

**CUMBERLAND
RIVER
AUTHORITY**

**NINTH
ANNUAL
REPORT**

FOR YEAR ENDED 31st MARCH, 1974

NOTE

The Report is published as required by Section 110 of the Water Resources Act, 1963. The Constitution of the Authority is governed by the Cumberland River Authority Constitution Order, 1964 (S.I. 1964 No. 1014).

This is the last Report of the Cumberland River Authority. As from 1st April, 1974 the powers and duties of the Authority will be taken over by the North West Water Authority.

CUMBERLAND RIVER AUTHORITY

NINTH

Annual Report

YEAR ENDED 31st MARCH, 1974

Chairman of the Authority:

P. J. LIDDELL, Esq., D.S.C., M.A., F.Z.S., *

G. N. F. WINGATE, Esq., O.B.E., D.L. †

Vice-Chairman:

G. N. F. WINGATE, Esq., O.B.E., D.L. *

E. H. FLEMING SMITH, Esq., T.D., J.P., F.R.I.C.S., F.L.A.S. †

*** To July, 1973**

† From July, 1973

CHERTSEY HILL, LONDON ROAD, CARLISLE, CA1 2QX.

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PART I

GENERAL

Chairman of the Authority:

P. J. LIDDELL, Esq., D.S.C., M.A., F.Z.S. *

G. N. F. WINGATE, Esq., O.B.E., D.L.,†

Vice-Chairman:

G. N. F. WINGATE, Esq., O.B.E., D.L. *

E. H. FLEMING SMITH, Esq., T.D., J.P., F.R.I.C.S., F.L.A.S., †

Members of the Authority:

A. Appointed by Local Authorities under Section 6(2) and 7 of the Act:

Cumberland County Council

- | | |
|--|--|
| J. O. Holliday, Esq., J.P., | The Gale, Silloth, Cumberland. |
| (a) W. Jackson, Esq., | Greensyke, Houghton, Carlisle. |
| (To January, 1974) | |
| (b) W. E. Knipe, Esq., | "Ridgeways", Loop Road South, |
| | Whitehaven, Cumberland. |
| (c) M. P. Nilsson, Esq., M.B.E., J.P. | "Burcot", 49, Newlands Lane, |
| | Workington, Cumberland. |
| Major T. R. Riley, | Burbank House, Blencowe, Penrith, |
| | Cumberland. |
| E. H. Fleming Smith, Esq., T.D., J.P., | Hawksdale Hall, Dalston, Carlisle. |
| F.R.I.C.S., F.L.A.S. | |
| (d) A. E. Thompson, Esq. | Ship Launch Inn, Egremont, Cumberland. |
| J. Westoll, Esq., J.P., D.L., | Dykeside, Longtown, Cumberland. |
| G. N. F. Wingate, Esq., O.B.E., D.L., | Bridge End House, |
| | Cockermouth, Cumberland. |
- (a) Appointed on the nomination of Border Rural District Council.
(b) Appointed on the nomination of Whitehaven Borough Council.
(c) Appointed on the nomination of Workington Borough Council.
(d) Appointed on the nomination of Ennerdale Rural District Council.

Westmorland County Council

Capt. The Hon. A. G. Lowther,	Whitbysteads, Askham, Penrith,
M.B.E., D.L.,	Cumberland.

Carlisle County Borough Council

R. C. Hayhoe, Esq.,	5, Etterby Lea Road, Carlisle.
J. F. Long, Esq.,	51, Upperby Road, Carlisle.
W. S. Bell, Esq.,	72, Lightfoot Drive, Carlisle.

B. Appointed by the Minister of Agriculture, Fisheries and Food:—

(i) under Section 6 (3) (a) — Representing Land Drainage:—

T. R. Fetherstonhaugh, Esq.,	The College, Kirkoswald, Penrith, Cumberland.
Major C. S. R. Graham, D.L.,	Crofthead, Longtown, Cumberland.
R. K. Nicholson, Esq., B.A.,	Sleastonhow, Kirkby Thore, Penrith, Cumberland.

(ii) under Section 6 (3) (b) — Representing Fisheries:—

P. J. Liddell, Esq., D.S.C., M.A., F.Z.S.,	Moorhouse Hall, Warwick-on-Eden, Carlisle.
W. McKenna, Esq., LL.B.,	The Exchange, Lonsdale St., Carlisle.
J. C. Wade, Esq., O.B.E., J.P.	Hillcrest, Inkerman Terrace, Whitehaven, Cumberland.

(iii) under Section 6 (3) (c) — Representing Agriculture.—

W. M. Wannop, Esq., J.P.,	Linstock Castle, Linstock, Carlisle.
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C. Appointed by the Secretary of State, Department of the Environment:

(i) under Section 6 (3) (d) — Representing Public Water Supply:—

R. L. Harrison, Esq., B.Sc., (Eng.) F.I.C.E., M.I.W.E.,	2 Dawlish Avenue, Lynton Park, Cheadle Hulme, Cheshire.
D. S. Henderson, Esq., B.Sc., (Tech.) C. Eng., M.I.C.E., M.I.W.E.,	“Crosby”, Egremont Road, Hensingham, Whitehaven, Cumberland.
D. G. Milroy, Esq., M.Eng., F.I.C.E., M.I.W.E., M.B.I.M.,	“Kingfields”, 64 Langrigg Road, Morton, Carlisle.

(ii) under Section 6 (3) (e) — Representing Industry other than Agriculture:—

W. B. Baker, Esq.,	“Windyridge”, Little Salkeld, Langwathby, Penrith, Cumberland.
A. C. Halfpenny, Esq.,	“Cartgate”, Hensingham, Whitehaven, Cumberland.

* To July, 1973

† From July, 1973

Mr. P. J. Liddell resigned from the Office of Chairman of the Authority in July 1973 on being designated Chairman-to-be of the North West Water Authority.

The following is a copy extract from the Minutes of the Meeting of the Authority held on 25th July, 1973.

“Mr. G. N. F. Wingate (Vice-Chairman) said that the Authority would receive Mr. Liddell's resignation with much regret but nevertheless appreciate the reasons which had led him to take this decision. As Vice-Chairman, he was sure he could express, on behalf of all members, their thanks to Mr. Liddell and regret that he was unable to be at the Meeting (because of Water Authority business elsewhere) to hear the appreciation of his work. Mr. Liddell joined the former Cumberland River Board in 1955, became Chairman of the Fisheries Committee when it was established in 1965, Vice-Chairman of the Authority in 1967 and Chairman of the Authority and the Water Resources Committee in 1970. He early displayed his ability to master a subject and to analyse problems so it was not surprising that in due course he became Chairman of the Executive Council of the Association of River Authorities and is recognised as an authority on water management. It was likewise **no** surprise that he had been appointed Chairman of the North West Water Authority and is Chairman of the North West River Authorities' Regional Group on Reorganisation. Mr. Liddell had been a very distinguished leader of the Cumberland River Authority and the Authority had been very fortunate to have him as its Chairman and representative in other places. Although this recital of his offices and achievements might have a resemblance to an obituary notice this was far from the facts as Mr. Liddell was highly active and, happily, was remaining a Member of the Authority as well as moving into a very strategic seat in the reorganisation of water services”.

It is with deep regret that the Authority records the death on 4th January, 1974 of Mr. W. Jackson and places on record an appreciation of his services to the Authority and the former River Board. Mr. Jackson was a Member of the Board from 1952 to 1965 and a Member of the Authority from 1965 until his death. He was Chairman of the Pollution Committee and Vice-Chairman of the Land Drainage Committee.

COMMITTEES

FINANCE AND GENERAL PURPOSES COMMITTEE

Chairman:

E. H. Fleming Smith, Esq.

Vice-Chairman:

D. G. Milroy, Esq.

W. S. Bell, Esq.,
A. C. Halfpenny, Esq.,
D. S. Henderson, Esq.,
W. Jackson, Esq.,
(To January, 1974)
P. J. Liddell, Esq.,
J. F. Long, Esq.,

Capt. The Hon. A. G. Lowther
R. K. Nicholson, Esq.,
M. P. Nilsson, Esq.,
A. E. Thompson, Esq.,
J. C. Wade, Esq.,
W. M. Wannop, Esq.,
G. N. F. Wingate, Esq.,

The Chairman and Vice-Chairman of the Authority and the Chairman of each Standing Committee (ex-officio).

WATER RESOURCES COMMITTEE

Chairman:

P. J. Liddell, Esq.,*

G. N. F. Wingate, Esq.,†

Vice-Chairman:

G. N. F. Wingate, Esq.,*

E. H. Fleming Smith, Esq.,†

W. B. Baker, Esq.,
W. S. Bell, Esq.,
Major C. S. R. Graham
A. C. Halfpenny, Esq.,
R. L. Harrison, Esq.,
R. C. Hayhoe, Esq.,
D. S. Henderson, Esq.,
W. Jackson, Esq.,
(To January, 1974)

W. E. Knipe, Esq.,
P. J. Liddell, Esq.,
D. G. Milroy, Esq.,
M. P. Nilsson, Esq.,
Major, T. R. Riley
E. H. Fleming Smith, Esq.,
J. C. Wade, Esq.,
J. Westoll, Esq.,

Co-opted Member:

W. A. Walker, Esq.

Croft House, Elizabeth Street,
Workington, Cumberland.

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance & General Purposes Committee (ex-officio).

* To July, 1973

† From July, 1973

LAND DRAINAGE COMMITTEE

Chairman:

Capt. The Hon. A. G. Lowther.

Vice-Chairman:

W. Jackson, Esq.,*

R. K. Nicholson, Esq.,†

T. R. Fetherstonhaugh, Esq.
Major C. S. R. Graham
J. O. Holliday, Esq.
W. E. Knipe, Esq.
J. F. Long, Esq.

W. McKenna, Esq.
R. K. Nicholson, Esq.
M. P. Nilsson, Esq.
W. M. Wannop, Esq.

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance & General Purposes Committee (ex-officio).

* To January, 1974

† From January, 1974

FISHERIES AND WATER RECREATION COMMITTEE

Chairman:

J. C. Wade, Esq.

Vice-Chairman:

Capt. The Hon. A. G. Lowther.

W. B. Baker, Esq.,
R. C. Hayhoe, Esq.,
J. O. Holliday, Esq.,
P. J. Liddell, Esq.,
W. McKenna, Esq.,

R. K. Nicholson, Esq.,
E. H. Fleming Smith, Esq.,
A. E. Thompson, Esq.,
J. Westoll, Esq.,

Co-opted Members:

E. P. Ecroyd, Esq.
L. Heyworth, Esq.

W. F. Hobson, Esq.

Capt. J. G. Milne Home
E. B. Totty, Esq.

Low House, Armathwaite, Carlisle.
"Roseneath", Station Road, Brampton,
Cumberland.

"Hillside", Lamplugh Road, Cocker-
mouth, Cumberland.

Irvine House, Canonbie, Dumfriesshire.
"Craigmuir", High Knott Road, Arnside,
Via Carnforth, Lancs.

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance & General Purposes Committee (ex-officio).

POLLUTION COMMITTEE

Chairman:

W. Jackson, Esq.,*

M. P. Nilsson, Esq.,†

Vice-Chairman:

M. P. Nilsson, Esq.,*

T. R. Fetherstonhaugh, Esq.,†

W. B. Baker, Esq.
T. R. Fetherstonhaugh, Esq.
R. C. Hayhoe, Esq.

W. McKenna, Esq.
E. H. Fleming Smith, Esq.
W. M. Wannop, Esq.

The Chairman and Vice-Chairman of the Authority and the Chairman of the Finance & General Purposes Committee (ex-officio).

* To January, 1974

† From January, 1974

Representatives on other bodies:

Association of River Authorities:

Major C. S. R. Graham

P. J. Liddell, Esq.

Capt. The Hon. A. G. Lowther

E. B. Totty, Esq.

Cumberland Sea Fisheries Committee:

W. McKenna, Esq.

Water Activities Consultative Committee of the
Northern Advisory Council for Sport and Recreation:

E. P. Ecroyd, Esq.

PART II
PARTICULARS OF STAFF

(as at 31st March, 1974)

1. CHIEF OFFICERS

Clerk and Chief Executive Officer	RALPH BIRKETT, A.C.I.S.
Chief Engineer	C. T. MARSHALL, B.Sc., Ph.D., M.I.C.E., M.I.W.E.
Treasurer	H. A. GELLEY, I.P.F.A.
Chief Pollution Officer	H. J. SMITH, M.Inst., W.P.C., (Dip.) M.R.S.H.
Fishery Officer	N. MACKENZIE, F.Z.S.

2. OTHER OFFICERS

GRADE

Clerk's Department

1 Deputy Clerk	Special Scale
1 Chief Clerk	A.P. 4/5
1 Inspector — Water Resources/ Administrative Assistant	A.P. 3/4
2 Clerical Assistants	Clerical 1
1 Senior Shorthand Typist	Shorthand Typists' Senior Scale B
1 Shorthand Typist	Shorthand Typists' (post vacant)
1 Copy Typist/Clerk	Copy Typists'

Finance Department

1 Deputy Treasurer	Senior Officers' 1/2
1 Senior Accountancy Assistant	A.P. 5
1 Rating Officer and Income Assistant	A.P. 5
1 Accountancy Assistant	A.P. 3
1 Audit/Technical Assistant	A.P. 3/4 (vacant)
1 Cashier/Clerical Assistant	Clerical 2
1 Clerk/Typist	Clerical 2
1 Clerical Assistant	Clerical 1
1 Junior Clerk	Clerical 1 (post vacant)

Engineer's Department

1 Deputy Engineer	Special Scale
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Water Resources Section

1 Chief Assistant Engineer	Principal Officers' 1
1 Senior Assistant Engineer	Senior Officers' 1
1 Assistant Engineer	A.P. 4/5 Senior Officers' 1
1 Assistant Engineer	A.P. 5
1 Assistant Hydrologist	A.P. 4/5
1 Technician	Technical 4/5
1 Technician	Technical 3/4
1 Records Clerk	Technical 1/2

Design

1 Chief Assistant Engineer	...	Principal Officers' 1
1 Assistant Engineer	...	A.P. 4/5/Senior Officers' 1
1 Surveyor	...	Technical 4/5
1 Technician	...	Technical 4/5
1 Technical Assistant	...	Technical 4/5
2 Tracers	...	Technical 1

Works Organisation

2 Divisional Engineers	...	Senior Officers' 1
1 Technical Assistant	...	Technical 4/5
1 Work Study Officer	...	A.P. 3/4
1 Clerk	...	Clerical 1

General

1 Clerical Assistant	...	Clerical 2/3/4
1 Secretary	...	Shorthand Typists' Senior Scales A/B
1 Clerk Typist	...	Clerical 1
1 Bonus Clerk	...	Clerical 1 (vacant)

Pollution Department

1 Deputy Pollution Officer	...	Senior Officers' 1
1 Assistant Pollution Officer I	...	A.P. 4/5
1 Assistant Pollution Officer II	...	Technical 3/4
1 Senior Chemist	...	Senior Officers' 1
1 Assistant Chemist I	...	A.P. 4/5
1 Assistant Chemist II	...	Technical 3/4
1 Trainee Pollution Officer	...	Trainee Grade
1 Clerk/Typist	...	Clerical 1

Fisheries Department

1 Deputy Fishery Officer	...	Senior Officers' 1
1 Biologist	...	A.P. 4/5
1 Assistant Biologist	...	A.P. 2
2 Fishery Inspectors	...	A.P. 2/3
1 Typist/Clerk	...	Shorthand Typists' Senior Scales A/B

3. WATER BAILIFFS

4 Head Bailiffs	...	Misc. 4-6.
13 Water Bailiffs	...	Misc. 4-6 (5 vacancies)
2 Trainee Water Bailiffs	...	Misc. 3 (2 vacancies)
1 Hatchery Manager	...	Misc. 4-6
68 Honorary Bailiffs	...	Unpaid

4. LABOUR FORCE

4 Foremen
3 Fitters
50 Workmen

Office Addresses:**Department:**

Clerk's	...	Chertsey Hill, London Road, Carlisle
Pollution	...	Chertsey Hill, London Road, Carlisle
Fisheries	...	Chertsey Hill, London Road, Carlisle
Engineer's	...	256, London Road, Carlisle
Finance	...	256, London Road, Carlisle

PART III

WATER RESOURCES

SECTION 1 – GENERAL REVIEW

The Water Resources Board approved the Authority's First Review of the Hydro-metric Scheme, which was submitted in 1971, and work on the implementation of the Scheme proceeded.

Discussion continued with Manchester Corporation Waterworks on the feasibility of releases from Thirlmere to augment the flow of the River Derwent. The Consultants to the Corporation indicated that 10,000M1 (2200mg) of Thirlmere storage could be made available for this purpose and it was agreed that 7,500M1 (1650mg) over a critical drought period of 19 months could be committed to a first stage scheme. Further trial releases were initiated in conjunction with Manchester Waterworks and valuable operational experience was obtained.

A Meeting was held in Keswick on 7th February, 1974 with all interested parties to discuss the effects on the river system of such releases; the representatives at the Meeting were generally in favour of the proposals. The River Authority subsequently recommended the scheme to the North West Water Authority for implementation.

SECTION 2 – PERIODICAL SURVEYS

The Authority's first Periodical Survey of water resources and foreseeable demands, published during 1970, included tables of water supplied by the statutory water undertakings in the Authority's area up to the year 1969. The following tables show the average rates of supply by each of the four water undertakings whose areas of supply are mainly within the area of the Authority during the years 1970 to 1973. For comparison with the original tables the rates of supply are expressed in megalitres per day and also millions of gallons per day.

Year	M1/d			mgd		
	Metered	Unmetered	Total	Metered	Unmetered	Total
CARLISLE CORPORATION						
1970	8.67	16.46	25.13	1.91	3.62	5.53
1971	8.85	16.84	25.69	1.95	3.70	5.65
1972	8.99	16.96	25.95	1.98	3.73	5.71
1973	9.58	16.88	26.46	2.11	3.71	5.82
Supplies available			31.88			7.01
EDEN WATER BOARD						
1970	5.64	8.09	13.73	1.24	1.78	3.02
1971	5.45	8.14	13.59	1.20	1.79	2.99
1972	5.46	8.63	14.09	1.20	1.90	3.10
1973	5.96	8.25	14.21	1.31	1.81	3.12
Supplies available			20.55			4.52
SOUTH CUMBERLAND WATER BOARD						
1970	36.58	17.43	54.01	8.05	3.83	11.88
1971	42.97	18.43	61.40	9.45	4.05	13.51
1972	44.94	18.23	63.17	9.89	4.01	13.90
1973	45.66	20.71	66.37	10.04	4.56	14.60
Supplies available			90.96			20.01
WEST CUMBERLAND WATER BOARD — Potable Supplies						
1970	10.53	22.30	32.83	2.32	4.91	7.22
1971	11.00	21.80	32.80	2.42	4.80	7.22
1972	12.30	24.60	36.90	2.71	5.41	8.12
1973	14.21	24.84	39.05	3.13	5.46	8.59
Supplies available			41.10			9.04

Year	MI/d	mgd
WEST CUMBERLAND WATER BOARD – Industrial Supply		
1970	12.97	2.85
1971	10.94	2.41
1972	11.08	2.44
1973	13.02	2.86
Supplies available	34.10	7.50

SECTION 3 – HYDROMETRIC SCHEMES

(a) Implementation

As expenditure on Hydrometric Schemes was limited, the Water Resources Board decided to restrict grant to schemes which they considered of importance and consequently drew up a list of works which they were prepared to recommend. The list initially comprised two new gauging stations:-

- (a) The River Calder at Calder Hall.
- (b) The River Ehen at Braystones

and improvements to two existing stations:-

- (a) The River Derwent at Ouse Bridge.
- (b) The River Cocker at Southwaite Bridge.

During the second half of the 1973/74 period it became apparent that additional funds would be available and on application the following proposals were approved as an extension to the programme:-

- (a) Improvements to the existing stations on the River Esk at Netherby and the River Cocker at Scale Hill
- (b) Miscellaneous raingauges.

The final programme thus became:-

- 2 New gauging stations.
- 4 Station improvements.
- 4 Magnetic tape raingauges.

