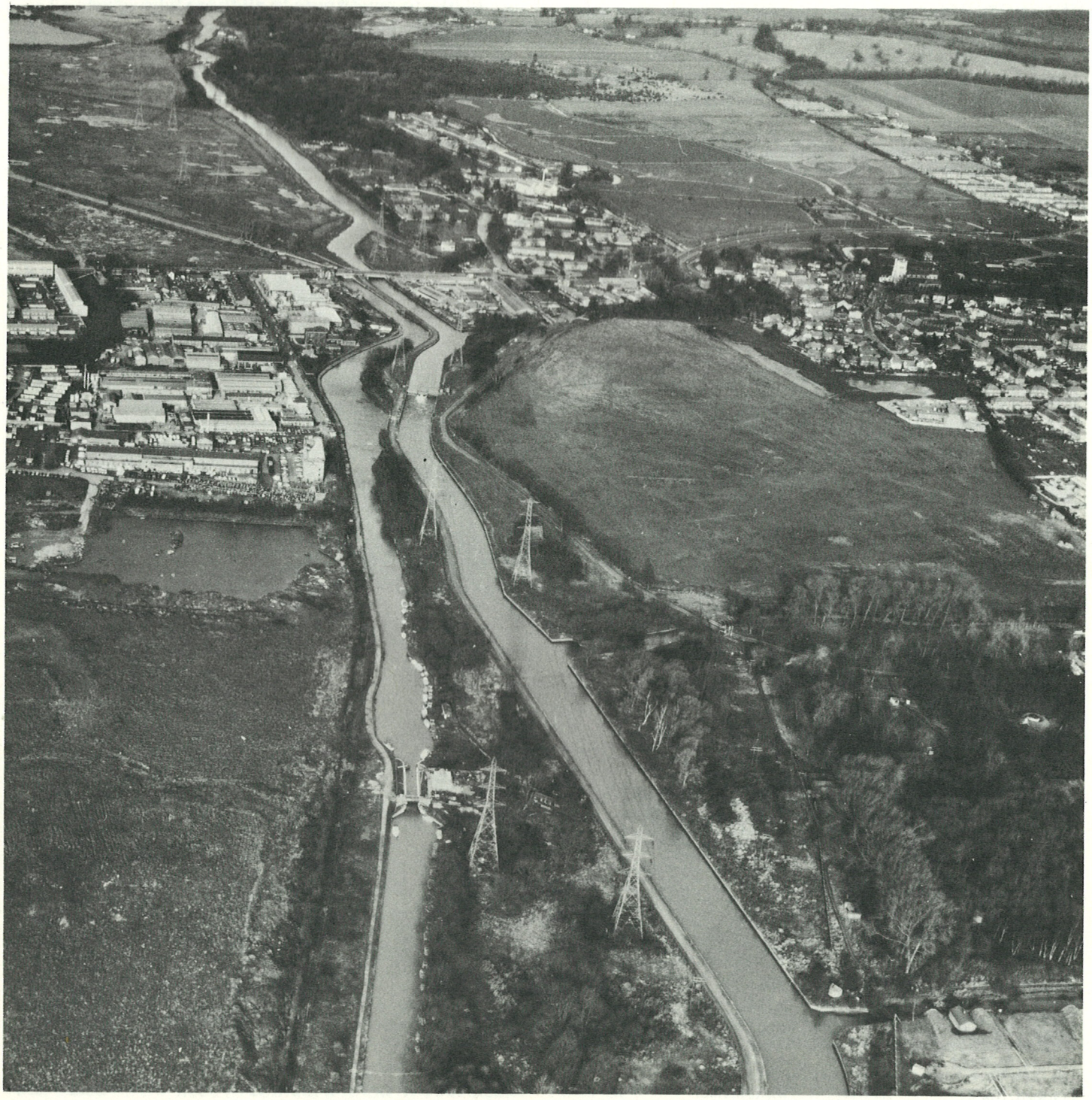
# On Her Majesty's Service

# Thames Water

**Lea Division**

## Chalk Bridge to Ware Flood Alleviation Scheme



# Contents



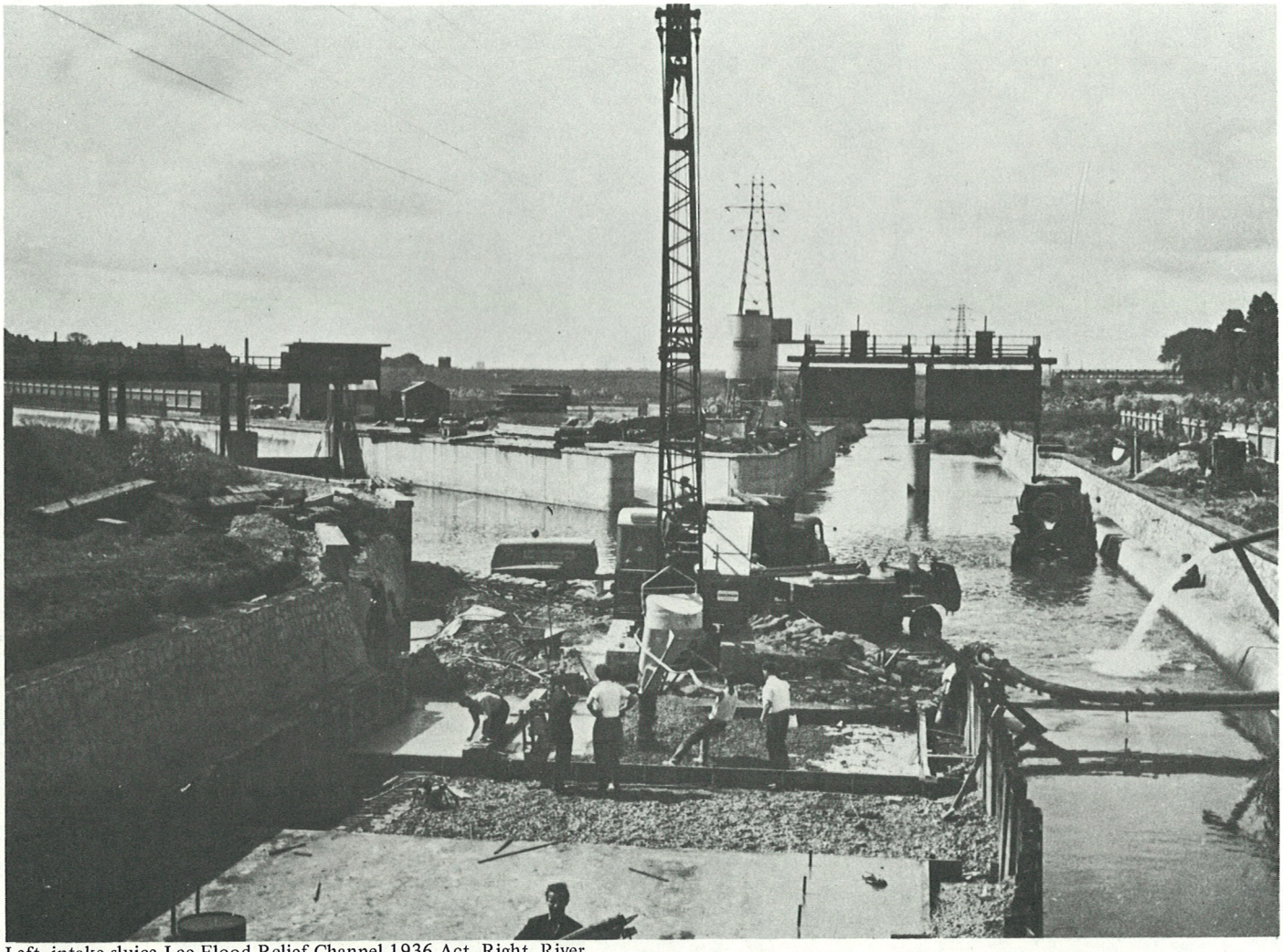
The inauguration of the Chalk Bridge to Ware Flood Alleviation Scheme, represents a major achievement for the Lea Division of the Thames Water Authority, for its predecessor Authority, and for the many other public bodies and individuals who have been concerned with the design and construction of this undertaking through many decades.

Yet although the scheme involves the latest and best that technology can provide, very great attention has been paid to ensuring that the river not only remains as visually attractive as possible but also that related leisure and recreational facilities are preserved and enhanced.

In noting that the construction of the scheme has been completed on schedule and within the financial limits determined at the commencement of operations, I should like to pay tribute to all those who have made this possible.

**Peter Black**
*Chairman*

*Cover Picture:*
Oblique Air Photograph Rammey Marsh Lock left looking up the Valley towards Waltham Abbey New Flood Relief Channel on the right with Rammey Marsh Sluices on the right (middle).
*Picture by courtesey of Aerofilms*



Left, intake sluice Lee Flood Relief Channel 1936 Act. Right, River Lee (New Cut) showing channel widening at Chalk Bridge.
**Contract, No. 21**

# The Lee Valley Chalk Bridge (Tottenham) to Ware Flood Alleviation Scheme 1956-1977

The Lee Valley Chalk Bridge to Ware Flood Alleviation Scheme, initiated and developed by the former Lee Conservancy Catchment Board and completed by the Lea Division of the Thames Water Authority, represents a major river improvement scheme designed to benefit residents, industry and agriculture, in a densely populated area of the Home Counties.

Prior to the completion of this scheme, flooding in the Lee Valley had often been severe. In 1856, for example, the railway bridge carrying the London to Cambridge railway across the River Lee at Rye House (Hoddesdon) was swept away and in 1926 heavy flooding, resulting from a thaw of snow accompanied by heavy rain damaged homes and factories throughout the Valley. It is estimated that at Feildes Weir flows in the latter flood exceeded 4,000 cubic feet per second (113.5 cubic metres per second) and at Lea Bridge Weir, Leyton, 5,500 cusecs per second (156.2 cubic metres per second).

It was in 1936 that the former Lee Conservancy Catchment Board prepared a scheme for the major improvement of the Rivers in the Lower Lee Valley from Carpenters Road, Stratford, to Chalk Bridge just south of the North Circular Road, Edmonton. These plans culminated in the 1938 Act which provided for the improvement of the River Lee by the widening of 1.25 miles (2km) and the construction of a new flood relief channel of 2.5 miles (4km) as well as ancillary work on other watercourses. The cost was estimated, at that time, at £1.25 m.

As a result of the 1939/45 war however, construction did not begin until 1949 and because of material shortages and financial difficulties, was not completed until 1960 at a total cost of over £3.5 m.

This Scheme had been designed to take a flood just in excess of the 1947 flows and the new relief channel included seven bridges, all of about 48 feet span (14.6m) which were two over trunk roads, two railway bridges, one 1,200 feet × 54 feet span (366 m × 16.5 m span), prestressed concrete culvert and a triple span railway culvert. Owing to the high cost of land in an urban area, the relief waterway was constructed in mass concrete rather than as an earthed lined channel so as to allow for a speed of flow, in flood, of about ten feet (three metres) per second.

As the 1938 Scheme was under construction however, rapid industrial and residential development took place throughout the Lee Valley — not only directly upstream of Edmonton along the banks of the river at Waltham Cross, Hoddesdon, Harlow and Hertford, but also at Hatfield, Stevenage, Welwyn Garden City, Luton and Dunstable. This development made the extension of the Flood Alleviation Scheme up the valley into Hertfordshire even more necessary, even though its desirability had been forseen in the 1930's and a parliamentary undertaking had been given during the debates on the 1938 Bill.

This undertaking was honoured in 1963 when approval in principle was received from the Ministry of Agriculture Fisheries and Food to commence work on the Lee Valley Chalk Bridge (Tottenham) to Ware Scheme. The design criteria for this Scheme, the estimated cost of which was £3.2m (at 1958 prices) was based on the need to contain a flood of 1947 peak flows with an allowance for freeboard.

From Chalk Bridge Tottenham, the site of the intake to the Lee Flood Relief Channel, upstream to South of Waltham Abbey, the then existing Flood Channel had been constructed by the former Metropolitan Water Board, as part of the works connected with the King George V and William Girling Reservoirs, which occupy a large part of the flood plain in that part of the Lee Valley. In this section the best solution to increase the capacity of the waterway was by raising the walls and widening the channel. North of Waltham Abbey it was possible to widen the existing earth channel and in places to make use of worked out gravel pits as a Flood Channel.

In order to prevent 'over drainage', and in order to supply water for British Waterway's navigation purposes, the new channels have vertical lift sluices or weirs at intervals so that the water level in the new flood relief channel remains constant except in times of flood when the sluices open and the flood waters are discharged.

As a result of the Flood Alleviation Scheme, the River Lee Navigation and the Flood Relief Channel are now two parallel 'rivers' from near Bow Locks, Poplar, to Feildes Weir, Hoddesdon. At this point the River Stort flows into the River Lee Navigation. Above Feildes Weir, after a full investigation as to the most economic design, it was shown that the improvement of the existing River Lee Navigation would solve the problem with bypass channels and sluices at Stanstead and Hardmead Locks, there being virtually no available land for a separate Flood Channel.

Throughout the progress of the Scheme close contact has at all stages been maintained with the British Waterways Board, the local authorities and the Lee Valley Regional Park Authority and in many cases minor variations were agreed to fit in the channel alignment with the requirements of the Authority concerned.

