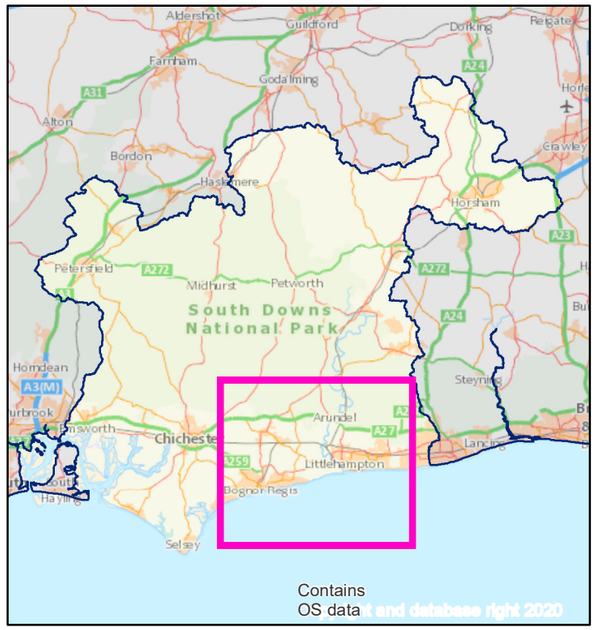
Drainage and Wastewater Management Plan

Ford
Wastewater System Plan

from Southern Water

Contents

Ford wastewater system: map and key facts



Population Equivalent (PE)	**132,208**
Discharge Waterbody	**Long overland outfall into English Channel**
Number of Pumping Stations	**124**
Number of Overflows	**22**
Length of Sewer (km)	**1131.7**
Catchment Reference	**FORW**

BRAVA Results Table

	Planning Objective	2020	2050
1	Internal Sewer Flooding Risk	1	
2	Pollution Risk	0	
3	Sewer Collapse Risk	1	
4	Risk of Sewer Flooding in a 1 in 50 year storm	2	2
5	Storm Overflow performance	2	2
6	Risk of WTW Compliance Failure	0	0
7	Risk of flooding due to Hydraulic Overload	0	0
8	Dry Weather Flow Compliance	0	1
9	Good Ecological Status / Potential	1	
10	Surface Water Management	2	
11	Nutrient Neutrality	NA	NA
12	Groundwater Pollution	0	
13	Bathing Waters	2	
14	Shellfish Waters	NA	

Drivers of Risks

- Customer
- Hydraulics
- Operational
- Quality
- Unknown

Catchment Strategy: IMPROVE

FORD WTW

0 0.5 1 2 3 4 Kilometers

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Problem Characterisation
Ford (FORW)

This document describes the causes of the risks identified by the Baseline Risk and Vulnerability Assessment (BRAVA). The BRAVA results for this wastewater system are summarised in Table 1. The results indicate that flooding, pollution and water quality are the main concerns in this wastewater system. We have completed risk assessments for 2050 where we have the data and tools available to do so. For the other planning objectives, we will explore how we can predict future risks for the next cycle of DWMPs. All the risk assessment methods need to be reviewed after the first DWMPs have been produced with a view to improve the methods and data for future planning cycles.

Table 1: Results of the BRAVA for Ford wastewater system

Planning Objectives		2020	Driver	2050
1	Internal Sewer Flooding Risk	1	Customer	
2	Pollution Risk	0	-	
3	Sewer Collapse Risk	1	Operational	
4	Sewer Flooding in a 1 in 50-year storm	2	Hydraulic	2
5	Storm Overflow Performance	2	Hydraulic	2
6	WTW Water Quality Compliance	0	-	0
7	Flooding due to Hydraulic Overload	0	-	0
8	WTW Dry Weather Flow Compliance	0	-	1
9	Good Ecological Status / Good Ecological Potential	1	Quality	
10	Surface Water Management	2	Hydraulic	
11	Nutrient Neutrality	NA	-	NA
12	Groundwater Pollution	0	-	
13	Bathing Waters	2	Customer	
14	Shellfish Waters	NA	-	

Key

BRAVA Risk Band	
NA	Not Applicable*
0	Not Significant
1	Moderately Significant
2	Very Significant

*No issues relevant to planning objective within Wastewater System

Investment Strategy

The risks identified in this wastewater system mean that we have assigned the following investment strategy:

Improve

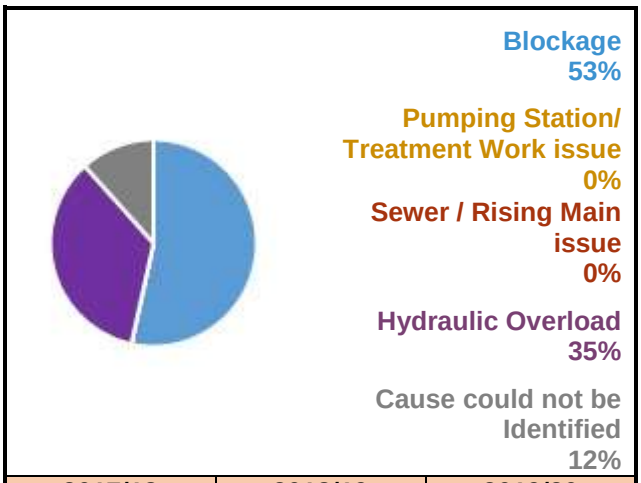
This means that we consider that the current performance of the drainage and wastewater system needs to be improved to reduce the impacts on our customers and/or the environment. We will plan investment to reduce the current risks by actively looking to invest capital funding in the short term to address current performance issues (and consider future risks when implementing improvements).