The new stations and improvements were completed and the raingauges received into stock for site installation during the 1974/75 year.

The present hydrometric installations are summarised in the following paragraphs of this section.

(b) River Flows

At the 31st March, 1974 the following river flow recording stations were in operation

<i>River</i>	<i>Type of Station</i>	<i>Location</i>	<i>Grid Reference</i>
Irt	Velocity Area	Galesyke	NY 136038
Calder	Structure (Flat Vee)	Calder Hall	NY 032041
Ehen	Velocity Area	Braystones	NY 009061
Ehen	Structure (Crump Weir)	Ennerdale	NY 084154
Derwent	Velocity Area	Camerton	NY 037305
Marron	Structure (Flat Vee)	Ullock	NY 074237
Cocker	Velocity Area	Southwaite Bridge	NY 131281
Cocker	Structure (Crump Weir)	Scale Hill	NY 149215
Derwent	Velocity Area	Ouse Bridge	NY 198321
Newlands Beck	" "	Braithwaite	NY 240239
Derwent	" "	Portinscale	NY 252239
Greta	" "	Low Briery	NY 288242
St. John's Beck	Structure (Crump Weir)	Thirlmere	NY 313195

Glenderamackin	Velocity Area	Threlkeld	NY 323248
Eden	" "	Sheepmount, Carlisle	NY 390571
Caldew	" "	Holm Hill	NY 378467
Petteril	" "	Harraby Green	NY 412544
Irthing	" "	Greenholme	NY 487583
Eden	" "	Warwick Bridge	NY 471567
Eamont	" "	Udford	NY 575305
Lowther	" "	Eamont Bridge	NY 525285
Eden	Velocity Area	Temple Sowerby	NY 604283
Eden	Structure (Flume Section)	Kirkby Stephen	NY 773097
Esk (Border)	Velocity Area	Netherby	NY 390718

Records are also obtained for the following Station from Solway River Purification Board.

Liddel Water	Velocity Area	Inch	NY 414759
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All stations are equipped with both autographic and punched tape recorders for measuring water level, and the following stations are provided with level interrogation facilities:—

River Derwent, Camerton
River Cocker, Southwaite Bridge
River Derwent, Ouse Bridge
River Caldew, Holm Hill
River Irthing, Greenholme
River Eden, Warwick Bridge
River Eamont, Udford
River Eden, Temple Sowerby
River Esk, Netherby

(c) Lake Levels

The following lake level recording stations were in operation on 31st March, 1974:—

<i>Lake</i>	<i>Location</i>	<i>Grid Reference</i>
Wastwater	Low Wood	NY 145040
Derwentwater	Fawe Park	NY 255227
Bassenthwaite Lake	Peel Wyke	NY 207307
Ullswater	Glenridding Pier	NY 391169

All the above stations have autographic water level recorders supplemented by punched tape recorders at Derwentwater and Bassenthwaite Lake stations. Additional lake level records are kept by the respective Water Undertakers at the following Lakes or Reservoirs:—

Ennerdale, Crummock Water, Haweswater, Thirlmere
and the Ullswater Lake at the Manchester Corporation
Waterworks Pumpouse.

(d) Rainfall

There were several instances of vandalism during the year and some gauges needed replacement. The total number of daily raingauges was reduced as several daily observers were unable to continue recording rainfall.

Additional automatic rainfall recorders and ground level gauges were ordered and received towards the end of the year, but had not been sited by the end of the period under review; they therefore are not listed on the schedule of instruments which follows.

The list shows the total network of raingauges, inclusive of special study instruments, for which the Authority is responsible at March 31st, 1974.

<i>Type of Instruments</i>	<i>Number</i>
Monthly standard raingauges	18
Weekly " "	4

Daily	”	”	...	...	...	...	...	...	...	75
Daily Ground Level	”		...	...	...	...	...	...	...	3
Weekly	”	”	”	...	...	...	...	...	...	5
Warning/interrogation raingauges			...	...	...	...	...	...	...	5
Raingauges recording on magnetic tape			...	...	...	...	...	...	...	20
Dines Automatic Chart Raingauge			...	...	...	...	...	...	...	1
Automatic Climate Stations inclusive of rainfall			...	...	...	...	...	...	...	2

The figure of 20 magnetic tape recorders is inclusive of the 5 gauges which have warning/interrogation facilities.

SECTION 4 – INVESTIGATION OF WATER IN UNDERGROUND STRATA

(a) *Groundwater Exploration of the Triassic Sandstones of S.W. Cumberland*

The study has now been completed and a draft report prepared jointly by the Authority and the Geological Section of the Water Resources Board. The final report is currently being assembled and should be issued by the summer of 1974.

(b) *Groundwater Network Study of the Authority Area*

A scheme for a groundwater network study of the three main sandstone aquifers in the Authority area was prepared in liaison with the Water Resources Board. This scheme envisaged the drilling of eight new observation boreholes, the clearing of three existing boreholes and general instrumentation throughout the area to enable a check to be kept of the groundwater levels in the three sandstone aquifers. Whilst the scheme received technical approval from the Water Resources Board in November 1973, a decision on the Authority's application for a contribution towards the cost, under Section 90 of the Water Resources Act, 1963, had not been received at the end of the year.

The Authority made arrangements with all landowners at sites where observation boreholes are required for the study and arranged for three blocked boreholes to be cleared of obstructions.

SECTION 5 – MINIMUM ACCEPTABLE FLOWS

The Authority has not submitted a draft statement under Section 19 of the Water Resources Act, 1963.

SECTION 6 – RESEARCH AND EXPERIMENTAL WORK

(a) *Coalburn Catchment Study*

The long-term study on afforestation and run-off in the Coalburn tributary of the River Irthing Catchment continued in association with the Institute of Hydrology and the Forestry Commission. The instrumentation was increased by two magnetic tape rain-gauges to improve interpretation of the weekly rainfall catches. Sediment sampling continued and an access road to the gauging weir was constructed by the Forestry Commission to facilitate the clearance of silt from the approach channel to the weir. The cost of the road was shared by the River Authority, the Institute and the Commission. The Forestry Commission provided a second store at the weir site to accommodate the water sampler bottles and erected deer proof fencing around the instrument sites. Results were good, and no difficulties were experienced in the joint operation of the study.

(b) *Derwent Catchment Study*

The study of the hydrology of the River Derwent Catchment continued, and good progress has been made on the 'Hydrocomp' simulation model. The ten 'Epsilon' magnetic tape rainfall recorders currently under evaluation for the Water Resources Board gave excellent results after an initial translation difficulty and are now satisfying the Meteorological Office criteria. Three temperature recording gauges were installed in the catchment to assist in the determination of snowmelt contribution to run-off from the area.

SECTION 7 – LICENCES

(a) Abstraction Licences.

Summary of Licences granted and Licences revoked or ceased to have effect during the year.

All quantities are stated in thousands of gallons.

	No.	Quantity Granted (Annual)	No.	Revoked, etc. Quantity (Annual)
Water Suppliers—				
Statutory Water Undertakers	2	6,477,500	1	5,096,000
Others ...	13	75,166	3	425
Spray Irrigators—				
Agriculture	3	10,160		
Others ...				
Agriculturalists	1	929	5	2,219
Industrialists		382,013	4	731,368

Variations to five licences of Statutory Water Undertakers resulted in decreases in annual quantities by 29,780.

The following is a summary of quantities licensed for abstraction at 31st March, 1974.

	Surface Water (Annual)	Ground Water (Annual)
Water Suppliers—		
Statutory Water Undertakers	88,395,930	1,243,343
Others ...	95,466	13,451
Spray Irrigators—		
Agricultural	34,852	
Others ...	2,600	
Agriculturalists	12,869	96,563
C.E.G.B. ...	15,171,050	
Industrialists	34,863,437	1,810,877

(b) Impounding Licences

No Licences were granted during the year.

SECTION 8 – CONSERVATION WORKS

(a) Bassenthwaite Lake Temporary Scheme

Powers permitting temporary pumped releases from Bassenthwaite Lake for augmentation of the River Derwent remain in force, but water demands in West Cumberland have not increased sufficiently to make the Scheme necessary. The Scheme has however been finalised and could be implemented with the minimum of delay should circumstances warrant the additional supply.

(b) Water Resources in the North – Thirlmere Releases to River Derwent

With the co-operation of Manchester Corporation Waterworks a further experimental release from Thirlmere reservoir took place during June, 1973, to establish water travel times and downstream benefits and obtain operational experience. The weather was good and a great deal of valuable information resulted.

(c) Inter River Authority Transfers

The Manchester (Shap Aqueduct) Water Order, to empower the Corporation to construct an additional aqueduct from Haweswater Reservoir to Watchgate Treatment Works via Shap, came into operation on 5th February, 1974. Work on the aqueduct is expected to be put in hand during 1974.

SECTION 9 – AGREEMENTS UNDER SECTION 81 AND ORDERS UNDER SECTION 82

Section 81 – None.

Section 82 – None.

SECTION 10 – CHARGING SCHEME

For the year under review the standard unit charge was 0.38p per thousand gallons, the actual rate of charge being determined by the application of the appropriate factors.

SECTION 11 – GENERAL REVIEW OF RAINFALL AND RIVER FLOW DURING 1973

(a) Rainfall

The outstanding feature of the weather of 1973 was its extreme dryness. Although 1971 was drier in a few areas, notably Appleby, an area of central Lakeland had its driest year on record. Less than 70% of average rainfall was recorded in a belt stretching from Keswick to Appleby and several gauges near the east end of Haweswater had less than 60% of average notably the daily gauge at Burnbanks (57%). This rainfall deficiency was spread evenly through the year and no month was appreciably wetter than usual. The only drought was recorded in March with up to 19 consecutive dry days.

The tables which follow show how the monthly rainfall totals recorded at selected stations in the Authority's area compare with the monthly averages.

RAINFALL AT SELECTED STATIONS, JANUARY – DECEMBER 1973

Station Grid Reference	Newton Rigg NY 491310			Temple Sowerby NY 601273			Appleby Castle NY 684198			Patterdale Hall NY 931162			Stainburn NY 022293		
	mm	LTA	% LTA	mm	LTA	% LTA	mm	LTA	% LTA	mm	LTA	% LTA	mm	LTA	% LTA
JANUARY	63.0	101	62.4	51.0	93.5	54.5	45.2	104.6	43.2	132.5	299.0	44.3	66.2	95.0	69.7
FEBRUARY	37.6	62	60.6	50.7	53.8	94.2	35.3	60.7	58.2	87.7	177.5	49.4	52.1	61.2	85.1
MARCH	27.6	56	49.3	19.9	52.1	38.2	25.8	58.2	44.3	88.6	157.5	56.3	26.2	59.4	44.1
APRIL	51.6	52	99.2	39.9	47.2	84.5	47.4	52.3	90.6	93.6	133.9	69.9	81.6	55.9	146.0
MAY	79.2	54	146.7	57.9	53.1	109.0	56.6	61.0	92.8	105.9	124.2	85.3	55.7	66.0	84.4
JUNE	28.0	55	50.9	28.7	51.3	55.9	29.4	55.6	52.9	66.9	120.9	55.3	67.3	67.8	99.3
JULY	73.4	78	94.1	73.8	75.4	97.9	92.9	85.1	109.2	62.2	146.3	42.5	56.1	81.5	68.8
AUGUST	97.2	84	115.7	91.5	82.8	110.5	108.1	92.7	116.6	191.3	187.5	102.0	110.6	103.1	107.3
SEPTEMBER	47.3	79	59.9	34.5	72.9	47.3	42.3	83.6	50.6	65.2	205.2	31.8	54.6	105.2	51.9
OCTOBER	52.2	97	53.8	46.2	88.6	52.1	43.0	97.5	44.1	96.8	270.5	35.8	65.3	112.0	58.3
NOVEMBER	59.6	85	70.1	56.1	79.5	70.6	43.0	88.4	48.6	114.0	265.4	43.0	55.8	112.0	49.8
DECEMBER	72.7	84	86.5	70.0	78.0	89.7	72.8	89.7	81.2	196.8	268.0	73.4	111.0	96.0	115.6
YEAR'S TOTAL	689.4	887	77.7	620.2	828.2	74.9	641.8	928.4	69.1	1301.5	2355.9	55.2	802.5	1015.2	79.0

(LTA = Long Term Average) Period 1916-50

RAINFALL AT SELECTED STATIONS, JANUARY – DECEMBER 1973

Station Grid Reference	Ennerdale NY 085153			Skelton NY 440374			Anthorn NY 185577			C.A.D. Longtown NY 348659			Renwick NY 597435		
	mm	STA	%STA	mm	STA	%STA	mm	STA	%STA	mm	STA	%STA	mm	STA	%STA
JANUARY	112.3	154.9	72.5	53.7	78.7	68.2	74.1	64.7	114.5	56.1	67.8	82.7	55.3	74.3	74.4
FEBRUARY	100.3	106.8	96.6	33.8	56.1	60.2	44.4	50.4	88.1	29.6	44.3	66.8	41.7	113.8	36.6
MARCH	65.0	105.4	61.7	23.1	61.6	37.5	39.0	57.1	68.3	33.4	50.0	66.8	31.7	52.9	59.9
APRIL	112.1	110.9	101.1	45.7	61.8	73.9	48.4	58.8	82.3	43.9	49.3	89.0	64.9	61.3	105.9
MAY	94.2	119.4	78.9	44.1	67.3	65.5	63.8	66.8	95.5	68.3	62.6	109.1	74.2	63.1	117.6
JUNE	82.7	125.4	65.9	24.8	60.4	41.1	54.3	72.6	74.8	34.2	62.5	54.7	39.0	66.1	59.0
JULY	80.0	137.6	58.1	59.3	62.5	94.9	73.1	79.3	92.2	62.0	76.3	81.3	91.4	88.2	103.6
AUGUST	191.3	168.0	113.9	101.0	91.7	110.1	100.8	95.3	105.8	112.0	95.0	117.9	88.6	106.9	82.9
SEPTEMBER	73.3	179.6	40.8	36.4	86.9	41.9	41.4	95.1	43.5	33.2	81.6	40.7	34.2	88.3	38.7
OCTOBER	112.3	181.8	61.8	52.1	97.9	53.2	64.8	93.3	69.5	52.5	73.6	71.3	91.4	92.7	98.6
NOVEMBER	103.5	169.3	61.1	42.2	96.8	43.6	37.1	76.3	48.6	27.1	75.9	35.7	43.0	89.9	47.8
DECEMBER	202.2	170.7	118.5	49.1	75.0	65.5	111.3	74.4	149.6	72.1	73.8	97.7	80.8	86.8	93.1
18 YEAR'S TOTAL	1329.2	1730.2	76.8	565.3	895.8	63.1	752.5	884.2	85.1	624.4	812.8	76.8	736.2	984.2	74.8
YEARS OF RECORD	18			13			10			23*			23		

(STA – Short Term Average)

* Incomplete record for 1960-61

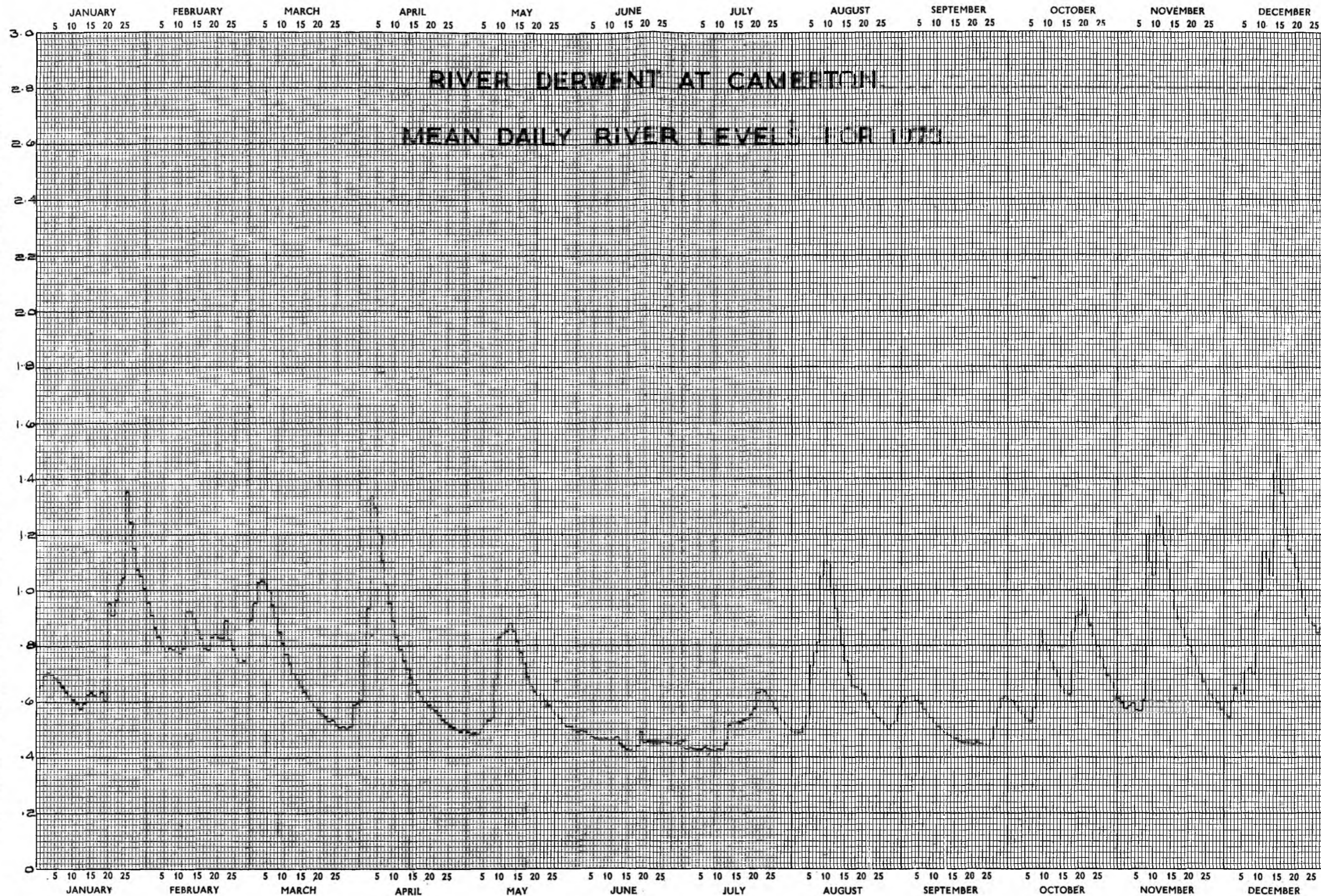
(b) River Flow

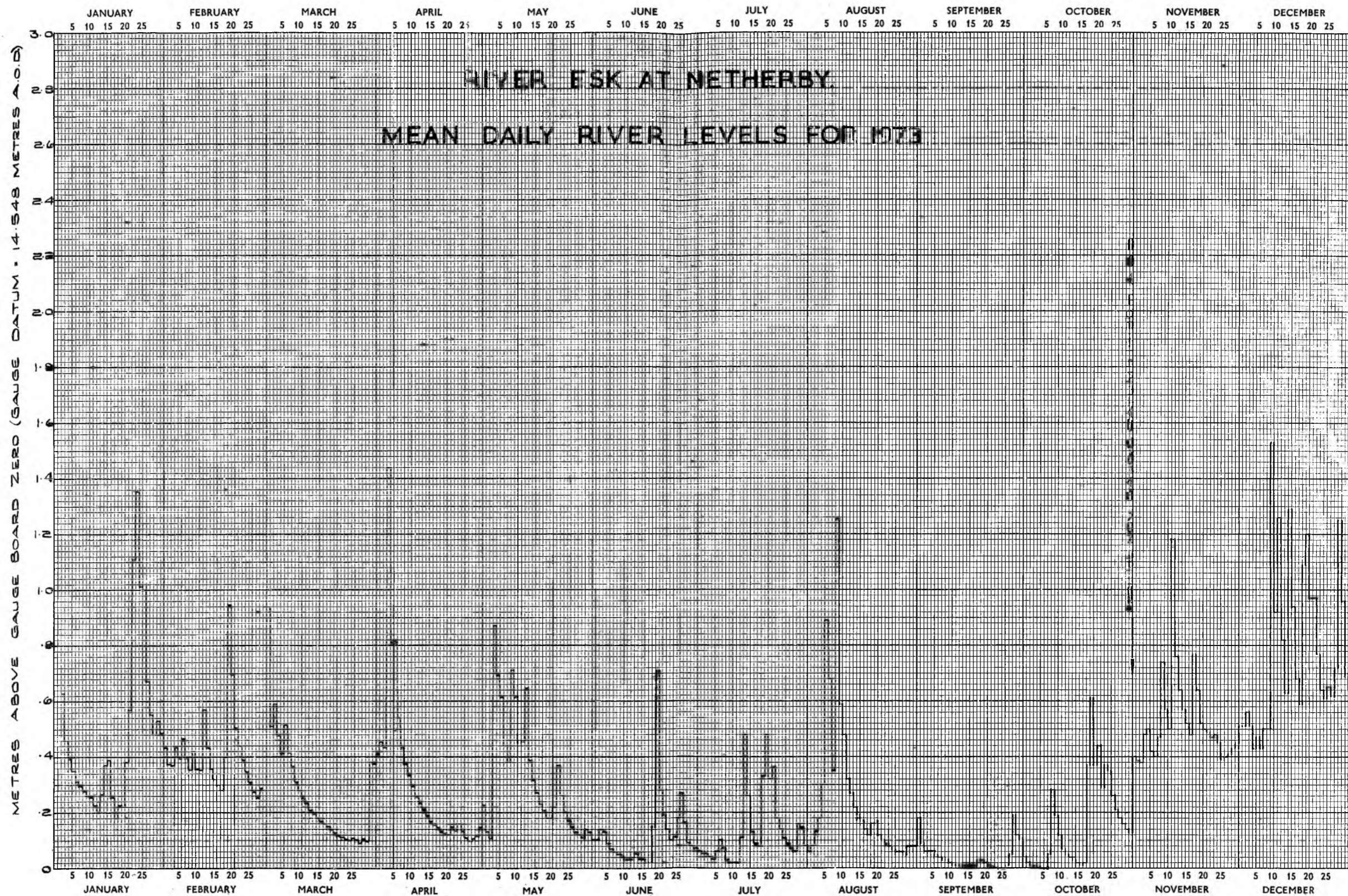
The hydrographs which follow illustrate river levels and discharges for 1973 at three of the Authority's gauging stations; Camerton on the River Derwent, Netherby on the River Esk and Warwick Bridge on the River Eden.

