## Existing and Proposed Development Splits

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |
| | | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Additional Land Use in the Framework Masterplan | | | | |
| Open urban land | 2.96 | 0 | 0 | |
| Greenspace | 16.17 | 0 | 0 | |
| Lowland | 0.00 | 0 | 0 | |
| Shrub | 0.28 | 0 | 0 | |
| Woodland | 0.62 | 0 | 0 | |
| Cereals | 6.11 | 0 | 0 | |
| Commercial/industrial urban land | 18.17 | 0 | 0 | |
| | | | | |
| | | | | |
| | | | | |
| | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | |
| **TOTAL** | **332.88** | **53.05** | **209.98** | **595.91** |

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Open urban land | 10.58 | 0.00 | 18.09 | |
| Greenspace | 77.27 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.40 | |
| Shrub | 1.97 | 0.00 | 0.36 | |
| Woodland | 0.66 | 0.00 | 0.92 | |
| Cereals | 163.47 | 34.61 | 131.70 | |
| Commercial/industrial urban land | 18.17 | 0.00 | 0.00 | |
| | | | | |
| | **332.88** | **53.05** | **209.98** | **595.91** |

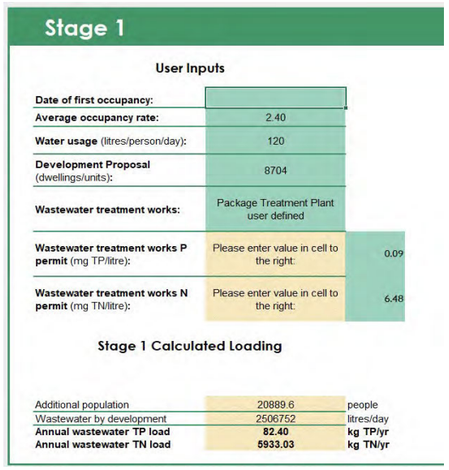
| Proposed Land Use | | | | | |
|---|---|---|---|---|---|
| | | Soilscapes classification | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Otterpool OPA Land Use | | | | |
| Development Parcels | Residential urban land | 145.21 | 13.16 | 98.25 | |
| | Commercial/industrial urban land | 14.50 | 1.50 | | |
| | Greenspace | 25.63 | 2.32 | 17.34 | |
| | community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | | |
| Public Open Space | Open urban land | 5.27 | 2.57 | 6.26 | |
| | Greenspace | 95.07 | 27.98 | 60.79 | |
| | community food growing | 2.69 | 0.00 | 4.07 | |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | | |
| | | 288.60 | 53.04 | 209.97 | 551.61 |
| | | | | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| | Additional Land Use in the Framework Masterplan | | | | |
| Development Parcels | Residential urban land | 30.53 | 0 | 0 | |
| | Commercial/industrial urban land | 0.00 | 0 | 0 | |
| | | | | | |
| | | | | | |
| Public Open Space | Open urban land | 3.23 | 0 | 0 | |
| | Greenspace | 10.55 | 0 | 0 | |
| | | | | | |
| | | | | | |
| | | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | | |
| | **TOTAL** | **332.91** | **53.04** | **209.97** | **595.92** |

| Proposed Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Development Parcels | Residential urban land | 175.74 | 13.16 | 98.25 |
| | Commercial/industrial urban land | 14.50 | 1.50 | 0.00 |
| | Greenspace | 25.63 | 2.32 | 17.34 |
| | community food growing | 0.00 | 0.00 | 0.22 |
| | | | | |
| Public Open Space | Open urban land | 8.50 | 2.57 | 6.26 |
| | Greenspace | 105.62 | 27.98 | 60.79 |
| | community food growing | 2.69 | 0.00 | 4.07 |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 |
| | | | | |
| | **332.91** | **53.04** | **209.97** | **595.92** |

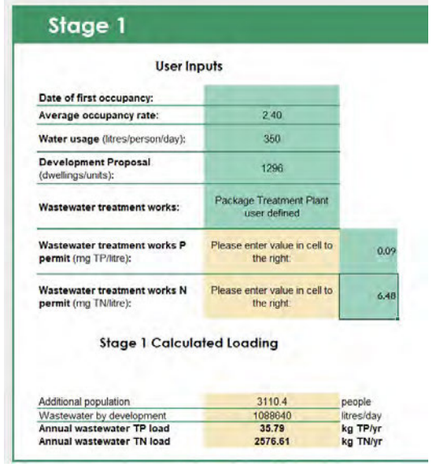
## Stage 1 Outputs

| Scenario 1 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 1** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 82.4 | 5933.0 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 35.8 | 2576.6 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 2.3 | 166.2 |
| **Final Stage 1 Output** | **120.5** | **8675.8** |

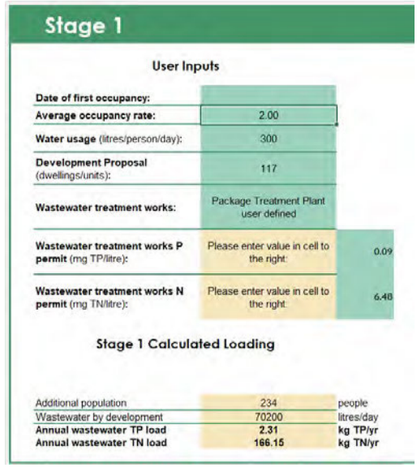
**Residential Class C3 (110 l/p/d + 10% buffer)**




**Residential Class C2 (350 l/p/d)**

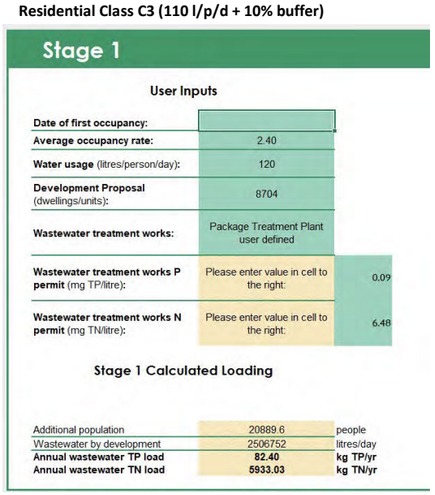



**Residential Class C1 (300 l/p/d)**

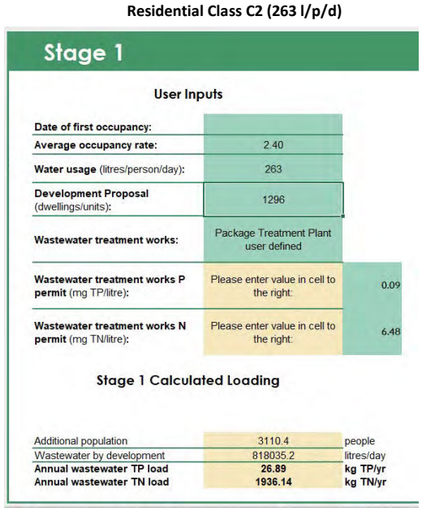



| Scenario 2 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 2** | |
| | **TP (kgN/yr)** | **TN (kgP/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 82.4 | 5933.0 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 26.9 | 1936.1 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 1.7 | 124.6 |
| **Final Stage 1 Output** | **111.0** | **7993.8** |

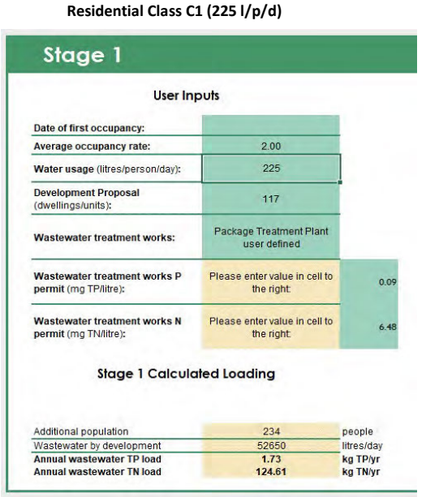
**Residential Class C3 (110 l/p/d + 10% buffer)**




**Residential Class C2 (263 l/p/d)**




**Residential Class C1 (225 l/p/d)**



# Stage 2 Outputs

## Stage 2 Results - Breakdown

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 62.9 | 6419.4 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **218.9** | **11115.4** |

### Stage 2 - Freely Draining

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| Open urban land | 2.96 | 2.30 | 23.57 |
| Greenspace | 16.17 | 0.32 | 48.51 |
| Lowland | 0.00 | 0.00 | 0.00 |
| Shrub | 0.28 | 0.01 | 0.84 |
| Woodland | 0.62 | 0.01 | 1.86 |
| Cereals | 6.11 | 1.01 | 190.51 |
| Commercial/industrial urban land | 18.17 | 19.28 | 130.91 |
| **Total:** | **332.88** | **62.94** | **6419.41** |

### Stage 2 - Impeded Drainage

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total:** | **53.048** | **44.18** | **931.02** |

### Stage 2 - Naturally Wet

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Naturally wet |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total:** | **209.99** | **111.82** | **3764.97** |

## Stage 3 Outputs

**Stage 3 Results - Breakdown**
**Total Annual Phosphorous and Nitrogen Nutrient Export**

| | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 280.7 | 2987.2 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **454.8** | **4974.0** |

**Stage 3 - Freely Draining**

**Stage 3**

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| | | | |
| Residential urban land | 30.53 | 44.28 | 412.42 |
| Commercial/industrial urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 10.55 | 0.21 | 31.65 |
| Open urban land | 3.23 | 2.51 | 25.72 |
| **Total:** | **332.908942** | **280.72** | **2987.19** |

**Stage 3 - Impeded Drainage**

**Stage 3**

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| **Total:** | **53.032** | **23.28** | **299.92** |

**Stage 3 - Naturally Wet**

**Stage 3**

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| **Total:** | **209.97162** | **150.84** | **1686.86** |

Please enter area in hectares.

# Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 356.4 | 2534.4 | 346.9 | 1852.4 |
| Step 2: Nutrient Budget* X 1.2 | 427.7 | 3041.2 | 416.3 | 2222.8 |
| **Stage 4 Final Nutrient Load** | **427.7** | **3041.2** | **416.3** | **2222.8** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 235.90 | -6141.43 | 235.90 | -6141.43 |
| Step 2: Nutrient Budget* X 1.2 | 283.08 | -7369.72 | 283.08 | -7369.72 |
| **Stage 4 Final Nutrient Load** | **283.08** | **-7369.72** | **283.08** | **-7369.72** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgN/yr) | TN (kgP/yr) | TP (kgN/yr) | TN (kgP/yr) |
| Step 1: Nutrient Budget* | 120.50 | 8675.79 | 111.02 | 7993.78 |
| Step 2: Nutrient Budget* X 1.2 | 144.60 | 10410.95 | 133.22 | 9592.54 |
| **Stage 4 Final Nutrient Load** | **144.60** | **10410.95** | **133.22** | **9592.54** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

# Nutrient Mitigation Outputs and Sensitivity Tests

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 35.64 | 3.27 | 34.69 | 2.39 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 23.59 | -7.92 | 23.59 | -7.92 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 12.05 | 11.19 | 11.10 | 10.31 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

# Appendix C

## Nutrient Neutrality Assessment – For Sellindge WwTW

# Offsite WwTW - OPA

## Existing and Proposed Development Splits

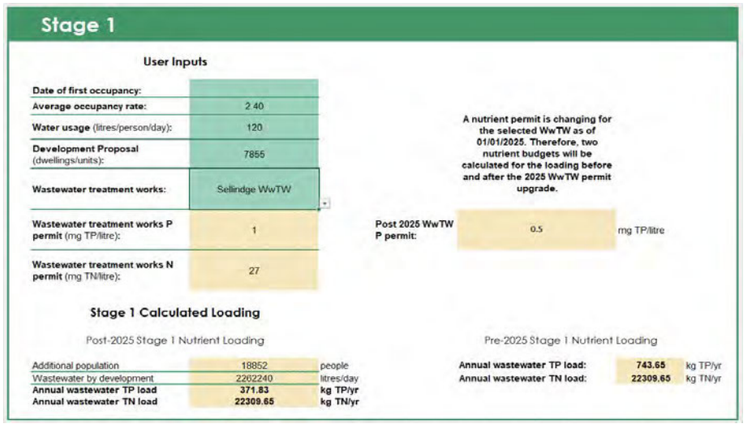
| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |

| Proposed Land Use | | | | |
|---|---|---|---|---|
| | | Soilscapes classification | | |
| | | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet |
| | Otterpool OPA Land Use | | | |
| Development Parcels | Residential urban land | 145.21 | 13.16 | 98.25 |
| | Commercial/industrial urban land | 14.50 | 1.50 | |
| | Greenspace | 25.63 | 2.32 | 17.34 |
| | community food growing | 0.00 | 0.00 | 0.22 |
| | | | | |
| Public Open Space | Open urban land | 5.27 | 2.57 | 6.26 |
| | Greenspace | 95.07 | 27.98 | 60.79 |
| | community food growing | 2.69 | 0.00 | 4.07 |
| | Water - stormwater wetlands | 0.23 | 2.00 | 14.96 |
| | Water - wastewater wetlands | 0.00 | 3.51 | 8.08 |
| | | | | |
| | | 288.60 | 53.04 | 209.97 | 551.61 |

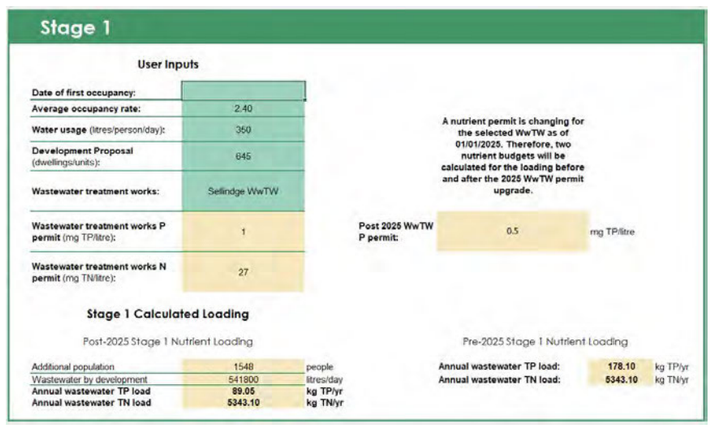
## Stage 1 Outputs

| Scenario 1 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 1** | |
| | **TP (kgP/yr)** | **TN (kgN/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 371.8 | 22309.7 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 89.1 | 5343.1 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 11.5 | 692.3 |
| **Final Stage 1 Output** | **472.4** | **28345.0** |

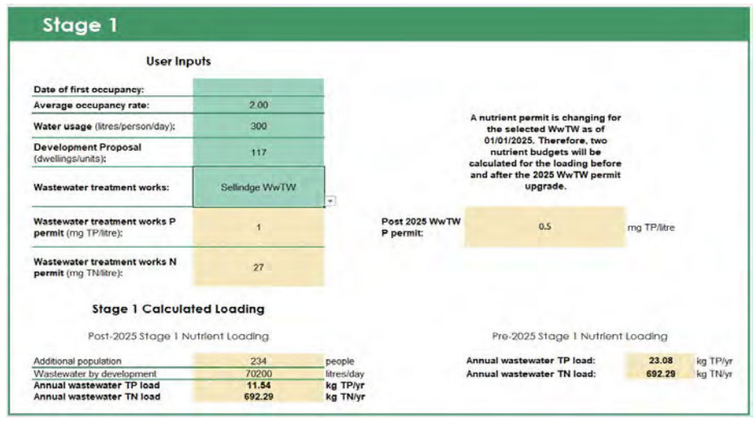
**Residential Class C3 (110 l/p/d + 10% buffer)**




**Residential Class C2 (350 l/p/d)**

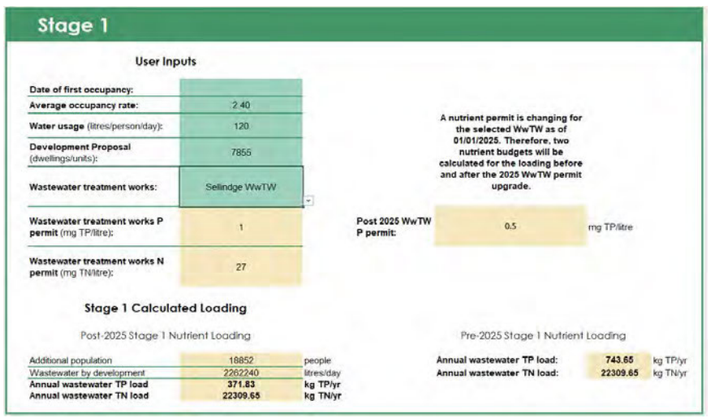



**Residential Class C1 (300 l/p/d)**

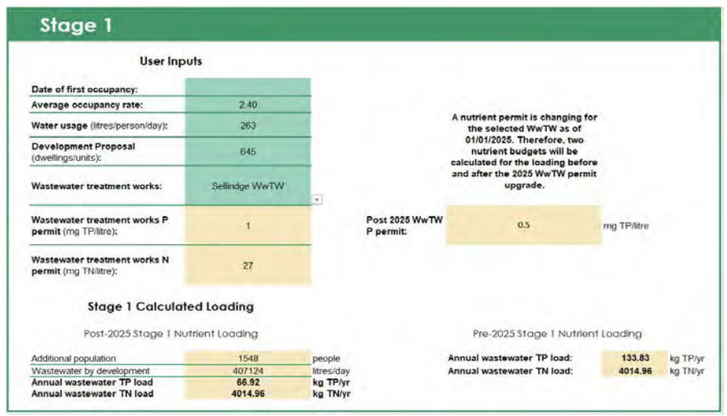



| Scenario 2 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 2** | |
| | **TP (kgP/yr)** | **TN (kgN/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 371.8 | 22309.7 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 66.9 | 4015.0 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 8.7 | 519.2 |
| **Final Stage 1 Output** | **447.4** | **26843.8** |

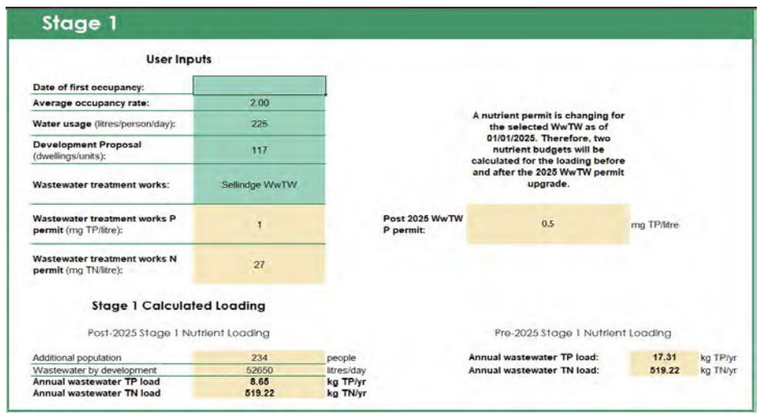
**Residential Class C3 (110 l/p/d + 10% buffer)**




**Residential Class C2 (263 l/p/d)**




**Residential Class C1 (225 l/p/d)**



# Stage 2 Outputs

**Stage 2 Results - Breakdown**

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 40.0 | 6023.2 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **196.0** | **10719.2** |

**Stage 2 - Freely Draining**

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| **Total:** | **288.57** | **40.00** | **6023.21** |

**Stage 2 - Impeded Drainage**

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total:** | **53.048** | **44.18** | **931.02** |

**Stage 2 - Naturally Wet**

## Stage 2

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Naturally wet |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total:** | **209.99** | **111.82** | **3764.97** |

## Stage 3 Outputs

| Stage 3 Results - Breakdown<br>Total Annual Phosphorous and Nitrogen Nutrient Export | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 233.7 | 2517.4 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **407.8** | **4504.2** |

**Stage 3 - Freely Draining**

**Stage 3**

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| Total: | 288.59894 | 233.72 | 2517.40 |

**Stage 3 - Impeded Drainage**

**Stage 3**

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| Total: | 53.032 | 23.28 | 299.92 |

**Stage 3 - Naturally Wet**

**Stage 3**

User Inputs

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| Total: | 209.97162 | 150.84 | 1686.86 |

Please enter area in hectares.

# Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgP/yr) | TN (kgN/yr) | TP (kgP/yr) | TN (kgN/yr) |
| Step 1: Nutrient Budget* | 684.3 | 22130.0 | 659.2 | 20628.8 |
| Step 2: Nutrient Budget* X 1.2 | 821.1 | 26556.0 | 791.1 | 24754.6 |
| **Stage 4 Final Nutrient Load** | **821.1** | **26556.0** | **791.1** | **24754.6** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgP/yr) | TN (kgN/yr) | TP (kgP/yr) | TN (kgN/yr) |
| Step 1: Nutrient Budget* | 211.84 | -6215.02 | 211.84 | -6215.02 |
| Step 2: Nutrient Budget* X 1.2 | 254.21 | -7458.02 | 254.21 | -7458.02 |
| **Stage 4 Final Nutrient Load** | **254.21** | **-7458.02** | **254.21** | **-7458.02** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgP/yr) | TN (kgN/yr) | TP (kgP/yr) | TN (kgN/yr) |
| Step 1: Nutrient Budget* | 472.42 | 28345.04 | 447.40 | 26843.83 |
| Step 2: Nutrient Budget* X 1.2 | 566.90 | 34014.05 | 536.88 | 32212.60 |
| **Stage 4 Final Nutrient Load** | **566.90** | **34014.05** | **536.88** | **32212.60** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

# Nutrient Mitigation Outputs and Sensitivity Tests

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 68.43 | 28.55 | 65.92 | 26.62 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 21.18 | -8.02 | 21.18 | -8.02 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 47.24 | 36.57 | 44.74 | 34.64 |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

