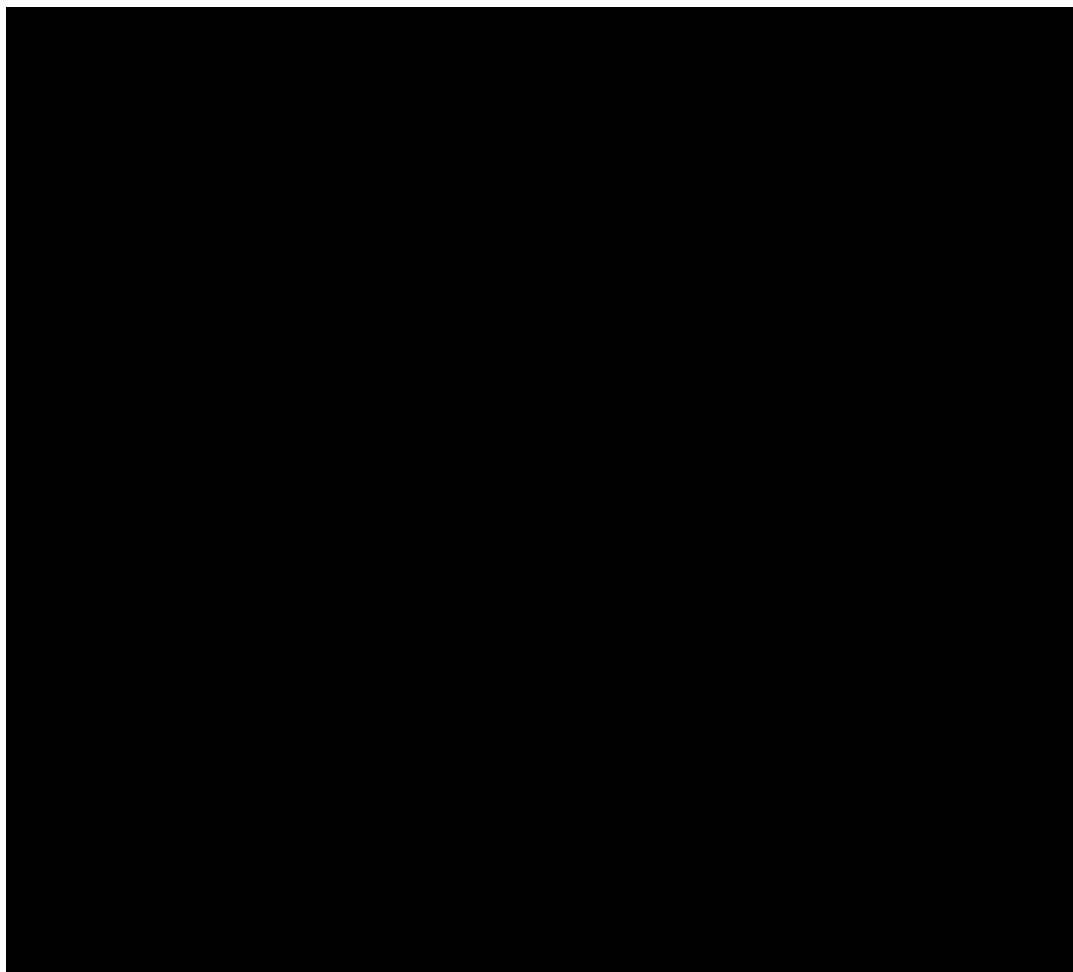
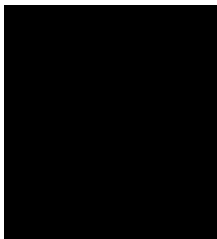




Whitfield Growth

Annex A2 - Feasible Options Review

September 2025

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Whitfield Growth

Annex A2 - Feasible Options Review

September 2025

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Contents

Executive Summary	1
1 Introduction	2
2 Context	3
3 Options Review and Update	6
4 Proposed Options Progression	24
5 Conclusion	27

Executive Summary

The area around Whitfield, Kent has been identified for managed expansion in the Dover District Local Plan. Southern Water is the statutory undertaker for wastewater and sewerage in this area and has a statutory duty to accommodate the population growth.

At the PR19 stage the shorter constrained list was:

- Option 1 Upgrade of Dover & Folkestone WTW (Broomfield Bank)
- Option 2 Transfer to Dambridge WTW (Major Upgrades)
- Option 2A Transfer to Dambridge WTW (Side Stream)
- Option 3 New WTW; Groundwater Discharge
- Option 4 New WTW; Coastal Discharge
- Option 5 New WTW; Inland River Discharge

The preferred option at the PR19 stage was identified as Option 4 New WTW; Coastal Discharge.

For the PR24 stage, previous reporting further appraised Option 1 and Option 4, and continued to recommended Option 4 as the preferred option.

As part of this large scheme gated process, the costing of the six options has been further updated. The assumed scope for costing of each option is detailed in this Annex. As covered in Annex A1, an unconstrained list of options was generated and then reduced to a shorter constrained list of options. This backcheck provides confidence that the constrained list of options listed above are the right ones.

Option 4, a new WTW with a coastal discharge is still viewed as the most likely final selected option. Activities, programme and risks for this option are set out in the Submission 1 report.

However, after further appraisal of the options, further work has been identified to resolve uncertainties and risks. This will confirm the final selected option and take it forward towards preliminary design.

It is recommended that Option 3 is not taken forward for more detailed appraisal due to the high likelihood that the Environment Agency will not provide consent to discharge to ground.

The further work required to select the final selected option is listed out in detail in this Annex. This relates to resolution on required treatment, permit requirements, storm flow management, ecological impacts and impacts to environmental designations, as well as consultation with relevant stakeholders.

1 Introduction

1.1 Purpose

The area around Whitfield, Kent has been identified for managed expansion in the “Dover District Local Plan1”. Southern Water is the statutory undertaker for wastewater and sewerage in this area and has a statutory duty to accommodate the population growth.

Annex A1 documents the process undertaken to inform the development of a shorter constrained list of options from an unconstrained list of options. PR19 optioneering focused on six options aimed at providing additional wastewater capacity. The six options are shown in Table 1.1 below.

Table 1.1: Whitfield Growth feasible options

Option Ref:	Option Name	Option Description
Option 1	Dover & Folkestone WTW (Broomfield Bank)	New rising main (12km - rural) to upgraded Folkestone WTW (also known as Broomfield Bank).
Option 2	Transfer to Dambridge WTW (Major Upgrades)	New rising main (14km) to Dambridge WTW (major upgrade).
Option 2A	Transfer to Dambridge WTW (Side Stream)	New rising main (14km) to Dambridge WTW (side stream).
Option 3	New WTW; Groundwater Discharge	New rising main (2.3km) to new WTW with groundwater discharge.
Option 4	New WTW; Coastal Discharge	New rising main (2.3km) to new WTW with final effluent to sea outfall via discharge rising main (9.5km) via Walmer
Option 5	New WTW; Inland River Discharge	New rising main (2.7km) to new WTW with final effluent to river discharge via discharge rising main 2.7 km along the A256 corridor.

This Annex A2 presents the six shortlisted “constrained” options in more detail and seeks to:

- Provide a description of the constrained options and details that have been used to develop costs for the purpose of option comparison.
- Report on further technical review and development of the six constrained options since PR19/24.
- Provide more detail on the latest assessed scope of the six options.
- Review the benefits of each option.
- Review the disbenefits, risks and uncertainties for each option.
- Identify key uncertainties that need to be addressed to advance and to confirm a preferred option.
- Reflect any relevant findings from the review and backcheck of unconstrained options (as discussed in Annex A1)
- Identify key further work required to further define the final preferred option.

This document accompanies Southern Water’s Submission 1 to Ofwat as part of the Large Scheme Gated Process.

2 Context

2.1 Introduction

The Whitfield Growth development forms a key component of the Dover District Local Plan, with significant implications for wastewater infrastructure planning and delivery. As Southern Water is the statutory undertaker for sewerage services in the region, it is important to understand the environmental, operational, and regulatory context within which feasible options for wastewater treatment and discharge must be considered.

This section outlines the factors that have influenced the option development. These contextual elements provide the foundation for assessing the viability, risks, and benefits of each proposed solution.

2.2 PR19 optioneering

As part of their PR19 submission in September 2018, SWS included a Cost Adjustment Claim¹ to support the assets required to accommodate the development. The housing forecast at the time projected 5,750 homes which is 500 fewer than the current forecast of 6,250 homes.