River discharges for the three stations are also shown in the form of flow duration curves, which indicate the percentage of the year during which flows exceeded any given value. Curves for 1973 are drawn in solid lines and can be compared with those for the whole of the seven year period 1967-73, drawn in broken lines, and the envelope curves (dotted) which illustrate the limits within which lie all points for any single year of the seven.

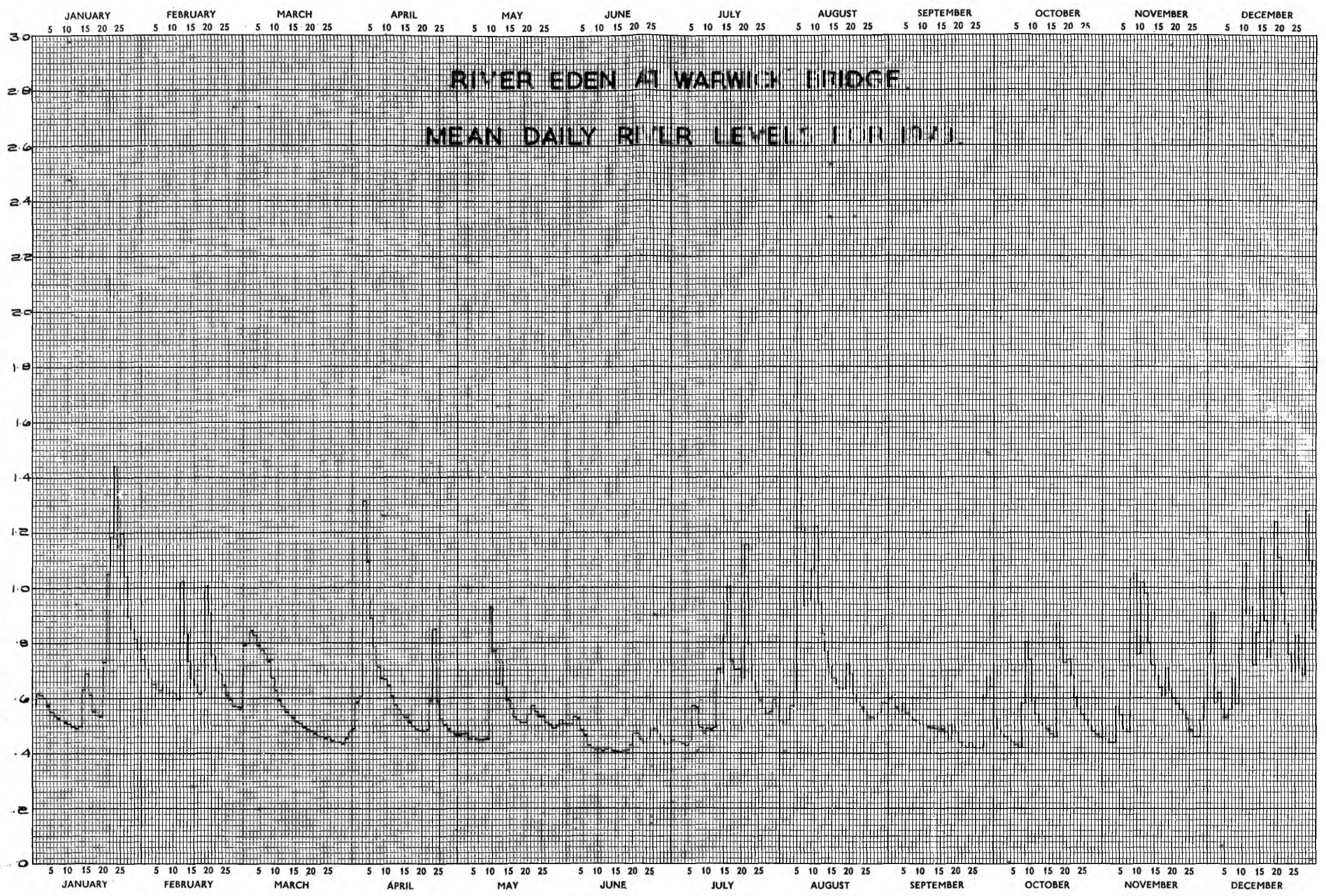
The flow duration curves for all three stations show that river discharges for 1973 were generally the lowest during the period 1967-73, giving mean annual discharges of only 60-65 percent of the seven year mean. This was achieved by a marked absence of high flows without any prolonged period of very low flows, indicated by the departure of the 1973 curve from the lower envelope curve in the low flow range.

METRES ABOVE GAUGE BOARD ZERO. (GAUGE DATUM = 16.679 METRES A.O.D.)





METRES ABOVE GAUGE BOARD ZERO (GAUGE DATUM = 17.532 METRES A.O.D.)



RIVER DERWENT AT LAMINGTON
MEAN DAILY DISCHARGES FOR 1973

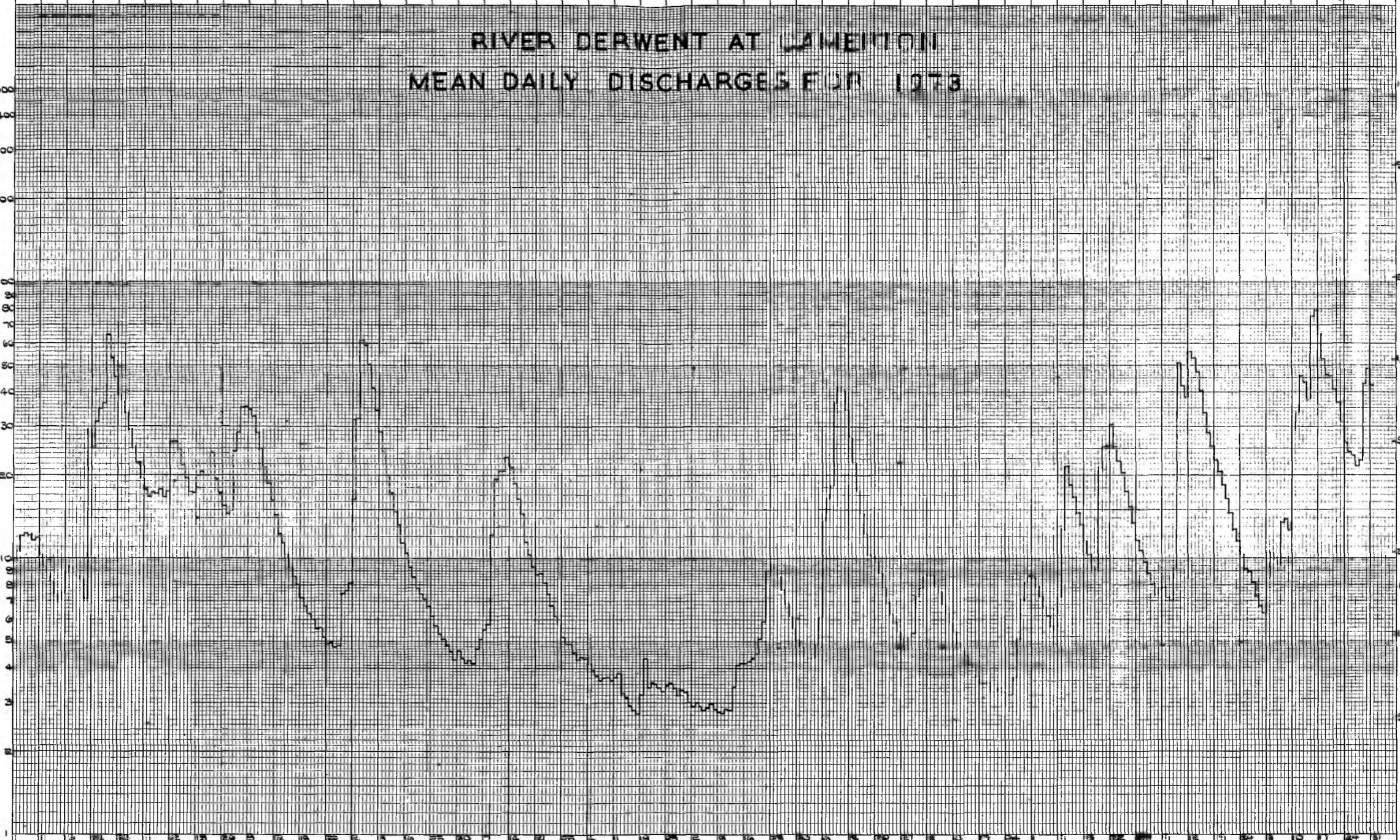
DISCHARGE IN CUBIC METRES PER SECOND

500
400
300
200
100
0

JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

DISCHARGE IN M.G.D.

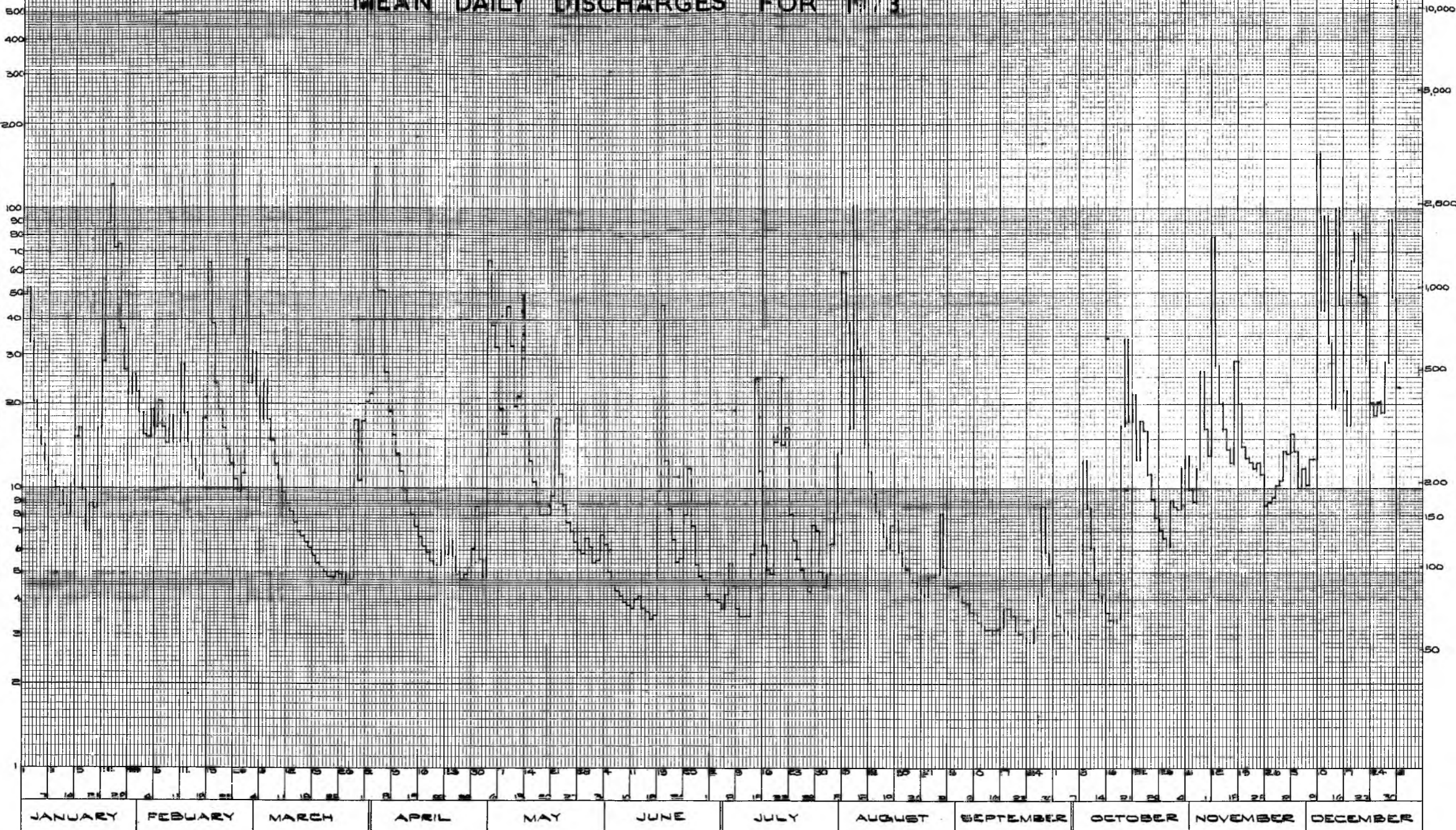
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1850
1900
1950
2000