# Offsite WwTW - FMP

## Existing and Proposed Development Splits

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Open urban land | 7.62 | 0.00 | 18.09 | |
| Greenspace | 61.10 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.4 | |
| Shrub | 1.69 | 0.00 | 0.36 | |
| Woodland | 0.04 | 0.00 | 0.92 | |
| Cereals | 157.36 | 34.61 | 131.7 | |
| | | | | |
| | | | | |
| | 288.57 | 53.05 | 209.98 | 551.60 |

| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
|---|---|---|---|---|
| Additional Land Use in the Framework Masterplan | | | | |
| Open urban land | 2.96 | 0 | 0 | |
| Greenspace | 16.17 | 0 | 0 | |
| Lowland | 0.00 | 0 | 0 | |
| Shrub | 0.28 | 0 | 0 | |
| Woodland | 0.62 | 0 | 0 | |
| Cereals | 6.11 | 0 | 0 | |
| Commercial/industrial urban land | 18.17 | 0 | 0 | |
| | | | | |
| | | | | |
| | | | | |
| | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | |
| **TOTAL** | **332.88** | **53.05** | **209.98** | **595.91** |

| Existing Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Open urban land | 10.58 | 0.00 | 18.09 | |
| Greenspace | 77.27 | 0.80 | 18.51 | |
| Lowland | 60.76 | 17.64 | 40.40 | |
| Shrub | 1.97 | 0.00 | 0.36 | |
| Woodland | 0.66 | 0.00 | 0.92 | |
| Cereals | 163.47 | 34.61 | 131.70 | |
| Commercial/industrial urban land | 18.17 | 0.00 | 0.00 | |
| | | | | |
| | **332.88** | **53.05** | **209.98** | **595.91** |

| Proposed Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA Land Use | | | | |
| Development Parcels: Residential urban land | 145.21 | 13.16 | 98.25 | |
| Development Parcels: Commercial/industrial urban land | 14.50 | 1.50 | | |
| Development Parcels: Greenspace | 25.63 | 2.32 | 17.34 | |
| Development Parcels: community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | |
| Public Open Space: Open urban land | 5.27 | 2.57 | 6.26 | |
| Public Open Space: Greenspace | 95.07 | 27.98 | 60.79 | |
| Public Open Space: community food growing | 2.69 | 0.00 | 4.07 | |
| Public Open Space: Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| Public Open Space: Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | |
| | 288.60 | 53.04 | 209.97 | 551.61 |

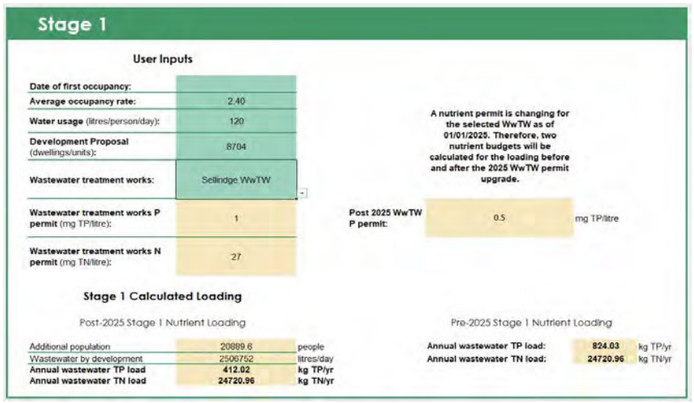
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
|---|---|---|---|---|
| Additional Land Use in the Framework Masterplan | | | | |
| Development Parcels: Residential urban land | 30.53 | 0 | 0 | |
| Development Parcels: Commercial/industrial urban land | 0.00 | 0 | 0 | |
| | | | | |
| | | | | |
| Public Open Space: Open urban land | 3.23 | 0 | 0 | |
| Public Open Space: Greenspace | 10.55 | 0 | 0 | |
| | | | | |
| | | | | |
| | 44.31 | 0.00 | 0.00 | 44.31 |
| | | | | |
| **TOTAL** | **332.91** | **53.04** | **209.97** | **595.92** |

| Proposed Land Use | | | | |
|---|---|---|---|---|
| | Soilscapes classification | | | |
| | Freely draining | Slowly permeable (Impeded Drainage) | Naturally Wet | |
| Otterpool OPA + Additional Framework Masterplan Land Use | | | | |
| Development Parcels: Residential urban land | 175.74 | 13.16 | 98.25 | |
| Development Parcels: Commercial/industrial urban land | 14.50 | 1.50 | 0.00 | |
| Development Parcels: Greenspace | 25.63 | 2.32 | 17.34 | |
| Development Parcels: community food growing | 0.00 | 0.00 | 0.22 | |
| | | | | |
| Public Open Space: Open urban land | 8.50 | 2.57 | 6.26 | |
| Public Open Space: Greenspace | 105.62 | 27.98 | 60.79 | |
| Public Open Space: community food growing | 2.69 | 0.00 | 4.07 | |
| Public Open Space: Water - stormwater wetlands | 0.23 | 2.00 | 14.96 | |
| Public Open Space: Water - wastewater wetlands | 0.00 | 3.51 | 8.08 | |
| | | | | |
| | **332.91** | **53.04** | **209.97** | **595.92** |

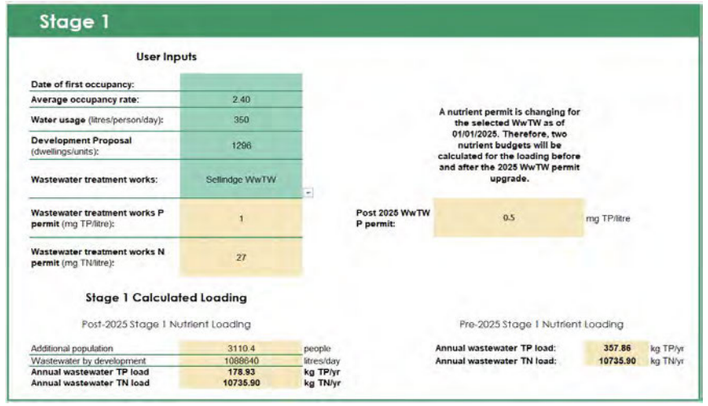
## Stage 1 Outputs

| Scenario 1 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 1** | |
| | **TP (kgP/yr)** | **TN (kgN/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 412.0 | 24721.0 |
| Stage 1 - Residential Class C2 (350 l/p/d) | 178.9 | 10735.9 |
| Stage 1 - Residential Class C1 (300 l/p/d) | 11.5 | 692.3 |
| **Final Stage 1 Output** | **602.5** | **36149.2** |

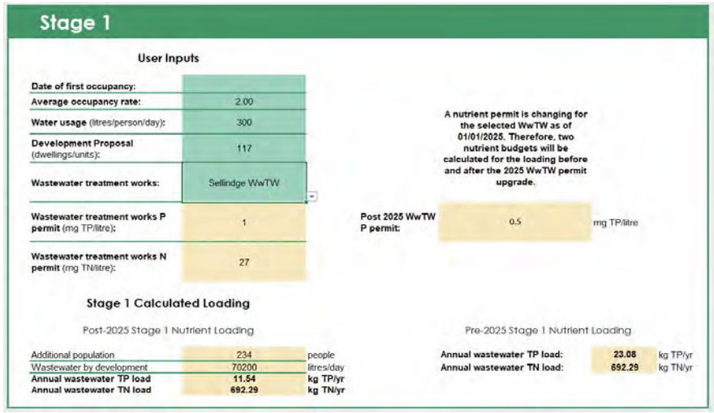
**Residential Class C3 (110 l/p/d + 10% buffer)**




**Residential Class C2 (350 l/p/d)**

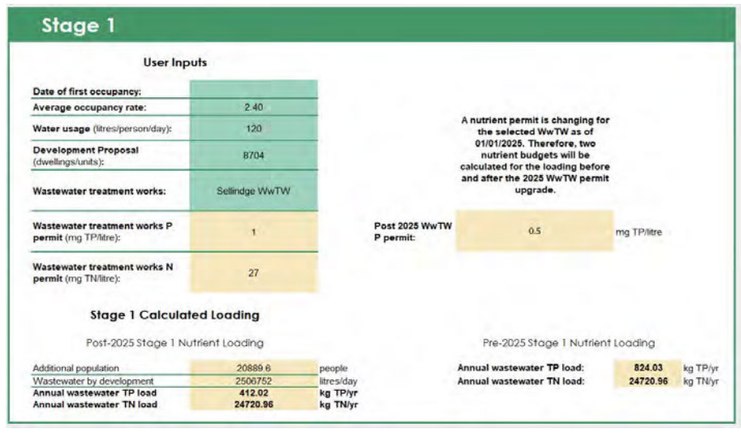



**Residential Class C1 (300 l/p/d)**

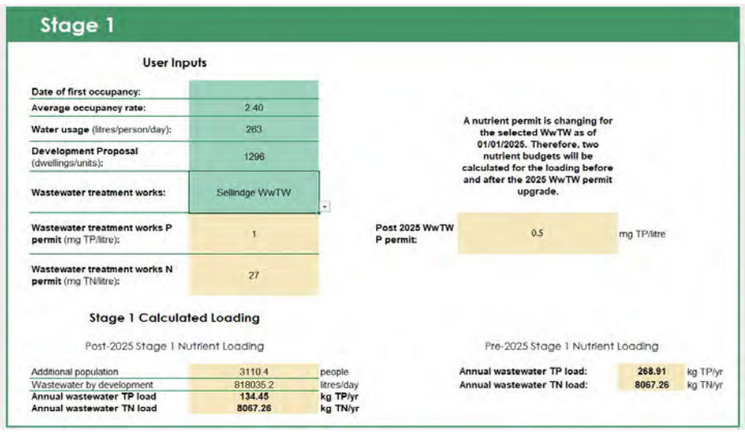



| Scenario 2 | | |
|---|---|---|
| **Stage 1 Results - Breakdown** | | |
| **Total Annual Wastewater TP and TN Load** | | |
| | **Scenario 2** | |
| | **TP (kgP/yr)** | **TN (kgN/yr)** |
| Stage 1 - Residential Class C3 (110 l/p/d + 10% buffer) | 412.0 | 24721.0 |
| Stage 1 - Residential Class C2 (262.5 l/p/d) | 134.5 | 8067.3 |
| Stage 1 - Residential Class C1 (225 l/p/d) | 8.7 | 519.2 |
| **Final Stage 1 Output** | **555.1** | **33307.4** |

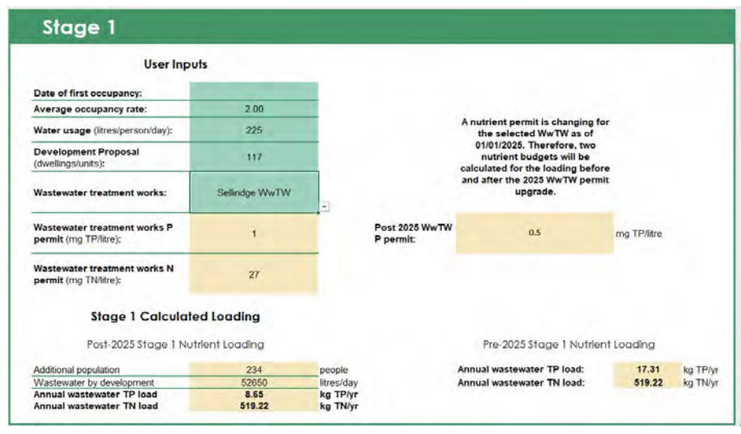
**Residential Class C3 (110 l/p/d + 10% buffer)**




**Residential Class C2 (263 l/p/d)**




**Residential Class C1 (225 l/p/d)**



## Stage 2 Outputs

**Stage 2 Results - Breakdown**

| | TP (kg/yr) | TN (kg/yr) |
|---|---|---|
| Stage 2 - Freely Draining | 62.9 | 6419.4 |
| Stage 2 - Impeded Drainage | 44.2 | 931.0 |
| Stage 2 - Naturally wet | 111.8 | 3765.0 |
| **Final Stage 2 Output** | **218.9** | **11115.4** |