Work on the Scheme was undertaken initially by the former Lee Conservancy Catchment Board under its Engineers, Mr. N. M. Medrington, O.B.E., C.Eng.,MICE.,MIWE., and his successor, Mr. O. T. Addyman, TD.,C.Eng.,FICE.,FIWES., and since 1974 by the Lea Division of the Thames Water Authority under Mr. Addyman as Divisional Manager.

Overall supervision of the Scheme has been the responsibility of Mr. W. D. Webster, BSc.,C.Eng., MICE.,MIWES., now Chief Projects Engineer to the Lea Division. Design and contract preparation has been undertaken by a team led by Mr. C. van Beesten, MSc.,FICE.,MIWES.,FASCE., Lea Division's Design Engineer, by Mr. R. E. Reed, Lea Division's Contract's Engineer till 1976, and by his successor Mr. K. Weeks, BS.,MICE.

The Scheme was forwarded to the Ministry of Agriculture, Fisheries and Food's Regional Engineer, the late Mr. A. C. Rice, MBE.,MICE.,MIWE., and to his successor, Mr. G. H. Partis, C.Eng.,MICE., MIWE.,ARICS., for overall approval, Contract by Contract. The Chief Engineer to the Ministry of Agriculture, Fisheries & Food was Mr. E. A. G. Johnson, CBE.,BSc.(Eng).,FICE., and his successor is Mr. G. Cole, BSc(Eng).,MICE.,MIWE.

# Contracts

## Contract No 21

**(Tender Sum £297,356)**
**From Chalk Bridge, Tottenham, to North of Lower Hall Lane, Chingford.**

The Scheme entailed the construction in mass concrete, reinforced concrete and steel sheet piling of works to about 5,135 feet (1,580 metres) of an existing open flood channel comprising a pair of walls some 8'6" high (2.6 metres) and an invert 66'0" wide (20.3 metres).

The work also included the re-alignment of the footbridge (Chalk Bridge) and the reconstruction of the Lower Hall Lane Bridge to a wider span and to a higher soffit level to give clearance to maximum flood levels.

**Contractor, Ruddock & Meighan Ltd.**

## Contract No 22

**(Tender Sum £391,236)**
**From upstream of Lower Hall Lane to South of Lee Valley Road, Chingford.**

The overall design for the Scheme required that the discharge capacity of a length of 8,700 feet (2,677 metres) which ran off existing walled flood channel in Chingford should be increased by about 50%. This was achieved by raising the channel walls, by widening on the east side and by replacing the existing effluent channel with a new one and by the replacement of the existing semi-circular water supply channel with a new 72" diameter (1.875m) diameter conduit so that water from King Georges Reservoir could run down river to Chingford Mill.

Also a major reconstruction of Flanders Weir was carried out by raising the weir level and the re-building of the two radial gates to electric (automatic) operation.

**Contractor, Thomas Fletcher & Co.**

## Contract No 23

**(Tender Sum £509,305)**
**From upstream of Lea Valley Road, Chingford to N.E. corner of King Georges Reservoir, Enfield Lock.**

The Contract consisted of lowering the invert of the pressure supply conduit upstream of Lea Valley Road to permit the lowering of the invert of the existing channel by 3'0" (0.92m) and the width of the channel was increased by 25 feet (7.6m) to 75 feet (23.0m) over a length of 9,500 feet (2923m).

The method of working by the Contractor was unusual in that the new invert was placed in long lengths with the use of a centre dam and a road-making machine to place the concrete, which was made by a batch mixing plant on the site.

**Contractor, W & C French Ltd. (Construction) Ltd., of Buckhurst Hill.**

## Contract No 24

**(Tender Sum £545,134)**
**NE of King Georges Reservoir to downstream of Highbridge Street, Waltham Abbey.**

This Contract comprised the construction of a Flood Channel 8,600 feet (2,457m) some 9 feet (2.7m) in depth and varying in width from 73 feet (22.5m) for the steel piled channel to 122 feet (37.5m) open cut.

The channel was to be constructed through a gravel pit back filled with flue ash which involved steel piling and gabions to retain the flue ash and form the new East bank of part of the channel.

In addition, one of the complications was the need to construct the new works within the confines of a security fence between the Royal Small Arms Factory and the Explosive Research and Development Establishment.

The construction work included two new vertical lift sets of sluice gates (automatic) at Newmans Sluices (East) and Rammey Marsh, a bridge over the River Lee and a long steel piled weir to retain the water level in the River Lee Navigation (Enfield Lock Pound) against a lower water level in the flood channel.

South of Waltham Abbey the existing 14" diameter (0.36m) Pumping Main was lowered to clear the invert of the new channel.

In addition lengths of the winding course of the River Lee were filled in so as to dispose of the spoil which was also deposited in the adjoining gravel pit and on land owned by the British Waterways Board so as to provide a level area of land adjoining the River Lee Navigation.

**Contractor, W. A. Dawson & Co. (Luton).**

## Contract No 25

**(Land Drainage cost estimated at £95,000)**
**New Channel and road bridge upstream and downstream of Highbridge Street, Waltham Abbey.**

This Contract was carried out in co-operation with the Essex County Council as part of a road widening scheme (A121) and was started out of sequence to the general progress of the scheme northwards up the valley.

The Scheme consisted of a new road bridge 75'0" span (22.8m) and channel parallel with the existing River Lee Navigation, the width being 25'0" (22.8m), the depth 9'0" (2.9m) with some 600 feet (18.2m), the downstream section steel piled and the upstream section leading to the Horsemill Stream in open channel.

At the same time the existing road bridge over the River Lee Navigation was rebuilt to the same span but with increased roadway width.

**Contractor, William Old Ltd., of North Harrow.**

## Contract No 26

**(Tender Sum £282,999)**
**From North of Highbridge Street to Fishers Green, Waltham Abbey.**

Once again the Contract was complicated by the security requirements of the Explosive Research & Development Establishment (Ministry of Defence) who operated the old Edmonsey Sluices (manual) and weir and with that establishment's consent the old Edmonsey Lock giving barge access from the Gunpowder Factory to the River Lee Navigation was demolished.

The security problem was overcome by the erection of a new fence, as the first operation, on the East bank of the existing Horsemill Stream and by a return fence at the North end of the ERDE Estate to meet the Cornmill Stream.

At the request of the Lea Valley Regional Park Authority, the channel line was altered in the vicinity of the Grand Magazine, which that Authority planned to purchase.

Further difficulties arose from the detection of explosive washes in the bed of the Horsemill Stream, whose deposits were dredged and disposed of by the ERDE.

The works consisted of the dredging and widening of the Horsemill Stream, 6,870 feet (2,094m) including the reconstruction of the Edmonsey Sluices (two radial gates), steel piled channel and new access bridges at Fishers Green, the dredging of the Cornmill Stream and old River Lee with a new inlet control sluice at Fishers Green and an inlet weir sluice on the old River Lee.

A large number of old trees were removed and as the works neared completion, a tree planting scheme was initiated so as to give the widened channel a natural appearance. In addition as part of the land transaction, the LCCB purchased the bed (and West bank of the Horsemill Stream, including the Fishing Rights) so that the Board was able to establish a new fishery operated from Fishers Green along the West bank.

Once the works were complete and shortly after the formation of the Thames Water Authority, special access and fishing stands were erected for disabled anglers by the Authority's direct labour section.

**Contractor, W. A. Dawson (Luton) Ltd. Works on the Cornmill Stream, dredging, by LCCB river maintenance section.**

## Contract No 27

**(Tender Sum £213, 254)**
**From Fishers Green, Waltham Abbey, to Kiora Sluices, East of Kings Weir, Nazeing.**

After consultation with the Lee Valley Regional Park Authority, the St. Albans Sand and Gravel Co., and the Central Electricity Generating Board who have a large high voltage switching station West of Fishers Green, the line of the new channel was fixed and it was decided that in order to preserve the existing Hall Angling Club Fishery on the natural River Lee above Fishers Green to below Kings Weir, a restricting footbridge would be built some 1312 feet (400m) below Kings Weir or the River Lee diversion, together with a 400 feet (122m) side weir so that in flood time the flow down the River Lee would be that which would be contained within the banks and the 'surplus' flow would be diverted into Holyfield Lake to a long control weir.

The works consisted of the footbridge and weir referred to above, the construction of a new flood relief channel some 5,570 feet (1671m) in length in open cut with a bed width 79 feet (24m) and 9'9" deep (3m) together with a twin span footbridge to give access to the River Lee at the Fishers Green loop (a private fishery) a heavy duty twin span bridge on the CEGB access road to their Fishers Green Station capable of taking the heaviest transformers and a long steel piled concrete capped weir of some 585 feet (177m) in crest length which retains the Holyfield Lake

to its normal level and special floating booms protect the structure and the sailing dinghys of the Civil Service Sailing Club from possible accidents.

During the progress of the works the Contractor went into voluntary liquidation and the outstanding works, the completion of the bridges, the long side weir etc., were carried out by the LCCB river maintenance section under Mr. J. H. Allen and Mr. K. R. Meek as Engineer on the site.

On this Contract, except for the purchase of the bed of the River Lee at the loop west of Fishers Green, the LCCB agreed to obtain a licence from the gravel company to construct and maintain the new channel, bridges and berms.

This has allowed the company the right to the potential fishing in the new channel, which fishing is operated by the subsidiary company, Leisure Sport Ltd.

**Contractor, Felixstowe Construction Ltd., of Felixstowe. LCCB direct labour river maintenance section completed the works.**

## Contract No 28a

**(Tender Sum £189,491)**
**Road Bridge and adjoining channel near Nazeing Road, Nazeing.**

As part of a road improvement scheme this Contract was let in advance of the rest of this Section so that the work of the services diversion etc., could be done as one operation to reduce local inconvenience to a minimum as during the progress of the work it was necessary to divert the traffic around the site of the new bridge.

The works comprised the construction in steel piling, of 700 feet (213m) of channel 50 feet (15m) in width and about 10 feet (3m) in depth with a gabion invert together with new road bridge in prestressed and reinforced concrete 50 feet span (15m) together with the diversion of telephone, gas, electricity and water services, the construction of a short new road to connect the New and Old Nazeing Road when the channel and bridgeworks were constructed.

**Contractor, Fitzpatrick & Sons (Contractors) Ltd., of Waltham Abbey.**

## Contract No 28

**(Tender Sum £531,733)**
**From Kiora Sluices east of Kings Weir Nazeing to South of Dobbs Weir, Roydon.**

The works consisted of the construction of a new flood relief channel 5,000 feet (1,310m) in length with a bed width of 85 feet (26m) and a depth of 13 feet (4m) together with vertical lift and radial sluices, gates, a labyrinth weir with access and footbridges etc.

The channel alignment was agreed after discussions with the Essex County Council, the Redland Gravel Co., and the St. Albans Sand and Gravel Co., as the route was through both lakes (ex gravel pits, now used for fishing and sailing) and through areas which had been infilled. Here again, the LCCB sought a licence to construct and maintain the channel and structures so that the fishing and sailing interests would be undisturbed, but considerable economies would follow by using some 5,290 feet (1600m) of gravel pit as flood channel.

The structures, consisted of Kiora Sluices twin radial gates east of Kings Weir and discharging into the Holyfield Lake (thus making use of some 3,150 feet (950m) as flood channel), access bridge road and light railway to give continuing access to active gravel winning or filling operations. At the New Nazeing Road the works 'joined up' with the channel constructed under Contract No. 28A.

At the South end of Rushymead Lake, a novel labyrinth weir of some 400 feet (131m) in crest length compressed into some 130 feet (42m) in approach or entry width. A new footbridge with a steel pile and concrete invert was constructed between Rushymead and Broxbourne Central Lake to preserve the existing public footpath and betwen Broxbourne Central and Northern Lagoons the three vertical lift gates of Meadgate Sluices, together with a road bridge were constructed. These sluices maintain the water level in the Broxbourne Northern lagoon for amenity purposes.

A small amount of dredging work was carried out near the Dobbs Weir Road to ensure an adequate waterway for the flood waters.

After about 80% of the work was completed the Contractor went into volunmtary liquidation and it again fell to the Rivers Maintenance and Construction Gangs to complete the works which together with the additional work from Contract No.27 placed a heavy burden on the Section and tribute must be paid to their efforts in completing the work.

**Contractor, P. W. Mason Ltd., of Ripley. LCCB river maintenance and construction section completed the outstanding works.**

## Contract No 29

**(Tender Sum £484,811)**
**Dobbs Weir Road to Feildes Weir, Roydon.**

The former Epping and Ongar Rural District Council (now Epping Forest D.C.) and the Lee Valley Regional Park Authority, were interested in transforming the Glen Faba chalet area, which had become derelict, into a recreational area and after much discussion, a line for the new channel was agreed so as to give in effect an island with an access bridge just South of Feildes Weir, the junction of the River Lee and River Stort (Navigations).

