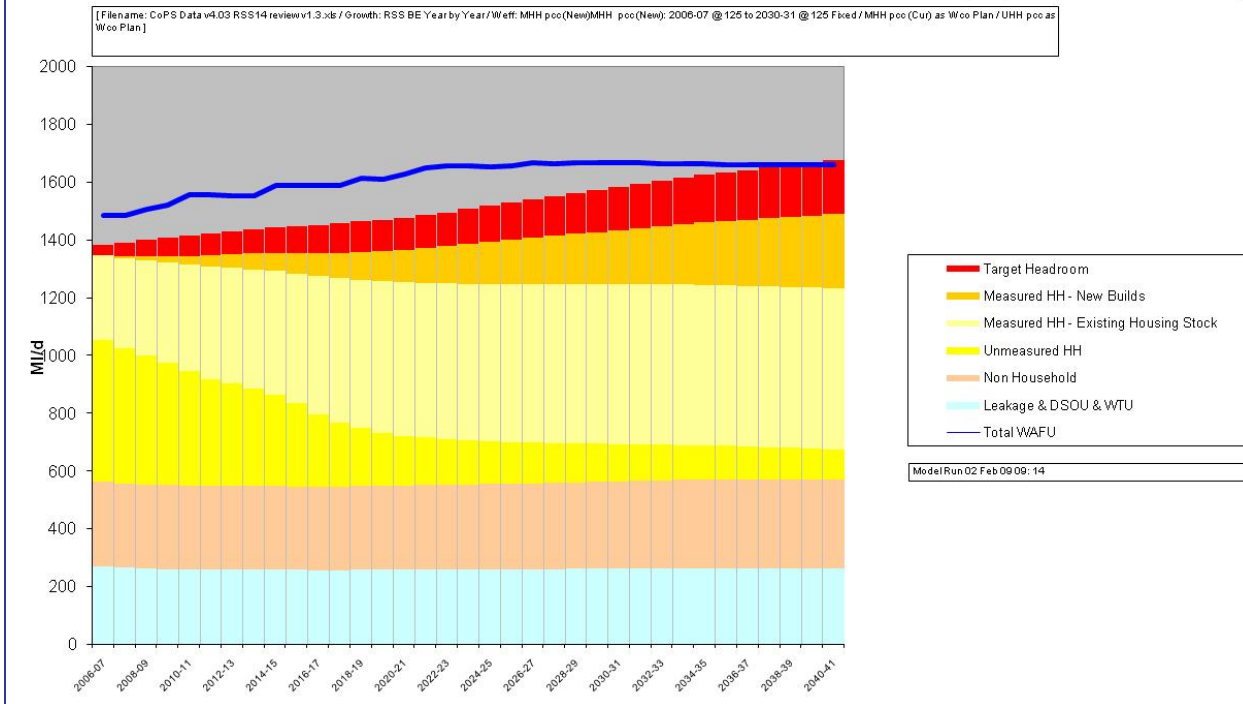
EoE - Components of Supply and Demand Scenario 5: RSS Growth and EEIP Aspirations, Final Planning



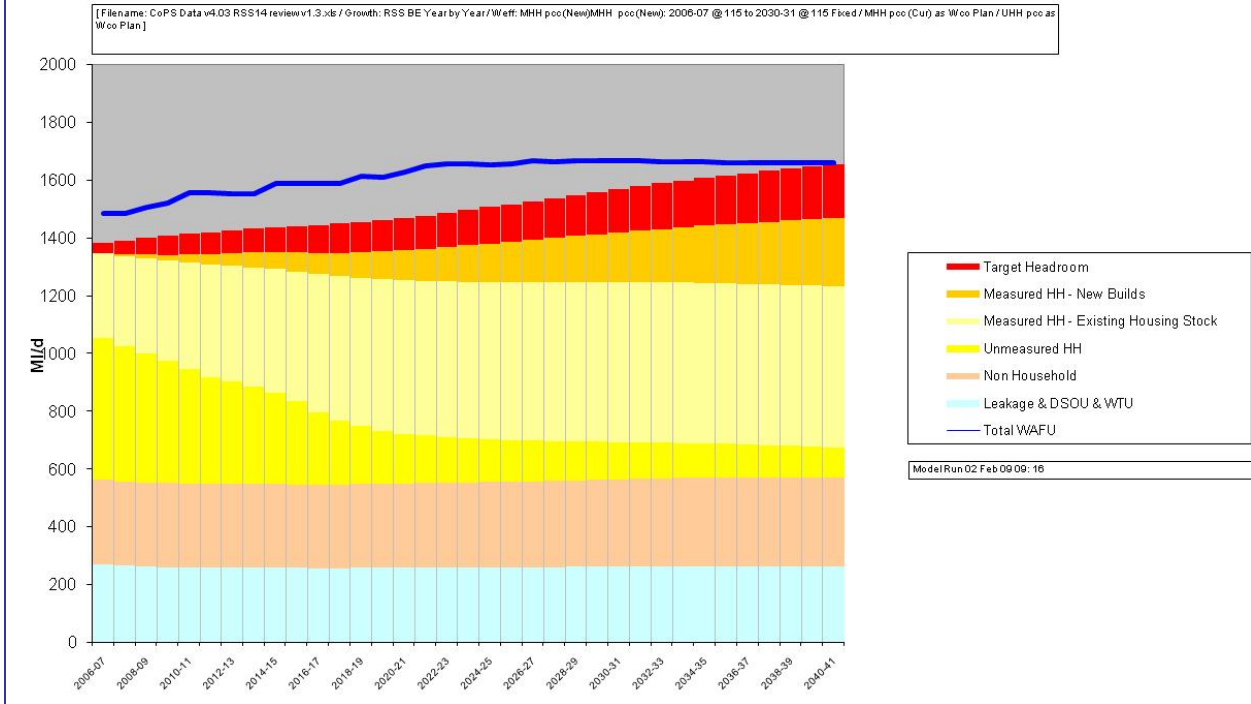
EoE - Components of Supply and Demand
Scenario 6: NHPAU Lower Growth and Business as Usual Water Efficiency, Final Planning



