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APPENDIX 1: DRINKING WATER SAFETY PLAN RISK ASSESSMENT

This high-level risk assessment is concerned with new or novel possible Hazards to Water Quality and No supply, unique to the proposed project type or a potential outcome of said project type.

It is not a regulation 27 or regulation 28 report. Potential hazards have been identified but the level of risk has not, beyond the basic RAG scoring. Mitigation might be possible, but its effectiveness has not been assessed or validated. Therefore, any change between Pre and Post RAG scores is speculative.

DESALINATION OPTION

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
Catchment	Change in raw water quality	Salinity levels; Boron; Bromide; Algae; Turbidity	Changing raw water quality due to natural events or increased brine strength, sediment mobilisation impact on the abstraction /works intake	Should be in the design scope of the WTW Variation in treatment challenge		
	Pollution event	Hydrocarbons; Chemical; Bacteria; Viruses	Diffuse or point source pollution/contaminant; petrochemicals, shipping accidents and associated spillage, other	WTW ability to manage oil spill		
	Algae bloom	Algae- currently unknown	Laboratory have no experience identifying marine algae or their potential dangers.			
	Flooding, high tides, surges, and storms	No supply	WTW shut down to protect infrastructure			
	PFAS	PFAS	PFAS RA required for catchment as well as sampling programme.			
	Brine effluent discharge	Salinity levels	Increase in brine concentration in the raw water resulting in sub optimal WTW operation			
Abstraction	Blocking of inlet screening at the abstraction point	No Supply	Lack of water flow at the abstraction point	Adequate screening required with cleaning mechanism		
	Use of fittings, materials or chemicals which do not comply with Regulation 31	Failure to comply with Regulation 31	Items not on the Regulation 31 approvals list, or lack of evidence for compliance with IFU	Ensure compliance with Reg 31		

DESALINATION OPTION

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
Treatment	Sub optimal operation of the remineralisation process	Inaccurate remineralization	Associated problems could include turbidity, colour, and chemical risks	Wrong dose of minerals, Shutdown and control measures must be in place		
	Failure of remineralisation chemical dosing plant	Remineralization process failure	Associated problems could include increased turbidity, colour, and additional chemical risks	Shutdown and control measures must be in place		
	Inadequate availability of treatment chemicals	No Supply	Problems with the supply chain in supply and demand. Standard treatments chemicals and remineralization chemicals	Potential for impact on treatment		
	Power cut or failure	No Supply	Desalination process has very high power use	Supplement with associated on-site renewable sources for example wind turbine and solar		
	Failure of treatment process	Desalination plant process failure	Process failure at any stage of the treatment process - failure or no treatment	Duty/standby kit and spares holding requirements. Minimum asset standards requirements.		
	Compromise of Regulation 26	Turbidity	> 1 NTU presented to disinfection stage	Identification of what the turbidity is - likely to be linked to upstream chemical use.		
	Partial or full failure of the conditioning plant process	Inadequate treatment or failure of the conditioning plant	low pH and alkalinity	Control and management of the conditioning plant. Minimum asset standards requirements.		
	Failure to meet the PCV, failure to be able to demonstrate minimisation of DBP's	Raw water quality challenge - Bromide levels in sea water	Correct disinfection process must be chosen to minimise DBP FP risk	Will need to be in the design scope of the WTW		

