Appendix A
Supporting Planning Information

The outline water cycle study has examined the consequences of building in line with the proposed development trajectories, emerging from the three Council's SHLAA assessments (13,674 dwellings by 2016/17 and 24,677 by 2024/25)[21]. United Utilities has indicated that its wastewater services will be able to serve the development up to 2014/15 (AMP5) but that after this it is less certain how much available capacity there will be.

Housing growth figures at ward scale were provided by the three local authorities (Tables A.1 to A.3). Growth per settlement was allocated to the relevant wastewater treatment works catchment areas using GIS. In this way the study analysed how demand on the treatment works is likely to change over time.

[21] SHLAA data dated August 2010 (provided by the Local Authorities)

Table A.1. Warrington Housing Trajectory

	1-5 years					6-10 years					11-15 years				
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Warrington (Wards)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Westbrook	0	15	30	30	24	0	0	0	0	0	0	0	0	0	0
Appleton	0	0	0	0	0	0	0	0	0	0	51	66	40	30	30
Whittle Hall	150	154	155	85	67	67	108	60	60	55	8	7	0	0	0
Lymm	25	18	26	15	0	0	0	0	0	0	29	11	0	0	0
Bewsey & Whitecross	82	104	82	60	54	33	0	0	0	0	84	142	214	50	175
Great Sankey North	2	1	0	0	0	15	30	30	30	40	5	15	0	0	0
Latchford East	34	70	45	60	60	101	99	90	90	53	31	53	52	36	0
Latchford West	40	41	60	86	60	60	54	30	0	0	12	27	30	31	34
Fairfield & Howley	61	22	29	0	0	35	77	30	30	30	47	60	58	30	30
Penketh & Cuerdley	2	5	0	0	0	0	0	0	0	0	0	9	0	0	0
Burtonwood & Winwick	1	0	0	0	0	0	0	0	0	0	23	0	0	0	0
Great Sankey South	0	0	0	0	0	0	0	0	0	0	20	11	0	0	0
Rixton & Woolston	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Stockton Heath	3	0	15	30	6	0	0	0	0	0	15	5	0	0	0
Orford	0	11	2	0	11	0	0	0	0	0	9	12	0	0	0
Hatton, Stretton & Walton	2	0	4	0	0	0	0	0	0	0	15	45	30	30	30
Culcheth, Glazebury & Croft	30	6	0	0	0	0	0	0	0	0	30	19	15	0	0
Grappenhall & Thelwall	0	10	0	0	0	0	0	0	0	0	32	42	60	60	60
Poplars & Hulme	2	0	0	0	0	0	0	0	0	0	16	3	0	0	0
Birchwood	0	0	0	0	0	15	30	0	0	0	24	0	0	0	0
Poulton South	0	0	15	30	30	60	60	60	45	0	1	0	0	0	0
Poulton North	0	10	0	0	0	0	0	0	0	0	3	15	30	30	16
Sum: Projected Net Completions	**435**	**467**	**463**	**396**	**312**	**386**	**458**	**300**	**255**	**178**	**455**	**542**	**529**	**297**	**376**
Sum: Cumulative Net Completions	**435**	**902**	**1365**	**1761**	**2073**	**2459**	**2917**	**3217**	**3472**	**3650**	**4105**	**4647**	**5176**	**5473**	**5849**

Appendix A

Table A.2. Halton Housing Trajectory

	1-5 years					6-10 years					11-15 years				
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Halton (Wards)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Appleton	0	0	14	23	42	0	34	66	79	77	51	30	44	19	0
Riverside	18	0	30	35	60	0	13	4	22	11	0	0	34	30	30
Kingsway	0	0	3	2	15	0	0	0	36	35	27	0	14	15	30
Grange	0	0	3	4	0	0	17	30	45	64	36	0	0	2	3
Windmill Hill	0	0	15	30	30	30	60	60	60	60	10	0	0	0	0
Mersey	43	51	204	204	263	100	101	179	250	160	87	95	154	100	82
Heath	0	21	8	2	32	0	15	50	102	110	20	0	42	29	40
Ditton	0	2	23	0	59	15	34	19	14	31	0	0	15	15	0
Daresbury	28	24	56	155	232	254	321	386	424	388	257	238	238	178	119
Farnworth	6	18	93	162	200	112	97	70	36	58	15	0	0	0	0
Broadheath	0	21	15	7	18	4	6	11	11	25	12	0	0	0	0
Halton Brook	0	24	49	65	18	0	15	45	50	30	30	55	15	5	0
Halton Castle	7	0	0	0	0	0	0	0	0	5	0	0	0	0	0
Castlefields	70	50	10	5	30	0	15	30	34	0	0	0	2	0	0
Halton View	1	0	30	54	66	8	0	23	21	7	0	0	5	0	0
Birchfield	15	30	28	6	3	0	17	26	17	47	15	0	0	0	0
Hale	0	0	0	0	0	0	0	0	4	16	0	0	0	0	0
Halton Lea	0	0	15	45	55	25	30	60	75	42	26	0	0	0	0
Hough Green	0	0	15	42	26	0	0	15	17	18	0	0	0	0	0
Norton North	63	16	0	17	42	30	30	30	15	0	0	0	0	0	0
Norton South	0	0	46	69	67	25	0	30	64	20	0	0	0	0	0
Beechwood	0	0	0	3	12	0	0	16	44	10	0	0	0	0	0
Sum: Projected Net Completions	**251**	**257**	**657**	**930**	**1270**	**603**	**805**	**1150**	**1420**	**1214**	**586**	**418**	**563**	**393**	**304**
Sum: Cumulative Net Completions	**251**	**508**	**1165**	**2095**	**3365**	**3968**	**4773**	**5923**	**7343**	**8557**	**9143**	**9561**	**10124**	**10517**	**10821**

Appendix A

Table A.3. St. Helens Housing Trajectory

	1-5 years					6-10 years					11-15 years				
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
St Helens (Wards)	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Billinge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Billinge & Seneley Green	3	22	16	7	0	2	1	3	0	0	0	0	0	0	0
Blackbrook	4	3	31	12	6	17	29	1	0	0	0	0	0	0	0
Bold	33	35	30	44	29	38	29	29	28	28	30	26	25	17	0
Earlestown	9	59	90	92	95	71	58	57	54	28	27	26	25	23	21
Eccleston	2	12	31	33	32	31	29	30	28	28	27	26	25	4	0
Haydock	3	18	92	90	39	34	15	0	0	0	0	0	0	0	0
Moss Bank	2	19	24	47	45	62	58	58	57	29	13	0	0	0	0
Newton	45	65	126	162	84	103	124	102	85	83	54	53	13	0	0
Parr	14	60	143	67	37	102	93	35	28	25	0	0	0	0	0
Rainford	18	13	3	0	0	7	0	0	0	0	0	0	0	0	0
Rainhill	19	44	36	29	29	32	0	0	0	0	0	0	0	0	0
Sutton	1	8	60	57	29	74	56	43	11	0	0	0	0	0	0
Thatto Heath	90	106	158	155	125	122	113	29	28	7	0	0	0	0	0
Town Centre	20	93	221	168	130	280	268	149	110	64	53	53	51	47	43
West Park	17	32	62	78	70	59	30	30	28	25	0	0	0	0	0
Windle	28	24	54	74	46	32	5	0	0	0	0	0	0	0	0
Sum: Annual Net Completions	**308**	**612**	**1177**	**1116**	**795**	**1066**	**910**	**566**	**459**	**316**	**204**	**184**	**139**	**91**	**64**
Sum: Cumulative Net Completions	**308**	**920**	**2097**	**3213**	**4008**	**5074**	**5984**	**6550**	**7009**	**7325**	**7529**	**7713**	**7852**	**7943**	**8007**