Planning Objective 1: Internal Sewer Flooding Risk

The number of internal sewer flooding incidents reported during the three years considered by the risk assessment are shown in Figure 1. The total number of connections in this wastewater system means there have been between 1.68 and 3.35 incidents per 10,000 connections per year (a threshold set by Ofwat) so the risk is in the 'moderately significant' band.2

The primary driver for internal sewer flooding in this wastewater system is 'Customer'. Blockages caused 53% of all incidents recorded in this wastewater system. Blockages are often caused by fats, oils, grease, nappies, wet wipes and sanitary products within the system. These items are non-flushable and should not be disposed of into wastewater systems.

Figure 1: Number of internal flooding incidents per annum and causes

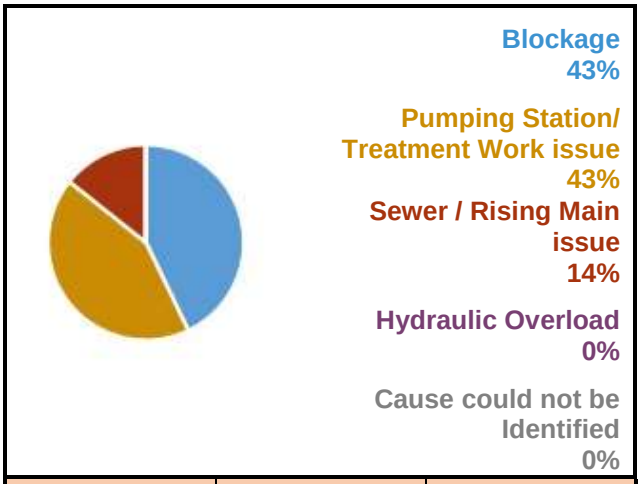


2017/18	2018/19	2019/20
4	21	18

Planning Objective 2: Pollution Risk

The number of pollution incidents reported during the three years considered by the risk assessment are shown in Figure 2. The length of sewer in this wastewater system means there have been less than 24.51 incidents per 10,000km per year (a threshold set by Ofwat) so the risk is in the 'not significant' band.

Figure 2: Number of pollution incidents per annum and causes



2017	2018	2019
1	3	3

Planning Objective 3: Sewer Collapse Risk

The number of sewer collapses reported during the three years considered by the risk assessment are shown in Table 2. The length of sewer in this wastewater system means there have been between 5.72 and 9.44 incidents per 1,000km per year (a threshold set by Ofwat), the risk is in the 'moderately significant' band.

Table 2: Sewer collapses and rising main bursts

Sewer Collapse	**2017/18**	3
	2018/19	4
	2019/20	11
Rising Main Bursts	**2017/18**	1
	2018/19	2
	2019/20	2

The primary driver is 'Operational' as the cause of these collapses and bursts is due to the age and condition of the sewers.

Planning Objective 4: Sewer Flooding in a 1 in 50 Year Storm

The risk of flooding in a 1 in 50 year storm is very significant in 2020 and 2050. This is because our computer model of the sewer network indicate for 2020 that approximately 5100 - 5200 properties within this wastewater system are in areas that could flood by water escaping from sewers. This model prediction increases the number of properties in areas at risk from flooding to approximately 7700 - 7800 by 2050.

Our wastewater networks are generally designed with capacity for up to a 1 in 30 year storm, hence flooding is expected to occur during more severe storms such as a 1 in 50 year event. Flooding will occur due to insufficient capacity of the drainage system either on the surface before it enters the drainage system, and/or from manholes, in people's homes or at a low point elsewhere in the system.

Planning Objective 5: Storm Overflow Performance

The storm overflow performance risk has been assessed as very significant for both 2020 and 2050. Table 3 shows the overflows that discharge above the low threshold set for storm overflow discharges to Shellfish Water, Bathing Water and inland rivers.

The primary driver for the Storm Overflow Performance is 'Hydraulic.'

Table 3: Overflows exceeding discharge frequency threshold per annum

	Number of overflows		Threshold for number of discharges per annum		
	2020	2050	Low	Medium	High
Shellfish Waters	0 Medium	0 Medium	Less than 8	Between 8-10	10 or more
Bathing Waters	1 High	4 Medium	Less than 3	Between 3-10	10 or more
Freshwater	2 High	2 High	Less than 20	Between 20-40	40 or more

Planning Objective 6: Wastewater Treatment Works Water Quality Compliance

The risk of non-compliance with our wastewater quality permit has been assessed as not significant for both 2020 and 2050. This is because the wastewater treatment works has no record of compliance failure during the last three years (2018-2020).

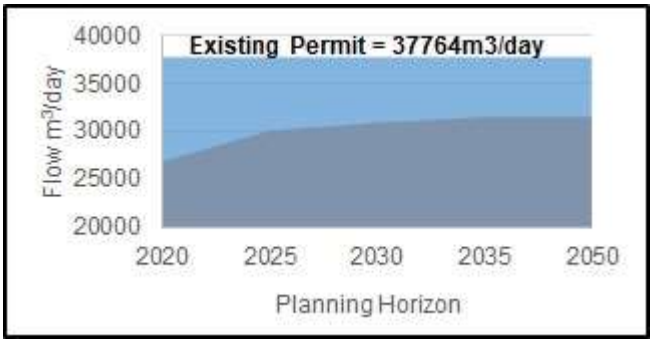
Planning Objective 7: Flooding due to Hydraulic Overload

Our initial assessment is that flooding from hydraulic overload is not significant in this wastewater catchment for both 2020 and 2050. We will use a hydraulic model of the wastewater system to determine if this catchment is at risk for Hydraulic Overload across the various storm events, and update this risk assessment accordingly for the next cycle of DWMPs.