Solution selection was undertaken, beginning with an unconstrained list of options, which was narrowed down to a feasible short list of six. These were evaluated using both:

- A qualitative SWOT analysis, and
- A whole-life TOTEX assessment.

The preferred solution was the construction of a new WTW during AMP7 with a sea outfall. The proposed WTW would have a capacity of 20,000 PE, of which 13,900 PE would serve the new development. The remaining capacity would allow for the transfer of existing flows from Whitfield Village, thereby freeing up capacity at Dover and Folkstone WTW to support organic growth in the towns of Dover and Folkestone.

The six options considered were:

- Upgrade of Dover and Folkstone WTW
- Upgrade of Dambridge WTW (two options with different technologies)
- Construction of a new WTW (three options with varying discharge locations)

In 2018, three growth scenarios were forecasted. The lowest forecasts projected 950 homes completed by 2024. However, the Dover District Local Plan to 2040² reported that as of October 2024, only 478 homes had been completed, representing a shortfall of 472 homes (49%) when compared to the lowest 2018 scenario. The actual housing build rate informed the AMP7 investment, leading to the installation of a network storage solution to ensure that assets were in line with demand and not ahead of need. The cost adjustment claim was withdrawn, and the investment was deferred to PR24.

2.3 PR24 optioneering

During PR24 option development was undertaken on the identified preferred option (known as the PR24 preferred option) for the purposes of further understanding the likely investment required in AMP8. Following the final determinations Whitfield Growth scheme was included in the Ofwat large scheme gated process. This gated process sets out requirements for optioneering potential solutions. The Options Development and Appraisal (ODA) approach was developed to help identify options as part of the development of the DWMP Cycle 1. This methodology has been adapted to meet the requirements of the large scheme gated approach as the Whitfield Growth scheme is likely to form part of the DWMP Cycle 2 development. This document covers the DWMP step of "Feasible options determined". Further information on the steps from 'Generic

¹ [ta-143-growth-whitfield.pdf](#)

² doverdistrictlocalplan.co.uk/uploads/Adopted-Local-Plan-Documents/V2-Dover-District-Local-Plan-to-2040-High-Resolution-for-download-RGB-87.44-MB.pdf

Options' through to 'Unconstrained options screening' can be found in Annex A1 and the step 'Estimate solution costs' are covered in Annex B2

2.4 Impacts of the scheme

To assess the suitability of the options to deliver the need, the impacts of each need to be considered. These provide the framework for assessing feasibility, risks and benefits for each proposed option. The major impacts of each option can be considered in three areas:

- Transfer of wastewater
- Treatment of wastewater
- Discharge of final effluent (Outfall)

The fundamental understanding of the requirement of the project are covered in the basis of design (Annex A4) however the key areas of potential impacts are included here.

Transfer of wastewater

While work to understand the network capacity is ongoing, an intermediate attenuation tank has been built in AMP7 to provide the interim storage required for the Whitfield Urban Expansion growth. The resolution of the network modelling and further development of growth figures will provide greater understanding on how each of the options may interact and integrate with the existing infrastructure. In the meantime, for the purposes of submission 1 the impacts of the wastewater transfer are considered in terms of environmental impact and construction complexity.

Treatment of wastewater

The impact of additional capacity being integrated into existing treatment works will provide important understanding of the feasibility of the option. Existing capacity and performance information is considered in Annex A4 however a summary of the existing sewerage assets which have been considered are below.

Broomfield Bank³ catchment and WTW serves several communities, including Dover, Folkestone, Hawlinge, Densole, Capel-le-Ferne, Whitfield, Lydden, Alkham, Shepherds Well and Guston. It is the largest catchment in the Sour River catchment and includes:

- 868 km of sewer network, and
- 150,000 population equivalent (PE)

Dambridge Wingham WTW is also considered within the feasible options review and is located approximately 13km from the development site. The WTW delivers treatment for approximately 17,000 Population equivalent (PE).

Discharge of final effluent (Outfall)

Given the scale of the development, the discharge of treated effluent into the environment—whether into rivers, groundwater, or the sea—and its impact is a key consideration.

Rivers

The village of Whitfield lies within the Stour River environmental management catchment, as defined by the Environment Agency's Catchment Data Explorer⁴. The River Dour is the primary operational catchment and is divided into two waterbodies:

- Upper Dour – classified as having "bad ecological status"
- Dour from Kearsney to Dover – classified as having "moderate ecological status"

Both waterbodies are relatively small, and wastewater discharges in the area are limited to storm overflows in Dover.

³ Also referred to as "Dover and Folkestone catchment / WwTW)

⁴ [England | Catchment Data Explorer](#)

Sea

There are six designated bathing waters near Dover, as show in Table 2.1.

Table 2.1: Table of designated bathing waters

Local Authority	Bathing Water Name	Classification
Dover District Council	Sandwich Bay	Good
	Deal Castle	Poor
	St. Margaret's Bay	Excellent
Folkestone and Hythe District Council	Folkestone	Sufficient
	Sandgate	Excellent
	Hythe	Excellent

Groundwater

The underlying geology of the area is predominantly chalk, and the development site falls within a groundwater nitrate protection zone. There are also pesticide issue priority zones nearby. Additionally, due to the geological characteristics, the area is designated as a surface water nitrate vulnerable zone.

3 Options Review and Update

3.1 Option 1 – Dover & Folkestone WTW (Broomfield Bank)

3.1.1 Description

Option 1 includes a new wastewater pumping station to the Dover and Folkestone WTW (also known as Broomfield Bank WTW) and upgrade of the WTW including a new storm tank, inlet screens and sludge storage and associated facilities. To avoid a major upgrade of existing assets through the centre of Dover, a new rising main would be required.

The option considers the following discharge permit conditions, which are assumed unchanged from the existing owing to this being a coastal discharge.

Table 3.1: Assumed Permit Conditions at Broomfield Bank WTW for Option 1

Permit type	TSS (mg/l)	BOD (mg/l)	COD (mg/l)	NH4-N (mg/l)	Total P (mg/l)	Total Fe (mg/l)
WRA	150 UT	-	-	-	-	-
UWWTR	-	25 LUT / 50 UT, 70%red	125 LUT / 250 UT, 75%red	-	-	-

Notes:

- The following acronyms apply: Lookup Table (LUT), Upper Tier (UT), Percent Reduction (%red), Annual Mean (AM), Rolling 12 Month Mean (R12MM).

3.1.2 Development of Option since PR19

Since PR19, further work has been undertaken, under the large scheme gated process, to optimise the pipeline route from the Whitfield development to Dover & Folkestone WTW. A rural route has been investigated, which avoids the disruption of construction through the Dover, and could thereby reduce programme time and risk. The treatment requirements have been further investigated and consideration of potential additional treatment processes likely to be included dependant on the final effluent requirements.

The required flows for a Wastewater Pumping Station near the Whitfield development have been reviewed and slightly increased.

Concern for the feasibility of the construction of this option has been investigated through a feasibility study at Broomfield Bank WTW and will be used to understand if this option should be discontinued. (SWS to confirm the name of this investigation).

3.1.3 Scope for Cost Update

For the purposes of the cost update, the rural pipeline route has been included for infrastructure costing. This is slightly longer at 12km compared to the length through Dover of 10km costed in PR19. The slightly increased size of pumping for the Wastewater Pumping Station at Whitfield has been included.

For non-infrastructure works at the WTW, the scope is largely the same as the scope from PR19. Further work is required to confirm the design flows and optimise the scope required for final costing.

The scope for costing is outlined below.

Infrastructure

12km pumped rising main (OD560 SDR11 PE-100) (avoiding Dover).

1 No. New Wastewater Pumping Station (204l/s).

1 No. Railway crossings.

1 No. Road crossing (A2).

Non-Infrastructure

New below ground preliminary treatment building comprising:

- Inlet chamber c/w H2S suppression and storm separation,
- Storm screens c/w screenings handling plant and skips,
- Wash water booster station.

Storm tank 691m³.

Storm return pump station (17l/s).

Storm outfall connecting into the treated effluent outfall.

Odour control to preliminary building.

Replacement of thickened sludge transfer pumps.

350m³ additional thickened sludge storage.

New centrifuge feed pump station.

To overcome the hydraulic capacity issues in the existing primary and secondary below ground treatment process structures:

- Modify security chamber to accept flow from new preliminary treatment building,
- Replace inlet screens, sized for 1028 l/s capacity,
- Replace and raise outlet launders on the Fat Oil and Grease (FOG) tanks,
- Replace and raise outlet launders on all four lamellas in the lamella hall,
- Replace existing centrifuges for high capacity units,
- Reuse and strengthen the existing centrifuge support steelwork,
- Replace and strengthen the Biological Aerated Flooded Filter (BAFF) bead screens,
- Provide a new Works MCC (220kW),
- New telemetry outstation.

