

# Southern Water

## WaterWise Teaching Resource



Down the drain

Fact sheets

© Southern Water 2002.

These materials are freely photocopyable in educational institutions.



## Down the drain

fact sheets

1

fact sheets

### Contents

The Fact Sheets give you background information that you will need to prepare for the debate.

- Fact Sheet 1: *Demographic information - population, topography, local economy and water use*
- Fact Sheet 2: *Map of the proposed site and surrounding area and background information about the new treatment works*
- Fact Sheet 3: *Data (tables) relating to water supply, treatment, present water consumption and predictions for future consumption*
- Fact Sheet 4: *Environmental effects of treated and untreated water*
- Fact Sheet 5: *Treatment processes and sludge recycling*
- Fact Sheet 6: *Historical information - historical facts, present works, why is a new works needed? why here? why now?*



## Demographic information

### Population

#### Richardford

Richardford, the site of the new wastewater treatment works, will treat the waste from Pountney and District (including Pountney, Filmore, Richardford, Gull Sands, Saltdown, Darton and Hartmouth).

<b>Area covered by present wastewater treatment works at Darton</b>	<b>Pountney and District ( Pountney, Filmore, Richardford, Gull Sands, Saltdown, Hartmouth and Darton) See Map Fact Sheet 2</b>
Resident population	87,389 (based on 1991 Census and population growth)
Resident and holiday population	94,375 (Information from Tourist Board)
No. of properties connected	42,013
Area covered	113 square miles (Local Government Commission 1994)

#### Main areas served by the Water Company

Counties served by the Water Company	Isle of Wight	Hampshire	Sussex	Kent	Total
<b>Resident population</b>	124,800	1,212,777	1,323,336	1,347,332	4,008,245
<b>Resident and holiday population</b>	165,704	1,306,680	1,457,238	1,514,327	4,443,949
<b>No. of properties connected</b>	53,684	493,468	634,830	590,152	1,772,134

### Topography

The local area consists of a belt of small towns broken up by agricultural land (mixed use, cattle, sheep and crops) and some countryside. The coast is a mixture of cliffs and sand/shingle beaches.

Much of the area is rural; the largest town of Pountney is located inland to the north. Pountney is situated on the region's main river, the Hart. Its subsidiary, the river Dian meets the Hart at Richardford, a small, centrally located town and the site of the proposed treatment works. Darton, the location of the long sea outfall, Gull Sands, Filmore, Hartmouth and Saltdown are small coastal towns.



## Local economy/industry

- Agriculture and fishing have been the traditional industries of the area.
- Tourism is now very important.
- There is a limited amount of high technology employment. Most businesses are of medium size employing 11 - 199 people.
- Over the next three years the population is expected to increase by 0.4% per year.
- Average hourly earnings in Sussex are below the national figure but the gap is closing.
- Unemployment is 3.3% which is below the Sussex rate of 3.8%.
- The level of investment in new developments (industrial and commercial) is insufficient to keep pace with demand.

## Water use

### Did you know?

#### Improvements in lifestyle mean we use 55% more water than 25 years ago

Taking a bath uses	80 litres
Taking a shower	30 litres
Flushing the toilet uses	8 litres
Watering the garden (sprinkler) uses	650 litres per hour
Washing machine	80 litres per wash
Dishwasher uses	35 litres per wash
Drinking and cooking	10 litres per day

### Did you know?

#### We use at least 160 litres of water per person, per day. And in industry...

To produce 1 tonne of ready mixed concrete takes	3,800 litres
To produce 1 tonne of steel takes	2,800 - 62,000 litres
To build an average car	2,600 - 8,000 litres
To brew a pint of beer	4 litres



## Map of proposed site and surrounding area



### Plans for new wastewater treatment works

**Location:** The Water Company has applied to the local Council for planning permission. It wants to build a new wastewater treatment works and sludge recycling centre near to its existing works at Darton. Darton is on the south coast of England between Hartmouth and Filmore.

**Construction:** This will take place on a brownfield site in Richardford, on the edge of an existing industrial estate. New buildings will be constructed, but low earthworks planted with a wide band of trees and shrubs should hide these. Only the stack of the sludge dryer will be visible above the trees. The sludge-recycling centre, built alongside the treatment works, will convert dried sludge into an odourless, organic soil conditioner. An odour control system will clean the air from the treatment plant.