### Stage 2 - Freely Draining

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Freely draining |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 7.62 | 5.93 | 60.69 |
| Greenspace | 61.10 | 1.22 | 183.30 |
| Lowland | 60.76 | 6.82 | 867.44 |
| Shrub | 1.69 | 0.03 | 5.07 |
| Woodland | 0.04 | 0.00 | 0.11 |
| Cereals | 157.36 | 26.00 | 4906.60 |
| Open urban land | 2.96 | 2.30 | 23.57 |
| Greenspace | 16.17 | 0.32 | 48.51 |
| Lowland | 0.00 | 0.00 | 0.00 |
| Shrub | 0.28 | 0.01 | 0.84 |
| Woodland | 0.62 | 0.01 | 1.86 |
| Cereals | 6.11 | 1.01 | 190.51 |
| Commercial/industrial urban land | 18.17 | 19.28 | 130.91 |
| **Total:** | **332.88** | **62.94** | **6419.41** |

### Stage 2 - Impeded Drainage

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Impeded drainage |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 0.80 | 0.02 | 2.40 |
| Lowland | 17.64 | 11.99 | 166.91 |
| Shrub | 0.00 | 0.00 | 0.00 |
| Woodland | 0.00 | 0.00 | 0.00 |
| Cereals | 34.61 | 32.17 | 761.72 |
| **Total:** | **53.048** | **44.18** | **931.02** |

### Stage 2 - Naturally Wet

**Stage 2**

**User Inputs**

| | |
|---|---|
| **Catchment:** | Upper Stour |
| **Soil drainage type:** | Naturally wet |
| **Annual average rainfall** (mm): | 700.1 - 750 |
| **Within Nitrate Vulnerable Zone (NVZ):** | Yes |

| Existing land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Open urban land | 18.09 | 14.08 | 144.06 |
| Greenspace | 18.51 | 0.37 | 55.53 |
| Lowland | 40.40 | 7.51 | 451.22 |
| Shrub | 0.36 | 0.01 | 1.08 |
| Woodland | 0.92 | 0.02 | 2.75 |
| Cereals | 131.70 | 89.83 | 3110.33 |
| **Total:** | **209.99** | **111.82** | **3764.97** |

## Stage 3 Outputs

**Stage 3 Results - Breakdown**
**Total Annual Phosphorous and Nitrogen Nutrient Export**

| | TP (kgN/yr) | TN (kgP/yr) |
|---|---|---|
| Stage 3 - Freely Draining | 280.7 | 2987.2 |
| Stage 3 - Impeded Drainage | 23.3 | 299.9 |
| Stage 3 - Naturally wet | 150.8 | 1686.9 |
| **Final Stage 3 Output** | **454.8** | **4974.0** |

**Stage 3 - Freely Draining**

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 145.21 | 210.62 | 1961.59 |
| Commercial/industrial urban land | 14.50 | 15.39 | 104.47 |
| Greenspace | 25.63 | 0.51 | 76.89 |
| Open urban land | 5.27 | 4.10 | 41.97 |
| Greenspace | 95.07 | 1.90 | 285.21 |
| Community food growing | 2.69 | 1.19 | 47.27 |
| Water | 0.23 | 0.00 | 0.00 |
| | | | |
| Residential urban land | 30.53 | 44.28 | 412.42 |
| Commercial/industrial urban land | 0.00 | 0.00 | 0.00 |
| Greenspace | 10.55 | 0.21 | 31.65 |
| Open urban land | 3.23 | 2.51 | 25.72 |
| **Total:** | **332.908942** | **280.72** | **2987.19** |

**Stage 3 - Impeded Drainage**

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 13.16 | 19.09 | 177.77 |
| Commercial/industrial urban land | 1.50 | 1.59 | 10.81 |
| Greenspace | 2.32 | 0.05 | 6.96 |
| Open urban land | 2.57 | 2.00 | 20.44 |
| Greenspace | 27.98 | 0.56 | 83.94 |
| Water | 2.00 | 0.00 | 0.00 |
| Water | 3.51 | 0.00 | 0.00 |
| **Total:** | **53.032** | **23.28** | **299.92** |

**Stage 3 - Naturally Wet**

**Stage 3**

**User Inputs**

| New land use type(s) | Area (ha) | Annual phosphorus nutrient export (kg TP) | Annual nitrogen nutrient export (kg TN) |
|---|---|---|---|
| Residential urban land | 98.25 | 142.51 | 1327.23 |
| Community food growing | 0.22 | 0.10 | 3.84 |
| Greenspace | 17.34 | 0.35 | 52.02 |
| Open urban land | 6.26 | 4.87 | 49.85 |
| Greenspace | 60.79 | 1.22 | 182.38 |
| Community food growing | 4.07 | 1.80 | 71.54 |
| Water | 14.96 | 0.00 | 0.00 |
| Water | 8.08 | 0.00 | 0.00 |
| **Total:** | **209.97162** | **150.84** | **1686.86** |

Please enter area in hectares.

# Stage 4 Outputs and Sensitivity Tests

**Stage 4 - Calculated Outputs**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgP/yr) | TN (kgN/yr) | TP (kgP/yr) | TN (kgN/yr) |
| Step 1: Nutrient Budget* | 838.4 | 30007.7 | 791.0 | 27166.0 |
| Step 2: Nutrient Budget* X 1.2 | 1006.1 | 36009.3 | 949.2 | 32599.2 |
| **Stage 4 Final Nutrient Load** | **1006.1** | **36009.3** | **949.2** | **32599.2** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - Land Use Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgP/yr) | TN (kgN/yr) | TP (kgP/yr) | TN (kgN/yr) |
| Step 1: Nutrient Budget* | 235.90 | -6141.43 | 235.90 | -6141.43 |
| Step 2: Nutrient Budget* X 1.2 | 283.08 | -7369.72 | 283.08 | -7369.72 |
| **Stage 4 Final Nutrient Load** | **283.08** | **-7369.72** | **283.08** | **-7369.72** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

**Stage 4 - Calculated Outputs (Sensitivity Test - WwTW Nutrients Only)**

| Total Annual Phosphorous and Nitrogen Load to Mitigate | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP (kgP/yr) | TN (kgN/yr) | TP (kgP/yr) | TN (kgN/yr) |
| Step 1: Nutrient Budget* | 602.49 | 36149.15 | 555.12 | 33307.44 |
| Step 2: Nutrient Budget* X 1.2 | 722.99 | 43378.98 | 666.14 | 39968.93 |
| **Stage 4 Final Nutrient Load** | **722.99** | **43378.98** | **666.14** | **39968.93** |

* Nutrient Budget = Final Stage 1 Output + (Final Stage 3 Output - Final Stage 2 Output)

# Nutrient Mitigation Outputs and Sensitivity Tests

| Nutrient Mitigation - Wetland Area Requirement Summary | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 83.84 | 38.72 | 79.10 | 35.05 |
| | | | | |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - Land Use Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 23.59 | -7.92 | 23.59 | -7.92 |
| | | | | |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

| Nutrient Mitigation - Wetland Area Requirement Summary (Sensitivity Test - WwTW Nutrients Only) | Scenario 1 | | Scenario 2 | |
|---|---|---|---|---|
| | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Final nutrient load/ Assumed Wetland TP/TN removal rate | 60.25 | 46.64 | 55.51 | 42.98 |
| | | | | |
| Assumed Wetland TN removal rate | 93 g/m2/yr | | | |
| Assumed Wetland TP removal rate | 1.2 g/m2/yr | | | |

# Appendix D

## D.1 Nutrient Neutrality Assessment – For Sellindge WwTW alternative permit

Based on the previous communication with the EA (Appendix D.2) and Southern Water (Appendix D.3) and NE during the WCS production, it was confirmed that the nutrient budget calculations for Sellindge WwTW should use a TP permit of 0.3 mg/l and a TN permit of 25 mg/l if the Proposed Development is to be accommodated at an upgraded Sellindge WwTW. NE has previously reviewed Arcadis nutrient budget assessments based these permit levels and had raised no objections to use them. Therefore, this Appendix summarises the Nutrient Neutrality calculations associated with this potential alternative permit levels for comparison.

*Table 25 WwTW TP and TN permit option*

| Description | Offsite (Sellindge) WwTW |
|---|---|
| TN permit | 25 mg/l |
| TP permit | 0.3 mg/l |
| 90% of the proposed consent TN limit[1] | 22.5 |
| 90% of the proposed consent TP limit[1] | 0.27 |

Stage 1

Table 26 shows the Annual Wastewater TP and TN load by the OPA based on the TP and TN Permit levels for Sellindge WwTW against the two PCC water usage rates scenarios.

*Table 26 Total Annual Wastewater TP and TN Load from the Sellindge WwTW alternative Option within OPA*

| Description | Sellindge WwTW Scenario 1 | | Sellindge WwTW Scenario 2 | |
|---|---|---|---|---|
| | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) |
| Class C3 | 223.1 | 18591.4 | 223.1 | 18591.4 |
| Class C2 | 53.4 | 4452.6 | 40.2 | 3345.8 |
| Class C1 | 6.9 | 576.9 | 5.2 | 432.7 |
| **OPA Final Stage 1 Output** | **283.5** | **23620.9** | **268.4** | **22369.9** |

Table 27 shows Annual Wastewater TP and TN load for the additional 44.29ha area covered by the FMP, as described in Section 3.1.

*Table 27 Additional Total Annual Wastewater TP and TN Load from the Sellindge WwTW Option within FMP*

| Description | Sellindge WwTW Scenario 1 | | Sellindge WwTW Scenario 2 | |
|---|---|---|---|---|
| | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) | Annual wastewater TP load (kg/ TP/year) | Annual wastewater TN load (kg/ TN/year) |
| Class C3 | 24.1 | 2009.4 | 24.1 | 2009.4 |
| Class C2 | 53.9 | 4494.0 | 40.5 | 3376.9 |
| Class C1 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Additional FMP Final Stage 1 Output** | **78.0** | **6503.4** | **64.6** | **5386.4** |

Stage 4

Table 28 gives a summary of the total estimated nutrient budgets for both the OPA and FMP, as described in Section 3.1.

*Table 28 Nutrient Budget Assessment Summary for Sellindge WwTW Option*

| WwTW Option | Loading Area Coverage | Combined Load From WwTW and Land Use | | Sensitivity Test - WwTW Load Only | | Sensitivity Test - Land Use Load Only | |
|---|---|---|---|---|---|---|---|
| | | TP (Kg/year) | TN (Kg/year) | TP (Kg/year) | TN (Kg/year) | TP (Kg/year) | TN (Kg/year) |
| Sellindge WwTW - PCC Scenario 1 | Otterpool OPA Area Loading | 594.3 | 20887.0 | 340.14 | 28345.03 | 254.21 | -7458.02* |
| | Extra Otterpool FMP Area Loading | 122.52 | 7892.42 | 93.65 | 7804.12 | 28.87 | 88.31 |
| | **TOTAL** | **716.82** | **28779.42** | **433.79** | **36149.15** | **283.08** | **-7369.71** |
| Sellindge WwTW - PCC Scenario 2 | Otterpool OPA Area Loading | 576.3 | 19385.8 | 322.13 | 26843.82 | 254.21 | -7458.02 |
| | Extra Otterpool FMP Area Loading | 106.43 | 6551.93 | 77.56 | 6463.62 | 28.87 | 88.31 |
| | **TOTAL** | **682.73** | **25937.73** | **399.69** | **33307.44** | **283.08** | **-7369.71** |

*Negative values mean that there is a net reduction in nutrients and there is no need to provide any offsetting mitigation measures

Nutrient Mitigation requirements

Table 29 below summarises the indicative total area of the new wetlands required to offset the nutrient budget shown in Table 28 gives a summary of the total estimated nutrient budgets for both the OPA and FMP, as described in Section 3.1.