Additional outfall upgrades to be assessed and agreed (not costed).

3.1.4 Benefits

The following benefits apply for this option:

- Good ground conditions at the WTW, decreasing design complexity and improve construction conditions.
- Construction compound can be made available on existing site, decreasing the need for planning/ land purchase and therefore a more efficient programme.
- Expansion planned on Southern Water owned land, therefore, land buying not required, resulting in a shorter programme.
- There is an existing coastal outfall and permit to discharge. If no increase in hydraulic capacity of the outfall is required, the permit to discharge will be simpler to manage, decreasing design, construction and maintenance work and subsequently costs.

3.1.5 Disbenefits, Risk and Uncertainty

This option has the following disbenefits, risks and uncertainties:

- Dover & Folkestone WTW is located within the Kent Downs National Landscape and constructed underground in a hillside, therefore providing additional process capacity whilst maintaining current levels of service is highly complicated. This could lead to increased programme duration and construction cost.
- There is significant complexity in the integration to the existing works, and to what effect ongoing capital maintenance activities at Dover & Folkestone WTW will allow for additional capacity to be added. This is considered a feasibility risk for this option.
- This option includes a long rising main from development to WTW with crossing of the A2 road link and the railway, therefore there is additional engineering complexity, ecological and archaeological surveys and consultation requirements.
- Channel Tunnel Rail Link (HS1) is nearby and adds complexity for engagement and construction.
- Expanding the existing WTW has potential to impact ecological features located within the surrounding area to the site. The new pipeline may intercept several statutory and non-statutory designations, depending on the final route. If the option requires an upgraded Broomfield Bank outfall at Dover at the current location, it could affect the Folkestone Warren SSSI and multiple areas of priority habitat (intertidal substrate offshore, lowland calcareous grassland and maritime cliffs and slopes).
- An additional discharge via the Dover and Folkestone WTW could present a risk to water quality and WFD compliance for the South Kent Coast waterbody which may affect permitting applications resulting in delayed programme and additional cost.
- Risk of the need to upgrade of primary and secondary treatment structures. This could be highly constrained due to land and environmental constraints, increasing design and construction complexity, resulting in a longer programme and increased cost.
- The pipeline and outfall construction could affect designated heritage assets, which the design should seek to avoid. The pipeline route should be designed to avoid the scheduled monument (bowl barrow 200m southwest of Little Watersend). If required, the upgrade of Dover and Folkestone outfall will need to ensure the protection of nearby scheduled monuments, including Archcliffe Fort and the Fortifications, Roman lighthouse and medieval chapel on Western Heights.
- Cost estimate uses industry cost codes. These do not adequately account for complexities of construction in the Kent Downs National Landscape and near the Channel Tunnel at this location. Therefore, the cost estimate may change.
- Risk that the existing coastal discharge may not have sufficient capacity for the extra flows. Additional costs for a new or an upgraded outfall would be significant and impact on the programme.
- This option is the least resilient for future growth due to land and environmental constraints. Therefore, additional works would be required in the future.
- Modification to discharge permit required, resulting in a longer programme and additional costs.
- Exclusions include pre-thickened sludge storage capacity, chemical storage capacity and storm outfall, if these are required, this will increase programme time and costs.

3.2 Option 2 - Transfer to Dambridge WTW (Major Upgrades)

3.2.1 Description

As described in Annex A1, the preferred option for transferring flows to another catchment was identified as Option 2 - Transfer to Dambridge WTW. This option was then split into Option 2 Transfer to Dambridge WTW (Major Upgrades) and Option 2A Transfer to Dambridge WTW (Side Stream) for further appraisal. A detailed discussion of Option 2A is provided in section 3.3.

Option 2 includes transfer via a 14km rising main to the existing Dambridge WTW. The WTW would have a major upgrade to treat the additional flow. The discharge of final effluent would be through an existing river outfall, though upgrading may be required.

Dambridge WTW provides scope for expansion within the current Southern Water land ownership area. The catchment boundary is located approximately 4km to the northwest of Whitfield. The Dambridge catchment serves 16,906 PE, with the new development at Whitfield expected to contribute an additional 15,240 PE by

2040. The sewerage infrastructure was assessed as being unlikely to have sufficient capacity for the flows from Whitfield, such that significant upgrades to the network infrastructure would be required. It was assessed that the connection would need to be directly to the WTW, and a mains route was identified to minimise disruption.

The option for the expansion of Dambridge WTW considers the following discharge permit conditions, based on a load stand-still presumption. For this option, phosphorous was reduced beyond this to 0.25mg/l given the sensitivity of the receiving water course.

Table 3.2: Assumed Permit Conditions at Dambridge WTW for Option 2

Determinant	PR19 Consent	PR19 Proposed
Dry Weather Flow (m ³ /d)	3150	6300
Flow to Full Treatment (FFT in l/s)	103	206
Total Suspended Solids (mg/l)	30	15
Biological Oxygen Demand (mg/l)	15	7.5
Ammonia (as N) mg/l	-	-
Total Iron (mg/l)	4	4
Total Phosphorous (mg/l)	2	0.25

Notes:

1. We note that the current consent DWF is now 3510 m³/d. This may result in a change to the PR19 proposed consent standards.
2. We note that Total Phosphorus permit at Dambridge Wingham under WRA is now 0.25 mg/l. This may result in a tighter phosphorus standard than assumed at PR19. The proposed consent conditions will be updated once the future DWF at Dambridge Wingham (and other options below) is confirmed. Any proposed consent would need to be discussed and agreed with the EA.

3.2.2 Development of option since PR19

There was no update to this option in previous PR24 reporting, which only included consideration of Option 1 and Option 4.

More recently, as part of the large scheme gated process, the transfer pipeline route has been reviewed, but the lengths remain largely unchanged. The required flows for the Wastewater Pumping station near Whitfield have been reviewed and slightly increased.

3.2.3 Scope for Cost Update

The infrastructure and non-infrastructure scope for costing is largely as of the scope from PR19. The slightly increased size of pumping for the Wastewater Pumping Station at Whitfield has been included.

Further work is required to confirm the flows and understand any change in final effluent quality requirement especially with regards to phosphorus.

The scope for costing is outlined below.

Infrastructure:

14km (OD560 SDR11 PE-100) rural pumped rising main.

1 No. Wastewater Pumping Station (204l/s) at the Whitfield development.

Crossing of rural roads only with no major crossings of major roads, rivers or railways.

Non-Infrastructure:

2 No. 539m³ Storm Tanks,

Inlet works comprising collection channel, flume, storm control / measurement and UWWTD sampling point,

2 No. inlet screens c/w screening handling and covered skips,

1 No. Detritor c/w classifier and skips,

Extensive modification to existing inlet works to accept new transfer connection,

Upgrade existing wash water booster station,

1 No. 10m³ Ferric storage for primary chemical dosing (in addition to the existing primary chemical ferric storage),

1 No. 10m³ ferric dosing system for secondary chemical dosing,

1 No. 15m³ ferric dosing system for tertiary chemical dosing,

3 No. Extended aeration lanes including internal recycle pump station,

5 No. Aeration blowers 2030m³/hr,

Make redundant and safe,

2 No. syphon chambers,

8 No. filter beds,

2 No. humus tanks,

1 No. final effluent chamber,

4 No. 17m dia. Final Settlement Tanks (FST),

1 No. Return/Surplus Activated Sludge (RAS/SAS) pump station at 158l/s capacity,

1 No. Tertiary Treatment Plant (TTP) feed pump station at 220l/s capacity,

2 No. Two-stage Tertiary cloth pile filters 1 No. Un-thickened sludge storage tank at 631m³ c/w Odour Treatment Unit (OTU),

1 No. Power upgrade,

1 No. Standby generator at 450kVA,

1 No. Works Motor Control Centre (MCC) at 350kW c/w new telemetry outstation.

3.2.4 Benefits

This option has the following benefits:

- The Dambridge WTW has Southern Water land available for its expansion, resulting in lower costs as land purchase is not required and a shorter programme.
- There is a relatively direct route across rural road and fields for a pumped main to the WTW, decreasing design complexity and therefore resulting in a shorter programme and lower costs.
- There is an existing permit to discharge, mitigating the need for associated new permit applications, resulting in a shorter programme and lower costs.
- The treated effluent will recharge a river rather than being lost to catchments if discharged to sea, benefitting the natural river habitats.
- This option is considered to be more resilient than Option 1 as there is space available for future growth. This would however require demolition of redundant assets in future to make space.
- Transfer pipe is largely through rural areas. Although it is 2km longer than for Option 1, it is likely be less problematic to construct overall thus decreasing construction programme and costs.
- Likely that operation costs for Option 2 will be lower than Option 2A.