Appendix B
Climate Change

B.1 Background

Climate change is likely to have major direct impacts on the water cycle as a result of changes in rainfall patterns, temperature and evaporation. Furthermore, climate change will affect patterns of water usage and have wider impacts on land use. Current climate change modelling broadly indicates that there will be wetter warmer winters and drier hotter summers and that some of these impacts will become evident within the timescale of the revised RSS up to 2021. Climate change has also been identified as a key issue in the North West Regional Spatial Strategy and the National WCS guidance. Each of the Councils SFRAs provides detailed guidance on the specific climate change impacts within each area on flood risk, the content here covers the general changes expected.

In particular, climate change may have the following impacts:

- Reduction of water resources availability due to reduced annual rainfall and increased temperature - increased evapo-transpiration may reduce aquifer recharge;
- Increased intensity and frequency of storms. This is likely to increase the intensity and frequency of fluvial flooding and urban drainage related flood events;
- Changes to water usage particularly in relation to irrigation of gardens and parkland using potable water. The benefits of rainwater harvesting and storage will also be affected. Demand for summer irrigation water for agriculture is also likely to increase;
- Changes in water table levels may also affect infiltration and leakage of water from the sewerage system;
- Reduced summer rainfall will result in lower river flows which would reduce dilution of wastewater discharges. Compliance with environmental quality standards is, in some cases, based on 90 percentile values which tend to occur during the summer period; reduced river flows may have a magnified impact on compliance; and
- Stress on wetlands. Consequently, these systems are likely to become less resilient to other perturbations such as impacts of abstractions and discharges.

The potential impacts outlined above change the context in which impacts of housing growth on the water cycle occur and should therefore be considered as part of the WCS process.

B.2 Climate Change Modelling and UKCP09

Assessment of climate change impacts is based on global climate models which include a representation of land, air, ocean, ice, hydrological cycle and the carbon cycle. Detailed scenarios for the UK are generated using a regional climate model. This is a high resolution model which is part of the full global climate model. This model produces the output that forms the basis of the climate change predictions produced by the UK Climate Programme (UKCP). The climate range models have been run for a range of scenarios to account for uncertainty regarding future carbon emissions.

The first set of scenarios was produced in 1998 and is known as UKCIP98. This was superseded in 2002 by UKCIP02, which are still used in some guidance documents, such as PPS25 and in water company plans. Recently, in June 2009 new output has been released, known as United Kingdom Climate Projections 2009 (UKCP09). The latest output uses the same climate change models but in contrast to previous output, probabilistic output has also been produced based on a range of model set ups and referencing output from other climate change models. The output is also at a higher resolution than previous UK scenarios, with data being available at a 25km resolution. This provides much greater spatial detail but also means that topographic features, such as air flow over hills and descriptions of catchments, should be more accurate.

For the first time, daily and sub-daily data will be available from a weather generator. This is a tool which provides information on future climate which is statistically consistent with the probabilistic climate projections.

B.3 Climate Change and the Study Area

Figure B.1 to **Figure B.3** show predicted changes in average annual temperature, summer precipitation and winter precipitation for the Medium Emissions scenario.

The key findings for North West England in the 2050s under the medium emissions scenario are listed below and are taken from the UKCP09 Climate Change Projections report[22]:

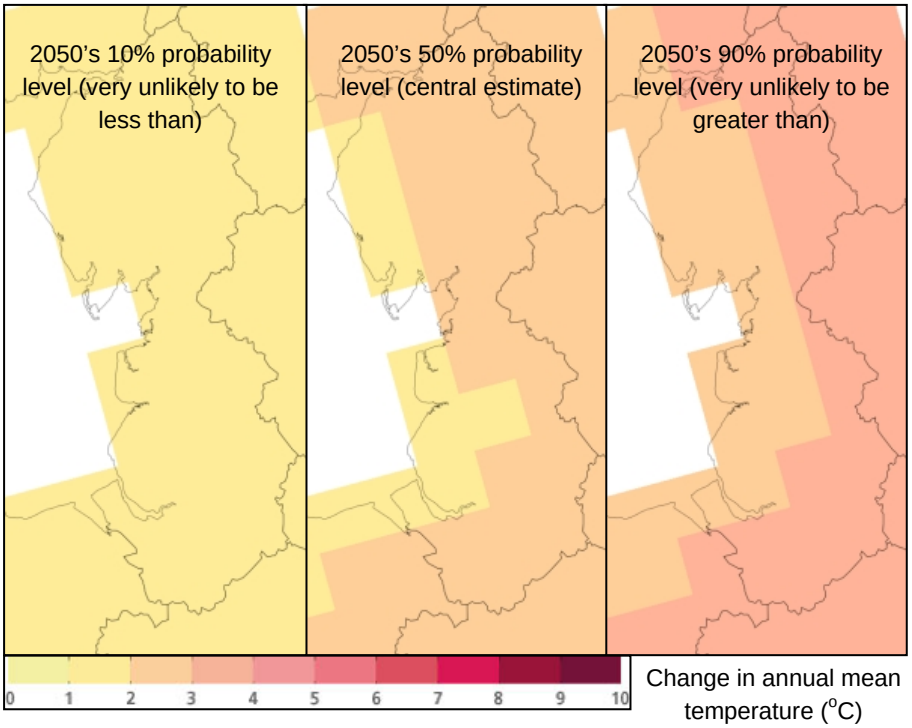
- The central estimate of increase in winter mean temperature is 2.0ºC; it is very unlikely to be less than 1.0ºC and is very unlikely to be more than 3.0ºC;
- The central estimate of increase in summer mean temperature is 2.6ºC; it is very unlikely to be less than 1.2ºC and is very unlikely to be more than 4.1ºC;

[22] Murphy, J.M., Sexton, D.M.H., Jenkins, G.J., Boorman, P.M., Booth, B.B.B., Brown, C.C., Clark, R.T., Collins, M., Harris, G.R., Kendon, E.J., Betts, R.A., Brown, S.J., Howard, T. P., Humphrey, K. A., McCarthy, M. P., McDonald, R. E., Stephens, A., Wallace, C., Warren, R., Wilby, R., Wood, R. A. (2009), *UK Climate Projections Science Report: Climate change projections*. Met Office Hadley Centre, Exeter.

