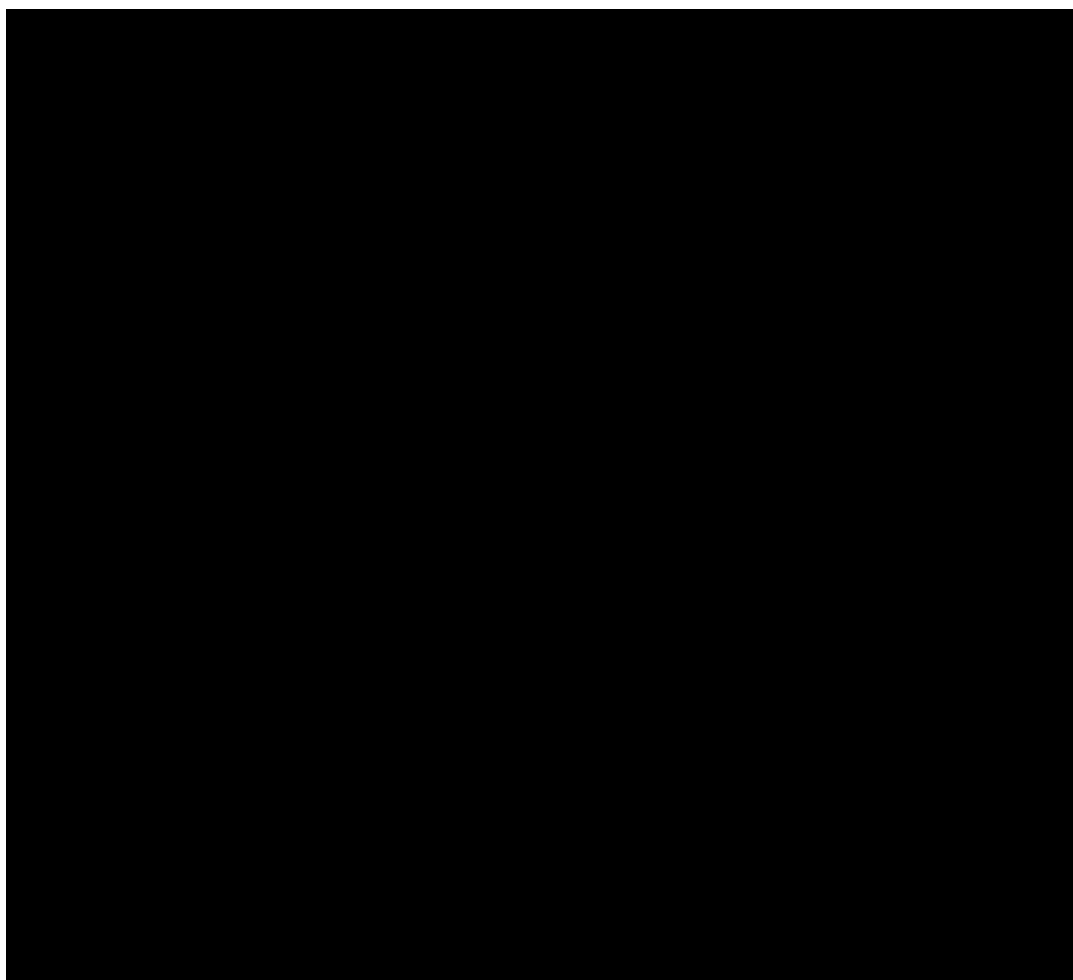




# **Whitfield Growth**

## **Annex A4 - Basis of Design**

September 2025

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# Whitfield Growth

## Annex A4 - Basis of Design

September 2025

# Issue and Revision Record

| Revision | Date    | Originator | Checker | Approver | Description                   |
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|          |         |            |         |          |                               |
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|          |         |            |         |          |                               |

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# 1 Executive summary

The purpose of this report is to discuss and understand the basis of design for the development of the Whitfield growth project for the purpose of Submission 1 of the Large Scheme gated process.

## 2 Background

The development of the village of Whitfield in Kent has been included as part of the adopted Dover District Council Local Plan 2040 (October 2024) and is expected to add significant additional population to the existing treatment in the area. Currently, flows from the Whitfield village are sent to Broomfield Bank WTW for treatment. The expansion of Whitfield is anticipated to provide an expansion of 6,350 by 2045<sup>1</sup>. To ensure best value for customers and prioritise the environmental impact, a review of best solution to deliver the required treatment for this growth needs to be undertaken. Following the submission of the PR24 business plan, the Whitfield growth scheme was included in the Ofwat large scheme gated process with development funding provided to agree the most suitable scope for the identified need. As part of the Large Scheme gated process the project is sized to deliver the full development and its population equivalent (PE) of 15,240<sup>1</sup> and the Southern Water Price Control Deliverable (PCD) reflects this value.