Planning Objective 8: Wastewater Treatment Works Dry Weather Flow Compliance

The risk of Wastewater Treatment Works Dry Weather Flow Compliance is not significant for 2020 but is predicted to increase to moderately significant in 2050, shown in Figure 3. This is because the predicted DWF in 2050 is expected to be between 80% and 100% of the current permit.

Figure 3: Recorded and predicted dry weather flow with existing permit



Planning Objective 9: Good Ecological Status / Good Ecological Potential

Table 4 shows the waterbodies connected to this wastewater system are not achieving Good Ecological Status or Potential (GES/GEP). The Environment Agency has attributed the 'reasons for not achieving good status' to water company operations. Our risk assessment has been assessed based on the worst assigned status (Moderate) and is moderately signficiant. This is because we are might not be complying with our permit from the Environment Agency, or the permits need to be tightened to reduce the risk.

Table 4: Waterbodies not achieving GES/GEP

Waterbody	Classification	EA-Status	Activity
Aldingbourne Rife	Ammonia (Phys-Chem)	Moderate	Sewage discharge (continuous)

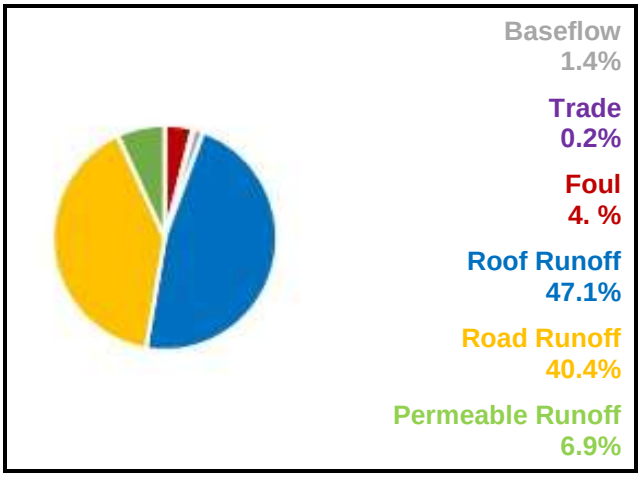
The primary driver is 'Quality'.

Planning Objective 10: Surface Water Management

Our initial high level assessment indicated that there is very significant interaction between surface water flooding and flooding from sewers in this wastewater system.The cause of this localised flooding is the capacity of the drainage network in these areas to convey both wastewater and surface water run-off.

Figure 4 illustrates the sources of water flowing in the wastewater system during a 1 in 20 year storm. It shows that surface water runoff from roofs, road and permeable surfaces constitutes more than 94.4% of the flow in the sewers. The total contribution of foul water from homes is 4. % with business contributing 0.2%. The baseflow is infiltration from water in the ground and makes up 1.4% of the flow in the system.

Figure 4: Sources of water flowing in sewers during a 1 in 20 year storm



Planning Objective 11: Nutrient Neutrality

This wastewater system is not hydraulically linked to Habitat Sites noted as under threat by Natural England.

Planning Objective 12: Groundwater Pollution

The risk of Groundwater Pollution is not significant. This is because the wastewater network in this wastewater system does not overlap with any groundwater Source Protection Zones (SPZ) used for water supply.

Planning Objective 13: Bathing Waters

The designated bathing waters that could be affected by discharges from this wastewater system are shown in Table 5, along with the current classification from the Environment Agency.

Table 5: Bathing Water annual results

Bathing Waters	Annual Results		
	2017	2018	2019
Felpham	Sufficient	Sufficient	Sufficient
Bognor Regis (Aldwick)	Sufficient	Sufficient	Good
Littlehampton	Sufficient	Good	Excellent
Bognor Regis East	Good	Excellent	Good
Pagham	Good	Excellent	Excellent

The risks from this wastewater system on Felpham, Bognor Regis (Aldwick), Littlehampton, Bognor Regis East bathing waters has led to an assessment of is very significant.

The primary driver is 'Customer' due to suspected foul to surface water misconnections as well as suspected agriculture affecting the bathing waters in this wastewater system.

Planning Objective 14: Shellfish Waters

The discharges from this wastewater system do not impact on any designated shellfish waters.

Generic Options Assessment for: Ford (FORW)

Planning Objectives		2020	Driver	2050
PO1	Internal Flooding	1	Customer	-
PO2	Pollution Risk	0	-	-
PO3	Sewer Collapse	1	Operational	-
PO4	Risk of Sewer Flooding in 1 in 50 yr	2	Hydraulic	2
PO5	Storm Overflow Performance	2	Hydraulic	2
PO6	Risk of WTW Compliance Failure	0	-	0
PO7	Annualised Flood Risk/Hydraulic Overload	0	-	0
PO8	DWF Compliance	0	-	1
PO9	Achieve Good Ecological Status	1	Quality	-
PO10	Improve Surface Water Management	2	Hydraulic	-
PO11	Secure Nutrient Neutrality	NA	-	NA
PO12	Reduce Groundwater Pollution	0	-	-
PO13	Improve Bathing Water Quality	2	Customer	-
PO14	Improve Shellfish Water Quality	NA	-	-