At Feildes Weir, where there has been flow gauging records for 150 years, the existing 8 manual timber lifting sluices comprising the 'weir' were replaced by a long fixed weir with a special weir plate to ensure accurate records plus three automatic vertical lift gates for flood flows. The design difficulties were considerable. The maximum estimated peak flow of the 1947 flood was 4,166 cubic feet per second (118 Cumecs) and the capacity of the existing River Lee Navigation downstream was to be 'held' at a maximum of 1,000 cusecs (28 Cumecs) so that the new sluice gates and flood channel was designed for a capacity exceeding 3,500 Cusecs (99 Cumecs).

In addition the effluent from Rye Meads Sewage Treatment Works — dry weather flow 8.15 million gallons per day (37,000 cubic metres per day)— passes under the River Stort (Navigation) and discharges into the Feildes Weir Pool immediately at the East end of the existing weir and the site of the new sluices.

The final design provided for a low dam driven with steel piles longitudinally down river on the East side of the weir pool so as to divide all low flows down the existing River Lee Navigation and to take the flood flow along the Netherhall Channel. There is a walkway and railings along this weir so that the fishing can continue along the weir pool.

The Rye Meads effluent channel was syphoned under the new sluices to add to the low flow discharge to the West of the long weir.

The two main vertical lift gates discharge into a steel piled channel with invert leading to the new Flood Relief (Netherhall) Channel.

As well as the reconstruction of Feildes Weir detailed above, the Contract included the construction of the twin radial sluice gate structure at Dobbs Weir Road, a twin span footbridge and an accommodation bridge across the 4,265 feet (1300m) open channel which has a bed width 78 feet (24m) and a depth 11'6" (3.5m).

The excavated material was spread over the Glen Faba area so as to enable the recreational development of this area to proceed as and when finance was available.

Unfortunately the Contractor on the Contract went into voluntary liquidation and some of the works were completed by the Authority's Direct Labour River Section and as the work on the actual structure at Feildes Weir was only partly complete, a new Contract No. 29B was prepared to finish this structure.

**This Tender Sum was £30,010.**

The new channel was constructed through and along land owned by the Redland Gravel Co., who commenced gravel winning while the work was in hand. The Authority paid compensation for both the gravel removed from or covered by the channel and access roads as well as compensation for difficulties of access to the area 'cut off' by the new channel. This compensation exceeded £250,000.

**Contractor No 29, P. W. Mason Ltd., of Ripley.**

**Contractor No 29B, T.C.L. Contractors Ltd., of Southampton. Thames Water Direct Labour carried out ancillary works etc.**

## Contract No 30

**(Tender Sum £535,484)**
**Feildes Weir, Hoddesdon, to junction of River Lee and River Lee Navigation, South of Stanstead Lock, Stanstead Abbots.**

Stanstead Abbots High Street and the adjoining streets have a long history of flooding and this Contract was designed to alleviate this situation.

After an aerial survey and a detailed examination of the possible routes for a new flood relief channel, and following discussions with the British Waterways Board, it was decided that the most economical Scheme was to widen the existing River Lee Navigation as an open channel and in areas where such widening was not possible, Rye House and Stanstead Abbots, to steel pile the channel and then dredge the invert to increase the cross-sectional area of the waterway.

With the co-operation of the St. Albans Sand and Gravel Co., permission was given to fill in the 'deeps' in the adjoining Stanstead Gravel Pits thus avoiding unsightly deposits of spoil.

The Contract then consisted of the widening, deepening and

steel piling over a total length of channel of 10,663 feet (3200m) together with the piling and bed protection under Rye House and Stanstead Abbots Road Bridges.

In addition, there was special treatment of the towpath using corrugated sheeting and timber capping with a similar sheeting along the low lying land upstream of Rye House on the East bank along the Bird Sanctuary.

Special works were carried out along the river frontage of the Lee Valley Regional Park's Stanstead Boatyard to improve the mooring facilities and in the steel piled sections ladders and safety chains were provided to enable anyone falling into the water from the towpath to have an easy way 'up' to dry land.

Above Stanstead Abbots the towpath was diverted and a new brick retaining wall provided for the towpath along the widened channel.

**Contractor, Anglo Dutch Dredging Co., of Beaconsfield.**

## Contract No 31

**(Tender Sum £589,875)**
**From Stanstead Lock, Stanstead Abbots,**
**to Ware Weir, Star Street, Ware.**

The choice facing the designers here was whether to obtain the increased waterway by widening the existing River Lee Amwell Magna Fishery by improving the river and the construction of flood banks to contain the flood waters or to widen the existing River Lee Navigation with bypass channels and sluices at Stanstead and Hardmead Locks.

Other factors affecting the problem were the intention of the gravel company to work the deposits between the River Lee and the River Lee Navigation, the Lee Valley Regional Park Authority's interest in the future use of the water areas and the need to affect the fishery and boat facilities as little as possible.

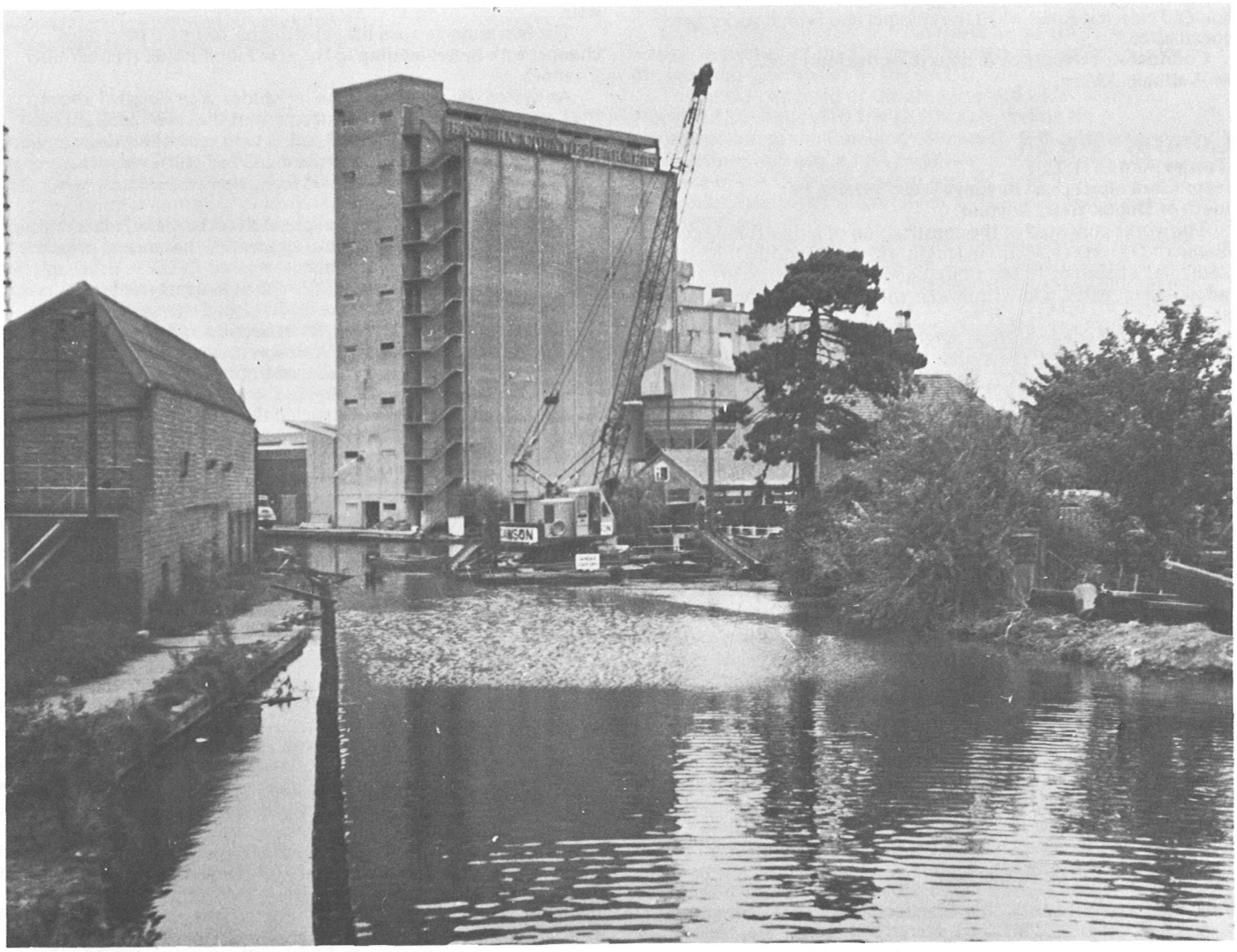
The final design and the Contract works consisted of the widening of the River Lee Navigation over a length of 5609 feet (1710m) with a by-pass channel at Stanstead Lock totalling 1345 feet (410m). At these two by-pass channels automatic radial gates were constructed to maintain the Navigation pound levels and at Ware Weir the old six vertical timber gate (manual) 'weir' was replaced by a fixed crest curved weir and a syphon which is self priming. The flow over this weir being limited to contain the discharge to below bank level of the existing river.

Again, special treatment was given to the towpath and to assist fishing and bird life a reed bed was planted close to the new (widened) East bank.

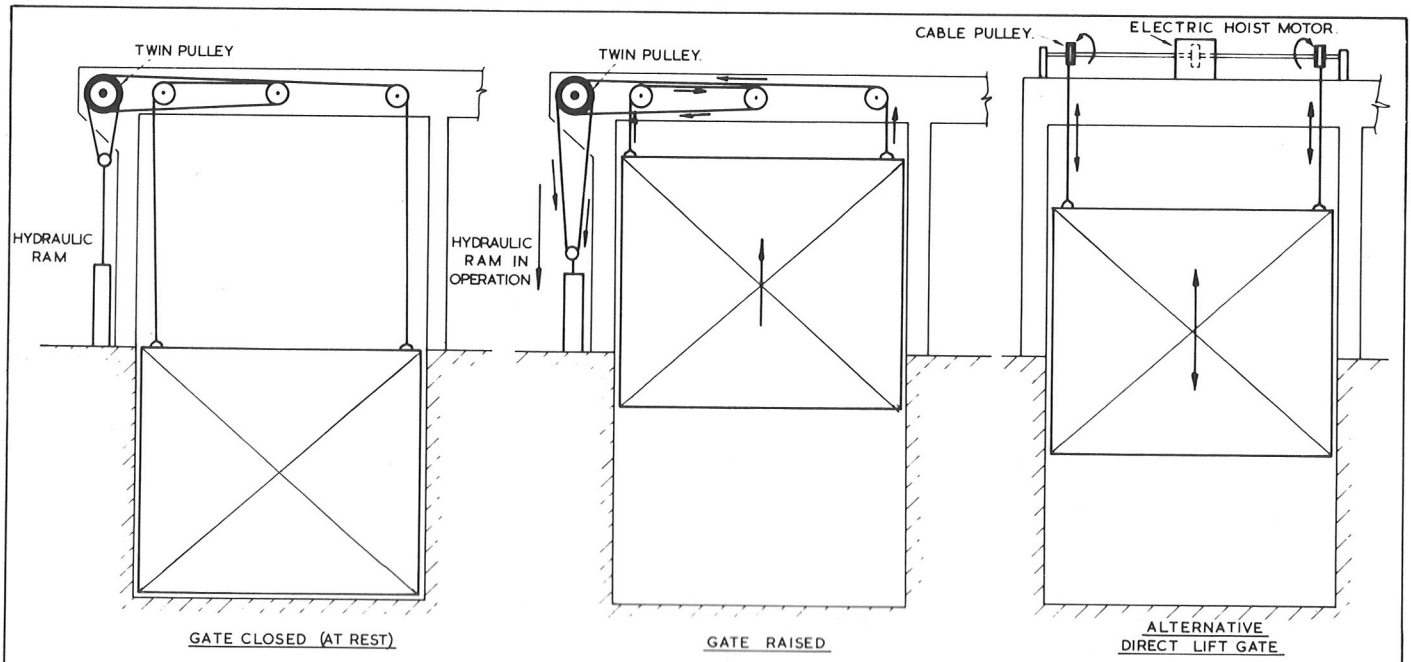
The access bridge at Hardmead Lock was replaced and a special design of timber bridge was used at the old Buntingford Branch railway bridge (now a L.V.R.P.A. bridleway) and at Ware Weir to replace the accessd bridge to a wider span.

In addition, works were carried out on the Amwell Magna Fishery by replacing the old sluices with fixed weirs, including a small labyrinth weir. A low dam and penstock was placed across the Stanstead Mill Stream to reduce the peak flows through that stream to Stanstead Abbots.

