Delivering First Time Sewerage to Rural Communities in the UK

CHRIS ROGERS - CONSULTANT

22 NOVEMBER 2019

My background

Honours Degree in Civil Engineering

Member of the University Engineering Industrial Advisory Group

Chartered Engineer

Chartered Water and Environmental Manager

Member of the Institution of Civil Engineers

Member of the Chartered Institution of Water and Environmental Management

Qualified Commercial Diver and Safety Coach

Delivering First Time Sewerage to Rural Communities in the UK

Many rural areas of the United Kingdom are not connected to the public sewerage system which can lead to loss of amenity, hot spots of pollution and in some cases prosecution.

The talk will provide the background to the legislation which encourages water companies to provide main drainage to some of these rural areas.

It will include a case study focussing on how one particular scheme in Cornwall was developed, together with looking at some of the technologies that are available to individuals to mitigate pollution in these areas.

Public Health in the UK

Public Health Act 1848

1854 – confirmation that cholera was spread by contaminated water rather than foul air

Sanitary Act 1866

Joseph Bazalgette 1819 - 1891


GETTY IMAGES

The UK Water Companies

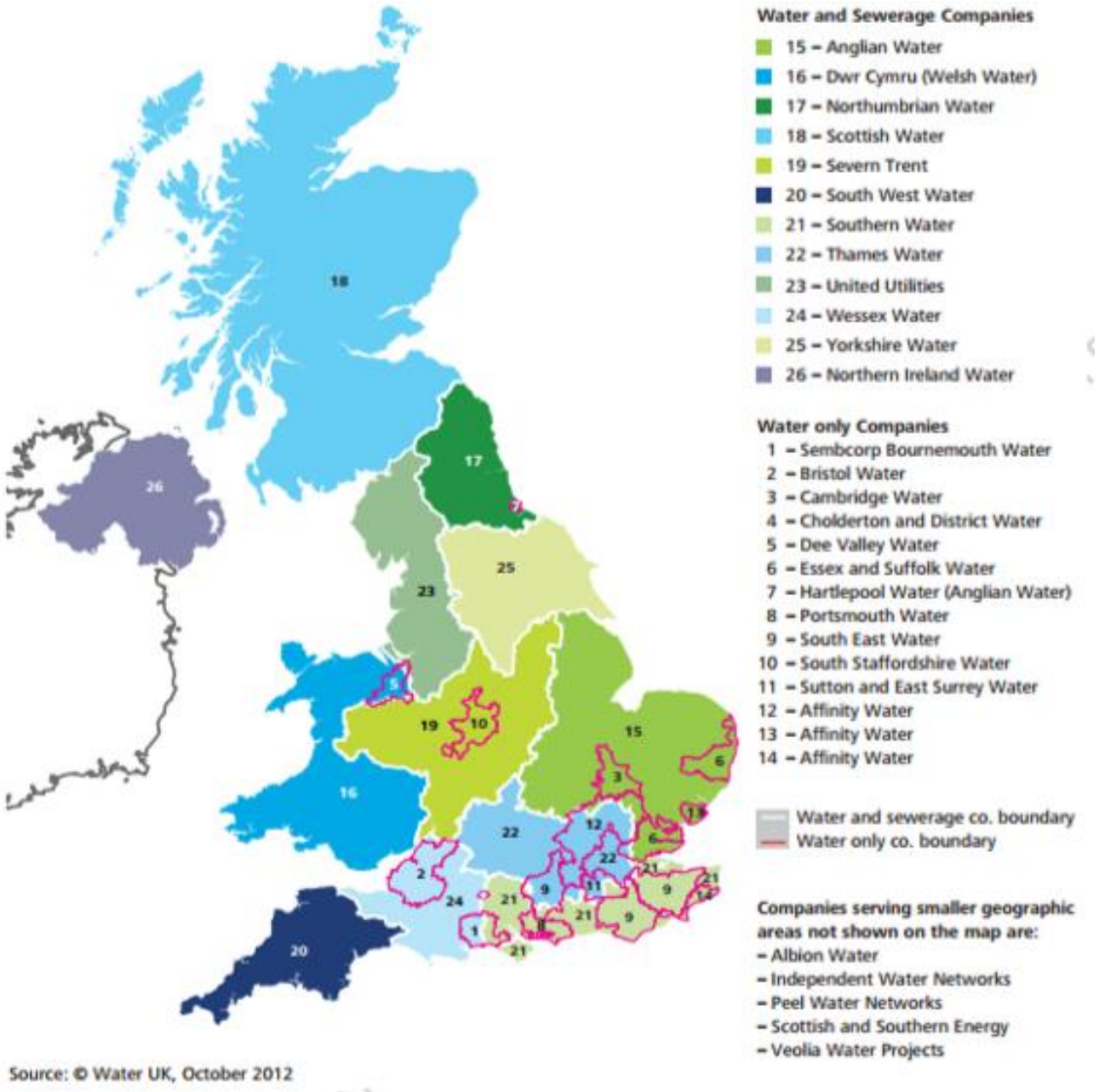
1945 – more than 1,400 organisations for sewerage

Water Act 1973 established 10 new regional water authorities in England and Wales

Water Act 1989 – Privatisation of 10 Water Companies in England and Wales

Water Industry Acts 1991 and 1999

Water Act 2003 brings in potential for competition



Water Company Duties

The 1973 Act gave statutory responsibility for all aspects of water management to each water authority in its region. The functions of the water authorities defined in the 1973 Act were:

Water conservation and development. Including operation of reservoirs, monitoring of river flows, collection of hydrological data and management of abstraction licences. It also required each authority to estimate future demands for water in its area and plan for development of future resources.

Water supply. The 1973 Act placed a primary duty on each water authority to provide a domestic supply of wholesome water within its defined area of supply.

Sewage collection, treatment and disposal. This included maintenance of sewerage systems, operating and developing sewage treatment works and sludge disposal. The 1973 Act imposed a duty on the water authorities to make arrangements to carry out certain sewerage functions, such as maintenance of the network, with district councils in their area. The water authorities could not make arrangements with other agencies to carry out their duties of sewage disposal or the reception and disposal of trade effluent.

Prevention of pollution and environmental improvement. This included a requirement for a significant improvement of rivers and estuaries by the early 1980's. It also included administration of discharge permits and river quality monitoring.