Type of Measures	Generic Option Categories	Icon	Take Forward?	Reasons	Examples of Generic Options
Source (Demand) Measures (to reduce likelihood)	Control / Reduce surface water run-off		Y	-	Natural Flood Management; rural land management and catchment management; SuDS including blue and green infrastructure; storm management
	Reduce groundwater levels		N	Reducing groundwater levels would reduce the risks from infiltration into the network. However, in practice, reducing groundwater levels will be detrimental to the environment, ground conditions and is prohibitively too costly to implement. For these reasons, this generic option has been discounted.	Reduce leakage from water supply pipes; pump away schemes to locally lower groundwater near sewer network
	Improve **quality** of wastewater		Y	-	Domestic and business customer education; incentives and behaviour change (reduce Fats, Oils & Grease, wet wipes etc.); monitoring trade waste at source; on-site black water and/or greywater pre-treatment
	Reduce the **quantity** / demand		Y	-	Water efficient appliances; water efficient measures; blackwater and/or greywater re-use; treatment at source
Pathway (Supply) Measures (to reduce likelihood)	Network Improvements		Y	-	Asset optimisation; additional network capacity; storage; separate flows; structural repairs; re-line sewer pipe and manholes; smart networks.
	Improve Treatment Quality		Y	-	Increase treatment capacity; rationalisation of treatment works (centralisation / de-centralisation); install tertiary plant; UV plant or disinfection facilities; innovation; improve Technical Achievable Limits; new WTWs
	Wastewater Transfer to treatment elsewhere		N	The causes of risk are not due to where our systems discharge to the environment or our ability to increase the capacity to connect more homes. Transferring wastewater for treatment elsewhere will not reduce any of the significant risks in this catchment.	Transfer flow to other network or treatment sites; transport sewage by tanker to other sites
Receptor Measures (to reduce consequences)	Mitigate impacts on Air Quality		N/A	Not included in first round of DWMPs	Carbon offsetting; noise suppression /filtering; odour control and treatments
	Improve Land and Soils		N/A	Not included in first round of DWMPs	Sludge soil enhancement
	Mitigate impacts on receiving waters		Y	-	River enhancement, aeration
	Reduce impact on properties		Y	-	Property flood resilience; non-return valves; flood guards / doors; air brick covers
Other	Study / Investigation		Y	-	Additional data required; hydraulic model development; WQ monitoring and modelling

August 2021
Version 1

Ford Wastewater System - Outline Options Appraisal

Generic Option	Location of Risk	Planning Objective and Description of Risk	Option Reference	Description	Further Description	Unconstrained Option?	Constrained Option?	Feasible Option?	Net Benefits	Estimated Cost	Preferred Option	Best value / Least cost or Reasons for Rejection
Control/ Reduce surface water entering the sewers	FORW (BONG) FC01_1 - Limmer Lane,	PO4 Floodin	FORW.SC01.1	Surface Water Separation	DAP Option.	No						
Control/ Reduce surface water entering the sewers	FORW (LITT) FC01_2 - Limmer Lane,	PO4 Flooding	FORW.SC01.2	Surface Water Separation	DAP Option.	No						
Control/ Reduce surface water entering the sewers	FORW (LITT) FC02_1 - The Causeway,	PO4 Flooding	FORW.SC01.3	Surface Water Separation	DAP Option.	No						
Control/ Reduce surface water entering the sewers	FORW (BONG) FC03_1 - Greenwood Close,	PO4 Flooding	FORW.SC01.4	Surface Water Separation	DAP Option.	No						
Control/ Reduce surface water entering the sewers	FORW (LITT) FC04_1 - West Drive,	PO4 Flooding	FORW.SC01.5	Surface Water Separation	DAP Option.	No						
Control/ Reduce surface water entering the sewers	FORW (LITT) FC05_1 - Millfield Close,	PO4 Flooding	FORW.SC01.6	Surface Water Separation	DAP Option.	No						
Control/ Reduce surface water entering the sewers	FORW (LITT) FC06_1 - South Terrace	PO4 Flooding	FORW.SC01.7	Surface Water Separation	DAP Option.	No						
Control / Reduce groundwater infiltration												
Improve quality of wastewater entering sewers (inc reducing FOG, RAG, pre-treatment, trade waste)	Hotspot 1 - Bognor Regis Hotspot 2 - Littlehampton Hotspot 3 - Angerming	PO1- Internal Flooding	FORW.SC03.1	Customer Education Programme.	Customer Education Programme.	Yes	Yes	Yes	Minor Positive +	£TBC - With Partners	No	Best Value
Control / Reduce the quantity / flow of wastewater entering sewer system	FORD WTW	PO8 (2050)- Dry Weather Flow	FORW.SC04.1	Water Efficient Appliance / Measures	Southern Water aims to reduce water consumption to 100 l/h/d by 2040.	No						Deliver the required outcome
Network Improvements (eg increase capacity, storage, conveyance)	Hotspot 2 - Littlehampton Hotspot 3 - Angerming	PO1- Internal Flooding	FORW.PW01.1	Additional Storage	Additional Storage.	No						Risk and uncertainty - future resilience
Network Improvements (eg increase capacity, storage, conveyance)	Hotspot 4 - Rustington Hotspot 5 - Felpham	PO3- Sewer Collapse	FORW.PW01.2	Pipe Rehabilitation Programme	Targeted CCTV / electroscan surveys and proactive sewer rehabilitation to reduce risk of sewer collapse.	Yes	Yes	Yes	Minor Positive +	£1,650K	No	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	Catchment Wide	PO8 (2050)- Dry Weather Flow	FORW.PW01.3	Pipe Rehabilitation Programme	Relining/improving structural grades of sewers across the catchment.	No						Risk and uncertainty - future resilience
Network Improvements (eg increase capacity, storage, conveyance)	Hotspot 1 - Bognor Regis Hotspot 2 - Littlehampton Hotspot 3 - Angerming	PO1- Internal Flooding	FORW.PW01.4	Jetting Programme	Jetting Programme.	Yes	Yes	Yes	Minor Positive +	£265K	No	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC01 Park Road	PO4, PO7 and PO1 - Flooding	FORW.PW01.5	Upsizing and Online Storage (FORW020 Option 1)	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC02 Park Road	PO4, PO7 and PO1 - Flooding	FORW.PW01.6	Offline Storage (FORW020 Option 2)	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC03 Chichester Road	PO4, PO7 - Growth	FORW.PW01.7	Upsizing and uprating (FORWGR001_Bognor Option 1 Section 1.1)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC04 Shirpney Road	PO4, PO7 - Growth	FORW.PW01.8	Upsizing and uprating (FORWGR001_Bognor Option 1 Section 1.2)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC05 New Town WPS	PO4, PO7 - Growth	FORW.PW01.9	Upsizing and uprating (FORWGR001_Bognor Option 1 Section 1.3)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC06 Pembroke Way	PO4, PO7 - Growth	FORW.PW01.10	Upsizing and uprating (FORWGR001_Bognor Option 1 Section 1.4)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC07 Rose Green Road	PO4, PO7 - Growth	FORW.PW01.11	Upsizing (FORWGR001_Bognor Option 1 Section 1.5)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC08 Nyetimber Lane	PO4, PO7 - Growth	FORW.PW01.12	Upsizing and uprating (FORWGR001_Bognor Option 1 Section 1.6)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC09 West Park WPS	PO4, PO7 - Growth	FORW.PW01.13	(FORWGR001_Bognor Option 1 Section 1.7)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC10 Gloucester Road	PO4, PO7 - Growth	FORW.PW01.14	Upsizing (FORWGR001_Bognor Option 1 Section 1.8)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC11 Van Gogh Place	PO4, PO7 - Growth	FORW.PW01.15	Upsizing (FORWGR001_Bognor Option 1 Section 1.9)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC12 Bangor	PO4, PO7 - Growth	FORW.PW01.16	Croncrete block removal (FORWGR001_Bognor Option 1 Section 1.10)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC13 Bew WPS, Yapton WPS and North Middleton WPS	PO4, PO7 - Growth	FORW.PW01.17	New WPS (FORWGR001_Bognor Option 1 Section 1.11)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,180K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BOGN) FC14 Gloucester Road Bognor CSO and Ford WTW	PO4, PO7 - Growth	FORW.PW01.18	Storages (FORWGR001_Bognor Option 1 Section 1.12)	DAP Option.	Yes	Yes	Yes	Major Positive +++	£TBC - With Partners	Yes	Best Value