**Contractor, W. A. Dawson (Luton) Limited.**



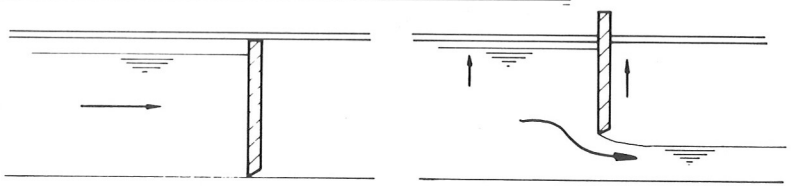
Ware Weir – crane on barge driving temporary coffer dam; on left new steel piling by old towpath. **Contract, No. 31**

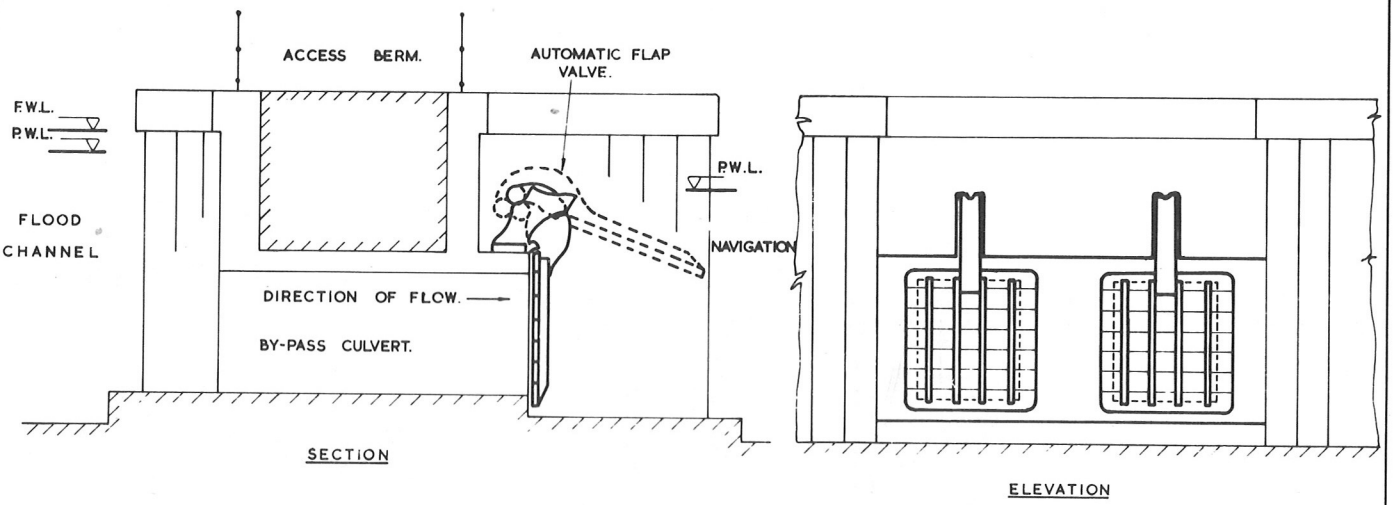



## VERTICAL LIFT GATE HYDRAULIC RAM/ PULLEY OPERATED.

NOTE ~

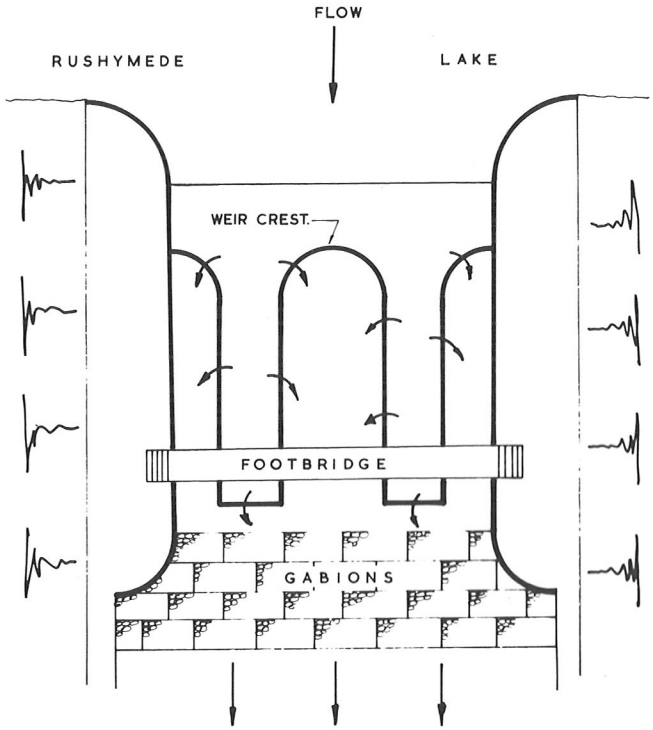
THE GATE OPENING i.e. MOVEMENT OF HYDRAULIC RAMS IS GOVERNED BY UPSTREAM WATER LEVEL RECORDED BY FLOAT METHOD.

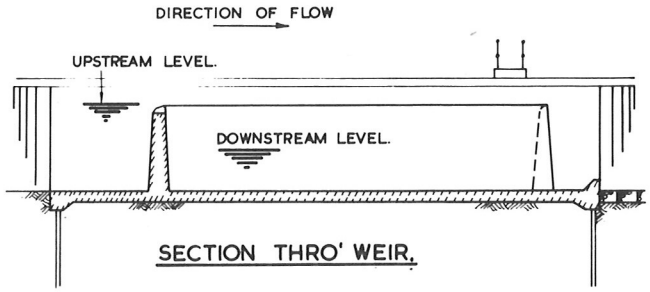





## FLAP GATES [ISMAILIA]

SELF ACTING NON-MECHANICAL FLAP GATE USED IN THIS INSTANCE (R.M.) C. 24, AS EMERGENCY BY-PASS.

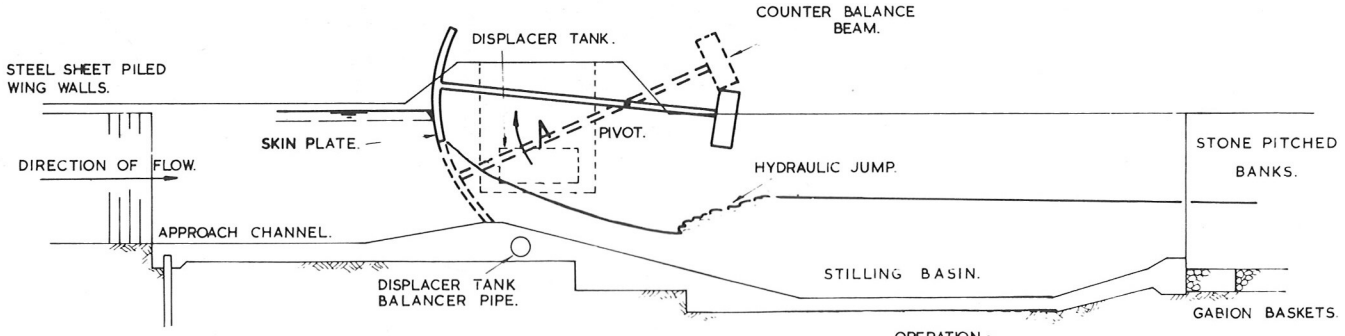



SECTION THRO' WEIR.

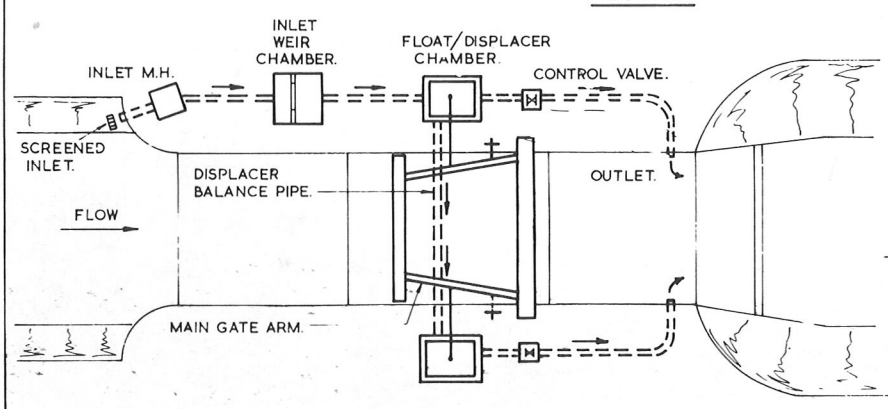
NOTE:-
FIXED CONTROL WEIR USED WHERE FOR A SPECIFIED HEAD OF FLOW, SPACE PROHIBITS THE USE OF A CONVENTIONAL SHARP CRESTED WEIR.

## LABYRINTH WEIR

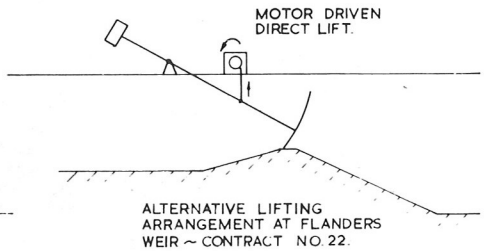



SECTION

OPERATION :-
WHEN WATER LEVEL U/S RISES, FLOW OVER INLET WEIR INCREASES AND DISPLACER CHAMBER FILLS UP, HENCE THE DISPLACER LOAD ON MAIN GATE ARMS IS REDUCED AND THE BALANCED GATE WILL RISE, THUS LETTING FLOW THROUGH UNDERNEATH.

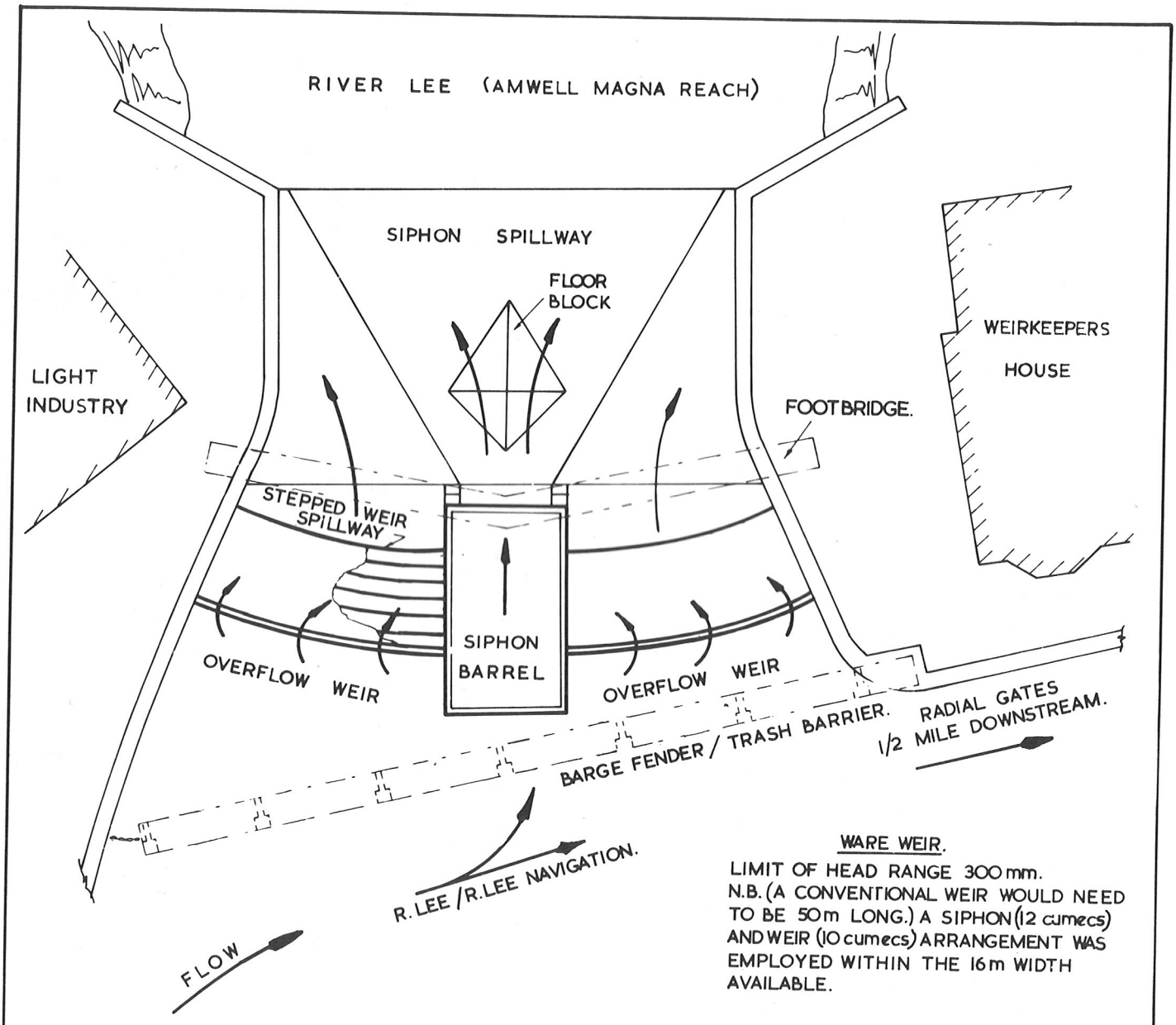



PLAN



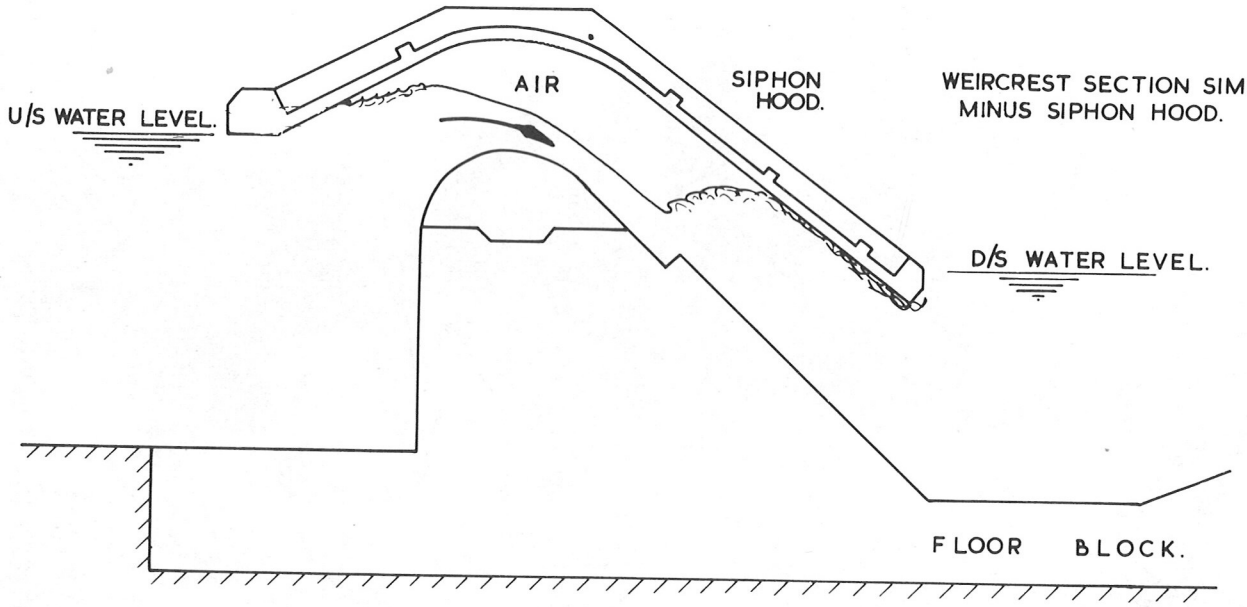

ALTERNATIVE LIFTING ARRANGEMENT AT FLANDERS WEIR ~ CONTRACT NO. 22.

