

# Modelling Symposium

# **Emotion over Evidence?** The Value of Modelling Storm Overflow Impact

Presented by Graham Moralee – Stantec New Zealand



The Value of Modelling Storm Overflow Impact

#### AGENDA

- **Who** am I?
- What are storm overflows?
- **Why** are we interested in how they perform?
- What have we done to get to know them?
- When did they become headline news in the UK?
- **How** did the UK Government respond?
- Where and how do we go from here?





The Value of Modelling Storm Overflow Impact

#### **Graham Moralee CWEM**

Senior Principal Wastewater Networks Modeller, Stantec New Zealand

- 18 years' experience in wastewater networks modelling
- Work locations: United Kingdom, India, New Zealand
- Chartered member of CIWEM
- Focus on storm overflows, catchment planning, sustainable drainage







The Value of Modelling Storm Overflow Impact

What are storm overflows?

- □ Storm Overflows SOs
- □ Combined Sewer Overflows CSOs

□ Type 2 Engineered Overflow Points – EOPs



- Surcharge relief points
- Used to control flows in combined sewer networks
- Help prevent incidents such as flooding





The Value of Modelling Storm Overflow Impact

**Why** are we interested in how they perform?

- Should operate within limits of issued consent
  - Pass-forward flow during spill
  - Location of discharge
  - Provision of screening
- Modelling has played a significant role in helping water companies understand how their overflows operate







## Modelling Symposium 2024

### **Emotion over Evidence?**

The Value of Modelling Storm Overflow Impact





Modelling Group

The Value of Modelling Storm Overflow Impact

What have we done to get to know and improve them?

#### Storm Overflow Assessment Framework (SOAF)

| No. Years EDM<br>Data | Trigger for<br>investigation<br>(annual average) |
|-----------------------|--|
| 1                     | >60  |
| 2                     | >50  |
| 3+                    | >40  |







The Value of Modelling Storm Overflow Impact

What have we done to get to know and improve them?

#### <u>Stage 1 – Confirm Cause of</u> <u>Spill Frequency</u>

- Investigate operational issues
- Review EDM data
- Upgrade wastewater network model
- Confirm hydraulic cause







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What have we done to get to know and improve them?

#### <u>Stage 1 – Confirm Cause of</u> <u>Spill Frequency</u>

- Investigate operational issues
- Review EDM data
- Upgrade wastewater network model
- Confirm hydraulic cause

|                                      | N71207001   |  |  |  |  |  |  |  |
|--------------------------------------|---|--|--|--|--|--|--|--|
|                                      |   |  |  |  |  |  |  |  |
| Site name                            | STAINDROP_WINSTONRD   |  |  |  |  |  |  |  |
| WINEP Scheme Name                    | STAINDROP PUMPING STATION, STAINDROP, BARNARD CASTLE                              |  |  |  |  |  |  |  |
| Permit Reference                     | 252/1020  |  |  |  |  |  |  |  |
| WINEP Unique ID                      | 7NW200541   |  |  |  |  |  |  |  |
| WINEP Driver                         | U_INV   |  |  |  |  |  |  |  |
| STAGE 1A - Exceptional Rainfall      |   |  |  |  |  |  |  |  |
| Period Covered                       | 2012 - 2020   |  |  |  |  |  |  |  |
| Exceptional Rainfall Years           | None.   |  |  |  |  |  |  |  |
| STAGE 1B - Asset Maintenance         |   |  |  |  |  |  |  |  |
| NWG Ops Feedback                     | No known issues.  |  |  |  |  |  |  |  |
| Other Known Issues                   | None.   |  |  |  |  |  |  |  |
| STAGE 1C - Hydraulic Assessment      |   |  |  |  |  |  |  |  |
| Average Annual Spill Frequency       | 70  |  |  |  |  |  |  |  |
| (EDM) - full years of available data | 70  |  |  |  |  |  |  |  |
| Average Annual Spill Frequency       | 47  |  |  |  |  |  |  |  |
| (EDM) - 2018-2020                    | 47  |  |  |  |  |  |  |  |
| Modelled Average Annual Spill        |   |  |  |  |  |  |  |  |
| Frequency - 2018-2020                | 73  |  |  |  |  |  |  |  |
| Modelled Average Annual Spill        | 45 240  |  |  |  |  |  |  |  |
| Volume (m3) - 2018-2020              | 15,210  |  |  |  |  |  |  |  |
| Modelled Average Annual Spill        | 47.200  |  |  |  |  |  |  |  |
| Duration (minutes) - 2018-2020       | 47,308  |  |  |  |  |  |  |  |
| Dry Weather Flow (m3/s)              | 0.003   |  |  |  |  |  |  |  |
| Oth an Outfalla                      | Single storm overflow and sewage treatment works effluent discharging at the same |  |  |  |  |  |  |  |
| other Outfalls                       | outfall location.   |  |  |  |  |  |  |  |
| Primary Cause of High Spill          | Darland Par Harana Ang Hard   |  |  |  |  |  |  |  |
| Frequency                            | Hydraulically controlled.   |  |  |  |  |  |  |  |





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What have we done to get to know and improve them?

#### <u>Stage 2 – Water Quality</u> <u>Impact Assessment</u>

- Assess impact of overflow discharges on water quality
- River Impact Optimisation Tool (RIOT)
- Ammonia and biological oxygen demand impacts







The Value of Modelling Storm Overflow Impact

What have we done to get to know and improve them?

#### <u>Stage 2 – Water Quality</u> <u>Impact Assessment</u>

- Assess impact of overflow discharges on water quality
- River Impact Optimisation Tool (RIOT)
- Ammonia and biological oxygen demand impacts