Ford Wastewater System - Outline Options Appraisal

Generic Option	Location of Risk	Planning Objective and Description of Risk	Option Reference	Description	Further Description	Unconstrained Option?	Constrained Option?	Feasible Option?	Net Benefits	Estimated Cost	Preferred Option	Best value / Least cost or Reasons for Rejection
Network Improvements (eg increase capacity, storage, conveyance)	FORW(BONG) FC01 - WEST PARK BOGNOR REGIS WPS	PO5 and PO13 - Spill Assessments	FORW.PW01.19	Storage ((BONG) FC01 WEST PARK BOGNOR REGIS WPS)	The DAP model has a confidence score of 2 and was last verified in 2014.	Yes	Yes	Yes	Major Positive +++	£835K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW(BONG) FC02 - BOGNOR MAIN WPS	PO5 and PO13 - Spill Assessments	FORW.PW01.20	Storage ((BONG) FC02 - BOGNOR MAIN WPS)	The DAP model has a confidence score of 2 and was last verified in 2014.	Yes	Yes	Yes	Major Positive +++	£TBC - With Partners	No	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC01 York Road	PO4, PO7 and PO1 - Flooding	FORW.PW01.21	Online storage	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC02 Fitzalan Road	PO4, PO7 and PO5 - Flooding	FORW.PW01.22	Offline storage	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC03 Fitzalan Road	PO4, PO7 and PO5 - Flooding	FORW.PW01.23	Install a pump	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC04 Fitzalan Road	PO4, PO7 and PO5 - Flooding	FORW.PW01.24	Increase pump rate	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BONG) FC01_1 - Limmer Lane,	PO4, PO7 Flooding	FORW.PW01.25	Storage	DAP Option.	No						
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BONG) FC01_2 - Limmer Lane,	PO4, PO7 Flooding	FORW.PW01.26	Storage	DAP Option.	Yes	Yes	Yes	Major Positive +++	£2,050K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC02_1 - The Causeway,	PO4, PO7 Flooding	FORW.PW01.27	Storage	DAP Option.	Yes	Yes	Yes	Major Positive +++	£2,800K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (BONG) FC03_1 - Greenwood Close,	PO4, PO7 Flooding	FORW.PW01.28	Storage	DAP Option.	Yes	Yes	Yes	Major Positive +++	£950K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC04_1 - West Drive,	PO4, PO7 Flooding	FORW.PW01.29	Storage	DAP Option.	Yes	Yes	Yes	Major Positive +++	£1,550K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC05_1 - Millfield Close,	PO4, PO7 Flooding	FORW.PW01.30	Storage	DAP Option.	Yes	Yes	Yes	Major Positive +++	£4,295K	Yes	Best Value
Network Improvements (eg increase capacity, storage, conveyance)	FORW (LITT) FC06_1 - South Terrace	PO4, PO7 Flooding	FORW.PW01.31	Storage	DAP Option.	Yes	Yes	Yes	Major Positive +++	£TBC - With Partners	Yes	Best Value
Improve treatment (capacity and quality at existing works or develop new WTWs)	FORD WTW	PO8 (2050)- Dry Weather Flow DWF Permit=37764m3 2664m3/day removal is required to achieve below 80% permit. It is expected the DWF will be between 80-100% of the current permit in 2050	FORW.PW02.1	Permit Review	Proposed permit-41094m3.	Yes	Yes	Yes	Minor Negative -	£2,165K	No	Least Cost
Wastewater Transfer	FORD WTW	PO8 (2050)- Dry Weather Flow	FORW.PW03.1	Construct New WPS & Rising Main	No other WTWs are within a 20km radius of FORD WTW with spare capacity to take DWF.	No						Cost Effective, Deliver the required outcome and Risk and uncertainty - future resilience
Mitigate impacts on Air Quality (e.g. Carbon neutrality, noise, odour)												Not included in the first round of DWMPs
Improve Land and Soils												Not included in the first round of DWMPs
Mitigate impacts on Water Quality												
Reduce consequences Properties (e.g. Property Flood Resilience)	Hotspot 2 - Littlehampton Hotspot 3 - Angerming	PO1- Internal Flooding	FORW.RC04.1	Property Flood Mitigation / Resistance	Short-term property level protection ahead of flood alleviation scheme - Non-return valves and flood mitigation doors / gates.	No						Risk and uncertainty - future resilience