RIVER E.K. AT NETHERBY MEAN DAILY DISCHARGES FOR 1973

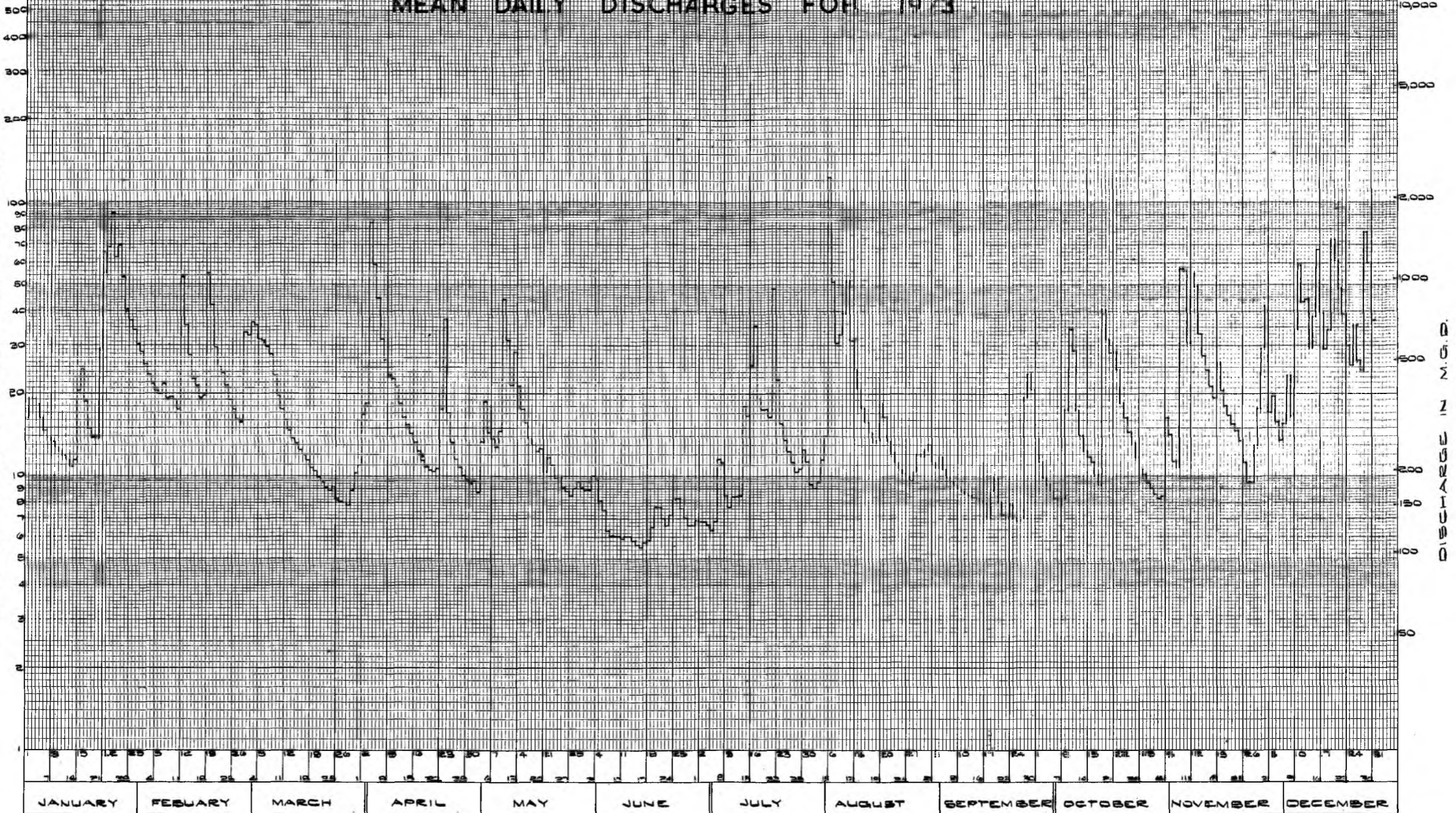
DISCHARGE IN CUBIC METRES PER SECOND

DISCHARGE IN CUBIC METRES PER SECOND

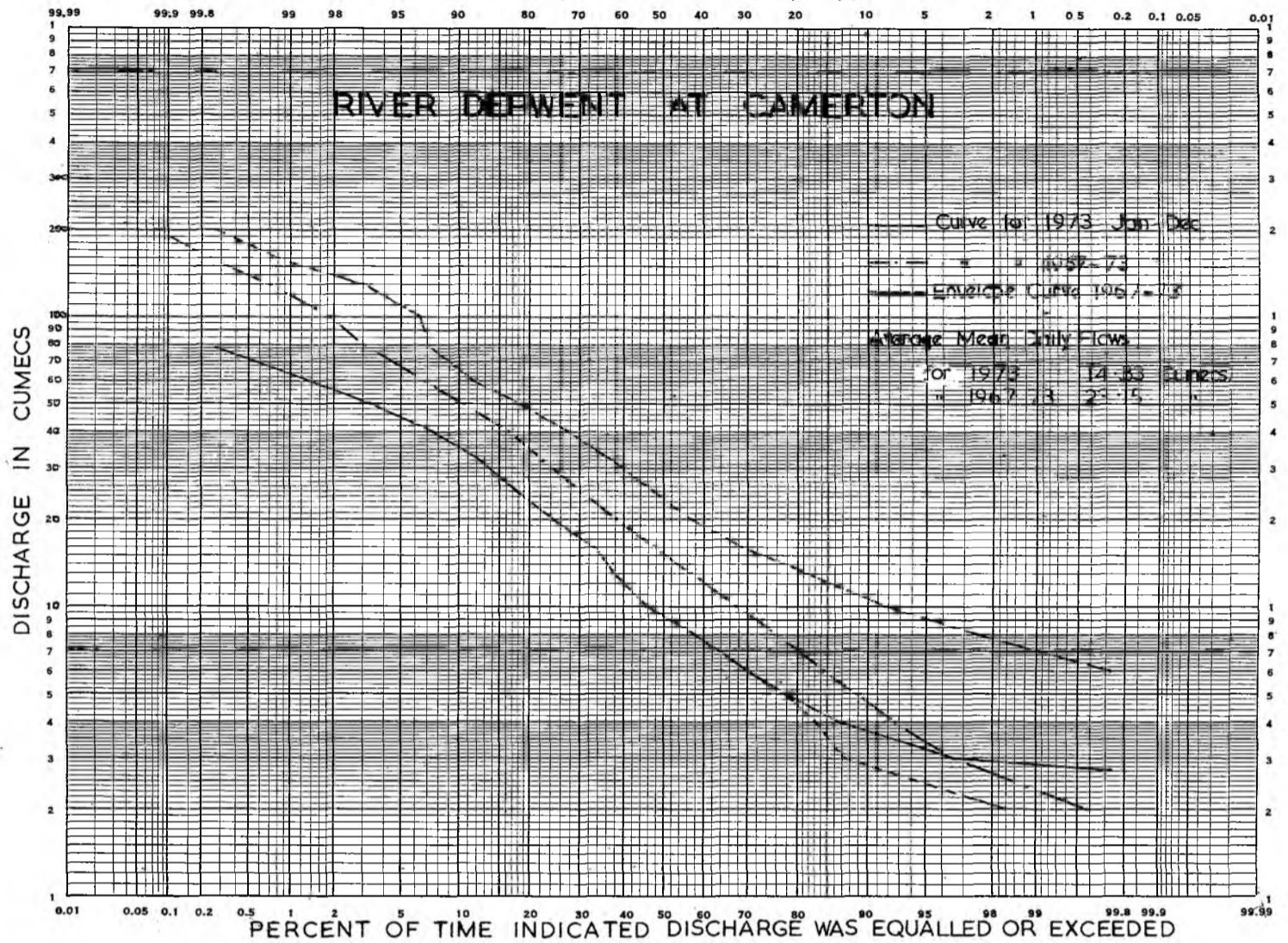


RIVER EDEN AT WARWICK [UNITED] MEAN DAILY DISCHARGES FOR 1973

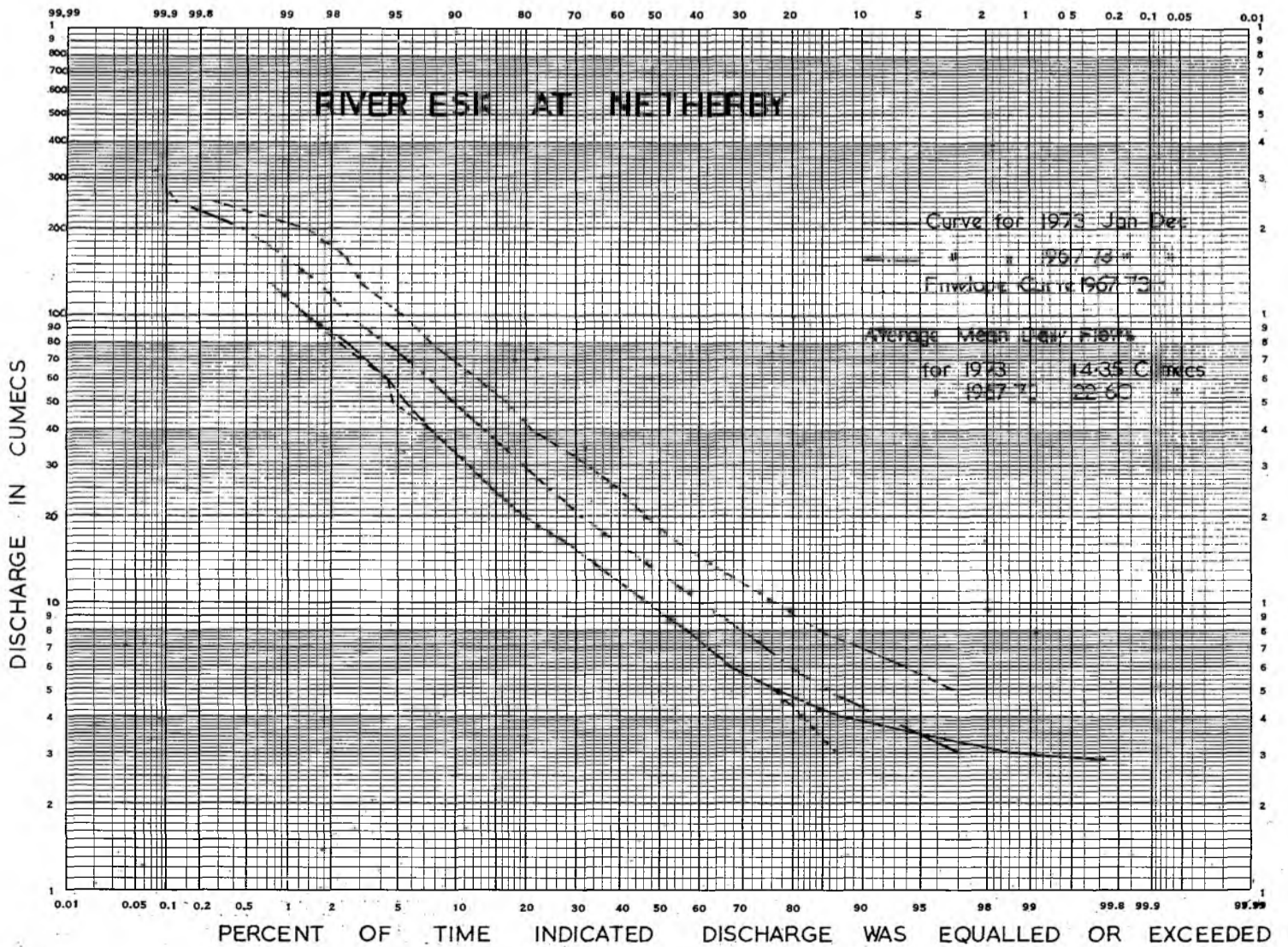
DISCHARGE IN CUBIC METRES PER SECOND



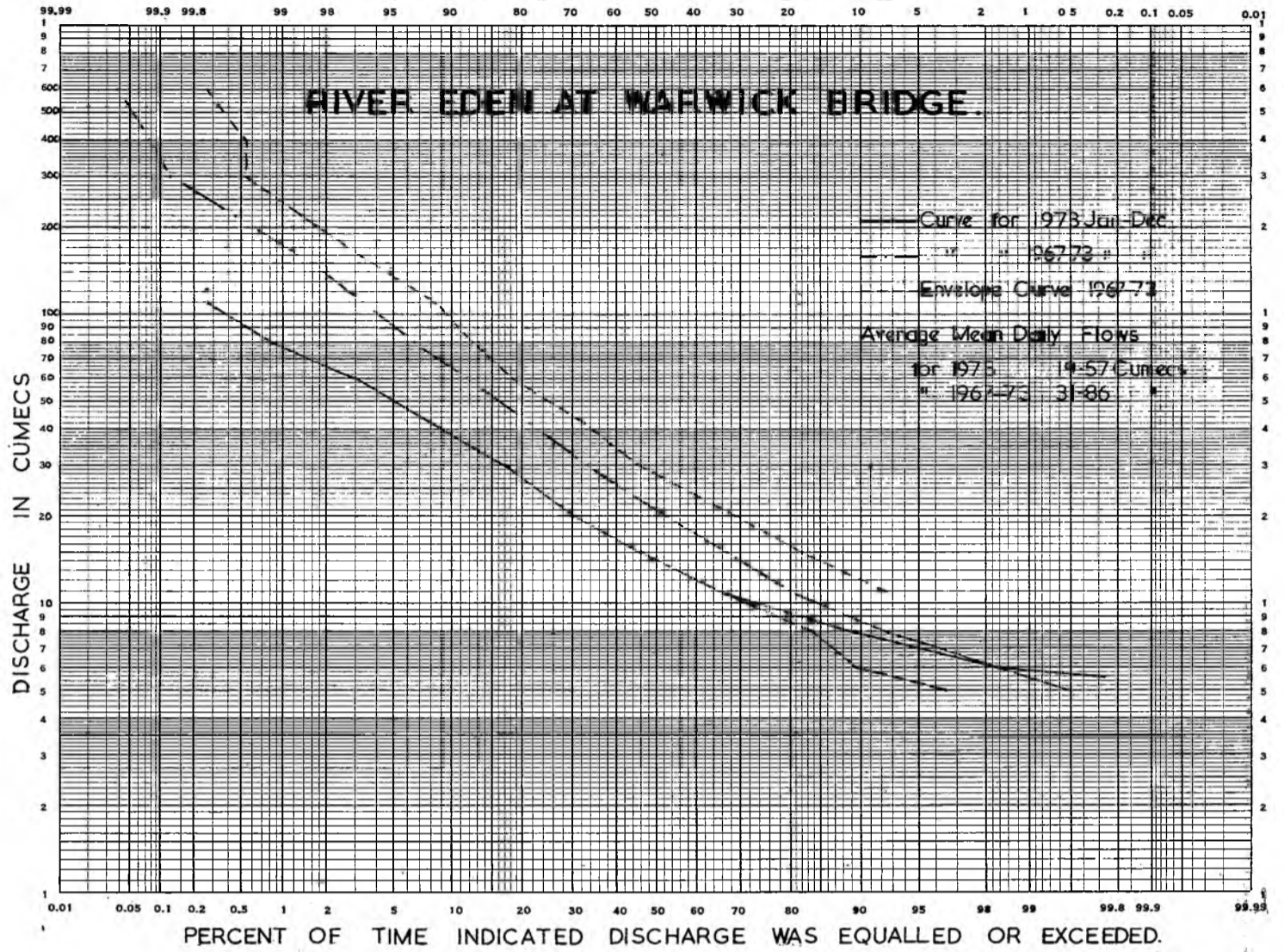
FLOW DURATION CURVE.



FLOW DURATION CURVE



FLOW DURATION CURVE



PART IV LAND DRAINAGE

SECTION 1 – CAPITAL WORKS

(i) GRANT-AIDED IMPROVEMENT SCHEMES IN PROGRESS DURING THE YEAR

(a) RIVER WAVER PART III

Work was completed on this scheme during the summer of 1972 but the delays in reaching agreement on compensation payments, noted in the last Annual Report, have continued again resulting in the scheme remaining open at the end of the year under review.

The approved estimate was £21,956 and the anticipated total cost including compensation is approximately £23,000.

(b) RIVER EDEN FLOODBANKS, CARLISLE

As mentioned in the last Annual Report work has been completed but compensation payments had still to be settled and the situation remains.

The approved estimate was £58,130 and expenditure to 31st March, 1974 was £57,580.

(c) COCKERMOUTH FLOOD WARNING SCHEME

The installation of instrumentation was completed by 31st March, 1973 with the exception of one rainfall warning instrument.

The approved estimate was £2,010.

(d) RIVER EDEN FLOOD WARNING SCHEME STAGE II

Additional river level interrogation equipment has been installed at Udford and Temple Sowerby Gauging Stations, but was not operational at the end of the year because of the delay in installing Post Office telephone equipment. The approved estimate was £2,260 and the expenditure to 31st March was £2,101.

(e) RUMBLING BRIDGE SOUGH

Work on this scheme which includes the installation of a small pumping station, commenced in August, 1973. Almost all the excavation was completed and the pumping equipment delivered by 31st March.

The approved estimate is £12,100 and the expenditure to 31st March was £14,154.

(f) CUDDYARCH AND DALE SOUGHS

This comprehensive scheme for the improvement of two main rivers and two internal watercourses commenced in September 1973. Excavation of Cuddyarch Sough had reached the Wigton-Kirkbride road, and on Dale Sough was almost complete, by 31st March. The estimated cost of the main river part of the scheme is £27,900 and the expenditure to 31st March was £13,307.

(g) ROOK BECK

Work on this scheme commenced in September 1973, rather later than was hoped and in consequence could not be completed by 31st March, 1974 as was originally intended. The approved estimate is £7,580 and the expenditure to 31st March was £5,181.

(ii) FUTURE WORKS APPROVED IN PRINCIPLE

(a) RIVER EDEN, APPLEBY

Mention was made of this scheme in the last Annual Report which gave the estimated cost as £87,200. During the current year, however, various design aspects have arisen which have not yet been resolved and could considerably increase the cost.

(b) RIVER EDEN, PROPOSED FLOOD PROTECTION SCHEME, ETTERBY TERRACE, CARLISLE

This scheme is a logical extension of the recently completed River Eden, Carlisle, Floodbanks Scheme, in that it raises the flood protection level downstream of Eden Bridge to give a freeboard similar to that provided upstream. The scheme provides for a length of reinforced concrete floodwall which will give protection to eleven houses which were flooded by the March, 1968 flood, but will be proceeded with only if the householders agree.

The estimated cost is £6,750.

(c) OTHER SCHEMES

Application has been made to the Ministry of Agriculture, Fisheries and Food for variation of the Authority's "main river" map to include a number of arterial watercourses as statutory "main river" with a view to their subsequent improvement. On 31st March 1974, the list of proposed new "main rivers" was on deposit and it is expected that they will be designated by early summer 1974.

In anticipation the Authority has approved two schemes for commencement in 1974-75 as follows:-

(i) BIRK SIKE

This watercourse discharges into Crowdundle Beck a right bank tributary of the River Eden near Temple Sowerby. The scheme will include considerable deepening and the replacement of several culverts. About 260 acres of poorly drained agricultural land will benefit from the scheme which is estimated to cost £16,650.

(ii) BLACK BECK

Black Beck is a tributary of the River Marron discharging into the right bank of that river about five miles south of Cockermouth.

Some 210 acres of badly drained land will benefit from the scheme, estimated to cost £14,500.

(iii) FUTURE WORKS PROPOSED

In addition to Birk Sike and Black Beck mentioned above, investigations have been made into other watercourses which pass through badly drained areas and which it is intended shall be designated main river.

In consequence schemes have been prepared for the following:-

Rockcliffe Beck	Estimated Cost	£58,000
Thacka Beck	„ „	£18,000
Matty Beck	„ „	£7,000

As stated in the last Annual Report these schemes have been prepared following consultation with officers of the Agricultural Development and Advisory Service (ADAS) of the Ministry of Agriculture, Fisheries and Food. Further schemes are in the course of preparation and in addition areas of badly drained land are being investigated.

Priorities for future schemes will be established in consultation with ADAS, and it will be necessary to make further additions to the "main river" map.

SECTION 2 MAINTENANCE

(i) NORTHERN DIVISION

The majority of the Northern Division is occupied by the Solway Plain, with its more difficult drainage problems. Two rivers, the Waver and the Wampool, carry the main drainage, the length maintained by the River Authority being 11½ miles in the former and 15½ in the latter. Tidal and alluvial silt is deposited in the bed and on the bank slopes of approximately 9 miles and two dragline excavators owned by the Authority are engaged almost exclusively on the removal of silt and weed from the two rivers.

Sixteen tributaries with a total length of fifty-five miles discharge into the Waver and Wampool and are maintained by the Authority. Thirty-five miles of these tributaries received attention in 1973-74. There are also fourteen small "main rivers" discharging directly into the Solway or the Cumbrian coast north of Workington. Their total length is fifty-five miles and thirty-three miles were cleaned in the financial year.

Two small dragline excavators and two hydraulic excavators make up the total tracked plant in the Division, but the hydraulic machines have been used on grant-aided improvement schemes only. Two small versatile hydraulic diggers mounted on tractors have also been employed continuously on maintenance work on the "small main rivers".

Apart from plant used on excavation there are various items of tractor-mounted plant which are used to keep weed and grass in check in the bed and on the banks.

Maintenance work in this Division has, in fact, followed a similar pattern to that described in the previous Annual Reports.

(ii) SOUTHERN DIVISION

Work has consisted of routine maintenance of channel and banks throughout the Division except for the following. During October, using a hired hydraulic excavator, cuts were made through large gravel shoals in the River Belah upstream of Brough Sowerby where considerable erosion was occurring and flooding of a considerable area was imminent. The same machine was used to assist with extensive bank repair of the River Glenderamackin upstream of Threlkeld and to remove gravel accumulations from the River Lyvennet near Cliburn.

Gravel accumulations were removed from Stonethwaite Beck in the early summer and from the River Cocker near Southwaite Mill in the late winter. Fairly extensive stoning of the banks of Newlands Beck near Little Braithwaite was carried out during the winter.

SECTION 3 – WORK IN INTERNAL DRAINAGE DISTRICTS ADMINISTERED BY THE AUTHORITY

1. WAVER AND WAMPOOL INTERNAL DRAINAGE DISTRICT

The Trodder Syke and Calvo Sough Improvement Scheme continued during the year, the whole of the work on Trodder Syke and on Calvo Sough to the main Wigton-Silloth road being completed.

It is intended to construct the new culvert under the main road during May and June 1974 and the remainder of the improvement to Calvo Sough will follow immediately afterwards.

The approved estimate is £12,520 and total expenditure to 31st March, 1974 was £10,792.

Approximately sixty six miles of watercourses are scheduled in this district and the allocation for maintenance for the year under review was £9,000. This figure is insufficient to carry out all the work necessary on these watercourses but the introduction of the incentive bonus scheme has meant that about 95% of the work has been completed at a cost of £9,381.

As part of the comprehensive scheme for the improvement of Cuddyarch Sough and its tributaries mentioned in Section 1 (1)(f) above, a scheme for the improvement of Wedholme and Lawrenceholme Soughs at an estimated cost of £6,630 has been approved for grant-aid by the Ministry of Agriculture, Fisheries and Food and it is expected that the work will commence in the summer of 1974.

2. ALLONBY BAY AND RIVER ELLEN INTERNAL DRAINAGE DISTRICT

The length of scheduled watercourses in this district has been increased to 5½ miles. All the watercourses were cleaned during the year at a cost of £1,041.

SECTION 4 – FLOODS

There were no significant floods during the year under review.

SECTION 5 – DRAINAGE CHARGES

The Authority has taken no further action on the levying of a drainage charge under the Land Drainage Act, 1961 and the Agriculture (Miscellaneous Provisions) Act, 1968.

SECTION 6 – STATUTORY SCHEME FOR INTERNAL DRAINAGE BOARDS

As stated in the last Annual Report the “appointed day” for the abolition of Brunstock Beck Internal Drainage District was 1st April, 1973.

A scheme under Section 24 of the Land Drainage Act, 1930 to exempt from drainage rates certain portions of land in the River Ellen and Allonby Bay Internal Drainage District between Harby Brow and Ireby was approved by the Authority at its final Meeting for submission to the North West Water Authority.

SECTION 7 – WORK STUDY

A Work Study Officer was appointed and took up his appointment in July, 1973. All the manual employees of the Authority were participating in the Incentive Bonus Scheme on 31st March, 1974, with the exception of plant fitters, who were about to be brought in, and the indirect employees such as surveyors’ chainmen and river gauging assistants.

PART V FISHERIES

1. GENERAL REPORT ON SALMON, TROUT AND FRESHWATER FISHERIES

1. SALMON AND SEA TROUT

(a) River Eden District.

Angling Season:

Salmon: 15th January to 14th October.

Sea Trout: 1st April to 14th October.

The total of 396 salmon taken by rod and line in the 1973 season is the lowest figure recorded in the last 30 years. As in several recent years, monthly catches for January, February, March and April were low and lower than the totals for these months in 1972. There was an improvement in catches in August, September and October and but for this the season's total would have been even lower. The average weight of fish taken by rod and line this year was 11.60 lb., nearly a pound lower than last year and this follows the trend of decreasing average weights recorded over the last ten years or so.

