

LINCOLNSHIRE CATCHMENT PANEL  
FIELD VISIT

FRIDAY 7 JUNE 1996



SOUTH FERRIBY LOCK AND SLUICE

ENVIRONMENT AGENCY



102529

## ITINERARY

08.30 Assemble Briggate Lodge Inn (Broughton)  
Coffee and Introduction

08.50 Depart by coach

- |        |   |
|--------|---|
| Site 1 | Toft Newton Reservoir   |
| Site 2 | River Ancholme at Brandy Wharf  |
| Site 3 | Cadney Water Intake,<br>Pumping Station, & Reservoir<br>inc. COFFEE<br>(Anglian Water Services Ltd) |
| Site 4 | Glanford Brigg Power Generating Station<br>(Regional Power Generators)                              |

12.50/  
13.50 LUNCH Briggate Lodge Inn

Site 5 Cement Works, South Ferriby  
(Rugby Cement Ltd)

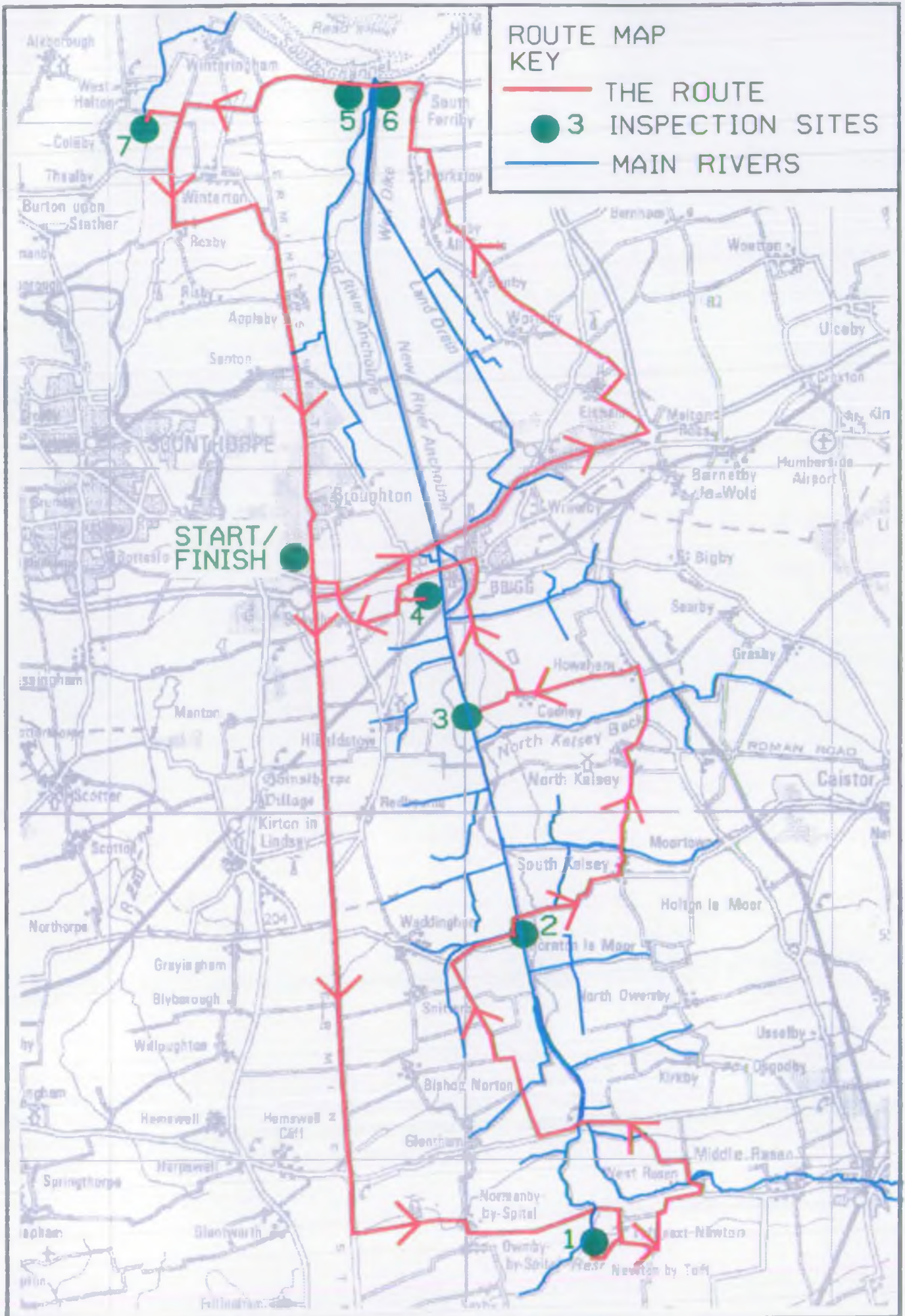
Site 6 South Ferriby Lock & Sluices  
inc. TEA AT HOPE & ANCHOR - MEET PG AT  
4.0 PM

Site 7 Winterton Landfill Site  
(Wastewise Ltd)

Return to Briggate Lodge Inn

17.20/  
17.30 TEA/COFFEE AND DEPART





ROUTE MAP  
KEY

- THE ROUTE
- 3 INSPECTION SITES
- MAIN RIVERS

START/  
FINISH



## RIVER ANCHOLME - HISTORICAL PERSPECTIVE

Today's River Ancholme is largely the result of several centuries of man's labours. The historic landscape of thousands of hectares of fresh and salt water marshes/meadows abundant with wildlife is now replaced with productive arable farmland. This fundamental land use change had its beginnings back in the latter years of the 13th century. In 1287, Edward I issued a writ "*As to whether it would be hurtful to him or any other if the course of the River Ancholme were opened*"

In 1294 in order to facilitate the passage of cargo boats laden with corn, coal, wood, livestock etc works were undertaken to straighten the course of the River Ancholme from Bishops Bridge to the Humber. This also had the effect of draining some areas of land but by 1312 siltation had reduced the depth of the channel and so began the regular tasks of dredging and bank works which continues through to today.

In 1635 Sir John Monson constructed the first sluice on the River at Horkstow. Prior to this the River Ancholme was open to the Humber and the lower reaches of the river were tidal. Over the next 100 years, due to neglect, the Ancholme Valley almost returned to an undrained marsh with sluices allowed to decay and banks burst and washed away. In 1767 a second sluice was built at Ferriby, the remains which can be seen in the Haven at low water.

In the Act of 1825 (amended Act 1802) works proceeded under Sir John Rennie to construct South Ferriby lock and sluice, in its current position. The sluice and lock were opened in 1844 by the then Earl of Yarborough.

Around the turn of the 19th century the navigation was extended with the construction of the Caistor Canal (1793) and the construction of Harlem Hill Lock (1827).

The Navigation ends at Bishops Bridge, built by one of the Bishops of Lincoln. In terms of navigation it used to be a busy place providing a link to the major industrial towns of Yorkshire and the rest of the country and in the late 1800's barges carrying farming equipment, coal, oil, corn, wood and livestock landed and left from the wharf.

In 1828 passenger boats provided a weekly service from Brigg to Hull, Leeds and Wakefield. More regular travel was provided by 'Fly Boat'. One left Brigg daily (except Sundays) and connected at South Ferriby with the Steam Packet 'Elizabeth' from Hull. In 1891 the Goole and Hull Steam Packet Company Ltd were given a licence to operate a steam driven craft on the river.

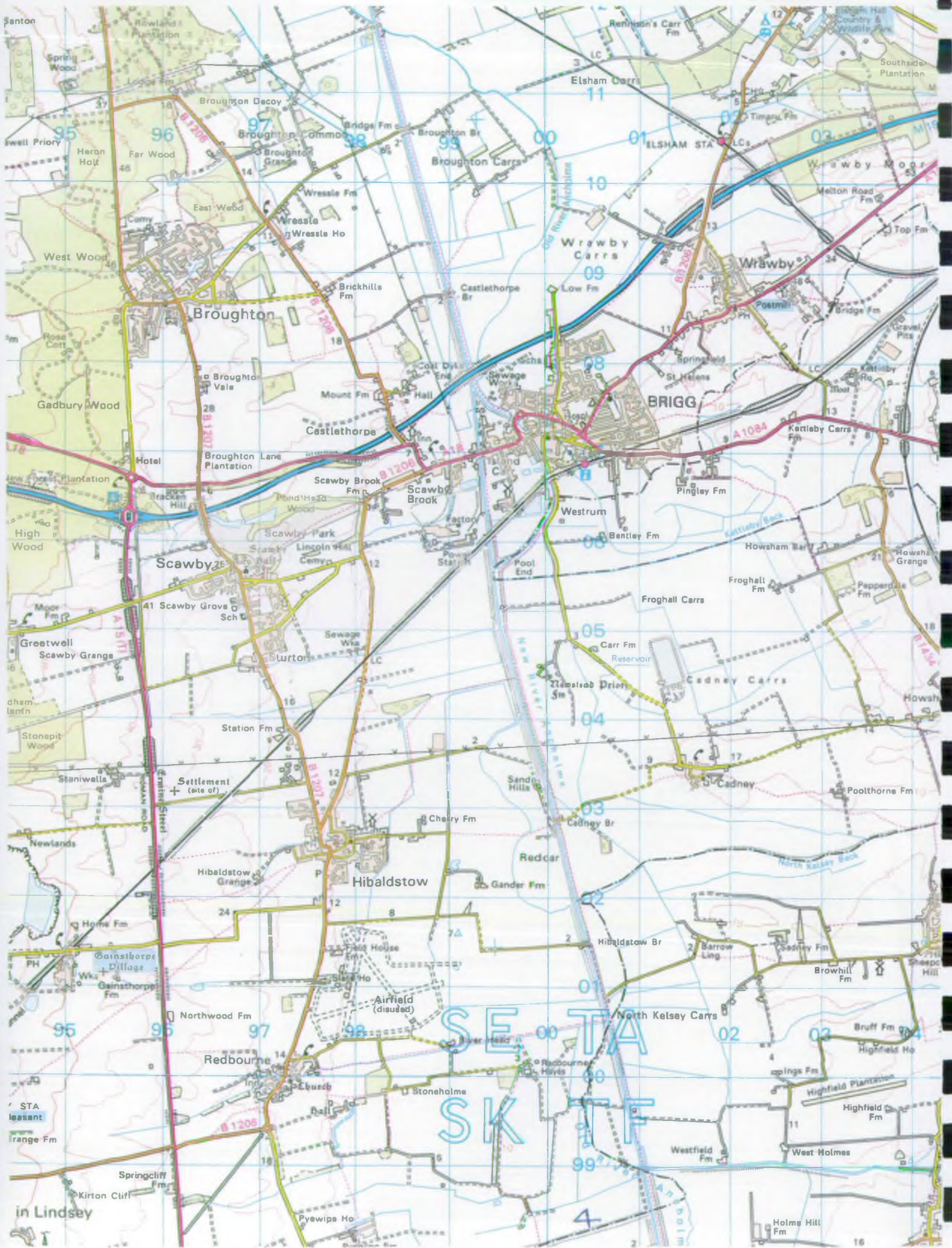
By 1930, although the level of water had been maintained for navigation purposes, the land had shrunk causing land drainage to become unsatisfactory. During the period 1935-1938 the Ancholme was dredged by steam bucket dredger from South Ferriby to Harlem Hill improving land drainage and flood protection in the valley.

