

## SUPPLEMENTAL INFORMATION

For the paper

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Projections of Domestic Water Demand over the Long-Term: A Case Study of London and the Thames Valley

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This document provides supplemental information for the published paper. Tables and Figures are referenced in the paper by numbers preceded by “S”.

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**Table S1.** Observed PHC (litres per day) for property types and WRZ by ethnicity and occupant number, Thames Water DWUS, 2006-2015

| Property Type      | Ethnicity | Other Ethnic |            |            |            |            |            | South Asian |            |            |            |             |            |
|--------------------|-----------|--------------|------------|------------|------------|------------|------------|-------------|------------|------------|------------|-------------|------------|
|                    |           | Occupants    | 1          | 2          | 3          | 4          | 5          | 6+          | 1          | 2          | 3          | 4           | 5          |
| Detached           |           |              |            |            |            |            |            |             |            |            |            |             |            |
| SWA                |           | 165          | <b>374</b> | <b>463</b> | <b>483</b> | 534        | 670        |             | 446        | 713        | 492        | 839         |            |
| London             |           | <b>172</b>   | <b>357</b> | <b>452</b> | <b>495</b> | <b>590</b> | 787        | 567         | 474        | 539        | 754        | 1342        |            |
| Kennet Valley      |           | <b>202</b>   | <b>339</b> | <b>423</b> | <b>487</b> | 618        | 916        |             | 399        | 284        | 519        |             |            |
| SWOX               |           | <b>204</b>   | <b>378</b> | <b>474</b> | <b>479</b> | 702        | 628        |             |            |            | 630        |             |            |
| Guildford          |           | 216          | 362        | 478        | 448        | 477        |            |             |            |            | 518        |             |            |
| Henley             |           | 204          | 365        | 378        | 586        | 564        | 533        |             |            |            |            |             |            |
| <i>Average</i>     |           | <b>192</b>   | <b>364</b> | <b>449</b> | <b>483</b> | <b>609</b> | <b>707</b> | <i>567</i>  | <i>451</i> | <i>561</i> | <b>618</b> | <i>1208</i> |            |
| Semi-detached      |           |              |            |            |            |            |            |             |            |            |            |             |            |
| SWA                |           | <b>221</b>   | <b>307</b> | <b>389</b> | <b>475</b> | 543        | 362        | 311         | 505        | 798        | 913        | 1511        | 1110       |
| London             |           | <b>218</b>   | <b>314</b> | <b>408</b> | <b>511</b> | <b>626</b> | <b>688</b> | <b>237</b>  | 399        | 593        | <b>654</b> | 710         | 942        |
| Kennet Valley      |           | <b>165</b>   | <b>289</b> | <b>393</b> | <b>383</b> | <b>525</b> | <b>601</b> | <b>209</b>  | 287        | 425        | 538        | 648         | 683        |
| SWOX               |           | <b>188</b>   | <b>311</b> | <b>389</b> | <b>469</b> | <b>530</b> | 537        | 182         | 234        |            | 316        |             |            |
| Guildford          |           | 252          | <b>298</b> | 350        | 462        | 651        | 464        |             |            |            |            |             |            |
| Henley             |           | 133          | 394        | 401        | 667        |            |            |             |            |            |            |             |            |
| <i>Average</i>     |           | <b>203</b>   | <b>309</b> | <b>397</b> | <b>473</b> | <b>591</b> | <b>626</b> | <b>222</b>  | <b>365</b> | <b>566</b> | <b>698</b> | <i>968</i>  | <i>869</i> |
| Terraced           |           |              |            |            |            |            |            |             |            |            |            |             |            |