The total salmon catch by nets and fixed engines this year of 1613, was an improvement over last year's total. The average weight of the fish was 9.46 lb. the same as for last year.

Spring fish were moving in the lower reaches of the Eden at the end of December, 1972 and further runs of fish moved into the lower reaches during the first half of January. With river levels at or slightly above normal level during the first two weeks of January, salmon were able to move well upstream and were in the Lazonby and Eden Lacy areas by the middle of the month.

The opening day of the salmon season saw river levels a little on the low side, but nevertheless 18 fish were caught, the best of these weighed 23 lb. The bulk of these fish were taken from the Carlisle, Warwick, Wetheral and Armathwaite areas, but one fish of 20 lb. was taken from Eden Lacy. During the second half of January, the level of the Eden tended to fluctuate but in general was above normal. Fishing in the Armathwaite to Wetheral area continued to be fairly good with fish being grassed from most beats, but on the lower Eden, especially in the Carlisle area, fishing fell off though several fish of up to 25 lb. were taken.

During the first half of February, water conditions were ideal and fishing improved, six fish being taken from the Carlisle area. It was in the Armathwaite area that the most significant improvement occurred with six fish taken below the weir and 7 above it. Good numbers of spring fish were at this time seen moving over Eden Lacy Weir.

River levels rose during the second half of February. Salmon fishing in the lower reaches fell off but in the middle reaches fishing continued to be quite good with fish being caught on most of the beats up to Eden Lacy. In fact, one fish was taken at the end of the month just below Eamont Foot.

During the first week of March river levels were at a good height for salmon fishing but catches were poor, just odd salmon being taken from the Carlisle and Warwick, Wetheral and Armathwaite areas. Salmon were at this time seen moving in the River Eamont below Udford and there was a report of one fish being taken on the lower reaches of the Lowther. River levels then started to fall steadily until very nearly the end of the month. Salmon fishing was at a standstill because of this. However, freshwater at the end of the month brought a run of fish into the Eden and 8 or 9 fish, the largest 25 lb. were taken in the Carlisle area. Unfortunately, there was not sufficient water to improve conditions further upstream and catches were limited to the occasional fish. The month's catch of 58 is the lowest recorded and is little more than one-tenth of the catch in 1966 and some earlier years.

River levels continued to rise during the early part of April and more salmon moved into the Eden. Levels were above normal until the middle of the month, but salmon fishing was very slow, few fish being grassed. During the second half of April the level of the Eden slowly fell and salmon fishing by the end of the month was again at a virtual standstill.

While river levels rose at the beginning of May, they fell again very quickly and continued to fall until by the middle of the month they were down to summer level. The freshwater brought a small number of fish into the lower Eden, but did not improve angling. Levels remained low throughout the remainder of May and salmon fishing suffered accordingly. Sea trout, however, provided some sport during the latter part of the month in the Carlisle area and up to Wetheral and even the odd one was seen above Armathwaite Weir. These conditions continued during most of June, but improved in the middle of the month when fresh water brought a run of grilse into the Eden and several were caught in the Carlisle area. Sea trout also continued to give quite good sport in the lower reaches.

Conditions finally improved during the second half of July, water levels rose and salmon fishing picked up and odd grilse were taken in the Carlisle and Wetheral areas. The fresh water also moved sea trout and herling in the lower Eden and fishing in the Carlisle area was much better.

Levels were just above normal at the beginning of August. Five salmon were taken between Langwathby and Eamont Foot during the first week of August. Lower down the river however, fishing continued to be slow though odd salmon were taken. Sea trout continued to provide good sport in the Carlisle area and also in the Eden at Warwick Bridge and the lower reaches of the Irthing.

During the second half of August, the water levels fluctuated but fresh water at times brought about a general improvement. Salmon and more sea trout moved into the Irthing and also up the Eden. In spite of rather low water, fish in fact moved forward quite quickly during the second half of August. By the end of the month salmon and some sea trout were reported in the Ormside area on the Eden and salmon were seen in the lower parts of the Lowther and also moving through the fish pass at Brougham Weir.

River levels were low during September and salmon fishing was very quiet. Sea trout fishing on the Lower Eden downstream of Carlisle provided some very good sport right up to the end of September.

Conditions improved at the beginning of October and during the first two weeks of the month fish were taken from most beats up to Kirkoswald and Eden Lacy.

The lower part of the river fished very well and from the Carlisle to Spa Wells stretch 11 fish were taken in the last few days of the season.

While there was sufficient water to move fish up the Eden and into the lower part of the Eamont, fish were slow moving onto the spawning grounds during the last week or so of October. Due to low water during the first half of November fish could not move forward and it was the middle of the month when fresh water came that the salmon finally moved onto the usual spawning grounds. Once there, spawning began straight away and was finished in little over a week. Later running fish seemed slow to move up and in fact many spawned in the main river instead of moving into the smaller tributaries. After the end of November, rivers were high for several weeks and kelts soon dropped back into the main river.

(b) River Esk (Border) District

Angling Season:

Salmon: 1st February to 31st October.

Sea Trout: 1st April to 30th September.

This year's total of 151 salmon taken by rod and line from the Border Esk and tributaries situated in England is virtually double the figure of 76 recorded for last season. While the monthly catches for February, March, April and May were still well below the figures for these months during the period prior to 1966, the catches for the months August, September and October show a marked improvement and are responsible for the increase in this year's total compared with 1972.

The average weight of fish taken by rod and line this year was 9.38 lb., a drop in the figure for last year and reflects the general downward trend of average weights in the last seven or eight years.

The number of salmon taken by draft net this year was again very small and this is due to the fact that the net was again only worked on a part-time basis.

The first spring fish were seen moving into the lower reaches of the Esk during the second half of January and with rivers high, these fish moved well upstream and by the end of the month were observed in the Canonbie area.

The opening day of the salmon season, 1st February, did not produce any spring fish, though several well mended Kelts were taken. Later in the month with river levels slightly higher, several good fish, a 22 lb. one from Wilkin's Pool and a 24 pounder from the Willow Pool, together with several smaller fish were grassed. The second half of February saw fishing at a virtual standstill due to ice covering many stretches of the river.

Conditions improved during the first half of March, river levels rose to a good fishing height and the high tides moved fresh fish into the Esk and these fish moved upstream and several fish were taken from the Esk between Langholm and Longtown. During this period spring salmon were reported moving into the lower reaches of the River Liddel. The second half of March fished very poorly due to the sudden drop in water level.

Fishing picked up during the first half of April due to higher water levels and fresh fish coming into the Esk, six salmon were taken in the Canonbie to Longtown stretch. Two fresh run sea trout were taken during this period from the Metal Bridge area on the lower Esk. River levels dropped in mid-April and remained low during the second half of the month which resulted in a poor period for fishing.

During May river levels fluctuated and fishing varied, but on the whole the month was poor, few salmon or sea trout being taken, though both species were present in better numbers in both the Esk and the Liddel.

Fresh water and further runs of sea trout moving into the Esk during the first week of June saw a marked improvement in fishing on the main river at least. The sea trout gave excellent sport to anglers fishing a small red worm. One angler was reported to have had 12 sea trout in one day and catches of five, six or seven were quite common.

Sport dropped off towards the middle of June, but improved again towards the end of the month when sea trout again provided the bulk of fish caught. Night fishing produced the best catches with some anglers having 10 – 12 fish in a night. Throughout June salmon fishing was very slow, few fish were landed though several were hooked and lost.

During the first week of July river levels dropped to well below summer level and fishing became very quiet apart from night fishing for sea trout. With the water low and clear fish were easy to see and it was found that the Esk was holding large numbers of sea trout from Langholm down to the estuary and also fair numbers of salmon; the Liddel held quite a good stock of sea trout, but relatively few salmon.

Levels rose during the second half of July and naturally sport improved. Considerable numbers of sea trout, herling and grilse were taken from the Esk and Liddel. Good runs of fish also moved into the lower Esk and these fish moved upstream, a salmon of 32 lb. was taken from the river at Longtown.

Good sport continued at the beginning of August, but then fluctuating levels for ten days or so resulted in poor catches generally, though some anglers catching the river just right had some good results. For example, ten salmon were taken from the Willow and Clog Pools in one day, the remainder of the river producing hardly a fish.

Towards the end of August levels dropped to below normal level and these conditions continued right through to the end of September. Consequently the sea trout season closed rather quietly and catches during September were poor, limited to odd fish. Salmon fishing was virtually at a standstill on both the Esk and the Liddel. However, conditions improved at the beginning of October when rivers came up in flood and remained above normal level until the end of the month.

Salmon fishing was somewhat slow in picking up and catches during the first two weeks of the month were not up to expectations. From mid-October onwards, however, catches improved with fresh fish moving into the river and moving well upstream. The Liddel fished very well, particularly during the third week when some 50 salmon were taken, most of these coming from the Penton area. Most of the fish taken on the Esk came from the Willow and Cauldron Pools, although fish were taken from Metal Bridge to Langholm, some fish even coming from as far upstream as Bentpath.

The water conditions during October moved sea trout into the spawning streams and, in fact, sea trout and a few salmon had started spawning by the beginning of November. Low water then prevailed throughout November, until the end of the month when rivers rose slightly, quickly dropping again in early December, rising in the middle of the month and remaining high until the end of the year.

Salmon spawning was held back slightly because of the low water, but though fish were unable to move to the top of the spawning tributaries many of them were able to spawn in the lower reaches of these streams. However, a larger number of salmon than is usual did spawn in the larger tributaries and in the main rivers.

(c) River Ellen and Allonby Bay District

Angling Season:

Salmon: 1st April to 31st October

Sea Trout: 3rd April to 31st October.

This year's total of salmon taken by rod and line from the River Ellen is 5 compared with last year's total of 11. The low figure for this season is no doubt due to the low water conditions that prevailed during most of July, August, September and October which prevented the movement of fish into the river.

Following high water at the beginning of April anglers fishing the Netherhall and Maryport areas of the river during the second half of the month had good catches of small sea trout. Fresh water at the beginning of May brought a run of large sea trout into the river and these fish moved up as far as Dearham by the middle of the month. Due to low water conditions for the second half of May few of these fish were caught. Low water continued throughout most of June and July and into the start of August. During this period fishing was restricted to the lower reaches where some quite good catches of sea trout were taken, fish having moved into the low reaches in spite of the low water.

River levels rose in the early part of August, this allowed the sea trout to move forward and also brought the first runs of salmon into the river. Levels then quickly dropped and remained low for the remainder of August and throughout the whole of September. Salmon were pooled in the lower reaches and very few were taken by anglers. Sea trout did however provide quite good sport as far as Rosegill Weir. But, above there angling was poor few fish in actual fact having moved above the weir.

A slight rise in water at the beginning of October though not sufficient to improve angling was enough to move large numbers of fish into the lower parts of the river and allow sea trout to move upstream. More fresh water improved conditions further and by the middle of the month the river was at a reasonable fishing height. Salmon were reported taken as far up as Rosegill Weir and large numbers of sea trout were caught up to Blennerhasset. When the levels dropped at the beginning of November fish were found to be well spread out throughout the river. Stocks of salmon were somewhat lower than usual but the numbers of sea trout were well up to normal.

During most of November and December river levels were well up and runs of fish, both salmon and sea trout, moved into the river and onto the spawning beds without difficulty. More salmon spawned this year in the main river, and by the end of December stocks of salmon were thought to be not far below normal.

(d) River Derwent District

Angling Season:

Salmon: 1st April to 31st October.

Sea Trout: 3rd April to 31st October.

This year's total of 549 salmon caught by rod and line is almost twice last year's figure, but is still well below the average for the years prior to 1966. However, the total for October, 312 is the highest for this month since 1964 when 1031 fish were taken. Totals for July, August and September are very much below normal and reflect the poor angling conditions and the restricted entry of fish into the rivers due to very low water conditions during these months. The average weight of rod-caught fish this year was 8.54 lb., slightly below last year's weight of 9.09 lb. but the highest apart from this since 1967.

The total of salmon taken this year by nets and fixed engines was 95, slightly more than half the number taken last year and the lowest yearly total recorded since 1952.

A small run of spring salmon entered the Derwent at the end of January and another small run during early March.

The first summer fish moved into the lower Derwent during the first half of April and several of these were taken in the Workington area below Yearl Weir. A few sea trout were also seen in the tidal water at this time but they did not move into the river proper. River levels fell steadily during the second half of April. Fresh water in early May moved small numbers of salmon and sea trout into the river and over Yearl Weir but fishing was very slow, improving slightly towards the end of the month when a small number of salmon and sea trout were taken from the lower reaches. Low water conditions prevailed during the first half of June, during the period small numbers of salmon and sea trout moved into the lower Derwent but the majority of fish were seen moving in and out on the tide. A rise of 6 inches in the middle of June improved conditions. This was just sufficient to bring fish in and allow them to move over Yearl Weir. However, it did little to improve angling which continued to be poor, just small catches of sea trout from the Workington area. River levels fell again and remained low until the end of June. Fishing picked up slightly, however, and with more sea trout in the lower Derwent some good catches were reported although most of these continued to be from the Workington area by anglers fishing at night.

Rivers continued to drop during the first half of July and by the middle of the month the Derwent was very low indeed. Large numbers of salmon and sea trout were congregated in the tidal part of the river and more fish were seen moving to and fro on the tides. A little fresh water in mid-July moved sea trout forward but salmon were unable to move. Salmon fishing was rather slow, but a few fish were taken from the lower reaches. Sea trout fishing, however, was good and while the bulk of fish were taken in the Workington area, fish were caught up river as far as Cockermouth.

Conditions improved immensely at the end of the first week of August. The Derwent rose to 2' 3" and further rain brought the level up still further. With the main river and all the tributaries carrying fresh water, fish were moving in very large numbers and big runs of fish were coming into the Derwent on nearly every tide.

Sea trout and salmon moved into the River Cocker, sea trout into the Marron and salmon into the Greta. With fresh water fishing improved immediately, between 90 and 100 salmon were reported taken from the Derwent in the week; the Cocker and the Greta produced several fish each day. In addition, sea trout on the Cocker but particularly on the Derwent provided excellent sport. Levels dropped slowly over the next week or so and while salmon catches fell off sea trout continued to be taken in large numbers from the Derwent.

By the end of August rivers were down to below normal summer level and both salmon and sea trout were again congregated in the bottom reaches of the Derwent. These conditions prevailed throughout September and by the end of the month the lower tidal reaches of the river were holding extremely large numbers of migratory fish and many more were moving in and out of the river mouth on the tides. Sport in the main was limited to the lower Derwent where sea trout still provided excellent sport for anglers fishing at night. Some sea trout fishing was possible in the middle reaches of the Derwent up to Cockermouth.

The beginning of October saw a very dramatic improvement; the Derwent rose to 2' 6" and the tributaries were all carrying fresh water and in the first 10 days or so of October salmon fishing produced extremely good catches, 120 to 140 fish from the Derwent, 60 or so from the Greta and a dozen or so from the Cocker. While the river levels dropped slowly during the second half of October the fishing continued to be very good. All rivers produced salmon and the Derwent, Marron and Cocker quite good bags of sea trout. The fresh water also moved fish into the larger streams and St. John's Beck, Glenderamackin and Naddle Beck were all holding fish by the end of October.

Rivers continued to run fresh during the first half of November which enabled sea trout to move onto the spawning grounds. Low water during the second half of November

held salmon back and while the majority were finally able to move onto the spawning grounds during early December more fish than usual were found to have spawned in the larger streams or even in the main river.

(e) South West Cumberland District

Angling Season:

Salmon: 1st April to 31st October

Sea Trout: 3rd April to 31st October

This year's total of 180 salmon taken by rod and line is slightly below last year's total and is the lowest season's catch since 1955. The average weight for this season was 6.96 lb. a reduction from the figure for last year of 7.76 lb. but not significantly below the average figure over the last ten years. Returns of salmon caught by rod and line in different rivers in South West Cumberland are as follows:-

	1973		1972		1971	
	No.	Wt.	No.	Wt.	No.	Wt.
River Ehen	47	305	63	468	108	703
River Calder	33	228	6	59	19	112
River Irt	98	712	107	846	153	1118
River Esk	—	—	8	55	6	39
River Annas	2	8	—	—	1	5
	<hr/> 180	<hr/> 1253	<hr/> 184	<hr/> 1428	<hr/> 287	<hr/> 1977

The number of salmon taken this year by nets and fixed engines was 27 compared with last season's total of 57.

The first migratory fish into the District moved into the River Irt during the first week of April and one or two of these fish were taken by anglers at this time and odd salmon and sea trout were taken over the next month. During the first half of June salmon and sea trout were seen moving in the estuaries but were unable to move into the river due to the low water conditions. Fresh water later in the month improved conditions and fish moved into the lower reaches of all rivers and provided some sport to anglers for a short time until the water dropped and remained low until the middle of July. The Rivers, with the exception of the Ehen then rose by 18 inches to 2 feet. On the Ehen fresh water was limited to the lower reaches below Cleator. However, salmon and sea trout moved into the Ehen as far as Egremont. In the other rivers fish were able to move forward more freely. Sport was rather slow but a low but steady number of salmon and sea trout were reported taken from the Irt and sea trout from the Esk, Calder and Ehen.

High water in the first half of August moved large runs of fish, the rivers Irt, Esk and Ehen getting the biggest runs. With these conditions angling picked up and fish were reported taken from all rivers. The Ehen and Irt producing the best catches. While the level of the Ehen and Calder quickly dropped other rivers still remained above normal level and on these rivers sport continued but at a slow pace and more fish moved into their lower reaches. The Ehen, however, was very low by the end of August and on that river sport was very poor and catches were limited to the lower reaches where small numbers of sea trout were moving in from the tides.

The overall picture remained virtually unchanged until nearly the end of September when fresh water coupled with high tides moved salmon and sea trout into all the rivers in the area. Sport was, however, rather poor contrary to expectations and in fact few anglers were out taking advantage of the better conditions.

The first half of October saw rivers running above normal level though the Ehen and the Calder tended to drop at times. For the second half of October rivers were well above normal level though they dropped off slightly at the end of the month. Fishing during most of October was fairly good and quite reasonable catches were reported from all rivers apart from the Mite.

By the end of October fish stocks which had tended to be below normal had increased and all rivers contained normal stocks well spread out with some sea trout moving into the upper reaches.

With rivers running fresh during the first half of November fish moved into the upper reaches and sea trout were spawning by the middle of the month. Lower water during the second half of November held salmon back and these fish did not start spawning until fresh water came in the first half of December. Spawning in the area was generally completed by the end of the month apart from a few late sea trout and salmon still coming in up to the end of the month.

(f) Spawning of Migratory Fish

Low water levels at the end of October and during much of November resulted in both salmon and sea trout being much later moving onto the normal spawning grounds. This was especially so in West and South West Cumberland, where a fair proportion of salmon spawned finally in the main rivers or larger streams, rather than move forward when eventually there was sufficient fresh water to do so. General observations show that in the main the numbers of salmon spawning this year was about average though on the Derwent and the rivers in South West Cumberland there did appear to be some decrease in the numbers of sea trout. The fact that spawning was greater in the main rivers and tributaries this year, coupled with the fact that once spawning was completed water levels were high for a considerable time prevented a full redd count being completed.

2. BROWN TROUT

Brown trout fishing on the rivers was affected along with fishing for migratory fish by the low water conditions during the period July, August and September. Prior to this trout fishing was reported to have been excellent on the River Eden and its tributaries and also on the Derwent from Cockermouth to Bassenthwaite Lake. Fishing on the lakes was generally considered to be well up to average and the fishing on Ullswater was reported to be the best for several years.

The abundance of weed on many stretches of the Eden coupled with low water severely restricted trout fishing towards the end of the season.

3. FRESHWATER FISH

Again this year there was an increase in the number of anglers coming into the Authority's area for coarse fishing. Several large competitions were held during the year on the River Eden and very good catches of chub, dace and grayling were taken. The Border Esk and the River Lyne were also popular with coarse fish anglers and on these rivers chub and dace fishing provided excellent sport. The lakes with their perch and pike fishing were also well fished by large numbers of anglers particularly by holidaymakers during the summer.