THE FOLLOWING THREE MAPS SHOW THE ANCHOLME VALLEY

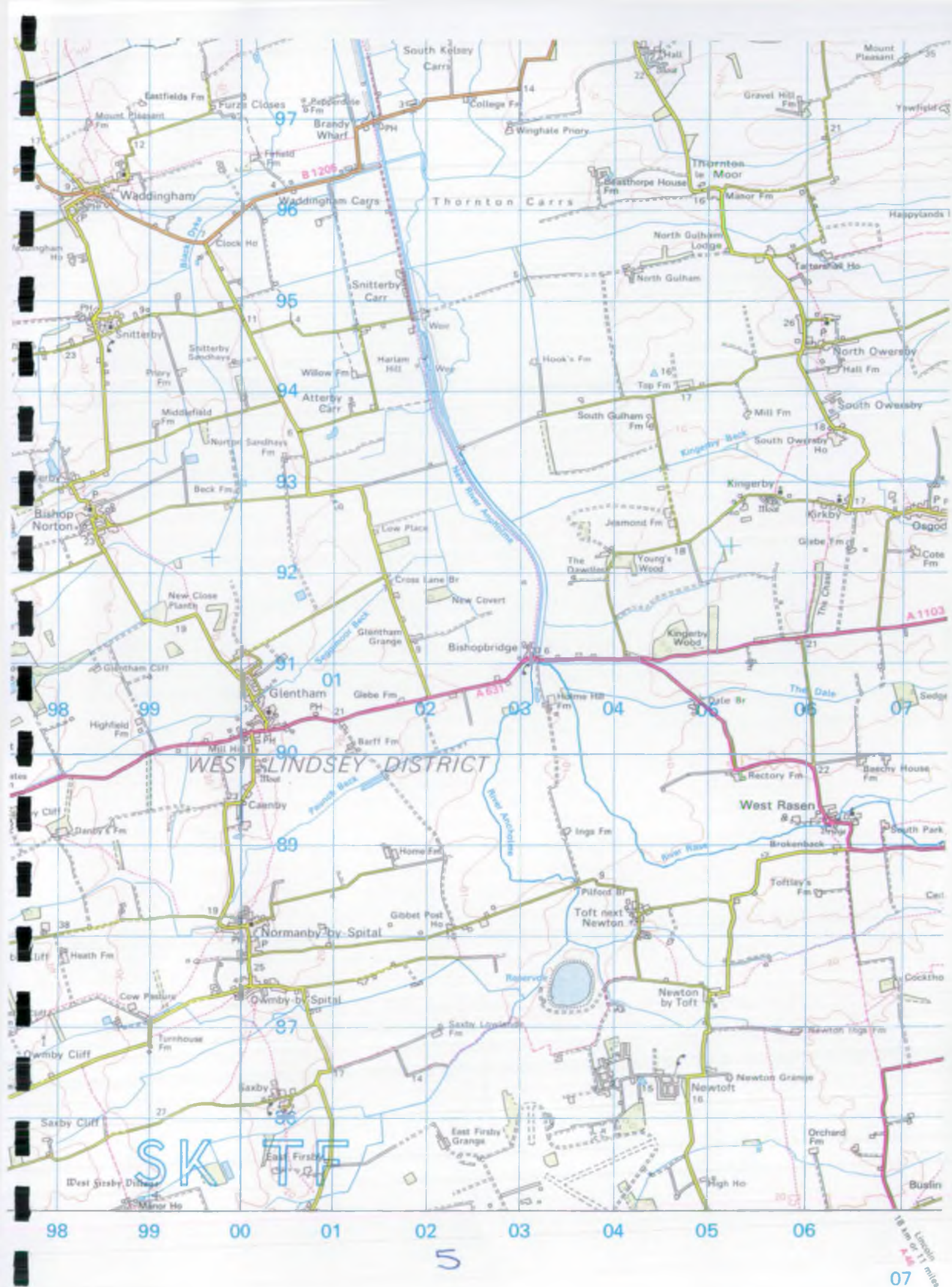














## SITE 1 TOFT NEWTON RESERVOIR

Toft Newton Reservoir forms part of the Trent Witham Ancholme River Transfer Scheme (TWA scheme) which is owned and operated by the Environment Agency. The TWA scheme is of strategic importance to the surface water resources and abstractions within the Ancholme, Lower Witham and Humberside catchments. The scheme was commissioned in 1974 largely to provide water to meet rapidly rising water demands within the South Humber bank Industrial area which could not be met by increased abstraction from the over committed chalk aquifer of the Lincolnshire Wolds.

The River Ancholme, which is an embanked channel from Bishopbridge to South Ferriby with large storage capacity, is regulated by transfers of water to ensure a continuous and adequate level and flow in the river during dry weather and summer periods.

Water is transferred from the River Witham system via a pumping station at Short Ferry which pumps water through 17 km of pipeline to the upper Ancholme at Toft Newton. The works here at Toft Newton include a 16.5 hectare reservoir which holds upto 7 days supply of water for emergency release to the Ancholme in the event of pumping failure at Short Ferry. During low flow periods the River Witham system itself is also augmented by transfer of water from the River Trent at Torksey. The water is pumped via a short pipeline to the Fosdyke Canal which carries it to the River Witham system.

### THE DIAGRAM OPPOSITE SHOWS THE PRINCIPLES OF THE TWA SCHEME

Currently there are a total of 97 abstraction licences which are supported by the TWA scheme, 18 of which are abstraction licences from the River Ancholme. The TWA scheme total supported licensed quantity is 41,059 tcma of which 37,698 tcma is from the Ancholme.

Under average conditions the River Ancholme only needs to be augmented by transfers in the summer period. The Industrial abstractions and public water supply abstraction at Cadney take place throughout the year.

The river transfer scheme is currently fully committed to existing licences, but only under extreme weather conditions and abstraction. ie: If all the licensed abstractors were abstracting at their licensed quantity (their limit) and this coincided with the severest dry year (eg 1976), then the transfer scheme would be operating at its limit.

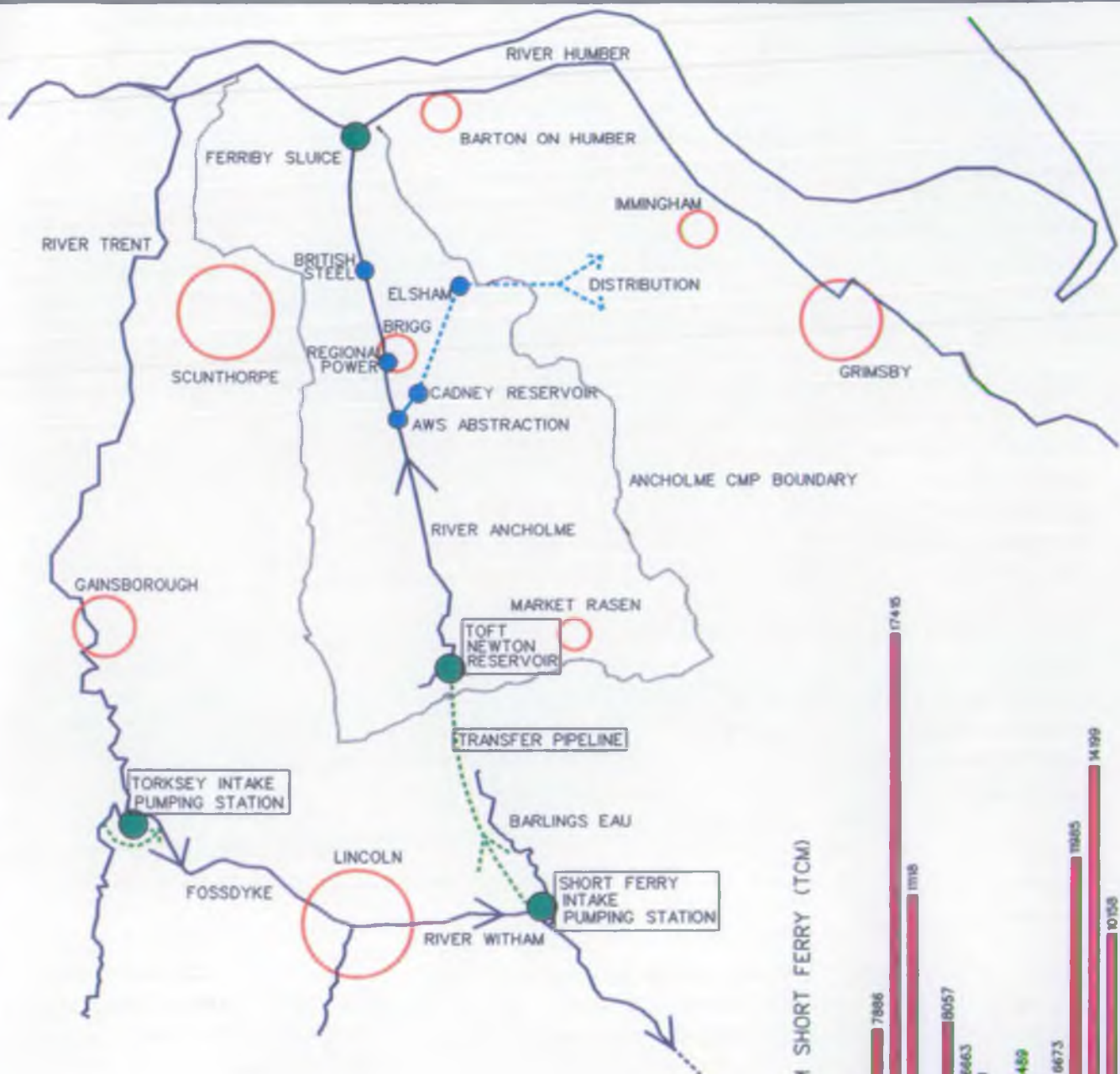
The TWA Scheme also provides water quality benefits to the Ancholme Catchment. The transfer of water during the summer period enables the River Ancholme to maintain a positive flow to tide which reduces the effect of eutrophication and also reduces the ingress of saline water into the system.

note

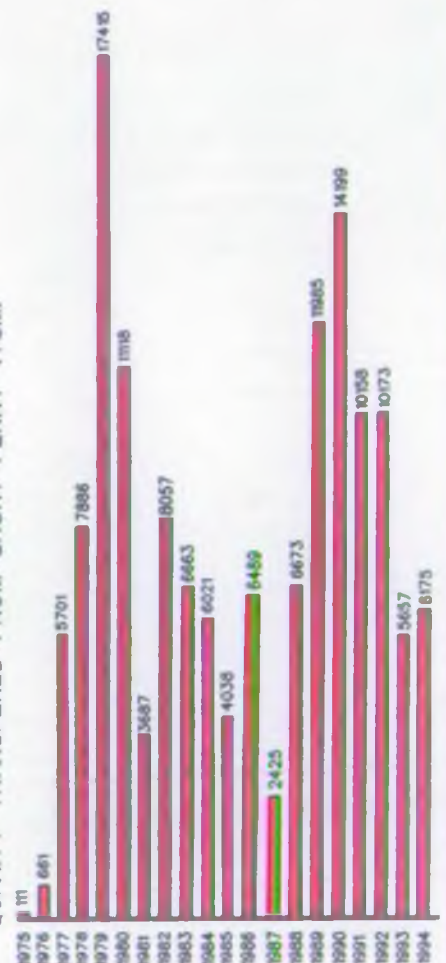
tcma stands for 'thousand cubic meters per annum'



# TRENT WITHAM ANCHOLME RIVER TRANSFER SCHEME (TWA)



QUANTITY TRANSFERRED FROM SHORT FERRY (TCM)



**ENVIRONMENT  
AGENCY**



## TOFT NEWTON RESERVOIR FISHERY

The 16.5 hectares of the reservoir offers some of the best opportunities for stillwater trout fishing in Lincolnshire, and is open from March to December.

Stocking of both rainbow and brown trout is carried out twice a week and over 7,000 fish have been taken by anglers this season including, a 12lb 5oz rainbow trout and a 6lb 8oz brown trout.

Boats are available for anglers who wish to fish away from the bank and a recent improvement to the facility has been the acquisition of a 'Wheelyboat'. This adapted boat allows a wheelchair to be taken on board and was purchased through donations from the following 15 organisations and individuals.

National Rivers Authority (now part of the Environment Agency)

The Country Landowners Association

Brigg Lions Club

Lincoln Rural Development Committee

Ise of Axholme Lions Club

Immingham Lions Club

Glanford and Lindsey Lions Club

Louth Lions Club

Grimsby and Cleethorpes Lions Club

Wheaters of Lincoln

Salmon and Trout Association

Scunthorpe and District AA

Lincoln and District AA

Mr Roland Wallis Clarke

Disabled Angling Eastern Region

Once aboard, the flat bottomed boat is very stable and allows safe, convenient access to the fishery.

Although originally conceived for use by wheelchair anglers, it is of equal value to people whose disabilities hamper their use of a normal rowing boat and thus their ability to enjoy the freedom and pleasure of being on the water.

Recent alterations to the brick site building will provide improved accommodation for visiting anglers, including the provision of disabled access.



# LINCASHORE '97



## AN ENVIRONMENTAL STATEMENT



**NRA**

*National Rivers Authority  
Anglian Region*



## INTRODUCTION

The beaches and sea defences between Mablethorpe and Skegness on the Lincolnshire coast provide flood protection to a large area of low lying coastal plain with residential, commercial, industrial and agricultural interests. The beaches, which are used extensively, are an important recreational and amenity resource. Many of the coastal towns are popular holiday resorts. The coastline also includes sites of special nature conservation value such as Gibraltar Point National Nature Reserve and areas of archaeological interest.

This part of the coast has a long history of flooding. The most notable event, in 1953, resulted in multiple breaching of the defences, 41 deaths, the total evacuation of Mablethorpe and Sutton and the flooding of 8,000 hectares of land.

Since 1953 there has been a continuing programme of sea defence works. More recent storms in 1976, 1978 and 1983 demonstrated the continuing risk to lives and property when damage occurred along much of the coast and a number of defences came near to breaching.