| PLR                              | NZ13207001   |  |  |  |  |  |  |  |  |  |  |  |
|----------------------------------|--|--|--|--|--|--|--|--|--|--|--|--|
| Site name                        | STAINDROP_WINSTONRD  |  |  |  |  |  |  |  |  |  |  |  |
| WINEP Scheme Name                | STAINDROP PUMPING STATION, STAINDROP, I  | BARNARD CASTLE   |  |  |  |  |  |  |  |  |  |  |
| Permit Reference                 | 252/1020   |  |  |  |  |  |  |  |  |  |  |  |
| WINEP Unique ID                  | /NW200541  |  |  |  |  |  |  |  |  |  |  |  |
| WINEP Driver                     | U_INV  |  |  |  |  |  |  |  |  |  |  |  |
| STAGE 2A - Aesthetics Assessment |  |  |  |  |  |  |  |  |  |  |  |  |
|                                  | Survey 1 - Autumn  | Survey 2 - Spring  |  |  |  |  |  |  |  |  |  |  |
| Sewage Litter Score              | 5  | 5  |  |  |  |  |  |  |  |  |  |  |
| Sewage Fungus Outfall Score      | 5  | 0  |  |  |  |  |  |  |  |  |  |  |
| Sewage Fungus Downstream Score   | 0  | 0  |  |  |  |  |  |  |  |  |  |  |
| Amenity                          | Nor  | ne   |  |  |  |  |  |  |  |  |  |  |
| Amenity Score                    | 0  |  |  |  |  |  |  |  |  |  |  |  |
| Complaints Score                 | 0  |  |  |  |  |  |  |  |  |  |  |  |
| Pollution Incident Score         | 0  | 0  |  |  |  |  |  |  |  |  |  |  |
| Total Aesthetic Impact Score     | 10   | 5  |  |  |  |  |  |  |  |  |  |  |
| Aesthetic Impact Classification  | Very Low   | Very Low   |  |  |  |  |  |  |  |  |  |  |
| Overall Impact Classification    | Very   | Low  |  |  |  |  |  |  |  |  |  |  |
| Is CSO screened?                 | No   | )  |  |  |  |  |  |  |  |  |  |  |
| Screen type                      | Not fo   | bund   |  |  |  |  |  |  |  |  |  |  |
| Potential Aesthetic Improvement  | Lov  | N  |  |  |  |  |  |  |  |  |  |  |
| Comments                         | Little sewage derived litter or fungus o   | bserved. No amenity value location.  |  |  |  |  |  |  |  |  |  |  |
|                                  | STAGE 2B - Invertebrate Impact   |  |  |  |  |  |  |  |  |  |  |  |
|                                  | Survey 1 - Autumn  | Survey 2 - Spring  |  |  |  |  |  |  |  |  |  |  |
| Upstream                         | High   | High   |  |  |  |  |  |  |  |  |  |  |
| Downstream                       | Good   | Good   |  |  |  |  |  |  |  |  |  |  |
| Short-Term Impact                | Low  | Very high  |  |  |  |  |  |  |  |  |  |  |
| Long-Term Impact                 | Hig  | h  |  |  |  |  |  |  |  |  |  |  |
| Overall Impact Classification    | Very   | high   |  |  |  |  |  |  |  |  |  |  |
| Comments                         | WFD classification deteriorates from 'H<br>downstream. Variable results from the inver | ligh' to 'Good' between upstream and tebrate surveys ranging from 'Low' to 'Very |  |  |  |  |  |  |  |  |  |  |





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What have we done to get to know and improve them?

#### <u>Stage 3 – Options and Cost-</u> <u>Benefit Appraisal</u>

- 10 spills per year option
- Water quality benefits
- Monetised benefits
- Calculate cost-benefit ratio







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- 10 spills per year option
- Water quality benefits
- Monetised benefits
- Calculate cost-benefit ratio

| PLR                                 | NZ13207001                 |                            |   |                             |  |  |  |  |  |  |  |  |  |  |
|-------------------------------------|----------------------------|----------------------------|---|-----------------------------|--|--|--|--|--|--|--|--|--|--|
| Site name                           | STAINDROP_WINSTONRD        |                            |   |                             |  |  |  |  |  |  |  |  |  |  |
| WINEP Scheme Name                   | STAINDROP PUMPING STATIO   | N, STAINDROP, BARNARD CAS  | TLE   |                             |  |  |  |  |  |  |  |  |  |  |
| Permit Reference                    | 252/1020                   |                            |   |                             |  |  |  |  |  |  |  |  |  |  |
| WINEP Unique ID                     | 7NW200541                  | NW200541                   |   |                             |  |  |  |  |  |  |  |  |  |  |
| WINEP Driver                        | _INV                       |                            |   |                             |  |  |  |  |  |  |  |  |  |  |
| STAGE 3 OPTION IDENTIFICATION       | STORAGE OPTION (30 SPILLS) | STORAGE OPTION (10 SPILLS) | HYBRID (75% SURFACE<br>WATER SEPARATION +<br>STORAGE) | SURFACE WATER<br>SEPARATION |  |  |  |  |  |  |  |  |  |  |
| Size (m3 / ha / m3/s)               | 140                        | 420                        | 320   | 2.01                        |  |  |  |  |  |  |  |  |  |  |
| Average Annual Spills Achieved (204 | 30                         | 10                         | 10  | 66.7                        |  |  |  |  |  |  |  |  |  |  |
| Population benefitting              | -                          |                            | 469   | 469                         |  |  |  |  |  |  |  |  |  |  |
| Cost (IMOD Express - lower)         | £ 634,468                  | £ 774,398                  | £ 1,365,649   | £ 632,100                   |  |  |  |  |  |  |  |  |  |  |
| Cost (upper)                        | £ 951,702                  | £ 1,161,596                | £ 2,592,634   | £ 1,506,000                 |  |  |  |  |  |  |  |  |  |  |
| Benefits (Water Quality)            |                            |                            |   |                             |  |  |  |  |  |  |  |  |  |  |
| Water Quality (lower)               | £ -                        |                            | £ -   | £ -                         |  |  |  |  |  |  |  |  |  |  |
| Water Quality (assessed)            | £ 779,229                  | £ 779,229                  | £ 779,229   | £ 779,229                   |  |  |  |  |  |  |  |  |  |  |
| Water Quality (upper)               | £ 779,229                  | £ 779,229                  | £ 779,229   | £ 779,229                   |  |  |  |  |  |  |  |  |  |  |
| Benefit / Cost Ratio                |                            |                            |   |                             |  |  |  |  |  |  |  |  |  |  |
| BCR (lower)                         | -                          | -                          | 0.090   | 0.154                       |  |  |  |  |  |  |  |  |  |  |
| BCR (estimated)                     | 1.228                      | 1.006                      | 0.550   | 1.019                       |  |  |  |  |  |  |  |  |  |  |
| BCR (upper)                         | 1.228                      | 1.006                      | 0.873   | 1.887                       |  |  |  |  |  |  |  |  |  |  |





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What have we done to get to know and improve them?

