CROWD: Clean Rivers Of West Dorset

An Evidence Base for CROWD
Part 1: Sewage output by the water companies

1: Waste Water Management in the CROWD area

The water companies must develop strategies and follow a 5-year Asset Management Plan (AMP). The public consultation by Wessex Water (WW) for its AMP8 (2025-2030) has ended. Its AMP8 intends to reduce spills from all its storm overflows to less than 10/year at a cost of about £80/household/year. WW is required to have monitors for each outflow (Fig 1).

***Fig 1**: Stormflow monitors installed by WW (dark blue) and to be installed in 2023 (light blue) in the CROWD area.*

CROWD area spills:

In 2021, most of these outflows discharged more than 10x each. Wessex Water and South West Water (SWW) had 526 spills into CROWD rivers for a total of 5,241 hours in 2021 (Table 1).

- WW's spills in the CROWD area represent 2.8% of the company's total spills and 4.1% of the total duration of its spills.
- SWW has 4 storm outflows in the Lyme Regis region that each spilled 10-34x in 2021. It also has a pumping station (at Cobb Gate) whose sewer storm overflow spilled directly into Lyme Bay 18 times for a total of 22 hours in 2021.

To set these spills in context – rainfall above the expected average for SW England in 2021 occurred in May (c250%), July (c155%), and October (c175%).[i]

West Dorset area spills:

There were 2,191 spills for 19,024 hours by WW in West Dorset parliamentary constituency in 2021.

- WW acknowledges the need to improve some storm overflows (SOs) that discharge into environmentally sensitive waterbodies (e.g. bathing waters, shellfish waters, chalk stream, designated environmental sites) to a higher standard by 2035 but consider this will only be delivered by towards 2050.
- Risk to human health and the environment from raw sewage (even when diluted by rainfall during storm conditions) is a significant reason for prioritising improvements. WW has supplied no evidence to suggest that its spills do not cause such risks.

Water Company	River	Approximate location	Number of spills	% total spills	Total duration (hr)	% total duration
Wessex Water	Bride	Puncknowle	113		2185	
		West Bexington	87		1048	
		Burton Bradstock	2		7	
		Sub Total	**202**	**31%**	**3240**	**53%**
	Brit	Beaminster	56		440	
		Netherbury	33		293	
		Bridport	59		184	
		Bridport	0		3	
		Bridport	47		76	
		Bridport	9		46	
	Mangerton	Powerstock	5		14	
	Asker	Bridport	35		141	
		Bridport	9		46	
	Brit *et al*.	**Sub Total**	**253**	**39%**	**1243**	**20%**
	Simene	Bridport	36		228	
		Sub Total	**36**	**5%**	**228**	**4%**
	Winneford	Chideock	62		700	
		Seatown	13		37	
		Sub Total	**75**	**11%**	**737**	**12%**
	Char		3		1	
		Sub Total	**3**	**0%**	**1**	**0.02%**
South West Water	Lim & trib.	UpLyme	30		469	
			34		130	
		Lyme Regis	12		8	
			10		73	
		Sub Total	**86**	**13%**	**680**	**11%**
		Grand Total	**655**		**6129**	

Table 1: *Number and duration of sewage storm overflows in the CROWD area by company in 2021 from records of The Rivers Trust*[ii] *Values in red indicate location where 10 or more spills occurred in 2021.*

2: Government requirements for Water Companies

Each water company must designate its outflows as unsatisfactory, substandard or satisfactory. Factors that lead to an unsatisfactory status are:

1. operating in dry conditions
2. a breach of permit conditions
3. causing significant visual or aesthetic impact due to solids or sewage fungus
4. a significant contribution to a deterioration in the biological or chemical statis of the receiving water

The Rivers Trust indicates that Wessex Water identifies reasons for outflows at three sites. Those at Chideock were due to infiltration (of groundwater). Those at West Bexington into the sea and at Beaminster into the Brit were due to hydraulic capacity. The latter designation suggests these two locations are classifiable as unsatisfactory.

Water companies are required to carry out assessments against 18 risk-based indicators to identify when further study is required with a Baseline Risk and Vulnerability Assessment (BRAVA).

The CROWD catchments failed 1, 8, 4 and 5 indicators for Puncknowle, Bridport, Chideock and Charmouth respectively. Storm overflows featured for all but Chideock. The Bridport catchment had a pollution incident(s). The follow-on assessment indicated significant issues (Table 2).