- The central estimate of change in winter mean precipitation is 13 per cent it is very unlikely to be less than 3 per cent and is very unlikely to be more than 26 per cent; and
- The central estimate of change in summer mean precipitation is –17 per cent it is very unlikely to be less than –34 per cent and is very unlikely to be more than one per cent.

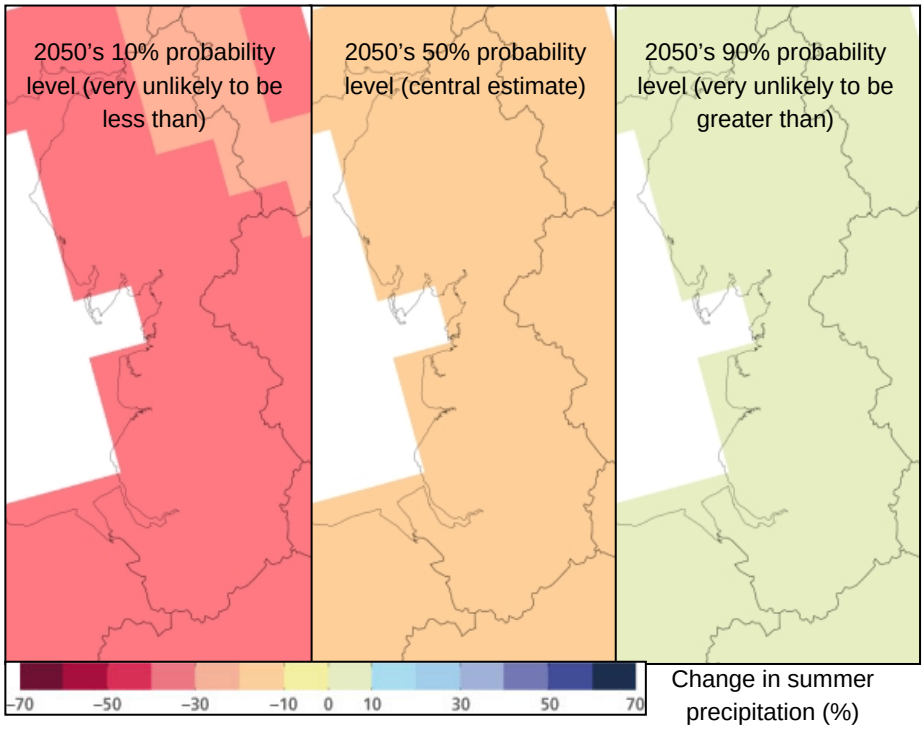
The rainfall patterns in the study area and high percentage of surface water resources are likely to be particularly vulnerable to climate change impacts in the immediate term. Furthermore, garden watering and agricultural demand for water will be increased as temperature rises in addition to reduced summer rainfall. Reduced river flows in surface water dominated systems will impact on the absorptive capacity of water courses to dilute wastewater discharges, the study has highlighted this is mostly likely to affect St. Helens WwTW in the future. Increased winter rainfall and more intense summer storms will increase flood risk.

Figure B.1 Change in Annual Average Daily Temperature for the 2050's under the Medium Emissions Scenario (UKCP09)



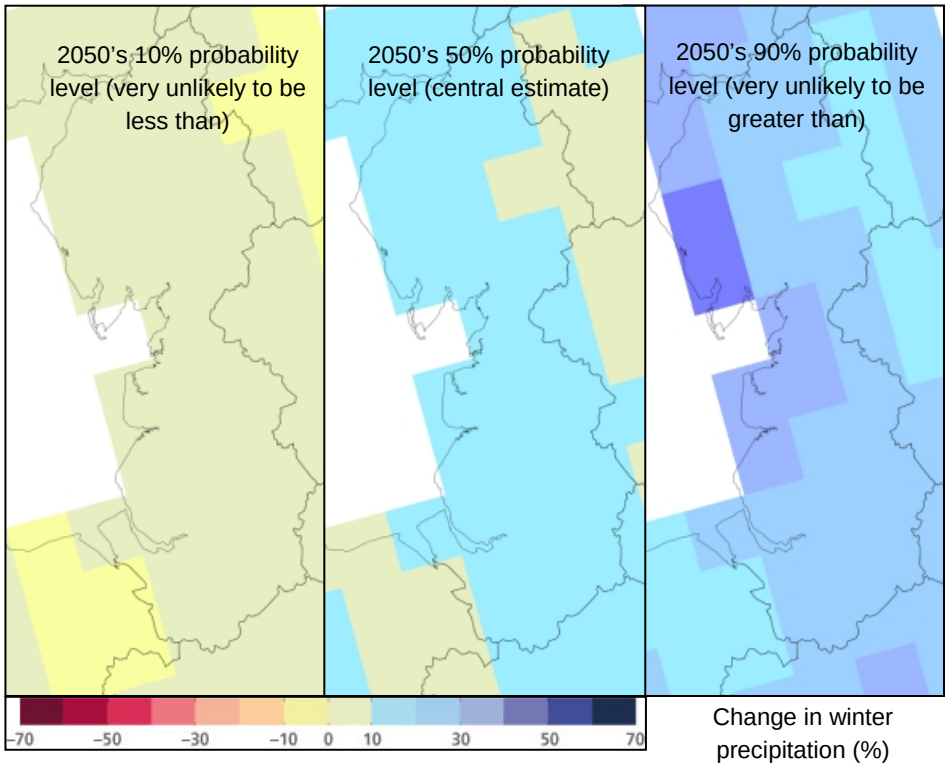
Source http://ukclimateprojections.defra.gov.uk/content/view/1154/543/

Figure B.2 Change in Summer Mean Precipitation for the 2050's under the Medium Emissions Scenario (UKCP09)



Source http://ukclimateprojections.defra.gov.uk/content/view/1154/543/

Figure B.3 Change in Winter Mean Precipitation for the 2050's under the Medium Emissions Scenario (UKCP09)



Source http://ukclimateprojections.defra.gov.uk/content/view/1154/543/

B.4 Climate Change and Flood Risk

The predicted climate change induced rises in sea level and increases in the intensity and duration of rainfall events will lead to an increase in flood risk. Guidance for the assessment of these impacts in England is included in table B.1 and B.2 of the current version of PPS25 (as revised in March 2010). This provides guidance on how to make allowances for climate change impacts in the application of the recommended methodologies to assess flood risk. Specifically these tables provide precautionary sensitivity guidance on allowances for increases in:

- sea level (1990 to 2025: 2.5mm pa; 2025 to 2055: 7.0mm pa; 2055 to 2085: 10.0mm pa; 2085 to 2115: 13.0mm pa);
- rainfall intensity (design lifetime up to 2085: +20 per cent; up to 2115: +30 per cent); and
- peak river flow (all design lifetimes up to 2115: +20 per cent).