DESALINATION OPTION

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
	Failure to meet the PCV	Raw water quality challenge - Boron 2 to 5 mg/l		Will need to be in the design scope of the WTW		
	Failure to comply with Regulation 31	Failure to comply with Regulation 31	Items not on the Regulation 31 approvals list, or lack of evidence for compliance with IFU	Ensure compliance with Reg 31		
	Sub optimal operation of the treatment plant due to unskilled workers operating it	Inadequate staff training and competency (LTO) of a complex new treatment process	More complex/new science, also requires additional training for any staff on site	LTO training and competency in place bespoke training package.		
Storage	Increases in treated water turbidity and colour downstream of the treatment plant.	Water chemistry - Turbidity, colour	Dissolving water in pipes historically with precipitation. Too little mineralization	Undertake pipe trials		
	Scouring of the internal pipe work due to hydraulic stress or chemical reaction	Hydraulic/chemical Scouring	Too high pressures and velocities	Undertake pipe trials		
	Use of fittings, materials or chemicals which do not comply with Regulation 31	Failure to comply with Regulation 31	Items not on the Regulation 31 approvals list, or lack of evidence for compliance with IFU	Ensure compliance with Reg 31		
Distribution	Increases in treated water turbidity and colour downstream of the treatment plant.	Water chemistry - Turbidity, colour	Dissolving water in pipes historically with precipitation. Too little mineralization	Undertake pipe trials		
	Scouring of the internal pipe work due to hydraulic stress or chemical reaction	Hydraulic/chemical Scouring	Too high pressures and velocities	Undertake pipe trials		
	Use of fittings, materials or chemicals which do not comply with Regulation 31	Failure to comply with Regulation 31	Items not on the Regulation 31 approvals list, or lack of evidence for compliance with IFU	Ensure compliance with Reg 31		

DESALINATION OPTION						
Stage	**Hazardous event**	**Risk/Hazard**	**Detail**	**Comments**	**Pre-mitigation RAG**	**Post-mitigation RAG**
Customer	Acceptability to customers	Taste and odour	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Hardness	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Acceptability to customers -feel of the water	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		

WATER REUSE OPTION

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
Catchment	Tankering	Chemical	Tankers can bring effluent/waste from variety of locations which could lead to Non permitted chemicals discharged into works via tankers from wide area	needs a controlled Waste carrier process		
	Permitted industrial discharges	BOD; COD, TOC, Ammonia; Suspended solids; PFAS	Population equivalent of town, detail of trade effluent consents (TE)	Adequate monitoring		
	PFAS Accumulation	PFAS	Accumulation of PFAS in effluent	RA of potential sources; sampling programme		
Treatment	Failure at upstream asset - PCV failure	Microbiological; Chemical; Other	large number of variables to consider based off monitoring data and TE consent detail	Treatment process to be designed for effluent water quality for wholesome water treatment		
	Failure to comply with Regulation 31	Chemical etc	Items not on the Regulation 31 approvals list, or lack of evidence for compliance with IFU	Ensure compliance with Reg 31		
	Failure to adequately disinfect	Microbiological	More sampling than would be typical at a site not including significant proportions of treated wastewater as raw water	Monitoring to be adequate level of risk		
	Wastewater or Water Treatment Plant Failure	Microbiological; Chemical; Other	Extra stages of failure possible, compounding risk	Training, Operational procedures, safe guards, automatic shutdowns, alarms, control room staff, 24hr manning		
	Disinfection by-product	DBP's; THM's	Risk of increased disinfection leading to By-products			
Storage	Microbial re-growth	Microbiological	Low residual chlorine levels	Regular inspections required		
Distribution	Failure at upstream asset - PCV failure	Microbiological/chemical/ physical	Microbiological/chemical/ physical	Operational procedures, training		

WATER REUSE OPTION

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
	Discolouration - flow reversal	Turbidity; Colour; discoloration; metals	disturbance of sediment, colour/turbidity	Flow velocity monitoring, network modelling		
	Hydraulic/chemical Scouring	Turbidity; Colour; discoloration; metals	Too high pressures and velocities	Pipe trials		
	Change in water chemistry	Turbidity; Colour; Taste and Odour	Dissolving water in pipes historically with precipitation. Too little mineralization	Pipe trials		
Customer	Acceptability to customers	Taste and odour	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Hardness	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Acceptability to customers -feel of the water	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Acceptability to customers -perception of safety	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		