## AUTOMATIC DISPLACER ~ OPERATED RADIAL GATES.




WARE WEIR.

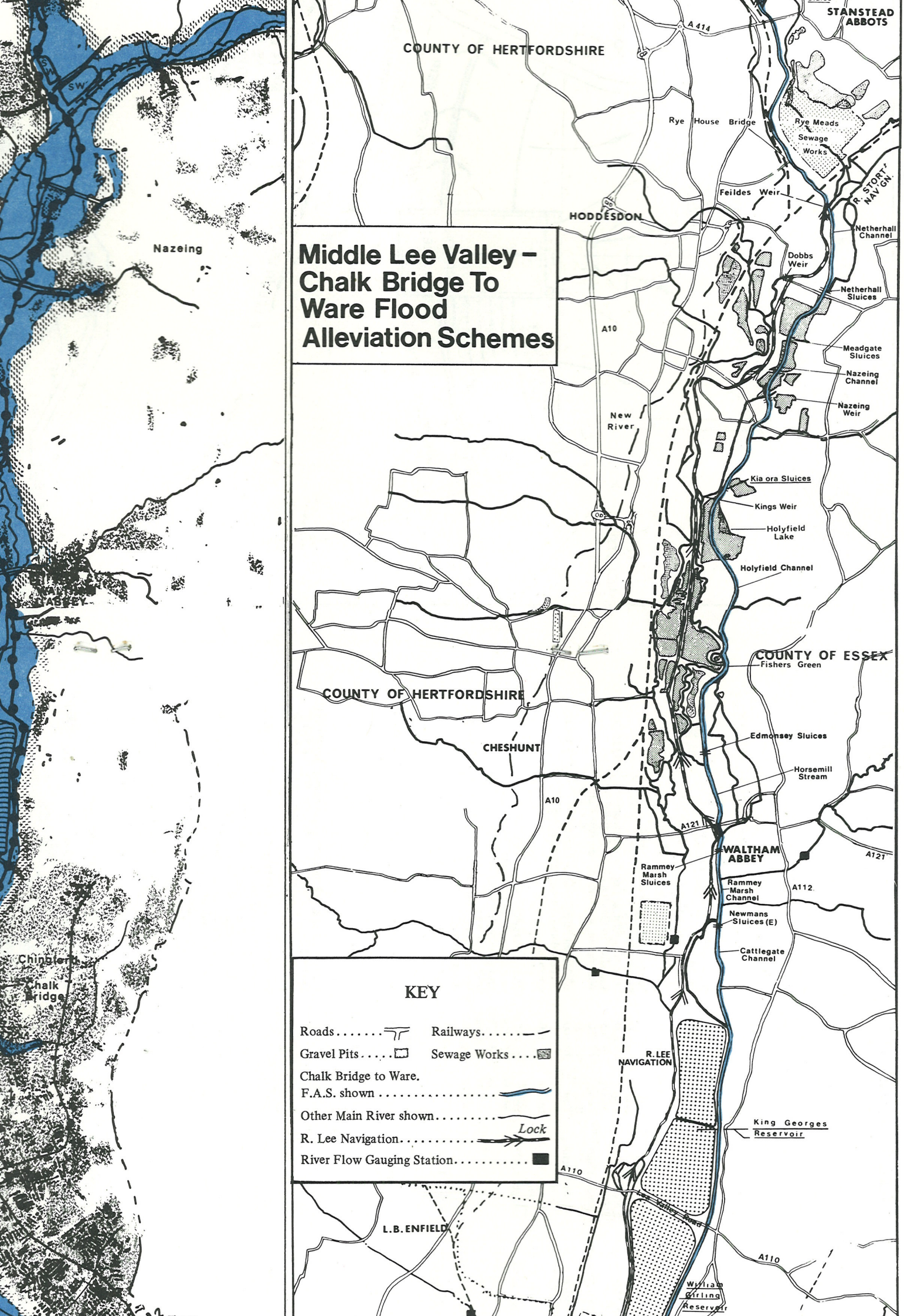
LIMIT OF HEAD RANGE 300 mm.
N.B. (A CONVENTIONAL WEIR WOULD NEED TO BE 50m LONG.) A SIPHON (12 cumecs) AND WEIR (10 cumecs) ARRANGEMENT WAS EMPLOYED WITHIN THE 16m WIDTH AVAILABLE.




WEIRCREST SECTION SIMILAR MINUS SIPHON HOOD.

TYPICAL SECTION THRO' SIPHON.

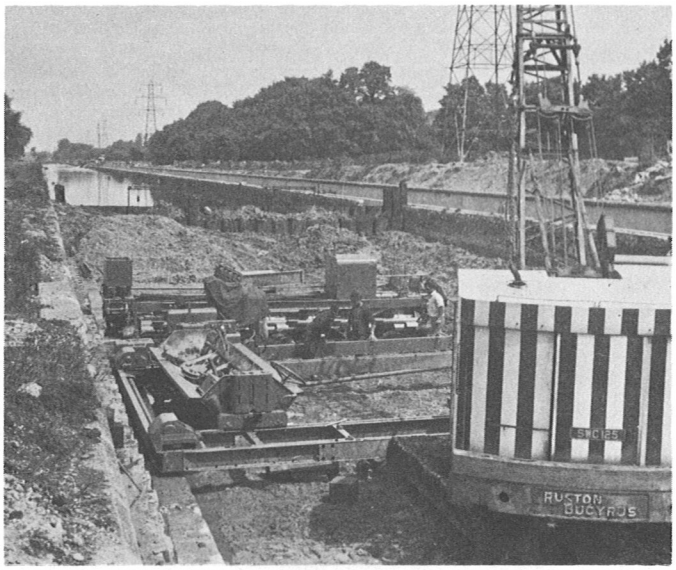
# AIR REGULATED SIPHON.


Middle Lee Valley – Chalk Bridge To Ware Flood Alleviation Schemes
COUNTY OF HERTFORDSHIRE
STANSTEAD ABBOTS
A414
Rye House Bridge
Rye Meads Sewage Works
R. STORT NAV GN.
Feildes Weir
HODDESDON
Netherhall Channel
Dobbs Weir
Netherhall Sluices
A10
Meadgate Sluices
Nazeing Channel
Nazeing Weir
New River
Kia ora Sluices
Kings Weir
Holyfield Lake
Holyfield Channel
COUNTY OF ESSEX
Fishers Green
COUNTY OF HERTFORDSHIRE
CHESHUNT
Edmonsey Sluices
Horsemill Stream
A121
WALTHAM ABBEY
Rammey Marsh Sluices
Rammey Marsh Channel
A112
Newmans Sluices (E)
Cattlegate Channel
R. LEE NAVIGATION
King Georges Reservoir
A110
L.B. ENFIELD
Nazeing
Chimbleth
Chalk Bridge
KEY
Roads
Railways
Gravel Pits
Sewage Works
Chalk Bridge to Ware.
F.A.S. shown
Other Main River shown
R. Lee Navigation
Lock
River Flow Gauging Station