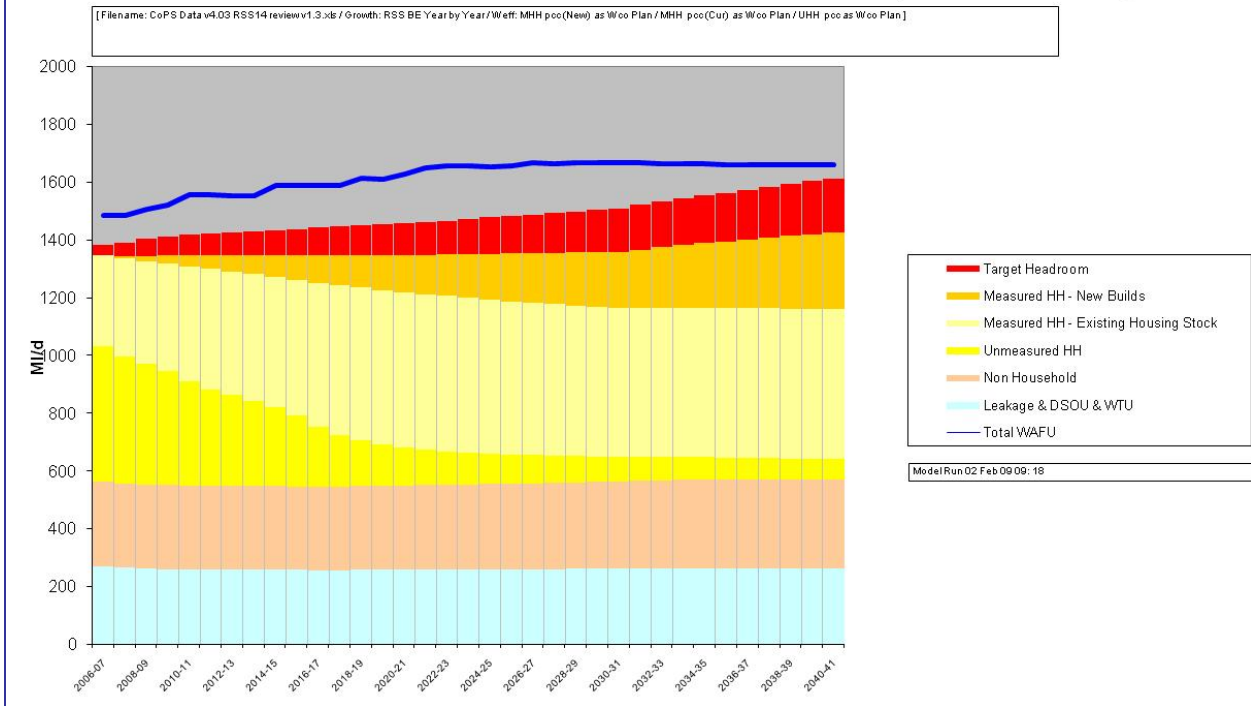
EoE - Components of Supply and Demand
Scenario 7: NHPAU Lower Growth and Business as Usual Building Regulations, Final Planning