General provisions for recreation. This included provision of recreation facilities at reservoirs and on some rivers.

Care of inland fisheries, funded by central government.

Land drainage and flood protection, which included work to improve flood defences in both urban and rural areas financed by central and local government.

Control of Pollution

A government committee reported on sewage disposal in 1970 and made a number of recommendations for the management of river water. The main conclusion drawn by the committee was that while the 20/30 standard was generally regarded as a useful minimum requirement, it was neither desirable nor practicable to adopt a uniform standard for trade effluents. The committee supported the use of permit standards for individual treatment works set by reference to local environmental quality objectives, rather than uniform emission standards which did not take the local environmental effects fully in to account. In addition, the committee recommended:

there should be a positive policy to improve rural sanitation;

discharge of unscreened storm sewage should be prohibited;

sewerage for new development should be separate to foul sewage;

production of shorter-life treatment plants should be investigated.

These recommendations were taken forward in the Control of Pollution Act 1974 which sought to treat pollution and waste together as a unified concept and covered waste on land, the pollution of water, noise and pollution of the atmosphere. The Act transferred the pollution control functions of the former river authorities to the water authorities. It introduced an offence for anyone to cause or knowingly permit (i) any poisonous, noxious or polluting matter to enter any stream, controlled waters or underground waters or (ii) any matter to enter a stream which would impede its natural flow.

Duties of Sewerage Undertakers

General duties of sewerage undertakers The general duties of the sewerage undertakers are defined in section 94 of the Water Industry Act 1991:

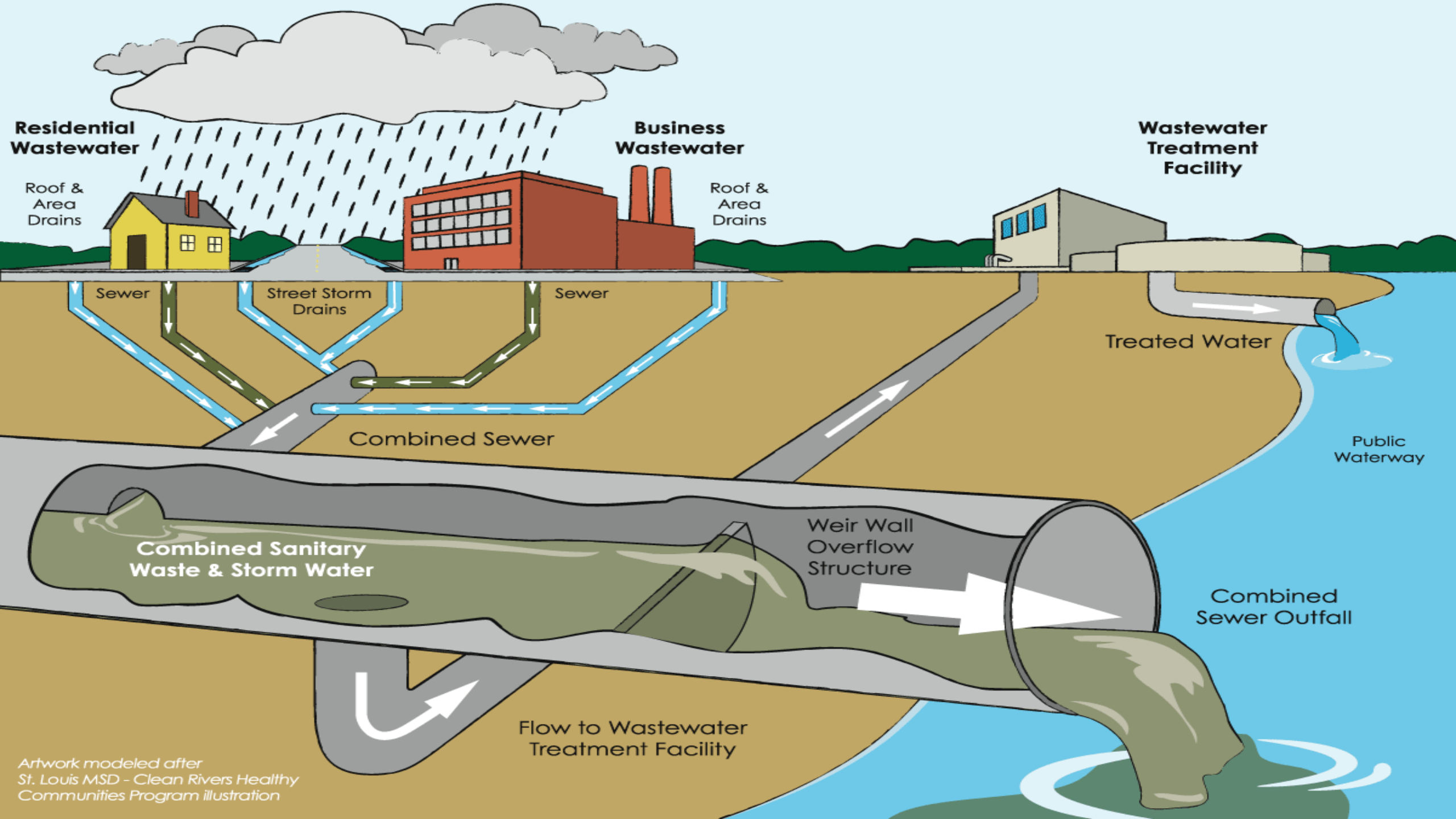
to provide, improve and extend a system of public sewers, and to cleanse and maintain them to ensure its area is effectively drained; and

to make provision for emptying its sewers and treatment of sewage. This duty is again enforceable by the Secretary of State or, with her consent, the Director General of Water Services. Specific duties and powers of the sewerage undertakers