The new pipes needed to link the towns to the treatment works will be buried if they cross agricultural land and countryside. These areas will be landscaped and returned to their previous state when the work is completed.

#### Long Sea Outfall

Treated water will enter the sea through the long sea outfall at Darton. Some minor modifications will be made.

#### Pumping Stations and Storm Overflows

Existing works at Filmore, Darton and Hartmouth will be converted to pumping stations. The outfalls at Saltdown and Gull Sands will be converted to storm overflows.



## Water supply and treatment at Darton, water consumption and projections for future consumption

### Water Supply

Number of homes and residents supplied with water in Pountney and District (this does not include supply to businesses)

<b>Area covered by present wastewater treatment works at Darton</b>	<b>Pountney and District ( Pountney, Filmore, Richardford, Gull Sands, Saltdown, Hartmouth and Darton) See Map Fact Sheet 2</b>
<b>Resident population</b>	87,389 (based on 1991 Census and population growth - 1% per year)
<b>Resident and holiday population</b>	94,375 (Information from Tourist Board)
<b>No. of properties connected</b>	42,013

### Water Treatment

Water is the ultimate recyclable material. After we use it, it is cleaned and treated, then safely returned to rivers and seas. Two European directives set the standards of treatment - the Bathing Waters Directive which sets a standard to be met by designated bathing waters, and the Urban Waste Water Treatment Directive which sets standards which wastewater should reach "at the end of the pipe" before it is released into the marine environment.

#### Amount of Treated wastewater at Darton

**Daily amounts (rainfall, factory, domestic use)** 28,343,000 litres



### Water consumption

The table shows how much water is needed every day (this does not include supply to businesses).

<b>Area covered by present wastewater treatment works at Darton, Filmore and Hartmouth</b>	<b>Pountney and District ( Pountney, Filmore, Richardford, Gull Sands, Saltdown, Hartmouth and Darton)</b>
<b>Resident population</b>	87,389 (based on 1991 Census and population growth - 0.4% per year)
<b>Resident and holiday population</b>	94,375 (Information from Tourist Board)
<b>Daily Consumption based on 160 litres per person per day (national averages): Resident population</b>	13,982,240 litres per day
<b>Daily Consumption based on 160 litres per person per day (national averages): Resident and holiday population</b>	15,100,000 litres

### Future consumption

The table shows an estimate of how much water will be needed every day in 5 years time; (this does not include supply to businesses).

It is estimated that the population will grow by 0.4% per year and that each person will use approx. 165 litres of water per day.

<b>Area covered by present wastewater treatment works at Darton, Filmore and Hartmouth</b>	<b>Pountney and District ( Pountney, Filmore, Richardford, Gull Sands, Saltdown, Hartmouth and Darton) See Map Fact Sheet 2</b>
<b>Resident population in 5 years time (estimate based on 0.4% growth)</b>	89,151
<b>Resident and holiday population in 5 years time (estimate based on 0.4% growth)</b>	96,278
<b>Daily Consumption based on 165 litres per person per day (estimated averages): Resident population</b>	14,709,885 litres per day
<b>Daily Consumption based on 165 litres per person per day (estimated averages): Resident and holiday population</b>	15,885,814 litres per day



## Down the drain

## Fact Sheet 3

fact sheets

7

### Did you know?

Every day in the UK, 58 million people use 19,067 million litres of water.

**Since privatisation, in 1989, Southern Water has spent a total of £2 billion on improvements to coastal discharges.**

(Memorandum Government submitted to House of Commons Select Committee enquiry into Sewage Treatment and Disposal 1997).

fact sheets



## Environmental effects of treated and untreated water

### Treated wastewater

- Reduces exposure to potentially harmful bacteria for bathers.
- Does not overwhelm the natural ecosystem (the community of plant and animal life) in rivers and seas.
- Cleaner water for shellfish means that supplies are of good quality for the local fishing industry.
- Local tourism benefits from beaches being given 'the blue flag' - an official recommendation that the beach and bathing waters are clean for residents and holidaymakers. Bathing water quality is one of the key criteria for the award of a 'Blue flag'.