4. FISH DISEASE

Ulcerative Dermal Necrosis (U.D.N.) has again this year affected fish in all the rivers in the Authority's area. During most of the year there was relatively little evidence of the disease but as in previous years signs of it became much more evident in October, with the onset of the spawning period. While most adult fish were able to spawn before succumbing to U.D.N. and the stress of spawning a small number unfortunately were removed dead from the rivers before they had spawned.

Two outbreaks of furunculosis occurred amongst salmon and sea trout in the River Derwent during the summer. Both outbreaks occurred at a time when the river level had been low for some considerable time and water temperatures were high. These two outbreaks were fortunately limited to fish in the lower reaches of the Derwent and no widespread outbreak affecting the whole river occurred.

5. FISH HATCHERY

(i) Salmon

80 hen fish and 30 cock fish were obtained from the River Eden system and stripped at the Hatchery and these fish yielded approximately 216,000 ova. In addition to these the following numbers of salmon ova were obtained from fish taken in rivers in West and South West Cumberland.

River Ellen	20,000	River Derwent	35,000
River Ehen	15,000	River Irt	35,000

To augment the numbers of salmon ova obtained from local rivers 100,000 ova were purchased in conjunction with the River Eden and District Fisheries Association and the Authority purchased a further 290,000 ova from Scotland and the Wye River Authority.

(ii) Sea Trout

300 hen fish and 280 cock fish were obtained from the Border Esk system and these yielded approximately 182,000 ova. Sea trout ova in the following numbers were obtained from rivers in West and South West Cumberland.

River Ellen	25,000	River Derwent	25,000	River Irt	5,000
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In addition 150,000 sea trout ova were purchased from the Northumberland River Authority.

All fish being held at the Hatchery prior to stripping were treated with malachite green again this year to minimise the fungus growth associated with U.D.N. and which, without treatment, gives rise to heavy mortalities amongst the fish. Also a number of fish were injected with 'Chloramphenicol' to give protection against bacterial infections, and from the limited number of fish treated it would appear that this is a useful prophylactic treatment to be used in future years.

The following is a summary of the planting of fry undertaken and intended from the Hatchery since 1960.

SALMON						Up to 1972 (000's)	1978 ⁴ (000's)
River Eden District							
Tributaries of the River Eden						6232	10
Bannerdale Beck	...	...	...	...	...		10
Ramsgill Beck	...	...	...	...	...		10
Dovedale Beck	...	...	...	...	...		10
Grisedale Beck	...	...	...	...	...		10
Kirkstone Beck	...	...	...	...	...		10
Scandale Beck	...	...	...	...	...		10
Lyvennet Beck	...	...	...	...	...		10
Jordan Beck	...	...	...	...	...		10
Shawfield Beck	...	...	...	...	...		4
River Esk (Border) District							
River Esk and Tributaries						390	7.5
Eweless Burn	...	...	...	...	...
River Liddel and tributaries	...	...	...	...	...	135	10
Twistlehope Burn	...	...	...	...	...
River Lyne and tributaries	...	...	...	...	...	80	4
Kirk Burn	...	...	...	...	...
River Ellen District							
River Ellen and tributaries						86	*

River Derwent District							
River Derwent and tributaries	...	...	...	...	...	300	*
River Cocker and tributaries	...	...	...	...	...	183.5	*
River Marron and tributaries	...	...	...	...	...	30	68
South West Cumberland District							
River Irt and tributaries	...	...	...	...	...	231	*
River Ehen and tributaries	...	...	...	...	...	253	*
River Calder and tributaries	...	...	...	...	...	251	*
River Esk and tributaries	...	...	...	...	...	221	*
River Annas and tributaries	...	...	...	...	...	83	*
River Mite and tributaries	...	...	...	...	...	45	*
Hatchery for feeding	...	...	...	...	...	220	20
Sunnygill Mill Race for smolts	...	...	...	...	...	75	
Harrington Reservoir for smolts	...	...	...	...	...	75	
SEA TROUT							
River Esk (Border) District							
River Esk and tributaries	...	...	...	...	...	734	
Tarras Burn	...	...	...	...	...		10
Coulow Burn	...	...	...	...	...		10
River Liddel and tributaries	...	...	...	...	...	516.5	
Braidlie Burn	...	...	...	...	...		10
Whitrope Burn	...	...	...	...	...		10
River Lyne and tributaries	...	...	...	...	...	30	
Bathrigg Beck	...	...	...	...	...		5
River Eden District							
River Eden and tributaries	...	...	...	...	...	31	
Hellbeck	...	...	...	...	...		5
River Ellen District							
River Ellen and tributaries	...	...	...	...	...	107.5	*
River Derwent District							
River Derwent and tributaries	...	...	...	...	...	80	*
River Cocker and tributaries	...	...	...	...	...	55	*
River Marron and tributaries	...	...	...	...	...	55	48
South West Cumberland District							
River Ehen and tributaries	...	...	...	...	...	96.5	*
River Calder and tributaries	...	...	...	...	...	154.5	*
River Irt and tributaries	...	...	...	...	...	20	*
River Annas and tributaries	...	...	...	...	...	40	*
River Mite and tributaries	...	...	...	...	...	15	*
River Esk and tributaries	...	...	...	...	...	25	*
Hatchery for feeding	...	...	...	...	...	30	10

* A serious pollution affecting some six miles of the River Marron occurred in June, 1974. As a result of this and following discussions with the Angling Associations, it was decided that the fry intended this year for the Rivers Derwent, Ellen and those in South West Cumberland should be used for stocking the Marron.

During the year work continued on the improvements to Holmwrangle Hatchery and at the end of the year, apart from final levelling of the ground and reseeded together with general tidying up, work was virtually completed.

An electricity supply was brought to the site, primarily so that the submerged pump in the borehole can be operated but it also allows for electric lighting etc., to be installed in the Hatchery building. This will result in greater convenience to the staff and enable work to be carried out at night.

Twenty fibre glass tanks 6' x 6' x 3' deep have been installed together with automatic feeders. These tanks will enable fry to be fed for much longer and allow for the planting of fry to be delayed until the natural feeding in the streams has started to increase as water temperatures rise in the late Spring. Three 30 ft. circular concrete ponds have been constructed. These will allow some smolt production for experimental purposes and also for the feeding of brown trout fry for re-stocking in the Authority's area in the coming year.

A certain amount of work has also been carried out in repairing the existing earth ponds, used for the holding of adult fish prior to stripping, and the entire network of old supply and waste pipes in the Hatchery has been replaced with new plastic piping.

The bungalow referred to in the last Report, has not been built.

6. FISHERIES PROTECTION

The following full-time staff were employed during the year.

Fishery Officer
Deputy Fishery Officer
Biologist
Assistant Biologist
2 Inspectors
3 Head Bailiffs
12 Water Bailiffs
3 Student Water Bailiffs (Part-time)

During conditions of low water poaching on some rivers continued to give the Bailiffs a great amount of extra work. The Authority wishes to record its appreciation of the services given by the Chief Constable and Officers of the Cumbria Constabulary and by the Honorary Bailiffs.

The number of offenders dealt with during the year:

District	Prosecution	Warning	No Action
River Esk (Border)	13	5	1
River Eden	51	8	11
River Ellen	39	26	10
River Derwent	45	25	10
S.W. Cumberland	28	17	8

7. LICENCE DUTIES

The Authority made application to the Ministry to be excused from regulating fishing for freshwater fish and eels by means of a licensing system in the area, as required under Section 6 of the Salmon and Freshwater Fisheries Act 1972.

The application was granted until 31st December, 1974.

8. BYELAWS

The Authority prepared new fishery byelaws having regard to the 1972 Act and other matters. The new byelaws were advertised and submitted to the Ministry of Agriculture, Fisheries and Food for confirmation. A number of objections were made and the byelaws were not confirmed at 31st March, 1974 when the Authority ceased to exist.

II. ESTIMATED NUMBER AND GROSS WEIGHT OF SALMON CAUGHT DURING THE SEASON

	No.	Weight lb.
(a) With Nets and Fixed Engines	1743	16,369
(b) With Rod and Line	1281	11,931
Total number of salmon licences issued	4095	
Number of returns received	1134	
Returns showing fish taken	396	
'Nil' Returns	738	

III. LICENCES ISSUED

				Salmon		Trout and Char	
Whole Area				No. Issued	Rate £.p	No. Issued	Rate £.p
(a)	Rod and Line	...	...	S. 1154	6.00	S. 3819	2.00
				7D. 769	2.00	7D. 8288	0.50
				1D. 709	1.00		
(b)	Nets						
	Haaf Nets	...	...	S. 178	6.50		
Part Area							
	Rod and Line	...	...	S. 693	4.00		
River Esk (Border) District							
(a)	General Licences	...	...	1	45.00		
				1	30.00		
(b)	Draft Net	...	...	1	30.00		
(c)	Rod and Line	...	...			SJ. 126	0.25
River Eden District							
(a)	Instruments other than rod and line viz:-						
	Coops	...	...	3	55.00		
	Draft Nets	...	...	2	60.00		
(b)	General Licences	...	...	1	120.00	1	100.00
				2	50.00	1	40.00
				1	45.00	1	25.00
				1	23.00		
(c)	Rod and Line	...	...			SJ. 2167	0.25
River Ellen and Allonby Bay District							
	Rod and Line	...	...			SJ. 113	0.25
River Derwent District							
(a)	Instruments other than rod and line viz:-						
	Coops	...	...	1	125.00		
(b)	Rod and Line	...	...			SJ. 1065	0.26
(c)	General Licences	...	...	1	40.00	1	10.00
South West Cumberland District							
(a)	Instruments other than rod and line viz:-						
	Garth	...	...	1	65.00		
(b)	Rod and Line	...	...	SJ. 572	0.50		

Public Waters within the Authority's jurisdiction

Drift and Hang Net	4	35.00
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S=Season S.J.=Season Juvenile 7D=Seven Day 1D=One Day

IV. APPROXIMATE NUMBER OF MEN ENGAGED IN COMMERCIAL SALMON AND TROUT FISHING

Nets	Licence Holders	Endorsees
Haaf Nets	178	—
Draft Nets	3	9
Hang Nets	4	12
Fixed Engines	3	8

V. NUMBER OF PROSECUTIONS INSTITUTED DURING THE FINANCIAL YEAR WITH NATURE OF OFFENCE AND RESULT OF ACTION

	Fines £.p	Adv. Fee £.p	
River Esk (Border) District			
7 Fishing without a licence	26.00	15.00	1 Absolute Discharge
1 Fishing for coarse fish during Annual Close Season	—	—	1 Absolute Discharge
2 Fishing for sea trout during Annual Close Season	10.00	10.00	
1 Using an illegal net	9.50	—	
1 Taking immature fish	7.00	—	
1 Using hand line	2.00	8.00	
1 Giving wrong name and address ...	5.00	—	
River Eden District			
39 Fishing without a licence	138.00	38.00	2 Absolute Discharge 1 Not Guilty
3 Fishing for trout during Annual Close Season	9.00	3.00	
3 Fishing for coarse fish during Annual Close Season ...	12.00	7.00	
1 Using maggots as bait	3.00	2.00	
3 Using groundbait	7.00	6.00	
3 Using a poisonous substance to take fish	180.00	30.00	
3 Unlicensed fishing	30.00	—	
3 Using an illegal net	30.00	—	
River Ellen District			
22 Taking fish by hands	166.00	53.00	3 Conditional Discharge 1 Not Guilty 1 Case Dismissed
3 Fishing without a licence	5.00	3.00	
1 Refusing name and address	5.00	—	
1 Assaulting a Bailiff	10.00	—	
1 Attempting to take fish with hands	3.00	5.00	
4 Using an illegal instrument	10.00	14.00	2 Conditional Discharge
1 Obstructing a Bailiff	—	3.00	1 Conditional Discharge
1 Aiding and abetting person taking fish with hands	—	—	1 Absolute Discharge
1 Using an unlicensed instrument ...	10.00	3.00	
4 In possession of an illegal instrument	35.00	11.00	
1 Refusing to give particulars ...	—	—	1 Conditional Discharge
River Derwent District			
12 Fishing for coarse fish during the Annual Close Season	18.00	—	2 Conditional Discharge

2 Fishing for trout during the Annual Close Season	30.00	5.00	
6 Using more than one rod	30.00	15.00	3 Conditional Discharge
6 Fishing without a licence	32.00	16.00	
5 Fishing with unlicensed instrument	125.00	28.50	
3 Using maggots as bait	2.00	—	2 Conditional Discharge
1 Using an unlicensed instrument ...	5.00	7.50	
1 Refusing to allow search of a fishing vessel	10.00	10.00	
1 Using an illegal instrument	5.00	9.00	
1 Using an illegal net	20.00	—	
2 Refusing to state particulars ...	5.00	—	
5 Using a net during the hours of darkness	50.00	6.00	
6 In possession of an illegal instrument	70.00	23.00	2 Not Guilty
1 Assault on a Bailiff	—	—	Case Dismissed
1 Fishing during weekly close time ...	10.00	—	
3 Taking dead fish from river	5.00	5.00	2 Case Dismissed
6 Removing fish by hands	15.00	17.50	1 Conditional Discharge
South West Cumberland District			
10 Using an illegal instrument	270.00	32.30	
7 Aiding and abetting person using an illegal instrument	175.00	15.10	
3 Aiding and abetting a person using an unlicensed instrument	30.00	14.50	1 Conditional Discharge
3 Fishing without a licence	60.00	9.90	
5 In possession of an illegal instrument	160.00	29.15	
1 Aiding and abetting a person in possession of an illegal instrument	40.00	—	
2 Refusing particulars	20.00		

VI. ASSESSED FISHERIES

- (a) Total Annual Value £611.50
(b) Rate in the £ imposed NIL

VII. FISHERIES RESEARCH

(a) Lake Surveys

A number of biological surveys of still water fisheries, or potential fisheries, have been undertaken during the year. The approach has generally been to study gill netted samples of the fish population, invertebrate bottom samples, plankton samples and water chemistry and advise on future development on the basis of this information. Waters thus investigated include Flodders Tarn, Appleby (for Appleby Angling Association); a gravel pit at Longtown and Cogra Moss Reservoir, Lamplugh (for Cockermouth Angling Association).

Some further observations have been made on High Stand Plantation Flight Pond, Armathwaite, a long disused gypsum working where calcium sulphate leaching into the bottom water in a deep, steep sided section of this sheltered water has given rise to a permanently stratified situation, with complete deoxygenation of the bottom water and a continuous process of sulphate reduction to sulphite by bacterial action.

Growth rate of perch in Littlewater Tarn, Bampton, where trapping was advocated last year has been recorded from analysis of opercular bones and fin spines.

Gill netting of Thirlmere to investigate growth rates of the resident species, with particular reference to trout has been undertaken and has so far provided good samples of pike, but insufficient trout samples. This work is continuing.

(b) Fish Disease

The laboratory stock of rainbow trout was severely affected by a typical infection with *Ichthyophthirius multifiliis*, where the characteristic white spot formation did not occur and extensive secondary bacterial infection was noted. Mortality was high.

This year treatment of impounded salmon and sea trout in holding ponds at the hatchery with intramuscular antibiotic injections significantly reduced pre-stripping mortality as compared to untreated controls.

Reports by anglers of tapeworm infection of trout in Ennerdale was investigated and the presence of a *Diphyllbothrium* infection in a small sample of gill netted trout was confirmed. The number of parasites per host was moderate in the sample and the plerocercoids were encysted round the gut. Such infections are not uncommon in still water trout fisheries and relatively well tolerated at low intensities of infection.

However, anglers reports indicate some fish taken to be very heavily infected with numerous plerocercoids in the body musculature and arrangements have been made to acquire some specimens if they occur in future. Two netted zooplankton samples of cyclopoid copepods and *Diaptomus gracilis* were microscopically examined but no trace of proceroid infection was found in these samples of potential intermediate hosts.

(c) Stream Surveys

A limited biological survey of Briggie Beck at Little Salkeld was undertaken from the Pollution Department in November and clear changes in the invertebrate bottom fauna in the lower part of the stream were detected.

The reported failure of adult salmon to ascend to the upper reaches of Swindale Beck for spawning was investigated by an electric fishing survey of juvenile salmonid stocks above and below the Manchester Corporation intake dam and associated fish pass. No young salmon were present above the pass, whereas juvenile salmon were the predominant salmonids in sites below the pass. A series of small falls downstream of the pass present an impassable barrier to upstream migrants with the flow regime now in operation; there appears nothing wrong in the design of the fish pass itself.

Reinstatement of the lost spawning area by artificial plantings has been ruled out because of the likelihood of downstream migrants passing into the intake with the present screening arrangement.

The growth of young salmon in Swindale Beck is slow with fish averaging 5.6 cms at one year and 10.1 cms at 2 years. It appears that this stream produces a larger proportion of 3 year smolts than many in our area.

(d) Hatchery Silt

Problems of silt deposition in the Hatchery troughs when the stream supply was in flood were investigated with regard to the settlement rate, particle size and nature of the offending material.

Alternative stream sources with generally lower suspended solid loads were also studied. The difficulties have now been resolved by use of borehole water at times of spate in the stream.

(e) Brougham Weir

The operation of the salmon tube counter and water monitoring installation at Brougham Weir was begun during the year. The monitoring installation has had its fair share of teething troubles, with both recorder and depth sensor failures. With these resolved, it is hoped there will be continuous trouble-free operation during the coming season.

(f) Nursery Stream Project

This study on ten salmon nursery streams undertaken with the assistance of the Biology Departments of local schools continues to progress well.

An interim report on results up to summer 1973 was produced during the year with practical recommendation on nursery stream management based on the findings.

During the summer Mr. K. Bell, a Sandwich Student from Liverpool Polytechnic, undertook a study on invertebrate drift fauna in the four test streams stocked this season and sampled salmon fry stomach contents simultaneously with drift and invertebrate bottom samples.

Appendix 1

RETURNS OF SALMON CAUGHT

(a) River Eden District

(i) Rod and Line

SALMON

Year	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Total No.	Total Weight	Average Weight
1952	110	304	394	331	169	66	24	28	56	83	1,565	22,697 lb.	14.49 lb.
1953	78	244	291	306	128	58	22	37	46	—	1,210	17,834 lb.	14.74 lb.
1954	114	224	503	383	252	109	58	52	76	—	1,771	23,857 lb.	13.48 lb.
1955	177	402	471	365	320	62	26	25	72	—	1,920	28,629 lb.	14.91 lb.
1956	166	200	394	244	182	65	35	49	154	—	1,489	20,236 lb.	13.58 lb.
1957	220	485	533	327	196	41	40	61	136	55	2,094	27,228 lb.	13.00 lb.
1958	193	383	373	315	278	97	52	64	81	38	1,874	24,411 lb.	13.03 lb.
1959	195	331	531	372	227	52	23	12	30	26	1,799	23,783 lb.	13.22 lb.
1960	211	317	410	283	118	26	23	58	69	104	1,619	22,525 lb.	13.91 lb.
1961	153	361	387	272	147	36	31	37	73	38	1,535	20,165 lb.	13.14 lb.
1962	164	346	291	327	198	43	33	55	130	95	1,682	23,559 lb.	14.00 lb.
1963	17	61	352	431	231	51	46	67	210	149	1,615	20,163 lb.	12.48 lb.
1964	123	202	231	256	188	62	26	50	134	163	1,435	17,877 lb.	12.46 lb.
1965	309	293	393	355	211	59	58	136	140	130	2,084	25,336 lb.	12.16 lb.
1966	213	388	576	397	303	78	53	79	147	99	2,333	31,255 lb.	13.38 lb.
1967	64	123	237	49	14	12	24	80	118	20	741	10,243 lb.	13.82 lb.
1968	79	137	64	62	7	9	22	27	45	35	487	6,097 lb.	12.51 lb.
1969	61	65	102	73	9	6	8	7	69	32	432	5,451 lb.	12.62 lb.
1970	101	139	191	84	24	8	16	43	91	26	723	8,547 lb.	11.82 lb.
1971	82	90	100	19	13	17	5	56	31	17	430	4,899 lb.	11.39 lb.
1972	54	150	103	75	37	28	21	19	9	12	508	6,429 lb.	12.65 lb.
1973	39	82	58	33	25	55	18	34	31	71	396	4,594 lb.	11.60 lb.