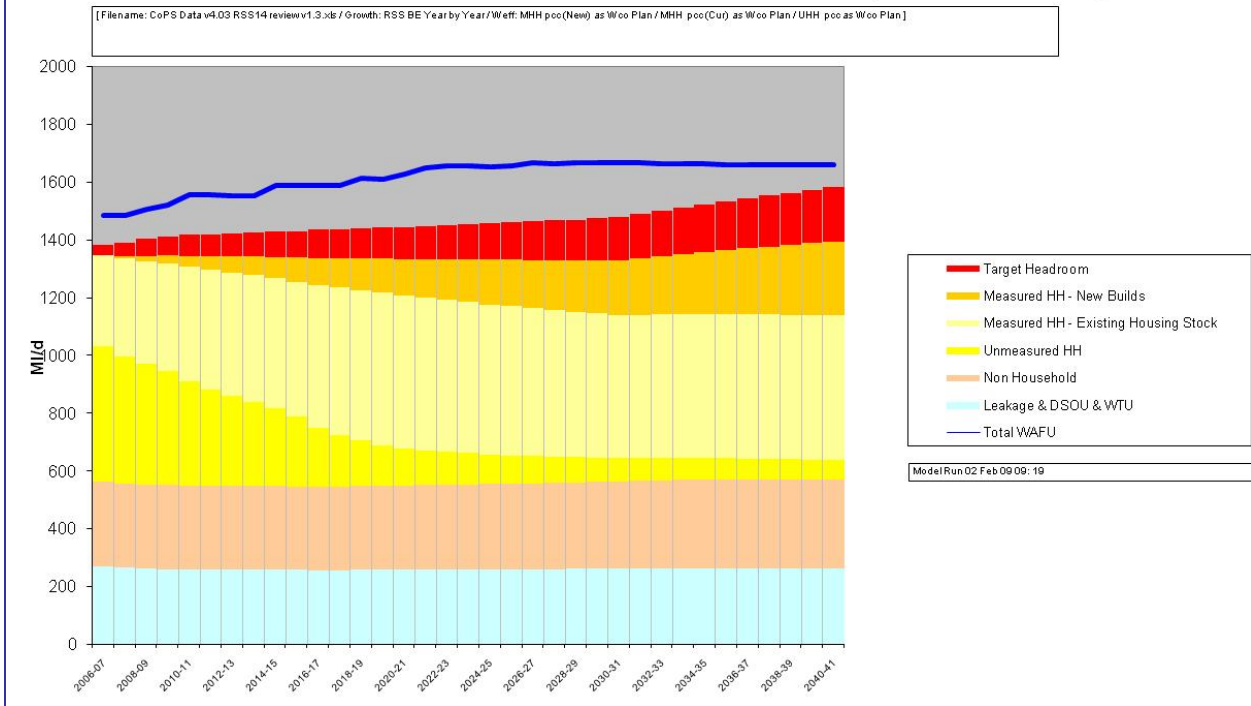
EoE - Components of Supply and Demand Scenario 8: NHPAU Lower Growth and Efficient New Development, Final Planning



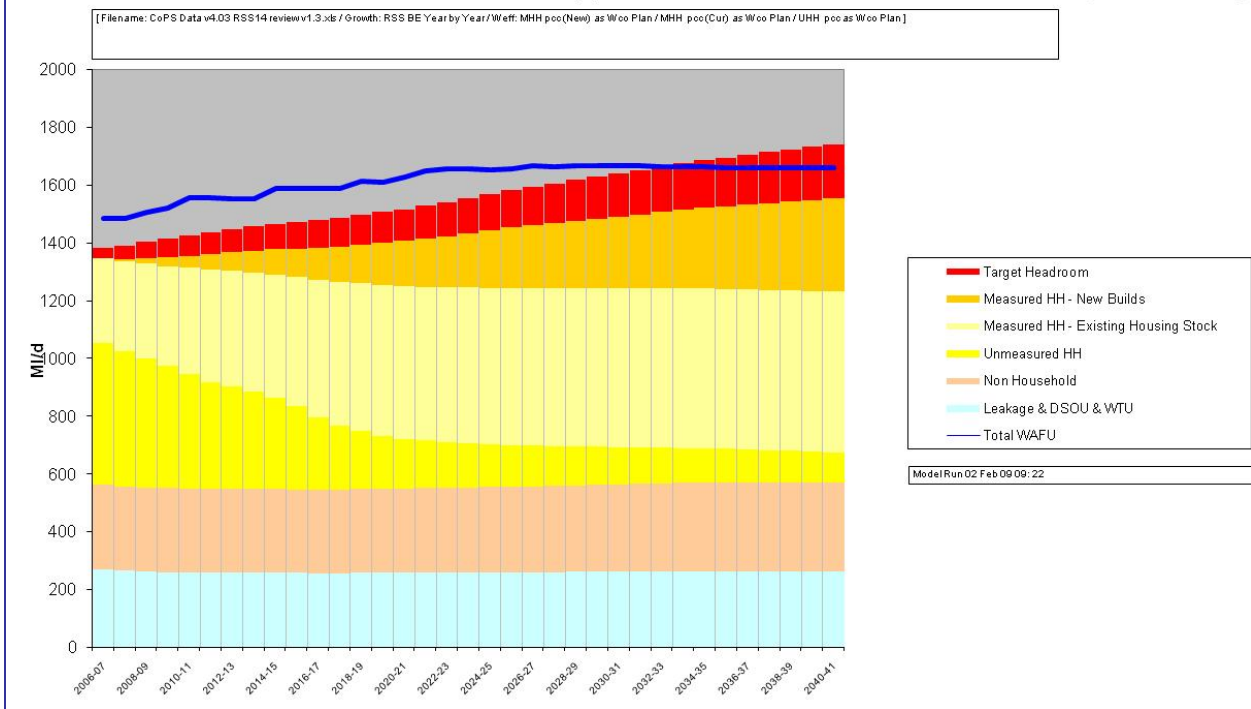
EoE - Components of Supply and Demand Scenario 9: NHPAU Lower Growth and DEFRA Aspirations, Final Planning