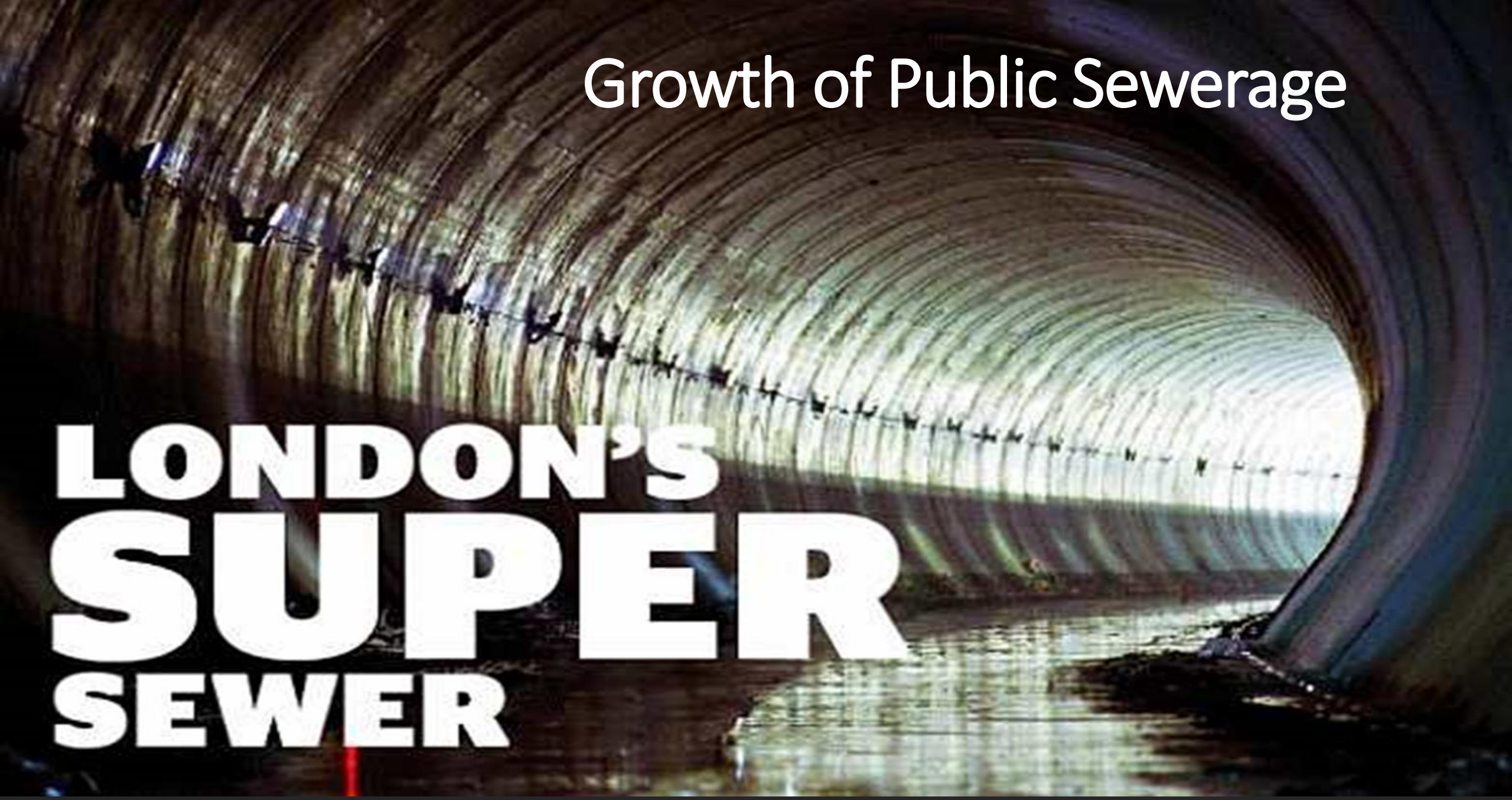
Sewerage undertakers have a duty to provide a public sewer for domestic drainage if requested by

(i) the owner or occupier of land on which there are, or are intended to be, buildings or

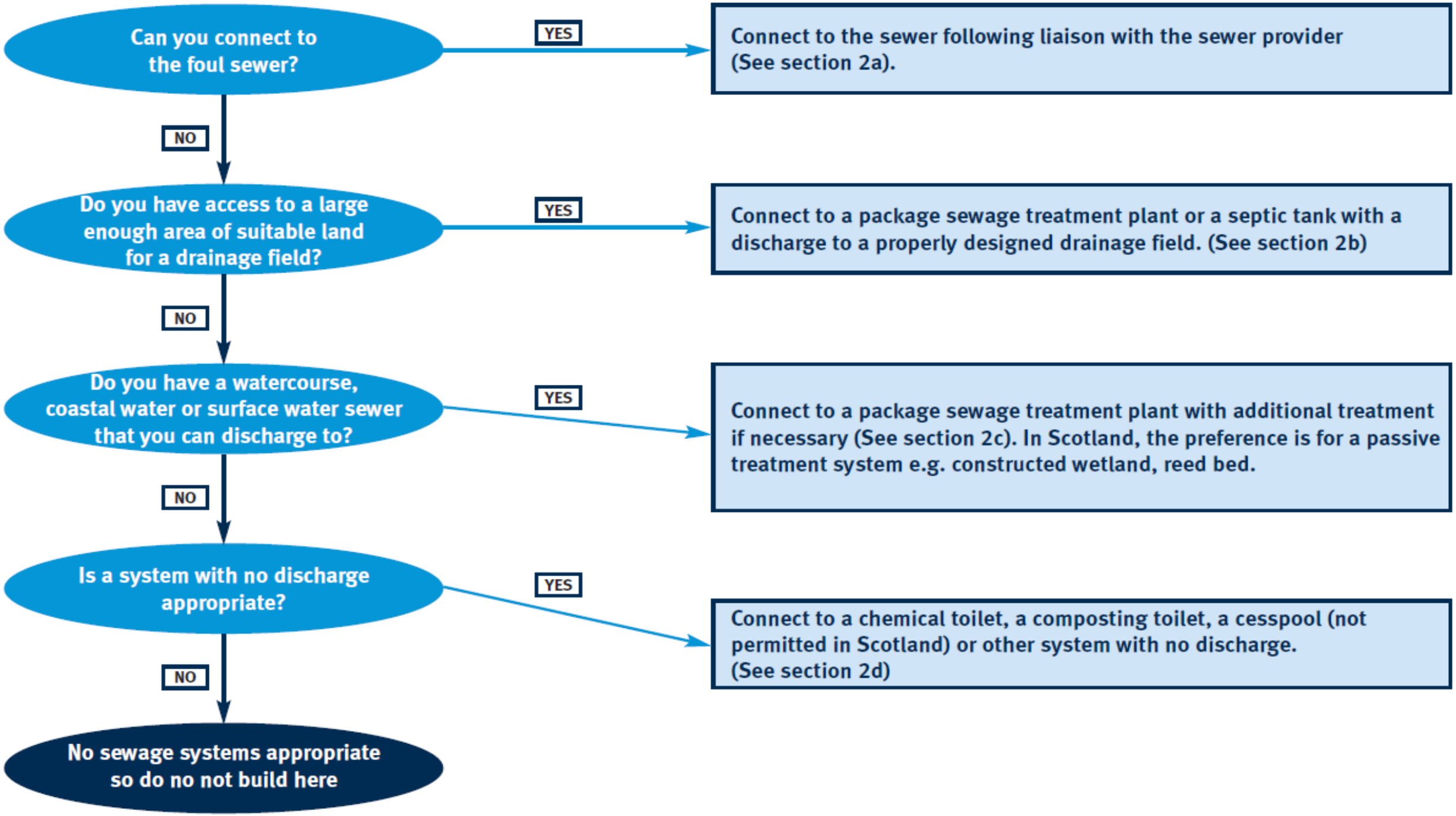
(ii) a Local Authority in the area that it serves.