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<sup>1</sup> PIB082 – Whitfield AMP8 Programme Initiation Brief v2.0 (20 June 2025)

## 3 Growth

### 3.1.1 Residential Population

An interim attenuation tank has been provided adjacent to the [REDACTED] Whitfield WPS to protect properties from flooding as connections are made which will allow for the developments to continue while the permanent solution for the growth at Whitfield is delivered. The design parameters of the existing [REDACTED] WPS are:

**Table 2.1: Existing [REDACTED] Pump Station Capacity**

| Parameter                                                                 | Existing capacity                   |
|---------------------------------------------------------------------------|-------------------------------------|
| <b>Pump station maximum flowrate</b>                                      | 36 <sup>2</sup> l/s                 |
| <b>Attenuation tank volume</b>                                            | 1200 m <sup>3</sup>                 |
| <b>Maximum flow that can be accepted by [REDACTED] PS network in 2031</b> | <b>To be confirmed by modelling</b> |

The Whitfield development build-out rates shown in Figure 2.1 show that 456 units have already been completed. These are understood to connect to the existing Whitfield village network and [REDACTED]. It is currently anticipated that the current network capacity and attenuation will be sufficient until 2031<sup>3</sup> at which point a solution will be required to be online. This solution may be an interim or phased solution should there be a delay in the long-term solution (i.e. if building of new treatment works will require additional time). Following discussions, it is assumed at this stage that any short-term adjustments to the network and treatment will not be suitable for use in the long term and as such any delivered solution must consider the full development capacity. Therefore, the basis of Submission 1 is that a new pump station and rising main will be built to serve the new development (including any properties that have already been built) and Whitfield village will continue to drain to Broomfield Bank WTW.

**Table 2.2: Key figures to be used as part of the development**

| Area                          | Assumption                                                                      | Comment                                                                |
|-------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------|
| <b>Build Out Rate</b>         |                                                                                 | Based on Rates provided and shown in Figure 2.1 below                  |
| <b>Project Design Horizon</b> | 2045                                                                            | PIB082 – Whitfield AMP8 Programme Initiation Brief v2.0 (20 June 2025) |
| <b>Total PE delivered</b>     | 15,240                                                                          | Based on a 2.4 multiplier on delivered properties                      |
| <b>Loading</b>                | Residential properties only, no storm flows to be included (i.e separate sewer) | Based on development requirements.                                     |
| <b>Intermediate capacity</b>  | Short term solutions to be provided to deliver capacity to Dec 2031             | Does not affect requirement to deliver the                             |

<sup>2</sup> Confirmed by Southern Water [REDACTED]

<sup>3</sup> PIB082 – Whitfield AMP8 Programme Initiation Brief v2.0 (20 June 2025)

|                                     |                                                                     |                                                                         |
|-------------------------------------|---------------------------------------------------------------------|-------------------------------------------------------------------------|
|                                     |                                                                     | full 15,240 PE treatment capacity.                                      |
| <b>Network modelling</b>            | Results will demonstrate that capacity is sufficient until Dec 2031 | Awaiting results of the headroom assessments.                           |
| <b>PCD</b>                          | Increase treatment capacity by 15,240 PE                            | Assumes that this will utilise existing spare capacity where available. |
| <b>Carbon reduction target</b>      |                                                                     | TBC                                                                     |
| <b>Climate resilience target</b>    |                                                                     | TBC                                                                     |
| <b>Biodiversity net gain target</b> |                                                                     | TBC                                                                     |

**Figure 2.1: Whitfield strategic growth build-out rates (taken from Whitfield Growth Workshop 2025-02-27)**

| Year                                                                                      | <2024/202 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 | 2039 | 2040 | >2040 |
|-------------------------------------------------------------------------------------------|-----------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------|
| Total annual completions/ expected completions                                            | 456       | 100  | 150  | 150  | 100  | 250  | 250  | 250  | 250  | 244  | 150  | 150  | 150  | 200  | 200  | 200  | 200  | 2900  |
| Cumulative Completions                                                                    | 456       | 556  | 706  | 856  | 956  | 1206 | 1456 | 1706 | 1956 | 2200 | 2350 | 2500 | 2650 | 2850 | 3050 | 3250 | 3450 | 6350  |
| Singledge Lane – 133 units completed                                                      | 133       |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |      |       |
| Cumulative Completions/ expected completions incl. Singledge Lane<br>*Already Constructed | 589*      | 689  | 839  | 989  | 1089 | 1339 | 1589 | 1839 | 2089 | 2333 | 2483 | 2633 | 2783 | 2983 | 3183 | 3383 | 3583 | 6483  |

### 3.1.2 Non-residential Population

In addition to the residential population growth of 15,240 PE there is expected to be some growth in non-residential numbers associated with the Whitfield development.

Assumed allocations have been taken from the Dover District Local Plan to 2040, adopted in October 2024 and the Whitfield Urban Expansion Supplementary Planning Document - Adopted Masterplan 2011. It is noted that the 2FE category school has been constructed and is operational (160 jobs FTE)<sup>4</sup>.

<sup>4</sup> Commissioning Plan for Education Provision in Kent 2022 - 2026

The number of full-time equivalent (FTE) employees has been estimated below.