3.2.5 Disbenefits, Risks and Uncertainties

This option has the following disbenefits, risks and uncertainties:

- Complexities of upgrading an existing operational WTW and difficulties in maintaining levels of service throughout the construction and commissioning, while considered less complex than in option 1, this has a potential to increase costs and delay the delivery programme.
- Uncertainty of the potential change or tightening of the existing discharge consent, when considering the additional flows. In the case of Dambridge WTW, the Total Phosphorus consent has been tightened since PR19 from 2 to 0.25 mg/l. Any additional tightening of the consent would lead to additional treatment requirements to this option, thus increasing design complexities and therefore, subsequently increasing costs and programme.
- There is uncertainty over the permitting requirements and whether an increase in flows to the River Stour would be acceptable. It is currently assumed that additional flows into the river are a benefit, however, should additional flows into the river not be agreed, this could make this option unfeasible.
- The installation of a 14km rising main to transfer the wastewater may result in septicity issues which could lead to odour complaints along the transfer main and in the locality of the treatment works. This would require septicity control measures to be considered which would increase the complexity of this option.
- Ecological and archaeological surveys may be required for working across fields, this could potentially result in delay to programme and increase cost.
- The Dambridge WTW is located adjacent to Flood Zone 2 and 3. There is a risk that construction of new structures associated with the upgrade could result in increase to flood risk. This would require additional mitigation to be included as part of the design and increase complexity, cost and potentially programme.
- Should flows from the Whitfield catchment be sent to Dambridge WTW this would constitute water from a particular catchment being treated in another catchment. The implications of this are not clearly defined at this stage and need to be reviewed. In addition, public support for increasing capacity at the treatment works to transfer wastewater from a new development 14km away is anticipated to be low. Therefore, additional stakeholder engagement and catchment reviews may be required, resulting in programme delay.

3.3 Option 2A – Transfer to Dambridge WTW (Side Stream)

3.3.1 Description

Option 2A is similar to Option 2 but offers benefits in terms reducing construction complexity by employing a side MBR stream which can be constructed off-line reducing interface with the existing treatment process. This side stream is sized to treat 50% of the flow before blending with the existing treatment effluent to produce a combined effluent stream to outfall in the River Stour.

The same permit conditions were considered as Option 2.

3.3.2 Development of option since PR19

As with Option 2, there was no update to this option in previous PR24 reporting, which only included consideration of Option 1 and Option 4.

The transfer pipeline routes and required flows for pumping for the Wastewater PS have been reviewed and adjusted as of Option 2.

3.3.3 Scope for Cost Update

The infrastructure and non-infrastructure scope for costing is largely as of the scope from PR19. The slightly increased size of pumping for the Wastewater pumping flows has been included. Further work is required to confirm the flows and optimise the scope required.

The scope is outlined below.

Infrastructure:

14km (OD560 SDR11 PE-100) rural pumped rising main

1 No. Wastewater Pumping Station (204l/s).

No major crossings.

Non-Infrastructure:

New inlet works including collection channel, flume, storm/flow control and UWWTD sampling point.

2 No. 6mm 2D Inlet screens c/w screening handling and covered skips.

1 No. Detritor c/w classifier and skips.

Upgrade to existing wash water booster station.

Convert the existing Primary Settlement Tanks (PST) to storm tanks to provide min of 539m³ storm volume required, c/w provision of storm mixers.

1 No. Storm return pump station (40l/s capacity).

2 No. 16m diameter Primary Settlement Tanks c/w with Auto De Sludge (ADS) unit.

1 No. Flow split chamber 50:50 downstream of PST.

1 No. 20m³ Ferric storage and dosing system to PSTs.

Reuse existing 10m³ primary ferric storage tank but convert the Point Of Application (POA) to secondary treatment to MBR anoxic tank on Stream B.

1 No. 15m³ Ferric dosing system to secondary settlement on Stream A.

Secondary treatment (Stream B).

1 No. 270m³ anoxic selector c/w 2.7kW mixer.

3 No. Membrane Bio Reactor (MBR) plant to treat 50% flow to a 0.1P, 5 BOD standard.

3 No. Aeration lanes for MBR plant, 1800m³ c/w aeration blowers @ 2000m³/hr.

1 No. 200m³ permeate tank.

Tertiary treatment (Stream A).

1 No. Deep Bed Sand Filter (DBSF) pump station at 110l/s capacity.

1 No. Deep Bed Sand Filter plant (40m² total area)

1 No. clean and dirty backwash tanks – 50m³ each.

1 No. Final effluent monitoring chamber.

1 No Sludge storage tank at 631m³ capacity c/w OUT.

1 No. 500kVA transformer and power upgrade.

1 No. Standby generator at 500kVA.

1 No. Works MCC at 350kW with new telemetry outstation.

The long wastewater rising main may require extensive dosing to avoid septicity issues.

3.3.4 Benefits

This option has the same benefits as option 2 as well as the following additional benefits:

- A side stream could be constructed offline, commissioned and integrated into the process reducing construction complexity and interface with the existing process during this time.

3.3.5 Disbenefits, Risks and Uncertainties

These are the same as option 2 above, as well as the following additional items:

- The compliance of final effluent from this treatment works would be reliant on performance of existing process stream for blending, should they be unable to perform the quality of the final effluent would be non-compliant and additional treatment would be required to be included.
- Due to the MBR treatment as side stream, it is anticipated that this option would result in higher operating costs than those anticipated in option 2.
- The use of MBR is considered to be a relatively operationally complex treatment solution and is not currently widely used in the UK. This raises uncertainty in the acceptability of using this form of treatment from an operational perspective.

3.4 Option 3 – New WTW Groundwater Discharge

3.4.1 Description

Sending flows to existing WTWs will require significant infrastructure and non-infrastructure investment, therefore, options were developed to assess the possibility of a new WTW local to the Whitfield growth development site.

Three discharge options were considered: discharge to ground (Option 3), discharge to sea via a long sea outfall (LSO) (Option 4) and discharge to river (Option 5).

With each of these discharge options, there is significant uncertainty relating to the permit conditions, location of the WTW and the location of the discharge.

Assumed permit condition are shown in Table 3.3:

Table 3.3: Assumed Permit Conditions at Whitfield New WTW for Option 3

Determinant	Proposed
Dry Weather Flow (m3/d)	3024
Flow to Full Treatment (FFT in l/s)	105
Total Suspended Solids (mg/l)	30
Biological Oxygen Demand (mg/l)	20
Total Nitrogen (mg/l)	10

It should be noted that the Dry Weather Flow (DWF) adopted, includes a 25% headroom factored in, which is appropriate to consider for a new strategic WTW, to enhance resilience to future growth.

3.4.2 Development of option since PR19

There was no update to this option in previous PR24 reporting, which only included consideration of Option 1 and Option 4.

More recently, under the large scheme gated process, the location of the new WTW for this option has been reviewed with other possible locations identified. Further work is required to review the environmental and engineering constraints for the other possible WTW locations.

The pipeline route to the location of the new WTW has been reviewed and optimised. As a result, the pipeline has reduced in length from 3.1km to 2.3km. The required flows for the Wastewater Pumping station near Whitfield have also been reviewed and slightly increased.

3.4.3 Scope for Cost Update

For infrastructure costing the reduced length of pipeline to the new WTW and the slightly increased size of pumping for Wastewater Pumping Station at Whitfield have been included.

For non-infrastructure works at the new WTW, the scope below is largely as of the scope from PR19. Further work is required to confirm the flows and optimise the scope required for final costing.

Infrastructure:

2.3km (OD560 SDR11 PE-100) pumped rising main to the new WTW from Whitfield.

1 No. Major Road crossing (A256).

1 No. Wastewater Pumping Station (204l/s).

Final effluent - It is assumed this is injected into the ground at the new treatment works site, so this option has no allowance for a final effluent transfer pipes.

Non-Infrastructure:

Land purchase 270x170m (11.4 acres min).