When including for the potential impact of climate change, developers should ensure that the most up to date planning guidance on climate change factors is utilised in their assessments. These changes should be applied over the appropriate lifetimes for development (typically 100 years for residential and 60 years for commercial/industrial

development). PPS25 advocates that the analysis is incorporated into Strategic Flood Risk Assessments. A recent review of the UKCP09 climate change impacts has been undertaken by the Environment Agency, and they have recommended that the climate change allowances within PPS25, based on the UKCIP02 climate change projections, should still be used for assessing flood risks.

Appendix C
Supporting Water Resources Information

C.1 A Strategic Rather than Local Issue

Public water supply is managed at a strategic rather than a local level based on WRZs. Mid Mersey is supplied with water from the Integrated WRZ, which covers a large geographical area, operated by United Utilities.

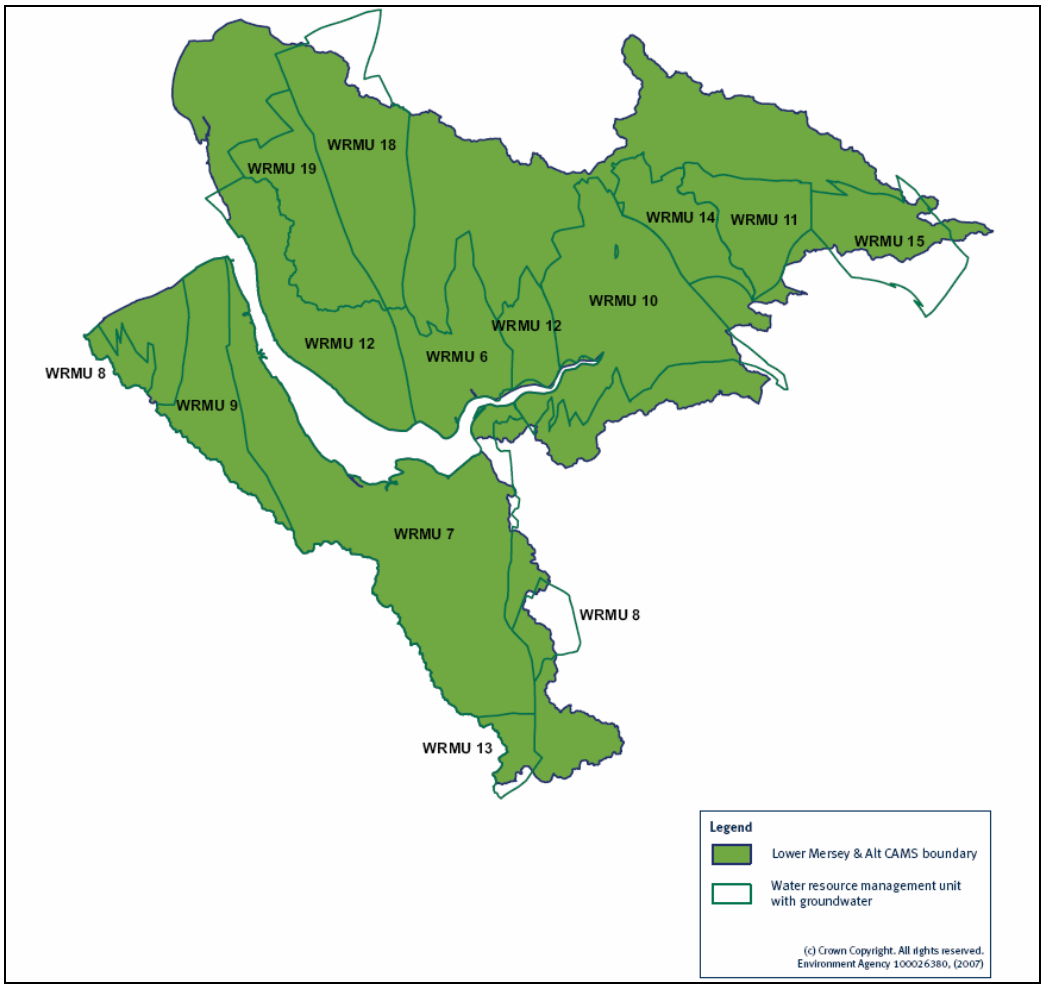
Figure 4.4 shows how the study area fits in to the context of the supply zone, and illustrates the main areas where water is abstracted for public water supply.

There are significant water resources in the Integrated WRZ, particularly from the large surface water sources in the Lake District and River Dee abstractions. There are also major aquifers beneath the region. In total 2147 megalitres of water is abstracted by United Utilities everyday to supply customers across the entire resource zone (2147 Ml/d).

C.2 Environmental Constraints: CAMS and Water Stress

The Environment Agency manages water resources within the environment, principally through the water resource abstraction licensing system. As part of this, the Environment Agency assesses water resource availability at a regional and local (catchment) level. The Catchment Abstraction Management Strategies (CAMS) set out how much water is available for additional abstraction taking into account the needs of the environment, and abstraction for public water supply and other uses. The results are used to inform future water abstraction licensing strategies and so provide a useful context in which to understand the environmental constraints affecting the water supply options available to United Utilities. Figure C.1 is an extract from the Lower Mersey and Alt CAMS document. It shows the location of the various groundwater water resource management units (WRMU). Public water supply abstractions are made from WRMU 6, 10, and 14. As stated in the main body of the report these are Over Abstracted/Over Licensed.

Figure C.1 Extract from Lower Mersey and Alt CAMS: Groundwater Water Resource Management Units (WRMU)



The Environment Agency has examined the relationship between levels of rainfall and household demand across England and Wales, to determine the level of 'water stress'[23]. The North West has been designated as a low water stress area. However, the Environment Agency believes that even in those areas designated as "low" water stress, there should be some activity to ensure that water is used more efficiently. Water companies and water users cannot disregard the environmental consequences of their abstractions and energy use.

C.3 Water Efficiency Scenarios

Entec has used its unique model to calculate forecasts of demand based on various assumptions regarding the water consumption in new and existing households and applies this to alternative growth rates. The model uses details

[23] Environment Agency (2009). Areas of water stress. Final classification.

specific to the study area, such as total number of existing households, proportion of the study area in a particular WRZ (in this case Mid Mersey is wholly within United Utilities' Integrated WRZ), and applies the water company's projection of pcc to generate an estimate for the area. The model can also perturb the water company forecasts to test the impacts of a more water efficient scenario and the consequences of failing to manage demand as expected. Table C.1 illustrates the scenarios that are applied.