**Table 2.3: Estimated non-resident population**

| Planning permission ref | Development                                                                 | Area (m <sup>2</sup> ) | Use Class                       | Density (sqm)<br>HCA employment Density Guide 2015 | FTE employees | Assumption                                                                                                        |
|-------------------------|-----------------------------------------------------------------------------|------------------------|---------------------------------|----------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------|
| <b>10/01010</b>         | Local centre retail                                                         | 250                    | Retail A1-A3                    | 20                                                 | 13            |                                                                                                                   |
| <b>10/01011</b>         | Local centre retail                                                         | 1975                   | Retail A1-A3                    | 20                                                 | 99            |                                                                                                                   |
| <b>10/01011</b>         | Office space                                                                | 750                    | B1(a)                           | 13                                                 | 58            |                                                                                                                   |
| <b>10/01011</b>         | Adult education and youth facilities and Health and Social Care Centre (D1) | 6100                   | D1 non-residential institutions | n/a                                                | 29            | GP 16 staff (8 GPs +8 support staff)<br>Dental 8 staff (4 dentists and 4 support staff)<br>Adult centre -5 staff" |
| <b>17/01057</b>         | Two form entry (2FE) mainstream school plus 1FE SEN school                  | 3722                   | D1 non-residential institutions |                                                    | 160*          | *Constructed and operational                                                                                      |
|                         |                                                                             |                        | <b>Total</b>                    |                                                    | <b>358</b>    |                                                                                                                   |

The non-resident population of 358 is very small compared to the resident population of 15,240 PE and within the margin of error for the resident population. It will likely also include some of the resident population. Therefore, for simplicity it is proposed to exclude this from the design population at this stage.

## 3.2 Design Flows

Table 2.4 below summarises the design flows for the Whitfield development.

**Table 2.4: Whitfield Development Design Flows**

| Design Flow                         | Value                              | Reference                                                           |
|-------------------------------------|------------------------------------|---------------------------------------------------------------------|
| <b>Dry weather flow (DWF)</b>       | 3,066 m <sup>3</sup> /d (35.5 l/s) | Whitfield Flow Estimation.xls<br>Rev 0.1 (Southern Water, 23/07/25) |
| <b>Average Daily Flow (ADF)</b>     | 46.1 l/s                           | Whitfield Flow Estimation.xls<br>Rev 0.1 (Southern Water, 23/07/25) |
| <b>Flow to Full Treatment (FFT)</b> | 90 l/s                             | Whitfield Flow Estimation.xls<br>Rev 0.1 (Southern Water, 23/07/25) |

|                                |         |                                              |
|--------------------------------|---------|----------------------------------------------|
| <b>Peak Instantaneous Flow</b> | 204 l/s | 757011-AFX-01-XX-RP-PE-00001-P02 ( 21/07/25) |
|--------------------------------|---------|----------------------------------------------|

The peak instantaneous flow has been used to size the WPS and rising main for transferring the Whitfield development flows. The design peak instantaneous flowrate is currently under review by Southern Water. This basis of design will be updated once a value has been finalised by Southern Water.

For conservativeness the scope and sizing of wastewater treatment options has been based on PR19 assumptions at this stage as outlined in sections 3.5 and 3.6. This is because the design flows and loads are likely to continue to be defined as the project progresses, and the development details become clearer.

### 3.3 Design Loads

Table 2.5 below summarises the design loads for the Whitfield development.

**Table 2.5: Whitfield Development Design Loads**

| Parameter                               | Per Capita Load (g/h/d) | Design Load (kg/d) |
|-----------------------------------------|-------------------------|--------------------|
| <b>Total suspended solids, TSS</b>      | 70                      | 1,066.8            |
| <b>Biochemical oxygen demand, cBOD5</b> | 60                      | 914.4              |
| <b>Ammonia, NH<sub>3</sub>-N</b>        | 8                       | 121.9              |
| <b>Total Kjeldahl Nitrogen, TKN</b>     | 12                      | 182.9              |
| <b>Total phosphorus, TP</b>             | 2.5                     | 38.1               |

Reference: 757011-AFX-01-XX-RP-PE-00001-P02 ( 21/07/25)

### 3.4 Consents, Catchment Characteristics and Design Criteria

The following information on existing WTW flow, load and discharge consents has been gathered to allow assessment of the unconstrained options.

**Table 2.6 Population Equivalent for all Catchments**

| <b>Population Equivalent (PE)</b> |             |             |             |             |             |
|-----------------------------------|-------------|-------------|-------------|-------------|-------------|
| <b>Site Name</b>                  | <b>2025</b> | <b>2030</b> | <b>2035</b> | <b>2040</b> | <b>2045</b> |
| <b>Broomfield Bank WTW</b>        | 115,610     | 123,276     | 128,656     | 131,602     | 138,508     |
| <b>Dambridge Wingham WTW</b>      | 21,992      | 22,370      | 22,728      | 23,206      | 23,794      |
| <b>Weatherlees Hill A WTW</b>     | 94,250      | 101,558     | 102,518     | 102,874     | 102,921     |
| <b>Hythe WTW</b>                  | 20,756      | 21,702      | 22,603      | 23,466      | 24,343      |
| <b>Eastry WTW</b>                 | 2,752       | 2,912       | 2,928       | 2,926       | 2,923       |
| <b>Newham Valley Preston WTW</b>  | 7,034       | 7,959       | 8,146       | 8,308       | 8,374       |

Notes:

1. PE values are provided by Southern Water from EDGE and include resident and non-resident population, trade effluent, cess, and tankered waste.