1 No. Administration / welfare building (10x10m),

Power, water, transport link and communications to site,

Including welfare, works laboratory and MCC Room,

1 No. Inlet works comprising,

6mm 2D Screen with 210 l/s capacity, inlet channel and FFT/storm control,

Screening handling c/w covered screening skips, grit detritor, classifier and skip,

1 No. 540m³ storm tank c/w mixing and storm return pump station. Storm overflow to groundwater discharge,

2 No. 11.2m dia. Primary Settlement Tanks (PSTs) c/w Auto De-Sludge pump station to sludge thickening plant,

1 No. Picket Fence Thickener (PFT) at 82m³,

Thickened sludge transfer pumps to thickened sludge holding tank,

1 No. 296m³ Thickened sludge holding tank,

1 No Extended aeration plant comprising:

- **1 No. Anoxic selector tank at 180m³ c/w 2kW mixer,**
- **3 No. First stage anoxic zones (total volume 500m³),**
- **3 No. Aeration lanes (total volume 2,500m³),**
- **3 No. Second stage anoxic zones (total volume 500m³),**
- **3 No. reaeration zones (total volume 125m³),**
- **Fine Bubble Diffused Aeration (FBDA) and aeration blowers for 3433m³/h capacity,**
- **1 No. Methanol dosing plant sized for 20m³ storage and 10l/h dose rate.**

3 No. 14.5m dia. Final Settlement Tanks (FSTs) c/w Auto De-Sludge.

1 No. Return Activated Sludge (RAS) pump station at 75l/s capacity.

1 No. Surplus Activated Sludge (SAS) control to Works Return Pump Station (WRPS) at 10l/s.

1 No. Works Return Pump Station (WRPS) sized at 20l/s.

1 No. Final effluent monitoring chamber.

1 No. Herringbone soakaway arrangement for land treatment / ground discharge.

1 No. Washwater chamber with washwater booster station.

3.4.4 Benefits

The advantage and benefits of this option are:

- The local aquifer, which is under stress, will be recharged ensuring water remains within the catchment and is not lost to coastal discharge or diverted elsewhere.
- A new WTW offers greater resilience than upgrading existing due to the allowance for 25% headroom factor for future growth.
- A new WTW means a shorter rising main from the new Whitfield development, resulting in lower design complexities and land management requirements.
- Wastewater treatment and discharge local to source, decreasing design complexities and therefore programme length.
- Construction of a new WTW will be more straightforward compared to upgrading an existing operational site, decreasing design complexities and therefore decreasing programme and design/construction costs.
- A new works would be constructed offline, avoiding any interface with existing treatment processes. This would mitigate any impacts on local stakeholders and Southern Water assets directly.
- This option has the shortest transfer infrastructure length.

3.4.5 Disbenefits, Risks and Uncertainties

The disbenefits, risk and uncertainties of this option are:

- Risk that permits will not be granted due to risk of contamination to ground water fed water supplies. There is a significant risk to this option relating to obtaining a permit to discharge to ground. In early consultation with the Environment Agency in 2017, feedback was received saying “we do not believe that is a good idea to discharge this volume of sewage effluent to the ground in these areas”. The Environment Agency made it clear that they would assess any application on its merits, but there was concern about impact on groundwater quality. This risks the feasibility of this option. SWS have engaged with the Environment Agency regarding this issue again since the start of the large scheme gated process to confirm that this is still their viewpoint.
- The discharge to ground and associated pipeline would need to consider risks to designated sites at Lydden and Temple Ewell Downs, including the SSSI, SAC and NNR, as well as areas of ancient woodland and priority habitats (Lowland Calcareous Grassland and good quality semi-improved grassland). A Habitat Regulations Appraisal (HRA) assessment would be required to consider the risk to the SAC, resulting in increased cost and programme delay.
- The new discharge to ground could affect the geology and groundwater and impact the underlying East Kent Chalk WFD groundwater body, which is currently at Poor status. The discharge location could be within a Source Protection Zone 3 and nitrate vulnerable zone. This risks the feasibility of this option.
- There are uncertainties around the required level of treatment before discharge to ground. There is a possible requirement to disinfect prior to discharge. This would increase the cost, complexity and likely programme to deliver the option.
- Due to the risk to drinking water aquifers there is likely to be stricter requirements for storm flows, emergency events and operational contingencies in the event of plant failure for example. The management of these events may include significant scope addition such as large storm storage volumes or a sea outfall for emergency events. These increase the complexity of this option and the overall cost. These potential requirements risk the feasibility of this option.
- The treatment process and discharge design will need to be developed alongside consideration for WFD and impacts to drinking water quality, with permitting requirements developed in consultation with the Environment Agency, this can cause programme delays due to additional processes set out by the Environment Agency.
- Risk that land purchase, planning and permitting requirement are more difficult than anticipated, causing delays to construction start dates.

- Ecological and archaeological surveys will be required for working across fields. Loss of habitat has consequences for BNG delivery and is likely to result in higher overall project costs to accommodate the net gains required.
- The new WTW will be a sizeable new structure in the landscape. Depending on the chosen location, the location of the WTW could pose a risk to designated and non-designated heritage assets, both built and below ground. Archaeological surveys may be required for working across fields, resulting in programme delay.

3.4.6 Conclusion on Option 3

There is uncertainty over potential permitting conditions that could be applied in the case of Option 3. It is considered that a permit of 8.3mg/l Total Nitrogen (TN) and an additional requirement to disinfect prior to ground discharge could be imposed. The basis of this view was that an 8.3mg/l TN permit has been issued to SWS and delivered under quality programme in AMP6 at Shipton Bellinger WTW; the discharge at this site was also a groundwater discharge to a chalk aquifer. 8.3mg/l TN represents 75% of the drinking water safe nitrate limit. The potential requirement for disinfection is from the microbial concern raised by the EA in their initial response. This hasn't been established before, but it is a view on the potential direction of travel based on interpretation of initial correspondence. If this risk materialised it would require Real Time Control (RTC) to the extended aeration plant and Ultraviolet (UV) disinfection after secondary settlement. A sub-option which considers a Membrane Bioreactor could be considered. This would add significant scope and costs to the option above what has previously been considered.

Following review of this option, the likely additional treatment requirements mentioned above, combined with significant complexity for the management of storm flows, emergency scenarios or plant failure, leads to considerable issues in the feasibility of this option. This, alongside discussions with the Environment Agency regarding permitting, and concern regarding the risk to water quality suggests the feasibility of this option is limited. Therefore, it is proposed that this option is discontinued at this stage of development.

3.5 Option 4 – New WTW and Coastal Discharge via LSO

3.5.1 Description

Option 4 involves transferring flows to a new WTW near Whitfield and pumping final effluent via a new underground pipeline to the coast, where it will be discharged into a balancing tank. This tank serves as a hydraulic buffer and flow regulator, feeding the downstream long sea outfall system.

The long sea outfall extends approximately 3km offshore and terminates in a diffuser structure, which facilitates the dispersion and dilution of the treated effluent into the marine environment.

The assumed length of the long sea outfall (3km) required to achieve adequate dispersion is based on findings from previous dispersion studies undertaken on PR19 and is assumed to be correct at this stage of option development.

For the purposes of this assessment the permit conditions as shown in Table 3.4 were assumed.

Table 3.4: Assumed Permit Conditions at Whitfield New WTW for Option 4

Determinant	Proposed
Dry Weather Flow (m3/d)	3,024
Flow to Full Treatment (FFT in l/s)	105
Total Suspended Solids (mg/l)	60
Biological Oxygen Demand (mg/l)	40
Total Nitrogen (mg/l)	-
UWWTD % reduction applied?	YES

It should be noted that the DWF adopted includes a 25% headroom factor, which is appropriate to consider for a new strategic WTW to enhance resilience to future growth.

3.5.2 Development of option since PR19

Option 4 was updated in previous PR24 reporting. This included:

- Relocation of the proposed outfall, including additional infrastructure to convey final effluent from the new WTW.
- Removal of a storm overflow, resulting in an increase in the treatment capacity required to treat all flows.
- Change to location of the new WTW, resulting in the need for additional pumping.

More recently, further work has been undertaken under the large scheme gated process, including.

- The location of the new WTW for this option has been reviewed with other possible locations identified. Further work will be required to review the environmental and engineering constraints for the possible WTW locations.
- Pipelines routes from the Whitfield development to the possible new WTW locations have also been reviewed and developed.
- Different outfall locations and pipeline routes to the outfall locations from the new WTW have also been developed.
- There is an alternative non-infra route which is a total of 2.3km shorter and more rural so would avoid disruption in the Walmer vicinity but would have additional environmental impacts that would need to be balanced against the disruption of street works by assessing cost, programme and risks of the options.
- Hydraulic analysis indicates that a final effluent PS is required at the new WTW to the outfall.
- The required flows for the Wastewater Pumping station near Whitfield have also been reviewed and slightly increased.

3.5.3 Scope for Cost Update

The infrastructure scope below allows for a rising main to the new WTW and pumped final effluent transfer that will take treated effluent to a long sea outfall.