| SWA                |           | <b>201</b>   | <b>277</b> | <b>426</b> | <b>417</b> | 511        | 662        | 152         | 245        | 514        | 632        | 584         |            |
| London             |           | <b>199</b>   | <b>300</b> | <b>427</b> | <b>487</b> | <b>541</b> | <b>824</b> | <b>310</b>  | <b>575</b> | <b>725</b> | <b>849</b> | <b>943</b>  | 889        |
| Kennet Valley      |           | <b>190</b>   | <b>299</b> | <b>359</b> | <b>415</b> | 630        | 795        |             |            | 328        |            |             | 565        |
| SWOX               |           | <b>163</b>   | <b>289</b> | <b>373</b> | <b>429</b> | 465        | 715        |             | 348        | 470        | 764        |             |            |
| Guildford          |           | 230          | 256        | <b>495</b> | 393        | 638        |            |             |            |            | 529        | 574         | 432        |
| Henley             |           | 174          | 372        | 380        | 422        |            |            |             |            |            |            |             |            |
| <i>Average</i>     |           | <b>192</b>   | <b>296</b> | <b>415</b> | <b>465</b> | <b>540</b> | <b>811</b> | <b>283</b>  | <b>491</b> | <b>630</b> | <b>797</b> | <b>911</b>  | <b>861</b> |
| Flats              |           |              |            |            |            |            |            |             |            |            |            |             |            |
| SWA                |           | 166          | <b>273</b> | 546        | 538        |            |            | 95          | 610        | 473        | 448        |             |            |
| London             |           | <b>181</b>   | <b>291</b> | <b>354</b> | <b>424</b> | <b>479</b> | 486        | 204         | <b>289</b> | <b>335</b> | 460        | 185         | 663        |
| Kennet Valley      |           | <b>134</b>   | 276        | 331        |            |            |            |             | 357        |            |            |             |            |
| SWOX               |           | <b>220</b>   | 403        | 437        | 386        |            |            | 390         | 545        | 998        | 1290       |             |            |
| Guildford          |           | 197          | 332        | 215        | 352        | 237        |            | 195         |            |            | 267        |             |            |
| Henley             |           |              |            |            |            |            |            |             |            |            |            |             |            |
| <i>Average</i>     |           | <b>180</b>   | <b>294</b> | <b>364</b> | <b>421</b> | <b>473</b> | <i>486</i> | <i>218</i>  | <b>317</b> | <b>350</b> | <i>472</i> | <i>185</i>  | <i>663</i> |
| All Property Types |           |              |            |            |            |            |            |             |            |            |            |             |            |
| SWA                |           | <b>196</b>   | <b>308</b> | <b>438</b> | <b>463</b> | <b>532</b> | 650        | 151         | 397        | <b>586</b> | <b>691</b> | <b>1272</b> | 1110       |
| London             |           | <b>190</b>   | <b>306</b> | <b>405</b> | <b>490</b> | <b>569</b> | <b>767</b> | <b>259</b>  | <b>458</b> | <b>550</b> | <b>768</b> | 902         | <b>900</b> |
| Kennet Valley      |           | <b>167</b>   | <b>305</b> | <b>393</b> | <b>426</b> | <b>575</b> | <b>675</b> | 209         | 342        | 386        | 532        | 648         | 651        |
| SWOX               |           | <b>185</b>   | <b>327</b> | <b>410</b> | <b>460</b> | <b>568</b> | <b>602</b> | 369         | <b>323</b> | 536        | 680        |             |            |
| Guildford          |           | <b>223</b>   | <b>315</b> | <b>422</b> | <b>438</b> | <b>583</b> | 464        | 195         |            |            | 345        | 574         | 432        |
| Henley             |           | 162          | <b>381</b> | 384        | 562        | 564        | 533        |             |            |            |            |             |            |
| <i>Average</i>     |           | <b>189</b>   | <b>312</b> | <b>407</b> | <b>469</b> | <b>568</b> | <b>710</b> | <b>255</b>  | <b>419</b> | <b>541</b> | <b>721</b> | <b>939</b>  | <b>861</b> |