Table C.1 Water Efficiency Scenarios Applied to Housing Growth Trajectories for Mid Mersey

Scenario	Existing Households	%	new hh pcc	new hh pcc external use	%	new hh pcc	new hh ppc external
1A	WRMP PCC -10%	35%	80	7.68	65%	105	10.08
2C	WRMP PCC	25%	125	12.00	75%	130	12.48
3C	WRMP PCC +10%	45%	130	12.48	55%	150	14.40

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Appendix C

Appendix D
Supporting Water Quality and Wastewater Information

D.1 Water Quality

The objectives of the Water Framework Directive (WFD) that will drive future improvements to river water quality (i.e. Good Ecological Status) and thus investment in wastewater treatment infrastructure, as well as programmes to tackle pollution from other sources. In the Mid Mersey area these could include urban and agricultural run-off. Ecological status is made up of several components; a biological component (fish invertebrates etc), pollutants (metals etc) and physiochemical components (Ammonia, phosphate etc). If any one of these is of a poor or bad status the overall Ecological status categorisation assumes that status.

Mid Mersey falls within the North West River Basin Management Plan (RBMP), produced as part of the Water Framework Directive. The overall status for the River Basin District (RBD) in which the study region falls indicates that 30 per cent of the surface waterbodies are currently at good ecological status/potential (Environment Agency, 2009).

The Mid Mersey area is located on the lower reaches of the River Mersey, at the point where the river becomes tidal. Water in the lower reaches of the River Mersey has been sourced from the Mersey and its tributaries including the Irwell, Roch, Irk, Medlock, Bollin, Tame, Etherow and Goyt. Land and water use in the upper part of the catchment impacts on the water quality in the River Mersey in the Mid Mersey area. In addition, there are a number of smaller watercourses that are sourced within or close to the Mid Mersey area including the Sankey, Ditton, Bowers and Keckwick Brooks.

Table D.1 shows the current status of the main watercourses within the Mid Mersey area. This shows that although 30 per cent of the surface waterbodies within the North West RBMP are currently of good status, all of the waterbodies listed in Table D.1 are moderate, poor or bad status or potential. Overall the components that currently contribute to the failures are high levels of phosphates and ammonium, low levels of dissolved oxygen and poor biological quality.

Table D.1 Water Quality Objectives for Main Rivers in Mid Mersey area (RBMP, 2009)

River Reach	Current Status	2015 Predicted Status	Main River Catchment	Contributing Factor	Justification if Overall Objective is Not Good Status by 2015
Rams Brook	Moderate	Poor	Mersey Estuary	Phosphates	Corrective measure/s: disproportionately expensive.
Stewards Brook	Bad	Poor	Mersey Estuary	Phosphates and biology	Corrective measure/s: disproportionately expensive.
Whittle Brook	Moderate	Moderate	Mersey Estuary	Phosphates	Corrective measure/s: disproportionately expensive.
Spittle Brook	Moderate	Poor	Mersey Estuary	Ammonia, dissolved oxygen, phosphate.	Corrective measure/s: disproportionately expensive.
Sutton (Sankey) Brook	Moderate	Moderate	Mersey Estuary	Ammonia and biology	Corrective measure/s: disproportionately expensive.
Sutton (Sankey) Brook (Hardshaw Bk to Rainford Bk)	Moderate	Poor	Mersey Estuary	Ammonia, dissolved oxygen	Corrective measure/s: Technically infeasible.
Sankey Brook (Rainford Bk to Black Bk)	Moderate	Poor	Mersey Estuary	Biology	Corrective measure/s: Not required
Sankey Brook (Black Bk to Mersey)	Poor	Moderate	Mersey Estuary	Biology and phosphate	Corrective measure/s: Technically infeasible, disproportionately expensive.
Hardshaw (Windle) Brook	Bad	Bad	Mersey Estuary	Biology	Corrective measure/s: disproportionately expensive.
Black Brook	Moderate	Moderate	Mersey Estuary	Biology	Corrective measure/s: Not required
Rainford Brook	Moderate	Moderate	Mersey Estuary	Biology	Corrective measure/s: Technically infeasible,
Dittton Brook (Halewood to Mersey Estuary)	Moderate	Bad	Mersey Estuary	Biology, ammonia and phosphate	Corrective measure/s: Technically infeasible, disproportionately expensive.
Bowers Brook	Bad	Bad	Mersey Estuary	Biology	Corrective measure/s: disproportionately expensive.
River Glaze	Poor	Poor	Mersey Estuary	Biology, dissolved oxygen and phosphate	Corrective measure/s: Technically infeasible, disproportionately expensive
Mersey (Tidal)	Moderate	Not given	Mersey Estuary	Not given	Not given (current status listed as being based on expert judgment in RBMP)
River Weaver (Dane to Frodsham)	Moderate	Bad	Weaver Gowy	Biology, ammonia, phosphate	Corrective measure/s: disproportionately expensive
Keckwick Brook	Poor	Poor	Weaver Gowy	Biology, ammonia, phosphate	Corrective measure/s: disproportionately expensive

River Reach	Current Status	2015 Predicted Status	Main River Catchment	Contributing Factor	Justification if Overall Objective is Not Good Status by 2015
Mersey (Man.Ship Canal, Irlam to Howley Weir)	Moderate	Bad	Weaver Gowy	Biology, ammonia, dissolved oxygen and phosphate.	Corrective measure/s: disproportionately expensive

The RBMP indicates that there is no predicted improvement in the water quality by 2015 in any of the river reaches the Mid Mersey area, with approaches to improvement being described as 'technically infeasible' and in some cases too expensive to undertake in the short time scale. However all waterbodies of the river catchments have the objective of being good status/potential by 2027, indicating improvements in water quality will occur in the study area, where the impacts of increased growth and hence future WwTW inputs will need to be considered.

In all the watercourses covering the study area, the main reasons are identified for current water quality failures (RBMP, 2009) include diffuse pollution from agricultural activities, point source pollution from water industry sewage works, diffuse pollution from urban sources, physical modification of water bodies and point source pollution from industrial discharges. Within the study are specific pollutants such as calcium sulphate from the glass industry are present, along with leachate from landfill sites, and other contaminants from the heavy industrialised areas of the catchment. High levels of phosphate and ammonia has been identified in several watercourses that flow through the study area, such as the Sankey, Ditton and Keckwick Brooks.

To meet the objective of all reaches being of good status/potential by 2027, actions will need to be taken by stakeholders within the RBD, to ensure improvement. The RBMP (2009) identifies the proposed actions to be undertaken and by whom. A list of key actions identified for the river catchments covering the Mid Mersey area, can be seen in Table D.2. Those relating to wastewater treatment works (WwTW) are of particular interest, as the capacity for growth may be constrained by the need for improvements in water quality.