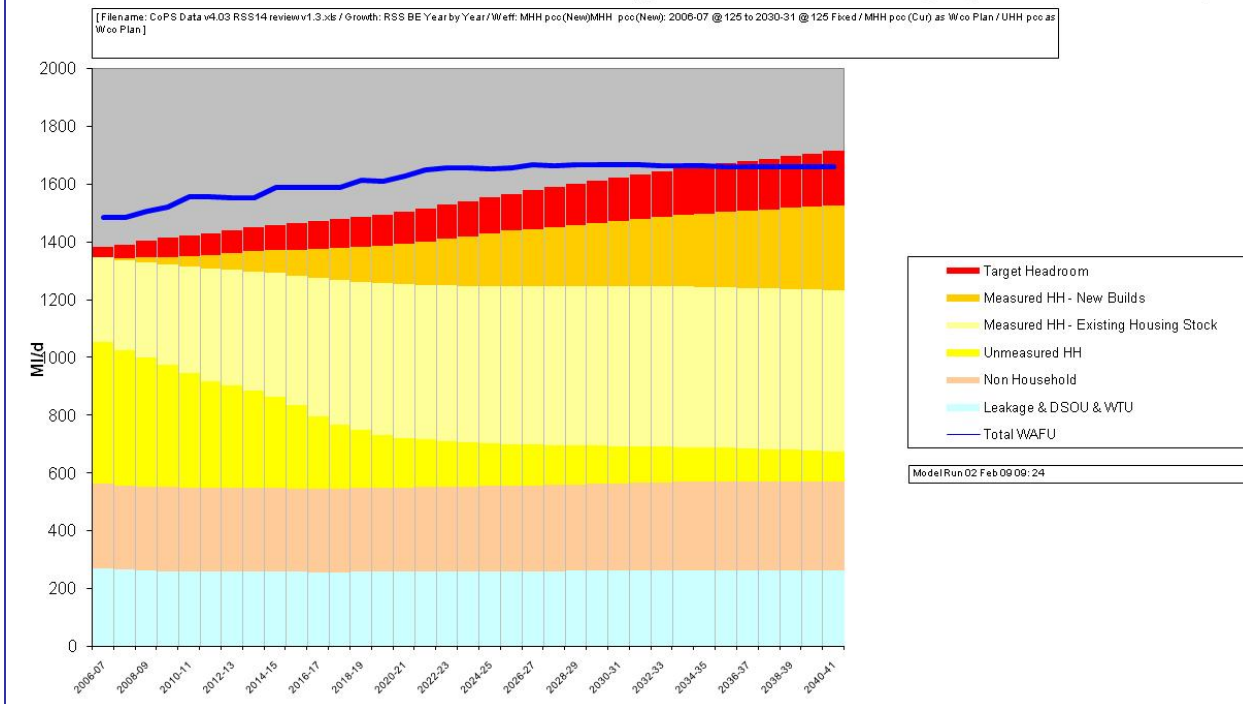
**EoE - Components of Supply and Demand
Scenario 10: NHPAU Lower Growth and EEIP Aspirations, Final Planning**