### Untreated wastewater

- Untreated wastewater in coastal or river waters can disrupt existing plant and animal habitats and plant and marine life.
- Untreated wastewater contains a mixture of microbiological species. Some of these species are called pathogens. Pathogens significantly increase the risk of disease for plants, animals and humans.
- The link between sewage pathogens and illness was first established in the late 19th century when Cholera outbreaks were linked to sewage contaminated drinking water supplies.
- It has been established that a bather (or water sports enthusiast) could take in enough pathogenic micro-organisms if bathing in sewage contaminated water to cause a mild illness such as a stomach upset or diarrhoea.



## Viewpoints to consider

*'An acceptable solution would be to divert the treated discharge away from the beaches via a long sea outfall, to protect bathers and coastal waters.'*

**Environment Agency**

*'In the UK it is the responsibility of the Water Companies to treat and dispose of waste water. Until recently the coastline of the UK was blighted by raw sewage outfalls, debris covered beaches and polluted rivers. (Many) Water Companies have done the minimum amount necessary, just adequate to remain inside the law. Sewage has not been a top priority. The long sea outfall, out of sight, out of mind attitude has enabled the pollution of Britain's beaches to continue.'*

**Surfers against Sewage**

*'Less than 10% of coastal pollution is from water company outfalls. Run offs from land, shipping and even sea birds, dogs or lack of toilets can all have a significant effect and lead to failure to meet acceptable standards. This will become more apparent as our work continues to improve bathing waters.'*

*'In 1995 the government reported that in the UK 300 million gallons of sewage were discharged to sea each day and that there was a need to review the standards of treatment applied to the discharges into coastal waters.'*

*'Southern Water's multi-million pound improvement programme is helping bathing waters throughout Kent, Sussex, Hampshire and the Isle of Wight meet stringent European standards which are monitored by the Environment Agency. In 2001, 99% of the 79 bathing waters in our region met European standards. In addition, over half met a 20 times higher "excellent" standard.'*