Table 28 and Table 29 show that the WwTW load and wetland requirement, based on the Sellindge permit levels are nearly two times higher than the Onsite WwTW option and significantly increases the total load to be mitigated for the OPA and FMP areas.

*Table 29 Mitigation Wetland Requirement Summary for Sellindge WwTW Option*

| WwTW Option | Loading Area Coverage | Combined Load From WwTW and Land Use | | Sensitivity Test - WwTW Load Only | | Sensitivity Test - Land Use Load Only | |
|---|---|---|---|---|---|---|---|
| | | TP [1] Wetland Area (ha) | TN [2] Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) | TP Wetland Area (ha) | TN Wetland Area (ha) |
| Sellindge WwTW – PCC Scenario 1 | Otterpool OPA Area Loading | 49.53 | 22.47 | 28.35 | 30.48 | 21.19 | -8.01[3] |
| | Extra Otterpool FMP Area Loading | 10.21 | 8.49 | 7.80 | 8.39 | 2.41 | 0.09 |
| | **TOTAL** | **59.74** | **30.96** | **36.15** | **38.87** | **23.6** | **-7.92** |
| Sellindge WwTW - PCC Scenario 2 | Otterpool OPA Area Loading | 48.03 | 20.85 | 26.84 | 28.86 | 21.19 | -8.01 |
| | Extra Otterpool FMP Area Loading | 8.87 | 7.05 | 6.45 | 6.95 | 2.41 | 0.09 |
| | **TOTAL** | **56.9** | **27.9** | **33.29** | **35.81** | **23.6** | **-7.92** |

[1] Assumed TN removal rate of 93 g/m$^2$/yr for both wastewater and stormwater discharges, which is a well-accepted figure as a Median Removal rate.

[2] Assumed TP removal rate of 1.2 g/m$^2$/yr for both wastewater and stormwater discharges, which is a well-accepted figure as a Median Removal rate.

[3] Negative values mean that there is a net reduction in nutrients and there is no need to provide any offsetting mitigation measures

Implications

As discussed under Section 6.1, the latest Sellindge WwTW mitigation requirements can only be compared to the previous combined load (WwTWs and Land Use) in the previous WCS report. As seen in Table 30, the latest NE guidance has had a significant increase on the wetland areas required for this option (> 13 ha) to achieve nutrient neutrality. This also means that the total wetland area requirement is now 59.74 ha for the FMP out of which 36.15 ha will be required to treat wastewater discharge and the remaining 23.6 ha will be required to treat the land use runoff discharges, for the worst-cast PCC Scenario 1. Therefore, it is still not considered a suitable viable option for this development as it requires significant offsite wetland mitigation.

*Table 30 Differences in total wetland area requirements for FMP*

| Nutrient Mitigation - Wetland Area Requirement Summary | PCC Rate – Scenario 1 | | PCC Rate – Scenario 2 | |
|---|---|---|---|---|
| | Wetland for Area TP (ha) | Wetland for Area TN (ha) | Wetland for Area TP (ha) | Wetland for Area TN (ha) |
| Difference in previous WCS report Wetland areas against latest wetland areas – FMP Area | -13.34* | -1.05 | -13.30 | -1.09 |

*Negative values here mean that there has been an increase in wetland area when comparing the wetland areas from the previous WCS against the latest wetland areas calculated in this assessment.

## D.2 EA Planning Advice

[redacted]

**From:** [redacted]@environment-agency.gov.uk>
**Sent:** 20 April 2018 17:03
**To:** KSL Enquiries
**Cc:** [redacted]
**Subject:** RE: KSL 81610 LB FW: KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request
**Attachments:** Otterpool indicative standards.docx

**Importance:** High

**Categories:** Red Category

[redacted] I attach a document showing the results of modelling I carried out for [redacted] at Arcadis. I have copied [redacted] in on this response as I am aware of urgency for a meeting next week. I hope the information is useful.

[redacted] raised some questions beyond modelling. My responses to these are below.

Point 3c. of 12 Jan email.

> c) If Southern Water is prepared to treat the final effluent to a much higher quality standard than at present at Sellindge WwTW and send back a portion of the extra treated effluent to Otterpool Park development for non-potable water recycling purpose (say 30% or 50% of the treated flow volume) then what are the relaxed permit conditions compared to (b) above in order to reflect the reduced extra DWF discharge to the receiving water environment on the East Stour. I appreciate that this would be subject to further discussion and agreement with Southern Water but I was wondering if you could provide some initial advice to facilitate such discussions and inform our WCS report?

The effect on permit conditions would depend on the permitted discharge retained. They would be somewhere in-between the values quoted for Sellindge above and the current permit (12 mg/L annual for BOD). An approximation based on proportions would be give an indication.

Note that there may be restrictions on what use such reused effluent may be put as it would still carry bacteriological and other contamination.

As you have noted, detailed discussions would be necessary with SWS to further this proposal.

Point 2. of 12 Jan email.

> What is the current DWF headroom available with the existing permit at West Hythe WwTW? Also, the quality parameters of the existing coastal discharge permit are currently less stringent than Sellindge WwTW. The additional environmental capacity available combined with minimal extra flood risk impact etc., it seems currently more favourable to accommodate Otterpool development at West Hythe WwTW but your views on this would be useful.

We do not hold accurate figures for available headroom at West Hythe WWTW. I am of the opinion however that the headroom would be insufficient for the large volumes of effluent you estimate for the Otterpool development. As a consequence, as described in our previous response a review of the permit would be likely to be required to determine whether further treatment, including microbiological is required. Headroom should be discussed in detail with SWS.

In general terms, whilst lower levels of treatment may be possible at West Hythe (than inland), and this might make it appear a preferable discharge option, there are considerable benefits to the inland discharge options from a hydrological point of view. This does of course depend on high levels of treatment being provided. We commented to this effect in our previous response.

Regards,

[redacted]

[redacted]
Environment Planning Specialist
Kent, South London & East Sussex Area - Integrated Environment Planning
✉ Orchard House, Endeavour Park, London Road, West Malling, Kent, ME19 5SH
☎ [redacted]
[redacted]@environment-agency.gov.uk


**Did you know? Over a quarter of a million homes in England and Wales are pouring their dirty water straight into our rivers and streams. Find out more here.**

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**From:** KSL Enquiries
**Sent:** 10 April 2018 12:12
**To:** [redacted]@environment-agency.gov.uk>
**Subject:** KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request

Hello [redacted]

Are you able to help with the customer's questions below?

Please respond by 17/04/2018.

Many thanks
[redacted]

[redacted]
**Customers & Engagement Officer**
**Kent South London & East Sussex**

**Environment Agency** | [redacted] | Orchard House | Endeavour Park | London Road | West Malling | Kent | ME19 5SH

DO YOU KNOW WHAT TO I

**From:** [redacted]@arcadis.com]
**Sent:** 29 March 2018 22:26
**To:** KSL Enquiries <KSLE@environment-agency.gov.uk>; [redacted]@environment-agency.gov.uk>
**Subject:** RE: KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request

Hi [redacted]

Thank you for the responses.

I have a few further queries/requests on the information provided.

- 1st point on my second email dated 16th Jan (i.e. Details of any existing licenced surface water and ground water abstractions within or near Otterpool Park Site, including those within the rest of Shepway District)

  For some reason, you have forgotten to attach the stated spreadsheet and please forward this missing spreadsheet.

- 3rd point on my first email dated 12th Jan (i.e. Discharge permits to the East Stour)

  a) The estimated Dry Weather Flow (DWF) for up to 10,000 new homes associated with Otterpool wider masterplan is approximately 2,841 m3/day (i.e. assuming a PCC of 90 l/p/day with extra 30% allowance for any infiltration) but this will increase to 3,472 m3/day if we were to assume a higher PCC of 110 l/p/day. So, please indicate the likely new permit parameters for discharging both DWF figure scenarios (2,841 m3/day and 3,472 m3/day ) from an onsite WwTW.

  b) Similarly, would it be possible to indicate the likely new discharge permit conditions associated with accommodating the above same DWFs (plus any other known committed sites in the existing catchment) to an upgraded Southern Water's Sellindge WwTW? Also what is the current DWF headroom available with the existing permit at Sellindge WwTW?

  c) If Southern Water is prepared to treat the final effluent to a much higher quality standard than at present at Sellindge WwTW and send back a portion of the extra treated effluent to Otterpool Park development for non-potable water recycling purpose (say 30% or 50% of the treated flow volume) then what are the relaxed permit conditions compared to (b) above in order to reflect the reduced extra DWF discharge to the receiving water environment on the East Stour. I appreciate that this would be subject to further discussion and agreement with Southern Water but I was wondering if you could provide some initial advice to facilitate such discussions and inform our WCS report?

- 2nd point on my first email dated 12th Jan (i.e. Discharge via West Hythe WwTW)

  What is the current DWF headroom available with the existing permit at West Hythe WwTW? Also, the quality parameters of the existing coastal discharge permit are currently less stringent than Sellindge WwTW. The additional environmental capacity available combined with minimal extra flood risk impact etc., it seems currently more favourable to accommodate Otterpool development at West Hythe WwTW but your views on this would be useful.

Please note that Otterpool Park Framework Masterplan was published last week with press releases issued to local, national and trade media. You can find both the Framework Masterplan
and the report on the website http://www.otterpoolpark.org/project-information/, which will provide some additional information on our emerging project proposals.

Finally, it would be very useful if we can have your additional responses by mid-April or late-April (at the latest) to inform the next steps. Please confirm the timescale and any charges associated with providing the requested new discharge permit requirements. As you are aware, we already have an agreed cost recovery mechanism with the Environment Agency for Otterpool project (see attached FYI) and I assume we can use this framework to cover your costs if necessary?

Kind regards
[redacted]

[redacted] | Technical Director | [redacted]@arcadis.com
**Arcadis Consulting (UK) Ltd** | Crystal Court, Aston Cross Business Village | 50 Rocky Lane, Aston | Birmingham, B6 5RQ, UK
M. [redacted]
**www.arcadis.com**




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**From:** KSL Enquiries <KSLE@environment-agency.gov.uk>
**Sent:** 27 February 2018 13:12
**To:** [redacted]a@arcadis.com>
**Subject:** KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request
**Importance:** High

Dear [redacted]

**RE: KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request**

Thank you for your enquiry which was received on 12 January 2018.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Please see last word document attached KSL 72905 LB Arcadis questions. Please also find attached relevant emails and deocuments.

Our planning department will contact you directly regarding the last 3 questions from your second email.