WATER TRANSFER OPTIONS

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
Catchment	Inherent variability between Sources and treatment process	Microbiological; Chemical; Taste; Odour; Hardness	Would assume an agreed set of parameters at supply point	Stage assessed by bulk exporter		
	PFAS	PFAS	Potential sources of PFAS	RA of catchment(s)- sampling program at abstraction points		
Treatment	Inherent variability between Sources and treatment process	Microbiological; Chemical; Taste; Odour; Hardness	Would assume an agreed set of parameters at supply point	Stage assessed by bulk exporter		
Storage	Mixing of waters from different sources- surface and ground water source	Microbiological; Chemical; Taste; Odour; Hardness	Mixing of GW/SW in zones, blending issues, chemistry of water, customer issues			
	Age of water	DBP's; microbiological; Taste; Odour				
	Change in Water chemistry	Microbiological; Chemical; Physical				
Distribution	Mixing of waters from different sources- surface and ground water source	Microbiological; Chemical; Taste; Odour; Hardness	Mixing of GW/SW in zones, blending issues, chemistry of water, customer issues			
	Mixing of different WQ and disinfection protocols at zone boundary	Taste; Odour				
	Failure at upstream asset - PCV failure	Microbiological/chemical/ physical	Monitoring and blending to be considered			
	Discolouration	Discolouration; Metals; Colour; Turbidity	Disturbance of sediment	Flow velocity monitoring; network modelling; Mains conditioning to reduce risk of discolouration		
	Water chemistry	Turbidity; Colour	Dissolving water in pipes historically with precipitation. Too little mineralization	Pipe trials		
Customer	Acceptability to customers	Taste and odour	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		

WATER TRANSFER OPTIONS

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
	Acceptability to customers	Hardness	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Acceptability to customers -feel of the water	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		

WINTER STORAGE RESERVOIR OPTIONS

Stage	Hazardous event	Risk/Hazard	Detail	Comments	Pre-mitigation RAG	Post-mitigation RAG
Catchment	PFAS	PFAS	Potential sources of PFAS	RA of catchment(s)- sampling program at abstraction points		
	Catchment use	Total pesticides, Nitrates	Industrial or farming; urban or rural			
Treatment	Change in raw water quality	Microbiological; Chemical; PFAS; Nitrates	Changes in raw water quality from winter storage could pose risk to treatment	WTW capable of changing water types and potential increases in removal.		
Storage	PFAS Accumulation	PFAS	PFAS accumulation over time	RA and monitoring through works.		
	Age of water	Microbiological; Taste; Odour				
	Nitrification	Ammonium; Nitrate; Nitrite		Blending to be considered		
	Change in Water chemistry	Microbiological; Chemical				
Customer	Acceptability to customers	Taste and odour	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Hardness	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		
	Acceptability to customers	Acceptability to customers -feel of the water	Subjective to customers	Stakeholder engagement and panel trials to achieve the optimal blend with native water		

Linford New WTW

The Regulation 27 and 28 reports for Linford currently sit outside of the DWSP until the site is brought into supply.

NES-Risk-T006-Linford.xlsx

Langford, Langham, and Barsham Nitrate removal Schemes

The below is an extract from the DWSP documenting the possible future risks of the options at Langford, Langham and Barsham. A full review of each option and regulation 27 and 28 reports in the DWSP will be created once the options are realised/work is commenced and completed.