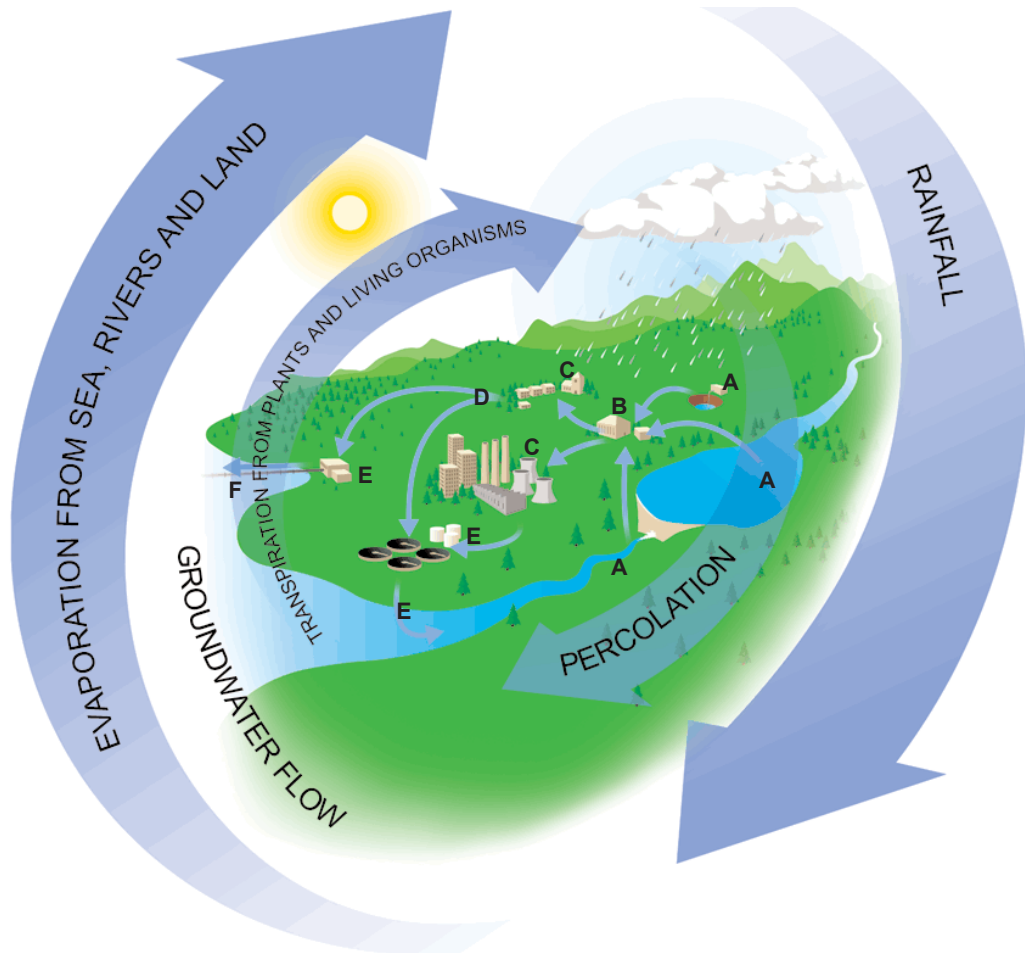
**Southern Water**



## Explanations of water supply and treatment processes

### Water supply

fact sheets



The water cycle is a continuous process. The clouds in the sky have been formed by evaporation from the land, seas, rivers and lakes. The water in the clouds falls as rain when weather conditions dictate.

Rainfall eventually finds its way either to the nearest reservoir or river, or percolates through porous ground such as chalk.

Southern Water collects and cleans the water which we then use. The dirty water is then cleaned and returned to the environment.

At every stage of its route back to the sea or rivers, some of this water evaporates to begin the water cycle once again.

### Key:

- A Water is collected from boreholes, reservoirs and rivers
- B Water treatment works
- C Clean water is supplied to domestic properties/industry/commerce etc
- D Wastewater into drainage system
- E Wastewater treatment works
- F Cleaned water either returned to rivers or to the sea via long sea outfalls



### Aquifers

Aquifers are areas of water-holding rocks underground - they hold water like a giant sponge. In this region, much of the surface rock is chalk or sandstone - both porous rocks. Rainfall soaks through this porous rock. Underground, underneath the porous rock are layers of impermeable rock. Impermeable rocks do not let the water pass through, so the water collects in the porous rock above this impermeable layer, deep below the Earth's surface.

Aquifers are really important in this region. 70% of the Water Company's water supply is abstracted (pumped out) from aquifers through boreholes drilled through the rock. It is then cleaned and used.

The sandstone and chalk have filtered the rainwater so it is mostly free from bacteria and is of a very high quality.

### Reservoirs

Water that is stored in reservoirs is checked and monitored constantly. There are a quarter of a million tests per year at reservoirs, water supply works and customers' taps. The government's Drinking Water Inspectorate monitors the tests and makes sure water companies meet the standards of quality required.

## At the treatment works

### Collecting the wastewater

- Wastewater enters the drainage system
- It is collected in sewers
- It travels through sewers to the wastewater treatment works

### Preliminary Screening

Larger materials in the system are removed. A large, perforated screen sieves out floating and suspended items. The screenings consisting of rags, grit and larger debris from the sewers are removed and put into sealed skips to be disposed of in landfill sites.

### Primary Settlement Process

Oil and grease are skimmed off.

The remaining wastewater passes through tanks which are designed to help solid particles to settle out. These can be large round tanks, smaller tanks with plates which act as collectors of solid particles, or even smaller tanks with helical spirals which collect solids more efficiently than the other two. The solid particles which collect at the bottom of the tanks are called "sludge". It is extracted and sent for recycling.