Please refer to the Open Government Licence which explains the permitted use of this information.

Please be aware that many of our datasets are now available online. Simply visit **environment.data.gov.uk**

If you have any further queries or if you'd like us to review the information we have provided under the Freedom of Information Act 2000 and Environmental Information Regulations 2004 please contact us within two months and we will happily do this for you.

We would be really grateful if you could spare five minutes to help us improve our service. Please click on the link below and fill in our survey – we use every piece of feedback we receive:http://www.smartsurvey.co.uk/s/EnvironmentAgencyCustomerSurvey/?a=KSL

Kind regards
[redacted]

[redacted]
**Customers & Engagement Officer**
**Kent South London & East Sussex**

**Environment Agency** | [redacted] Jabber 49353 | Orchard House | Endeavour Park | London Road | West Malling | Kent | ME19 5SH



---

**From:** KSL Enquiries
**Sent:** 22 February 2018 09:55
**To:** '[redacted]@arcadis.com>
**Subject:** KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request
**Importance:** High

Dear [redacted]

Thank you for your enquiry which was received on 12 January 2018.

I have been in contact with our planning department and we are currently collating the information from our teams. Apologies there will be a delay in providing the information requested.

We have provided the information for the question below.

1. Existing discharge permit details for Southern Water's West Hythe Wastewater Treatment Works (WwTW) located @ NGR E 612665, N 133120 and Sellindge WwTW located @ NGR E 608600 N 138200, including the location of existing discharge points.

We are aiming to provide the rest of the information early next week.

Kind regards
[redacted]

[redacted]
**Customers & Engagement Officer**
**Kent South London & East Sussex**

**Environment Agency** | [redacted]3 | Jabber 49353 | Orchard House | Endeavour Park | London Road | West Malling | Kent | ME19 5SH

**From:** KSL Enquiries
**Sent:** 09 February 2018 17:09
**To:** 'r[redacted]@arcadis.com>
**Subject:** KSL 72905 LB FW: Otterpool Park Garden Town - EA Planning Advice & Data Request
**Importance:** High

Dear [redacted]

Thank you for your enquiry which was received on 12 January 2018.

We are currently collating information from our teams and apologies, there will be a delay in providing the information requested.

We have provided the information for the question below which we received via three Environmental permit requests. I have attached the email responses which contain the permits.

1. Existing discharge permit details for Southern Water's West Hythe Wastewater Treatment Works (WwTW) located @ NGR E 612665, N 133120 and Sellindge WwTW located @ NGR E 608600 N 138200, including the location of existing discharge points.

We will aim to provide the rest of the information as soon as we can.

Kind regards
[redacted]

[redacted]
**Customers & Engagement Officer**
**Kent South London & East Sussex**

**Environment Agency** | [redacted] | Jabber 49353 | Orchard House | Endeavour Park | London Road | West Malling | Kent | ME19 5SH



**From:** [redacted]@arcadis.com]
**Sent:** 12 January 2018 20:46
**To:** [redacted]@environment-agency.gov.uk>
**Cc:** [redacted]@arcadis.com>
**Subject:** Otterpool Park Garden Town - EA Planning Advice & Data Request

Hi [redacted]

Hope that you're well.

Please see below a specific request for your urgent attention to inform our Otterpool WCS preparation.

2. Existing discharge permit details for Southern Water's West Hythe Wastewater Treatment Works (WwTW) located @ NGR E 612665, N 133120 and Sellindge WwTW located @ NGR E 608600 N 138200, including the location of existing discharge points.

3. What future permit levels are likely to be imposed by the Environment Agency if the proposed Otterpool Garden Park Site, which may accommodate up to 10,000 homes is also to be treated at West Hythe WwTW? If this information is not readily available would the Environment Agency currently have any significant water quality or flood risk concerns due to the additional wastewater flows from West Hythe WwTW due to the proposed Otterpool Garden Park Site and any other new growth in this specific wastewater catchment?

4. What future permit levels are likely to be imposed by the Environment Agency if the proposed Otterpool Garden Park Site would have an onsite WwTW with a potential discharge point to the River East Stour (@ NGR E 609426, N 137712) subject to satisfactorily meeting any downstream flood risk concerns? Please note that potential flood mitigation measures that we can consider may include provision of large effluent polishing wetlands for the WwTW, a range of onsite infiltration and attenuation SuDS measures, rainwater and/or treated wastewater effluent reuse, active low management measures.

5. If the Environment Agency is currently unable to provide the information for item 3 above, can the WFD/ water quality data be provided for us to assess the potential impact of the growth at Otterpool Park Garden Site due to onsite WwTW discharge. I have attached an example dataset, to outline the data required but if you have any specific queries my colleague, Aimee Hart can assist you on this specific query.

    - **Water Quality Data**- Monitored water quality data (to include BOD, phosphorous, ammonia etc.) for the watercourses in the location of both discharge points (ideally upstream and downstream of the discharge point). Both the mean values and standard deviation values are required. Please include the mean, 90%ile and SWD Good Status midpoint values for BOD, phosphorous and ammonia to use where water quality is less than good or where there is no data available.
    - **Flow data-** Q95 exceedance flow and mean flow data for the all WRC discharge point locations.

A quick response to the above would be much appreciated as we are now entering a critical phase of the WCS as the development masterplan and planning strategy is becoming more clearer now.

As WCS work progresses, we may need to request additional information and advice. We will keep our requests to a minimum, but consistent with performing a thorough analysis.

Regards

[redacted] | Technical Director | [redacted]
**Arcadis Consulting (UK) Ltd** | Crystal Court, Aston Cross Business Village | 50 Rocky Lane, Aston | Birmingham, B6 5RQ, UK
[redacted]
www.arcadis.com

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Environment Agency KSLES area

Integrated Environment Planning Team

Response to query KSL 81610 LB dated 10 April 2018

Request for indicative discharge permit standards relating to new Otterpool Park Garden Town development sewage effluent

Response date 20 April 2018.

**All results provided are indicative only and for assistance with Otterpool Park Framework Master planning process. The results provided are subject to review upon submission and determination of a permit application.**

Options Tested

1. Effluent treated at existing Sellindge wwtw (Southern Water Services; SWS), discharging to Horton Priory Dyke (HPD) tributary of East Stour,
2. Effluent treated at new wwtw discharging to East Stour 1 km upstream of HPD confluence,
3. Effluent treated at new wwtw discharging to East Stour at HPD confluence.

Results for both 'Lower' and 'Upper' effluent volumes have been requested.

1. Sellindge wwtw. @ 608600 138200
   Targets used in modelling: Equivalent impact on the HPD as allowed by the current permit to ensure no deterioration and also a proposed PR19 phosphorus improvement scheme (achieve good status in East Stour).

   Dry weather flow (DWF) of current permit increased to accommodate flows from Otterpool development. Allowance made for headroom at Sellindge – based on current DWF and an estimate of long term (2045) 'committed to' growth at the WWTW. An accurate assessment should be requested from SWS. We have estimated headroom for the purposes of these calculations as 558 m3/day. Resulting Lower (Sellindge) DWF = 3877 m3/day; Upper DWF = 4508 m3/day

   Seasonal look up table BOD limits in current permit converted to annual for the purposes of these calculations. Permit: 8 mg/L summer, 15 mg/L winter. Converted to 12 mg/L annual.

2. New WWTW to East Stour upstream of HPD confluence. @ 609426 137712
   Targets: 3% deterioration from present quality in East Stour at this point.
   Lower (Otterpool) DWF = 2841 m3/day; Upper DWF = 3472 m3/day.
   Sellindge WWTW current permit unaltered.

3. New WWTW discharge to East Stour at HPD confluence. @ 608558 138047
   This option investigated due to very stringent standards resulting from option 2 above.
   Targets. Equivalent impact on the East Stour using the permitted impact of Sellindge WWTW as a baseline from which to ensure no deterioration.
   Proposed PR19 P scheme also used as baseline.
   Lower (Otterpool) DWF = 2841 m3/day; Upper DWF = 3472 m3/day.
   Sellindge WWTW current permit unaltered.

<u>Information sources used in modelling:</u>
Permitted DWF at Sellindge.
Estimate of Otterpool 'Lower' and 'Upper' DWF provided by Arcadis consulting.
Qm and Q95 in HPD and East Stour
Sellindge effluent quality monitoring point Ref E0001437.
Horton Priory Dyke monitoring point u/s Sellindge wwtw Ref E0001432; 'HORTON PRIORY DYKE RAILWAY BRIDGE'
East Stour monitoring point u/s HPD confluence Ref E0001424; 'EAST STOUR HARRINGE COURT'
Sellindge WWTW Ref E0001437; 'SELLINDGE SEWAGE TREATMENT WORKS FINAL EFFLUENT'

<u>Results:</u>

Results provided as Look Up Table/Upper Tier limits for BOD and Ammonia and mean limits for phosphorus. Upper Tier limits are standard Environment Agency 'read across' values.

| | BOD mg/L | | Ammonia mg/L | | Phosphorus mg/L | |
|---|---|---|---|---|---|---|
| DWF | Lower | Upper | Lower | Upper | Lower | Upper |
| Sellindge wwtw | 8/45 | 8/45 | 2/12 | 2/12 | 0.3 | 0.3 |
| E Stour U/S | 5/20 | * | 0.5/12 | * | 0.1 | * |
| E Stour/HPD | 8/45 | 7/44 | 2/12 | 2/12 | 0.3 | 0.3 |

* Not calculated due to very stringent limits calculated for lower DWF

Lower (Otterpool) DWF = 2841 m3/day; Upper DWF = 3472 m3/day. Note equivalent DWF at Sellindge would be 3877 (Lower) and 4508 (Upper) m3/day.

[redacted]

20 April 2018

## D.3 Southern Water Advice

[redacted]

**From:** [redacted]@southernwater.co.uk>
**Sent:** 07 July 2020 16:54
**To:** [redacted]@folkestone-hythe.gov.uk; [redacted]
**Subject:** RE: Otterpool - SW catch up notes

All,

Following today's meeting, please see below responses that had my name against them;

1. The cost of upgrading West Hythe would be the subject of another feasibility study**.** [redacted] **to confirm if any work was done on this previously as initially, discharge to West Hythe was the preferred option**. KCC/AECOM Kent Water for Sustainable Growth Study (2017) also identified West Hythe as SW's preferred option for Otterpool.
   Follow up was made with Paul Goodwin on this matter and he informs me that pumping to West Hythe WTW was looked at as part of the Price Review 19. This option was discounted on the grounds of technical difficulties and cost;
   - Significant distance for the transfer of flows
   - Significant potential for an EIA related to the pipeline
   - Limited land availability within the existing site boundary
   - Treatment works served by a single pumping station (Range Road), which accommodates the preliminary treatment for the catchment prior to flow transfer to the treatment works, limited expansion capacity available at the pumping station site
   - Significant uprating of pumping capability and rising main required if Otterpool flows are transferred to Range Road
   - Flows from treatment works are pumped back to Range Road prior to pumping down long sea outfall, the increase in flow will require new transfer pumps and rising main between West Hythe WTW and Range Road PS
   - Increased flows may require new/additional long sea outfall
   - As there is no storage at West Hythe the incoming flow and outgoing flows are finely balanced, introducing additional flows directly to West Hythe will make the management of flows more complex

   Treatment of the additional full development flow was considered by increasing the existing FFT by 120l/s, utilising the existing works with additional processes. The requirements would be for new inlet screening and grit removal; additional ASP lane with upgrades to the RAS pumps and intermediate pumps; 2 No. new FSTs; 1 No. new sludge holding tank; upgrade of effluent return pumps and upgrade of power facilities. This notional solution excluded an assessment of the outfall condition and its ability to accept the additional flows, which remained a significant risk to this option.