Residential Wastewater
Roof & Area Drains
Business Wastewater
Roof & Area Drains
Wastewater Treatment Facility
Sewer
Street Storm Drains
Sewer
Treated Water
Combined Sewer
Public Waterway
Combined Sanitary Waste & Storm Water
Weir Wall Overflow Structure
Combined Sewer Outfall
Flow to Wastewater Treatment Facility
Artwork modeled after St. Louis MSD - Clean Rivers Healthy Communities Program illustration

Growth of Public Sewerage



Expanding Sewerage Networks

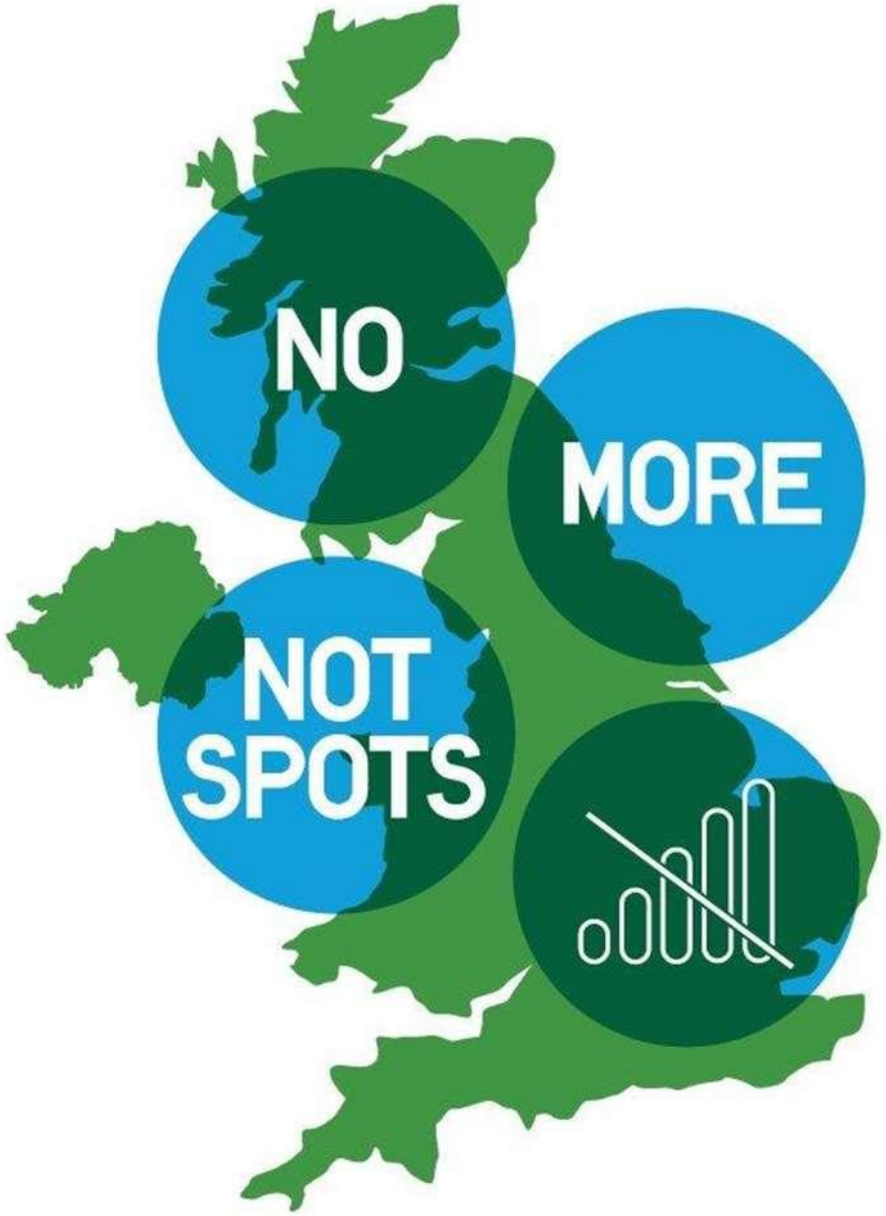

Can you connect to the foul sewer?
YES
Connect to the sewer following liaison with the sewer provider (See section 2a).
NO
Do you have access to a large enough area of suitable land for a drainage field?
YES
Connect to a package sewage treatment plant or a septic tank with a discharge to a properly designed drainage field. (See section 2b)
NO
Do you have a watercourse, coastal water or surface water sewer that you can discharge to?
YES
Connect to a package sewage treatment plant with additional treatment if necessary (See section 2c). In Scotland, the preference is for a passive treatment system e.g. constructed wetland, reed bed.
NO
Is a system with no discharge appropriate?
YES
Connect to a chemical toilet, a composting toilet, a cesspool (not permitted in Scotland) or other system with no discharge. (See section 2d)
NO
No sewage systems appropriate so do no not build here

Binding Rules for Private Treatment

#	Discharges to surface water	Discharges to ground	General binding rule
1		X	The discharge must be 2 cubic metres or less per day in volume.
2	X		The discharge must be 5 cubic metres or less per day in volume.
3	X	X	The sewage must only be domestic.
4	X	X	The discharge must not cause pollution of surface water or groundwater.
5		X	The sewage must receive treatment from a septic tank and infiltration system (drainage field) or a sewage treatment plant and infiltration system.