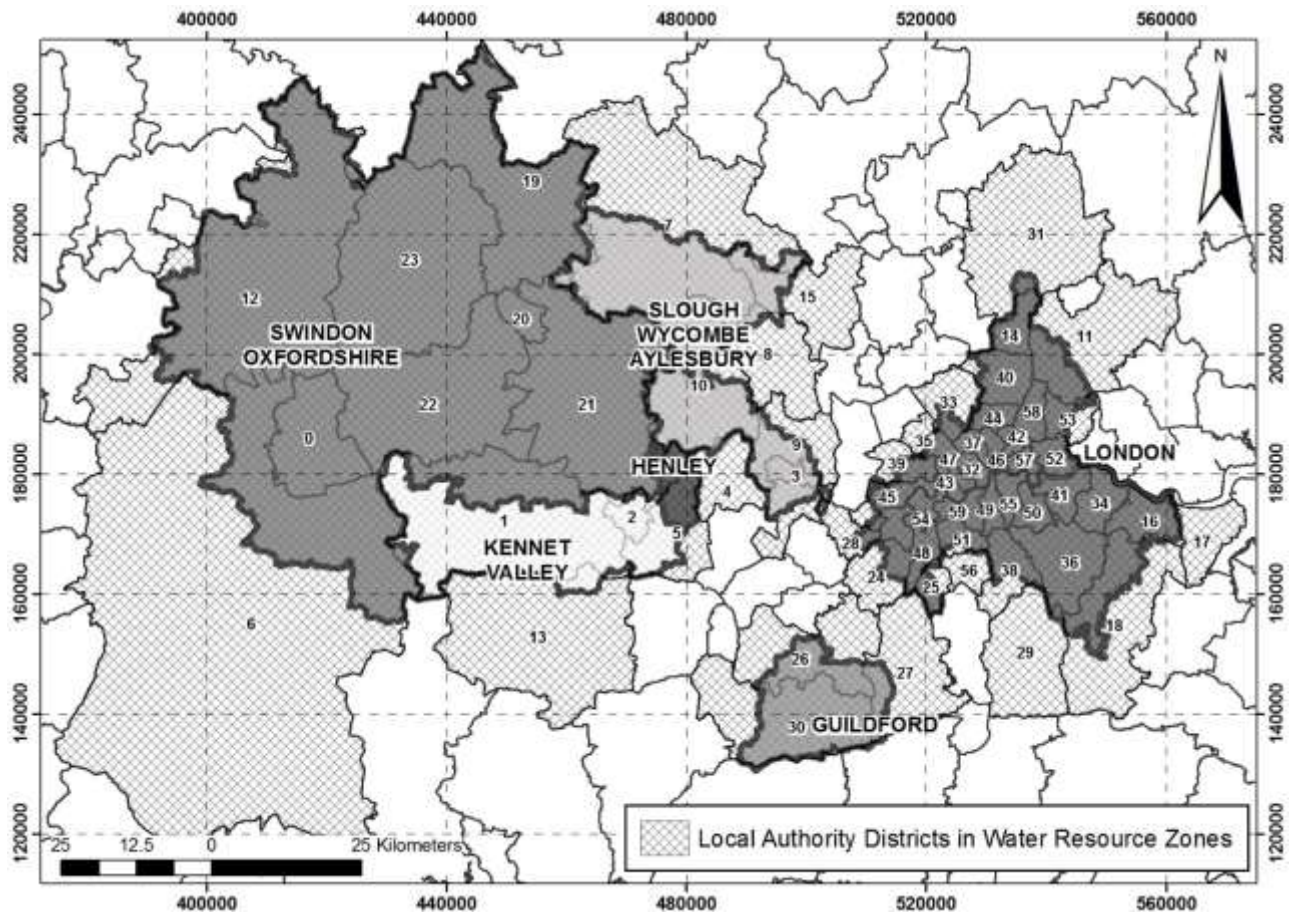
Notes:

1. PHC = Per Household Consumption, daily, averaged over 2006-2015.
  2. WRZ = Water Resource Zone. SWA = Slough Wycombe & Aylesbury, SWOX = Swindon & Oxfordshire.
  3. PHCs in **bold** are based on sample numbers  $\geq 50$ . Blank cells have no households in the sample.
- Source: Computed by the authors from Thames Water's Domestic Water User Survey (DWUS).