13. The DWFs as calculated by Arcadis reflect 90l/ person/day and 110l/person/day for new homes as per latest Local Plan policy. SW DWFs are currently calculated on 500l/dwelling as per SW's design guide which given an average occupancy of 2.4 people is significantly higher. This is how SW is currently addressing their risks related to potential breaching of the permit conditions at West Hythe WwTW. This difference may affect both the need for negotiating a new discharge permit with the EA and the extent of the upgrade, which will be considered as part of the R&V process. [redacted] **to investigate this further within SW and advise Arcadis what pcc value should be used for the purpose of Otterpool WCS update, Local Plan HRA Update etc.**
    The assumptions / design criteria for the infrastructure (pipeline) was based on:
    - Peaking factor of 4DWF used for optimal sizing for SWS method
    - Occupancy - 2.4 people/property
    - Consumption - 125l/person/d
    - Infiltration - 10%

• Assumed that the Health facilities are hospitals and will discharge over a 24hour period. This will be the worst case situation.

Main item is we have used 125l/person/d which is to SW standards.

In order to calculate the design per capita return to sewer rate (G) = 115.6 L/hd.d, we assumed a PCC = 125 L/hd.d and a return rate of 92.5%. There is concern with adopting a PCC of 110 L/hd.d for the non-infra design of the wastewater treatment facilities.

In the non-infra design for the wastewater treatment facilities the Infiltration rate for the Otterpool Park Garden Town development was calculated based on the EA storm overflow guidelines which states *"The infiltration allowance for the increase in population is normally at 50% of the per capita rate of infiltration in the existing sewerage system."* with the existing per capita rate of infiltration based on the Sellindge WTW catchment. Whereas Arcadis appear to have assumed an infiltration rate of 25%.

Please find below an extract from the position statement we issued to the EA in order to determine the discharge permit conditions for the proposed Sellindge WTW expansion to accept flows from the Otterpool Park Garden Town development. The position statement was based upon a phased approach with design / permitting horizons of 2035 and 2045. This information / approach was accepted by the EA.

| Parameter | Formulae/comments | Catchment | Units | Existing Permit | 2035 | 2045 |
|---|---|---|---|---|---|---|
| Population, resident, $P_R$ | | Sellindge | hd | | 8,420 | 8,836 |
| | | Otterpool | hd | | 13,140 | 24,000 |
| Population, non-resident, $P_{NR}$ | | Sellindge | hd | | 170 | 170 |
| | | Otterpool | hd | | 27 | 27 |
| Population equivalent, P | $P_R + P_{NR}$ | Sellindge | hd | | 8,590 | 9,006 |
| | | Otterpool | hd | | 13,167 | 24,027 |
| Per capita return to Sewer, G | 92.5% of 125 l/hd.d | | l/hd.d | | 115.6 | 115.6 |
| Trade, E | | Sellindge | $m^3/d$ | | 1.48 | 1.48 |
| | | Otterpool | $m^3/d$ | | 0 | 0 |
| Infiltration*1, $I_{dwf}$ | | Sellindge | $m^3/d$ | | 403 | 418 |
| | | Otterpool | $m^3/d$ | | 488 | 890 |
| DWF | $DWF_{2015} + (P-P_{2015})G/1000 + I_{dwf}$ | Sellindge | $m^3/d$ | 1,594 | 1,038*2 | 1,101*2 |
| | $PG + I_{dwf} + E$ | Otterpool | $m^3/d$ | | 2,010 | 3,668 |
| | | Combined | $m^3/d$ | | 3,048 | 4,770 |

With reference to the below TN query that was asked by Renuka on 02 June;

The response I've had is as follows:
*"The new plant wasn't designed specifically for total N. However, we did include an anoxic selector, so you can expect around 50% TN removal, so I would recommend 25 mg/l TN as a value to use in nutrient loading calculations. If they agency insist on a lower TN, its relatively easy to implement in the MBR, as the recirculation is already there. The MBR at Woolston achieves TN of 15 mg./l with no carbon addition."*

[redacted]

[redacted]

[redacted]
**Senior Project Manager (Engineering & Contruction)**

Southern Water [redacted]
www.southernwater.co.uk

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**From:** [redacted]@arcadis.com]
**Sent:** 04 June 2020 13:01
**To:** [redacted]@southernwater.co.uk>; [redacted]
<[redacted]@southernwater.co.uk>; [redacted]@southernwater.co.uk>; [redacted]
[redacted]@southernwater.co.uk>; [redacted]@folkestone-hythe.gov.uk; [redacted]t
<[redacted]a@arcadis.com>
**Subject:** Otterpool - SW catch up notes

Dear All,

Further to yesterday's meeting, please find below a list of actions / points raised.

1. The Risk and Value 1 did not take place on 29th May. It is expected to be rescheduled for June – [redacted] **to confirm new date**.
2. With regard to charging, it was confirmed that if there is no point of connection, connection charges are not payable but the developer would be expected to pay for the network.
3. The S98 sewer requisition process would follow a decision on which treatment works ie West Hythe or Sellindge. This is likely to be determined following R&V3 in 2 – 3 months.
4. The cost of upgrading West Hythe would be the subject of another feasibility study**.** [redacted] **to confirm if any work was done on this previously as initially, discharge to West Hythe was the preferred option**. KCC/AECOM Kent Water for Sustainable Growth Study (2017) also identified West Hythe as SW's preferred option for Otterpool.
5. The developer cannot pay for treatment works upgrades.
6. JE provided indicative costs for quality upgrade costs to the WwTWs based on population equivalent figures from the Solent study.
7. Southern Water typically use 9 – 10 mg/l for Total Nitrogen levels when planning for future upgrades.
8. Arcadis' initial calculations show that nutrient neutrality (for both Nitrogen and Phosphorus) will be an issue at Otterpool for both Sellindge and onsite WwTW options. Consideration is to be given to the feasibility of providing a notable level Nitrogen and Phosphorous offsetting across the catchment if either of these WwTW options is to be taken forward - [redacted].
9. The Winep Study which looks specifically at the impact of all impacted WwTWs in the River Stour catchment (including Sellindge) on Stodmarsh Lakes is due in 2022.
10. It is not known if / when Natural England and the EA will do a review of permits into the Stour but even if nitrogen was reduced at Sellindge to 10mg/l there would still be neutrality issues if Otterpool is also to be connected to the WwTW. This shows treatment upgrade costs alone could be between £5M to £7.5M.
11. There are similar concerns about achieving nutrient neutrality with the on-site treatment options but further treatment could be provided using reed beds.
12. Arcadis' West Hythe WwTW headroom calculations based on DWFs suggest that there is capacity for Otterpool plus the committed sites and other future developments in the Local Plans / Places and Policies Site Allocations in this treatment catchment. However, Southern Water noted that DWF headroom does not necessarily equate to the treatment capacity. This will be looked at as part of the R&V process.
13. The DWFs as calculated by Arcadis reflect 90l/ person/day and 110l/person/day for new homes as per latest Local Plan policy. SW DWFs are currently calculated on 500l/dwelling as per SW's design guide which given an average occupancy of 2.4 people is significantly higher. This is how SW is currently addressing their risks

[redacted]

related to potential breaching of the permit conditions at West Hythe WwTW. This difference may affect both the need for negotiating a new discharge permit with the EA and the extent of the upgrade, which will be considered as part of the R&V process. [redacted]**o investigate this further within SW and advise Arcadis what pcc value should be used for the purpose of Otterpool WCS update, Local Plan HRA Update etc.**

14. If Otterpool discharges to West Hythe, it would not be possible to have a return supply for recycling. However a bulk supply from Sellindge for reuse would still be a potential option. Rainwater harvesting using SuDS is also another likely option that Aracdis is currently exploring further to address this issue (i.e. with all three WwTW options being considered).

Date of next meeting to be confirmed once R&V1 date is known. [redacted] to invite Affinity Water to the meeting.

Please let me know if you have any comments.

Kind Regards,

[redacted] Project Manager | [redacted]
**Arcadis LLP** | The Surrey Research Park, 10 Medawar Road, Guildford | GU2 7AR | United Kingdom
[redacted]
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Be green, leave it on the screen.

# Appendix E

## Hydraulic Loading Calculations

# Hydraulic Loading Calculations

**Wetland Details Summary**

| Wetland_ID (See Note 1) | Wetland Area (m2) | Wetland Area (ha) | Wetland Depth (m) | Treatment depth (m) | Comments |
|---|---|---|---|---|---|
| W1 | 14609 | 1.46 | 0.72 | 0.34 | Receives storm discharge. W1, W2, W3 & W8 are interlinked (Total area 4.9ha). |
| W2 | 9161 | 0.92 | 0.73 | 0.31 | Receives storm discharge. W1, W2, W3 & W8 are interlinked (Total area 4.9ha). |
| W3 | 9365 | 0.94 | 0.45 | 0.04 | Receives storm discharge. W1, W2, W3 & W8 are interlinked (Total area 4.9ha). |
| W4 | 17028 | 1.70 | 0.37 | 0.09 | Receives storm discharge |
| W5 | 21077 | 2.11 | 0.46 | 0.18 | Receives storm discharge |
| W6 | 26315 | 2.63 | 0.87 | 0.34 | Receives storm discharge |
| W7 | 24838 | 2.48 | 0.54 | 0.15 | Receives storm discharge |
| W8 | 16076 | 1.61 | 0.79 | 0.57 | Receives storm discharge. W1, W2, W3 & W8 are interlinked (Total area 4.9ha). |
| W9 | 2692 | 0.27 | 0.73 | 0.17 | Receives storm discharge. W9 & W10 are interlinked (Total area 1.58ha) |
| W10 | 13151 | 1.32 | 0.81 | 0.16 | Receives storm discharge. W9 & W10 are interlinked (Total area 1.58 ha) |
| W11 | 10004 | 1.00 | 0.65 | 0.02 | Receives storm discharge. W11 & W12 are interlinked (Total area 2.3 ha). |
| W12 | 12623 | 1.26 | 0.34 | 0.05 | Receives storm discharge. W11 & W12 are interlinked (Total area 2.3 ha). |
| W14 | 11103 | 1.11 | 0.38 | 0.10 | Receives storm discharge |
| W13 | 97597 | 9.76 | 0.50 | 0.25 | Receives wastewater discharge. The total footprint of the wetland is 13.0ha but only 75% is taken as effective area (9.76ha) due to earth works required for cascade wetland features. |
| W15 | 17661 | 1.77 | 0.50 | 0.25 | Wastewater Wetland W15 for the extra FMP flows has been extended further south within the current Public Open Space and wetland area increased to 2.73 ha . However, only 65% is taken as effective area (1.77ha) to account for the terraced wetland features and bridle way. |
| | **285640** | **30.33** | | | |