WRMP24-Future risk DWSP.xlsx

APPENDIX 2: FEASIBLE WATER SUPPLY OPTIONS

Feasible Water Supply Options – Essex

No.	Option UID	Option Name	Option Description	Option Type	Deployable Output (Ml/d)	Earliest start date
1	ESW-ABS-002	Linford New WTW	Reinstatement of abandoned artesian well, no network upgrade should be required. New borehole drilled to make use of an additionally available 3.5 Ml/d on the licence. Assume existing borehole provides 3.5 Ml/d and new borehole provides 3.5 Ml/d giving 7 Ml/d overall.	Abstraction	7	2027
2	ESW-ABS-003	Linford New WTW 10	Reinstatement of abandoned artesian well, and WTW capacity to 10Ml/d. Requires drilling of up to two new boreholes, a raw water transfer to a new water treatment works, connection to network and wastewater discharge connection. No network upgrade should be required.	Abstraction	10	2027
3	ESW-ASR-004A	Abberton ASR with additional treatment capacity	ASR scheme located near Abberton Reservoir. Single borehole located adjacent to Layer WTW. Additional treatment capacity included at the borehole site. It is assumed that there is sufficient capacity in the River Stour to Abberton Reservoir transfer as well as the Abberton Reservoir to Layer WTW transfer. 80% recovery meaning 3 Ml/d is injected and 2.4 Ml/d is subsequently abstracted from the borehole.	ASR	2.4	2032
4	ESW-ASR-004B	Abberton ASR using existing Layer WTW	ASR scheme located near Abberton Reservoir. Single borehole located adjacent to Layer WTW. No additional treatment capacity included at the borehole site, as it is assumed that the treatment at Layer WTW will be sufficient. It is assumed that there is sufficient capacity in the River Stour to Abberton Reservoir transfer as well as the Abberton Reservoir to Layer WTW transfer. 80% recovery meaning 3 Ml/d is injected and 2.4 Ml/d is subsequently abstracted from the borehole.	ASR	2.4	2032
5	ESW-DES-001	Canvey Island Desalination (Terrestrial)	Seawater desalination plant at Canvey Island with a transfer to Hanningfield WTW. The intake / outfall will be via a pier type structure.	Desalination	25, 31.5, 35, 38, 41.5, 50, 65 100, 190	2032
6	ESW-EFR-001 ESW-EFR-001A ESW-EFR-001B	Southend-on-Sea Water Reuse	Water reuse plant being fed from Anglian Water's WRC with a transfer to Hanningfield reservoir - output based upon the maximum output from the WRC	Water Reuse	40.5, 20.5, 20	2032
7	ESW-EFR-003	Colchester Water Reuse	Water Reuse plant fed from Anglian Water WRC with transfer to Abberton - developed at max output	Water Reuse	3.5, 6.5, 10, 15	2032

8	ESW-NIT-005	Langford EDR Nitrate Treatment	Electrodialysis Reversal nitrate treatment at Langford WTW so that final water meets nitrate PCV. Option contains a discharge stream transfer to Maldon STW (AWS)	Nitrate Treatment	2.75	2029
9	ESW-NIT-006	Langham EDR Nitrate Treatment	Electrodialysis Reversal nitrate treatment at Langham WTW so that final water meets nitrate PCV. Option contains a discharge stream transfer to Colchester STW (AWS)	Nitrate Treatment	0.9	2029
10	ESW-PMP-001A	Abberton RWPS and Langford Clarifiers	Additional pumping capacity pending the completion of a transfer to Abberton Reservoir. Option also includes an upgrade at Langford WTW	Pump and clarifier upgrade	8	2030
11	ESW-TRA-009	Langham WTW to SPA	On the basis the Strategic Pipeline Alliance (SPA) is constructed (led by Anglian Water)	Transfer (inter-company)	3.5, 6.5, 9.5, 10	2030
12	ESW-UVC-001	Langford UV	Additional ultraviolet treatment contactors to treat for cryptosporidium	UV Treatment	0.2	2029

Feasible Water Supply Options – Suffolk

No.	Option UID	Option Name	Option Description	Option Type	Deployable Output (Ml/d)	Earliest start date
			Blyth WRZ			
1	ESW-DES-003-BW	Sizewell Desalination using Beach Well	Construction of a small scale desalination plant using beach wells in the Sizewell area	Desalination (BW)	20.1	2032
2	ESW-DES-003-IG	Sizewell Desalination using Infiltration Gallery	Construction of a small scale desalination plant using infiltration galleries in the Sizewell area	Desalination (IG)	11.2	2032
3	ESW-TRA-001	Barsham WTW to Saxmundham Tower	This option transfers treated water from Barsham WTW (in Northern Central WRZ) through an existing main to Shadingfield with a new main constructed from Shadingfield to Saxmundham	Transfer (interzonal)	8,15	2028
4	ESW-TRA-008	Sizewell to Saxmundham	Transfer from Sizewell to Saxmundham	Transfer (intrazonal)	3.5, 8	2028
5	ESW-TRA-010	Transfer from Wherstead (AWS) to Saxmundham	Transfer from Wherstead to Saxmundham, using AW's SPA main as the water source	Transfer (inter-company)	3.5, 10	2028
6	ESW-TRA-010A	Transfer from Wherstead (AWS) to Saxmundham	Transfer from Wherstead to Saxmundham, using AWS's SPA main as the water source. This option assumes that ESW-TRA-010 is not constructed as functions on its own	Transfer (inter-company)	8, 18.5, 34.5, 44	2028
7	ESW-TRA-010B	Transfer from Wherstead (AWS) to Saxmundham	Transfer from Wherstead to Saxmundham, using AWS's SPA main as the water source. This option assumes that ESW-TRA-010 is constructed and supplements it	Transfer (inter-company)	4.5, 8.5, 15, 24.5, 31, 34, 40.5	2028