**Table S2.** Empirical prediction intervals (EPIs) for forecasts of domestic water consumption in millions of litres per day, Thames Water Region, by scenario, for selected years

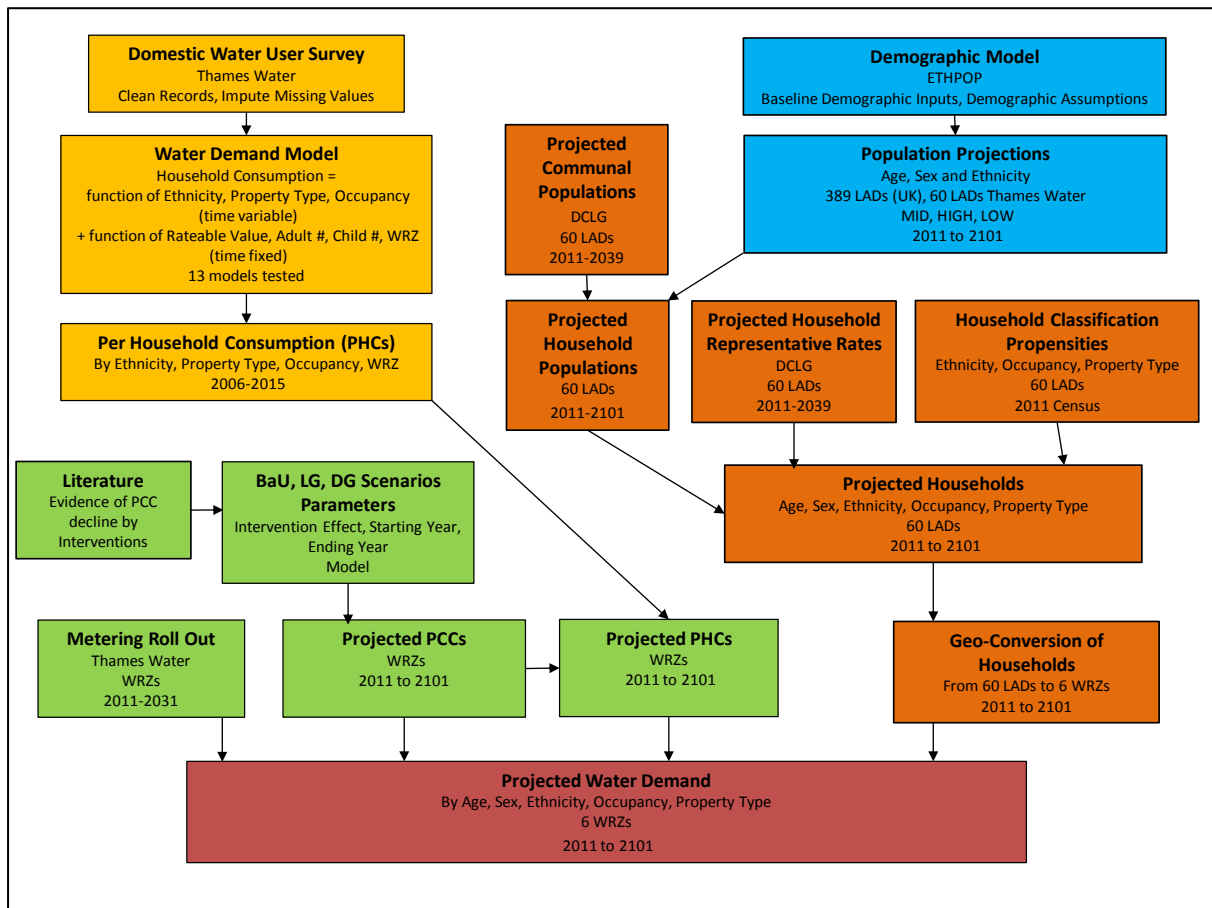
| Scenario          | EPI | 2011 | 2021        | 2041        | 2061        | 2081        | 2101        |
|-------------------|-----|------|-------------|-------------|-------------|-------------|-------------|
| Business as Usual | 90% |      | <i>1426</i> | <i>1868</i> | <i>2319</i> | <i>2659</i> | <i>2821</i> |
|                   | Mid | 1225 | 1350        | 1708        | 2048        | 2271        | 2332        |
|                   | 10% |      | <i>1274</i> | <i>1548</i> | <i>1777</i> | <i>1882</i> | <i>1842</i> |
| Light Green       | 90% |      | <i>1411</i> | <i>1725</i> | <i>2072</i> | <i>2366</i> | <i>2502</i> |
|                   | Mid | 1225 | 1336        | 1578        | 1830        | 2021        | 2068        |
|                   | 10% |      | <i>1260</i> | <i>1430</i> | <i>1588</i> | <i>1675</i> | <i>1634</i> |
| Dark Green        | 90% |      | <i>1399</i> | <i>1611</i> | <i>1875</i> | <i>2055</i> | <i>2166</i> |
|                   | Mid | 1225 | 1324        | 1473        | 1656        | 1755        | 1790        |
|                   | 10% |      | <i>1249</i> | <i>1335</i> | <i>1437</i> | <i>1455</i> | <i>1414</i> |