#	Discharges to surface water	Discharges to ground	General binding rule
15	X	X	New discharges must not be within 30 metres of a public foul sewer.
16	X	X	For new discharges, the operator must ensure that the necessary planning and building control approvals for the treatment system are in place.
17	X		New discharges must not be in or within: 500 metres of a Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar site, biological Site of Special Scientific Interest (SSSI), freshwater pearl mussel population, designated bathing water, or protected shellfish water; 200 metres of an aquatic local nature reserve; 50 metres of a chalk river or aquatic local wildlife site.

Rural “Not Spots”



Help is at hand….

Section 101A of the Water Industry Act 1991…

Legislation under Section 101A of the Water Industry Act 1991 came into force on 1st April 1996. The legislation states that it shall be the conditional duty of a sewerage undertaker to provide a public sewer for existing properties if;

- The property produces domestic sewage
- The property includes buildings
- There is no existing connection directly or indirectly to the public sewer
- The existing drainage is giving or is likely to give rise to adverse effects to the environment or amenity

However, the water company shall also take into consideration the practicability of providing the public sewer in comparison with other options.

The duty does not arise if there is only one building involved. The definition of building excludes sheds, glasshouses or other outbuildings not intended for human habitation.

What does this mean….

There is sometimes a low cost option for householders to connect to the public sewerage system

Is it any good?

Yes – in most cases – it provides a statutory framework which in many cases increases the number of properties connected to the public sewerage system. This helps control pollution and manage the treatment of waste water.

Is it a quick fix for everyone

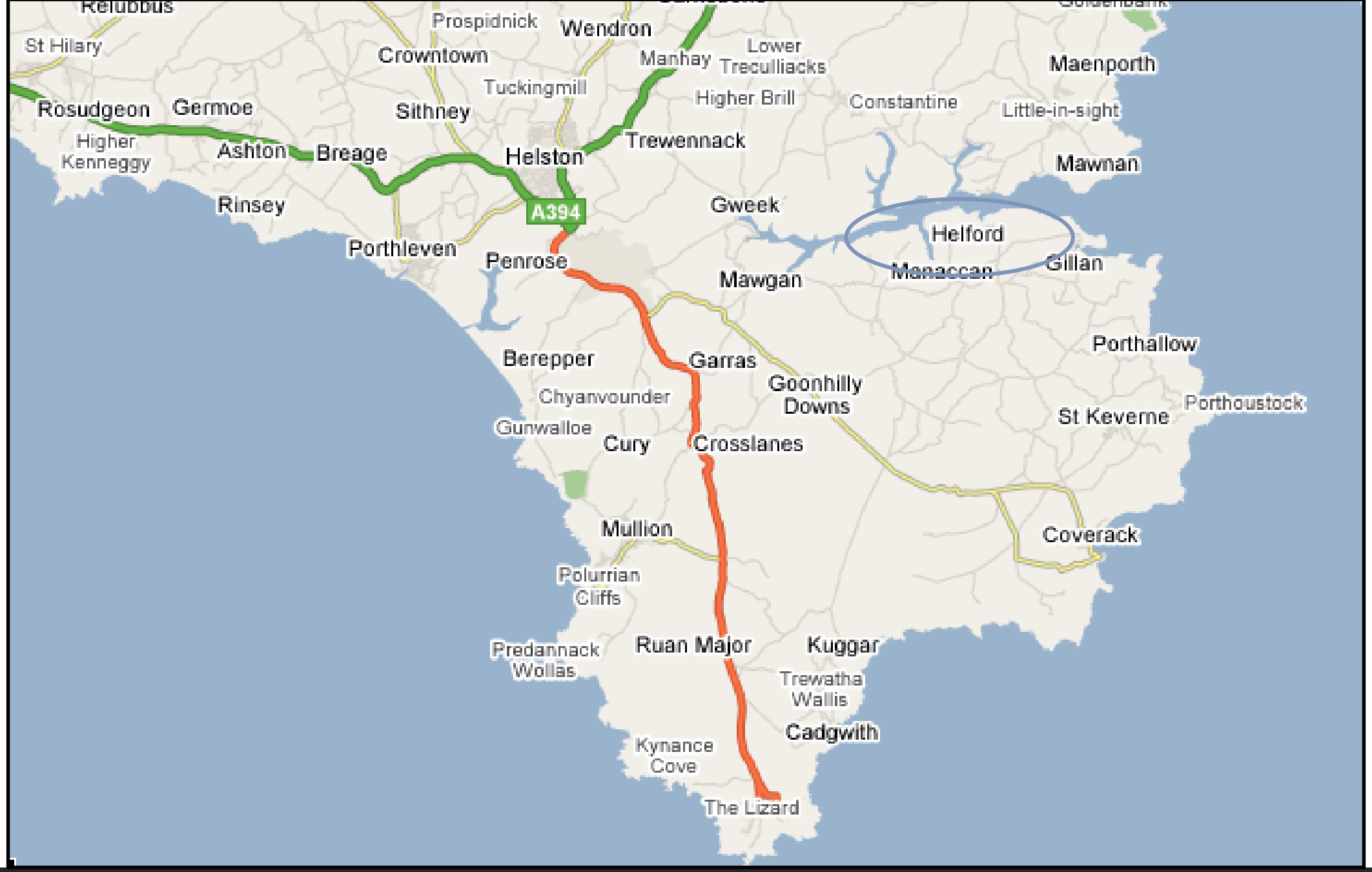
No – the timescales link in with OFWAT spending review periods (5 year asset management periods)

Water companies only have capacity to deliver a handful of schemes at a time

Not all applicants are successful

Case Study - Helford


Barnstaple
Bridgwater
A39
Taunton
Great Torrington
Tiverton
A30
Bude
M5
A35
Okehampton
A39
A30
A30
Exeter
Newton Abbot
Exmouth
A30
A38
A39
A38
Saltash
Torbay
St. Austell
Plymouth
Dartmouth
Truro
Redruth
A30
Penzance


Relubbus
St Hilary
Prospidnick
Wendron
Crowntown
Manhay
Lower Treculliacks
Maenporth
Tuckingmill
Higher Brill
Constantine
Little-in-sight
Rosudgeon
Germoe
Sithney
Higher Kenneggy
Ashton
Breage
Helston
Trewennack
Mawnan
Rinsey
A394
Gweek
Helford
Porthleven
Penrose
Manaccan
Gillan
Mawgan
Porthallow
Berepper
Garras
Goonhilly Downs
Chyanvounder
Porthoustock
St Keverne
Gunwalloe
Cury
Crosslanes
Mullion
Coverack
Polurrian Cliffs
Predannack Wollas
Ruan Major
Kuggar
Trewatha Wallis
Cadgwith
Kynance Cove
The Lizard

100 Years Apart


FH 728
PZ771
PZ771

Does Helford Qualify for FTS?