#### Example of a cost-beneficial scheme

| PLR               | NZ35418201                 |
|-------------------|----------------------------|
| Site name         | LUDWORTH_MOORCR            |
| WINEP Scheme Name | NZ35418201_LUDWORTH_MOORCR |
| Permit Reference  | 245/1256                   |
| WINEP Unique ID   | N/A                        |
| WINEP Driver      | U_INV                      |



| Site name                                   | NZ35418201_LUDWORTH_MOORCR                   |
|---|--|
| Average Spill Frequency (all years of data) | 41   |
| Average Spill Frequency (2018-2020)         | 58   |
| Stage 1 Assessment Outcome                  | Hydraulic Overload                           |
| Aesthetic Overall Classification            | Low  |
| Invertebrate - Worst Case Impact            | -  |
| Receiving Watercourse                       | Sherburn Beck from source to Pittington Beck |
| Dilution                                    | 1.8  |
| WQ Model Outcome (CSO Impact)               | High to Bad                                  |
| 30 Spills Storage BCR                       | 1.953  |
| 30 Spills Surface Water Separation BCR      | 0  |
| Option(s) with BCR > 0.5?                   | Yes  |
| Next Step                                   | Potential for scheme                         |

| STAGE 3 SCREENING SUMMARY   |
|---|
| Model assessed maximum WQ <b>benefit is significant</b>           |
| Aesthetic benefit is zero due to existing screen and low          |
| impact and low amenity  |
| Surface water removal option would deliver some wider             |
| benefits but costs are high and uncertain and cannot              |
| achieve 30 spills per year  |
| Overall assessment is storage option is <b>potentially cost</b> - |
| beneficial  |
| Recommendation: Consider taking forward as potential scheme       |



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What have we done to get to know and improve them?

#### Example of a non cost-beneficial scheme

| PLR               | NZ16363205                        |
|-------------------|-----------------------------------|
| Site name         | RODDYMOOR_FARRERSARMS_5           |
| WINEP Scheme Name | PEASES WEST CSO, CROOK, CO.DURHAM |
| Permit Reference  | 241/1083                          |
| WINEP Unique ID   | 7NW200501                         |
| WINEP Driver      | U_INV                             |



| Site name                                   | NZ16363205_RODDYMOOR_FARRERSARMS_5 |
|---|------------------------------------|
| Average Spill Frequency (all years of data) | 47                                 |
| Average Spill Frequency (2018-2020)         | 55                                 |
| Stage 1 Assessment Outcome                  | Hydraulic Overload                 |
| Aesthetic Overall Classification            | Moderate                           |
| Invertebrate - Worst Case Impact            | No impact                          |
| Receiving Watercourse                       | Beechburn Beck (Trib of Wear)      |
| Dilution                                    | 1.2                                |
| WQ Model Outcome (CSO Impact)               | High to Good                       |
| 30 Spills Storage BCR                       | 0.089                              |
| 30 Spills Surface Water Separation BCR      | 0.319                              |
| Option(s) with BCR > 0.5?                   | No                                 |
| Next Step                                   | No further action                  |

| STAGE 3 SCREENING SUMMARY  |
|--|
| Model assessed maximum WQ <b>benefit is zero</b> for Good to<br>High |
| Aesthetic benefit is zero due to existing screen and low             |
| impact and low amenity   |
| Surface water removal option would deliver some wider                |
| benefits but costs are high and uncertain and cannot                 |
| achieve 30 spills per year   |
| Overall assessment is options are <b>non cost-beneficial</b>         |
| Recommendation: No further action under SOAF                         |





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What have we done to get to know and improve them?