8	ESW-TRA-012	Transfer from Eye Airfield to Saxmundham	Transfer from Eye Airfield to Saxmundham	Transfer (interzonal)	3.5, 8	2028
9	ESW-TRA-017	Transfer from Saxmundham to Sizewell	Transfer from Saxmundham to Sizewell	Transfer (intrazonal)	2.5	2028
			Hartismere WRZ			
10	ESW-TRA-011	Transfer from Saxmundham to Eye Airfield	Transfer from Saxmundham to Eye Airfield	Transfer (interzonal)	6.5, 9.5	2028
11	ESW-TRA-015	Transfer from Barsham to Eye Airfield	Transfer from Barsham WTW to Eye Airfield	Transfer (interzonal)	6.5, 9.5	2028
12	ESW-TRA-016	Transfer from Norwich (West, AWS) to Eye Airfield	Transfer from Norwich (AW, west – near Little Melton) to Eye Airfield	Transfer (inter-company)	6.5, 9.5, 10, 18.5, 36, 44	2028
13	ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	Transfer from Holton WTW to Eye Airfield	Transfer (interzonal)	8.5	2028
			Northern Central WRZ			
14	ESW-DES-004-BW	California (Caister) Desalination using Beach Well	Construction of a small scale desalination plant using beachwells in the Great Yarmouth Area near Caister WRC	Desalination (BW)	25.1	2032
15	ESW-DES-004-IG	California (Caister) Desalination using Infiltration Gallery	Construction of a small scale desalination plant using infiltration galleries in the Great Yarmouth Area near Caister WRC	Desalination (IG)	14.0	2032
16	ESW-DES-008-BW	Corton Desalination using Beach Well	Construction of a small scale desalination plant using beachwells in the Lowestoft area near Corton WRC	Desalination (BW)	10.1	2032
17	ESW-DES-008-IG	Corton Desalination using Infiltration Gallery	Construction of a small scale desalination plant using infiltration galleries in the Lowestoft area near Corton WRC	Desalination (IG)	5.6	2032
18	ESW-EFR-002	Lowestoft Water Reuse to Lound Lakes	Water reuse plant fed from Anglian Water's WRC with a transfer to Lound Lakes	Water Reuse	3.5, 6.5, 10, 11	2030
19	ESW-EFR-002A	Lowestoft Water Reuse to Ellingham Mill	Water reuse plant fed from Anglian Water's WRC with a transfer to Ellingham Mill	Water Reuse	3.5, 6.5, 10, 11	2030
20	ESW-NIT-004	Barsham EDR Nitrate Treatment	Electrodialysis Reversal nitrate treatment at Barsham WTW so that final water meets nitrate PCV. Option contains a discharge stream transfer to Beccles STW (AWS)	Nitrate Treatment	2.15	2029