For the scope for the cost update the outfall location and rising main route that avoids Walmer has been chosen as the best estimate for the scope of the option at this stage.

The slightly increased size of pumping for the Wastewater PS from the Whitfield development has been included. An additional treated effluent pumping station to take treated effluent to the outfall has been included.

The scope for the new WTW (non-infrastructure) is largely the same as that from PR19. Further work is required to confirm the flows and optimise the scope required for final costing.

The scope and estimated costs of this option are outlined below:

Infrastructure: PR19

2.3km (OD560 SDR11 PE-100) pumped rising main to a new WTW, PR19 site.

1 No. Wastewater pumping stations (204l/s).

1 No. Treated effluent pumping station (204l/s).

9.5km (OD560 SDR11 PE-100) transfer main, including 2.4km along the A256 in Walmer.

A hydraulic balancing tank, an HDD from land to the seabed and a 3km Outfall. (As per existing study).

Infrastructure: Alternative route avoiding Walmer

1.3km (OD560 SDR11 PE-100) pumped rising main to a new WTW, alternative site.

1 No. Wastewater pumping stations (204l/s).

1 No. Treated effluent pumping station (204l/s).

8.2km (OD560 SDR11 PE-100) transfer main avoiding Walmer.

A hydraulic balancing tank, an HDD from land to the seabed and a 3km Outfall. (As per existing study).

Non-Infrastructure:

Land Purchase 250x70 (min).

Road access and parking.

1 No. Administration / welfare building (10x10m).

Power, water and communications to site.

Including welfare, works laboratory and MCC room.

1 No. Inlet works comprising:

- **6mm 2D Screen with 210 l/s capacity, inlet channel and FFT/storm control,**
- **Screening handling c/w covered screening skips, grit detritor, classifier and skip.**

1 No. 540m³ storm tank c/w mixing and storm return pump station. Storm overflow to outfall.

2 No. 11.2m dia. Primary Settlement Tanks c/w auto de sludge pump station to sludge thickening plant.

1 No. Picket Fence Thickener at 82m³.

Thickened sludge transfer pumps to thickened sludge holding tank.

1 No. 296m³ Thickened Sludge Holding Tank.

1 No Extended aeration plant comprising:

- **1 No. Anoxic selector tank at 180m³ c/w 2kW mixer,**
- **3 No. Aeration lanes (total volume 1,000m³),**
- **Fine Bubble Diffused Aeration and Aeration Blowers for 1633m³/h capacity.**

3 No. 14.5m dia Final Settlement Tanks c/w auto de sludge.

Return Activated Sludge pump Station at 75l/s capacity.

Surplus Activated Sludge control to Works Return Pump Station at 10l/s.

1 No. Works Return Pump Station sized at 20l/s.

1 No. Final Effluent monitoring chamber.

1 No. Washwater chamber with washwater booster station.

3.5.4 Benefits

The benefit of this option are:

- A less stringent effluent quality standard is likely to be considered acceptable for discharge to a marine environment compared to Options 3 and 5, therefore, there is a lower risk of the Environment Agency refusing to issue a discharge permit.
- The new WTW is expected to require lower complexity and fewer treatment units due to the more relaxed quality consent.
- A new WTW offers greater resilience than upgrading existing WTW due to the allowance for 25% headroom factor for future growth.
- Locating the WTW closer to the Whitfield development (compared to longer distance transfers to remote WTW) results in shorter rising mains resulting in lower design complexities and land management requirements.

- Construction of a new WTW will be more straightforward compared to a construction at an existing operational site. Therefore, there is less risk of impacting local stakeholders and the existing site.

3.5.5 Disbenefits, Risks and Uncertainties

The disbenefits, risk and uncertainties of this option are:

- Effluent quality requirements and hence treatment requirements are assumed at this stage based on the assumed permit conditions discussed above. The likely restrictions will be confirmed as the scheme progresses. This may affect the feasibility of this option.
- Difficulties and disruption of constructing a new transfer main which would cross major roads (A256) and the final effluent rising main which would require railway crossings and tunnelling activities, this increases design complexities, resulting in increased costs and programme delay.
- Risk that land purchase, planning and permitting requirement are more difficult causing delays to construction start dates.
- The long sea outfall will involve extensive marine construction activities, including a substantial tunnelling section between the LSO balancing tank and the offshore tunnel outlet located on the seabed. These increased design complexities may result in increased design and construction costs.
- To achieve the required hydraulic head for discharge through the outfall diffuser, the LSO balancing tank may need to be elevated above ground level. This could result in a significant visual impact and pose a risk to obtaining planning permission. Additional detailed hydraulic design and assessment is required, resulting in additional costs and programme delay.
- Depending on location the pipeline and outfall could intercept several biodiversity designations on the east Kent coast, including Dover to Kingsdown Cliffs SAC and SSSI, Dover to Deal MCZ and Kingsdown and Walmer Beach LWS. Construction of the outfall could cause loss or damage to nationally and locally identified priority habitats (intertidal chalk and vegetated shingle). Further considerations are required to understand the effects of this, including a HRA and WFD assessment, resulting in additional cost and possible programme delay.
- While the exact location of the new discharge to sea between Walmer and Dover is unconfirmed, the outfall could pose a risk to a designated bathing water, either Deal Castle (latest annual classification of 'Poor') or St Margaret's Bay (latest annual classification of 'Excellent'). The risk of impact to the WFD coastal waterbody due to the discharge will also need to be considered, although mitigation would be developed via the permitting process. This may affect the feasibility of this option.
- The new WTW, pipeline and outfall construction could pose a risk to designated and non-designated heritage assets, both built and below ground. Archaeological surveys may be required for working across fields, resulting in additional costs and possible programme delays.
- Ecological surveys may be required for working across fields, resulting in additional costs and possible programme delays.

3.6 Option 5 – New WTW; Inland River Discharge

3.6.1 Description

The final option considered was a new WTW with the discharge to the River Dour that runs through the centre of Dover.

The River Dour is a chalk stream, approximately 4km in length which discharges into the Wellington Dock, which leads to the Granville Dock. Both docks have dock gates which open into a tidal basin at Dover harbour.

The River Dour is in hydraulic continuity with the groundwater table. The groundwater contributes to the flow in the river for part of the year, and the ground water receives water from the river for part of the year recharging it. Therefore, any solution discharging into this surface water presents a risk to ground water quality as well as surface water quality.

With respect to the groundwater environment in the Whitfield area, there are several abstractions operated by Southern Water and by Affinity Water with Source Protection Zones around them. Several of these abstractions are showing rising trends of pollution, predominately nitrate but some pesticides too. These deteriorating trends have resulted in the Source Protection Zones being designated as Safeguard Zones.

In this option under PR19, the surface water discharge has been positioned outside the Source Protection Zone III, discharging into the River Dour. This is to reduce the risk of pollutants impacting groundwater quality within designated safeguard / protection zones. However, it requires the new final effluent transfer to go through Dover to get to the discharge point.

For the purposes of this study the following permit was assumed:

Table 3.5: Assumed Permit Conditions at Whitfield New WTW for Option 5

Determinant	Proposed
Dry Weather Flow (m ³ /d)	3024
Flow to Full Treatment (FFT in l/s)	105
Total Suspended Solids (mg/l)	30
Biological Oxygen Demand (mg/l)	10
Total Nitrogen (mg/l)	10
Phosphorous (mg/l)	0.25

It should be noted that the DWF includes a 25% headroom factored in, which is appropriate to consider for a new strategic WTW, to enhance resilience to future growth.

3.6.2 Development of option since PR19

There was no update to this option in previous PR24 reporting, which only included consideration of Option 1 and Option 4. Our review identified the need for additional tertiary treatment to achieve the assumed permit conditions including phosphorus.

Recently, under the large scheme gated process, the location of the new WTW for this option has been reviewed and other possible locations identified. The location of the river outfall has also been reviewed and other possible locations identified. Further work is required to review the environmental and engineering constraints for the other possible WTW and outfall locations.

An alternative river outfall location higher up the river Dour and pipeline route has been identified that would be shorter, easier and quicker to build and avoids the A256 road corridor and the new WTW site would be slightly further away from town. However, the alternative discharge location into the River Dour is in a Source Protection Zone. Further work will be required to review the environmental and engineering constraints of alternatives before we can confirm they are feasible. At this stage, these alternatives have not been incorporated in the scope for the cost update below. Note for alternative discharge new treatment works may require a higher quality effluent

Hydraulic analysis indicates that a final effluent PS would be required at the new WTW to take flow to the outfall, assuming the locations in the PR19 scoped option.