### Secondary Process

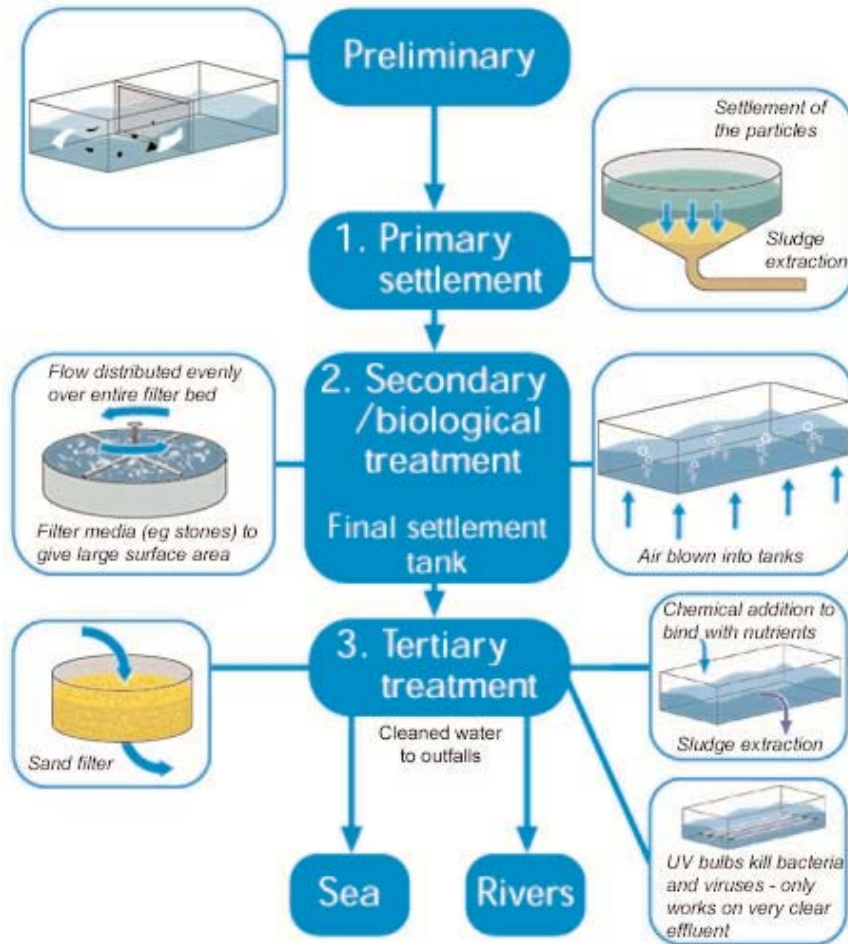
In the secondary process, the wastewater is treated biologically with natural bacteria and oxygen. The bacteria "eat" organic material remaining in the wastewater at this stage. The oxygen is injected to encourage the right kind of bacteria to breed and keep the process going.

If required, the wastewater can go through a tertiary process which can either provide further solids settlement, or can filter out very fine particles, or can use ultra-violet light to neutralise a large proportion of remaining bacteria.



The processes are described diagrammatically below.

fact sheets





## Sludge recycling

### Treatment

The sludge taken from the Primary Settlement Process is screened and thickened. The sludge is then transferred to digester tanks containing bacteria that break down the warmed organic sludge over 12 days. A natural gas (methane) is produced and stored. The digested material is pressed or passed through large dryers to reduce water content.

### Products

- Recycled sludge is turned into digested cake or dried granules. These are valuable soil conditioners and fertilisers that can be used by local farmers and other land improvement schemes.
- The methane gas is recycled and used to generate power to help run the treatment works, so they are energy efficient. Excess gas that isn't needed is, in some locations, used to create electricity which can be exported to the National Grid.

### Benefits

#### Recycled sludge

- The process of turning recycled sludge into fertiliser is conservation friendly. At the present time the phosphorous in many fertilisers comes from phosphate rich rocks. These are a non-renewable resource. In less than 20 years, at the current rate of use, many of these easily mined phosphate rocks will be used up. Sludge recycling is the obvious solution to this problem.
- Recycled sludge cake and granules are useful sources of nutrients for the soil. The quality of local soil is considerably improved.
- This process is recycling material that would otherwise have to be disposed of in landfill sites or incinerated. Both are costly (these costs would have to be passed on to the customer) and landfill takes up valuable land area.

#### Methane Gas

- The methane gas can be collected to produce electricity to run the machinery in the treatment works. This means that less methane is being released into the atmosphere so the process is more environmentally friendly.
- The cost to customers is lower because the Water Company is generating its own electricity for Wastewater Treatment.

#### General

- Cost savings can be passed onto customers and that means lower water bills.
- The government is promoting conservation and recycling methods so sludge recycling is government approved.
- The processes are environmentally friendly.



## Historical Information: why is a new works needed, why here, why now?

The works must go ahead somewhere. Local people can have a say in the location of the works through the local planning system but, any plans must be in line with European and British law.