Recognising the need to plan ahead, to provide sound and secure defences on the 24 kms stretch of coast between Mablethorpe and Skegness and to ensure protection of lives and property a detailed investigation was carried out into a long term strategic approach to the future of the area's defences.

As part of the investigation, an environmental review of the potential impact of the preferred solution of beach nourishment was carried out by consultants for the Anglian Region of the National Rivers Authority. This leaflet summarises the main points in the 84 page report.

## THE STUDY AREA

The shoreline comprises extensive sand and shingle beaches crossed by numerous timber groynes. The beach is backed by extensive lengths of seawalls of varying designs interspersed with dune revetted systems.

The coast is of regional importance as a holiday destination for many people living in the East Midlands and South Yorkshire. Its attractive beaches and the proximity of flat land suitable for holiday development have been important factors in the substantial and rapid increase of caravan, chalet and holiday complexes.

The existing sea defences provide protection against flooding for over 20,000 hectares including more than 15,500 residential properties as well as commercial and industrial developments. Recent capital investment in leisure developments in the area has been considerable. The economic justification for providing defences is illustrated by the extent of the potential damage to homes - in excess of £950 million - a figure which does not include indirect, intangible or social costs.



## EXISTING SEA DEFENCES

The existing defences consist of lengths of revetment and concrete slab or stepwork structures complete with wave and splash walls. The defences also incorporate many groynes, a significant number of which are in poor repair.

Since 1953 work has been in progress to rebuild and, where necessary, improve the defences. Reconstruction has generally consisted of new facing works and extending the toe of the concrete structures. Some current and planned schemes include the use of rock armour or "seabee" concrete armour units placed at the toe of the defence to break up and hence reduce wave energy. All recent new schemes have also involved the replacement or refurbishment of existing groynes.

Other improvements have involved the building of splash walls, embankments and decking, together with the provision of gated walls across pullovers (wide points of access from the road to the defences).

## THE BEST SOLUTION

In considering strategies for the future two basic approaches could be adopted:

- **Seawalls.** Continued reliance on seawalls alone would do little to stem the long term fall in beach levels. Design refinements (wave throwback walls, steps and rock toes) could improve the resistance to overtopping and, to some extent, help reduce the rate of beach lowering. But as time went by the beaches would continue to fall and new walls would need to be bigger and stronger.
- **Beach nourishment.** Beach nourishment reduces or eliminates the lowering of beaches by providing a much larger beach in front of the existing seawalls. The protective layer of sand, which would be several metres thick, would reduce any tendency for lowering of the foreshore. These 'new' beaches cause waves to break before reaching the wall so reducing the potential for wave overtopping or damage.



However, the defence must be secure in the long term and this might require new beach control structures (groynes or breakwaters) and/or periodic renourishment.

Such an approach is used with great success along much of the Dutch and Danish coasts. In the Anglian Region beach recharge has been used at Hunstanton and Heacham on the Wash and at Clacton in Essex.

Beach nourishment is the strategy which has been adopted for this stretch of the Lincolnshire coast.

## BEACH NOURISHMENT

Beach nourishment involves dredging sand from an offshore source, transporting it by dredger to the site and pumping it ashore.

The sand would be taken from the offshore source using a trailer suction dredger and transported to a discharge point located approximately 1 km offshore. The discharge point would comprise a buoyed and anchored floating pipeline connected to a sinker line, laid on the sea bed. The sinker line would run to the existing sea defences where it would be fitted with a "T" to connect distribution pipes in both directions.

The distribution pipe would be extended as the beach feed progressed with a total of 2 km of beach feed being potentially achievable from a single sinker line position. It is anticipated that two sinkers would be deployed at any one time, possibly with a third being located in readiness.

Large volumes of seawater are used to flush the sand out of the transporting vessel and pump it ashore. The mixture of sand and water (over 95% water) from the discharge pipe would be used to distribute the material to a natural profile with only minimal mechanical reworking.

The planning and phasing of the operation would be likely to be:



- **Sinker line assembly.** A suitable coastal site would be required for the assembly of the sinker line. This can normally be performed on a drying beach area with the pipe rolled out at high water in 250m lengths. The pipe is then jointed whilst afloat to form a 1km line for tow-out and sinking.
- **Offshore Discharge Point.** The offshore discharge point from the dredger into the sinker line would be subject to a Notice to Mariners and marked with appropriate navigation aids.
- **Phasing.** The beach nourishment would be phased over five years, starting in the south at Skegness and progressing northwards along the coast.
- **Rate of progress.** The typical rate of advance of the pipeline along the beach would be 24 metres a day.
- **Sinker line.** Each sinker line is likely to be in position for a period of 12 weeks. Fishing operators would be notified of the position of the sinker line.
- **Placement line.** Up to a maximum of 2 kms of shore parallel pipe (0.75m diameter) would be laid along the toe of the existing defences. The line would be laid on previously placed material to ensure that it remains above the tide and wave action level. Access points across the pipeline would be provided at appropriate locations.
- **Discharge Point.** During discharge operations it would be necessary to prohibit all public access within 200 metres of the discharge point.
- **Fines Washing Out.** The quantity of excessively fine sediment (silt) should be small, but would require monitoring.
- **Working.** The dredging and pumping operation would be performed on a 24 hour, 7 day week basis. The operation of any mechanical plant on the foreshore would be restricted to daylight hours.







The beach nourishment solution will still involve some maintenance works to the existing seawalls and, in due course, the replacement of some of them.

However, since foreshore levels will have been increased significantly by the beach nourishment, the scale of works will be less than those currently required and much reduced from those which would be necessary if seawalls alone were used.

A key feature of nourishment is the need to compensate for any loss of beach material by periodically feeding new material on to the beach. Monitoring of beach levels and recharge will be needed to maintain beaches at or around their design levels to ensure their effectiveness. This monitoring will be integrated with regional monitoring programmes and beach management plans. On average it is expected recharge will be required about every 10 years.

## IMPACT OF BEACH NOURISHMENT

In summary the effects of the nourishment scheme will be:

- **Land Use, Improved Flood Protection, Nature Conservation, Local Community.** Improved flood protection.
- **Recreation.** Raised beach levels; improved beach quality.
- **Landscape.** Aesthetically more pleasing than seawall approach: covering of exposed clays.
- **Fisheries.** Should not generally interfere with fisheries activities provided fishermen are kept fully informed. Possible turbidity unlikely to affect shellfish, but monitoring will be required.
- **Nature Conservation.** Possible deposition of beach nourishment materials at Gibraltar Point is unlikely to be significant, but will be monitored.

Possible change in calcium carbonate content of dune building materials will be minimised by the selection of appropriate materials.

- **Geology.** Protection of features of geological interest by covering with sand.
- **Archaeology.** Protection of features of archaeological interest by covering with sand. Possible damage to features will be minimised by liaison with County Archaeologist.
- **Traffic.** Possible congestion and/or disturbance due to heavy vehicle movements. Careful programming and routing of vehicle movements will minimise impact.
- **Tourism.** Possible disturbance due to works on beaches during summer months will be kept to a minimum.
- **Recreation, local community.** Possible dangers to public due to proximity of major civil engineering works. Stringent safety measures will be applied.

## CONCLUSION

Beach nourishment is the solution which has the greatest number of significant benefits and, in the majority of instances where there is any environmental impact, the level is assessed as being either minor or short lived for the duration of the beach building operation.

The scheme will make a significant contribution to reducing the risk of flooding along the coast. The tourist trade will benefit from the maintenance or improvement of beach quality and increased beach levels will improve general access and open up larger sections of beach previously underused because of exposed clay.





**LINCOLNSHIRE CATCHMENT PANEL FIELD VISIT  
FRIDAY 7 JUNE 1996**

Attendance List

Robert Spaight, <b>Chairman</b>	-	Salmon & Trout Association
Tony Richards	-	Lincs Anglers Consultative
Nicholas Playne	-	Country Landowners Association
Ian Biddick	-	Humberside County Council <i>John</i>
Roger Harvey	-	British Waterways
Bud Shields	-	East Lindsey District Council
Cliff Middleton	-	West Lindsey District Council
John Shackles	-	English Nature
Roger Wardle	-	FWAG
Nevison Boast	-	Chemical Industrial Association
Paul Bird	-	Eel Fishermen
Peter Thompson	-	Tioxide UK
Ed Smith	-	Anglian Water Services Ltd
Jim Dodsworth <i>cc</i>	-	Lincolnshire Local Flood Defence Committee

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Cllr Bryan Robins	-	Brigg Town Council
Mrs P E Freke	-	Winteringham Parish Council
Cllr J Burgon	-	Winterton Parish Council
<del>Kate Percival</del>	-	North Lincs Unitary Authority
Mr R East	-	Lincolnshire County Council <i>John</i>
Peter Vjestica	-	Rugby Cement Plc
Trevor Vessey	-	North East Lindsey Drainage Board
Bruce Gelsthorpe	-	Ancholme Internal Drainage Board
Roger Morris	-	English Nature
Betty Goble	-	Chairman, Regional Environment Protection Advisory Committee
Ken Pettican	-	Chairman, Regional Fisheries Advisory Committee
James Epton	-	Chairman, Lincolnshire Local Flood Defence Committee
Ruth Davies	-	Regional Personnel Manager
Mervyn Pettifor	-	Planning & Customer Services Manager
Angela Hole	-	Secretary to Area Manager
Irven Forbes	-	FRCN Manager
Graham Chantry	-	Area Business Services Manager
Roger Ashford	-	Catchment Quality Officer
Dave Watling	-	Senior Engineer (Water Resources)
Richard Kisby	-	Catchment Planning Officer
Paul Rushton	-	Waste Regulation Officer
Stuart Richmond	-	IPC Manager
Phil Young	-	Senior Enforcement Officer (Ridings Area)
John Ulyatt	-	Catchment Engineer







## ON ROUTE

### RIVER RASE IMPROVEMENT SCHEME

The River Rase has a catchment area of 6200ha which includes the urban areas of Market Rasen and Middle Rasen through which the river passes. Its feeder streams which converge to form the two main tributaries, the North and South branches, are of relatively steep gradient and since the majority of the area is underlain by Kimmeridge Clay, rainfall run-off and catchment response is rapid.

In recent years there have been two significant rainfall events which caused flooding in Market and Middle Rasen as well as several occasions when the channel has run bankfull approaching an emergency state. The first event was in April 1981 when flooding up to 600mm deep affected over 100 residential and industrial properties as well as many hectares of agricultural land. The return period of this event has been calculated as over 1 in 50 years.

The second event in October 1993 was less severe in terms of the extent of flooding in urban areas, but the intense rainfall which reached 15mm/hr caused significant flooding problems in the upper catchment above main river. Obstructions in the river and in-channel attenuation reduced the peak flows reaching Market Rasen to a return period calculated as 1 in 20 years, however, flooding still occurred to residential and industrial properties.



LOW CHURCH ROAD, MIDDLE RASEN OCT.93



A scheme to improve the flood protection to Market and Middle Rasen is currently being investigated by the Environment Agency.

The standard of service (SoS) provided by the Rase is calculated to be 1 in 20 years through the urban areas and 1 in 10 years along the agricultural stretches, set against the fact that the Indicative SoS for urban areas is 1 in 75 years and 1 in 10 years for agricultural land, the present standard is woefully lacking for the towns whilst just satisfactory for farm lands.

The principle objectives of the project are to increase the standard of service provided from 1 in 20 years to 1 in 75 years for the urban areas of Market and Middle Rasen in an economically viable way without detriment to the natural environment and where possible, enhance it.

Nine improvement options have been considered, the preferred option being off line storage on both the North and South Branches of the River Rase in the form of washlands.

The current estimated capital cost of this scheme is £483,000 and an application for grant aid will be submitted to MAFF when landowners have confirmed their agreement in principle.



SUMMER FLOWS AT LOW CHURCH ROAD, MIDDLE RASEN



## BLACK DYKE FLOOD WALL

An existing 540m long post and panel floodwall along the south bank of Black Dyke is in need of repair and, in places, replacement. The upstream section requires only minor repairs whilst the downstream section (250m) has reached the end of its design life and does not offer an effective form of flood defence. Many posts are broken off or badly damaged and a number of panels are broken or missing. Concrete has spalled from a number of posts due to corrosion of the reinforcement.

Over 300ha of surrounding arable farmland, buildings and houses are now vulnerable to flooding.

A number of options have been considered and the preferred scheme is to construct an in-situ reinforced concrete wall using the existing wall as the rear shutter.

Work has commenced on site by the Environment Agencys Emergency Work Force and the estimated cost of the scheme is £31,200.