The required flows for the Wastewater Pumping station near Whitfield have also been reviewed and slightly increased compared to PR19.

3.6.3 Scope for Cost Update

Although possible alternative locations for the new WTW and the river outfall have been identified, these will not be included in the scope for the cost update until they have been confirmed as feasible. For this reason, the scope for the infrastructure is largely as of the option at PR19.

A slightly increased pump capacity has been included at the Whitfield development for the increased flow requirement identified.

An additional treated effluent pumping station to take treated effluent to the outfall has also been included.

For non-infrastructure works at the new WTW, the scope below is largely the same as the scope from PR19. Further work is required to confirm the flows and optimise the scope required for final costing.

The revised scope and estimated costs of this option are outlined below.

Infrastructure: PR19/24:

2.7km (OD560 SDR11 PE-100) rural pumped rising main.

1 No. Wastewater pumping stations (204l/s).

1 No. Treated effluent pumping station (204l/s).

2.7km (OD560 SDR11 PE-100) transfer main to the River Dour (1.8km alongside the A256).

1 No. River Outfall. – (outside source protection zone)

2 No. Main road crossings, including A2 and A256.

Non-Infrastructure:

Land Purchase 270 x 90 (min).

Road access and parking.

1 No. Administration / welfare building (10x10m).

Power, water and communications to site, including welfare, works laboratory and MCC room.

1 No. Inlet works comprising:

- 6mm 2D Screen with 210 l/s capacity, inlet channel and FFT/storm control,
- Screening handling c/w covered screening skips, grit detritor, classifier and skip,

1 No. 540m³ storm tank c/w mixing and storm return pump station.

Storm overflow to outfall (River Dour).

2 No. 11.2m dia. Primary Settlement Tanks c/w auto de sludge pump station to sludge thickening plant.

1 No. Picket Fence Thickener at 82m³.

Thickened sludge transfer pumps to thickened sludge holding tank.

1 No. 296m³ Thickened Sludge Holding Tank.

1 No. Extended aeration plant comprising:

- 1 No. Anoxic selector tank at 180m³ c/w 2kW mixer,
- 3 No. First stage anoxic zones (total volume 500m³),
- 3 No. Aeration lanes (total volume 2,500m³),
- 3 No. Second stage anoxic zones (total Volume 500m³),
- 3 No. reaeration zones (total volume 125m³).

Fine Bubble Diffused Aeration and aeration blowers for 3433m³/h capacity.

1 No. Methanol dosing plant sized for 20m³ storage and 10l/h dose rate.

1 No. Ferric storage and dosing plant sized for 30m³ capacity with 2 No. Pump sets for Primary and Tertiary dosing points of application.

3 No. 14.5m dia Final Settlement Tanks c/w auto de sludge.

Return Activated Sludge pump station at 75l/s capacity.

Surplus Activated Sludge control to Works Return Pump Station at 10l/s.

1 No. Works Return Pump Station sized at 20l/s.

1 No. Final Effluent monitoring chamber.

1 No. Washwater chamber with washwater booster station.

1 No. outfall to River Dour.

3.6.4 Benefits

The benefits of this option are:

- The local aquifer, which is under stress, will be recharged and not lost to another catchment or to a coastal discharge. This is because the chalk river and aquifer are hydraulically continuous.
- The river will be recharged, supporting river abstraction and local habitats.
- A new WTW offers greater resilience than upgrading existing due to the allowance for 25% headroom factor for future growth.
- New local WTW means a shorter pumped route from the new Whitfield development, resulting in lower design complexities and land management requirements.
- Construction of a new WTW will be more straightforward compared to a construction at an existing operational site. Therefore, there is less risk of impacting local stakeholders and the existing site.

3.6.5 Disbenefits, Risks and Uncertainties

The disbenefits, risks and uncertainties are:

- Effluent quality requirements and hence treatment requirements are assumed at this stage based on the assumed permit conditions discussed above. The likely restrictions will be confirmed as the scheme progresses. This may affect the feasibility of this option.
- The discharge for this option is likely to be upstream of the Upper Dour WFD water body, which is currently at bad ecological status, and the Dour from Kearsney to Dover water body status (moderate ecological status). The River Dour is in hydraulic continuity with the groundwater and flows through a SPZ1. The risk to ground water quality and surface water quality could present difficulties for obtaining a discharge permit, resulting in programme delay.
- Risk that land purchase, planning and permitting requirement are more difficult causing delays to construction start dates.
- Difficulties and disruption of constructing new final effluent transfer main through Dover to the River Dour, interactions with a major road (A256) and railway crossings could result in delay to programme.
- Could intercept designated sites at Lydden and Temple Ewell Downs, including the SSSI, SAC and NNR, as well as areas of ancient woodland and priority habitats (lowland calcareous grassland and good quality semi-improved grassland), resulting in extra caution during construction which may cause programme delays.
- The River Dour is a chalk stream and discharge is likely to result in risks to biodiversity from changes to water flow and quality impacting aquatic and riparian species. This may affect the feasibility of this option.
- The new WTW will be a sizeable new structure in the landscape requiring more advanced treatment units due to its tighter consent compared to Option 4. Depending on the chosen location, the location of the WTW could affect the setting of the Grade II listed buildings or Temple Ewell conservation area. This increases design complexities which subsequently may increase cost and delay programme.
- Ecological and archaeological surveys may be required for working across fields, resulting in additional costs and possible programme delays.
- The identified alternative transfer is 2.3km shorter and more rural so would reduce disruption in the Dover area but could have additional environmental impacts as the discharge location is within the Source protection zones. This would need to be balanced against the disruption of street works by assessing cost, programme and risks of the options as well as a review of the final effluent quality and WTW process design.

3.7 PR24 Preferred Option

The preferred option at PR19 stage was Option 4 New WTW: Coastal Discharge, which was chosen through a SWOT Analysis and weighted Option Evaluation Matrix¹.

An earlier PR24 reporting Option 4 remained the preferred option. The reasons given included the following:

- A reasonable weighed score in the Option Evaluation Matrix.
- Higher likelihood of gaining discharge consent, compared to Options 3 & 5.
- Greater opportunity to size a new WTW to accommodate flows for additional future capacity in the network, compared to Options 1, 2 and 2A.
- Lower impact to customers compared to Option 1, as reduced risks to the Kent Downs National Landscape and the Channel Tunnel Rail Link.

Option 4 is still considered the preferred options, but further work is required to resolve uncertainties and risks within the large scheme gated process, before this can be confirmed as the final selected option for PR24.

4 Proposed Options Progression

4.1 Introduction

Prior to choosing the final selected option for the Whitfield Growth scheme, a number of uncertainties and risks are required to be reviewed and resolved. This will provide the additional information to make a final selected option decision. The PR24 preferred option continues to be progressed alongside resolution of the uncertainties for other options.

4.2 Additional work to inform the scheme

In the development to Submission 2 the following activities will be progressed and will provide further understanding to overall scheme.

- Flow and load understanding. As the development continues to progress, the knowledge of flow and loads anticipated to be produced by the development will be further understood. This may lead to changes to the options and will be monitored as the solution develops.
- Network modelling and capacity assessment. This will confirm the current understanding of the existing capacity, anticipated date for capacity depletion and interim solution requirements.
- Investigation of interim options, including expansion of networks, additional attenuation and storage, partial flow transfers (such as to West Hythe). This will be influenced by the results of the hydraulic modelling and network capacity assessments which are ongoing.
- Proposed storm/spill management. The transfers of untreated wastewater from Whitfield Urban Expansion is limited by pump capacity. If the incoming flows exceed the wastewater pumping station capacity, then spills will occur. Therefore, spill management needs to be fully considered. As Whitfield growth has separated foul and storm drainage systems this issue should be manageable. However, a robust long-term solution needs to be developed as part of the overall project delivery.
- Further work is required to confirm the management of untreated storm overflows and the implications for discharge consents.

4.3 Feasible options issues resolution

While Option 4 still seems the most likely final selected option, further work is required before discontinuing other options. Resolution of the following issues are required:

4.3.1 All Options

- Understanding the potential ecological impact, the interaction of the options with local designations and likely complexities that these could add to the delivery of the options will provide greater assurance to the choice of preferred option. Further assessment requirements are discussed in Annex A3: Environmental Appraisal.
- Understanding construction impact to existing services. There is complexity in maintaining the level existing service while constructing/commissioning additional capacity. Understanding the degree of difficulty for the options which are expansion of existing treatment works will provide confidence in the feasibility of the options.
- There is uncertainty around likely permit requirements across all options. Further discussion with the Environment Agency is required to improve definition around these. There is a risk that previously assumed final effluent discharge consent conditions (on which current scopes are based) will change due to a change in assumed DWF at the individual WTWs in 2045. In the case of option 2 and 2A (Dambridge Wingham WTW) the Total Phosphorus consent has been tightened since PR19 from 2 to 0.25 mg/l, and any option at this site could further impact on this consent.