21	ESW-RES-002A; ESW-RES-002B; ESW-RES-002C	North Suffolk Winter Storage Reservoir	New winter storage reservoir to be filled in winter from River Waveney at ESW's existing Shipmeadow intake and from a new intake on the Hundred River at Kessingland (currently pumped to sea by IDB at Kessingland). IDB indicates annual average of ~30Ml/d available. The IDB is about to setback the sea defence and construct a new Hundred River PS which will have a t-off for winter storage.	Reservoir	16.2 (3500Ml reservoir), 18.5 (5000Ml reservoir), 19.9 (7000Ml reservoir)	2033
22	ESW-TRA-007	Norwich (East, AWS) to Barsham WTW Transfer	Transfer to intercept AWS Great Yarmouth, Caister or Bacton desalination options with a transfer to Barsham	Transfer (inter-company)	3.5, 4, 7.5, 26.5, 34.5, 44	2028
23	ESW-TRA-013	Transfer from Saxmundham to Barsham	Transfer from Saxmundham to Barsham WTW	Transfer (interzonal)	26.5	2028
24	ESW-TRA-014	Transfer from Eye Airfield to Barsham	Transfer from Eye Airfield to Barsham WTW	Transfer (interzonal)	26.5	2028
25	ESW-TRA-018	Transfer from Bungay Wells to Broome WTW	Transfer from Bungay Wells to Broome WTW	Transfer (intrazonal)	1	2028
26	ESW-TRA-021	Transfer from Caister-on-Sea EFR to Ormesby	Transfer from Caister-on-Sea EFR Plant (AWS) to Ormesby	Transfer (inter-company)	10	2028
27	ESW-TRA-022	Transfer from AWS Caister-on-Sea Desalination to Caister-on-Sea	Transfer from Caister-on-Sea Desalination Plant (AWS) to Caister-on-Sea	Transfer (inter-company)	14, 25.1	2028
28	ESW-TRA-023	Broome to Barsham Transfer	Transfer from Broome WTW to Barsham WTW	Transfer (intrazonal)	1	2028
29	03b-0478-B	Caister Water Reuse	Water reuse plant fed by AWS Caister WRC	Water reuse	16.4	2030

APPENDIX 3: DECISIONS DETERMINING OUR ALLOCATION OF BASE AND ENHANCEMENT FUNDING

The following information responds to DEFRAs request for Essex & Suffolk Water to confirm how we identified any overlap between base and enhancement funding within our WRMP24 plan.

Our business cases for water supply improvements are set out in NES14 A3-01 WRMP Supply Options which can be found in the supporting information in our PR24 business plan.

We followed Ofwat's PR24 guidance to determine the enhancement schemes included in our business plan and WRMP24.

All the costs associated with our water supply projects – that is, to address supply side needs - meet the enhancement funding criteria in full. We did not include any investment relating to the maintenance of existing infrastructure or restoring any capacity (for example, by replacing aging infrastructure).

Within the information below, we have provided a summary of the key factors driving our water supply investment needs which support decisions in the apportionment of base and enhancement funding. Table 1 summarises any overlap between base and enhancement funding within our WRMP24 plan for AMP8.

Table 1: Summary of AMP8 Base and Enhancement Investments

	Supply-side schemes [1]	Leakage costs to deliver 2.7 Ml/d reduction	Metering (Option 5)	Water Efficiency
Enhancement (£m)	352.520	16.088 [2]	89.676	5.129
Base (£m)	0.000	12.052	40.116	4.601
Totex	352.520	28.140	129.792	9.730

Each WRMP water supply investments falls into one of three categories: A New Assets; B New Water Treatment Processes; or C Investment for Existing Assets.

Categories A and B relate to designing and building brand new assets and processes that do not currently exist. These new assets are required to meet future needs driven by the supply demand deficit, climate change and water quality changes.

Category C relates to investment at existing water supply and distribution assets. We have provided more detail on our needs, supporting our decision to allocate 100% of costs to enhancement funding.

A New Supply Assets

The following water supply enhancement projects are entirely about the design and construction of new water supply, distribution, and storage assets to address the supply / demand deficit. These projects are:

- Linford New WTW 10 (ESW-ABS-003)
- Lowestoft Water Reuse for Ellingham Mill and Transfer (ESW-EFR-002A)
- Suffolk Strategic Network comprising:
    - Holton WTW Eye Airfield (ESW-TRA-019)
    - Barsham WTW to Saxmundham Tower (ESW-TRA-001)
    - Service Reservoirs and Pumping Stations
- North Suffolk Winter Storage 7500 and Transfer ESW-RES-002C.