| Campibate Data |             |   |  |                          |                         |                  |   |  | Slage 1a -<br>Europticaal<br>Rainfall | Slage 16 -<br>Maart<br>Haintename | 51.                            | ye 1a - Nydeantin A              | 1  |                                       | 51.4.                                    | 2 Aralbolia                                | . 109201                        |   |          |                 | 51.q. 2   | l - Inneelekee                        | le (Dialogiael) lageal                | Slage Zo - Walee Quality Impact       |   |   |   |          |                              |   |
|----------------|-------------|---|--|--------------------------|-------------------------|------------------|---|--|---------------------------------------|-----------------------------------|--------------------------------|----------------------------------|--|---------------------------------------|--|--|---------------------------------|---|----------|-----------------|-----------|---------------------------------------|---------------------------------------|---------------------------------------|---|---|---|----------|------------------------------|---|
| 1              |             | 5il                                     | WINEP Salver Nor.  | Promit<br>Reference<br>V | WINEP<br>Baigar ID<br>V | WIREP D          | Proposed<br>Beliarry<br>Bale            | Annar<br>Spill<br>Isli geografi<br>of di | 5,:11<br>[2848.<br>282                | âaaraaanal<br>Caayteliaa<br>Bale  | Annennal<br>Completion<br>Bale | Assessment<br>Completion<br>Pale | 8  | Slayr 1 Praining                      | Availation<br>Survey 1 -<br>Bale         | Aralkelia<br>Sararg 1 -<br>Classifiadi<br> | Arathelia<br>Savarg 2 -<br>Bale | Aralbelia<br>Sarary 2 -<br>Classificati | ●        | wrs<br>Bysleren | •***<br>• | laarelekeste<br>Aslaan 2020<br>Impart | laarelekeste<br>Spring 2021<br>Impart | Inneelekente<br>Balana 2021<br>Inpari | ale lanerslebeal<br>• Ourgall •<br>• Lang-Term<br>• Impar | Innerstehends<br>• Warnt Con-<br>Ingart | Rearining Walesconson                           | Bilaliaa | Wa Hadal<br>Accessed<br>Bale | We Hadel<br>+alasar (CS+<br>Impeal)<br>[kald infi-<br>prefialed a<br>story] |
| - 5            | 111112111   | HU1988288 LONGFRAM_THEGREEN             | Hew Hall Fare CSO, CSO LONGFRAMLINGTON, HORTHUMP                                 | 225/8522                 | 78//200435              | U_187            | 51/85/2822                              |  | 56                                    | 21/81/2821                        | 13/12/2021                     | 13/42/2024                       | Hydraelis Overland   | Program In Stage 2                    | 21/11/2121                               | Halayard                                   | 38/83/2824                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Cagarl From Perrol Para in Tidal Limit          | 8.7      | 19/12/2021                   | 16.   |
| - 0            | Y78635786   | HY78555785_HALTWHISTLE_STATIOHRD        | OLD TYNE BRIDGE, HALTWHISTLE   | 252/1166                 | 78//200497              | U_187            | 51/15/2122                              | 45                                       | 58                                    | 21/01/2021                        | 17/11/2121                     | 17/11/2121                       | Hydraulis Overland   | Progress In Stage 2                   | 11/11/2121                               | Yreglau                                    | 25/85/2824                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Saalb Tyur Fran Tipall Dara la Allea            | 284.5    | H/e /                        | H/A   |
| - 0            | 47146668S   | HY71455585_ALSTOH_STATIOHRD_85          | THE CARAVAN PARK CSO, ALSTON, CUMPRIA  | 292/1159                 | 7HW200557               | U_187            | 54/85/2822                              | 75                                       | 15                                    | 21/11/2021                        | 21/10/2021                     | 21/10/2021                       | Hydraulis Overland   | Progress In Stage 2                   | 21/11/2121                               | Verglau                                    | 25/85/2824                      | Verglau                                 | Verglau  |                 |           |                                       |                                       |                                       |   |   | Saalk Tyor Fran Plank Para la Tipall Para       | 566.7    | 17/12/2021                   | High > High   |
| - 1            | Y84643412   | HYBREASA12_HAYDOHDRIDG_CHURCHST         | THE VICARAGE, HAYDON DRIDGE, HEXNAM, HORTHUMP                                    | 252/1148                 | 2HW200562               | U_187            | 51/85/2822                              | \$7                                      |                                       | 24/84/2824                        | 24/42/2824                     | 24/42/2824                       | Hydraulis Overland   | Progress In Slage 2                   | 27/18/2828                               | Verglau                                    | 25/85/2824                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Saalk Tyor From Allea In Harlk Tyor             | 363.4    | <u> </u>                     |   |
| <u>1</u>       | 492658984   | HYSZESESE1_ACOMD_GARDENHOUSEDANK        | ACOMP 550, ACOMP   | 255/6/1245               | 78/20010                | U_187            | 51/15/2122                              | 55                                       | 78                                    | 21/01/2021                        | 14/12/2821                     | 14/12/2021                       | Hydraulis Ourrlaad   | Progress In Slage 2                   | 21/11/2121                               | Verglau                                    | 25/85/2824                      | Verglau                                 | Verglau  |                 |           |                                       |                                       |                                       |   |   | Red Para [Trik of Type]                         | 2272.5   | <u>1 11/8</u>                | H/A   |
| L              | Y38646482   | HYSEGGERZ_CORDRIDGE_WELLDAHK            | HYSEGGGEZ_CORDRIDGE_WELLDAHK   | 255/1252                 | H/A                     | U_INV            | 51/15/2122                              | 46                                       |                                       | 21/11/2121                        |                                |                                  |  |                                       | 21/11/2121                               | Verglau                                    | 25/85/2824                      | Verglau                                 | Verglau  | •               |           | •                                     |                                       |                                       |   |   | Type FranWalernmeel in Tidal Limit              | 371.4    | <b></b> '                    | <b>└───</b>   |
| L              | 211131113   | H20119009_COTHERSTONE_THEHAGG           | THE HAGGSSO, COTHERSTONE, BARMARD CASTLE   | 251/1152                 | 7HW20550                | U_INV            | 31/13/2122                              | 46                                       |                                       | 21/11/2121                        | 21/11/2121                     | 21/11/2121                       | Hydraelie Oerrlaad   | Progress In Slage 2                   | 25/15/2121                               | VergLau                                    | 17/14/2024                      | Leu                                     | Leu      | •               | Paar      | •                                     | •                                     |                                       |   | · ·                                     | Balder Calabaral [Irib of Tera]                 | 485.5    | <u> </u>                     | <b>└───</b>   |
| H              | 211305506   | H2113BSSB_TOWLWW_SEWHGEWORKS            | TOW LAW STW, TOW LAW, DISHOP ADCKLARD, CO.DURNA                                  | 1 2012110                | 78028555                | U_167            | 54/15/2122                              |  |                                       | 0/1/00                            | 67172121                       | 67172121                         | Higheantin Verelaad  | Progress in Slage 2                   | 11/11/2121                               | VergLau                                    | 51/85/2821                      | Hadecale                                | Hadecale |                 |           |                                       |                                       |                                       |   |   | Hanarlay Brak from Saarar laWrar                | 3.5      | 11/11/2121                   | Pad > Dad   |
| H              | 212412115   | HETERS_KHITSLET_KHITSLETHOOK            | VUTSPIELD LARE CSO [DER 132], DELVES, CORSETT, CO.D                              | 20071011                 | 70020005                | U_187            | 54/15/2122                              |  |                                       | 0/01/01/0                         | meneder                        | minicalet                        | Hydraelie Verriead   | Progress in Slage C                   | 12/11/2121                               | Halayaal                                   | 51/15/2021                      | VergLau                                 | VergLau  | High            | High      | Leu                                   | Hadreale                              | Hadres                                | Haderale  | Hadecale                                | Smallbape Para Fran Saarar la Prawary, Slaabe   | 2.2      | 16/11/2021                   | Pad > Pad   |
| H              | 21928287884 | HEISENTELSTWINDKOP_WINSTONKD            | STRINGROUP UNPERING STRITON, STRINGROUP, DARMARD C                               |                          | 700760341               | u_inv            | 51/15/2122                              |  |                                       | 61/11/2021                        |                                |                                  |  |                                       | 19/11/2121                               | VergLau                                    | 17/10/2024                      | Verglau                                 | Verglau  | High            | Gaad      | Leu                                   | Verghigh                              | · Verghi                              | Righ  | Verghigh                                | Sadhara Prak Fran Saarar la Langleg Prak        | 19.7     | t'                           | 1   |
| H              | 215313385   | HEISTISS WITTORLEWERK WITTORSPS         | THE HOLE AND A DEPONDENT AND A DEPONDENT AND |                          | 700720073               | L_IN7            | 51/15/2122                              | 31                                       |                                       | 21/11/2021                        | 11/11/11/14                    | 23/10/2021                       | Hearing Verriese   | Progress la slage c                   | 21/11/2121                               | VergLau                                    | 11/14/2021                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Wear Fran Hanariag Prak in Perakhara Prak       | 113.6    | 15/11/2121                   | High>High   |