Planning Objective	Catchment			
	Puncknowle	Bridport	Chideock	Charmouth
1. Internal Flooding	0	0	0	0
2. Pollution Risk	0	1	0	0
3. Sewer Collapse Risk	0	1	0	1
4. Blockages Risk	0	0	1	0
5. Risk in a 1 in 50 Year Storm	0	0	2	1
6. Storm Overflow Performance	0	0	1	1
7. Risk of WRC Flow Compliance Failure	2	2	1	1
8. Risk of WRC Quality Compliance Failure	0	0	0	0

Table 2: *Outcome of Baseline Risk and Vulnerability Assessment (BRAVA) of catchment in the CROWD area*[iii]
Key: scores – 2 = very significant; 1 = moderately significant' 0 = not significant. WRC = water resource catchment. In the CROWD area, WW is improving the storm overflow at West Bexington by 31/03/2025 to <20 overflows/year (Storm Overflows Improvement Plan 2022-25 PDF).

3: Key Issues

Information that might be sought from WW includes:

1. Date and duration of each spill in the CROWD area
2. The duration and extent of rainfall causing a storm overflow at each site
3. Evidence that no spill represents a human health hazard taking into account seasonal factors such as exposure to those on holiday and local users of bathing waters.
4. The increased storage volume needed at each site to reduce spillages to <10x /year.
5. Identification of which storm outflows Wessex Water rate as unsatisfactory or substandard as required by Government.[iv]
6. An explanation of why a huge range of 0-113 spills occurred in 2021 within the CROWD area. The local rainfall range across its small geographical expanse is unlikely to be very large.

Discharge of final/treated effluent by other than water companies in CROWD rivers

The approximate number of sites are as follows:

one discharging into each of the Simene and Winneford, two into the Bride, six into the Char and one into a stream entering Lyme Bay directly. There are many soakaways which presumably do not pollute any of the rivers.

Sampling does not reveal an appreciable consequence of discharge of final/treated effluent from a small discharge point on the biological quality of the Mangerton. This conclusion is based on comparing its monitored site below the discharge point relative to the Asker at Loders which lacks such a discharge upstream of its sample point.

4: Possible roles for Citizen Science in support of CROWD

DEFRA (2012) estimated 59% of nitrates and 26% of phosphates in English waters are of agricultural origin. The standard sought is 30mg/L for nitrates and 100µg/L for phosphates. In 2006, 29% and 50% of UK rivers exceeded these values respectively. Data could be collected by volunteers if the required data on water quality is not available from WW or the Environment Agency. Measurements could be:

1 Comparative measurements above and below discharge points of concern

2 Measurement directly from a storm overflow

a. Measurement could be made of: i) **turbidity** and ii) **phosphate levels** with inexpensive strips (c£18 for 25 strips; in use by Asker monitors and West Country Rivers Trust [WCRT] monitors but not its CSI scheme)

b. **nitrate levels** with simple, inexpensive strips (c£26 for 25 strips, the river water may need diluting c3x with deionised water; in use with WCRT monitors but not its citizen scientists)

c. **coliform bacteria**. This is relatively expensive (c£30 for 4 tests) and is not in use with WCRT. It may be better achieved through a lab. if not measured for CROWD by Wessex Water or Dorset Council (which publishes values for seaside waters). WCRT may help identify a lab but presumably would not pay.

d. Low values from Riverfly monitoring could detect any "*significant contribution to a deterioration in the biological status of the receiving water*" (see section 2).

Part 2: Bathing quality in the coastal waters off CROWD area

1 Background

The Environment Agency (EA) samples the sea at designated bathing waters for viable microbes during the bathing season which in the UK is designated to be from 15th May to 30th September only. Samples are taken at approximately weekly intervals in that period in accordance with the EU directive on bathing water quality.[v]

Sampling was incomplete in 2021 due to COVID. There must be a minimum of 16 samples and data for 4 years provides the basis for classification. The effect of short-term microbiological contamination can be discounted providing:

a. adequate management measures are being taken, including surveillance, early warning systems and monitoring, with a view to preventing bathers' exposure, by means of a warning or, where necessary, a bathing prohibition;

b. adequate management measures are being taken to prevent, reduce or eliminate the causes of pollution

c. the number of samples disregarded because of short-term pollution during the last assessment period represents no more than 15 % of the total number of samples provided for in the monitoring calendars established for that period, or no more than one sample per bathing season, whichever is the greater

Sampling was carried out by EA at 5 locations in the CROWD area but not at Freshwater Beach although there is a substantial holiday home complex there. The results are summarised in Table 1.