Study/ investigation to gather more data	Hotspot 2 - Littlehampton Hotspot 6 - Arundel	PO1- Internal Flooding	FORW.OT01.1	Investigation into causes	Further investigation to identify the cause of the internal flooding incident.	No						Cost Effective
Study/ investigation to gather more data	Rustington, Felpham	PO3- Sewer Collapse	FORW.OT01.2	CCTV Investigation	CCTV Investigation.	No						Risk and uncertainty - future resilience
Study/ investigation to gather more data	Catchment Wide	PO8 (2050)- Dry Weather Flow	FORW.OT01.3	Infiltration Reduction Plan	Relining/improving structural grades of sewers across the catchment.	No						
Study/ investigation to gather more data	Aldingbourne Rife	PO9- GE Status / Potential	FORW.OT01.4	Study and Investigation-Ammonia (Phys-Chem)	Catchment was banded 1 in because; Aldingbourne Rife-Ammonia (Phys-Chem) (Moderate Sewage discharge (continuous)).	Yes	Yes	Yes	Minor Positive +	£75K	Yes	Best Value
Study/ investigation to gather more data	Catchment Wide	PO4- 1 in 50 year PO5- Storm Overflow PO10- Surface Water Management	FORW.OT01.5	Improve Hydraulic Model	Improve Hydraulic Model.	Yes	Yes	Yes	Minor Positive +	£450K	Yes	Best Value
Study/ investigation to gather more data	FORW(BONG) FC017 - ALDWICK AVENUE BOGNOR CSO	PO5 and PO13 - Spill Assessments	FORW.OT01.6	Storage	The DAP model has a confidence score of 2 and was last verified in 2014.	Yes	Yes	Yes	Major Positive +++	£1,000K	Yes	Best Value
Study/ investigation to gather more data	FORESHORE WPS	PO5 Storm Overflow	FORW.OT01.7	Storage	Storage.	Yes	Yes	Yes	Minor Negative -	£1,000K	Yes	Least Cost
Study/ investigation to gather more data	BROADMARK LANE RUSTINGTON WPS	PO5 Storm Overflow	FORW.OT01.8	Storage	Storage.	Yes	Yes	Yes	Minor Negative -	£1,000K	Yes	Least Cost
Study/ investigation to gather more data	ESPLANADE BOGNOR CSO	PO5 Storm Overflow	FORW.OT01.9	Storage	Storage.	Yes	Yes	Yes	Minor Negative -	£1,000K	Yes	Least Cost
Study/ investigation to gather more data	SEA ROAD LITTLEHAMPTON WPS	PO5 Storm Overflow	FORW.OT01.10	Storage	Storage.	Yes	Yes	Yes	Minor Negative -	£1,000K	No	Least Cost
Study/ investigation to gather more data	WEST PARK BOGNOR REGIS WPS	PO5 Storm Overflow	FORW.OT01.11	Storage	Storage.	No						Risk and uncertainty - future resilience
Study/ investigation to gather more data	FORW (LITT) FC02_3 - The Causeway,	PO4, PO7 Flooding	FORW.OT01.12	Storage	DAP Option.	No						
Study/ investigation to gather more data	FORW (BONG) FC03_3 - Greenwood Close,	PO4, PO7 Flooding	FORW.OT01.13	Storage	DAP Option.	No						
Study/ investigation to gather more data	FORW (BONG) FC03_4 - Greenwood Close,	PO4, PO7 Flooding	FORW.OT01.14	Storage	DAP Option.	No						
Study/ investigation to gather more data	FORW (LITT)	PO4, PO7 - Growth	FORW.OT01.15	Storage	DAP Option.	No						
Study/ investigation to gather more data	FORD (LITT) FC05 - FORESHORE WPS	PO5 - Spill Assessments	FORW.OT01.16	Storage	DAP Option.	No						
Study/ investigation to gather more data	FORD (LITT) FC06 - BROADMARK LANE RUSTINGTON CEO	PO5 and PO13 - Spill Assessments	FORW.OT01.17	Storage	DAP Option.	No						
Study/ investigation to gather more data	Catchment Wide	PO4 PO5 PO7 PO10	FORW.OT01.18	Study	Utilisation of disused older infrastructure.	Yes	Yes	Yes	Minor Positive +	£TBC - With Partners	Yes	Best Value

Ford Wastewater System - Outline Options Appraisal

Generic Option	Location of Risk	Planning Objective and Description of Risk	Option Reference	Description	Further Description	Unconstrained Option?	Constrained Option?	Feasible Option?	Net Benefits	Estimated Cost	Preferred Option	Best value / Least cost or Reasons for Rejection
Study/ investigation to gather more data	Catchment Wide	PO13 - Bathing Water Misconnections	FORW.OT01.19	Misconnection Surveys (Foul into Surface Water)	Misconnection Surveys (Foul into Surface Water).	Yes	Yes	Yes	Minor Positive +	£TBC - With Partners	No	Best Value

DWMP Investment Needs

1. The options listed in the DWMP Investment Needs below are the preferred options in our DWMP. They will need further refinement as we implement the DWMP to confirm the exact location and scope of action needed, and the cost.