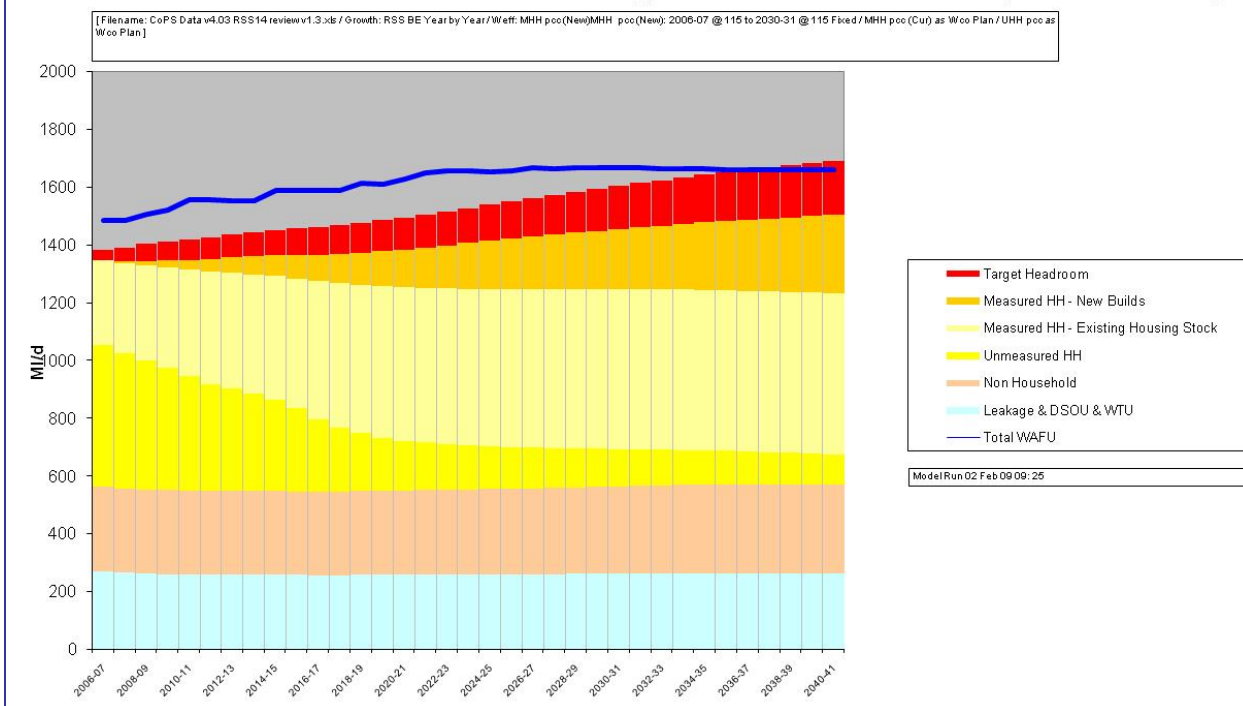
**EoE - Components of Supply and Demand
Scenario 11: NHPAU Upper Growth and Business as Usual Water Efficiency, Final Planning**



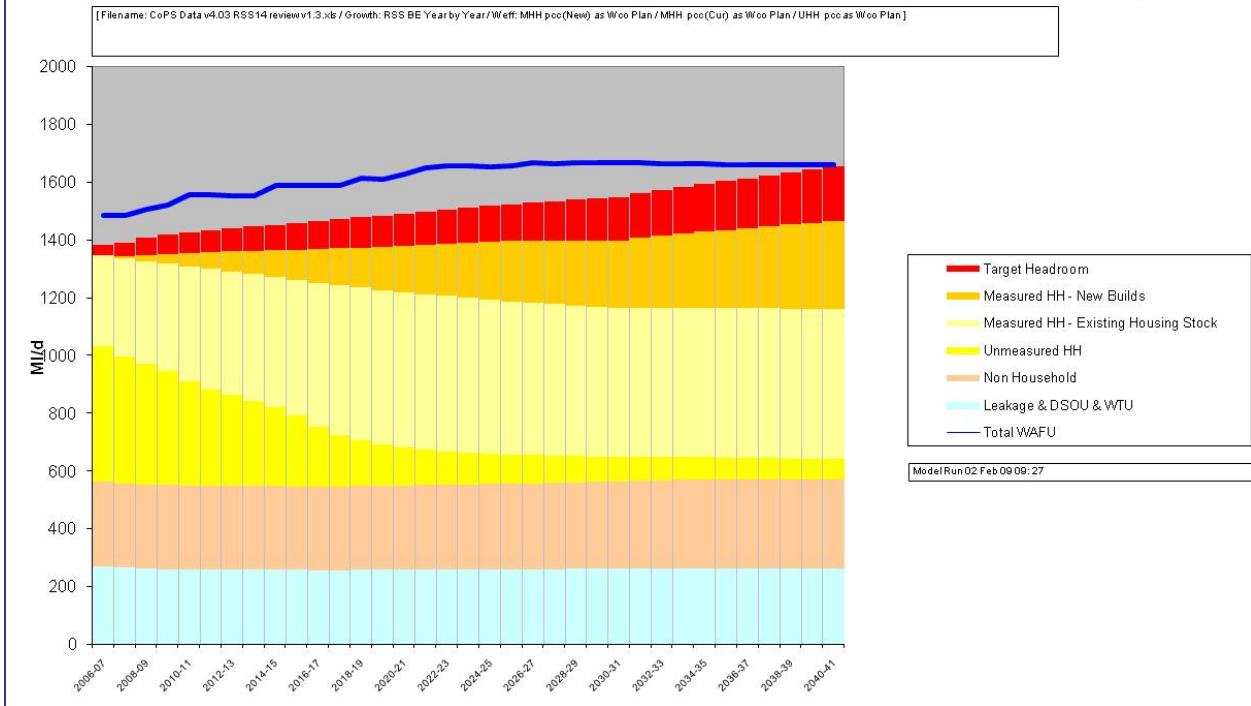
EoE - Components of Supply and Demand Scenario 12: NHPAU Upper Growth and New Building Regulations, Final Planning