Table D.2 Key Actions from the RBMP (2009)

River Catchment	Key Actions Relevant to the Study Area
Mersey	Defra is funding investigation of diffuse pollution from golf courses on River Mersey. Mersey Life project to reduce barriers to fish migration in the River Mersey and its tributaries, with project plans to deliver scoping, design and construction of 10 Fish passes in 6 priority catchments. Implementation of best practice controls and remediation at abandoned coal mines at Black Brook and Millingford (Newton) Brook. AMP5 improvement schemes in the Mersey Estuary catchment at Widnes and Warrington WwTW to remove more ammonia than required by the Urban Waste Water Treatment Directive and at Glazebury WwTW, as a result of the 2007 inland sensitive areas (eutrophic) designations. Outstanding AMP3 improvement schemes at Bewsey Pumping Station (Sankey Brook)

River Catchment	Key Actions Relevant to the Study Area
	Screening will be provided to reduce the aesthetic impact of 40 discharges across the RBD to improve aesthetics. This includes Sankey Brook (Black Brook to Mersey) and Sankey Brook (Rainford Brook to Black Brook);
	65 intermittent discharges will be improved, either by providing storage, increasing volumes treated at wastewater treatment works, or by transfer of flows. Includes the following waterbodies; Dittton Brook;.; Manchester Ship Canal; Rainford Brook; Stewards Brook; Whittle Brook; Bower Brook.
Weaver Gowy	AMP4 improvement scheme at Northwich WwTW to meet Freshwater Fish Directive requirements (will improve water quality downstream of works, i.e. within Mid Mersey).

D.2 Wastewater Treatment

Wastewater services in Mid Mersey are provided by United Utilities, with treatment located at Warrington North, Warrington South, St. Helens, Billinge South, Glazebury, Irlam, Widnes and Runcorn. These are all controlled by means of numeric permits (discharge consents).

Based on the indicative growth plans, a number of WwTW will be under pressure to accommodate additional growth. The result of this will be an increased discharge to, and potential change in water quality or volume of, the receiving waters. To reach the objectives of the WFD it is important to ensure 'no deterioration' from current quality, and enable improvements to good quality by 2027. Overall it can be seen that the WFD objectives pose some constraint to discharge consents as water quality must be improved to Good Ecological Status by 2027.

D.3 Wastewater Treatment Works and Water Quality in Mid Mersey - Environment Agency Role

The Environment Agency's role in Mid Mersey is threefold: as an Environmental Operator, an Environmental Advisor, and an Environmental Regulator.

As an Environmental Operator, it plays a central role in managing flood risk. It has a strategic overview role for flood risk management form all sources, including rivers, the sea, groundwater, reservoirs and surface water.

As an Environmental Advisor, the Environment Agency is an independent adviser on environmental matters. At a local level it advises throughout the spatial planning process on environmental issues by influencing strategic plans. The Environment Agency is also a statutory consultee on environmental and sustainability appraisals for land use planning and advises local authorities to prevent inappropriate development in flood plains.

Finally, as the Environmental Regulator, the Environment Agency uses permits, authorisations and consents to set conditions operators must comply with so that their activities do not adversely impact on the environment. In

addition, it has specific powers and duties to implement regulations transposed from European Directives, such as the Water Framework Directive.

It is a requirement of the Water Framework Directive to ensure that there is no deterioration in the quality of the watercourses within European Union member states, which includes England and Wales. Therefore, waste water and sewage effluent produced by new development needs to be dealt with to ensure that there is no deterioration in the quality of the watercourses receiving this extra volume of treated effluent.

Discharge Consents

If the wastewater treatment works (WwTW) facility does not have sufficient capacity to accommodate and adequately treat the additional sewage generated by any new development; United Utilities will need to apply to the Environment Agency in order to increase the amount of treated effluent they can discharge into the watercourse (referred to as the Dry Weather Flow).

Any application by United Utilities to increase the Dry Weather Flow (DWF) over and above consented DWF will involve tightening of numeric quality consented limits in order to comply with no deterioration policy under the Water Framework Directive (WFD). In other words the water quality of the treated effluent needs to be improved further in order to generate additional capacity at the sewage treatment works.

It may not be possible to improve the water quality any further if a sewage treatment works is already treating effluent using Best Available Technology (BAT) techniques. In this situation industry recognised technology is not available to improve the water quality any further. Consequently, it is not possible to generate any additional capacity at the works. Unless this is addressed in future AMPS this is likely to limit the amount of growth that is able to take place within the sewage catchment.

The Environment Agency would object to any application by United Utilities to increase discharge from such a sewage treatment works until such time as it is possible to treat any increase waste water and sewage effluent produced by new development so that there is no deterioration in the receiving watercourse. This position applies to wastewater treatment works across the Mid Mersey area.

The River Glaze was designated as a Sensitive Area (eutrophic) on 15 October 2007[24], which receives treated effluent from Glazebury WwTW located within the Mid Mersey area, but also from Leigh WwTW. Both works are listed as having AMP5 schemes in place to improve phosphate removal in the RBMP (Environment Agency, 2009).

[24] http://www.defra.gov.uk/environment/quality/water/waterquality/sewage/sensarea/documents/sensarea-nwest.pdf

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Appendix D

Appendix E
Supporting Flood Risk, Sewerage and Surface Water Drainage Information

E.1 Existing Flood Risk Information

Flood risk across the study area is predominantly associated with watercourses spilling out onto their natural floodplains (both Main River and Ordinary Watercourses[25]), as well as other sources of flooding such as surface run-off from saturated ground and groundwater (i.e. "environmental" in cause). Flooding associated with infrastructure includes the exceedance of artificial drainage systems in urban areas, where a rainfall event is in excess of a system's capacity, causing surface water flooding, the residual risk of breach or overtopping associated with flood defences, impounded waterbodies and (where raised) canal embankments. Groundwater flood risk may be influenced by historic mining activities.

E.2 Development and Flood Risk Zones

Section 4.4.2 reports the results of a GIS analysis of the proposed Councils' residential and employment development areas compared to the Environment Agency Flood Zones. From the analysis it is clear that all or part of several of the development sites are located in Flood Zone 3.

The development of these sites will need to take into account the potential level of flood risk to the development. The SFRAs contain guidance on the application of the PPS25 Sequential and Exception Tests, as appropriate to sites such as these. In general a sequential approach should be taken with the sites at lowest risk of flooding brought forward for development first, unless there are overriding reasons for their development (i.e. essential as part of a regeneration strategy). Within each site a sequential approach should be taken, placing the most vulnerable proposed development type within the part of the site at lowest risk of flooding, and allocating uses such as landscaping/informal open space etc to the parts of the site at highest risk of flooding. For these sites early consultation with the Environment Agency is recommended to ascertain the viability of developing the site and to ensure that new development is not placed without mitigation in areas of flood risk. In some cases a site may be suitable for development, but with a less vulnerable use (see PPS25 Table D.2), or via a flood alleviation scheme. By ensuring developments are sited appropriately, and (where development is considered acceptable),

[25] 'Main Rivers' are the larger watercourses and those that pose the largest level of flood risk; these are overseen by the Environment Agency. All other watercourses are classified as 'Ordinary Watercourses' and are overseen by Local Authorities. Whatever the watercourse's classification the adjacent landowners have a responsibility to maintain the watercourse.

incorporating appropriate flood risk mitigations it can be ensured that new development does not increase flood risk, and where possible contributes to reducing the current level of flood risk.