OLD DECAYING FLOODWALL



## SITE 2 RIVER ANCHOLME AT BRANDY WHARF

### ANCHOLME FLOODING

In recent years there have been two rainfall events which caused flooding in the Ancholme Valley, the first, and more significant, occurred in April 1981 when between 60mm and 100mm of rain fell in 69 hours on a catchment held at a winter state of soil moisture, which in the Upper Ancholme resulted in flows with a return period of 1 in 75 years. This overwhelmed the floodbanks in places causing 5 breaches, one at Brandy Wharf and two on both Sallowlow Drain and North Kelsey Beck. Flooding affected 2,600 hectares (more than 10sq miles) of agricultural land and some isolated properties, for periods of upto six weeks.

The widespread flooding of the Upper Ancholme Valley relieved the situation in Brigg where the return period was calculated to be 1 in 16 years, but evenso, at periods of the tide lock river levels overtopped Cadney Road and severe seepage occurred through the floodbanks into Manley Gardens.

In October 1993, rainfall of between 80 and 90mm occurred in a period of 60 hours and within that period 60mm fell in just 20 hours. With the antecedent conditions wet, flood levels at Brigg were close to those experienced in 1981, whilst in the Upper Ancholme the channel was bank full and overtopping occurred on several tributaries causing the flooding of large areas of agricultural land however, no breaches occurred.



FLOODING AT BRANDY WHARF 1993





FLOODING AT BRANDY WHARF 1981



## FLOOD PROTECTION

In the early 1980's a major scheme to improve the standard of flood protection for the Ancholme and tributaries was actively promoted and the need for work was given impetus by the flooding in April 1981.

The improvement works identified in 1983 included channel works, a controlled washland and £850,000 of flood defence raising in Brigg to provide a 1:50 year protection.

Whilst the total scheme had a relatively low benefit/cost ratio it was agreed in principle by the Ministry of Agriculture Fisheries and Food who required the provision of the washland to be the first phase. Unfortunately agreement with landowners was not forthcoming and the scheme was eventually overtaken by the need to direct more capital funding towards sea defence work with less importance being given to increased agricultural output (hence less benefit from the scheme). The scheme was therefore postponed indefinitely.

£132,000 of work was, however, carried out in Brigg at Manley Gardens to remedy potential weak spots in the flood defence, priority being given to people and property.

Over the years the river embankments have continued to settle and weaken, and with the increased threat of overtopping/breaching, the Local Flood Defence Committee in 1992, recommended the need, and justification for improvements to the Ancholme valley be re-investigated.

Due to the lapse in time from the 1983 study a pre-feasibility study was undertaken which produced information that will help form the basis of the Project Appraisal and Environmental Assessment.

The current situation is that a full feasibility study is in progress to review all the earlier design work carried out since 1981, including complete re-surveying and modelling, and to assess the standard of protection currently provided.



## ANCHOLME DREDGING

In 1995/96 5kms of the River Ancholme between Harlem Hill Lock and 500m downstream of Caistor Canal was dredged removing upto 1 metre depth of silt which was deposited on adjacent land. For the current year, consideration is being given to continuing the dredging downstream to Kettleby Beck subject to there being siltation sufficient to make it worth while.

## STONING WORKS

As part of the annual flood defence work to prevent toe erosion of the river bank a 4m wide berm has been formed between Broughton Bridge and Castlethorpe Bridge, a length of 1.9km, by placing a longitudinal stone mound to just below summer water level.

The berm area behind has been excavated in a series of "scallops" to give 150mm depth of water and a wet berm whilst maintaining the flow characteristics of the channel. This will improve the diversity of habitat present and the material excavated has been used to reinforce the floodbank. At present, fishing stances are being built.

A similar length of this work is planned for the current year.

Glandford District Council contributed £70k towards this work.



## STONING WORKS



### **SITE 3      CADNEY WATER PUMPING STATION INTAKE & RESERVOIR**

Water is abstracted from the River Ancholme at Cadney by Anglian Water Services Ltd. for public water supply and industrial use, mainly on the South Humber bank area. Anglian Water Services Ltd. have an abstraction licence to abstract up to 31,000 tcm. This is 82% of the licensed amount allowed from the River Ancholme.

There have been a number of occasions when abstraction has ceased due to low level intermittent pollution from unknown sources.

During the summer period the abstraction is supported by water transferred into the system by the TWA scheme. During low flow periods this may include water from the River Trent at Torksey being transferred into the River Witham and then into the Ancholme. The quality of water abstracted from the River Trent is continuously monitored by an Automatic Water Quality Monitor, which is linked, by telemetry, to the Environment Agency's 24hr Control Room. Any significant decline in water quality can therefore be swiftly reported and, if necessary, the abstraction stopped.

#### **Cadney Intake**

Water is abstracted from the river Ancholme at Cadney intake.

The intake consists of coarse screens and 2 fine drum screens with backwashing, trash removal and chlorination equipment.

The water is then pumped the 2km to Cadney reservoir via a twin 1,800mm dia concrete pipeline.

#### **Cadney reservoir**

Water is stored in an Oxford clay embanked reservoir with a capacity of 900,000m<sup>3</sup> = 7 days storage.

The surface area of the water is 14ha and the reservoir has a maximum depth of 11m.

#### **Cadney Pumphouse**

The water is pumped from Cadney intake to the reservoir by 2 low lift pumps each having a capacity of 1,060l/s.

Two high lift fixed pumps and two variable speed pumps then pump the water the 10km, to Elsham Treatment Works via a 1,220mm dia steel pipeline at an elevation of 90m.

The capacity of the fixed speed pumps range from 130 - 300l/s.

The pumphouse also contains standby diesel generators, surge vessel, compressors and chlorination equipment.

#### **Elsham Treatment Works**

The raw water is treated by 'Accentriflocs' and rapid filters for partial softening, sedimentation and filtration to produce a potential output of 60 megalitres of non-potable water per day.

Further treatment, including Nitrate removal, GAC filtration and ozonation, produces a potential output of 30 megalitres of high quality potable water per day.

The site contains a chemical block, machine hall with relift pumps and generators, administration block and control.

There are 45,000m<sup>3</sup> non-potable and 30,000m<sup>3</sup> potable water covered reservoirs adjacent to the works and an emergency overflow lagoon.

THE MAP OPPOSITE SHOWS THE LOCATIONS OF THE ABOVE



ELSHAM TREATMENT WORKS

DISTRIBUTION TO HUMBER  
BANK INDUSTRIAL AREAS

1220mm DIA STEEL PIPELINE

CADNEY RESERVOIR  
AND PUMP HOUSE

CADNEY INTAKE

2 x 1800mm DIA  
PIPELINES



## ANCHOLME BRIDGES

When the River Ancholme was improved in the 1840's, 10 new bridges were constructed to carry public access routes across the widened channel. Of these 10 structures, 2 have been adopted by the Highway Authority (at Brigg and Brandy Wharf) and Minnits Bridge at North Kelsey was demolished in the 1950's.

The maintenance of the remaining 7 bridges at Horkstow, Saxby, Broughton, Castlethorpe, Cadney, Hibaldstow and Snitterby is the responsibility of the Environment Agency.

All of these bridges have timber decks and six are Grade II listed structures. In addition to having foot-paths or bridleways crossing them, adjacent landowners have rights to access over the bridges for farm vehicles.

A study has been carried out to examine the structural integrity of the bridges. The analysis of their load bearing capacity has resulted in them being classified as unsuitable for vehicular traffic. Possible strengthening options have been considered to increase their potential Live Load capacity giving, due consideration to their listed status.

The study also considered the potential environmental impact of the various options available based on information obtained from an extensive consultation exercise.

The recommended option of the study is the strengthening of all seven bridges and local contractor, C. Spencer Limited, has been awarded the contract to undertake the work, consisting of replacement timber decking to all the bridges and steelwork strengthening to six of them. Work is programmed to commence July/August 1996 at a total cost of £300,000.



HORKSTOW BRIDGE



## ON ROUTE

### RIVER ANCHOLME FLOOD PROTECTION WORKS IN BRIGG

Work to protect people and property from flooding was carried out at Manley Gardens in Brigg during 1992/93.

In order to eliminate the unacceptable risk of bank failure of the River Ancholme and to ensure that the existing defence level was sustained a 4.5m sheetpile wall along the landward edge of the bank crest for a length of 200m was constructed.

The design of the scheme was based on a maximum river level of 2.7m ODN (this being the bank level of Island Carr Lake).



FLOODING ISLAND CARR BRIGG OCT.93







## **INTEGRATED POLLUTION CONTROL**

One of the functions of the Environment Agency is Integrated Pollution Control, (IPC), which was introduced in Part 1 of the Environmental Protection Act 1990.

Regulations made under Part 1 of the Act identify industrial processes (known as prescribed processes) which use or produce potentially harmful material (known as prescribed substances) in significant amounts.

Since 1991 an operator has needed an IPC authorisation to start operating a prescribed process. For processes that were already operating before April 1991 a timetable for different industries was set up and all such applications should now have been made.

The main objectives of IPC are;

- a . to prevent or minimise the release of prescribed substances and to render harmless any substances which are released;
- b to develop an approach to pollution control that considers discharges from industrial processes to all media in the context of the effect on the environment as a whole.

An IPC authorisation will set detailed limits and operating standards to cover emissions to air, water and land. Industrial plants are subject to a complete review at least once every 4 years and the Environment Agency has a number of powers to enforce the conditions of the authorisation.

The next two sites are prescribed processes and use/produce prescribed substances. They both have current authorisations from the Environment Agency.



## **SITE 4      GLANFORD BRIGG GENERATING STATION**

The plant is operated by Regional Power Generators and is a 240 MW combined-cycle gas turbine generating station (CCGT) comprising 2 modules.

Fuel in the form of natural gas is fed to the gas turbine. The gas is mixed with air in the combustion system and ignited. This causes the gas turbine to rotate with the result that electrical power is produced via a generator which is connected to the gas turbine. The exhaust from the gas turbine flows through ducts to the heat recovery boiler where the heat is recovered to produce high pressure steam.

The steam then flows into and rotates a steam turbine which is connected to a generator thus creating more electrical power.

This boosts efficiency from approx 33% for a conventional station to 46.5%.

### **Plant Detail**

#### **Module 1 consists of:-**

No. 1A Gas Turbine and 40 MW(e) Alternator.  
No. 1A Waste Heat Recovery Boiler and 70m Stack.  
No. 1B Gas Turbine and 40 MW(e) Alternator.  
No. 1B Waste Heat Recovery Boiler and 70m Stack.  
No. 1C Steam Turbine, condenser, and 40 MW(e) Alternator.

#### **Module 2 consists of:-**

No. 2A Gas Turbine and 40 MW(e) Alternator.  
No. 2A Waste Heat Recovery Boiler and 70m Stack.  
No. 2B Gas Turbine and 40 MW(e) Alternator.  
No. 2B Waste Heat Recovery Boiler and 70m Stack.  
No. 2C Steam Turbine, condenser, and 40 MW(e) Alternator.

### **Miscellaneous Equipment**

Fuel Gas Treatment Plant  
Condenser Water Cooling Towers  
Boiler Feedwater Treatment Plant  
Standby Distillate Fuel Storage

To maximise the efficiency of the two steam turbines the exhaust steam is condensed. Cooling water for the condensers is provided by forced draught cooling towers and circulates around the condensers and the cooling towers. Some cooling water is lost through evaporation and there is a purge to the New River Ancholme to avoid concentrating suspended and dissolved solids. Make up water is taken from the New River Ancholme.

In order to provide high quality boiler feed water which will not make scale or cause corrosion, water from the New River Ancholme is filtered and ion-exchanged in a water treatment plant. Some of the boiler feed water is purged (to prevent a build up of dissolved solids) to the New River Ancholme.

**THE DIAGRAM OPPOSITE SHOWS THE LAYOUT OF THE SITE**

# Site Plan

- 1 The power station is split into two distinct modules of 120 MW (total output of 240 MW).

- 3 and one steam turbine with each turbine driving a 40 MW electrical generator.

- 2 Each module consists of two gas turbines







**4** The hot exhaust gases from the gas turbines pass through the waste heat recovery boilers which raise the steam used to drive the steam turbine, hence creating a combined-cycle.

**5** The electricity generated is exported via a new 132,000 volt overhead line which is connected to Yorkshire Electricity's distribution system.



## **SITE 5      SOUTH FERRIBY CEMENT WORKS**

The site is operated by Rugby Cement Ltd. and there has been a cement factory on this site since 1938. Semi-dry kiln lines replaced the old wet feed kiln in 1967 and 1974. This saved some 50% of energy input.

Since 1988 some £26m has been spent to upgrade the works of which £15.5m was spent to improve the environmental impact.