Is there an applicant?

Is there more than one property?

Is it domestic sewage?

Is there potential to cause environmental harm?

Is there a cost effective way to provide a public sewerage system?

Is it more cost effective to provide a public system rather than for individuals to remedy?


SOUTH WEST WATER
Welcome to our
SOUTH WEST WATER
HELFORD VILLAGE
FIRST TIME
SEWERAGE
SOUTH WEST WATER
HELFORD VILLAGE
FIRST TIME
SEWERAGE
PUBLIC CONSULTATION
1100 - 1900 Hrs

Regulatory Approvals

SWW Governance

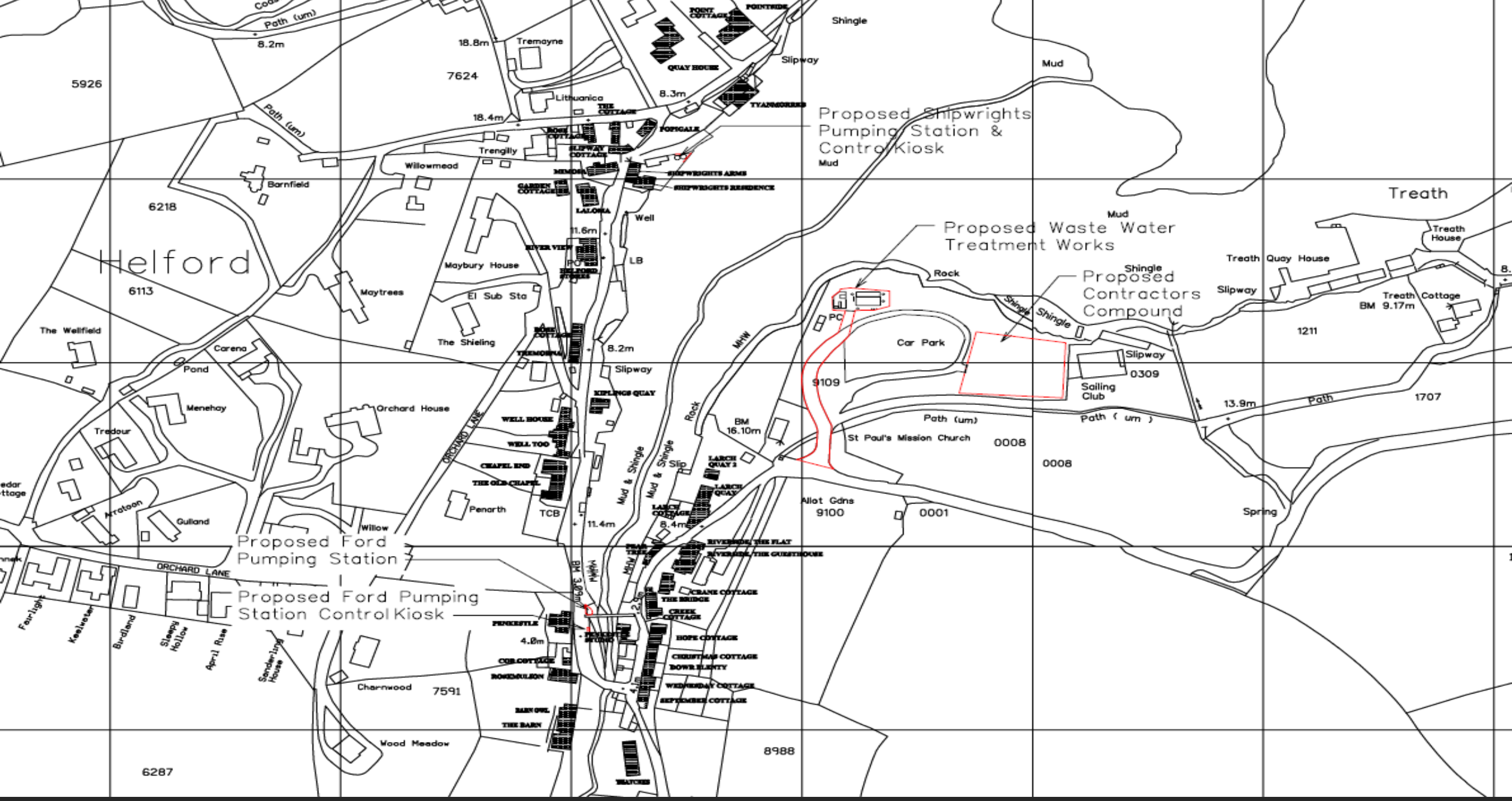
Planning Permission

Environment Agency Discharge Permit

Environmental Designations – EU Designated Shellfish Water, Conservation Area, AONB, Area of Great Scientific Value, Listed Buildings, County Wildlife Site, SAC and SSSI

Cornwall Council Approvals

Land Purchase and discharge of covenants


Proposed Shipwrights Pumping Station & Control Kiosk
Proposed Waste Water Treatment Works
Proposed Contractors Compound
Proposed Ford Pumping Station
Proposed Ford Pumping Station Control Kiosk
Helford
Treath
Shingle
Mud
Slipway
Path (um)
Tremayne
Lithuanica
Trengilly
Willowmead
Barnfield
Maybury House
Maytrees
El Sub Sta
The Shieling
The Wellfield
Carena
Pond
Menehay
Tredour
Orchard House
ORCHARD LANE
Penarth
TCB
Willow
Gulland
Arratoon
Charnwood
Wood Meadow
Rock
Car Park
Sailing Club
St Paul's Mission Church
Allot Gdns
Treath Quay House
Treath House
Treath Cottage
Spring
Path
Sandwling House
April Rise
Sleepy Hollow
Bordland
Keelwater
Fairlight
5926
6218
6113
7624
6287
7591
8988
9109
9100
0008
0001
0309
1211
1707