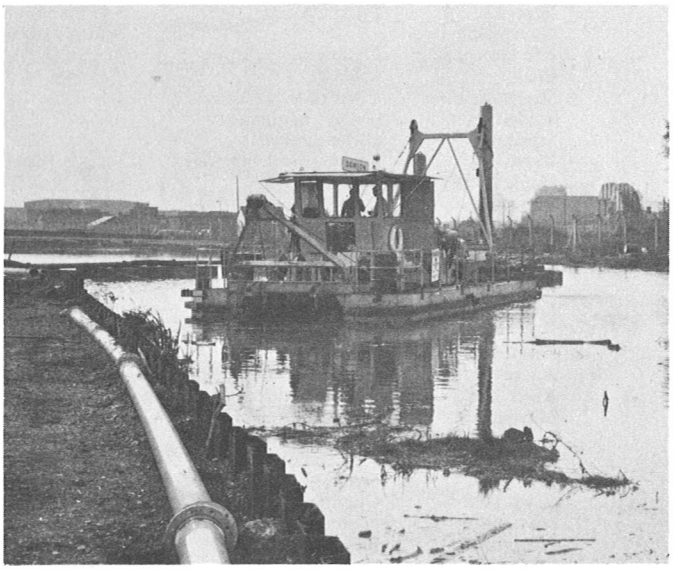
| Contract No. | Name | Description | Dimensions metres and Levels in metres A.O.D. Newlyn | | | Notes | Nat. Grid Ref. |
|---|---|---|---|---|---|---|---|
| 21 | Chalk Bridge Tottenham | Open Steel girder bridge concrete deck. | Span 25.100m | Invert | 6.480m | Existing bridge "skewed" to a smaller angle to allow increase in channel width. | TQ 367914 |
| | River Lee (New Cut) | Open concrete channel (narrow section) | Length 606m | Top<br>Bed | 16.750m<br>15.840m | Channel confined by reservoir and industrial area. Walls raised invert lowered. | |
| | River Lee (New Cut) | Open concrete channel | Length 552m | | | New Walls and Invert. | |
| | North Circular Road Bridge. | Open channel between Lee Valley viaduct. | | Invert<br>Top<br>Bed | 7.440m<br>17.380m<br>16.450m | Walls raised only. | TQ 362923 |
| | | Additional channel under viaduct. | Length 122m | Invert<br>Top<br>Bed | 7.975m<br>3.200m<br>2.440m | For increased capacity of waterway. | TQ 362923 |
| | River Lee (New Cut) | Open Channel | Length 222m | Top<br>Bed | 19.800m<br>18.280m | Walls raised, new east wall and concrete invert. | |
| | Lower Hall Lane Bridge, Chingford. | Two span R.C. bridge. | 2 No. × 15.075m | | | Carries Lower Hall Lane over the channel — old bridge demolished. | TQ 363925 |
| 22 | Eastern Flood Channel. | Open channel, concrete lined. | Length 407m | Top<br>Bed | 20.700m<br>19.500m | West wall raised, new east wall lowered invert. | |
| | Aqueduct Sluice | Twin vertical lift sluices (manual) | 2 No. 4.560 × 1.575m | Top<br>Invert | 10.800<br>9.245 | Used to discharge flood water from aqueduct to Eastern Flood Channel. | TQ 364927 |
| | Eastern Flood Channel | Open channel, concrete lined. | Length 170m | Top<br>Bed | 17.050<br>15.840 | Wall raised, new invert, new east wall. | |
| | Flanders Weir | Long weir with piers. Two radial gates. | 10 No. openings 2.745m<br>2 Gates. 7.610mx 1.727m | Top<br>Invert | 10.800<br>9.100 | Weir crest raised. Radial Gates deepened and converted to electric operation. | TQ 367933 |
| | Eastern Flood Channel | Open concrete lined channel. | Length 1,907m | Top<br>Bed 1x<br>1x<br>1x | 27.450m<br>15.850m<br>8.820m<br>1.000m | West wall raised, old east wall lowered, new east wall with effluent channel and pressure conduit (1.829m diameter) within east wall. | |
| | Lee Valley Road Bridge | Three span bridge as existing. | | Invert | 10.550m | No work done to the existing bridge. Work done on the invert. | TQ 376949 |
| 23 | Eastern Flood Channel | Open channel concrete lined. | Length 1,898m<br>d/s end<br>u/s end | Invert<br>Invert<br>Top<br>Bed | 10.560m<br>13.200m<br>22.880m<br>22.820m | New east wall, channel widened, new invert with 0.200m fish weirs at 330m intervals. | |
| 24 | Cattlegate Footbridge | Twin span "Preflex" beam footbridge. | 2 No. spans of 18.350m | Invert | 13.120m | Maintains footpath access to Enfield Lock. | TQ 376979 |
| | Cattlegate Channel | Open channel with steel piled, gabion faced east bank. | Length 496m | Invert d/s<br>Top<br>Bed | 13.120m<br>31.980m<br>26.800m | Natural earth, west bank, gabions on east bank. | |
| | Cattlegate Bridge | Twin span "Preflex" beams. | 2 No. spans of 16.920m | Invert | 13.440 | Carries Cattlegate Road across the new flood channel. | TQ 375984 |
| | Cattlegate Channel | Open Channel. | Length 474m | Top<br>Bed | 31.980m<br>26.800m | | |
| | E.R.D.E. Bridge | Twin Span "Preflex" beams R.C. deck. | 2 No. spans of 16.550m | Invert | 13.450 | Provided to take MOD traffic across the new channel. | TQ 376987 |
| | Cattlegate Channel | Open Channel | Length 398m | Top<br>Bed | 37.480m<br>31.000m | Earth channel, piling and bed protection below Newmans Sluices. | |
| | Newmans Sluices (East) | Vertical Lift Gates. | 4 No. 7.010m × 2.615m | Top<br>Gill | 16.755<br>14.140 | Automatic electric operation<br>Telemetry equipment fitted. | TQ 375993 |
| | River Lee berm Access bridge | Twin span bridge. "Preflex" prestressed beams. R.C. deck. | 2 No. 16.550m | Invert | 13.800 | Carries berm access road across road across River Lee | TQ 377996 |
| | Long Weir East Bank River Lee Navigation u/s Newmans Weir | Long Steel piled weir. | 15.5m (crest) | Pound Level | 17.160m | Protects River Lee Navigation-Enfield Lock pound against lower water level. | TQ 373992 |
| | Rammey Marsh Channel | Open channel steel piled walls. | Length 1,064m | Top<br>Bed | 22.580<br>22.580 | Course parallel and east of the River Lee Navigation. | |
| | Rammey Marsh Sluices | Vertical Lift Sluices. | 4 No. 7.010m × 2.743 | Top<br>Cill | 17.750m<br>15.007m | Automatic electric operation<br>Telemetry equipment fitted. | TQ 375999 |
| 25 | River Lee (Rammey Marsh Channel) | Open Channel Steel Piled. | | Top | 18.248m | Piled Channel u/s and d/s of Clerks Bridge has a concrete invert. | |
| | Clerks Bridge Waltham Abbey | Clear Span Prestressed and R.C. concrete. | Span 18.300m | Invert | 15.300m | Carries A121 over new channel concrete invert. | TL 376006 |
| 26 | Horsemill Stream | Open Channel | | Top<br>Bed | 30.050m<br>22.820m | Natural earth channel — widened Thames Water Fishery from West bank. | |
| | Edmondsey Sluice | Twin Radial Gates | 2 No. 6.700m × 3.340m | Top<br>Cill | 19.550m<br>16.210 | Boom upstream cleared by E.R.D.E. | TL 374019 |
| | Horsemill Stream | Open Channel | | Top<br>Bed | 30.050m<br>22.820m | Widened earth channel<br>Thames Water Fishery — disabled anglers stands at Fishers Green. | |
| | Fishers Green Bridge | Twin span — Prestressed concrete beams. | 2 No. 9.900m span. | Invert | 17.640m | Carries access road over new channel. | TL 367026 |
| 27 | Cornmill Stream inlet sluices | Vertical lift gate (manual) | 1 No. 3.657m × 3.048m | Top | 20.726m | Controls intake to Cornmill Stream. | TL 367026 |
| | River Lee | Open channel widened river and new cut in part. | Length 175m | Top<br>Bed | 32.000m<br>24.000m | | |
| | Fishers Green Footbridge | Twin span — prestressed concrete. | 2 × 18.100m | Bed | 17.770m | Gives access to fishery in old loop. | TL 378029 |
| | River Lee — open channel. | Open channel and widened — new cut. | Length 486m | Top<br>Bed | 35.800m<br>23.000m | | |
| | C.E.G.B. Bridge | Twin span prestressed and reinforced concrete. | 2 × 16.250m | Invert | 18.000 | Heavy duty bridge to carry heavy transformers to the CEGB Switching Station. | TL 376032 |
| | Holyfield Channel | Open Channel | Length 1001m | Top<br>Bed | 34.000m<br>23.000m | Part new cut and part through worked out gravel pits. | |
| | Holyfield Hall Weir | Long Weir | Crest Length 172m | Crest | 20.000m | Retains water level in the Holyfield Lake | TL 377042 |

| Contract No. | | Description | Dimensions metres and Levels in metres A.O.D. Newlyn | | | Notes | Nat. Grid Ref. |
|---|---|---|---|---|---|---|---|
| | Holyfield Lake | Lake | Length 998m | rest Level | 20.000m | Flood Channel through Lake. | |
| 28 | Kiora Sluices | Radial Gates | 2 No. 8.000m × 2.420m | Top<br>Cill | 22.770<br>20.350 | Retains water in the Nazeing Channel. | TL 376053 |
| | Kiora light railway bridge | Three span skew (Bailey Bridge) | 2 × 19.930<br>1 × 24.000 | Invert (gabions) | 20.055 | Carried gravel operators — light railway across channel. | TL 376054 |
| | Nazeing Channel | Open Channel | Length 651m | Top<br>Bed | 35.000m<br>26.000m | Steel piled "causeway" beside the lake. | |
| | Green Lanes Access Bridge | Three span "Preflex" prestressed beam R.C. deck. | 2 × 9.986m<br>1 × 16.452m | Invert (gabions) | 20.313 | Carries road traffic to gravel plant. | TL 379055 |
| | Nazeing Channel | Open Channel | Length 301m | Top<br>Bed | 35.000m<br>26.000m | | |
| 28A | Nazeing Road Bridge B194 | Twin Span Bridge Prestressed concrete beam & RC deck. | Skew sp. 15.230m<br>Piled Channel u/s & d/s | Invert<br>15.000m | 20.450m<br>wide | Carries B194 Broxbourne to Nazeing Road over the flood channel. | TL381062 |
| 28 | Nazeing Channel | Open Channel | Length 625m | Top<br>Bed | 35.000m<br>26,000 | Earth Channel | |
| | Redlands Access Bridge | Three Span Preflex beams & RC Deck. | 2 × 9.986m<br>1 × 16.492m | Invert | 24.691 | | TL 383063 |
| | Nazeing Weir | Labyrinth Weir | Crest 131m long | Crest | 23.800 | Discharges into the Nazeing Channel | TL 383063 |
| | Rushmeade Lake | Lake | Length 385m (in lake) | | | Flood Channel through Lake. | |
| | Pecks Hill Footbridge | Clear Span Prestressed concrete | Span 24.752m<br>Channel 21.720m | Invert | 21.500m | Steel Piles retain the invert and concrete cill. | TL 385069 |
| | Broxbourne Central Lake | Lake | Length 502m (in lake) | | | Flood Channel Through Lake. | |
| | Meadgate Sluices & Access Bridge | Vertical Lift Gates Electric Operated | 3 No.<br>6.000m × 3.000m | Top<br>Cill | 24.700m<br>21.700m | Retains the Broxbourne Northern Lagoon for amenity purposes. | TL 385074 |
| | Broxbourne Northern Lake | Lake | Length 652m (in lake) | | | Level controlled by Meadgate Sluices Flood Channel through lake | |
| 29 | Dobbs Weir Road Bridge | Twin Span "Preflex" prestressed beam RC deck. | 2 × 9.700m | Invert | 22.800 | Carries the Dobbs Weir Road over the Flood Channel. | TL 390080 |
| | Netherhall Sluices | Radial Gates | 2 No.<br>6.900m × 1.840m | Top<br>Cill | 25.840m<br>24.000m | Retains water in the Netherhall Channel | TL 390080 |
| | Netherhall Channel | Open Channel | Length 538m | Top<br>Bed | 32.000m<br>24.000m | Earth Channel | |
| | Netherhall Footbridge | Twin Span "Preflex" prestressed beams RC deck. | 2 No. × 18.300m | Invert | 23.666m | | TL 392084 |
| | Netherhall Channel | Open Channel | Length 585m | Top<br>Bed | 32.000m<br>24.000m | Earth Channel | |
| | Glen Faba Access Bridge | Twin Span "Preflex" prestressed beams RC deck. | 2 No. 16.000m | Invert (gabions) | 23.896 | | |
| 29B | Feildes Weir Weir and Sluices | Long Weir<br>Small vertical lift gate<br>Large vertical lift gate | Crest Length 28.000m<br>1 No. × 2.000m × 3.000m deep.<br>2 No. 6.000m × 3.000m deep. | Crest<br>Top<br>Top | 27.000m<br>27.000m<br>27.000m | Fixed weir trash boom u/s Small gate for minor adjustment of pound level for flood discharge to Netherhall Channel. | TL 392093 |
| 30 | River Lee Navigation | Open Channel (new cut) | Length 253m | Top<br>Bed | 32m<br>22m | New cut to give improved approach to Feildes Weir and Sluices. | |
| | Rye House Railway Bridge | Clear span includes towpath (no alteration) | Width (piling) 38.000m | Invert | 24.370 | Carries London to Cambridge Railway line over the River Lee Navigation. | TL 389093 |
| | River Lee Navigation | Piled Channel | Length 606m<br>Width 25.000m | | | Channel Piled through stadium/factory area. | |
| | Rye House Road Bridge | Clear span including towpath. | Bridge 18.330m<br>Channel 14.000m | Invert | 24.500m | Carried Rye House Toll Road over the River Lee Navigation. | TL 385097 |
| | Stanstead Road Bridge (High Street) | Clear span highway bridge. Abutments under-pinned | | Invert | 25.390 | Carries A414 over River Lee Navigation. Gabions and concrete invert. | TL 383118 |
| | River Lee Navigation | Channel widened and new towpath. | Length 154m steel piled. New Towpath | | 24.410m | River Lee Navigation and Flood Channel (widened) | |
| 31 | Stanstead Sluices | Radial Gate. | 1 No. 8.000m × 2.200m | Top<br>Cill | 30.200m<br>27.300m | Retains River Lee Navigation Stanstead pound. | TL 381123 |
| | Stanstead Lock Bypass Channel | Part steel piled, part with pitched banks. | Length 350m (new cut) | | | Leads to and from Stanstead Sluice. | TL 381123 |
| | River Lee Navigation | Channel widened — towpath protected. | Length 738m (From Stanstead Lock) | Top<br>Bed | 23.000m<br>14.000m | New access road (berm) on widened east bank. Reed bed provided by east bank. | |
| | Amwell Marsh Access Bridge | Clear Span Prestressed pre-cast beams. | 21.000m | | | Access bridge to Marshes east of River Lee Navigation. | TL 376127 |
| | River Lee Navigation | Channel widened towpath protected. | Length 534m | Top<br>Bed | 23.000m<br>14.000m | | |
| | L.V.R.P.A. Footbridge | Clear span (timber replaced old railway bridge) | 25.000m | | | New timber footbridge carries LVRPA footpath across River Lee Navigation. | TL 374128 |
| | River Lee Navigation | Channel widened, towpath protected. | Length 505m | Top<br>Bed | 21.000m<br>15.000m | | |
| | Hardmead Sluice | Radial Gate | 1 No. 8.000m × 2.180 | Top<br>Cill | 31.930m<br>28.900m | Retains River Lee Navigation Hardmead Pound. | TL 371134 |
| | Hardmead Lock by-pass channel | Part steel piled, part with pitched banks. | 200m (new cut) | | | Leads to and from River Lee Navigation. | |
| | River Lee Navigation | Channel widened towpath protected. | Length Hardmead Lock Ware Weir 1003m. | | | | |
| | Crane Mead Access Bridge | New clear span (timber). | 24.800m | | | Access to marshes east of Ware Weir. | TL 365140 |
| | Ware Weir | Fixed weir and syphon. | 2 No. 6.500m × 3.000m syphon 3.000m. | Crest | 33.880m | Replaces former 6 gate vertical gate timber weir. | TL 365141 |
| | Amwell Magna Weirs by Amwell Magna Cottage | Weir by Cottage in Mill Stream<br>Labyrinth Weir (Mill Stream) | Crest width 11.000m<br>Crest width 16.000m<br>Crest width 29.000m | | | Replaces Amwell Cottage Sluice.<br>Replaces Six Gate Sluices demolished. | TL 380129 |