The site manufactures a range of cements including Ordinary Portland, Sulphate Resisting and Oilwell Cements using the semi-dry process in two 1250 tonne per day kilns.

The process is described as follows:

### **Raw Materials Extraction**

The raw materials for all cements manufactured at South Ferriby are chalk and clay, (both brought by conveyor belt from the local Middlegate Quarry), and sand and iron oxide (which are imported by road).

### **Raw Material Storage**

Bulk raw materials are stored in dedicated areas.

Recycled process water used as necessary for road wetting purposes and for damping down dry and otherwise dusty stockpiles.

### **Raw Meal Plant**

The chalk and clay are dried and milled together with small amounts of sand and iron oxide to produce a powder known as 'raw meal'.

The two raw meal preparation plants use recovered heat supplemented by individual coal/gas oil fired furnaces. Raw meal is classified within the process using cyclone systems and bag filters, and moist air discharges to air through individual exhausts, each fitted with a continuous dust monitoring system.

### **Raw Meal Storage**

The Raw Meal is conveyed by bucket elevators and air-slides into any of four 600 T concrete blending silos. The Raw Meal is analysed and blended as necessary and subsequently transferred into any of four 2500 T concrete storage silos.

### **Fuel Milling Plant**

Coal and petroleum coke fuel for the kilns are brought in by road and stockpiled on site. The fuels are recovered by mechanical shovel into a reclaim system and conveyed into hoppers within the kiln building. Both coal and petroleum coke are pulverised and held in separate bunkers prior to use in the ratio 20:80 coal:coke.

### **Nodulisers and Kilns**

Each kiln line is rated at 52 tph production using the semi-dry technique.

The Raw Meal is extracted from any of the four storage silos at the rate required by the cement kilns, and is converted into small spheroids on nodulising tables by the addition of water abstracted from the River Ancholme. In this nodulised form, the meal is preheated on a Lepol grate by exhaust kiln gas, before entering the kiln. The heated raw materials calcine and then combine to form cement clinker as they pass the kiln burning zone. Product clinker leaving the low end of the kiln is air cooled on a second grate prior to storage.



The kilns and clinker coolers are equipped with electrostatic precipitators (EP's) for particulate removal. Dust collected by these EP's is mixed with recycled process water, and pumped to the works settlement lagoons which occupy the adjacent old quarry workings. The EP dust cannot be recycled into the clinker because of the high alkali content. Hot gas from No 2. kiln clinker cooler is passed through a 3 zone EP and is then used in the Raw Meal preparation stage. The excess hot gas joins No. 2 and No. 3 kiln outlets at the base of the 91 metre main process chimney located at the south end of the site. Hot gas from No. 3 kiln clinker cooler passes through a 2 zone EP before discharging to atmosphere through a dedicated stack at the north end of the site.

#### **Clinker Transport**

Principle storage facilities are two steel clinker silos, and for strategic stock, a 55,000 T covered store tent. Additional smaller steel silos are available for clinker storage together with a Gantry store used also for import and export. An open stockpile of underburned clinker is being recovered and recycled.

#### **Cement Milling**

Cement clinker and gypsum are ground into a fine powder in mills which are the closed circuit type and are equipped with cyclone and bag filter dust classification and arrestment equipment.

#### **Cement Storage and Bulk Loading**

The final product is stored in concrete silos prior to dispatch by road tanker or as bagged product on pallets.

#### **Bagging Plant and Dispatch**

The bagging, palletising and storage facilities are all inside process buildings or warehouses.

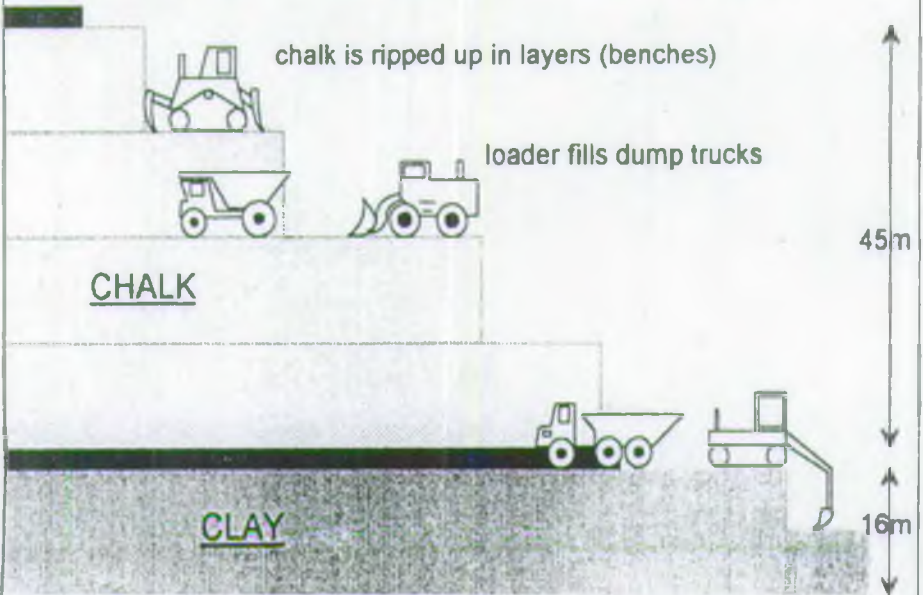
THE DIAGRAMS ON THE FOLLOWING THREE PAGES SHOW THE PROCESS



PHOTOGRAPH SHOWING THE CONVEYOR BELT LEADING TO THE WORKS

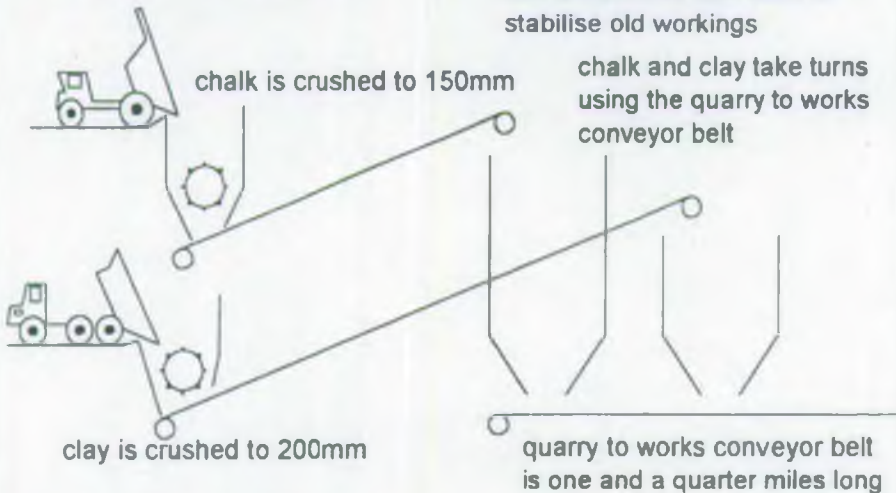
# QUARRYING

top & subsoil is removed and used to restore worked out areas



approximately 3,000 tonnes of chalk is quarried per day

layer between chalk and clay is called 'red chalk interburden' this is removed and used to stabilise old workings

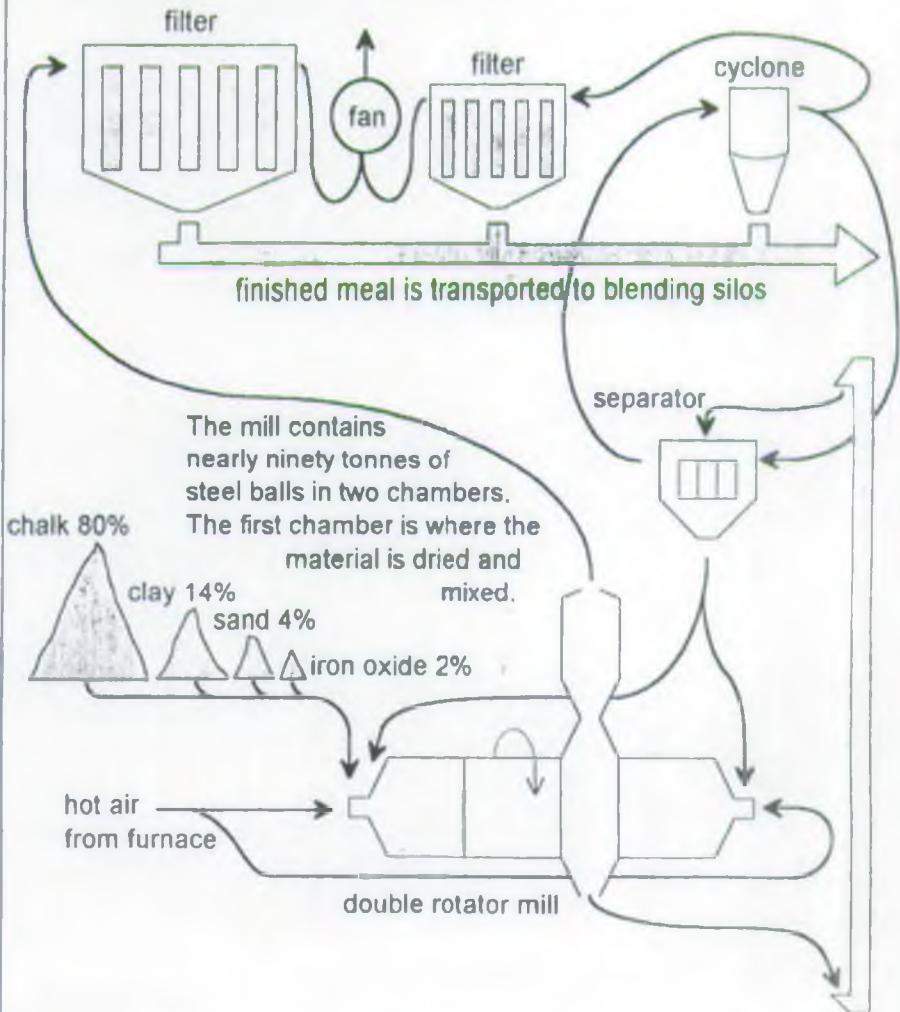


approximately 1,000 tonnes of clay is quarried per day



## RAW MEAL PRODUCTION

Chalk, clay, sand and iron oxide are dried and ground into a powder called raw meal in a double rotator mill. Some of the meal exits the mill down a central outlet from where it is elevated to a particle separator. The separator sends overlarge particles back to the mill for re-grinding, meal of the correct size is drawn through a cyclone/filter system from where it is transported to a blending silo. Meal that leaves the mill through the upper exit is also filtered out and transported. An exhaustor fan provides the air flow required to draw material through the mill system. Two types of meal are produced, for ordinary Portland cement and for Sulfate Resisting cement. Ferriby makes all the SR for the Rugby Group.



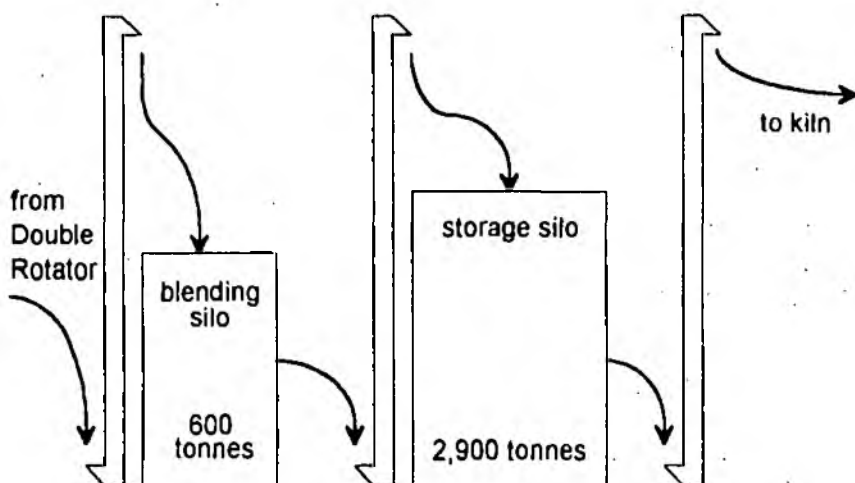
## BLENDING & STORAGE

Raw meal produced at the Double Rotators is tested hourly using state-of-the-art x-ray techniques.

To make sure the right chemical make-up is maintained. The Meal Tester can adjust the amount of clay, sand and iron oxide that goes into the mix in order to achieve his quality targets.

When a batch of meal is considered to be chemically correct it is sent to a storage silo. The mill feed, meanwhile, is diverted to one of the other blending silos where the process begins again. Each of the two double rotators has two blending silos to feed.