These are entirely allocated to enhancement funding because these are "providing new solutions for water provision in drought (dry year) conditions", as identified in final water resource management plans (Ofwat PR24 methodology, Appendix 9, p20)

B New Water Treatment Processes

We identified a requirement for an additional water treatment process to remove nitrates at three sites, Langford WTW, Langham WTW, and Barsham WTW. This investment addresses the deterioration in quality in some of our river water sources, which meant that we would need additional treatment processes at these sites. This deterioration in water quality, combined with changes in demand and abstraction licences which mean current alternatives will no longer be available to be considered. As this is related to an increase in nitrates from agriculture and wastewater, this is beyond our control.

The nitrate standard is a health-based standard that we must meet. There is a deteriorating trend in Essex and Suffolk river nitrate concentrations, both in terms of an increasing duration (weeks) and of peak autumn and winter concentrations. We currently achieve compliance with the Nitrate Prescribed Concentration Value (PCV) through abstraction management and/or blending a low and a high nitrate source. As described for each of the three water treatment works, this impacts on reservoir refill and deployable output because the high nitrate sources are so high that the volume must be limited to achieve an acceptable blend and level of nitrate. This means that during part of the autumn and winter when nitrate concentrations are above target, available raw water is not abstracted and flows to sea. During these times, we can no longer use the full capacity of the treatment works because of the deteriorating raw water.

Installing a new ultraviolet (UV) water treatment process at Langford is needed to treat cryptosporidium. Achieving acceptable and consistent levels of output from the Essex system is dependent on our ability to abstract water from the Langford Mill to supply Langford WTW. This enables our Blackwater intake to be used to fill Hanningfield reservoir.

We are often unable to use the Langford Mill intake due to the high crypto risk. The risk is heightened as the intake is situated at a dead-end of the river, minimising its ability to move and remain fresh. To avoid outages at Langford WTW, we currently abstract water from the Rivers Chelmer intake and Blackwater intake but this reduces the available water to transfer to Hanningfield, compromising Hanningfield reservoir's refill, particularly in dry years.

This presents significant risks due to the size of population Hanningfield reservoir serves.

When this situation occurs, we call on the Langford Recycling Plant and the Ely Ouse to Essex Transfer Scheme more frequently which the EA does not want us to do as the Ely Ouse transfer is a drought scheme and not there to mitigate poor and deteriorating raw water quality beyond the designed treatment capability of our WTWs.

All four water quality process driven investment projects provide an improvement in water available for use. Maximising WAFU is essential due to the supply / demand position and the current solutions are no longer viable.

This means that these are categorised entirely as enhancement expenditure through adding to new treatment processes – there is no investment relating to the maintenance of existing infrastructure or for replacing aging infrastructure.

C Investment in Existing Assets

As stated above, no investment is included relating to the maintenance of existing infrastructure or restoring any capacity (for example, by replacing aging infrastructure).

Abberton Raw Water Pumping Station (RWPS)

The Abberton RWPS scheme includes replacing two of the four existing pumps with larger capacity pumps to increase pumping station capacity by 50Ml/d.

This investment is **not** because these pumps need replacing. The existing four pumps can consistently deliver both current and historical pumping requirements. This pumping station was constructed in AMP6, and the pumps are in good condition.

Instead, this investment is needed to provide additional capacity to transfer up to 50 Ml/d of raw water from Abberton to Langford WTW through the new AMP7 Abberton to Langford Pipeline. This is in addition to maintaining all previous raw water pumping (that is, transferring raw water from Abberton Reservoir to Layer WTW and back-pumping raw water to Langham WTW during periods of poor raw water quality in the River Stour).

The drivers and benefits for investment at Abberton RWPS and Langford Clarifier are set out in p72 of nes14.pdf (nwg.co.uk).

There is no cross over with base maintenance of the existing assets, and we would not otherwise need to invest here.