Main scheme elements

Collection network - sewerage

Treatment process - RBC

Disposal – tidal holding tank and short outfall


Public Footpath


Benford


ST OFFICE
HELFORD
POST
OFFICE
Available here!
You can cash a cheque at
Wall's
GIRO
Personal Banking
HELFORD FTS
WEEK ENDING 28th DECEMBER 2006
WEEK ENDING 7th JANUARY 2007
MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
GANG 1
PAUL HAGUE
GANG 2
SID MITCHELL
GANG 3
WILLIAM HARRISON
SITE PHONE:
OUT OF HOURS: 07740 299834
(PETE SHARP)
SITE MOBILE: 07929 104256
MAY GURNEY: 01726 885300


TB180FR


TAKEUCHI
TB180
DOWR
PENTY


KX53 VBL
Benford

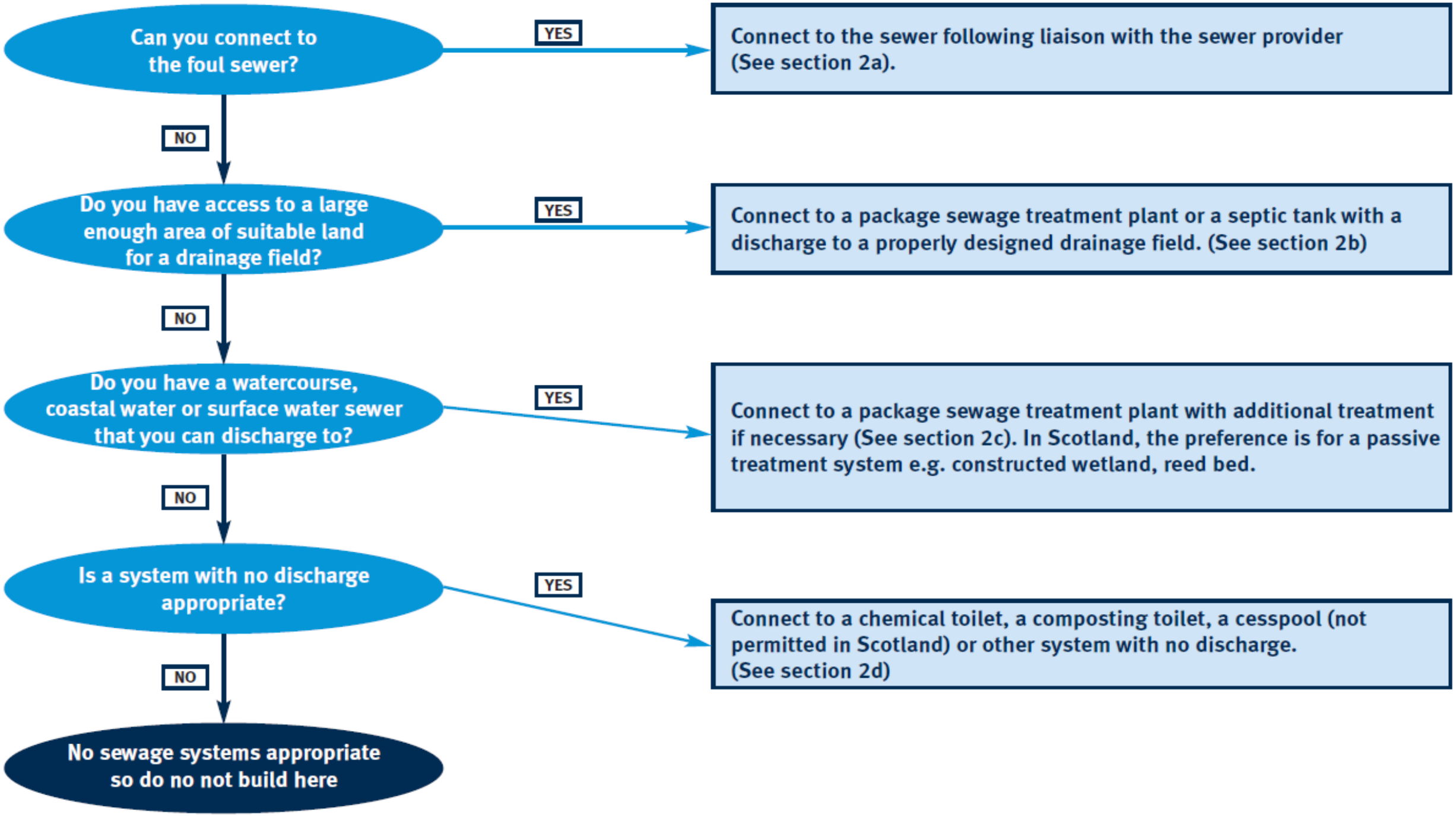

PUBLIC FOOTPATH TO
HELFORD POINT
AND FERRY
KP04 GHZ
Benford
PLEASE WAIT HERE
TO BE ESCORTED
THROUGH CONSTRUCTION
AREA


cemex


Copa
EX
Danger

Treatment Technologies for Householders

What are your options if you don’t qualify for First Time Sewerage?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Treatment Systems

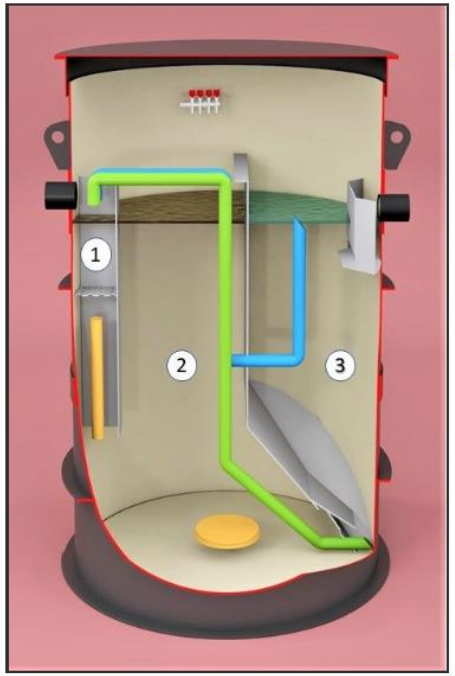
Cess Pit – high operating costs as need to be emptied frequently possibly 16 times per year costing up to £11,000