| H              | 163333384   | HARTING COOK DIODETIDE AT               | DIODEFIDE CTO, CROOK, CO DUDUOM  | 14414                    | 100120000               | L 107            | 31/13/2122                              | 14                                       |                                       | 1414413134                        | 11/11/11/14                    | 11/11/11/14                      | Harriste Verrieze  | Program in stage c                    | 11/11/2121                               | VergLau                                    | 11/14/2021                      | Leu                                     | Leu      | Gaad            | Gaad      | dererly erer                          | Reimpaul                              |                                       | High High   | derarly area                            | Presbars Pres Trib of Wear                      |          | 11/11/2021                   | Pad > Pad   |
| - B            | 216357384   | HARTING CROOK_PERPENDE_I                | DEALERINE CIO, CROOK, CO.DURNAN  | 244/488                  | 70072004                | 0,007            | 31/13/2022                              |  |                                       | 14/14/11/14                       | 11/11/11/1                     | 11/11/11/1                       | Hada and American  | Program in stage t                    | 11/11/2121                               | Leu  | 21/15/2021                      | Pladecale                               | Haderale | High            | Gaad      |                                       | High                                  |                                       | are graver  |   | Presbars Preb Trib at Wear                      |          | 15/11/2021                   | 0.450.4   |
| - B            | 216363285   | HTTELSTATE CONTRIAND DODDOTOD           | MEMODIAL HALL STA DANTELAND  | 226/8488                 | 200-2200-403            | 0_00             | 51/15/2022                              |  |                                       | 24/84/2824                        |                                |                                  | Address of the second s |                                       | 11/11/2121                               |  | 6/10/2121                       | Hadecale                                | Haderale | High            | High      | Recepted                              | Recepted                              | - Recept                              | n ne regard   | Recepted                                | Perukkara Prak [TrikatWear]                     | 1.4      | 1/1//////                    | and served  |
| - B            |             | H24211ELLS HIGHGRANGE LOWWARTWORTH      | LOWWADWORTH SPS. LOWWADWORTH FARM, CROOK   | 241/1884                 | 200/200425              | U 1HP420 1HV12.  | 4 444447477                             | 54                                       |                                       | 24/84/2824                        | 23/11/2124                     | 21/11/2124                       | Made calls Genela ed   | Province le Slove 2                   |  | Providence                                 | 10/10/10/1                      | Lau                                     | 1        |                 |           |                                       | 111177317                             |                                       | -   |   | West from Henry In Dark In Dearbhan Deab        | 141.4    | 1.000                        | Web a Web   |
| - H            | 47548547    | H242548647 ANNPIELDOL MITCHELLST        | H242548642 ANNELDEL MITCHELLST   | 255/1822                 | 8/9                     | U 187            | 14/11/2022                              | 42                                       | 45                                    | 24/84/2824                        | 11/10/2021                     | 11/10/2024                       | Hade calls Overland  | Proverse le Silver 2                  | 47/48/2128                               | Hadaada                                    | 47/14/2024                      | Madagada                                | Helesda  |                 |           |                                       |                                       |                                       |   |   | To an form formula Tom                          | 212.1    | 41/41/2124                   | Buls Bul  |
| - H            |             | H211548818 KIPHILL TOMPIELDLEOSTH       | H21154001 KIPHILL TANFIELDLEASTH   | 255/4745                 | 8/8                     | U 187            | 54/15/2022                              | 54                                       | 58                                    | 21/81/2821                        | 11/10/2021                     | 11/11/2121                       | Hade calls Overland  | Program la Silver 2                   | 26/48/2828                               | 1 au                                       | 49/84/2824                      | Madaada                                 | Hedrede  |                 | Base      |                                       |                                       |                                       |   |   | To us from Second In Torus                      |          | 4424822824                   | 8.4.5.8.4   |
| – H            | 2212347     | HZZ1211211 DISHOPAUCK THEDELL           | H221214211 DISHOPAUCK THEDELL  | 242/1842                 | 8/8                     | U THEATU HEY IZ. | 4 94/19/2022                            | 186                                      | 111                                   | 21/11/2121                        |                                |                                  |  |                                       | 10/11/2020                               | Law.                                       | 12/14/2024                      | Hadaada                                 | Hadavala | Mint.           | Hint.     | - Levi                                | . Law                                 |                                       | Vera lev  | - Lev                                   | Guadana Sana Hamma Bask la Wala                 | 22.4     |                              |   |
| - E            | 222499489   | H222133413 MANFIELD APPEYVILLA          | Menfield STW 550 MH3, Menfield   | 252/8/1275               | 78/200403               | U INY            | 14/11/2022                              |  | 65                                    | 21/11/2121                        | 15/11/2021                     | 15/11/2021                       | Hade callin Careland   | Proservas la Silvar 2                 | 28/89/2828                               | He les vel                                 | 42/84/2824                      | Law.                                    | Lev.     |                 | P.d.      |                                       |                                       |                                       | 1000  |   | Han mad laik of Pines Tana                      | 4528.3   | 8/4                          | 8/0   |
| - li           | 222438584   | HZZZ498581_EDHOHDSLEY_DEECHVILLE        | H2224SISB1_EDHOHDSLEY_DEECHVILLE   | 245/1883                 | H/A                     | U_INV            | 31/13/2122                              | 58                                       | 58                                    | 21/81/2821                        | 11/10/2021                     | 11/10/2021                       | Hydraelis Overland   | Pragress la Slage 2                   |  |  | 12/14/2021                      | Veralau                                 | Verslaw  | Hink            | Hist      |                                       | Lev                                   |                                       |   |   | Case Para from Secret la Tuisell Para           | 52.2     | 23/13/2121                   | Rad > Rad   |
| - lī           | 24383783    | HZZ4585785_DROWHEY_DROWHEYLH            | PROWNEY LANE CSO, PRANDON, DURNAM  | 244/1005                 | 78/20050                | U_187            | 31/13/2122                              | 47                                       | 54                                    | 21/81/2821                        |                                |                                  |  |                                       | 0/11/2020                                | Hadecale                                   | 11/14/2024                      | Yerslaw                                 | Haderale |                 | Paur      |                                       |                                       |                                       |   |   | Unsued trib of River Provers                    | 0.1      |                              |   |
| - lî           | 224997882   | HZZ4557882 DROWHEY DROWHEYLH            | FRONT STREET CSO, DROWNEY, DROWNEY, CO.DURNAM                                    | 244/8527                 | 78/20031                | U_IHV            | 31/83/2822                              | 58                                       | \$7                                   | 21/81/2821                        |                                |                                  |  |                                       | 13/11/2121                               | Lev  | 13/14/2121                      | Halassal                                | Lev      |                 | Paur      |                                       |                                       |                                       |   |   | Provers from Decentration and However           | 617.4    |                              |   |
| - lî           | 225346586   | HZZSSHESHE SPENNYHOOR HAYPIELDS         | HAYFIELD CSO, SPENHYHOOR, CO.DURHAH  | 245/8572                 | 786/201407              | U_187            | 31/83/2822                              | 43                                       | 55                                    | 21/01/2021                        | 17/10/2021                     | 17/11/2121                       | Hydraulis Ourrlaad   | Progress In Slage 2                   | 13/18/2828                               | Yerslaw                                    | 878472824                       | Yerslaw                                 | Yerslaw  |                 | Paur      |                                       |                                       |                                       |   |   | Valles Para from Source IsWear                  | 8.5      | 15/15/2121                   | Pad > Pad   |