(a) River Eden District

Returns of Salmon Caught — Continued

SALMON

(ii) Nets and Fixed Engines (Exclusive of Haaf Nets up to and including 1955)

Year	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Total No.	Total Weight	Average Weight
1952	123	103	155	118	151	389	168	—	1,207	13,468 lb.	11.16 lb.
1953	94	66	100	131	171	234	131	—	927	10,394 lb.	11.21 lb.
1954	102	142	221	141	90	200	63	—	959	10,891 lb.	11.36 lb.
1955	68	109	196	107	135	440	491	—	1,546	15,930 lb.	10.30 lb.
1956	104	194	183	221	334	534	151	9	1,730	19,398 lb.	11.21 lb.
1957	73	107	145	177	393	317	338	7	1,557	14,950 lb.	9.60 lb.
1958	98	127	193	183	213	391	378	18	1,601	16,744 lb.	10.46 lb.
1959	340	169	189	316	343	383	830	22	2,592	28,408 lb.	10.96 lb.
1960	33	69	206	253	285	465	640	30	1,981	20,422 lb.	10.31 lb.
1961	84	246	123	158	435	710	483	33	2,272	24,782 lb.	10.95 lb.
1962	69	98	84	178	324	507	512	34	1,806	18,639 lb.	10.32 lb.
1963	27	59	145	257	380	417	740	54	2,079	21,512 lb.	10.35 lb.
1964	62	58	90	171	302	739	968	45	2,435	23,331 lb.	9.58 lb.
1965	88	78	87	172	365	532	189	29	1,540	17,122 lb.	11.12 lb.
1966	45	116	97	163	319	1,264	1,140	45	3,189	30,662 lb.	9.74 lb.
1967	107	89	78	94	276	768	455	19	1,886	21,573 lb.	11.43 lb.
1968	66	151	30	77	225	487	894	20	1,950	21,415 lb.	10.98 lb.
1969	10	18	48	59	115	1,095	1,087	23	2,455	21,608 lb.	8.80 lb.
1970	33	28	28	89	160	504	552	17	1,411	13,139 lb.	9.31 lb.
1971	22	21	33	103	274	715	503	4	1,675	14,768 lb.	8.82 lb.
1972	18	51	28	54	48	685	384	21	1,289	12,192 lb.	9.46 lb.
1973	54	51	44	82	198	590	565	29	1,613	15,258 lb.	9.46 lb.

Returns of Salmon Caught — Continued

(b) River Esk (Border) District (to Scottish Border only)

(i) Rod and Line

SALMON

Year	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Total No.	Total Weight	Average Weight
1956	8	17	19	23	5	5	18	47	76	218	2,708 lb.	12.42 lb.
1957	38	41	40	17	9	15	28	98	73	359	3,778 lb.	10.52 lb.
1958	62	62	41	36	11	7	29	39	66	353	4,166 lb.	11.80 lb.
1959	31	70	36	32	4	11	4	26	84	298	3,652 lb.	12.26 lb.
1960	24	55	42	16	14	14	23	56	66	310	3,596 lb.	11.60 lb.
1961	41	29	32	23	9	9	14	30	43	230	2,989 lb.	12.99 lb.
1962	30	27	27	32	10	15	30	115	113	399	4,533 lb.	11.36 lb.
1963	6	31	75	58	27	31	52	114	226	620	7,390 lb.	11.92 lb.
1964	54	36	34	18	9	14	32	107	191	495	5,583 lb.	11.38 lb.
1965	47	58	42	28	15	23	30	59	106	408	5,040 lb.	12.35 lb.
1966	36	30	37	13	17	16	56	146	165	516	6,250 lb.	12.11 lb.
1967	6	13	10	7	6	15	49	98	34	238	2,582 lb.	10.85 lb.
1968	7	7	8	3	2	9	7	20	20	83	850 lb.	10.24 lb.
1969	3	18	10	5	5	7	16	45	13	122	1,211 lb.	9.92 lb.
1970	7	5	9	4	1	9	27	40	21	123	1,138 lb.	9.25 lb.
1971	7	3	5	6	4	9	40	15	13	102	933 lb.	9.15 lb.
1972	7	8	7	8	11	10	10	1	14	76	823 lb.	10.83 lb.
1973	4	5	14	3	7	20	37	17	44	151	1,417 lb.	9.38 lb.

Returns of Salmon Caught — Continued

(b) River Esk (Border) District (to Scottish Border only)

(ii) Nets and Fixed Engines

SALMON

Year	Feb.	Mar.	April	May	June	July	Aug.	Total No.	Total Weight	Average Weight
Netting was last carried out in 1955 when a total of 130 salmon were caught.										
1966	—	—	1	1	35	40	48	125	1,167 lb.	9.33 lb.
1967	—	—	—	—	35	22	7	64	768 lb.	12.00 lb.
1968	—	—	—	—	9	7	4	20	147 lb.	7.35 lb.
1969	—	—	—	—	6	9	—	15	115 lb.	7.67 lb.
1970	—	—	—	—	—	3	—	3	20 lb.	6.67 lb.
1971	—	—	—	—	2	1	—	3	33 lb.	11.00 lb.
1972	—	—	—	—	5	2	2	9	115 lb.	12.78 lb.
1973	—	—	—	—	2	3	3	8	80 lb.	10.00 lb.

Returns of Salmon Caught — Continued

(c) River Derwent District

(i) Rod and Line

SALMON

Year	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Total No.	Total Weight	Average Weight
1955	8	19	47	63	14	192	425	—	768	6,074 lb.	7.91 lb.
1956	3	16	18	129	604	468	512	—	1,750	15,996 lb.	9.14 lb.
1957	7	16	18	135	445	541	257	—	1,419	11,119 lb.	7.84 lb.
1958	14	45	60	145	521	603	588	—	1,976	17,981 lb.	9.10 lb.
1959	14	29	22	54	35	33	320	—	507	4,732 lb.	9.33 lb.
1960	21	9	23	116	227	406	369	—	1,171	9,618 lb.	8.21 lb.
1961	10	20	32	205	220	237	302	—	1,026	10,260 lb.	10.00 lb.
1962	5	18	43	86	630	639	546	—	1,967	15,825 lb.	8.45 lb.
1963	6	54	68	197	498	740	673	—	2,236	19,738 lb.	8.83 lb.
1964	10	12	64	237	611	817	1,031	—	2,782	22,628 lb.	8.13 lb.
1965	7	14	52	228	566	485	285	—	1,637	12,945 lb.	7.91 lb.
1966	6	33	67	137	607	555	253	—	1,658	14,919 lb.	8.99 lb.
1967	3	3	15	105	322	270	230	—	948	8,253 lb.	8.71 lb.
1968	2	3	—	52	18	148	103	—	326	2,374 lb.	7.28 lb.
1969	—	2	9	42	50	245	149	—	497	4,002 lb.	8.05 lb.
1970	—	3	6	137	184	259	136	—	725	5,861 lb.	8.08 lb.
1971	—	2	14	64	296	127	245	—	748	5,887 lb.	7.87 lb.
1972	6	9	48	89	98	15	15	—	280	2,546 lb.	9.09 lb.
1973	3	6	3	31	118	76	312	—	549 ⁵⁵⁴	4,689 lb.	8.54 lb.

(ii) Nets and Fixed Engines

SALMON

1955 Total Number—112;	Total Weight 1,059 lb.	1965 Total Number— 479;	Total Weight 2,722 lb.
1956 Total Number—229;	Total Weight 2,330 lb.	1966 Total Number— 740;	Total Weight 6,263 lb.
1957 Total Number—402;	Total Weight 2,717 lb.	1967 Total Number— 762;	Total Weight 6,079 lb.
1958 Total Number—662;	Total Weight 6,262 lb.	1968 Total Number— 348;	Total Weight 2,164 lb.
1959 Total Number—574;	Total Weight 5,506 lb.	1969 Total Number— 382;	Total Weight 2,511 lb.
1960 Total Number—438;	Total Weight 3,684 lb.	1970 Total Number— 369;	Total Weight 2,469 lb.
1961 Total Number—148;	Total Weight 1,454 lb.	1971 Total Number— 271;	Total Weight 2,385 lb.
1962 Total Number—423;	Total Weight 2,910 lb.	1972 Total Number— 170;	Total Weight 1,450 lb.
1963 Total Number—1,351;	Total Weight 8,312 lb.	1973 Total Number— 95;	Total Weight 827 lb.
1964 Total Number—439;	Total Weight 2,705 lb.		

Returns of Salmon Caught—Continued

(d) South West Cumberland District

(i) Rod and Line

SALMON

Year	April	May	June	July	Aug.	Sept.	Oct.	Total No.	Total Weight	Average Weight
1957	1	2	11	116	181	219	88	618	4,025 lb.	6.55 lb.
1958	4	13	49	170	391	367	303	1,297	9,063 lb.	7.00 lb.
1959	1	7	29	69	52	120	182	460	3,641 lb.	7.91 lb.
1960	1	1	29	84	163	140	81	499	3,676 lb.	7.37 lb.
1961	5	17	57	99	154	77	108	517	3,827 lb.	7.40 lb.
1962	4	12	45	191	653	416	239	1,560	10,793 lb.	6.92 lb.
1963	1	7	56	175	381	381	248	1,249	9,333 lb.	7.47 lb.
1964	1	16	90	274	565	381	205	1,532	10,742 lb.	7.01 lb.
1965	1	8	70	197	440	284	113	1,113	7,670 lb.	6.89 lb.
1966	2	19	76	129	244	175	78	723	6,142 lb.	8.49 lb.
1967	2	5	9	67	127	132	88	429	3,271 lb.	7.39 lb.
1968	—	—	6	31	57	87	96	277	1,786 lb.	6.45 lb.
1969	—	—	8	40	81	126	61	316	2,235 lb.	7.07 lb.
1970	—	—	2	70	114	94	45	325	2,281 lb.	7.02 lb.
1971	—	6	6	28	103	70	74	287	1,977 lb.	6.89 lb.
1972	—	4	32	30	51	38	29	184	1,428 lb.	7.76 lb.
1973	—	—	3	32	55	25	65	180	1,231 lb.	6.96 lb.

(ii) Nets and Fixed Engines

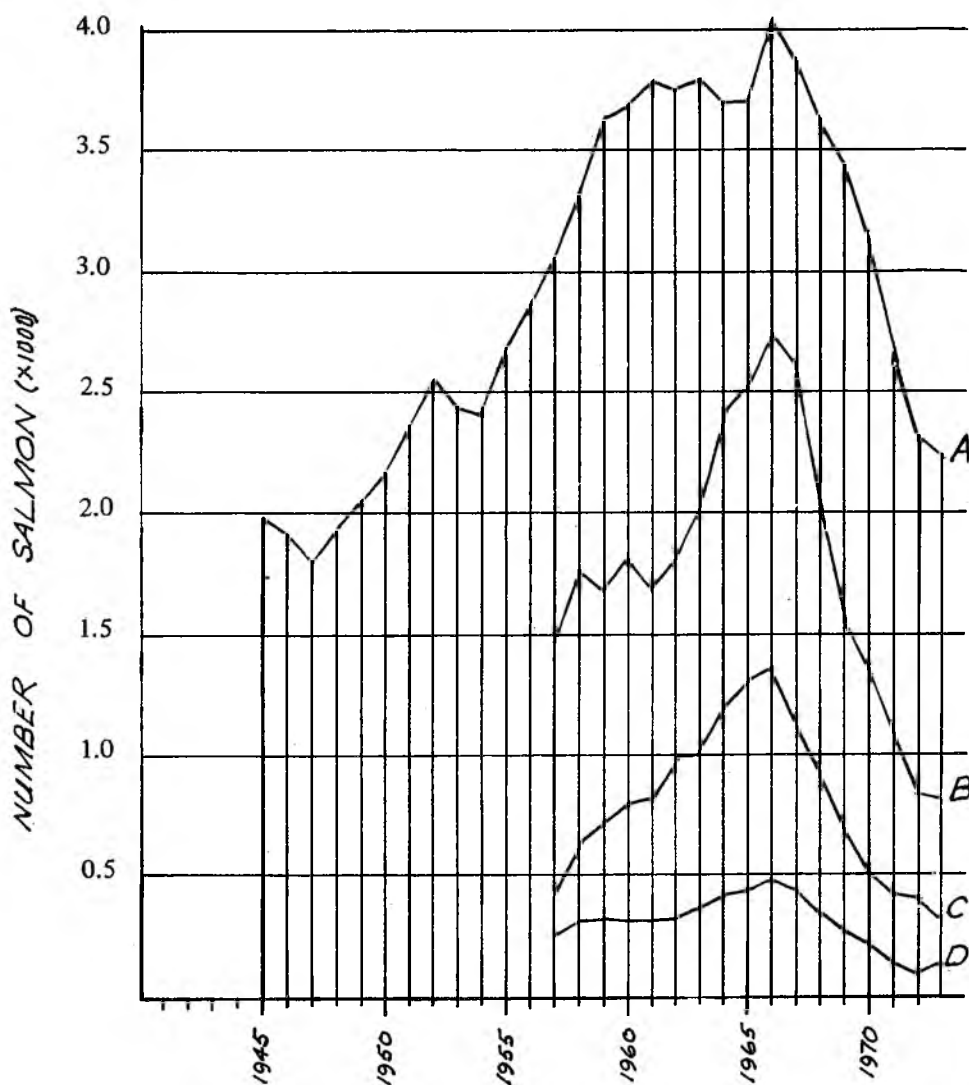
SALMON

1956 Total Number— 36; Total Weight 196 lb.	1965 Total Number— 23; Total Weight 238 lb.
1957 Total Number—237; Total Weight 1,135 lb.	1966 Total Number— 92; Total Weight 647 lb.
1958 Total Number—144; Total Weight 679 lb.	1967 Total Number— 11; Total Weight 74 lb.
1959 Total Number—183; Total Weight 1,098 lb.	1968 Total Number—247; Total Weight 1,535 lb.
1960 Total Number—183; Total Weight 570 lb.	1969 Total Number—116; Total Weight 771 lb.
1961 Total Number— 90; Total Weight 327 lb.	1970 Total Number— 53; Total Weight 303 lb.
1962 Total Number— 78; Total Weight 756 lb.	1971 Total Number— 45; Total Weight 290 lb.
1963 Total Number—250; Total Weight 1,447 lb.	1972 Total Number— 57; Total Weight 493 lb.
1964 Total Number—159; Total Weight 586 lb.	1973 Total Number— 27; Total Weight 204 lb.

Diagram Showing:—

Running five year average of combined Salmon catches for each district.

- A. River Eden District (Rods, nets and fixed engines).
- B. River Derwent District (Rods, nets and fixed engines).
- C. South West Cumberland (Rods and fixed engines).
- D. Border Esk (Rods only).



PART VI

PREVENTION OF POLLUTION

SECTION 1. QUALITY OF WATER

(1) Major rivers in the area continued to be satisfactory in general quality but the increasing frequency of operation of storm sewage overflows in dry weather in the Carlisle area gives rise to concern. An increase in weed growth in the Eden and Eamont partially attributed to increased nutrient levels derived from agricultural run-off and partly to the less severe winter seasons experienced in the past 2 - 3 years has been noted. Some smaller stream systems especially in the Solway Plain to the west of Carlisle have suffered seasonal declines in quality due to the overloading of small rural sewage works and the ever increasing volume of agricultural effluents.

(2) Routine sampling of river systems has continued as reported previously, the location of sampling stations together with maximum, minimum and mean results of analysis being shown in the Appendix pages 52 to 64.

SECTION 2. STANDARDS APPLIED TO EFFLUENTS

The following chemical standards are used by the Authority in assessing the quality of effluents discharged to non-tidal waters, but it is emphasised that variations may be introduced in the light of local circumstances including cases where dilution is shown to be critical.

1. Sewage Effluents

- (a) Works providing full primary and secondary treatment.
 - (i) Solids in suspension, dried at 105°C shall not exceed 30 parts per million (milligrams per litre).
 - (ii) Biochemical oxygen demand, 5 days at 20°C shall not exceed 20 parts per million (milligrams per litre).
- (b) Storm water tanks at sewage works.

Solids in suspension dried at 105°C shall not exceed 100 parts per million (milligrams per litre).

Additionally it is usual to require that a specific volume of sewage (often expressed as a multiple of the dry weather flow) shall pass for full treatment prior to any discharge being made.
- (c) Septic tank and filter installations.
 - (i) Solids in suspension dried at 105°C shall not exceed 60 parts per million (milligrams per litre).
 - (ii) Biochemical oxygen demand, 5 days at 20°C shall not exceed 40 parts per million (milligrams per litre).

2. Trade Effluents

Effluent quality is assessed in the light of local circumstances and in consideration of the manufacturing process involved. It is usual to limit some or all of the following:-

pH value (usually within the 5 to 9 range), temperature, solids in suspension, permanganate value (4 hours), biochemical oxygen demand and toxic substances. Where appropriate it is also required that oil or grease shall not be present.

SECTION 3. SAMPLES AND ANALYSES OF EFFLUENTS

The following table gives particulars of the numbers of effluent samples analysed and the classifications given in accordance with the standards quoted in Section 2 together with comparative numbers for the previous two years.

Classification	Sewage			Trade		
	1973-74	1972-73	1971-72	1973-74	1972-73	1971-72
Satisfactory	199	146	93	77	63	46
Unsatisfactory	396	307	252	606	389	151
Not Classified	226	277	130	216	87	69
TOTALS	821	730	475	899	539	266

The samples not classified include those taken at intermediate stages of treatment in order to provide information in connection with treatment efficiency and also those analysed on behalf of local authorities.

In addition 1083 samples of river water were analysed together with 414 of a miscellaneous nature giving a total of 3,217 during the year compared with 3,178 and 1,953 in 1972-73 and 1971-72 respectively.

Bacteriological analyses was commenced towards the end of the year and 37 samples were examined for the presence of coliform organisms.

SECTION 4. SEWAGE AND TRADE EFFLUENTS

The Report of a River Pollution Survey of England and Wales 1970 referred to in the last Annual Report was updated to 1972 and published during the year.

The following extracts are relevant to the Cumberland River Authority area:-

"The changes recorded in this area are minor. There has been an improvement in 2 of the 72 previously unsatisfactory sewage effluent discharges to non-tidal waters. Only 1 discharge has ceased. The discharges involved have flows of less than 2,500 gallons per day. No changes in crude sewage discharges are recorded. Of the industrial discharges previously considered to be unsatisfactory, 3 are now satisfactory".

Thirty applications for consent for new outlets and/or new discharges under Section 7 of the Rivers (Prevention of Pollution) Act, 1951 were received which, together with 1 application awaiting determination on 31st March, 1973 have been dealt with as follows:-

	Local Authority		Private Sewage Works	Trade Premises
	Sewage Works	Storm Sewage Overflows		
Consent granted	2	8	17	4
Consent refused	—	—	—	—
	2	8	17	4

In addition 3 Notices imposing conditions under Section 7(4) of the 1951 Act were issued and 2 applications for consent to continue discharges in accordance with Section 1 of the 1961 Act were granted.

It is disappointing to record that little progress was made in the field of remedial works in this the last year before both local government and water services reorganisation. The impression left at the end of the review period was that a number of local authorities had either lost interest in sewage treatment or were content to leave much needed

sewerage/sewage treatment schemes to the new Regional Water Authorities. Two important sewage treatment schemes which had reached the tender acceptance stage were deferred by the Department of the Environment (Appleby and Penrith) in view of the general economic situation which prevailed towards the end of 1973. These schemes will therefore have to be considered by the North West Water Authority when that body is in a position to decide its priorities in the light of very severe pruning of capital estimates by central government. It is to be hoped that the new authority will sanction both the Appleby and Penrith schemes as in the former case increased volumes of trade effluent will shortly be connected to sewer from a cheese creamery and in the latter case much needed residential development will otherwise be stifled.