Septic Tank – provides primary treatment with disposal of effluent to the ground and needs to be emptied regularly – not allowed to discharge to a body of water, costs about £200 per year to empty

Proprietary Systems – various systems with operating / maintenance costs of around £400 per year

Mains Drainage – costs for a family are about £500 per year

Make of Plant	Biological Oxygen Demand (BOD) Mg/L	Suspended Solids {SS) Mg/L	Ammoniacal Nitrogen (NH4 - N) Mg/L
Environment Agency Maximum Limits	20	30	20
Klargester Biodisc	20	23	5
Klargester Envirosafe	12	21	3.4
Klargester Bio-Ficient	20	27	0.4
WPL Diamond	10	21	7.3
Balmoral Hydroclear	11	19	4.5
Tricel	11	16	8
Graf Klaro E	12	20	12
Condor ASP	8	12	7.7
Apex	11	16	5.9
Vortex	7.3	15.2	0.4
FilterPod Non-Electric	10	12	11
Premier Tech Aqua Ltd. Epurfix Non-Electric	11	14	20
Clearfox Non-Electric	9	29	12



The Vortex Wastewater Treatment Plant Process

(Schematic Diagrams Only)

- Wastewater from the building enters the Vibro Screen box **(1).** Here coarse air bubbles are used to physically break down solid matter in the sewage and form a mixed liquor with the water prior to treatment.
- The mixed sewage liquor flows into the Aeration Chamber for treatment **(2).** A bacterial culture is present in the Aeration Chamber which digests the pollutants in the wastewater. The bacterial culture must have a constant oxygen supply and this is provided by a fine bubble diffuser at the base of the tank.
- The mixed sewage liquor then flows into the Clarification Chamber **(3)** where it is able to separate into clear, treated sewage effluent and sludge. The clear effluent is able to flow past the scum baffle and out of the tank.

Step 1

The plant accepts and treats the incoming sewage in the central bio-zone chamber, with use of the extended aeration principle.

Step 2

A simple course diffuser, housed in a draft tube, introduced the air from the integrated blower that provides the oxygen to the bacteria, which then treat the sewage.

Step 3

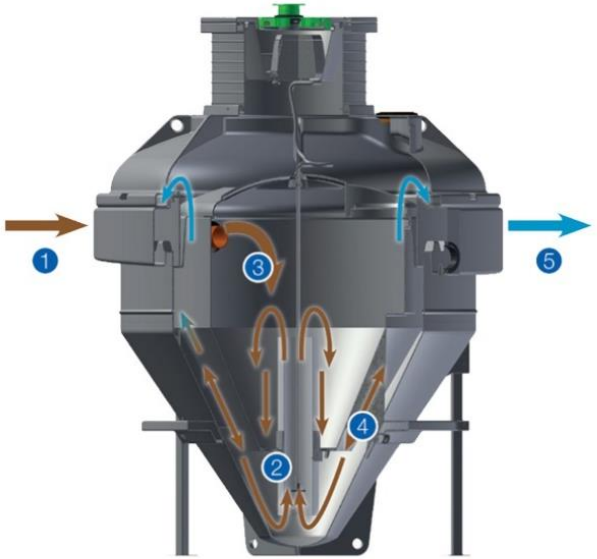
The Bio-zone then retains the mixture of sewage and bacteria until the level of treatment has been achieved.

Step 4

The treated final effluent then enters the settlement zone where settlement takes place. The settled solids are drawn back towards the draft tube, housing the diffuser and are returned via the airlift principle to the bio-zone for further treatment.

Step 5

The treated (final) effluent subsequently leaves the plant over a weir, at the outlet level, that extends around the circumference of the tank. The movement of the fluid through the whole system is only by gravity displacement.

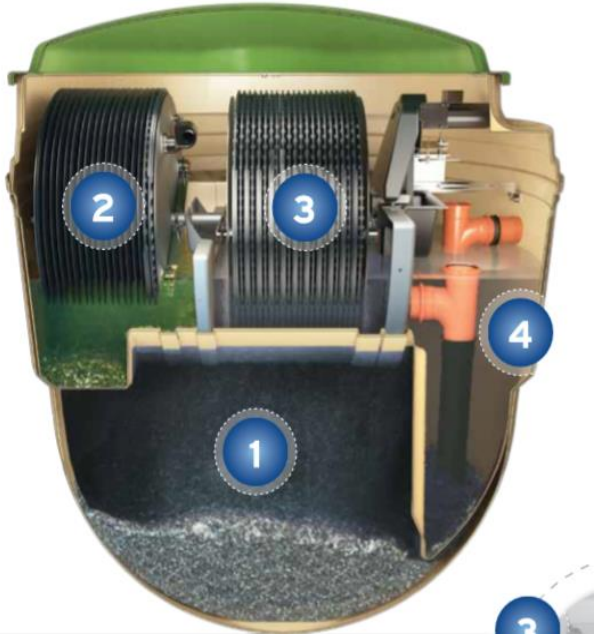


BioDisc®
HOW IT WORKS

The Rotational Biological Contactor (RBC) is central to the operation of each Kingspan Klargester BioDisc®. It supports a biologically active film or biomass onto which aerobic micro-organisms, naturally found in sewage, become established. Natural breakdown of sewage can then occur as described below.

UNIT SIZE	SINGLE HOUSE		MULTIPLE HOUSES	
	BA	BA-X	BB	BC
Population Equivalent	1 House up to 4 bedrooms	1 House up to 7 bedrooms	2 House up to 8 bedrooms	3 House up to 12 bedrooms
Overall diameter / Width (mm)	1995	1995	1995	2450
Standard drain inlet (mm)	750*	750*	750*	600†
Standard outlet (mm)	835	835	835	685
Depth from invert to base (mm)	1400	1400	1400	1820
Pipework Diameter (mm)	110	110	110	110
Sludge storage period (Approx)	12 Months	9 Months	6 Months	7 Months
Standard power supply	Single Phase	Single Phase	Single Phase	Single Phase
Motor rating	50W	50W	50W	75W
Weight (tonnes) standard units	0.388	0.418	0.418	0.650

* BA-BB 450/1250 † BC 11000



In Summary

Mains drainage has improved the health of the population, controls disease and pollution

Lots of places are not on mains drainage and have very little impact

Should we keep it local?

There isn’t a single option to fit all scenarios