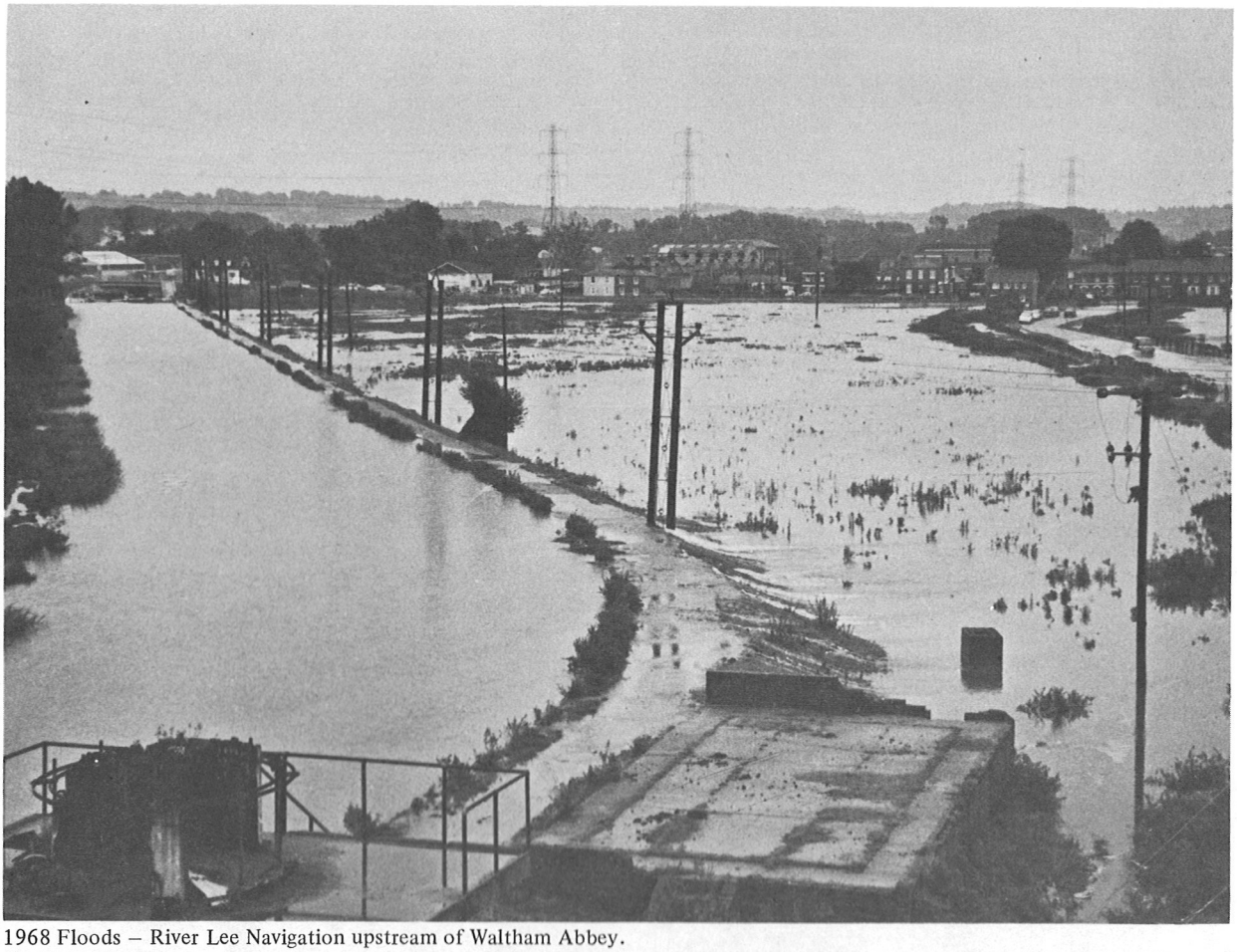
Lee Valley Road, Chingford. Eastern Flood Channel on right new pressure culvert, effluent channel and widened channel under construction. **Contract, No. 22**



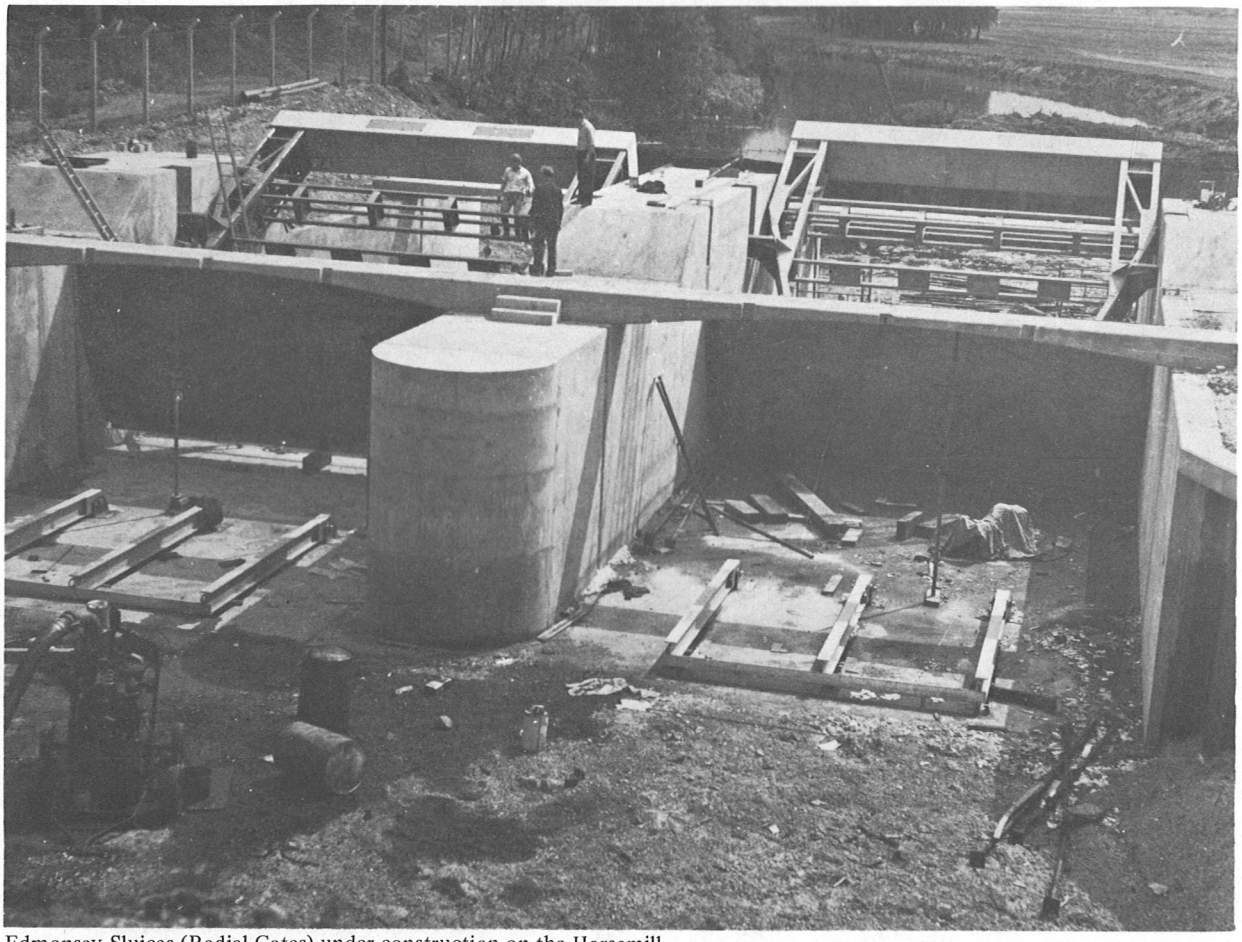

Eastern Flood Channel Chingford. Temporary dam with road laying machine starting to lay the new concrete invert. **Contract, No. 23**



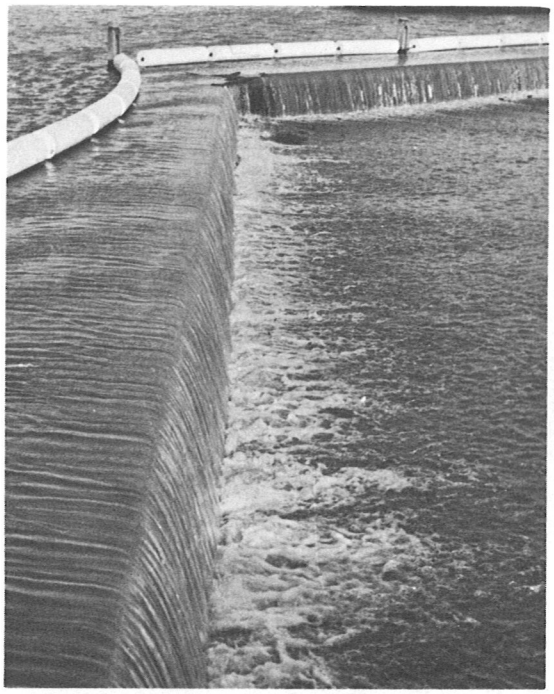
New channel between RSAF and ERDE Waltham Abbey. Suction dredger, dredging the channel and pumping the spoil to old gravel workings. **Contract, No. 24**



1968 Floods – River Lee Navigation upstream of Waltham Abbey.
**Contract, No. 26**



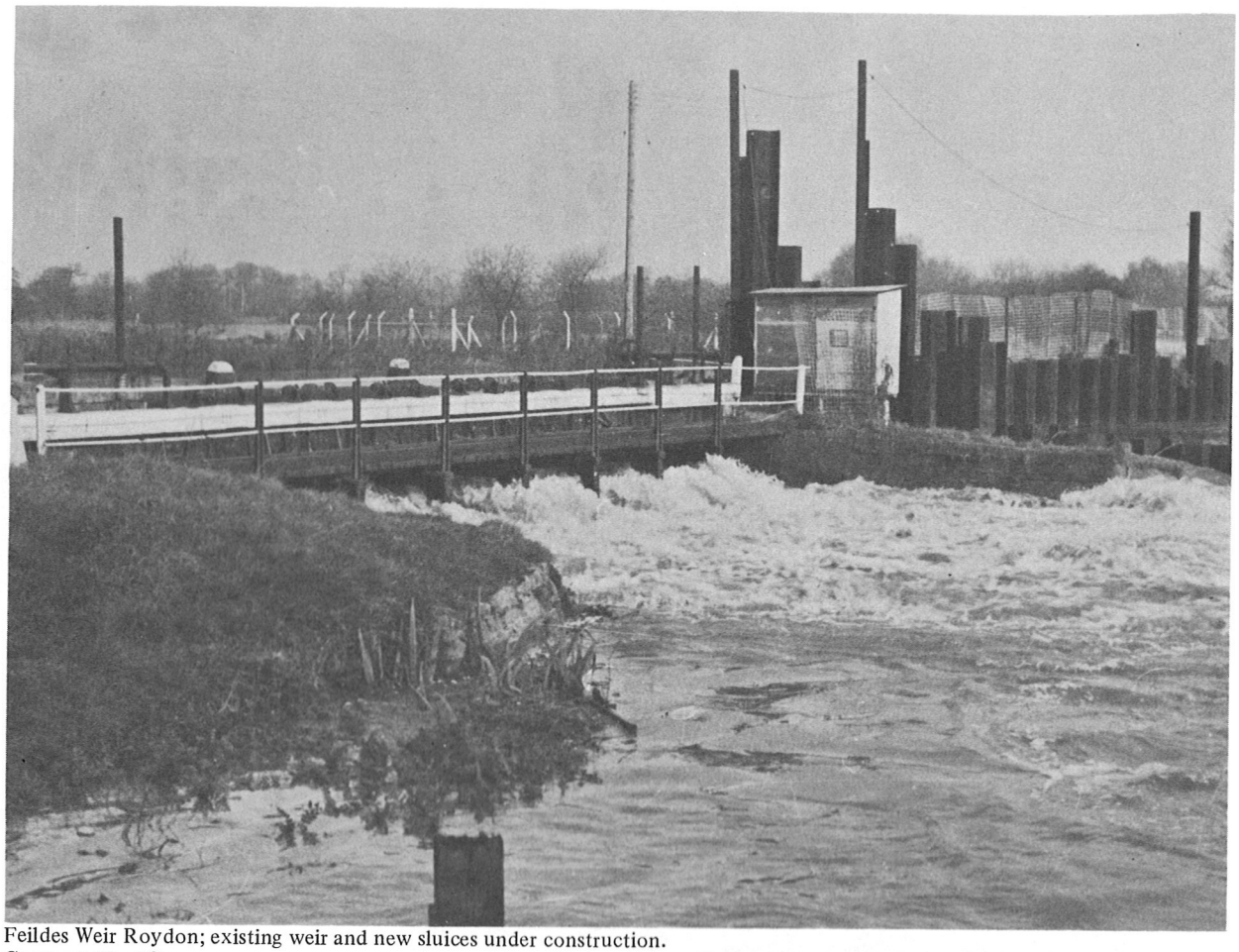
Edmonsey Sluices (Radial Gates) under construction on the Horsemill Stream upstream of Waltham Abbey. **Contract, No. 26**