We have four storage silos, two hold the meal to make Ordinary Portland cement (OP), two hold the meal to make Sulfate Resisting cement (SR). SR differs from OP in the amount of sand and iron oxide used in the mix. SR is used in ground conditions that would attack OP. A special version of SR is used to line oilwells where pressures and temperatures at depths of 18,000 ft are extremely demanding. South Ferriby is the only plant in the UK making this cement.

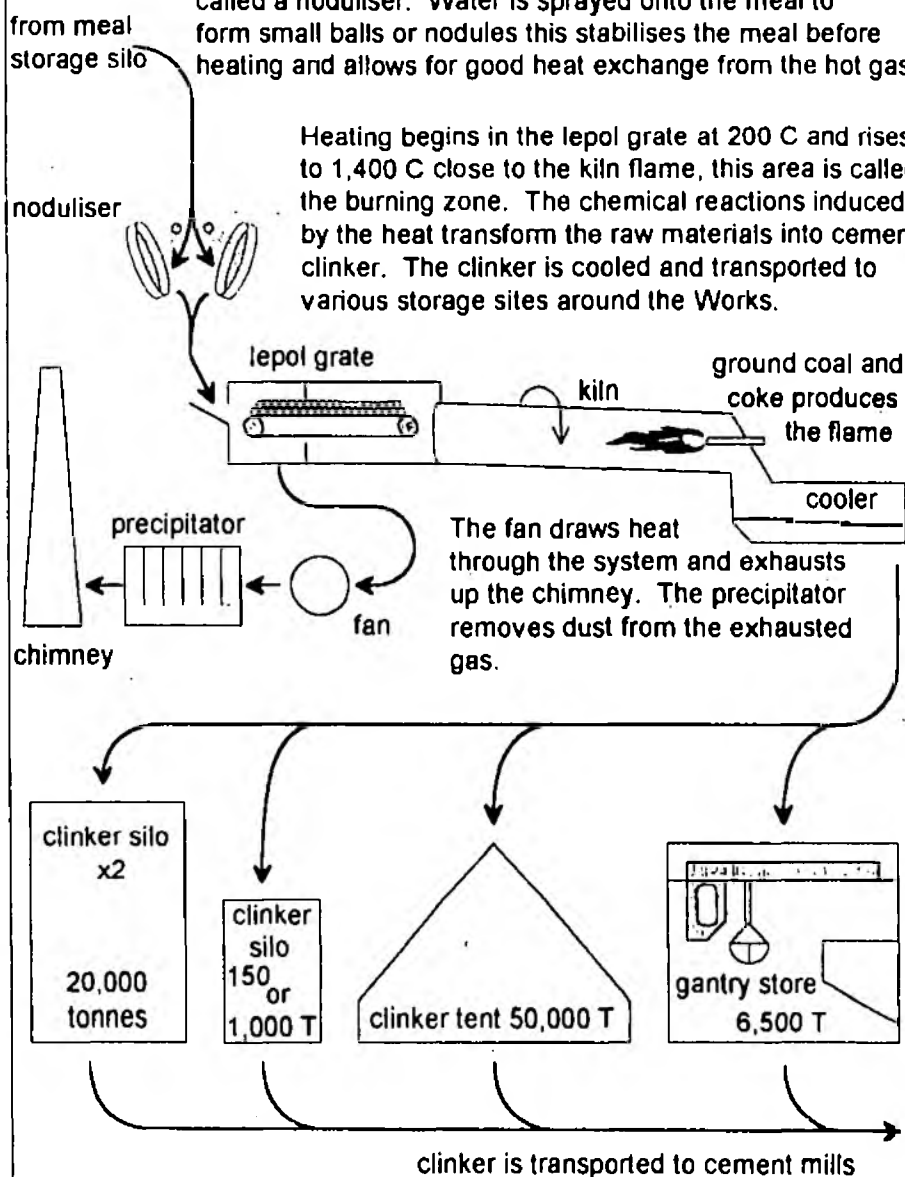




## CLINKER PRODUCTION

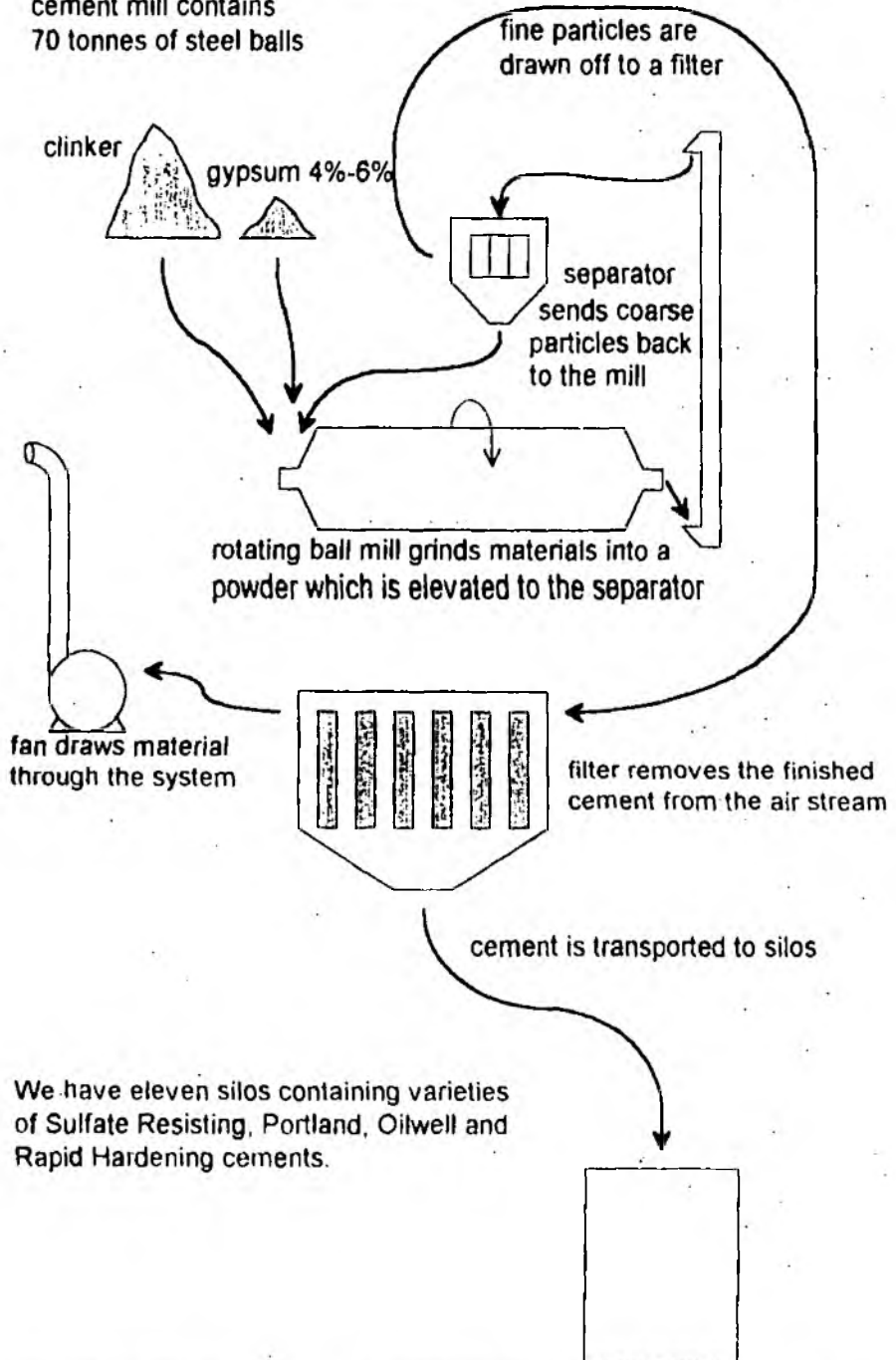
Meal from the storage silo is poured onto a rotating table called a noduliser. Water is sprayed onto the meal to form small balls or nodules this stabilises the meal before heating and allows for good heat exchange from the hot gas.

Heating begins in the lepol grate at 200 C and rises to 1,400 C close to the kiln flame, this area is called the burning zone. The chemical reactions induced by the heat transform the raw materials into cement clinker. The clinker is cooled and transported to various storage sites around the Works.



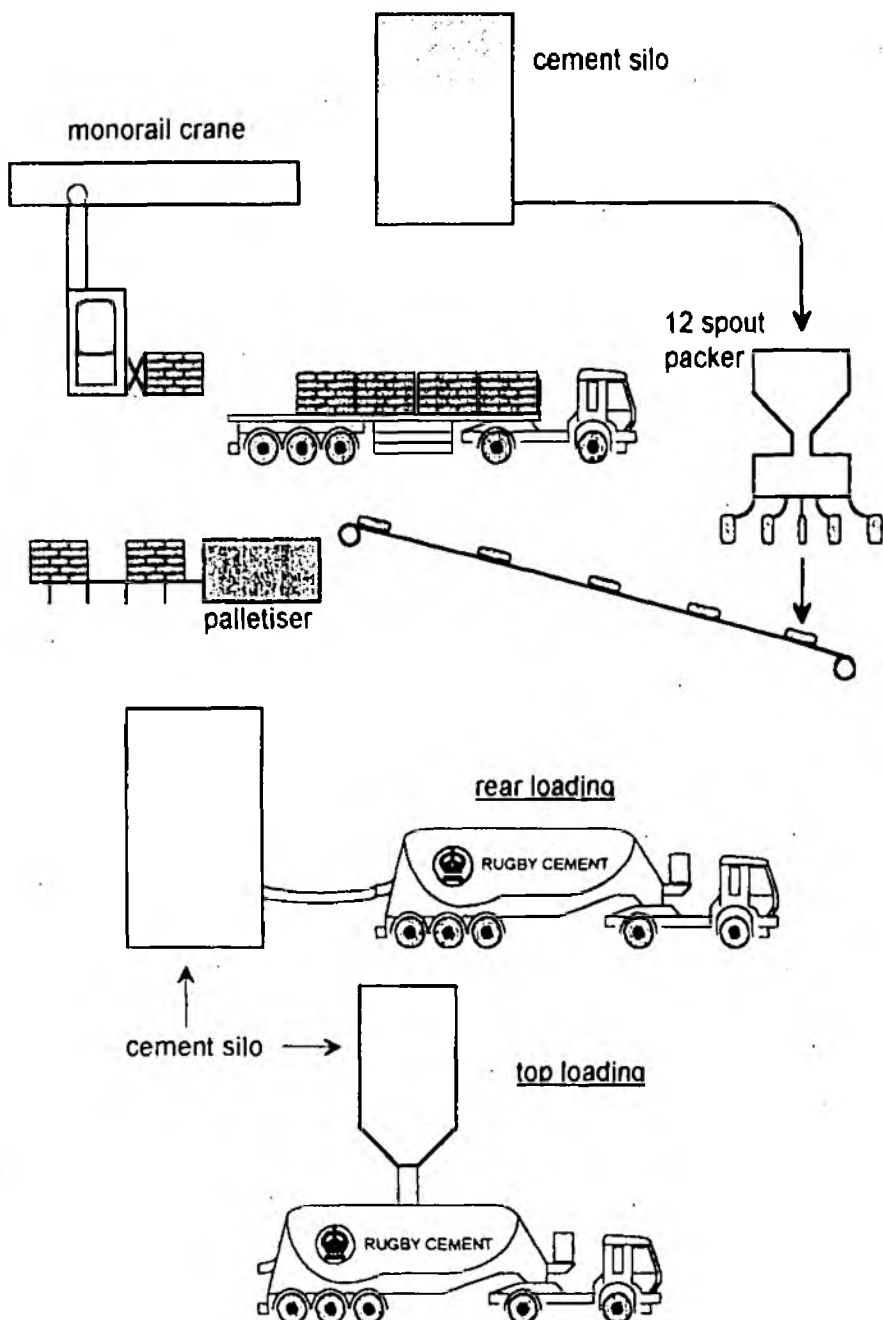
## CEMENT MILLING

cement mill contains  
70 tonnes of steel balls





## PACKING & LOADING



## SITE 6 SOUTH FERRIBY LOCK AND SLUICE

South Ferriby Lock is owned, maintained and operated by the Environment Agency. The lock has 4 pairs of timber gates and the original gates were thought to have been constructed out of English Oak, but the present gates, which date from 1904, are constructed from a variety of timbers. The 1904 gates last underwent major refurbishment in 1944, and currently are in need of refurbishment.

The hydraulic lift road bridge is electrically operated and is part of the locking operation controlled by the lock keepers. The locking procedure is slow and arduous and requires 2 lock keepers to be present. The lock keepers hand operate pinions and screws to raise/lower cast iron paddles to allow water in/out of the lock and the doors are opened and closed by manually operated counter balance beams assisted by winches and wires.

Vessels can enter the lock from the Humber and the Ancholme during all conditions except around low tidal states or when the River Ancholme is in flood.