2. The costs are indicative costs for planning purposes only. The basis for the cost estimates, including assumptions and uncertainties, are explained in our DWMP Investment Plans.

3. The table of Investment Need provides an indicative cost so we know what level of funding is needed to reduce the risks. It is not a commitment to fund or deliver any option.

4. The Indicative Timescale is when the investment is needed. Some options may take several investment periods to achieve the desired outcomes.

5. Potential Partners have been identified in the table of Investment Needs. This is to indicate where there may be opportunities for us to work with these partners when developing and delivering these options. It is not a commitment by any of the partners to work with us.

6. These options will inform our future business plans as part of the Ofwat periodic review process to secure the finance to implement these options.

7. The options listed are prioritised by the method stated in the Programme Appraisal Technical Summary.

Date : May 2023
Version : 1.0

WATER for LIFE
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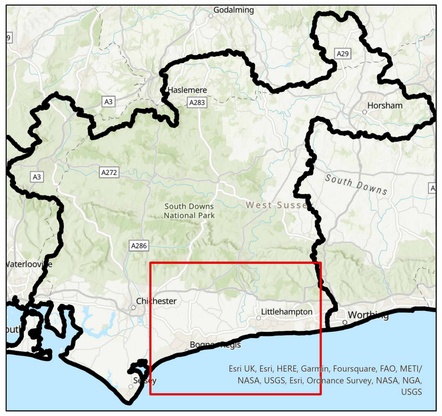
Reference	River Basin (L2)	Wastewater System (L3)	Location	Option	Indicative Cost	Indicative Timescales	Potential Partners	Applicable Planning Objectives
Arun and Western Streams								
Ford								
FORW.SC03.1	Arun and Western Streams	Ford	South Terrace, Sea Road, Queensway, Willow Brook, Hewarts Lane, Sea Lane, High Street, Lizard Head, Clun Road, Horsham Road,	Customer Education Programme: Targeted campaign to reduce the amount of FOG (fats, oils and grease) and unflushables discharged into the sewer network	£115K	AMP8 onwards	West Sussex County Council Arun District Council	PO1
FORW.PW01.2	Arun and Western Streams	Ford	Rustington, Felpham	Sewer Rehabilitation: Targeted CCTV or electroscan surveys and sewer rehabilitation to reduce the risk of sewer bursts and collapses	£1,650K	AMP8 onwards	-	PO3
FORW.PW01.4	Arun and Western Streams	Ford	South Terrace, Sea Road, Queensway, Willow Brook, Hewarts Lane, Sea Lane, High Street, Lizard Head, Clun Road, Horsham Road,	Enhanced Sewer Maintenance: Increase targeted sewer jetting to reduce the number of blockages in the network	£265K	AMP8 onwards	West Sussex County Council Arun District Council	PO1
FORW.PW01.7	Arun and Western Streams	Ford	Chichester Road	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.8	Arun and Western Streams	Ford	Shirpney Road	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.9	Arun and Western Streams	Ford	New Town WPS	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.10	Arun and Western Streams	Ford	Pembroke Way	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.11	Arun and Western Streams	Ford	Rose Green Road	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.12	Arun and Western Streams	Ford	Nyetimber Lane	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.13	Arun and Western Streams	Ford	West Park WPS	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.14	Arun and Western Streams	Ford	Gloucester Road	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.15	Arun and Western Streams	Ford	Van Gogh Place	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.16	Arun and Western Streams	Ford	Bangor	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.17	Arun and Western Streams	Ford	Bew WPS, Yapton WPS and North Middleton WPS	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7