**Table 2.7 Flow Consents for Existing Wastewater Treatment Works**

|                              | DWF - permit (m3/d) | FFT - permit (l/s) | Formula A (m3/d) | Storm tank volume (m3) | Storm tank storage (hrs) |
|------------------------------|---------------------|--------------------|------------------|------------------------|--------------------------|
| <b>Broomfield Bank</b>       | 42512               | 940 <sup>2</sup>   | -                | -                      | -                        |
| <b>Dambridge Wingham</b>     | 3510                | 103                | -                | 1,157 <sup>5</sup>     | -                        |
| <b>Weatherlees Hill A</b>    | 21435               | 919 <sup>3</sup>   | -                | -                      | -                        |
| <b>West Hythe</b>            | 12587               | 247 <sup>3</sup>   | -                | 2153.37 <sup>4</sup>   | -                        |
| <b>Eastry</b>                | 497                 | -                  | -                | -                      | -                        |
| <b>Newham Valley Preston</b> | 2371                | -                  | -                | -                      | -                        |

Notes:

1. Consent conditions taken from DWMP Workbook for Broomfield Bank v0.8.xlsx , DWMP Workbook for DAMBRIDGE WINGHAM v0.5.xlsx, DWMP Workbook for Weatherlees Hill A v09.xlsx. Consent-002643-5 (West Hythe).pdf, Consent-003151-1 (eastry).pdf, Consent-000445-7 (newnham valley).pdf.
2. There is no FFT permit for Broomfield Bank WTW. The Discharge Consent Application produced when the Broomfield Bank WwTW was planned and constructed, included provision for an incoming FFT of 940 l/s with a design horizon of 2021, but this is not the permit (Ref: Broomfield Bank WTW AM410.2.doc).
3. This is the sum of the permitted FFT for the terminal pump stations; the site treats all incoming flow with no storm separation. Storm separation takes place at the terminal pumping stations (Ref: Weatherlees Hill A WTW AM410.2.doc). FFT was increased from 212 l/s to 247 l/s following AMP7 U\_IMP5 project.
4. In the case of West Hythe WTW, online storm storage is built into Range Road WPS. This has two screened storm overflows (Outlet 1 and 2) set at 212 l/s and 390 l/s respectively. Hence the maximum flow to West Hythe WTW is assumed to be 212 l/s.
5. Storm storage capacity increased from 739m<sup>3</sup> to 1,157m<sup>3</sup> following AMP7 U\_IMP6 project.

**Table 2.8 Quality Consents for existing Wastewater Treatment Works**

|                          | Per mit type | TSS (mg/l ) | BOD (mg/l)             | COD (mg/l)               | NH4-N (mg/l) | Total P (mg/l) | Total Fe (mg/l) |
|--------------------------|--------------|-------------|------------------------|--------------------------|--------------|----------------|-----------------|
| <b>Broomfield Bank</b>   | WRA          | 150 UT      | -                      | -                        | -            | -              | -               |
|                          | UW WTR       | -           | 25 LUT / 50 UT, 70%red | 125 LUT / 250 UT, 75%red | -            | -              | -               |
| <b>Dambridge Wingham</b> | WRA          | 30 LUT      | 15 LUT / 50 UT         | -                        | -            | 0.25 R12M M    | 4 LUT / 8 UT    |

|                                           |           |           |                              |                                |                                                 |                |               |
|-------------------------------------------|-----------|-----------|------------------------------|--------------------------------|-------------------------------------------------|----------------|---------------|
|                                           | UW<br>WTR | -         | 25 LUT /<br>50 UT,<br>70%red | 125 LUT /<br>250 UT,<br>75%red | -                                               | 2 AM           | -             |
| <b>Weatherlees Hill A</b>                 | WRA       | 35<br>LUT | 25 LUT /<br>60 UT            | -                              | Summer: 5 LUT/20<br>UT, Winter: 10<br>LUT/37 UT |                | 4 UT          |
|                                           | UW<br>WTR | -         | 25 LUT /<br>50 UT,<br>70%red | 125 LUT /<br>250 UT,<br>75%red | -                                               | -              | -             |
| <b>West Hythe</b>                         | WRA       | 150<br>UT | -                            | -                              | -                                               | -              | -             |
|                                           | UW<br>WTR | -         | 25 LUT /<br>50 UT,<br>70%red | 125 LUT /<br>250 UT,<br>75%red | -                                               | -              | -             |
| <b>Eastry</b>                             | WRA       | 30L<br>UT | 15LT /<br>50UT               | -                              | 6LUT / 23UT                                     | 1 AM<br>/ 5UT  | 4LUT /<br>8UT |
|                                           | UW<br>WTR | -         | 25 LUT /<br>50 UT,<br>70%red | 125 LUT /<br>250 UT,<br>75%red | -                                               | -              | -             |
| <b>Newham Valley Preston <sup>2</sup></b> | WRA       | 40<br>LUT | 30LUT /<br>64UT              | -                              | 10LUT / 30UT                                    | 1<br>R12M<br>M | 4LUT /<br>8UT |
|                                           | UW<br>WTR | -         | 25 LUT /<br>50 UT,<br>70%red | 125 LUT /<br>250 UT,<br>75%red | -                                               | -              | -             |

Notes:

1. The following acronyms apply: Lookup Table (LUT), Upper Tier (UT), Percent Reduction (%red), Annual Mean (AM), Rolling 12 Month Mean (R12MM).
2. Newham Valley Preston WTW BOD permit is planned to be amended under AMP 8 WINEP (ref 08SO104124) to a LUT of 5mg/l.
3. Consent conditions taken from DWMP Workbook for Broomfield Bank v0.8.xlsx, DWMP Workbook for DAMBRIDGE WINGHAM v0.5.xlsx, DWMP Workbook for Weatherlees Hill A v09.xlsx. Consent-002643-5 (West Hythe).pdf, Consent-003151-1 (eastry).pdf, Consent-000445-7 (newnham valley).pdf.