During high water, Humber water is used to fill the lock and the brackish water is subsequently drained into the West Drain via culverts.

However, whenever a boat enters the Ancholme from the Humber during high water, some of the brackish water remaining in the lock will mix with river water when the inner doors are opened.

During low water, river water is used to fill the lock and it is drained into the Humber as the vessel moves out of the river.

Consequently some boat locking contributes to saline intrusion in the lower River Ancholme,

South Ferriby Sluice is also owned, maintained and operated by the Environment Agency and consists of three sets of timber pointing doors and two electrically operated guillotine gates.

The guillotine gates can be operated manually if required.

To retain the level in the Ancholme the gates remain closed. To lower the level in the Ancholme the gates are raised and this allows water to pass underneath.

With a lower level in the Humber the two sets of pointing doors will open and Ancholme water will discharge to the Humber.

The third set of pointing doors is at the head of the West Drain and allows discharge at low water into the Humber.

The 'chamber' between the Ancholme guillotine gates and pointing doors is used in the control of saline ingress from locking operations and leakage.



## Saline Ingress

The quality of the lower reaches of the Ancholme and West Drain can be adversely affected by saline ingress through the tidal structures of both the lock and sluice. This may affect the suitability of these watercourses for spray irrigation, industrial and potable use and if unchecked would affect both fauna and flora.

To manage this problem on the River Ancholme, the Environment Agency has installed two 'bubble curtains' to limit the movement of salt water upstream.

Revised operating procedures for the lock now allow the saline water from locking operations to discharge to the West Drain.

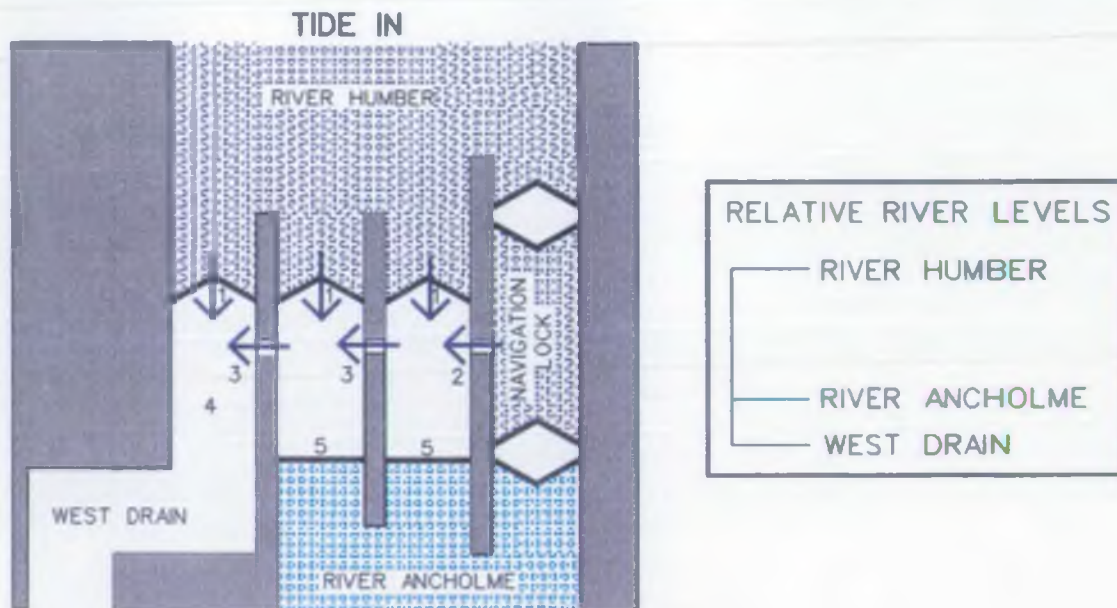
During periods of low flow saline ingress is also limited by operation of the TWA scheme which maintains a positive flow to tide.

Salinity is observed by a continuous monitor at Saxby, this information assists in determining how much water is transferred.

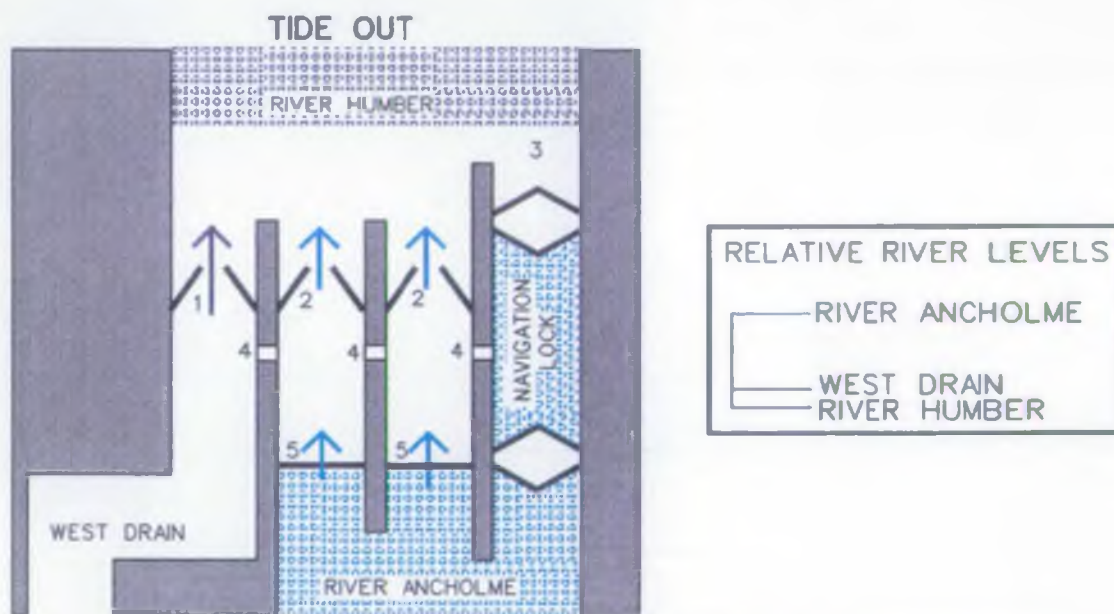
THE DIAGRAM OPPOSITE SHOWS THE LAYOUT OF THE STRUCTURE



# DIAGRAM OF SOUTH FERRIBY LOCK AND SLUICE



- 1 LEAKAGE OF SALINE WATER OCCURS THROUGH THE SHUT TIDAL DOORS
- 2 DISCHARGE OF SALINE WATER VIA PENSTOCK FROM LOCK OPERATIONS
- 3 SALINE WATER PASSES INTO THE WEST DRAIN VIA PENSTOCKS FOR TEMPORARY STORAGE
- 4 SALINE WATER IS STORED IN THE WEST DRAIN UNTILL LOW TIDE
- 5 VERTICAL GUILLOTINE GATES RETAIN FRESH WATER IN THE RIVER ANCHOLME



- 1 UNCONTROLLED DISCHARGE OF SALINE WATER VIA OPEN TIDAL DOORS PREVIOUSLY STORED IN THE WEST DRAIN
- 2 FRESH WATER FROM THE RIVER ANCHOLME IS DISCHARGED VIA THE OPEN TIDAL DOORS
- 3 FRESH WATER USED IN LOCK OPERATIONS IS DISCHARGED TO THE RIVER HUMBER
- 4 PENSTOCKS SHUT
- 5 THE RIVER ANCHOLME LEVEL CAN BE CONTROLLED BY PASSING WATER UNDER THE GUILLOTINE GATES



**ENVIRONMENT  
AGENCY**



## ENVIRONMENTAL IMPROVEMENT WORKS TO THE RIVER ANCHOLME

The Environment Agency and Scunthorpe and District Angling Association have collaborated on a number of projects this year and they are as follows;