| - 17           | 225425588   | H225425588_DURNAH_TOLLHOUSERD           | TOLL NOUSE ROAD CSO, CROSSGATE MOOR, DURNAM                                      | 244/101                  | 78/200564               | U_187            | 51/85/2822                              | 55                                       | 52                                    | 21/01/2021                        |                                |                                  |  |                                       | 19/18/2828                               | Verslaw                                    | 16/84/2824                      | Yrralau                                 | Yrrates  | Haderale        | Gand      | Hadreale                              | Haingard                              | Hadres                                | Hainsel   | Hadecale                                | Provers from Smallboor Para Deceases anofi      | 87.4     |                              |   |
| - 17           | 226975784   | HZZES75781_SUNDERLANDBRDG_THELODGE      | SUNDERLAND DRIDGE 550, SUNDERLAND DRIDGE   | 245/0/8568               | 78/200555               | U_187            | 51/85/2822                              | 44                                       | 47                                    | 21/01/2021                        | 15/12/2021                     | 15/12/2021                       | Hydraelis Overland   | Progress In Slage 2                   | 13/11/2121                               | Verslau                                    | 11/14/2024                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Wear from Gambres in Provers                    | 336.3    | H/e                          | 8/8   |
| - 17           | 226479481   | HZZE475481_PLAWSWORTH_SEWAGEWORKS       | PLAWSWORTH SSO MH1, PLAWSWORTH   | 245/6/8245               | 78/200510               | U_IHP47U_IHV12.  | 4 31/83/2822                            | 58                                       |                                       | 21/01/2021                        | 15/11/2021                     | 15/44/2024                       | Hydraulis Overland   | Program In Stage 2                    | 21/11/2121                               | Hadecale                                   | 15/84/2821                      | Verglau                                 | Hadecale | Haderale        | Hadecale  | Verglau                               | Haingaal                              | Yees la                               | Haingaal  | Verglau                                 | Plankdrer Pers Is seeflereer wilk Wear          | 5.4      | 17/12/2021                   | b.d < b.d   |
| - 0            | 226692489   | HZZEESZINS_DENTOH_GRASSHOLMEPL_NS       | GRASSHOLM PLACE CSO, LONGPENTON, NEW CASTLE UPO                                  | 255/1856                 | 286/20032               | 0_1HV            | 51/85/2822                              | 42                                       |                                       | 21/01/2021                        |                                |                                  |  |                                       | 22/10/2020                               | Leu  | 14/84/2821                      | Hadecale                                | Haderale | Paar            | Haderale  | Haingaal                              | Halayart                              | Hainga                                | I Haingaal  | Haingaal                                | Oner Para from Secret la Tyar                   | 8.3      |                              |   |
| - 0            | 220244000   | HZZEZ44EE_HEWTOHAYCLIFFE_GROATDR        | TRAVELLERS GREEN CSO [SENIS], REAR OF STRAVELLER                                 | \$ 259/1269              | 786/200567              | U_187            | 54/15/2122                              | 62                                       | 55                                    | 21/11/2121                        | 17/11/2121                     | 17/11/2121                       | Hydraelie Oerrlaad   | Progress in Slage 2                   | 51/15/2121                               | Leu  | 16/14/2124                      | Hadecale                                | Hadreste | Gaad            | Gaad      | Yeey high                             | Haingaal                              | · Very hi                             | Hadecale  | Verykigh                                | Unsued Irik In Derman's Peak                    | 5.7      | 21/15/2121                   | Pour > Dad  |
| - 0            | 220043303   | HZZER45585_CAMPOIS_GLAXO                | GLAXOWEST CSO, WEST SLEEKPURH, HORTHUMPRIA                                       | 225/1825                 | 786/20055               | U_187            | 51/15/2122                              | - 47                                     | 33                                    | 21/11/2121                        | 17/11/2021                     | 17/11/2021                       | Hydraelie Oerrlead   | Progress in Slage 2                   | 21/10/2020                               | Verglau                                    | 21/14/2124                      | Verglau                                 | Verglau  |                 |           |                                       |                                       |                                       |   |   | Halparlaf a riser/WB salabaral - Riser/Wassbrak | 21.7     | H/e /                        | H/A   |
| - 0            | 220060240   | H220060210_ASHINGTON_HEWDIGGINRD        | HZZENSEZIL_ASHINGTON_NEWDIGGINRD   | 225/1878                 | H/A                     | U_187            | 31/13/2122                              | 45                                       | 52                                    | 21/01/2021                        | 12/11/2021                     | 12/11/2121                       | Hydraelis Verrlaad   | Program In Stage 2                    | 21/10/2020                               | Leu  | 21/14/2124                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Wanakeak Fean Palkal Para la Harik Sea          | 1135.8   | H/8                          | H/A   |
| - 0            | 220314006   | H228914886_ELLINGTON_FIRSTROW           | LYHE CSO [CHINS], HEAR 17 FIRST ROW, ELLINGTON, HOR                              | 224/1555                 | 78//200477              | U_187            | 31/83/2822                              | 41                                       | 33                                    | 21/81/2821                        | 25/11/2124                     | 23/10/2024                       | Hydraulis Overland   | Program In Stage 2                    | 21/18/2828                               | Leu  | 28/84/2824                      | Hadecale                                | Haderale |                 | 8.4       |                                       |                                       |                                       |   |   | Unnamed Irik In River Lyne                      | 42.2     | 878                          | H/A   |
| 1              | 229947889   | H225517885_LYHEHOUTH_SEAVIEW            | SEA VIEW CSO, LYHEHOUTH, HORTHUMPERLAND  | 224/8554                 | 284/288525              | U_187            | 51/85/2822                              | 24                                       | - 18                                  | 21/01/2021                        | 23/10/2024                     | 23/11/2124                       | Hydraulis Overland   | Progress In Stage 2                   | 21/10/2020                               | Halapart                                   | 28/84/2824                      | Verglau                                 | Verglau  |                 |           |                                       |                                       |                                       |   |   | River Lyor                                      | 2.5      | <u> 878 </u>                 | 8/8   |
| <u>1</u>       | 292418982   | H292418982_SHERBURH_HILLLH              | H292418982_SHERPURH_HILLLH   |                          | H/A                     | U_187            | 51/15/2122                              | 44                                       | 55                                    | 21/01/2021                        | 20/05/2024                     | 20/03/2021                       | Operational Canor  |                                       | 16/11/2121                               | Leu  | 15/84/2821                      | Verglau                                 | Leu      | High            | High      | Haingaal                              | Tree ararer                           |                                       | les Les   | Tree arares                             | Shadfarlk Prak la Pillinglan Prak               | 24.4     | <u> </u>                     | H/A   |
| L              | 23242488    | H292421009_SHERDURH_CHAPELCOURT         | CHAPEL COURT DUILS, SHERPURH   | 245/4884                 | 78/200005               | U_187            | 51/15/2122                              | 56                                       | 58                                    | 21/01/2021                        | 21/13/2124                     | 21/13/2124                       | Hydraelie Oerrlaad   | Progress In Slage 2                   | 21/11/2121                               | Halapart                                   | 15/84/2821                      | Halayard                                | Halayard |                 |           |                                       |                                       |                                       |   |   | Shadfarlh Prak la Pillinglan Prak               | 3.5      | 27/13/2121                   | Page > Page   |
| L              | 233487684   | H255487581_HOUGHTOH_DROOKSIDE           | WARDEN GROVE SSO, PROOKSIDE, HETTOH-LE-HOLE                                      | 245/0/1299               | 78//200574              | U_1HV            | 51/15/2122                              | \$2                                      | \$1                                   | 21/01/2021                        |                                |                                  |  |                                       | 19/19/2020                               | Verglau                                    | 19/84/2821                      | Leu                                     | Leu      | Gaad            | High      | Leu                                   | Leu                                   | ·                                     | Leu   | Leu                                     | Raisles Pere la Heara Pere                      | 5.Z      | <b>↓</b> '                   | <b>└───</b> ┤   |
| - 14           | 233523483   | H299529489_HOUGHTOH_TRAVERSST           | HOUGHTON LE SPRING, DACK TRAVERS ST CSO INERRING                                 | EPRODITIVA               | 78/200107               | 0_187            | 54/85/2822                              | 42                                       |                                       | 21/11/2021                        |                                |                                  |  |                                       | 49/40/2020                               | Verglau                                    | 21/14/2124                      | Verglau                                 | Verglau  | 8.4             | Paar      | Haingaal                              | Verglau                               | Yeeg la                               | Hainpaal  | Verglau                                 | Herringlan Para Fran Sanrar la Lanley Park Para | 3.7      | <u> </u>                     | +   |