**Table 2.9: Receiving Watercourse for Existing Wastewater Treatment Works**

|                              | Broomfield Bank | Dambridge Wingham | Weatherlees Hill A | West Hythe      | Eastry                    | Newham Valley Preston |
|------------------------------|-----------------|-------------------|--------------------|-----------------|---------------------------|-----------------------|
| <b>Receiving Watercourse</b> | English Channel | The Wingham River | River Stour        | English Channel | Tributary of North Stream | River Stour           |

Notes:

1. Receiving watercourses taken from DWMP Workbook for Broomfield Bank v0.8.xlsx, DWMP Workbook for DAMBRIDGE WINGHAM v0.5.xlsx, DWMP Workbook for Weatherlees Hill A v09.xlsx. Consent-002643-5 (West Hythe).pdf, Consent-003151-1 (eastry).pdf, Consent-000445-7 (newnham valley).pdf.

## 3.5 Assumed Permit Conditions

There is a general uncertainty with the proposed permit requirements across all of the options. At this stage the following assumptions have been made for the permit conditions for the options under consideration, where the Whitfield development flow is to be transferred to a new or existing WTW. These will need to be confirmed through discussion with the Environment Agency.

### 3.5.1 Broomfield

As this is a coastal discharge, it is assumed that there will be no change to the existing permit. This is consistent with the basis used at PR19.

### 3.5.2 Dambridge Wingham

The basis used at PR19 assumed that the WRA consent concentration limits will be reduced to maintain the same mass loads as the existing consent (based on DWF), except for phosphorus where a more conservative estimate was made. UWWTR will also apply. The PR19 assumptions are presented below.

**Table 2.10: Dambridge Wingham PR19 assumed permit conditions**

| Determinant                                | PR19 Consent      | PR19 Proposed |
|--------------------------------------------|-------------------|---------------|
| <b>Dry Weather Flow (m<sup>3</sup>/d)</b>  | 3150 <sup>1</sup> | 6300          |
| <b>Flow to Full Treatment (FFT in l/s)</b> | 103               | 206           |
| <b>Total suspended solids (mg/l)</b>       | 30                | 15            |
| <b>Biochemical oxygen demand (mg/l)</b>    | 15                | 7.5           |
| <b>Ammonia (as N) mg/l</b>                 | -                 | -             |
| <b>Total Iron (mg/l)</b>                   | 4                 | 4             |
| <b>Total Phosphorus (mg/l)</b>             | 2 <sup>2</sup>    | 0.25          |

Notes:

1. The current consent DWF (see Table 2.7) is now 3510 m<sup>3</sup>/d. This may result in a change to the PR19 proposed consent standards.
2. Total Phosphorus permit at Dambridge Wingham under WRA is now 0.25 mg/l (see Table 2.8). 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.

### 3.5.3 Weatherlees Hill A

It is assumed that the WRA consent concentration limits will be reduced once the DWF permit is exceeded to maintain the same mass loads to the river as the existing DWF consent. UWWTR will also apply.

### 3.5.4 West Hythe

As this is a coastal discharge, it is assumed that there will be no change to the existing permit (see Table 2.8). This is consistent with the basis used at PR19 for Broomfield Bank.

### 3.5.5 Easry

It is assumed that the WRA consent concentration limits will be reduced once the DWF permit is exceeded to maintain the same mass loads to the river as the existing DWF consent. UWWTR will also apply.

### 3.5.6 Newnham Valley Preston

It is assumed that the WRA consent concentration limits will be reduced to maintain the same mass loads as the existing consent (based on DWF). UWWTR will also apply.

### 3.5.7 New WTW - Groundwater Discharge

The following consent conditions were assumed at PR19.

**Table 2.11: New WTW Groundwater Discharge Permit**

| Table          |      | WRA                   |           |                       |           | UWWTR      |             |     |
|----------------|------|-----------------------|-----------|-----------------------|-----------|------------|-------------|-----|
|                |      | Winter                |           | Summer                |           | Whole Year |             |     |
|                |      | LUT                   | UT        | LUT                   | UT        | LUT        | % reduction | UT  |
| <b>TSS</b>     | mg/l | 30 <sup>2</sup>       |           | 30                    |           |            |             |     |
| <b>BOD</b>     | mg/l | 20 <sup>2</sup>       | 50        | 20                    | 50        | 25         | 70%         | 50  |
| <b>COD</b>     | mg/l |                       |           |                       |           | 125        | 75%         | 250 |
|                |      | <b>Annual Average</b> | <b>UT</b> | <b>Annual Average</b> | <b>UT</b> |            |             |     |
| <b>Total N</b> | mg/l | 10 <sup>2</sup>       | -         | 10                    | -         |            |             |     |

Notes:

1. Assumed consent conditions taken from WHITFIELD PR19 STATEGIC GROWTH OPTION 3.xls
2. It was noted in PR19 that due to the uncertainty over the permitting requirements, differing views exist, with Southern Water's Strategic Solutions Partner at the time suggesting a permit of 8.3mg/l Total Nitrogen (TN) and a requirement to disinfect prior to ground discharge<sup>5</sup>.