EA sample for colony forming units in 100ml of sea water (cfu/100ml). They aim to detect Enterococci. They are not harmful to humans but indicate the presence of faecal material in water and the possible presence of disease-causing bacteria, viruses, and protozoa. Indicators: Enterococci | US EPA. They also examine the sample for viable *Escherichia coli* (*E. coli*). They are a diverse group of bacteria present in faeces and the wider environment. They are also indicators of faeces in water. Many are harmless but some populations cause diarrhoea and others cause different medical conditions including urinary tract infections, respiratory illness and pneumonia.[vi]

A weakness of the approach is that the EA only samples at weekly intervals. No evidence is provided on the direction of the tide or the co-incidence of stormy weather noted. It does note if the site is affected by heavy rainfall. EA does not determine if the duration of a pollution event is less than about 72 hours. The data set suggests that short-term pollution events exceed that time limit when two or more consecutive samples record more bacteria than the upper limit set for excellent water quality as occurred in 2019-22 at Lyme Regis and Charmouth only (Table 3).

Location	Number of samples	Intestinal *Enterococci* colonies (cfu/100ml)		*Escherichia coli* colonies (cfu/100ml)		Classification	Discountable	Discounted
		sample with count >10	% of samples >10	samples with count >10	% of samples >10			
Lyme Regis Front beach	62	36	58%	30	48%	Good	2	1
West Bay	26	7	27%	4	15%	Excellent		
Charmouth West	60	9	15%	11	18%	Excellent	4	3
Eypemouth	21	3	14%	3	14%	Excellent		
Seatown	31	2	6%	3	10%	Excellent		

Table 3: *Bathing quality water sample history 2019-2022 for CROWD area beaches. Source The Environment Agency (Bathing water quality (data.gov.uk)*

2. Risk to bathers and those at the sea edge.

Risk is determined by both a hazard and exposure. In this case the main means of exposure of bathers is swallowing sea water and the hazard is the subset of ingested microorganisms that can harm health. The classification of water as excellent requires the 90% point of the data probability density function is no more than 100 cfu/100ml Enterococci and 200 cfu/100ml E. coli. The Good category value limits are 2x these values. The sensitivity of the detection approach is such that <10cfu/100ml seem not to be considered to influence negatively a classification.

Four sewer storm overflows of South West Water spilled in 2021 for a combined total of 92 times for 234 hours into Lyme Bay. Both SWW and WW have final/treated effluent discharges into Lyme Bay at

Lyme Regis and Charmouth respectively. A key question is which company is polluting Lyme Regis Front beach in the bathing season (Table 4). Is the predominant sea tidal flow from east to west or vice versa during sewage discharge? The storm overflow pipe outlets in the sea at Lyme Regis are about 50% the distance of the Charmouth sewer storm overflow pipe from the beach. Possibly South West Water is the principal contributor to microbial pollution at Lyme Regis and an important source of a lower frequency at which bacteria are detected at Charmouth West. Biobeads have been recovered from Charmouth West. They can be shed by a water company from its sewage plant during a storm outflows. They likely come from the South West sewage treatment plant at Uplyme as Wessex Water does not use them at its sewage plants around the South Coast.[vii]

Location	Year	May	June	July	August	Sept
Lyme Regis Front beach	2019		3	2	8	
	2021		3	3		
	2022		2		7	
Charmouth West	2021	2				2
	2022					2

Table 4: *Number of consecutive samples at about weekly intervals that record intestinal Enterococci count and E. coli counts higher than the upper limit for bathing water to be classed as excellent.*

The widely used indicator species includes *E. coli*. A subset of these organisms that are a health risk. Unfortunately, the study of the decline of viable coliform organisms is not a reliable indicator of the persistence of other pathogens such as noroviruses. They have been detected at up to 2km from a sewage outflow pipe.[viii] This suggests little is known about the abundance of human pathogens such as noroviruses in Lyme Bay. A recent systematic review of the risks of illness caused by sea bathing in high-income countries demonstrated a significant increase in the risk of experiencing symptoms of gastro-intestinal infection among bathers compared to non-bathers. There is also evidence that ingestion of water containing antibiotic-resistant *E. coli* during swimming is a risk factor for urinary tract infections caused some bacteria.[ix]