Langford WTW Clarifiers

The existing Langford WTW Clarifiers can currently treat the full deployable output of Langford WTW, so there is no requirement for any maintenance or upgrades to keep the current level of service.

Instead, the Langford WTW Clarifier scheme is required to treat raw water from Abberton Reservoir that will be transferred to Langford WTW through the new AMP7 Abberton to Langford Pipeline.

Abberton Reservoir water is of a different quality (significantly lower alkalinity) and requires more settlement time and filtration time. The existing clarifiers and filters were designed to treat water from the River Blackwater and River Chelmer (much higher alkalinity and settling velocity).

The new clarifiers scheme is included as enhancement expenditure as it is only required to meet this higher need for settlement time and filtration.

There is no cross over with base maintenance of the existing assets, and we would not otherwise need to invest here.

The AMP7 pipeline

When we originally designed the transfer scheme, the pipeline would have transferred water from Abberton reservoir to Hanningfield reservoir. The Abberton reservoir water would be transferred from Langford to Hanningfield through the existing pumping station and raw water pipeline between Langford and Hanningfield.

However, this was subsequently discounted as a viable option because of the risk of transferring Invasive Non-Native Species (INNS) from Abberton Reservoir into Hanningfield Reservoir (after PR19). In response, we revised the scheme so that the water is treated at Langford WTW. As the water types are so different additional clarifiers and filters will be required.

Subsequent hydraulic and process reviews have confirmed that they are required to realise the full Water Available for Use (WAFU) gain. This investment was not included in our AMP7 enhancement case for the pipeline, because this risk was not known at the time – so this has not already been funded by customers at PR19.

Demand Management Options

Our business cases for Demand Management are set out in NES14 A3-01 WRMP Supply Options which can be found in the supporting information in our PR24 business plan. NES15 A3-02 Demand Management (Household) and NES36 A3-22 NHH business Demand (non household).

We have followed Ofwat's PR24 guidance to determine the enhancement schemes included in our business plan and WRMP.

Leakage, Metering and Water Efficiency needs are funded by both base and enhancement drivers. The following information below explains how we have apportioned costs to each category.

Smart Metering

Our approach to allocation of costs between base and enhancement adheres to Ofwat's guidance (see Appendix 9 of the PR24 methodology), industry best practise and our previous PR19 business plan methodology. Our approach is detailed below:

- **Enhancement** the costs for new meters (where no meter previously existed). For replacement meters, we only include attribute costs to enhancement funding relating to the smart element of the meter
- **Base Funded activities** include the cost of replacing existing meters, minus the cost of the smart technology.

Water Efficiency

For our standard AMP8 household water efficiency programme, we allocated 100% of costs to base funding in line with Ofwat's guidance, industry best practise and our previous PR19 methodology. In practice, this will require more base funding in AMP8 than in AMP7.

Ofwat's PR24 guidance expects us to include a water efficiency programme for non-household customers from 2030. This is a new regulatory requirement for water companies. There are no historical costs associated with these needs as the responsibility for this activity previously resided with retailers. So, we included 100% of non-household water efficiency costs as enhancement funding (there is no implicit allowance as this was not a wholesale responsibility).

As part of our extensive AMP8 smart metering programme, we are carrying out activities with household customers to help them maximise benefits from smart metering and reduce consumption. These activities are in addition to our standard household water efficiency programme. This is a new activity linked to smart metering. It has no overlap with the standard household water efficiency programme hence we have allocated 100% of costs to enhancement funding. This aligns with Ofwat's smart metering funding approach for other companies in PR19.

Leakage

To determine our split between base and enhancement funding, we identified the historical level of leakage reduction the industry has achieved. We allocated costs associated with meeting current / historical leakage levels to base funding on the basis that this level of funding would be included in Ofwat's historical econometric models. Costs associated with delivering leakage improvements beyond historical levels are not included in Ofwat's historical models. We have allocated these costs to enhancement funding. This methodology aligns with decisions made by the CMA for AMP7 for other companies. We explain this approach in more detail in our business plan in NES15 - Enhancement Case WR – Demand Management.