Reference	River Basin (L2)	Wastewater System (L3)	Location	Option	Indicative Cost	Indicative Timescales	Potential Partners	Applicable Planning Objectives
FORW.PW01.18	Arun and Western Streams	Ford	Gloucester Road Bognor CSO and Ford WTW	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,180K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.26	Arun and Western Streams	Ford	Limmer Lane	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,385K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.27	Arun and Western Streams	Ford	The Causeway	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£2,050K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.28	Arun and Western Streams	Ford	Greenwood Close	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£2,800K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.29	Arun and Western Streams	Ford	West Drive	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£950K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.30	Arun and Western Streams	Ford	Millfield Close,	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£1,550K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW01.31	Arun and Western Streams	Ford	South Terrace	Flood Alleviation: Separate or attenuate excess rainwater in sewer network using Sustainable Drainage Systems (SuDS) to reduce risk of flooding (Costs based on storage solution but surface water separation is our preferred approach)	£4,295K	AMP9	West Sussex County Council Arun District Council	PO4 PO7
FORW.PW02.1	Arun and Western Streams	Ford	Ford WTW	Increase capacity to allow for planned new development	£11,500K	AMP8	Environment Agency	PO8
FORW.OT01.4	Arun and Western Streams	Ford	Aldingbourne Rife	Study and Investigation to understand the impact of wastewater discharges on the local environment and identify measures required to achieve good ecological status in the receiving waterbody	£75K	AMP8	Environment Agency	PO9
FORW.OT01.5	Arun and Western Streams	Ford	System Wide	Improve the Hydraulic Model: Surveys and reverification of model to improve confidence and accuracy	£450K	AMP8	West Sussex County Council Arun District Council	PO4 PO5 PO10
FORW.WINEP01.1	Arun and Western Streams	Ford	WEST PARK BOGNOR REGIS CEO	Reduce impact from storm spills from WEST PARK BOGNOR REGIS CEO through wetland creation and/or sewer lining to reduce infiltration of groundwater	£88,325K	AMP9	-	PO5
FORW.WINEP01.2	Arun and Western Streams	Ford	SEA ROAD LITTLEHAMPTON CEO	Reduce impact from storm spills from SEA ROAD LITTLEHAMPTON CEO through wetland creation and/or sewer lining to reduce infiltration of groundwater	£5,800K	AMP9	-	PO5
FORW.WINEP01.3	Arun and Western Streams	Ford	FORD ROAD ARUNDEL CEO	Reduce the number of storm discharges from FORD ROAD ARUNDEL CEO by creating below-ground storage	£2,300K	AMP10	-	PO5
FORW.WINEP01.4	Arun and Western Streams	Ford	CARLTON AVENUE BOGNOR CSO	Reduce the number of storm discharges from CARLTON AVENUE BOGNOR CSO by creating below-ground storage	£1,520K	AMP11	-	PO5
FORW.WINEP01.5	Arun and Western Streams	Ford	SOUTH TERRACE LITTLEHAMPTON CSO	Reduce the number of storm discharges from SOUTH TERRACE LITTLEHAMPTON CSO by creating below-ground storage	£1,220K	AMP9	-	PO5 PO13

Reference	River Basin (L2)	Wastewater System (L3)	Location	Option	Indicative Cost	Indicative Timescales	Potential Partners	Applicable Planning Objectives
FORW.WINEP01.6	Arun and Western Streams	Ford	ALDWICK AVENUE BOGNOR CSO	New or improved screen to reduce aesthetics impacts from storm discharges at ALDWICK AVENUE BOGNOR CSO	£130K	AMP11	-	PO5
FORW.WINEP01.7	Arun and Western Streams	Ford	GLOUCESTER ROAD BOGNOR CSO	New or improved screen to reduce aesthetics impacts from storm discharges at GLOUCESTER ROAD BOGNOR CSO	£130K	AMP12	-	PO5
FORW.WINEP01.8	Arun and Western Streams	Ford	VICTORIA ROAD BOGNOR CSO	New or improved screen to reduce aesthetics impacts from storm discharges at VICTORIA ROAD BOGNOR CSO	£130K	AMP11	-	PO5
FORW.WINEP01.10	Arun and Western Streams	Ford	BROADMARK LANE RUSTINGTON CEO	New or improved screen to reduce aesthetics impacts from storm discharges at BROADMARK LANE RUSTINGTON CEO	£130K	AMP12	-	PO5
FORW.WINEP01.11	Arun and Western Streams	Ford	ONSLOW DRIVE FERRING CEO	New or improved screen to reduce aesthetics impacts from storm discharges at ONSLOW DRIVE FERRING CEO	£130K	AMP11	-	PO5
FORW.WINEP01.12	Arun and Western Streams	Ford	TOWN QUAY ARUNDEL CEO	New or improved screen to reduce aesthetics impacts from storm discharges at TOWN QUAY ARUNDEL CEO	£130K	AMP12	-	PO5
FORW.WINEP01.13	Arun and Western Streams	Ford	WATER LANE LITTLEHAMPTON CEO	New or improved screen to reduce aesthetics impacts from storm discharges at WATER LANE LITTLEHAMPTON CEO	£130K	AMP12	-	PO5
FORW.WINEP01.14	Arun and Western Streams	Ford	SHRIPNEY ROAD SOUTH BERSTED CEO	Reduce impact from storm spills from SHRIPNEY ROAD SOUTH BERSTED CEO through wetland creation and/or sewer lining to reduce infiltration of groundwater	£935K	AMP12	-	PO5
FORW.WINEP01.15	Arun and Western Streams	Ford	STATION ROAD RUSTINGTON CSO	Reduce impact from storm spills from STATION ROAD RUSTINGTON CSO through wetland creation and/or sewer lining to reduce infiltration of groundwater	£600K	AMP12	-	PO5

Drainage and Wastewater Management Plan: Location of Potential Options FORD Wastewater system in Arun and Western Streams River Basin Catchment

(i) This map should be read in conjunction with the list of Investment Needs for this wastewater system
(ii) The areas shown on this map are the potential locations for the options. The location of the risk may be elsewhere in the system.
(iii) Labels for each location are the option references in the list of Investment Needs
(iv) Drainage Area Plan (DAP) options on flooding and growth are not shown.



- Customer Education
- Pipe Rehabilitation
- Asset Resilience
- Wastewater Treatment
- WINEP Nutient Neutrality
- WINEP Storm Overflows

FORW.PW01.2
FORW.SC03.1
FORW.PW01.4
FORW.WINEP01.12
FORW.SC03.1
FORW.PW01.4
FORW.WINEP01.3
FORW.PW01.2
FORW.SC03.1
FORW.SC03.1
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FORW.SC03.1
FORW.WINEP01.7
FORW.SC03.1
FORW.WINEP01.2
FORW.WINEP01.6
FORW.WINEP01.8
FORW.SC03.1
FORW.PW01.4
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FORW.WINEP01.1

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