### 3.5.8 New WTW - Sea Discharge

The following consent conditions were assumed at PR19.

**Table 2.12: New WTW Sea Discharge Permit**

|            |      | WRA    |    |        |    | UWWTR      |             |     |
|------------|------|--------|----|--------|----|------------|-------------|-----|
|            |      | Winter |    | Summer |    | Whole Year |             |     |
|            |      | LUT    | UT | LUT    | UT | LUT        | % reduction | UT  |
| <b>TSS</b> | mg/l | 60     | -  | 60     | -  |            |             |     |
| <b>BOD</b> | mg/l | 40     | 50 | 40     | 50 | 25         | 70%         | 50  |
| <b>COD</b> | mg/l |        |    |        |    | 125        | 75%         | 250 |

<sup>5</sup> The basis of this view (at PR19) was that an 8.3mg/l TN permit has been issued to Southern Water 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 requirement for disinfection is from the microbial concern raised by the EA in their initial response.

Notes:

1. Assumed consent conditions taken from WHITFIELD AM410 PR19 Strategic Growth Opt 4.xls

### 3.5.9 New WTW - River Discharge

The following consent conditions were assumed at PR19.

**Table 2.13: New WTW River Discharge Permit**

|                |      | WRA                   |           |                       |           | UWWTR      |             |     |
|----------------|------|-----------------------|-----------|-----------------------|-----------|------------|-------------|-----|
|                |      | Winter                |           | Summer                |           | Whole Year |             |     |
|                |      | LUT                   | UT        | LUT                   | UT        | LUT        | % reduction | UT  |
| <b>TSS</b>     | mg/l | 20 <sup>2</sup>       | -         | 20                    | -         |            |             |     |
| <b>BOD</b>     | mg/l | 10 <sup>2</sup>       | 50        | 10                    | 50        | 25         | 70%         | 50  |
| <b>COD</b>     | mg/l |                       |           |                       |           | 125        | 75%         | 250 |
| <b>NH4-N</b>   | mg/l | 2                     | -         | 2                     | -         |            |             |     |
|                |      | <b>Annual Average</b> | <b>UT</b> | <b>Annual Average</b> | <b>UT</b> |            |             |     |
| <b>Total N</b> | mg/l | 10                    | -         | 10                    | -         |            |             |     |
| <b>Total P</b> | mg/l | 0.25                  | -         | 0.25                  | -         |            |             |     |

Notes:

1. Assumed consent conditions taken from WHITFIELD PR19 STRATEGIC GROWTH OPTION 5.xls (note that Technical Annex to PR19SRN\_CAC02\_Growth (version 0.6) mentions TSS 30 mg/l and makes no mention of an ammonia standard)
2. It was noted in PR19 that due to the uncertainty over the permitting requirements, differing views exist, with Southern Water's Strategic Solutions Partner at the time suggesting TSS 10 mg/l, BOD 5mg/l and Ammonia of 1mg-N/l (instead of a Total Nitrogen standard).

## 3.6 Discussion on PR19 design assumptions

This section discusses the design flows used as the basis for the AM410 PR19 Strategic Growth calculations used to develop the options scopes at PR19.

The DWF reported in the PR19 strategic growth options, associated with the development of 5,750 properties (13,793 PE) was 28 L/s (2,419 m<sup>3</sup>/d) which can be derived assuming an occupancy rate of 2.4 persons per property, G = 125 l/person/d, and I = 40% PG. Design flows were based on the 2035 horizon.

The new properties were assumed to connect to the [REDACTED] (Whitfield) Wastewater Pump Station (WPS), which serves the existing Whitfield catchment. The Whitfield WPS peak pump rate adopted in PR19 was 180 L/s. It is not clear what this was based on, but from discussion with Southern Water it may have been based on 2,000 l/property/day and 7,450 properties associated with the existing Whitfield village (1,700 properties) and the new Whitfield development (5,750 properties).

Including the Whitfield development (13,793 PE), the Experian 7.1 population forecast predicted an increase in PE of 18,929 in the Broomfield Bank catchment between 2015-2035<sup>6</sup>.

Hence the options effectively considered DWF and FFT (3DWF) from the Whitfield strategic expansion (5,750 properties) while the peak flow was from the combined Whitfield village and

<sup>6</sup> Whitfield Growth Phase 2 Briefing Paper v0.1 (17 Nov 2017)

strategic expansion (7,450 properties) and load from the full Broomfield catchment including growth (18,929 PE).

### 3.6.1 Option 1 - Broomfield Bank WTW

In option 1 no margin was added to the calculated DWF, and FFT was taken as 3 x DWF (ie 3PG + 3I, not 3PG + I).