3 Key issues

- Assuming the standards set by the EU Directive are retained by the UK government, the water companies should be able to describe what "adequate management measures are being taken to prevent, reduce or eliminate the causes of pollution".
- Which water company is principally responsible for viable Enterocci and *E. coli* pollution of bathing water at Lyme Regis and Charmouth? Does evidence suggest that South West Water is the bad actor?
- Information is required on the persistence of the viable human pathogens in sea water for which the two bacteria are indicators. Also can any of the pathogens colonise beach sand as do some *E. coli*.?
- Should the holiday destination of Freshwater Beach at the mouth of the River Bride be assessed for its bathing quality?

Part 3: Sewage and the marine environment off the CROWD area

1. Background

The sewage works at Bridport, Charmouth (both WW) and Cobb Gate pumping station (SWW) discharge final/treated effluent and/or sewage overflows directly onto or adjacent to the reefs of Lyme Bay. Other outflows enter the sea via the rivers of the CROWD area.

Lyme Regis sewage treatment works has a consented dry weather flow of about 3 million litres/day and provides secondary treatment, with additional UV disinfection, during the bathing season. Its estimated bacterial loading is 3,000 million/day and about 1000x that figure at other times. It discharges only 600m off Lyme Regis. Charmouth Sewage treatment plant has a dry weather consent of about 40% of that of Lyme Regis but lacks a UV treatment and generates 1000x faecal coliforms/day in the bathing season relative to this discharge from Lyme Regis, of about 4x10. It discharges about 1.3 km off Charmouth. It is likely that the size of Bridport ensures its bacterial discharge is much higher than that of Lyme Regis. Although of some value, recent work suggests that norovirus particularly as vesicles are resistant to UV disinfection.[x]

Among the 10 reasons provided by the tourist organisation promoting Dorset are: 1) Its UNESCO World Heritage site 2) Fossil hunting, 3) award winning beaches 4) fabulous food and drink and 5) its beautiful, unspoilt and inspiring environments much of which within an area of outstanding natural beauty.[xi]

2. Compromising a major holiday area and important source of employment

Jurassic coast tourism is valued at > £100m/ year and is a major source of local employment. Sewage-related concerns compromise all these promoted benefits of tourism in the area.

3. A risk to UNESCO Status

The whole of the CROWD area falls within the only natural UNESCO site in England. "*The property comprises eight sections in a near-continuous 155km of coastline with its boundaries defined by natural phenomena: on the seaward side the property extends to the mean low water mark and on the landward side to the cliff top or back of the beach. This coast is considered by geologists and geomorphologists to be one of the most significant teaching and research sites in the world".*[xii] Consequently, the intertidal region is part of this designation and has been reported by local citizens to receive pollution from water company activities. The advice the many people who search for fossils is "*the best and safest place to search is amongst the shingle and exposed foreshore at low-tide as shown below*".[xiii] Fossil hunting is not restricted to the bathing season and searching after storms is often favoured as it reveals fossils on the intertidal region of the beach. This increases exposure to hazardous pollutants from sewage.

4. Compromising a Marine Special Area of Conservation

It is inappropriate for sewage discharges to continue onto or adjacent to the reefs of Lyme Bay. They are considered to be a 'hotspot' for marine life, supporting some of the most biologically diverse reef communities in England. In 2018, Natural England, assessed the condition of the Lyme Bay reefs in '**unfavourable**' but 'recovering' condition. Two basic types of rocky reef exist: Shallow infralittoral reefs are characterised by kelp or other algae whereas the deeper circalittoral reefs are where sponges, corals, anemones, sea squirts occur. Examples of highly protected species in these habitats are the hard coral *Leptopsammia pruvoti* which occurs at only five locations in the UK and a nationally important pink sea-fan coral (*Eunicella verrucosa).* Fishing activity *includes for* abundant scallops, brown crabs, lobsters, cuttlefish, whelks and sole.[xiv] All the coast in the CROWD area has reefs that are included in the 14% of UK coastal areas covered by the Marine Special Area of Conservation (SAC) to protect both this habitat and some species of marine organisms.[xv] The Marine Strategy Framework Directive being followed by the UK requires a Good Environmental Status for the marine environment to be achieved by 2020 but this has not yet to be achieved for sublittoral rock habitats.[xvi] Good Environmental Status is described as, "*environmental status of marine waters where these provide ecologically diverse and dynamic oceans which are clean, healthy and productive within their intrinsic conditions…*" [xvii]