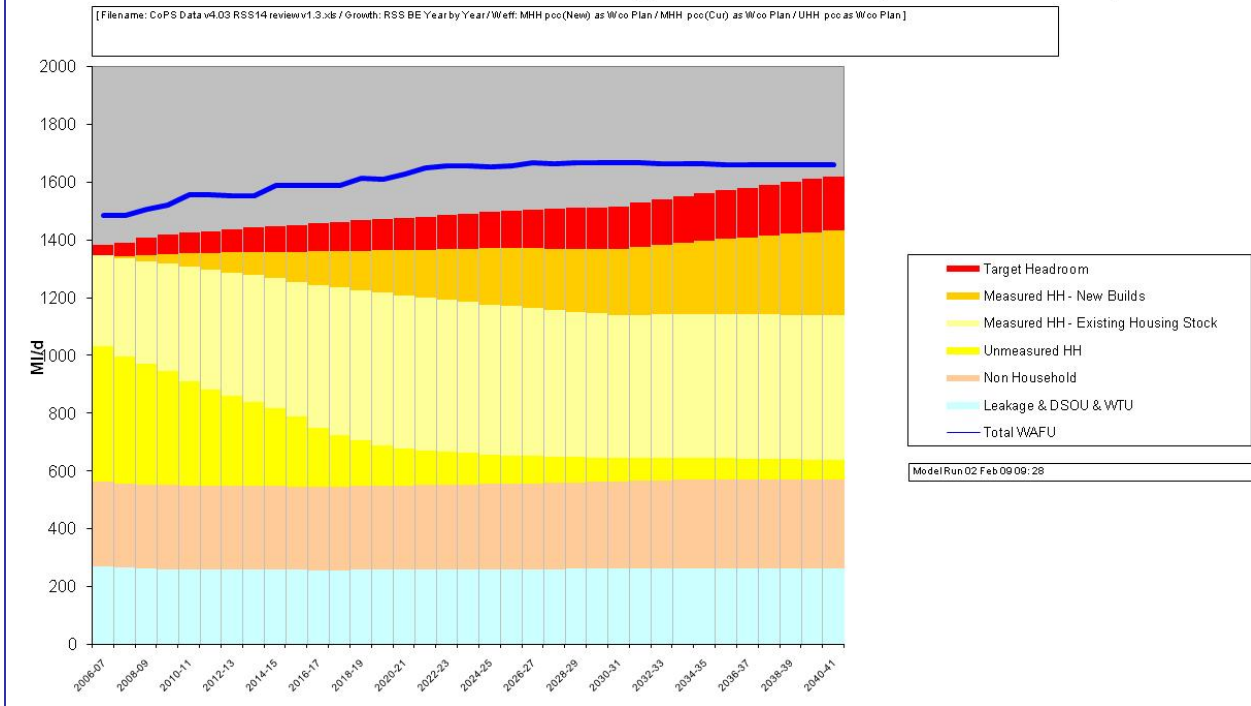
EoE - Components of Supply and Demand Scenario 13: NHPAU Upper Growth and Efficient New Development, Final Planning