Note: The EPIs are computed for the projected populations for Water Resource Zones summed to a total for the Thames Water Region (Fig.M1). The derivation of the EPIs is described in Rees and Clark (2018), based on a set of historical projection errors for local authorities with small, medium and large populations reported in UKWIR (2015). A piece wise linear function was derived to relate EPIs to population size and a linear function used to relate projection error to length of the forecasting period. The EPIs estimate the uncertainty in water demand forecasts due to uncertainty in population and household forecasts.



| Label | Local Authority District Name | Label | Local Authority District Name  |
|-------|-------------------------------|-------|--------------------------------|
| 0     | Swindon                       | 30    | Waverley                       |
| 1     | West Berkshire                | 31    | East Hertfordshire             |
| 2     | Reading                       | 32    | City of London and Westminster |
| 3     | Slough                        | 33    | Barnet                         |
| 4     | Windsor and Maidenhead        | 34    | Bexley                         |
| 5     | Wokingham                     | 35    | Brent                          |
| 6     | Wiltshire                     | 36    | Bromley                        |
| 7     | Aylesbury Vale                | 37    | Camden                         |
| 8     | Chiltern                      | 38    | Croydon                        |
| 9     | South Bucks                   | 39    | Ealing                         |
| 10    | Wycombe                       | 40    | Enfield                        |
| 11    | Epping Forest                 | 41    | Greenwich                      |
| 12    | Cotswold                      | 42    | Hackney                        |
| 13    | Basingstoke and Deane         | 43    | Hammersmith and Fulham         |
| 14    | Broxbourne                    | 44    | Haringey                       |
| 15    | Dacorum                       | 45    | Hounslow                       |
| 16    | Dartford                      | 46    | Islington                      |
| 17    | Gravesham                     | 47    | Kensington and Chelsea         |
| 18    | Sevenoaks                     | 48    | Kingston upon Thames           |
| 19    | Cherwell                      | 49    | Lambeth                        |
| 20    | Oxford                        | 50    | Lewisham                       |
| 21    | South Oxfordshire             | 51    | Merton                         |
| 22    | Vale of White Horse           | 52    | Newham                         |
| 23    | West Oxfordshire              | 53    | Redbridge                      |
| 24    | Elmbridge                     | 54    | Richmond upon Thames           |
| 25    | Epsom and Ewell               | 55    | Southwark                      |
| 26    | Guildford                     | 56    | Sutton                         |
| 27    | Mole Valley                   | 57    | Tower Hamlets                  |
| 28    | Spelthorne                    | 58    | Waltham Forest                 |
| 29    | Tandridge                     | 59    | Wandsworth                     |

**Fig. S1** The water resource zones of Thames Water and overlapping local authority districts



**Fig. S2** The framework for projecting domestic water demand

Notes: DCLG = Department of Communities and Local Government

PCC = Per Capita Consumption, PHC = Per Household Consumption (both in litres per day)

Blue = Demographic modules, Fawn = Household modules, Yellow = Water demand prediction modules