It should be noted that this analysis was based on the available flood risk zoning information with regards to fluvial flood risk along the larger watercourses in Mid Mersey. For St Helens and Warrington the Environment Agency's November 2011 Flood Zone 3 and 2 layers were used, whilst for Halton the Council's Level 1 SFRA layers were used. However, it should be noted that the respective Level 1 and Level 2 SFRAs for the Councils will not have covered all of the smaller watercourses, and for these a precautionary approach should be taken. A lack of flood risk information does not mean there is no flood risk from these smaller watercourses. Some development sites may be adjacent to smaller watercourses with unmapped flood zones, and in addition other non-fluvial sources of flooding should be considered when any site is brought forward for development.

Appendix F
Environment Agency Developer Checklist

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Appendix F

Environmental checklist

This checklist compiles all of the guidance and expectations described in each of the chapters in The Environmental Issues

Use this checklist to make sure you have fulfilled your obligations and considered advice on making your development better for the environment. You can use it for your discussions with the local Environment Agency office.

→ Visit our website to download more copies of this checklist: **www.environment-agency.gov.uk/developers** For more information visit the corresponding chapters in The Environmental Issues

Development:

Location:

Date:

Main Environment Agency contact:

General notes:

Recommended actions	Notes	☑
Managing the risk of flooding		
• Establish if your development is at risk of tidal or river flooding. Check the flood maps on our website, and any strategic flood risk assessment.		☐
• Make sure the location of your development meets the Sequential Test (PPS25). Only where there is no other choice, it must meet the Exception Test.		☐
• Maintain an effective flood defence on-site at all times. Install temporary flood defences where necessary. You must obtain our consent to do this.		☐
• Keep flood flow routes and the byelaw margin clear at all times.		☐
• Make sure your flood risk assessment assesses all possible sources of flooding. To eliminate or reduce the flood risk, it must propose mitigation measures as required.		☐
• Speak to us for advice on flood risk and to ensure you understand our flood risk management requirements. Local byelaws may vary.		☐
• Contact your planning authority to confirm whether a flood risk assessment is required. If so, find out what conditions apply and if they have any guidance or other information to help you target your flood risk assessment more effectively (for example, through a strategic flood risk assessment).		☐
• Choose your site and design the layout so it is compatible with the flood risk. You must avoid causing flooding elsewhere.		☐
• Assess and manage the risk from all possible sources of flooding. The risks may be from groundwater, river or coastal flooding (e.g. overtopping or breach of flood defences), surface water, overland flow, breached reservoirs or sewer flooding.		☐

Recommended actions	Notes	☑
Managing the risk of flooding continued		
• Speak with the local Environment Agency office to make sure you understand our flood risk management requirements. You should: – always check with the local office as different byelaws apply (they are contained in our publication **Living on the edge**); – assess the condition of any flood defences; – make sure there is no encroachment in front of tidal defences; – consider the opportunity to retreat riverside flood defences; – compensate for any loss of flood storage volumes in the flood plain.		☐ ☐ ☐ ☐ ☐
• Design your development so that it is safe for people to occupy, access and leave the site during a flood.		☐
• Where development is acceptable, build-in flood resilience and resistance. This will reduce damage to your development should flooding occur, and make it more insurable.		☐
• Obtain all necessary consents to manage the risk of flooding before starting work. If work is carried out without our consent, we can inspect your site and require you to put things right. We could even reclaim the cost from you for removing or altering your work.		☐
• Always leave adequate space for maintenance and renewal if you upgrade or build new flood defences. Consider setting them back from the riverside.		☐

Managing surface water		
• Before you plan your site, consider how you can manage the rate of surface water run-off so that it is similar to the conditions before the development. Also consider the effect this run-off will have on any receiving watercourse.		☐
• Discuss with the local planning authority their policy and requirements for surface water drainage.		☐
• Speak to us about the surface water drainage proposals for your site. We can tell you what consents you will need, which types of SUDS are unsuitable and whether you will have to take special precautions to prevent pollution or reduce infiltration.		☐
• Where infiltration techniques are not possible, or where space is limited, you can still use features such as green roofs to reduce the rate or total amount of run-off.		☐
• Use CIRIA guidance to inform your choice of SUDS design for the development.		☐
• Obtain outline acceptance of your scheme from the local planning authority and us.		☐
• Demonstrate in your flood risk assessment that you will deal with surface water by installing the best combination of SUDS techniques for your site.		☐
• You must obtain any Environment Agency flood risk management consent or authorisations before starting work (see 3.1).		☐
• Whilst constructing your site, protect adjoining areas from flooding.		☐
• You will need to consider your timetable for construction. Where permeable surfaces are installed, you need to ensure they are not blocked with silt from site activities.		☐
• Ensure you have an adequate management and maintenance system in place.		☐

Recommended actions	Notes	✓
Using water wisely		
• Talk to the local planning authority and relevant water company to ensure they can provide the water supply infrastructure and enough water for the lifetime of your development.		☐
• Contact the local Environment Agency office for advice on our consents. You must obtain all necessary consents before you start work on the site.		☐
• Design your development to at least meet the minimum level of the Code for Sustainable Homes.		☐
• Consider water and energy-efficient appliances and fittings in your development such as 'A-rated' washing machines and low or dual-flush toilets. In London the Mayor has set a minimum water efficiency standard for all new developments of 110 litres, per head, per day.		☐
• If your development is large, consider leak-detection, rainwater-harvesting or even rainwater re-use systems. However you must understand their management and maintenance requirements.		☐
• Provide water butts and use drought-resistant landscaping to keep your development looking good.		☐
Wildlife and green space		
• Before you design your proposal, talk to us and other environmental organisations about your obligations. Find out which consents you will need and what information you will need to provide. We can provide advice and guidance on enhancement opportunities.		☐
• Carry out an environmental assessment that is proportional to the size and nature of your development. This should identify the opportunities for improving wildlife and both highlight and avoid any potential ecological impacts.		☐
• Avoid impacts on protected or priority species or sites.		☐
• Protect biodiversity and create, manage and enhance wildlife habitats.		☐
• Draw-up an ecological master plan to capitalise on opportunities to create, manage and enhance wildlife habitats within and affected by your development. Use the guiding ecological principles from **Planning Policy Statement 9,** the environmental assessment and local biodiversity action plans.		☐
• Design multifunctional green spaces that provide a range of environmental and social benefits. Make them part of a linked local network to help ensure their longer-term maintenance.		☐
• Establish any mitigation and compensation measures before the impacts take place.		☐
• Time your operations so they avoid sensitive periods, such as bird breeding or fish spawning seasons.		☐
• Provide and protect buffer zones if you are working close to watercourses or sensitive sites. Control invasive species such as Japanese knotweed.		☐
• Encourage public awareness and community participation.		☐
• For large sites, have a plan for the continued maintenance of any newly created or enhanced areas.		☐