| - 14           | 294622745   | H254622715_DOLDOHCOLL_HAILSWORTHCL      | STATION ROAD CSO, BOLDON COLLIERY, GATESHEAD, TY                                 | 255/4782                 | 78//200547              | 0_187            | 51/15/2122                              |  |                                       | 21/11/2121                        |                                |                                  |  |                                       | 51/11/2121                               | Leu  | 21/14/2124                      | Leu                                     | Leu      | 6.4             | Paar      |                                       |                                       |                                       | · ·   |   | Dan fran Saarar In Tidal Limit                  | 1.1      | <u>، اسمار ا</u>             | 4   |
| - 14           | 235114383   | HEISING HIDOHEROW_THEFROHT_SIS          | HEISING HIDOHEROW_THEFROHT_SIS   | EPRPDIISYX               | H/A                     | 0_187            | 51/15/2122                              |  | - 16                                  | 21/01/2021                        | 17/12/2024                     | 17/12/2021                       | Operational Canor  |                                       | 21/15/2121                               | Verglau                                    | 12/14/2121                      | Hadreste                                | Hadreste |                 | · ·       | · ·                                   |                                       |                                       | - · · ·   |   | Tera fran Skrear In Tidal Linil                 | 283.6    | <u>ن</u>                     | +   |
| - 14           | 235121313   | RESSTERSES_MIDONEROW_THEPROHT_SES       | HIDDLETON ONE ROW CSO, THE PRONT, HIDDLETON ONE                                  | GR.25/10/150             | 700/20100               | 6_187            | 31/13/2122                              |  | 51                                    | 21/01/2021                        |                                |                                  |  | +                                     | 21/11/2121                               | Verglau                                    | 12/14/2121                      | Verglau                                 | Verglau  | •               | •         |                                       |                                       |                                       | · ·   | · ·                                     | Tera fran Skrear la Tidal Linil                 | 225.5    | <u> </u>                     | +   |
| - 14           | 235418281   | MESSANEEN_LUDWORTH_HOORCR               | Incastingen_Lupworth_HOORCR  | 245/1256                 | H/A                     | 0_187            | 31/13/2122                              | - 44                                     |                                       | 21/01/2021                        | ca/13/2021                     | 0/10/2021                        | Hydrautic Corrigad   | Progress in Slage 2                   | 16/16/2121                               | Leu  |                                 |   | Leu      | Haderale        | Gaad      | •                                     | Leu                                   |                                       |   |   | Sheebara Deak Fran anner la Pillinglan Deak     | 1.1      | 21/19/2021                   | Bigh > Dad  |
| - 14           | 235619782   | RESSANT/RE_POLDORCOLL_PROOKERY_RE       | WROOME HYERUE INVERTS I VINS CSO, SEADURH & ROKER                                | 4 EPRP9792AU             | 200020055               | <u>a_187</u>     | 51/15/2022                              |  |                                       | 21/01/2021                        |                                |                                  |  |                                       | 51/10/2020                               | VergLau                                    | 21/85/2821                      | Leu                                     | Leu      | Haderale        | Haderale  | Leu                                   | 1                                     | · 5                                   | Leu   | 300000                                  | Das fran Saarar Is Tidal Linil                  | 18.3     | <b></b> '                    | ++  |
| - 14           | 295619789   | RESSISTED_POLDORCOLL_PROOKERV_85        | WEST BOLDON SSO NO 4, BOLDON   | 65/1/1614                | 70020576                | 4_187            | 51/85/2822                              |  |                                       | 21/01/2021                        |                                |                                  |  |                                       | 51/11/2121                               | Halapaal                                   | 21/85/2821                      | Leu                                     | Leu      |                 |           |                                       |                                       |                                       |   |   | Das fran Saarar Is Tidal Linil                  | 3.3      | <u> </u>                     | t   |
| - 8            | 2979585814  | NEARASINAL I KINDONCOLL_NORSECLLM       | ENHALET MECK CS0, SOUTH OF WILLOWFIELD HOUSE, TRI                                | 0/07/051                 | 20020005                | 4_187            | 51/15/2122                              | - 11                                     |                                       | 21/11/2021                        | 0/11/2021                      | 0/11/2021                        | Highrantin Overland  | Progress in Slage 2                   | 16/11/2121                               | Halapaal                                   | 19/84/2821                      | Leu                                     | Leu      | Paar            | Gaad      | Haingaal                              | Haingaal                              | · Hainga                              | Haingaal  | Haingaal                                | Langleg Peak - Irik of River Sherne             |          | <u> </u>                     | H/A   |
| H              | 237611313   | HEARING CHAINOLDON_STGEORGESTC          | THE POLEON STORE TO BE THE POLE AND          | 1 177 14417              | 200/2000                | 4_187            | 51/15/2122                              | 42                                       |                                       | 21/11/2021                        |                                |                                  |  |                                       | 31/11/2121                               | Halapaal                                   | 20/04/2024                      | Halapaal                                | Halapaal |                 |           |                                       |                                       |                                       |   |   | Des Fran Searar la Tidal Linil                  | 4.1      | <u> </u>                     | ++  |
| H              |             | NAMES OF TANK AND A TRADE OF THE OFFICE | DOLTON LE DOLE CEO LEMIL CONFELIME DEON DOOD                                     | 17710 1111               | 100/201515              |                  | 31/15/2122                              |  |                                       | 1414412124                        | 1414013034                     | 14 148 13834                     |  |                                       | 87172121                                 | YrrgLau                                    | 14/84/2821                      | Leu                                     | Leu      | Haderale        | Haderale  | Heimpani                              | 20000                                 | · 37.77                               | Finderale   | 30.000                                  | Chap Pool Prok source to tidal limit            |          | <u> </u>                     | t   |
| H              |             | H24241124E FOOLFSCHER BUTTTEN           | STORT FOR FSCUPPE BANK STOCKTON  | 254/442*                 | 2002007                 | 1 189            | 31/13/2022                              | 23                                       | 15                                    | 24/14/2024                        | contract.                      |                                  | A A REAL PROPERTY AND A RE | · · · · · · · · · · · · · · · · · · · | 20/10/2020                               |  | 15/84/2821                      | Lou                                     | Leu      | Haderale        | Haderale  | Yrrylau                               |                                       |                                       | 212 Lev   |   | a parties areas in floring by a                 |          | arrenard (                   |   |
| - B            |             | HZ41412214 FASINGTON PAPADISTRADA       | PAPADISE PARM CSO FRAMEN FASINGTON COLUMN  | 255/4242                 | 200/201                 | 0,007            | 11/11/2022                              |  | -                                     | 21/11/2024                        | 11/12/2024                     | 11/12/2024                       | Hada calla Oscala da   | Paramana la Storra 3                  | 21/11/2020                               | Verglau                                    | 12/11/2021                      | Lou                                     | Lou      | 6.1             | 6.1       |                                       |                                       |                                       |   | No.                                     | the second strength in total band               | 362.7    |                              | 1 0.000   |
| - H            |             | HIERARD SKELTON STANCHAUDD              | STONGUOU DOOD NO 3 CTO LINGDOLF SVELTON SOLTO                                    | 252152425                | 200.0200545             | 1 100            | 31/13/2022                              |  |                                       | 24/84/2824                        | 121 121 121                    |                                  |  |                                       |  | Leu  | 15/11/2021                      | Law                                     | Leu      | Gand            | Gand      | Yrrylaw                               | Taderate                              | - Hadres                              | Leu   | Tuderale                                | annan ea cruis ab Thorpe Vera In Raeth Sea      |          | anterenet                    | - P145 P14  |
|                |             |   |  |                          |                         | 1 2,000          | 1 |  |                                       |                                   | 1                              |                                  |  | 1                                     | 1. |  |                                 |   |          |                 |           |                                       |                                       |                                       |   | 1 .                                     | Indian Pres Free course is \$7.                 |          | <u> </u>                     | 4   |