This results in the following design flows:

DWF = 28 l/s

FFT (3xDWF) = 84 l/s

Peak Flow = 180 l/s

The difference between 180 and 84 l/s was assumed to overflow to a storm tank.

Load was based on the full Broomfield catchment growth of 18,929 PE.

### 3.6.2 Option 2 – Dambridge Wingham

Option 2 adopted similar, but not identical, design flows to Options 3, 4 and 5 (see Table 2.14). The exact reasoning for this minor difference is not currently known, but higher DWF was used and FFT appears to have been calculated based on the FFT/DWF ratio in the existing permit.

Load was based on the full Broomfield catchment growth of 18,929 PE.

### 3.6.3 Options 3, 4 and 5 - New Whitfield WTW

In the PR19 options 3, 4 and 5 (New Whitfield WTW) a margin of +25% was added to the calculated DWF ( $1.25 \times 28 = 35$  l/s), and FFT was taken as 3 x DWF (ie 3PG + 3I, not 3PG + I) for assessing the WWTP upgrade requirements. This results in the following design flows:

DWF = 35 l/s

FFT (3xDWF) = 105 l/s

Peak Flow = 180 l/s

The difference between 180 and 105 l/s was assumed to overflow to a storm tank.

Load was based on the full Broomfield catchment growth of 18,929 PE (rounded up to 20,000 PE).

### 3.6.4 Summary

Table 2.14 summarises the design values used in the individual AM410 PR19 Strategic Growth calculations.

**Table 2.14: Design values used in AM410 PR19 Strategic Growth calculations**

| Option                           | PE     | DWF (l/s) | FFT (l/s) | PIF (l/s) |
|----------------------------------|--------|-----------|-----------|-----------|
| <b>1 - Broomfield Bank</b>       | 18,929 | 28        | 84        | 180       |
| <b>2, 2A - Dambridge Wingham</b> | 18,929 | 36.5      | 103       | 180       |
| <b>3 - New WTW – Ground</b>      | 20,000 | 35        | 105       | 180       |
| <b>4 - New WTW – Sea</b>         | 20,000 | 35        | 105       | 180       |
| <b>5 - New WTW – River</b>       | 20,000 | 35        | 105       | 180       |

Source: AM410 PR19 Strategic Growth calculations for individual options

## 4 Key Assumptions

The following table shows the status of the key assumptions made in this basis of design.