Flood Flow over the 122m long weir South of Holyfield Lake. **Contract, No. 27**

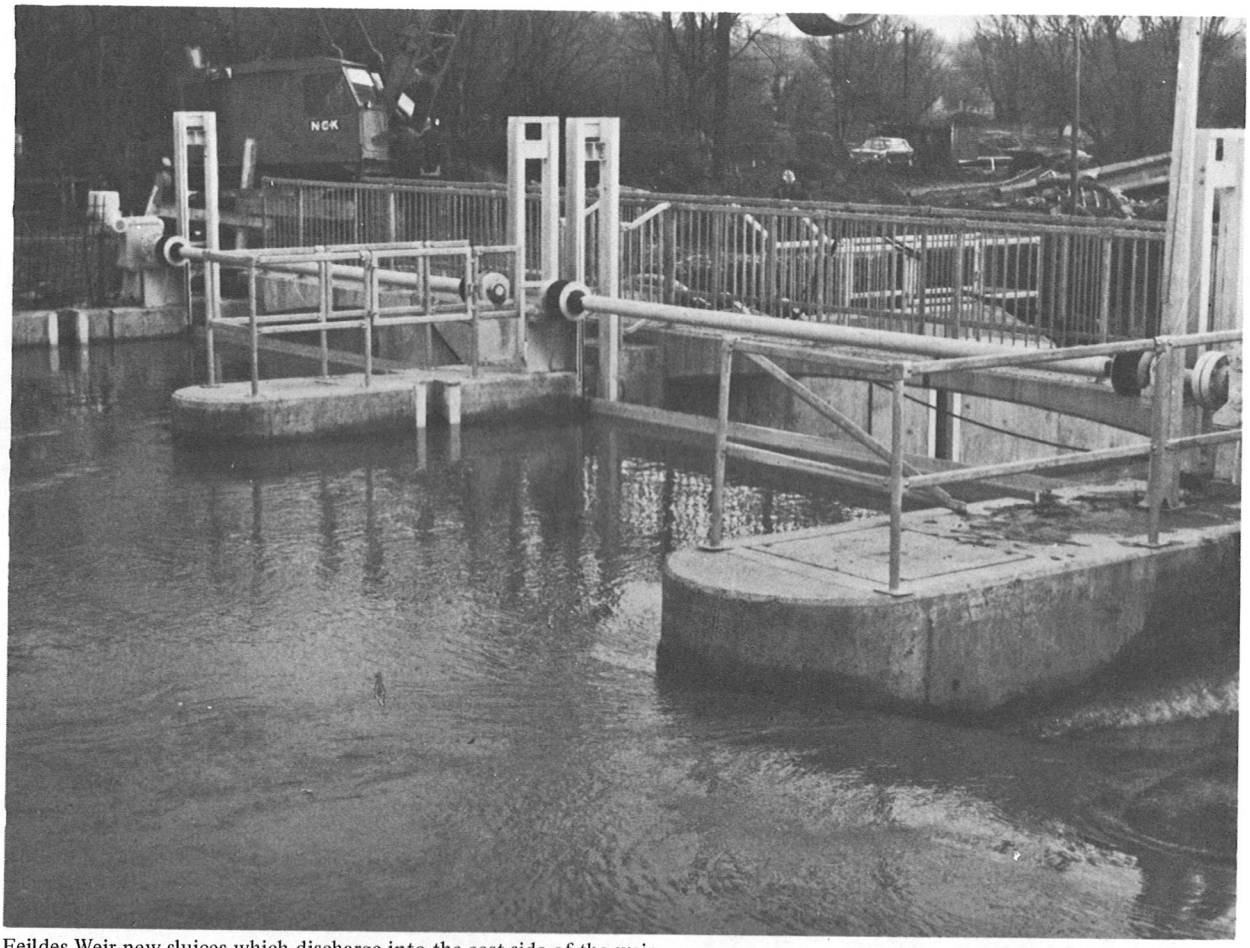
Steel Piled Flood Channel with concrete invert with new road bridge under construction. **Contract, No. 28**

Oblique Air Photograph Bottom left Dobbs Weir and River Lee Navigation Feildes Weir top left (junction River Lee & River Stort) Right Netherhall Flood Relief Channel.

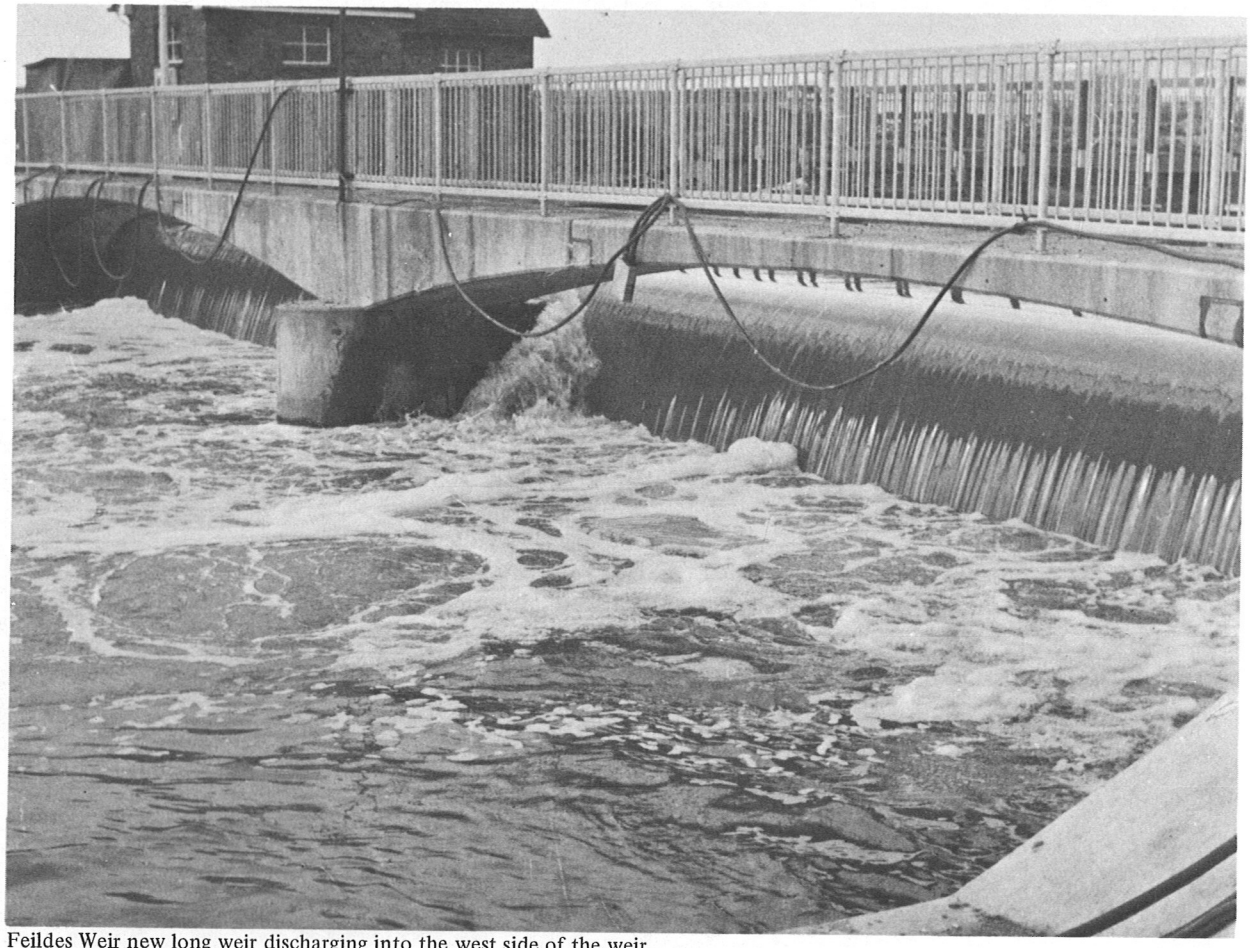


Feildes Weir Roydon; existing weir and new sluices under construction.
**Contract, No. 29**

Feildes Weir new long weir nearly complete.
**Contract, No. 29**

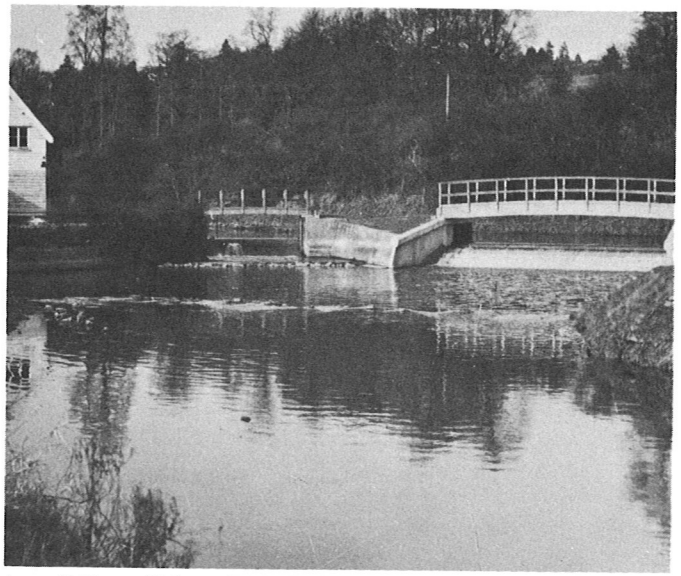


Feildes Weir new sluices which discharge into the east side of the weir pool and new flood channel. **Contract, No. 29**

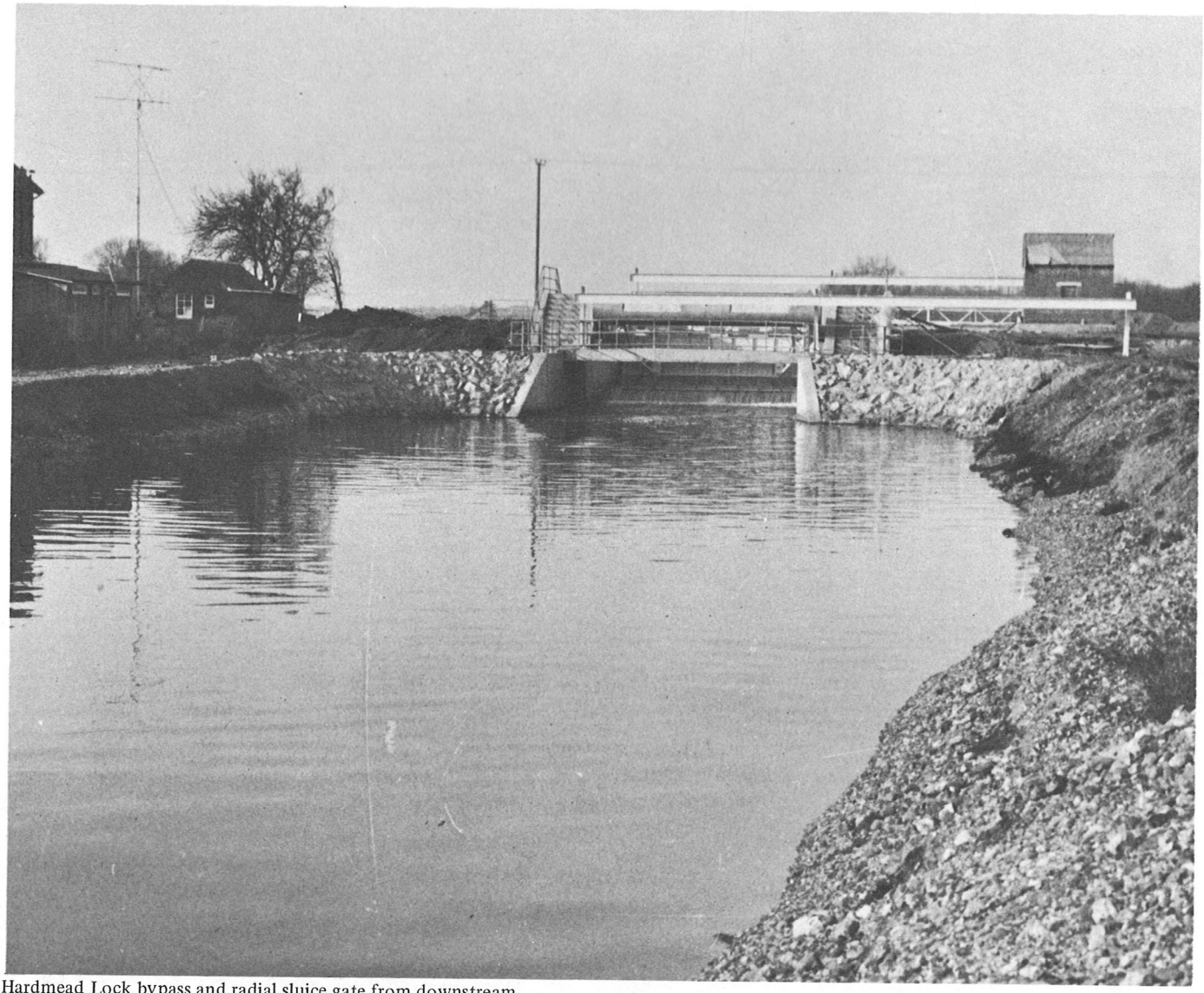


Feildes Weir new long weir discharging into the west side of the weir pool. **Contract, No. 29**

Below Stanstead Abbots River Lee Navigation steel piled channel and improved towpath. **Contract, No. 30**



Amwell Magna Fishery (River Lee) sluices replaced by new fixed weirs with new timber footbridges. **Contract, No. 31**



Hardmead Lock bypass and radial sluice gate from downstream.
**Contract, No. 31**