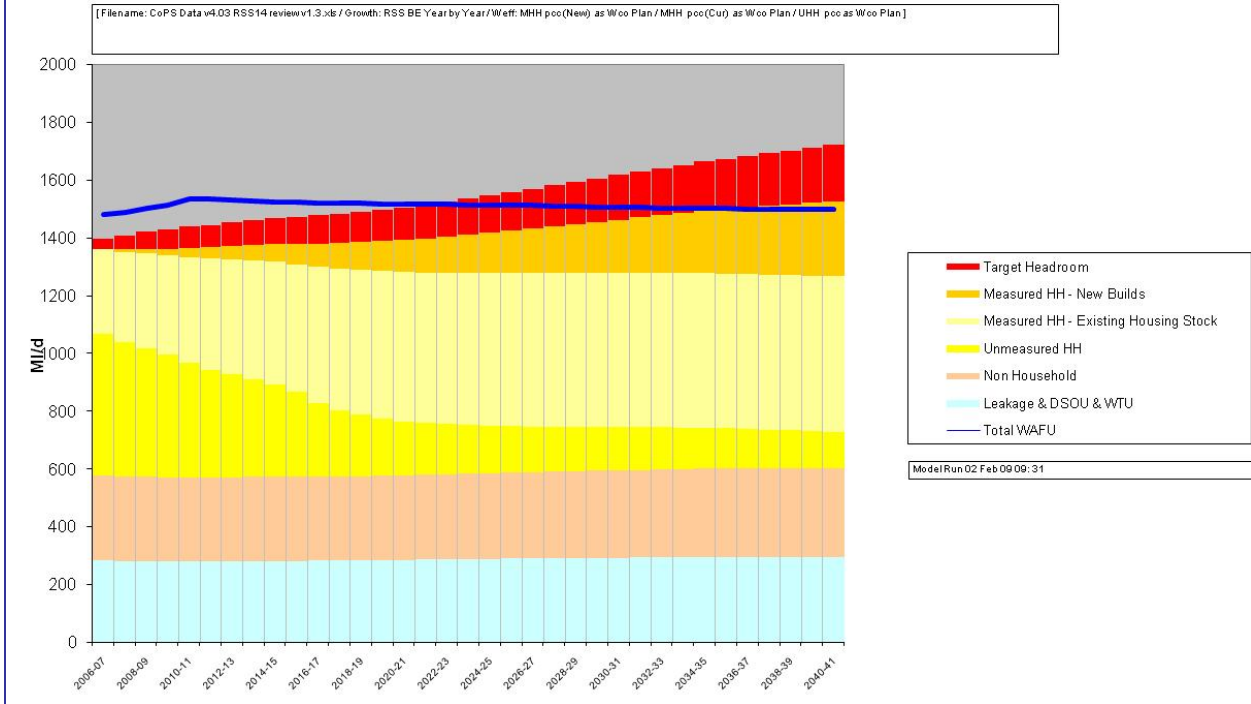
EoE - Components of Supply and Demand Scenario 14: NHPAU Upper Growth and DEFRA Aspirations, Final Planning



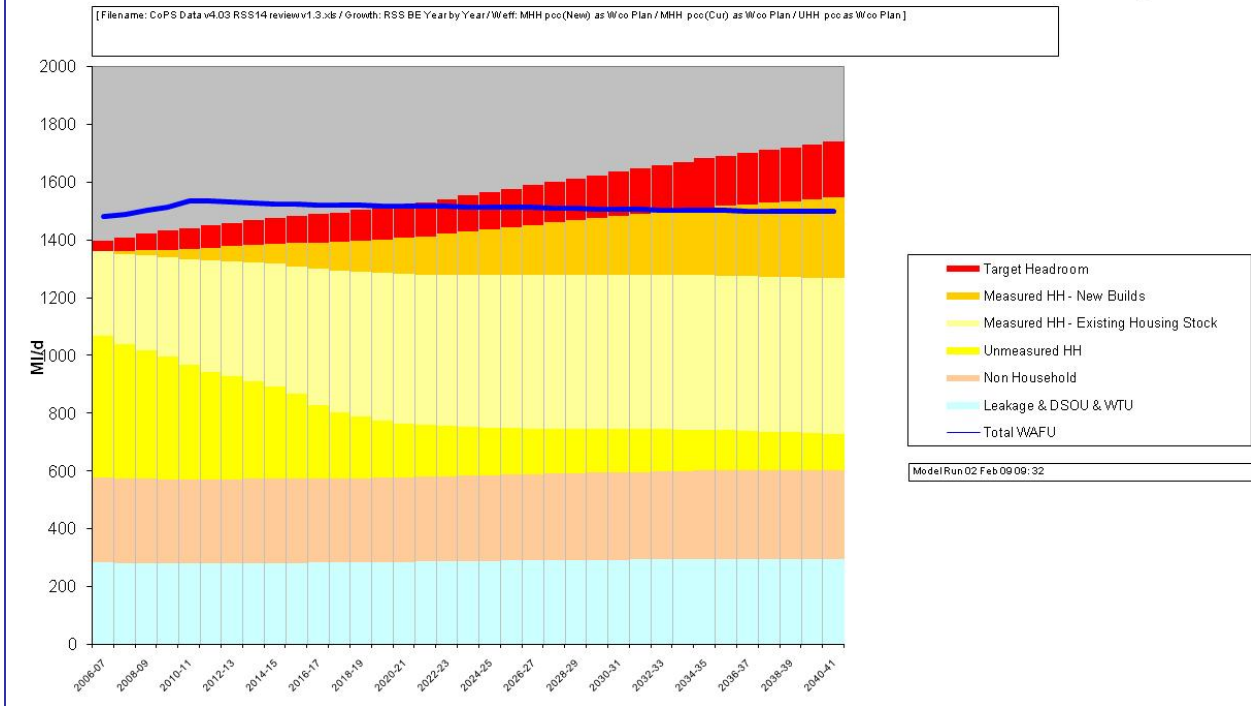
EoE - Components of Supply and Demand Scenario 15: NHPAU Upper Growth and EEIP Aspirations, Final Planning