The Value of Modelling Storm Overflow Impact

#### When did they become headline news?



Faulty monitors leave hundreds of rivers with sewage spill blindspots. The water industry boasts it monitors all outlets pumping raw sewage into rivers and the sea, but figures seen by The Times show hundreds of monitors don't work





Drone captures sewage pumped into sea for days

Overflows: 'There is raw sewage going into the

river' Data shows that the number of recorded sewage spills in Scotland has increased by 40% over the last five years.

2 August 2021 - 👎 News - Scotland

Home | Israel-Gaza war | War in Ukraine | Q England | Regions | Cornwall

> Raw sewage 'discharged at Cornwall and Devon beaches'

'making surfers ill'

Raw sewage at Porthleven beach







The Value of Modelling Storm Overflow Impact

**How** did Government respond?

Image: Storm Overflows Discharge ReductionDepartment<br/>for Environment<br/>Food & Rural AffairsStorm Overflows Discharge ReductionPlan

#### Headline Targets

- 10 spills per year at <u>all</u> inland storm overflow locations by 2050
- 2 or 3 spills per bathing season at <u>all</u> bathing storm overflow locations by 2035
- Less than 10 spills per year at locations where ecological harm is caused by 2050







The Value of Modelling Storm Overflow Impact

How did Government respond?



#### What is the impact?

- Largest ever investment profile in wastewater infrastructure
- Increase in customer rates to pay for required works
- Innovation in delivery is now a must-do, not a should-do







The Value of Modelling Storm Overflow Impact

Where and how do we go from here?

- Continued water quality impact assessments at lower dilution overflow locations to determine 'harm' and scale of option
- Water companies targeting model maintenance programmes to improve confidence in wastewater network models needed for solution development
- `Low hanging fruit' overflows being identified for fast-track delivery of `no regret' schemes







The Value of Modelling Storm Overflow Impact

**Could** a SOAF programme be applied in New Zealand?

- In short... yes!
- Work already ongoing by some water authorities to look at water quality impact from storm overflows
- Methodology has been developed and with some regional updates to water quality parameters, could be applied
- Cultural considerations must be taken into account









# Thank you! Questions? Patai?