4.3.2 Option 1

- Option 1 was assessed as a high complexity option because it is likely that structures will need to be underground for planning/consultation requirements in line with the existing works. Further

consultation is required to understand whether this would be the case for any upgrade. Engagement with the Kent Downs National Landscape Unit and Local Planning Authority will help to better understand the constraints associated with this option.

- Option 1 is also high risk as the new underground structures will be adjacent to or over the Channel Tunnel Rail Link (HS1) posing a risk to national infrastructure. Further information is required on the location and depth of the channel tunnel to further assess this risk and to assess the feasibility of mitigation measures.
- Option 1 may require additional scope to allow for modifications to the existing outfall, this would be dependent on likely modifications required to the flow discharge permit and confirmation of capacity restrictions on the existing outfall. Further consultation with the EA to determine the likely changes will provide confirmation on changes required.

4.3.3 Options 2 and 2A

- Option 2 and 2A, which would include a long pipeline to another catchment (Dambridge WTW), may pose issues with septicity. Further work is required to ensure that the complexity of this option is sufficiently understood.
- Concern regarding public support particularly for Options 2 and 2A where the treatment is located 14km from the development may result in increased scrutiny and complex customer and stakeholder engagement. This would be reflected in the Submission 2 stakeholder engagement plan discussed in Annex E1
- Option 2A has concerns regarding the suitability of the proposed treatment, both in operational acceptability and also due to the reliance on blending to ensure final effluent compliance. Further review of the proposed treatment to define the risk will enable a conclusion as to whether this option is feasible is to be undertaken.

4.3.4 Option 3

Option 3 is proposed to be discontinued at this stage of works. The following items provide the reasoning.

- Option 3 has significant risks relating to obtaining a permit to discharge to ground. The concerns regarding the impact on groundwater quality, which are shared by the Environment Agency, mean that obtaining a permit is considered highly unlikely
- There is significant uncertainty to the expected quality of the final effluent and potential additional treatment scope required.
- In addition, Option 3 has operational complexity in the management of storm overflows, emergency flows or operational contingencies which could result in significant additional scope. This could reduce the identified benefits of this scheme above others. For example, an outfall could be required for plant failure scenarios.

4.3.5 Option 5

- Option 5 has high risk relating to obtaining a permit to discharge to river. The River Dour is a chalk stream as it is in hydraulic continuity with the groundwater, such that any impact to water quality in the river would be seen as impacting water quality in the aquifer. Ongoing discussions with the EA will provide clarity on this risk.
- Confirmation of the proposed discharge point will identify any potential implications for the final effluent quality requirements and the overall discharge consent.
- Potential delays caused by difficulties in the land purchase, planning and permitting activities are to be managed in line with the plan discussed in Annex D1.
- Complexities of construction in highly populated areas of Dover, interaction with major roads and railway crossings need to be further understood to determine how they would constrain the option.
- Further review of the identified alternative option in order to understand the balance of environmental risk against the cost, programme, deliverability and overall risk of the option and any additional treatment requirements to determine if this could improve this option against the PR24 preferred option.

4.4 PR24 Preferred Option Development

To progress toward confirming the final selected option, the following actions are required.

- The proposed treatment will be developed alongside the growing understanding of flow and loads to be treated.
- Review and assessment of potential treatment works location to balance cost, programme, feasibility and environmental impact.
- The consideration of nature-based solutions should be incorporated as a part of a hybrid process treatment solution.
- Consideration to potential wider benefits the option could provide (such as sizing for any additional catchment growth) to understand if this could provide additional resilience to the overall service provided by customers and provide better value in the round.
- Further development on pipe routing, pipe requirements, key hydraulic structures and the construction methods will better confirm the feasibility and cost. Where possible pipe routes will be optimised to reduce hydraulic restrictions avoid major road interaction, railway crossings and minimise need to undertake disruptive open cut installation.
- Investigation of most suitable outfall location including consideration of novel solutions (such as utilising existing outfall locations) in order to balance, cost, complexity and environmental impact.
- Investigation into the feasibility of horizontal directional drilling from land to the seabed to better confirm feasibility and cost.
- Consideration of operational resilience, maintenance and redundancy of the treatment works, network and outfall will be included in the ongoing development of the design.
- Further review the scope and cost of the marine outfall for Option 4. Further investigation and modelling is required to confirm location and the diffuser arrangement required for adequate dispersion and dilution. Further engineering review is required to define the need for scour protection of the diffuser. The cost of similar outfalls from past projects can be investigated to better define likely cost ranges. Better confidence on cost could help confirm this as the final preferred option.
- Further review is required to determine whether a downward pumping system for the final effluent, supplemented by a Pressure Sustaining Valve (PSV) would be acceptable. Given that the system handles final effluent, the selection of appropriate valve types is critical.
- Further review is required to assess whether Horizontal Directional Drilling (HDD) is the most suitable construction technique for the LSO tunnel section. This evaluation should consider geological conditions, environmental constraints, and constructability risks. The long sea outfall will involve extensive marine construction activities, including a significant tunnelling section between the LSO balancing tank and the offshore tunnel outlet located on the seabed. A detailed comparison of alternative tunnelling methods—such as microtunnelling or marine trenching—it will be necessary to ensure the selected approach is technically feasible, cost-effective, and environmentally compliant.
- Further hydraulic analysis is required to further confirm pipe diameters, pumping requirements and that sufficient fittings are included for air management, washouts and pressure management etc.
- Potential delays caused by difficulties in the land purchase, planning and permitting activities are to be managed in line with the plan discussed in Annex D1.
- Iterative option development balancing the technical feasibility, programme and cost with any potential environmental impacts is to be undertaken. This will identify potential benefits over and above the current baseline that has been established on the current indicative designs. Further assessment requirements are discussed in Annex A3: Environmental Appraisal.

5 Conclusion

This document has reviewed six feasible options for accommodating wastewater flows from the Whitfield Urban Expansion, in alignment with Southern Water's statutory obligations and the Dover District Local Plan. Each option has been assessed in terms of infrastructure requirements, environmental constraints, permitting risks, operational resilience, and cost implications.

Following this review, Option 4 a new wastewater treatment works (WTW) with coastal discharge via long sea outfall remains the preferred solution. It offers the greatest potential for long-term resilience, flexibility to accommodate future growth, and a lower risk profile in terms of permitting and environmental impact. However, several uncertainties remain, particularly around final effluent quality requirements, outfall design, and ecological impacts, which must be resolved.

Option 3 (Groundwater Discharge) is proposed to be discontinued due to significant permitting risks.

The remaining options, options 1, 2, 2A, and 5 require further investigation to fully understand their viability. The key issues which require resolution prior to a final selected option are:

- Technical feasibility – particularly for Option 1 as there are concerns that this option has constructability issues which could discount this option or lead to significant cost increase.
- Understanding the potential environmental impacts of the pipeline routes during construction and operation and if any modifications to the option would result in more supportable route.
- Defining likely regulatory restrictions in the form of discharge consents and the quality requirements of the produced final effluent.
- Understanding interaction of option with existing equipment during construction/commissioning and determining methods to maintain existing levels of service.
- Building a stormwater management plan for this development to understand how each option would need to consider and what systems could be implemented to deal with these potential flows.

Key areas of development for Option 4 are:

- Treatment requirements. The consideration of likely discharge restrictions, whether nature-based solutions can be implemented and any wider benefits the treatment works could provide.
- Pipeline and outfall development. The pipeline route requires optimisation in order to reach a balance of hydraulic operability, cost and environmental impact. The potential impacts of the long sea outfall need to be further understood, and changes made to the routing as appropriate, as part of a site and route selection exercise.
- Investigation into appropriate construction methods. The overall impact of the option could be impact by the chosen construction method, in particular when looking at pipeline routes. Preference will be given to methods which would reduce overall environmental impact, the delivery cost and programme duration.

In addition, some items will continue to be developed as the scheme progresses and will inform the decisions for the overall solution implemented. This includes understanding the current network and the associated capacity restrictions. This will determine whether additional interim options will be required or if a phased construction approach is required.

This will support a confident decision at the next stage of the gated process and ensure the chosen solution delivers value, resilience, and environmental performance for the Whitfield Growth scheme.