**Additional Stormwater Wetlands**

| Wetland_ID (See Note 1) | Wetland Area (m2) | Wetland Area (ha) | Wetland Depth (m) | Treatment depth (m) | Comments |
|---|---|---|---|---|---|
| ASW1 | 10640 | 1.06 | 1.2 | 0.06 | Treats OPA Site storm discharge. ASW1, W4 & W5 when interlinked can give a total area of 4.87ha. |
| ASW2 | 2114 | 0.21 | 1.2 | 0.22 | Treats OPA Site storm discharge. ASW2, ASW3, W9, W10, W11 and W12 when interlinked can give a total area of 4.86 ha. |
| ASW3 | 8036 | 0.80 | 1.2 | 0.06 | Treats s OPA Site storm discharge. ASW2, ASW3, W9, W10, W11 and W12 when interlinked can give a total area of 4.86ha. |
| ASW4 | 6269 | 0.63 | 1.2 | 0.03 | Treats OPA Site storm discharge. |
| ASW5 | 6645 | 0.66 | 1.2 | 0.17 | Treats OPA Site storm discharge. |
| ASW6 | 7630 | 0.76 | 1.2 | 0.13 | Treats OPA Site storm discharge. |
| ASW7 | 2600 | 0.26 | 1.2 | 0.18 | Treats OPA Site storm discharge. ASW7 and W14 when interlinked can provide a total area of 1.37 ha. |
| ASW8 | 4883 | 0.49 | 1.2 | 0.14 | Treats OPA Site storm discharge. ASW8 and ASW9 when interlinked can provide a total area of 0.95 ha. |
| ASW9 | 4659 | 0.47 | 1.2 | 0.10 | Treats extra FMP Site storm discharge. ASW8 and ASW9 when interlinked can provide a total area of 0.95 ha. |
| | **53475** | **5.35** | | | |
| | **Total** | **35.68** | | | |

* Wetland area has been increased from the previous wetland areas in WCS (Table 20 in Nutrient Budget Analysis Update report, October 2022).

# Hydraulic Loading Calculations

**Preliminary Hydraulic Loading Calcs For Storm Wetlands**

| | | | | First Flush Treatment Storage Check - using 15mm depth (Based on EA R&D Technical Report P2-159/TR2) | | | Alternative Treatment Storage Check - (Based on EA R&D Technical Report P2-159/TR2) | | |
|---|---|---|---|---|---|---|---|---|---|
| Storm Wetland | Contributing Drainage Zones (See Notes 2 and 3) | Contributing Storm Drainage Zone Area (ha) | Estimated Storm Catchment Impermeability (%) | Paved First Flush Volume (m3) | Average Treatment Depth (m) | WWAR (%) | Treatment Storage Rq (m3/ha) - Ref Figure 2.2 | Treatment Storage Rq (m3) | Average Wetland Depth (m) |
| W1 | WH1 (75%), ET1, ET2 | 66.76 | 49% | 4943 | 0.34 | 2% | 62 | 4139 | 0.28 |
| W2 | WH2 (80%), ETS | 33.69 | 56% | 2853 | 0.31 | 3% | 67 | 2257 | 0.25 |
| W3 | WH1 (25%) | 8.20 | 33% | 409 | 0.04 | 11% | 48 | 394 | 0.04 |
| W4 | RS2, RS3 & RH4 | 23.04 | 43% | 1502 | 0.09 | 7% | 56 | 1290 | 0.08 |
| W5 | RS1, WH3, E03 & WO2 | 62.45 | 41% | 3857 | 0.18 | 3% | 55 | 3435 | 0.16 |
| W6 | BH1, BH3, BH6, BH7, WO4 | 121.94 | 49% | 8997 | 0.34 | 2% | 62 | 7560 | 0.29 |
| W7 | W01, W03, BH2, BH4, BH5 & Phase 9 | 101.25 | 24% | 3678 | 0.15 | 2% | 41 | 4151 | 0.17 |
| W8 | WH2 (20%), WN1, WN2, EO4, SO6(30%), EO1 (70%), EO2, SO1, SO2 (70%), SO3, SO4, S05 | 131.97 | 46% | 9150 | 0.57 | 1% | 59 | 7786 | 0.48 |
| W9 | RS5 (25%) | 4.87 | 64% | 467 | 0.17 | 6% | 74 | 360 | 0.13 |
| W10 | WH5, RS5 (75%) | 23.02 | 62% | 2129 | 0.16 | 6% | 73 | 1680 | 0.13 |
| W11 | WH4 (30%) | 4.74 | 34% | 244 | 0.02 | 21% | 50 | 237 | 0.02 |
| W12 | WH4 (70%) | 11.05 | 34% | 570 | 0.05 | 11% | 50 | 553 | 0.04 |
| W14 | EO5, EO1 (30%), SO2 (30%) | 21.57 | 36% | 1163 | 0.10 | 5% | 51 | 1100 | 0.10 |
| | | | | **39959** | | | | **34943** | |

**Preliminary Hydraulic Loading Calcs For Additional Storm Wetlands**

| | | | First Flush Treatment Storage Check - using 15mm depth (Based on EA R&D Technical Report P2-159/TR2) | | | | Alternative Treatment Storage Check - (Based on EA R&D Technical Report P2-159/TR2) | | |
|---|---|---|---|---|---|---|---|---|---|
| Storm Wetland | Contributing Drainage Zones (See Notes 2 and 3) | Contributing Storm Drainage Zone Area (ha) | Estimated Storm Catchment Impermeability (%) | Paved First Flush Volume (m3) | Average Treatment Depth (m) | WWAR (%) | Treatment Storage Rq (m3/ha) - Ref Figure 2.2 | Treatment Storage Rq (m3) | Average Wetland Depth (m) |
| ASW1 | RS3 (50%), RS4 | 8.34 | 55% | 691 | 0.06 | 13% | 65 | 542 | 0.05 |
| ASW2 | RS5 (25%) | 4.86 | 64% | 467 | 0.22 | 4% | 74 | 360 | 0.17 |
| ASW3 | RS5 (25%) | 4.86 | 64% | 467 | 0.06 | 17% | 74 | 360 | 0.04 |
| ASW4 | EO2 (25%) EO3 (5%) | 5.43 | 20% | 161 | 0.03 | 12% | 38 | 206 | 0.03 |
| ASW5 | SO4 (10%) SO5 (25%) SO1 | 16.15 | 45% | 1097 | 0.17 | 4% | 58 | 937 | 0.14 |
| ASW6 | BH7 (40%) WO2 (50%) | 15.96 | 40% | 958 | 0.13 | 5% | 54 | 862 | 0.11 |
| ASW7 | E05, SO2 (30%) | 12.69 | 24% | 457 | 0.10 | 4% | 42 | 533 | 0.11 |
| ASW8 | WO1 (25%), WO3 (10%) | 9.16 | 50% | 688 | 0.14 | 5% | 64 | 586 | 0.12 |
| ASW9 | FMP1 | 7.44 | 40% | 447 | 0.10 | 6% | 54 | 402 | 0.09 |
| | | | | **5432** | | | | **4788** | |

**Preliminary Hydraulic Loading Calcs For Wastewater Wetland (W13) - Only OPA**

| | Effective Wetland Area (m2) - See Note 4 | Effective Wetland Depth (m) | Max Dry Weather Flow, DWF (m3/day) | Hydraulic Retention Time, HRT (days) - See note 5 | Hydraulic Loading Rate, HRT (m/day) - See Note 5 |
|---|---|---|---|---|---|
| OPTION 1 - Assuming 50mm effective treatment depth | 97597 | 0.05 | 2685.72 | 1.8 | 0.03 |
| OPTION 2 - Assuming 150mm effective treatment depth | 97597 | 0.15 | 2685.72 | 5.5 | 0.03 |
| OPTION 3 - Assuming 250mm effective treatment depth | 97597 | 0.25 | 2685.72 | 9.1 | 0.03 |

**For Wastewater Wetland (W13 & W15) - Only OPA/FMP**

| | Effective Wetland Area (m2) - See Note 6 | Effective Wetland Depth (m) | Max Dry Weather Flow, DWF (m3/day) | Hydraulic Retention Time, HRT (days) - See note 5 | Hydraulic Loading Rate, HRT (m/day) - See Note 5 |
|---|---|---|---|---|---|
| OPTION 1 - Assuming 50mm effective treatment depth | 115258 | 0.05 | 3456.70 | 1.7 | 0.03 |
| OPTION 2 - Assuming 150mm effective treatment depth | 115258 | 0.15 | 3456.70 | 5.0 | 0.03 |
| OPTION 3 - Assuming 250mm effective treatment depth | 115258 | 0.25 | 3456.70 | 8.3 | 0.03 |

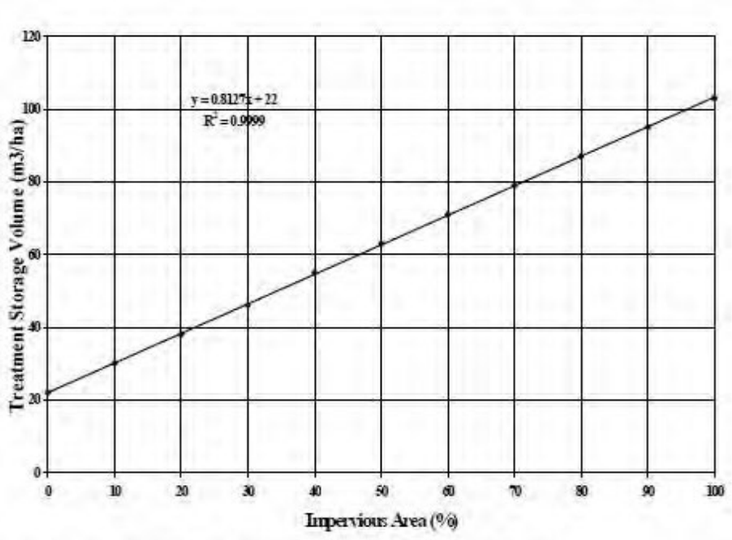


Figure 2.2 Wetland Treatment Storage Volumes

**Notes**

1. Proposed Wetland locations are shown on Drawing No. 10029956-AUK-XX-XX-DR--CW-0041-P3 (Proposed Nutrient Mitigation Strategy) in Appendix F.
2. Proposed Surface Water Drainage Zones are shown on Drawing No. 10029956-AUK-XX-XX-DR-CW-0014-P5 (Surface Water Drainage Strategy Overview) in Appendix A
3. Proposed Surface Water Drainage Strategy is shown on Drawing No. 10029956-AUK-XX-XX-DR-CW-0014-P5 (Surface Water Drainage Strategy Overview) in Appendix A
4. Total wetland area for W13 is 13.01ha but assumed 75% for effective wetland area and remaining 25% for creating bunds for cascade features (i.e. @ 1 in 20 existing ground slope).
5. The above shows that HRT of > 5 days and HLR of < 0.1 m/day can be achieved with the proposed WwTW wetland W13 (Option 3 - 250mm effective treatment depth) and therefore meets the recommended wetland design guidance.
6. Total wetland area for W15 is 2.73ha but assumed 65% for effective wetland area and remaining 35% for creating bunds for cascade features (i.e. @ 1 in 20 existing ground slope).

# Appendix F

## AECOM's Nitrogen and Phosphorus Nutrient Neutrality Habitats Regulations Assessment