4 Risk to human consumption of marine animals from Lyme Bay.

Norovirus is abundant in untreated sewage and remains present in treated final effluent from sewage treatment plants.[xviii] Discharges from SOs can lead to short-term reductions in water quality that may be missed by routine monitoring programmes using faecal indicator bacteria. Such discharges can lead to a higher incidence of norovirus in shellfish and thus potentially illness in consumers. Recently, it has recommended that site-specific impact assessments are required in addition to spill-event monitoring.[xix]

This concern in the CROWD area includes the inshore commercial mussel beds less than 20km to the west. In addition other molluscs harvested on the reefs and elsewhere in Lyme Bay, and possibly crustacea that also filter feed or consume detritus, may also accumulate noroviruses. Recently, Southern Water has been fined £90 million for deliberately pouring sewage into the sea.[xx]

Given the increased public concern about sewage it is surely important that water companies with sewage discharges in the CROWD area are fully transparent and provide data showing the volume of their sewage including storm overflows both within and outside of the bathing season.

5. Key issues

1. It should be a high priority for the water companies to prevent storm and final/treated outflows questioning the holiday and UNESCO status of the area and to prevent reputational damage that might accrue.
2. The water companies should be fully transparent and demonstrate with full data to CROWD on the volume, duration of its storm outflows to demonstrate that risks are not a concern and progressively declining.

Part 4: Sewerage network discharges into the CROWD rivers in 2021 and 2022

The Rivers Trust has updated its sewage map for discharges in 2022.[xxi] It was necessary to check that the data in our evidence base for the sewage discharges the trust provided for 2021 were not due that year being exceptional. It was not. The number of spills into the CROWD area was 569 in 2021 and 451 in 2022. The duration of discharges in hours was 5,451 in 2021 and 3,659 in 2022 (Table 5). There was considerable variation among those discharging sites contributing to the overall means not being significantly different. The rainfall for these two years was not exceptional at 103% and 104% of the long-term averages for 2021 and 2022 respectively (data is from Southern Water for reservoirs in the south-west region).

A key issue is the variation between months (Figure 2). If the days when discharges occurred in the CROWD area were known that could be linked to daily rainfall records for the CROWD area. Even at the monthly level there are considerable differences. One month each year received over twice the long-term average for that month (Oct 2021 and Nov 2022) and an additional four months received over 1.5x their average value (May-July 2021 and Sept 2022). It is particularly noteworthy that over 1.5x the long-term average occurred for three months within the bathing season (May-July) in 2021 The additional holiday population at that time in the area may increase the likelihood of discharges during heavy rain.

Apparently, systems discharging in the CROWD area lack the resilience to cope with frequent, above average rainfall. How readily could that weakness be reduced?

		2021			2022		
Water Company	**River**	**Number of spills**	**Total duration (hr)**	**mean hr/occasion**	**Number of spills**	**Total duration (hr)**	**mean hr/occasion**
Wessex Water	Bride	202	3240	16.04	139	2528	18.19
	Brit	204	1042	5.11	125	417	3.33
	Asker*	49	201	4.10	49	173	3.53
	Simene	36	228	6.33	35	210	6.01
	Winneford	75	739	9.85	44	249	5.65
	Char	3	1	0.33	66	92	1.40
	Total	**569**	**5451**		**458**	**3670**	
SW Water	Lim	86	680	7.9	155	2093	13.5

Table 5: *Number of spills and their total duration of discharges into rivers in the CROWD area.*[xxii]