### Historical facts

#### Important dates

**1960's and 1970's:** The need to improve bathing water quality was given very low priority throughout the UK.

**1976:** The European Union Bathing Water Directive was agreed and some action had to be taken.

**1984:** The Government was embarrassed when the Royal Commission on Environmental Pollution criticised them for not carrying out the Bathing Water Directive fully. It stated that many of the bathing waters around the UK had an undesirable degree of sewage contamination.

**1990:** The House of Commons Select Committee Report stated that: 'wherever possible, all sewage should receive at least primary and secondary treatment'.

**1998:** The Periodic Review carried out by OFWAT and the government recommended an environmental clean up around the coastline of the UK over the period 2000 - 2005.

### Present works

The present works in Darton dates from Victorian times. It does not provide current day treatment standards and many of its installations are old and out-of-date.

#### Location

The present works are close to the centre of Darton.

#### Equipment

The basic sewerage system and a pumping station were installed in Victorian times. Since then the Water Company has added equipment for Preliminary Screening. (See Fact Sheet 5). Other than this, there is no treatment with crude sewage being discharged through long sea outfalls.

## Why is a new works needed?

Until now, the present works has coped with the wastewater it has had to treat. But the present works can no longer cope.

#### Reasons

The Water Company must comply with new European and British laws for treating

- wastewater. It needs to install more modern equipment and additional processes. The site needs to be extended.

All this must take place fairly soon or the Government will face heavy fines.

-



## Why here?

The Water Company has looked at lots of possibilities. It would like to build its new treatment works on a local site, about three miles from Darton town centre and two miles from the present works.

### Reasons

- The site is suitable from a technical viewpoint and there is plenty of room to build.
- The population of the towns along the coast is growing. The Water Company expects a 4% increase in the next 10 years and they must plan for the future.
- The tourist industry is also growing, and this is placing heavier demands on the system. Any future demands can be met by the new site.
- When treated wastewater is discharged into the sea through a long sea outfall, it is distributed and dispersed quickly and easily by the tides.
- The sea can cope with the amount of treated wastewater discharged by the long sea outfall.
- Darton is the lowest point in the existing network to which all wastewater currently flows under gravity, so it is the natural choice for a treatment works.

### Alternative sites

The Water Company looked at lots of alternative sites but they were not as suitable as Darton because:

- There is no room on the other sites to build any extra buildings or install any new equipment.
- There are no sites that are at lower points in the networks and pumps would have to be used to move the water either inland or elsewhere creating an extra demand for electricity and therefore making a significant extra contribution of CO<sub>2</sub> to the atmosphere.
- Possible inland sites were no good because treated water from them would be discharged into the River Dian or the River Hart. Neither river could cope with the volume of wastewater - it would affect natural habitats, raise the water table and, at some times of the year, increase the risk of flooding.
- There were environmental restraints on most of the other sites, or lack of room for improved processes. The Water Company must provide these according to the law.
- Some of the other sites were too far away from any town, which would mean laying lots of extra pipes along the coastline.

## Why now?

The Water Company must act fairly quickly. It has to allow time for planning and building. It has to meet EU and British legislation.

### Reasons

#### The law

The EU and the British government have laid down laws saying that any wastewater entering the sea must be properly treated. It must meet government and EU standards.

The Water Company has a five-year plan (2000 - 2005) to clean up its coastline and introduce up to date treatment, equipment and processes.

If the Company fails to meet the standards, the Government will be open to the risk of prosecution from Europe and the imposition of heavy fines.



## Viewpoints to Consider

*'It is within the local Council's authority to grant planning permission for the new treatment plant. If it refuses, the Water Company can appeal for a public enquiry to the Secretary of State for the government. The Water Company would prefer not to go to the Secretary of State because this would take up valuable planning and construction time.'*

**Chairman, the Water Company**

*'Our plans meet the requirement of EU and British law. We now need to take the debate to the local community.'*

**Managing Director, the Water Company**

*'The Government is encouraging wastewater treatment plants to look at sewage recycling wherever possible. This is included in the Water Company's plan. However, we will listen to all the arguments and make our own judgements.'*

**Local Council**

*'The Urban Waste Water Treatment Directive requires that the dumping of sewage sludge at sea, by ship or barge, should cease by the end of 1998 and sludge be re-used whenever appropriate. We must also ensure that the development of the wastewater treatment infrastructure meets environmental, economic and social criteria to ensure sustainable growth in the UK.'*

**DEFRA**