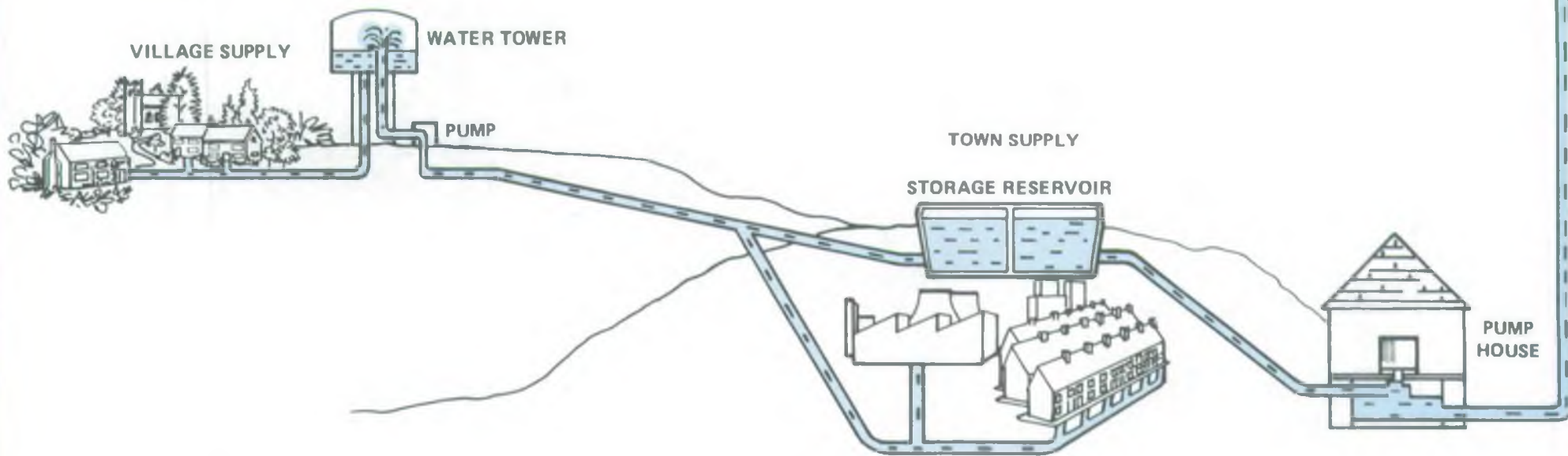
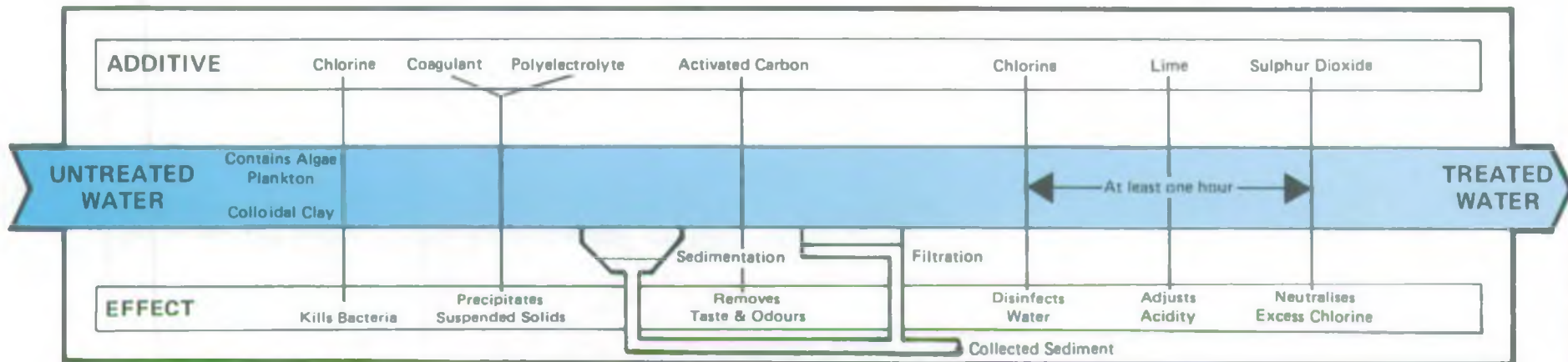
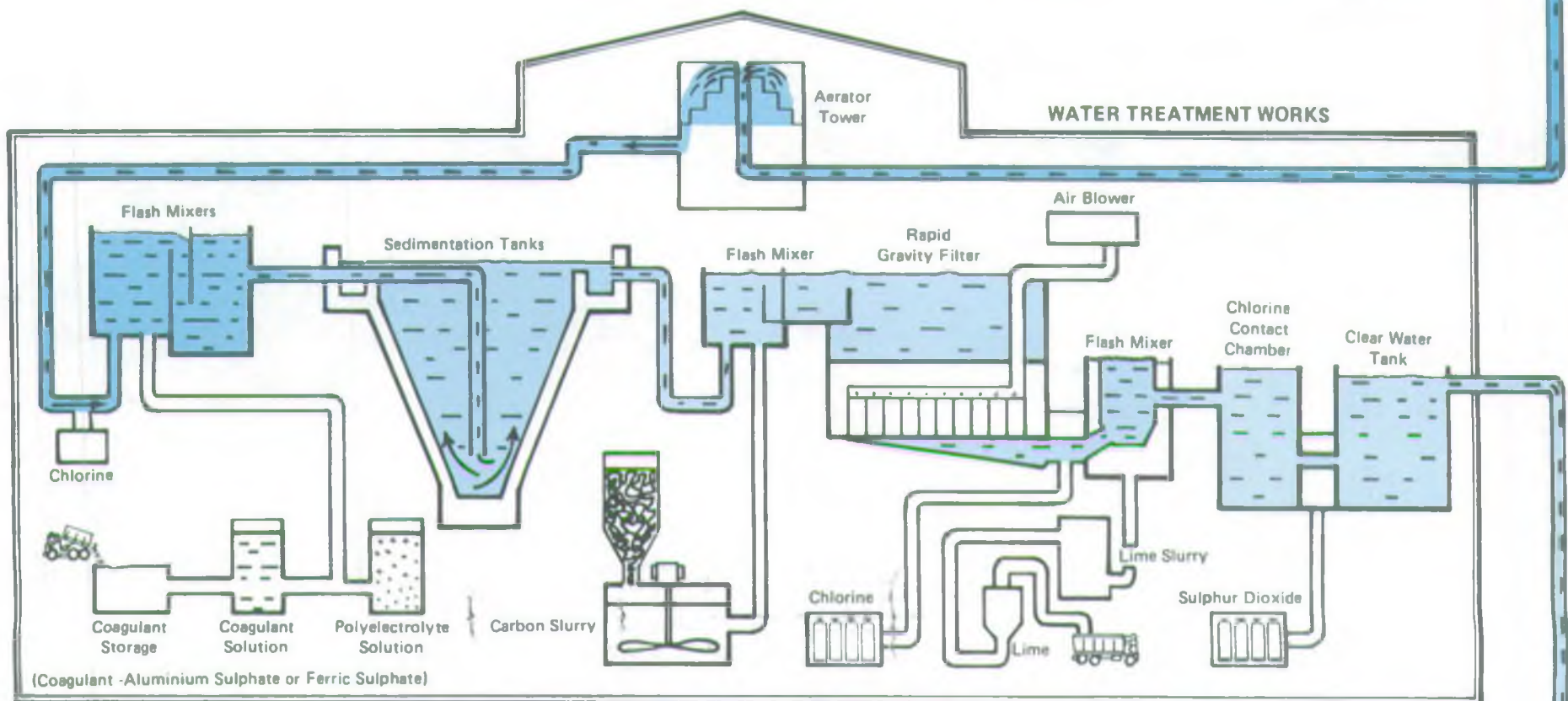
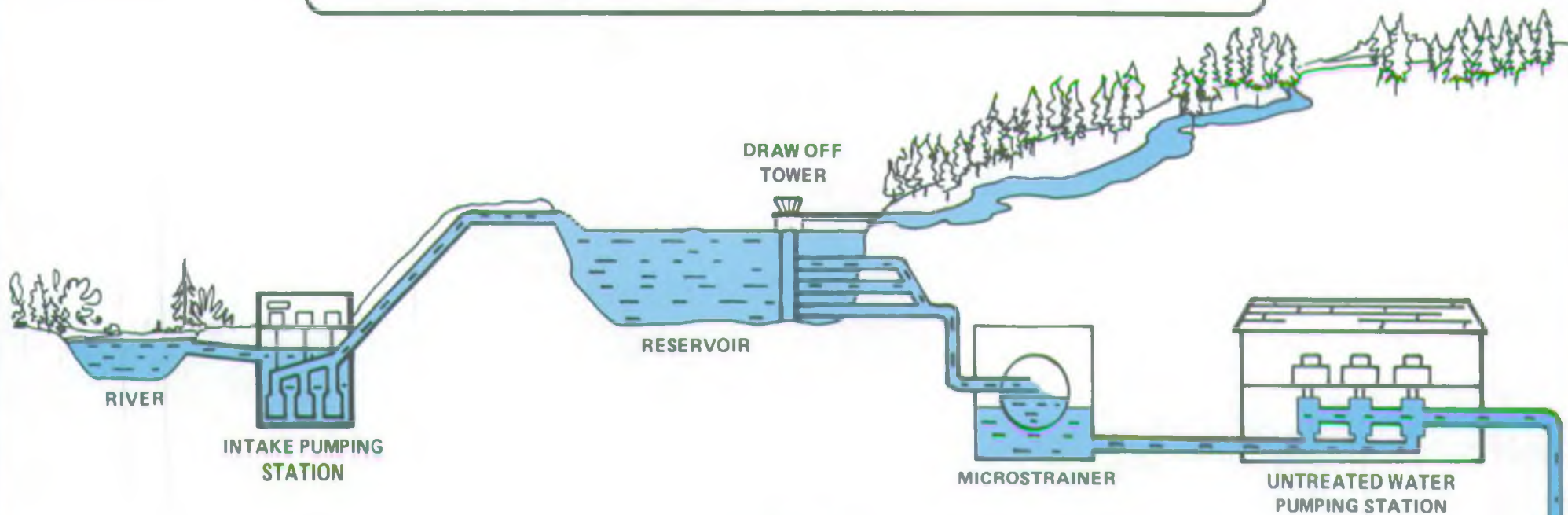
- 1 Construction of 10 fishing pegs in Brigg.
- 2 Creation of 28 angling stances in the river at Scabcroft (AA contributed £3,400 and EA contributed £1,000)
- 3 Joint purchase of 40t of slag material which the residents of Snitterby, together with the Angling club members, used to repair a well used access track to the river.
- 4 Repairs to an access track and small car park at Appleby.

In addition to the Environment Agency's flood defence work to repair toe erosion on the River Ancholme a £140,000 collaborative project (over 2 years) between the Agency (£70,000), Glanford BC (£70,000), the Countryside Commission and the landowner was completed, resulting in over 2km of scalloped riverside, providing a wet berm and a minimum 6m buffer zone between the arable field and the river. Work also included the creation of 98 fishing pegs. Further work is planned for 1996/97.



# WATER

## COLLECTION·TREATMENT·DISTRIBUTION





## SITE 7 WINTERTON LANDFILL SITE

Humberside Wastewise Waste Management Services Limited operates this major co-disposal landfill site known as Winterton landfill site which is located approximately 8km north of Scunthorpe.

The landfill utilises a worked out ironstone gullet which supplied iron ore to Scunthorpe Steel Works during the 1970's.

The geology consisted of clays, shales and mudstone overlaying a 10 metre thickness of Frodingham ironstone. Immediately to the west of the site runs Winterton Beck, a small river which the Ancholme Catchment Management Plan identifies as having a river Quality of RE2, "water of good quality suitable for all fish species".

Planning consent for the site was obtained in August 1977 to fill excavated areas of the quarry and restore to agricultural use.

The approximate volume of the site prior to infilling was 7.75 million cubic metres with a proposed operational life of over 20 years.

The site was operated under a Resolution by Humberside County Council from August 1983 until 7th December 1992. The Count's arms length company, Wastewise, was the vested and a waste disposal licence issued.

In early phases of the site there existed a degree of natural containment which was complemented with the emplacement of low permeability clays. During 1994 the interface between phases 4 & 5 was sealed with a fully engineered clay bund, constructed to an elevation of 17m AOD. The site has operated on the full containment principle and is fully engineered.

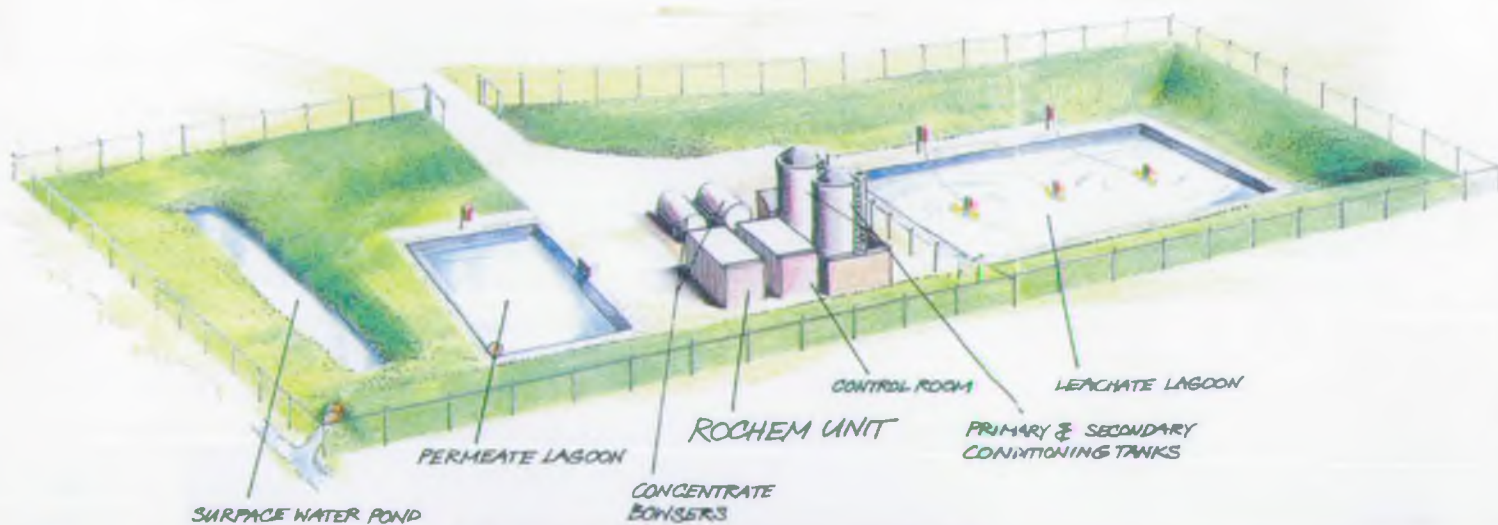
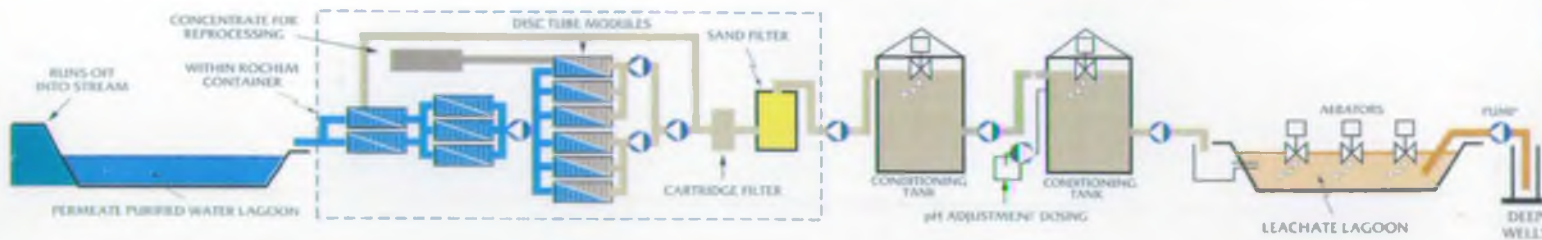
The site has an approximate annual input of 300,000 tonnes of domestic commercial and industrial waste with up to 20% of the total notified as "special waste".

The site also has a monodisposal facility to accommodate specific waste streams that are not suitable for disposal with other wastes types, for example, gypsum and other sulphate bearing wastes.

A reverse osmosis system has been installed in order to treat leachate being generated at the site. This came on line in November of 1994.

The plant has a discharge consent, issued by the Environment Agency, to discharge treated leachate into the Winterton Beck. The plant currently complies with all of the consent conditions, the only problem has been that the treatment plant has broken down on occasions requiring the storage of untreated leachate on site. This stored leachate has then been treated and discharged as per the consent.

THE DIAGRAM OVER THE PAGE SHOWS THE REVERSE OSMOSIS SYSTEM



Permeate purified water lagoon



Rochem containerised leachate treatment system



Leachate collection and aeration lagoon



LVRP - disabled fully boat

LVRP 75 Arises Brochure

+

ROGER HARVEY

✓ B Sat 13/2/96

LEISURE & TOURISM MANAGER

BRITISH WATERWAYS

1 DOCK ST.

LEADS

151 / 144

de Ransley

Name badges - No Posters

Note paper - titles

Profession Qualifications not allowed in business cards

## MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including government.

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The 24-hour emergency hotline number  
for reporting all environmental incidents  
relating to air, land and water

**ENVIRONMENT AGENCY  
EMERGENCY HOTLINE**

**0800 80 70 60**



**ENVIRONMENT  
AGENCY**