Green = Water demand projection modules, Purple = Projected water demand

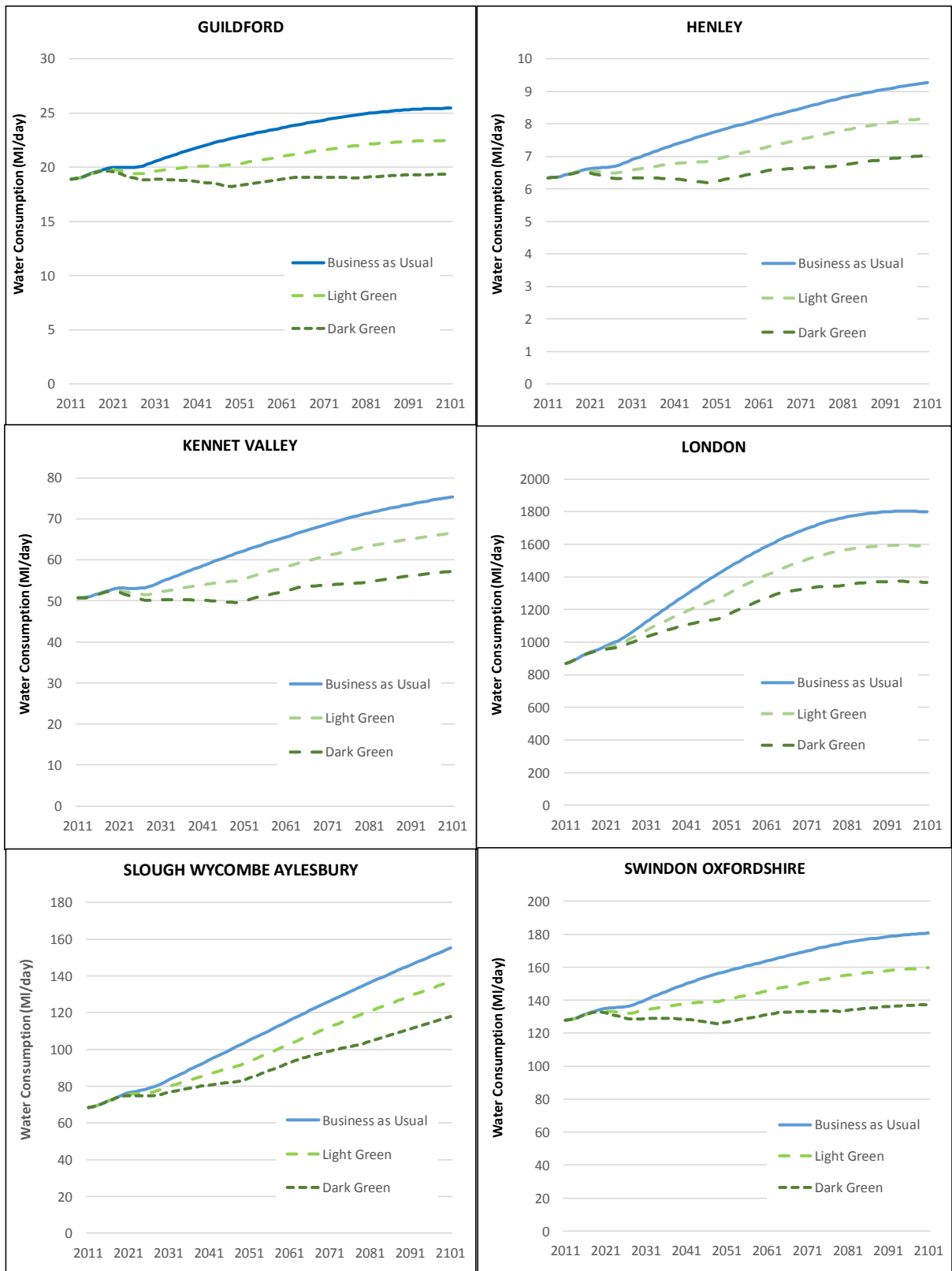


Fig. S3 Total domestic water consumption in the six water resource zones, by scenario, 2011-2101