EoE - Components of Supply and Demand Scenario 16: RSS Growth and Business as Usual Water Efficiency, Baseline

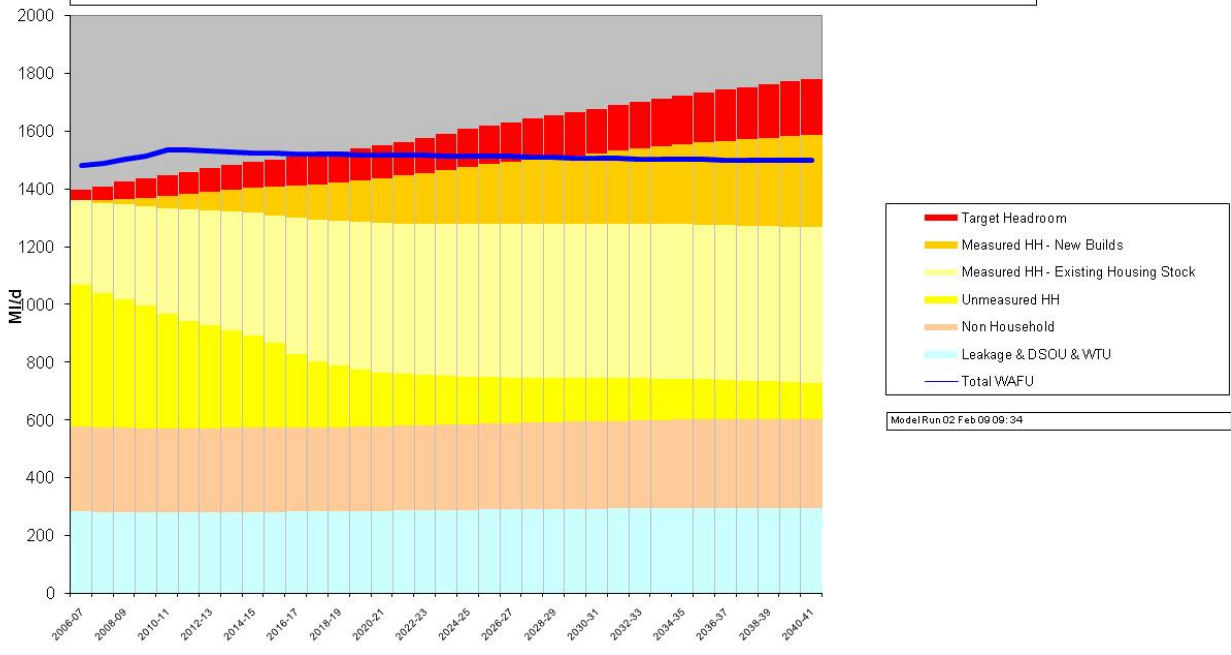


EoE - Components of Supply and Demand Scenario 17: NHPAU Lower Growth and Business as Usual Water Efficiency, Baseline



EoE - Components of Supply and Demand
Scenario 18: NHPAU Upper Growth and Business as Usual Water Efficiency, Baseline

[Filename: CoPS Data v4.03 RSS14 review v1.3.xls / Growth: RSS BE Year by Year / Weff: MHH pcc(New) as Woo Plan / MHH pcc(Cur) as Woo Plan / UHH pcc as Woo Plan]



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