** includes the Mangerton. The value for the Brit includes discharges into West Bay harbour.*

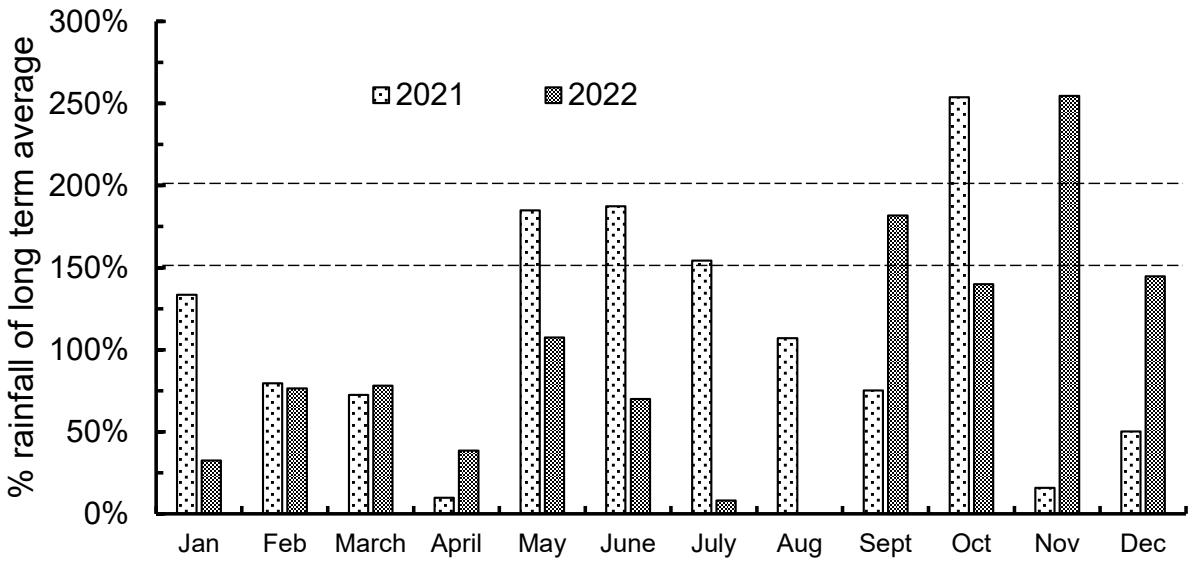

Figure 2: *Regional monthly rainfall in 2021 and 2022 for South West England as percentages of monthly long term averages. Values are from Southern Water.*[xxiii]

Report researched and compiled by Howard Atkinson
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[i] Source Water situation report for England December 2022 (publishing.service.gov.uk).

[ii] *Sewage Map | The Rivers Trust).*

[iii] *DWMP BRAVA Risk Dashboard (arcgis.com)*

[iv] Water companies: environmental permits for storm overflows and emergency overflows - GOV.UK (www.gov.uk)

[v] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A31991L0271.

[vi] Bacteria and *E. coli* in Water | U.S. Geological Survey, usgs.gov.

[vii] charmouth_sewage_10_22.pdf (riverchar.org)

[viii] Winterbourn et. al., 2016, Water Research, 105, 241-50)

[ix] Leonard *et al.*, 2018, *Environment International* 114, 326–333

[x] Zhang *et al.,* 2021, *Environmental Science &. Technology*, 55, 6197−6205

[xi] 10 Great Reasons to Visit Dorset and the Jurassic Coast – Visit Dorset (visit-dorset.com).

[xii] Dorset and East Devon Coast – UNESCO World Heritage Centre

[xiii] Charmouth (Dorset) | Discovering Fossils

[xiv] Lyme Bay Reefs – Dorset's Marine Protected Areas (dorsetmpas.uk)

[xv] SACs with marine components | JNCC – Adviser to Government on Nature Conservation

[xvi] Marine Strategy Part One: UK updated assessment and Good Environmental Status (publishing.service.gov.uk)

[xvii] General advice on assessing potential impacts of and mitigation for human activities on MCZ features, using existing regulation and legislation (jncc.gov.uk)

[xviii] Norovirus | Food Standards Agency; sewage variation report, PDF

[xix] Younger *et al.* 2022, *Land 11,* 1576-88)

[xx] https://marinescience.blog.gov.uk/2021/08/25/cefas-evidence-supports-successful-prosecution-in-the-environment-agency-verses-southern-water-wastewater-permit-breaches-case/

[xxi] Sewage Map | The Rivers Trust

[xxii] Sewage Map | The Rivers Trust

[xxiii] *Regional rainfall - water levels at reservoirs, compared with averages (southernwater.co.uk)*