Recommended actions	Notes	✓
Preventing pollution		
• You must avoid anything during the development process that pollutes the environment. Consider this as part of your environmental assessment.		☐
• Talk to the local planning authority and sewerage company to ensure: – there is sufficient sewage treatment capacity for the lifetime of your development; – there are arrangements for sewage discharges to foul sewer; – what consents you will need.		☐ ☐ ☐
• Talk to the local planning authority and sewerage company to ensure there is a sufficient treatment capacity for the lifetime of your development.		☐
• Investigate the past use of the site to make sure operations will not disturb any land affected by contamination. If the site includes contamination, consult the local authority and the local Environment Agency office.		☐
• Talk to the local Environment Agency office as early as possible to discuss our consent requirements. You must obtain all required consents before starting work.		☐
• Find out from us whether your site is within a Groundwater Protection Zone and any special precautions you must take.		☐
• Avoid pollution and prosecution by following our Pollution Prevention Guidelines.		☐
• Follow good environmental site practice. Examples of this are set out by CIRIA.		☐
• Make sure your managers are committed and employees are suitably trained. They should all understand why preventing pollution is important.		☐
• Take care to avoid contaminating groundwater by being aware of what makes it vulnerable.		☐
• Identify and mark underground services.		☐
• During construction, regularly inspect and maintain drainage features and discharges. Make sure permeable surfaces are protected from silt.		☐
• Consider the effects of foundations on contaminated land and groundwater flow.		☐
• Obtain our permission to use herbicides or pesticides in or near water. However first of all you should consider alternative or mechanical methods.		☐
• Keep your site secure from vandalism – you will be responsible for any pollution caused.		☐
Managing waste		
• At a minimum, make sure you comply with your duty of care obligations. Set strict contractual obligations on all subcontractors to make sure none of the waste produced from your operations is disposed of illegally.		☐
• Make sure you understand your legal obligations. You may want to take the advice of lawyers or consultants.		☐
• Speak to the local Environment Agency office about your waste management obligations. Understand which permissions you will need from us and demonstrate your compliance with the regulations across the life of the project.		☐
• Draw-up and follow a site waste management plan for each major project. For smaller projects make sure you have assessed the likely types and amounts of waste.		☐
• Minimise and segregate hazardous waste.		☐
• Understand the environmental and financial value of your soils on site and protect them.		☐

Recommended actions	Notes	✓
Managing waste continued		
• Re-use and recycle construction and demolition waste wherever possible.		☐
• Talk to the local planning authority about the method and systems they use for sorting and collecting recycled waste.		☐
• Provide your buildings with storage space for segregating and recycling waste. Subcontractors should also use these facilities – write this into their contracts.		☐
• Follow the Waste Hierarchy: reduce, re-use, recycle, recover, dispose. Use materials that can be re-used at the end of their life and which have minimal impact on the environment.		☐
• Keep your site secure and don't be a victim of crime. Construction companies often suffer from illegal fly-tipping and you will be responsible for its clean-up and any pollution caused.		☐
Land affected by contamination		
• Make sure you understand your legal obligations when remediating land affected by contamination. You may want to take the advice of lawyers or consultants.		☐
• Speak to the local authority's contaminated land team and the local Environment Agency office to make sure you have correctly understood your obligations and the permissions you will need.		☐
• Make sure you do not pollute the environment or harm human health. Follow best practice and conform to the regulations.		☐
• Follow the risk assessment framework outlined in **Guidelines for environmental risk assessment and management.**		☐
• Follow the **Model procedures for the management of land contamination (CLR11).**		☐
• Understand the implications of Part 2A of the Environmental Protection Act 1990 (the Contaminated Land regime). Take into account advice contained in **PPS23: Planning and pollution control**.		☐
• Investigate the previous use of the site. Assess the risks from contamination through at least a proper desk study and conceptual site model.		☐
• Where contamination is likely, you will need to carry out a further risk assessment including on-site investigations – involving soil and water sampling.		☐
• Monitor and audit the site during construction. All work must continue to meet your plans and risk assessment, and must comply with the regulations.		☐
• Agree the final shut down of any systems, such as the pumping and treatment of groundwater, with the local authority and us.		☐

Recommended actions	Notes	✓
Sustainable construction		
• Carry out an environmental and sustainability assessment at an early stage to help you to consider the environmental impacts and solutions in a holistic way.		☐
• Consider water and energy-efficient appliances and fittings in your development such as 'A-rated' washing machines and low or dual-flush toilets. In London the Mayor has set a minimum water efficiency standard for all new developments of 110 litres, per head, per day.		☐
• Consider incorporating green roofs into your development to reduce surface water run-off.		☐
• Talk to the local planning authority to find out if they have supplementary planning guidance or standards on sustainable construction.		☐
• Speak to the local authority to find out about kerbside recycling. Design buildings with space for sorting and storing waste to make recycling easier.		☐
• Think about the way energy could be generated on-site, the supply you will need from the neighbouring areas and any infrastructure you will need.		☐
• If you will be using the ground as a source of heating or cooling, you must address the risks of groundwater pollution.		☐
• Consider how climate change will affect your development by using the Three Regions Climate Change Partnership checklist.		☐
• Design buildings to be adaptable to different future uses.		☐
• Talk to the utility companies to make sure their infrastructures are resilient to climate change. For example, gas mains and electricity cables in flood risk areas will require better protection.		☐
• Use all of your materials wisely and consider the impact they will have at the end of their life.		☐
• Carry out a supply chain assessment to reduce the impacts from your material suppliers in a structured way.		☐
• Retrofit existing buildings to re-use resources and minimise disruption. The scope for this needs to be considered at an early stage when opportunities come up for development. It should be decided at the start of your project life-cycle.		☐
Recreation, society and health		
• Recognise the full social implications of your development on the local community.		☐
• Talk to the local planning authority about their open space requirements and their green travel plans.		☐
• Make sure there is viable public transport and pedestrian and cycle access to the site. Provide safe routes through your development. Public transport, shops and community facilities like schools should be within walking distance.		☐
• Provide multifunctional green or other open spaces for communities to enjoy. Make sure they are managed in the long-term.		☐
• Integrate recreational and health aspects into your landscape and ecology strategies.		☐
• Any development that could have an adverse effect on air quality should receive a full assessment and a health impact assessment.		☐
• We encourage providing appropriate access to rivers within development. You will need our consent for any development affecting towpaths, river banks, landing stages, bridges or other structures in rivers.		☐