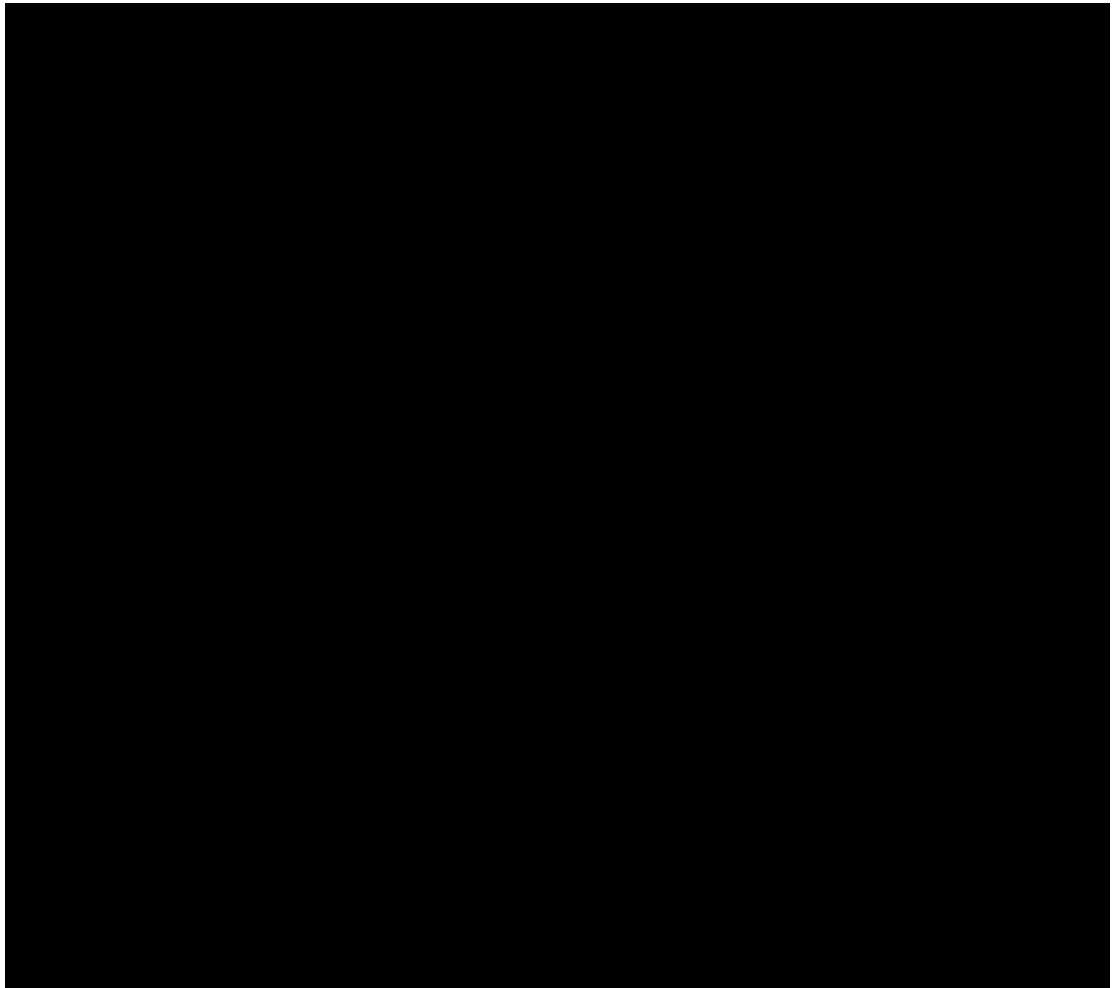
**Table 3.1: Key Design Assumptions**

| Assumptions                                                                                                                                                                                                                                                                                                                                                       | Status (Confirmation required / Proposed for Acceptance / Accepted by SWS) | Action                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------|
| <b>3 Growth</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                            |                                               |
| <b>3.1.1</b> The design population equivalent <b>to be used for the Whitfield development</b> is 15,240 PE                                                                                                                                                                                                                                                        | Accepted by SWS                                                            |                                               |
| <b>3.1.1</b> It is assumed that the Whitfield development will be developed using a separate sewer system and therefore will contain no storm water surface run-off                                                                                                                                                                                               | Further confirmation required                                              | Southern Water to confirm network assumptions |
| <b>3.1.2</b> The non-resident population of 358 is very small compared to the resident population of 15,240 PE and within the margin of error for the resident population. It will likely also include some of the resident population. Therefore, for simplicity it is proposed to exclude the non-resident population from the design population at this stage. | Proposed for acceptance                                                    | Southern Water to confirm acceptance          |
| <b>3.2 Design Flows</b>                                                                                                                                                                                                                                                                                                                                           |                                                                            |                                               |
| <b>DWF</b>                                                                                                                                                                                                                                                                                                                                                        | Accepted by SWS                                                            |                                               |
| <b>ADF</b>                                                                                                                                                                                                                                                                                                                                                        | Accepted by SWS                                                            |                                               |
| <b>FFT</b>                                                                                                                                                                                                                                                                                                                                                        | Accepted by SWS                                                            |                                               |
| <b>Peak flow</b>                                                                                                                                                                                                                                                                                                                                                  | Further confirmation required                                              | Southern Water to confirm peak flow           |
| <b>3.3 Design Loads</b>                                                                                                                                                                                                                                                                                                                                           |                                                                            |                                               |
| <b>Design Loads</b>                                                                                                                                                                                                                                                                                                                                               | Accepted by SWS                                                            |                                               |
| <b>Section 3.5 assumed permit conditions</b>                                                                                                                                                                                                                                                                                                                      |                                                                            |                                               |
| <b>3.5.1</b> Broomfield Bank - as this is a coastal discharge, it is assumed that there will be no change to the existing permit concentration limits. This is consistent with the basis used at PR19.                                                                                                                                                            | Further confirmation required                                              | Southern Water to arrange meeting with EA     |
| <b>3.5.2</b> Dambridge Wingham - It is assumed that the concentration limits will be reduced to maintain the same mass loads as the existing consent                                                                                                                                                                                                              | Further confirmation required                                              | Southern Water to arrange meeting with EA     |
| <b>3.5.3</b> Weatherlees Hill A - It is assumed that the WRA consent concentration limits                                                                                                                                                                                                                                                                         | Further confirmation required                                              | Southern Water to arrange meeting with EA     |

|                                                                                                                                                                                                                       |                               |                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------|
| <b>will be reduced to maintain the same mass loads as the existing consent (based on DWF). UWWTR will also apply.</b>                                                                                                 |                               |                                           |
| <b>3.5.4 West Hythe - As this is a coastal discharge, it is assumed that there will be no change to the existing permit concentration limits. This is consistent with the basis used at PR19 for Broomfield Bank.</b> | Further confirmation required | Southern Water to arrange meeting with EA |
| <b>3.5.5 Eastry - It is assumed that the WRA consent concentration limits will be reduced to maintain the same mass loads as the existing consent (based on DWF). UWWTR will also apply.</b>                          | Further confirmation required | Southern Water to arrange meeting with EA |
| <b>3.5.6 Newnham Valley Preston - It is assumed that the WRA consent concentration limits will be reduced to maintain the same mass loads as the existing consent (based on DWF). UWWTR will also apply.</b>          | Further confirmation required | Southern Water to arrange meeting with EA |
| <b>3.5.7 - Assumed Consent Data found in Table 2.11: New WTW Groundwater Discharge Permit</b>                                                                                                                         | Further confirmation required | Southern Water to arrange meeting with EA |
| <b>3.5.8 - Assumed Consent Data found in Table 2.12: New WTW Sea Discharge Permit</b>                                                                                                                                 | Further confirmation required | Southern Water to arrange meeting with EA |
| <b>3.5.9 - Assumed Consent Data found in Table 2.13: New WTW River Discharge Permit</b>                                                                                                                               | Further confirmation required | Southern Water to arrange meeting with EA |

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