Carlisle Corporation submitted the Petteiril Valley Relief Sewer proposals for comment but the Authority were not able to support the scheme due to the number of projected storm sewage overflows involved. Revised proposals drastically reducing the number of Storm Sewage Overflows have been suggested. It has become increasingly clear that Carlisle's main sewage works at Willowholme is overloaded as the following flow data illustrates. The Plant was designed to cater for a projected 1978 dry weather flow of 4.73 million gallons per day whereas the actual average dry weather flow now amounts to 6.3 million gallons per day. Updated flow data received from Cockermouth Rural District Council indicated that of the 51 works owned by the Council only 7 were operating with design capacity. The majority of overloaded works additionally received appreciable volumes of farm drainage and very little effort was made to control such trade effluents.

SECTION 5. REMEDIAL ACTION

Brief particulars of the position at the end of the review period on the more important schemes of sewerage and sewage treatment in the area are as follows:-

Appleby Borough Council

Appleby	—	Deferred by Department of the Environment
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Border Rural District Council

Brampton	—	Area scheme in preparation
Burgh-by-Sands	—	Area scheme awaiting approval
Warwick Bridge	—	Extensions in construction

Carlisle County Borough Council

Willowholme	—	Sludge pressing scheme in construction
Petteiril Valley	—	Relief sewer proposals amended

Ennerdale Rural District Council

Arlecdon	—	Consultants preparing scheme
Asby	—	Completed design
Calder Bridge	—	Preliminary investigation
Gosforth	—	Advanced design
Ennerdale Bridge	—	Completed design
Rowrah	—	Works completed

Haltwhistle Rural District Council

Gilsland	—	Works in construction
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Millom Rural District Council

Drigg and Seascale	—	Scheme submitted to Department of the Environment
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North Westmorland Rural District Council		
Crosby Ravensworth	—	Scheme submitted to Department of the Environment
Penrith Rural District Council		
Catterlen/Newton Reigny	—	Scheme submitted to Department of the Environment
Motherby/Penruddock	—	Advanced design
Penrith Urban District Council		
Whinfellholme	—	Scheme deferred by Department of the Environment
Whitehaven Borough Council		
Whitehaven	—	Advanced design — partial treatment works.
Wigton Rural District Council		
Abbeytown	—	Scheme in preparation
Aspatria	—	Works in construction
Blencogo	—	Area scheme in construction
Kirkbampton	—	Works completed
Thursby	—	Works in construction
Silloth	—	Scheme in preparation

SECTION 6. STATISTICS RELATING TO POLLUTION CONTROL

TABLE 1. DISCHARGES INTO STREAMS REQUIRING CONSENT UNDER SECTION 7 OF THE 1951 ACT.

	Consents and notices issued during the year	Refusals during year
(a) Effluents from local authority sewage disposal works and other domestic sewage effluents	18	—
(b) Effluents from storm sewage overflows and storm sewage tanks ...	8	—
(c) Effluents from trade premises ...	4	—
(d) Farm effluents	—	—
	30	—

TABLE 2. DISCHARGES INTO TIDAL WATERS REQUIRING CONSENT UNDER SECTION 7 OF THE 1951 ACT AS EXTENDED BY SECTION 1 OF THE 1960 ACT.

One consent was granted during the year.

TABLE 3. REVIEW OF CONDITIONS OF CONSENT UNDER SECTION 5
OF THE 1961 ACT.

Two consents were varied during the year.

TABLE 4. DISCHARGES TO UNDERGROUND STRATA REQUIRING
CONSENT UNDER SECTION 72 OF THE 1963 ACT.

No consents were issued during the year.

SECTION 7. RESEARCH

Thin layer chromatographic determinations have been carried out on various proprietary brands of pesticides, fungicides and herbicides and the results photocopied directly from the chromatogram with a view to cataloguing the information for reference purposes should the need arise to identify a source of that type of pollution.

The estimation of arsenic by Atomic Absorption Spectrophotometry using a flameless technique has also been investigated, greatly increased sensitivity was achieved but the method was abandoned at this laboratory due to the failure in obtaining reproducible results.

RESULTS OF CHEMICAL ANALYSIS OF RIVER WATERS – APRIL, 1973 to MARCH 1974

Chemical Results in mg/l

	Temp. °C	pH	Solids			P. V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonie Detergents	Chloron	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂	
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium							
River Eden u/s Kirkby Stephen																									
Max.	14.6	7.7	17	148	154	6.9	2.4	0.26	0.004	0.86	4.18	15	110	12.5	104	100	83	17							
Min.	6.4	6.7	4	79	96	0.8	0.6	0.04	> 0.002	0.63	0.04	9	47	9.1	87	38	33	5							
Mean	8.9	7.2	8	120	128	4.5	1.7	0.16	0.025	0.74	1.08	11	82	11.0	93	71	59	11							
River Eden, Warcop																									
Max.	15.5	7.9	16	219	225	8.1	2.2	0.24	0.009	1.16	2.58	21	172	12.7	109	209	163	47							
Min.	7.2	7.0	6	190	206	2.6	1.1	0.05	> 0.002	0.86	< 0.02	13	118	10.1	88	86	65	21							
Mean	9.6	7.4	9	208	217	5.2	1.8	0.13	0.006	0.97	0.67	17	143	11.2	98	150	113	37							
River Eden, Appleby																									
Max.	17.0	8.0	13	219	223	6.3	2.2	0.32	0.008	1.37	0.94	21	156	11.1	105	195	155	41							
Min.	7.3	7.1	4	174	183	3.5	0.9	0.07	< 0.002	0.79	0.02	12	110	10.2	85	76	58	18							
Mean	9.8	7.6	8	193	201	4.9	1.7	0.20	0.004	1.00	0.26	15	134	10.6	93	137	104	33							
River Eden, Bolton																									
Max.	17.4	8.1	49	209	232	7.5	2.7	0.18	0.02	1.48	0.28	19	170	12.3	118	268	220	48							
Min.	7.0	7.3	2	183	194	4.6	0.4	0.08	< 0.002	0.86	0.02	13	110	10.6	86	73	55	18							
Mean	10.2	7.7	17	193	210	5.7	1.9	0.13	< 0.002	1.05	0.10	16	137	11.5	102	164	127	37							
Trout Beck, Kirkby Thore																									
Max.	15.4	7.9	61	480	486	8.9	4.4	0.34	0.16	2.11	0.08	20	118	12.1	103	267	202	65							
Min.	6.6	7.3	3	177	180	0.6	1.3	0.11	> 0.002	1.32	< 0.02	10	80	10.1	83	86	71	15							
Mean	9.5	7.7	20	284	304	3.4	2.4	0.24	0.010	1.65	0.05	15	103	10.9	95	142	111	31							

Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Anionic Detergents	Chlorine	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
		Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium						
River Leith u/s River Lyvennet, Cliburn																							
Max.	18.8	8.2	83	337	348	8.0	3.9	0.32	0.008	2.64	0.05	56	230	17.9	189	300	273	27					
Min.	7.2	7.4	9	239	252	2.7	1.7	0.07	> 0.002	0.46	< 0.02	31	134	10.2	83	142	118	20					
Mean	10.8	7.9	29	290	319	4.6	3.0	0.20	0.006	1.77	0.03	41	171	13.8	127	211	187	24					
River Lyvennet u/s River Leith																							
Max.	15.6	8.2	84	287	304	7.6	2.5	0.34	0.008	1.84	0.10	19	222	15.3	134	235	220	31					
Min.	8.0	7.5	3	220	252	1.4	0.7	0.08	< 0.002	1.19	0.04	15	142	10.4	85	139	120	15					
Mean	10.0	7.9	25	258	283	3.5	1.9	0.16	0.005	1.48	0.06	17	185	12.0	105	182	161	20					
River Leith d/s River Lyvennet																							
Max.	18.0	8.2	105	308	314	8.6	3.2	0.32	0.009	1.98	0.15	31	216	16.1	155	220	200	31					
Min.	7.7	7.5	6	209	250	2.3	1.0	< 0.01	< 0.002	0.82	0.06	17	140	10.2	84	130	110	12					
Mean	11.0	8.0	33	264	296	4.0	2.4	0.16	0.007	1.62	0.09	24	179	13.3	121	165	144	21					
Crowdunle Beck u/s River Eden																							
Max.	5.4	8.1	65	158	164	7.3	2.5	0.21	0.008	1.48	0.04	17	96	11.9	104	89	81	18					
Min.	7.4	7.4	6	69	113	1.2	1.0	0.08	< 0.002	0.79	< 0.02	7	62	9.3	89	45	35	8					
Mean	9.8	7.8	22	113	135	3.4	1.7	0.14	0.002	1.03	0.02	10	78	10.8	94	75	62	13					
River Eamont at Eamont Bridge																							
Max.	18.3	8.2	25	88	105	2.5	2.5	0.13	0.006	1.05	0.04	14	50	12.7	114	37	29	8					
Min.	6.4	7.2	5	61	66	1.3	0.8	< 0.01	< 0.002	0.66	< 0.02	12	34	9.7	89	27	21	5					
Mean	14.3	7.8	12	78	89	1.9	1.7	0.07	0.003	0.82	0.03	13	42	11.1	100	31	24	6					
River Lowther at Lowther Bridge																							
Max.	17.2	8.0	35	141	176	4.8	2.2	0.09	< 0.002	1.26	0.04	17	84	12.9	118	89	81	18					
Min.	6.8	7.3	3	110	118	2.3	0.7	0.01	< 0.002	0.79	< 0.02	10	62	10.1	89	55	45	8					
Mean	10.7	7.8	14	124	138	3.0	1.6	0.05	< 0.002	0.94	0.02	13	76	11.4	102	69	57	13					
River Eamont, Udford																							
Max.	18.3	7.8	13	107	111	2.8	2.3	0.26	0.020	1.48	0.08	14	70	12.9	115	63	48	15					
Min.	6.5	7.1	5	84	89	1.9	1.4	0.13	< 0.002	0.92	0.02	11	50	10.0	90	39	29	8					
Mean	11.0	7.6	9	96	102	2.3	1.9	0.19	0.008	1.16	0.05	12	61	11.4	102	48	36	12					
River Eden, Langwathby																							
Max.	18.5	8.2	25	175	192	4.6	3.7	0.24	0.018	2.11	0.04	18	100	11.8	118	102	78	24	0.07	0.48	0.32	2.28	20
Min.	6.6	7.2	< 1	156	156	1.8	1.1	0.04	< 0.002	1.05	< 0.02	11	84	10.7	86	62	48	14	0.03	0.12	0.07	0.69	5
Mean	11.1	7.9	11	164	175	2.3	2.2	0.15	0.009	1.35	0.03	14	92	11.3	102	84	67	17	0.04	0.26	0.21	1.58	10

	Temp. °C	pH	Solids			P. V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Chlorine	Anionic Detergents	Total Oxidised	Dissolved Oxygen		Hardness as CaCO ₃			Manganese as Mn	Iron as Fe	Phosphate as PO ₄	Silica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂	
			Suspended	Dissolved	Total			NH ₃	Nitrite	mg/l				% Sat.	Total	Calcium	Magnesium								
River Eden, Armathwaite																									
Max.	17.5	8.3	22	166	171	5.0	2.0	0.11		0.010		1.84	0.03	16	102	11.7	102	101	78	29					
Min.	6.2	7.3	5	142	153	2.1	1.3	0.01	>	0.002		1.19	>	12	82	10	93	31	24	7					
Mean	10.4	7.8	12	154	166	3.3	1.7	0.07		0.006		1.45	>	14	92	11.1	98	75	54	19					
River Eden, Warwick Bridge																									
Max.	16.5	8.1	20	181	187	7.2	3.1	0.13		0.008		1.71	0.05	16	124	11.5	97	129	90	39					
Min.	6.3	7.3	5	142	162	2.4	1.1	>	0.01	>	0.002	1.05	0.02	11	68	9.3	92	30	25	5					
Mean	9.7	7.7	13	157	169	4.1	2.0	0.07		0.005		1.30	0.04	14	93	10.9	94	75	55	20					
River Irthing, Lanercost																									
Max.	16.4	8.0	18	155	169	14	3.0	0.18	<	0.002		1.05	0.04	15	78	11.4	96	80	63	17					
Min.	6.2	7.2	5	85	96	12	1.4	0.07	>	0.002		0.66	<	11	48	8.3	80	21	18	3					
Mean	9.6	7.6	11	131	142	13	2.2	0.12	<	0.002		0.80	0.02	13	63	10.1	87	52	41	11					
River Irthing at Crooked Holme																									
Max.	16.5	7.8	21	174	180	14	3.2	0.53		0.003		1.48	0.07	15	94	11.8	101	78	61	17					
Min.	6.0	7.0	6	126	142	10	0.7	0.03	<	0.002		0.66	<	12	27	8.3	82	41	31	10					
Mean	9.8	7.4	12	145	157	12	2.2	0.20		0.002		0.98	0.04	14	62	10.3	88	62	48	14					
River Irthing, Newby East																									
Max.	16.7	7.7	27	183	191	11	3.1	0.47		0.017		1.58	0.05	16	96	11.6	99	106	78	28					
Min.	6.2	7.0	4	124	135	8.3	1.1	0.05	>	0.002		0.66	<	13	31	7.5	77	25	18	7					
Mean	10.0	7.5	13	152	165	9.5	2.1	0.23		0.008		1.24	0.03	15	70	10.2	88	64	47	17					
Brunstock Beck, Rickerby Park																									
Max.	17.3	7.9	17	317	319	10	5.1	0.86		0.101		5.27	0.08	32	188	1.41	129	196	123	73					
Min.	6.3	7.0	2	287	294	2.7	1.9	0.29		0.034		3.03	0.06	22	98	7.6	73	67	50	17					
Mean	10.9	7.6	11	298	308	5.4	3.3	0.52		0.060		3.72	0.07	26	158	10.2	93	136	84	52					
River Petteril at Greystoke																									
Max.	17.0	7.7	41	241	247	9.1	4.7	0.42		0.023		2.64	0.07	42	192	11.8	94	200	144	56					
Min.	6.0	7.1	4	135	139	0.1	1.7	0.18		0.002		0.33	0.02	13	104	8.5	73	82	63	19					
Mean	9.7	7.4	15	200	214	4.2	2.8	0.29		0.008		1.63	0.04	21	143	10.0	86	129	95	33					
River Petteril at Newton Reigny																									
Max.	17.5	8.0	45	272	277	9.0	5.0	0.37		0.029		2.80	0.07	17	208	12.3	117	218	158	60					
Min.	4.6	7.2	5	224	233	1.3	1.9	0.11		0.004		1.71	<	14	122	9.3	80	139	108	29					
Mean	9.2	7.6	16	241	257	4.5	3.0	0.27		0.016		2.26	0.03	16	171	11.2	97	172	130	42					

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Anionic Detergents	Chlorion	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂	
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium							
River Petteril at Plumpton Wall																									
Max.	21.8	8.7	90	320	325	9.1	6.3	0.42	0.056	3.13	0.06	48	212	13.4	145	216	154	62							
Min.	4.1	7.5	5	222	253	2.7	2.2	0.21	0.021	1.19	0.02	17	142	9.6	82	151	118	31							
Mean	9.9	8.0	27	262	289	5.5	3.8	0.31	0.028	2.38	0.04	27	183	12.4	108	171	128	43							
River Petteril at Aikbank																									
Max.	18.1	8.0	39	381	384	7.9	8.9	0.58	0.044	5.93	0.11	93	224	13.4	100	232	162	70							
Min.	3.5	7.6	3	279	285	2.3	2.6	0.21	0.009	1.71	0.02	21	166	9.3	80	154	119	32							
Mean	8.6	7.8	13	318	331	4.2	4.3	0.41	0.029	3.49	0.04	41	191	11.3	94	181	138	43							
River Petteril at Southwaite																									
Max.	18.6	8.0	33	377	383	5.9	5.9	0.50	0.046	4.61	0.11	76	220	13.3	126	232	160	72							
Min.	3.7	7.6	6	278	287	2.6	2.5	0.09	0.018	2.31	0.02	20	162	9.9	83	94	73	21							
Mean	8.7	7.8	14	308	324	4.4	3.8	0.26	0.027	3.50	0.06	45	182	12.1	102	163	122	41							
River Petteril at Golden Fleece																									
Max.	18.4	8.3	12	347	348	5.1	3.9	0.40	0.082	5.27	0.11	76	188	13.1	131	214	154	60							
Min.	3.5	7.7	1	297	309	1.9	1.5	0.05	0.013	2.64	0.03	24	148	9.8	82	149	119	30							
Mean	8.8	7.9	6	319	325	3.3	2.4	0.21	0.046	3.82	0.06	47	166	12.1	103	172	133	39							
River Petteril at Petteril Bank																									
Max.	21.3	8.7	15	338	341	5.5	4.9	0.37	0.042	5.60	0.17	57	190	15.1	168	214	148	66							
Min.	3.8	7.8	3	282	297	1.8	1.6	0.01	0.025	2.31	0.02	25	148	10.0	84	147	115	28							
Mean	10.4	8.1	7	309	316	3.7	3.4	0.23	0.036	3.72	0.08	42	167	13.1	115	170	129	41							
River Petteril at London Road																									
Max.	21.6	8.8	25	340	344	5.4	4.4	0.37	0.047	5.60	0.14	66	196	15.2	168	224	156	68							
Min.	3.8	7.7	2	292	305	1.5	1.8	0.03	0.020	1.98	0.03	25	150	10.5	88	155	123	31							
Mean	9.7	8.1	10	309	319	2.9	3.1	0.25	0.034	3.93	0.07	44	170	13.3	117	178	137	42							
River Petteril at Warwick Road																									
Max.	22.2	8.9	13	346	347	5.1	4.5	0.47	0.047	5.27	0.13	72	190	15.8	177	228	154	74							
Min.	3.7	7.7	1	293	301	2.0	2.4	< 0.01	0.016	1.98	< 0.02	27	146	9.9	84	137	108	29							
Mean	9.9	8.1	6	313	318	3.5	3.2	0.25	0.030	3.79	0.06	45	165	13.2	118	174	132	42							
River Petteril at Stonyholme																									
Max.	22.8	9.0	31	313	315	6.2	3.9	0.55	0.048	5.93	0.14	71	192	17.7	176	224	164	60							
Min.	3.9	7.2	< 1	260	283	1.8	2.1	< 0.01	0.019	1.71	< 0.02	23	114	10.0	84	117	78	23							
Mean	10.2	8.1	8	291	300	4.3	3.2	0.22	0.031	3.59	0.07	36	163	13.4	121	161	124	37							

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonic Detergents	Chlorion	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga-nese as Mn	Iron as Fe	Phos-phate as PO ₄	Sil-ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium						
River Eden, Eden Bridges																								
Max.	17.6	8.2	25	174	178	7.6	3.3	0.26	0.011	2.11	0.05	16	112	11.4	95	111	80	31						
Min.	6.4	7.3	3	145	170	3.4	1.2	0.04	0.005	0.92	0.02	12	72	8.6	87	50	36	14						
Mean	10.2	7.9	15	161	175	5.2	2.3	0.18	0.007	1.40	0.03	15	93	10.5	91	84	65	20						
River Caldew, Hesketh-new-Market																								
Max.	16.8	7.1	32	161	163	7.6	3.7	0.32	0.007	1.32	0.04	22	110	12.4	97	97	80	17						
Min.	4.8	6.4	2	109	141	1.3	1.8	0.07	> 0.002	0.53	0.03	11	44	6.7	78	33	23	10						
Mean	10.0	6.9	14	140	154	5.2	2.8	0.23	0.004	0.92	0.03	16	69	9.9	88	62	49	13						
Cald Beck u/s River Calder																								
Max.	15.0	7.6	25	151	157	8.9	2.9	0.29	> 0.002	0.92	0.06	39	134	12.0	98	106	83	23						
Min.	6.8	6.8	3	121	139	1.2	1.6	0.11	> 0.002	0.79	< 0.02	12	70	9.8	86	65	53	12						
Mean	10.1	7.2	11	136	147	4.2	2.2	0.20	> 0.002	0.86	0.03	22	104	10.7	93	90	71	18						
River Caldew, Sebergham																								
Max.	14.2	7.7	31	118	146	7.1	2.5	0.34	> 0.002	1.32	0.04	15	96	12.0	99	80	60	20						
Min.	5.6	6.9	5	99	104	0.9	1.3	0.04	> 0.002	0.86	< 0.02	11	66	10.0	84	46	34	12						
Mean	9.4	7.3	14	111	124	3.3	1.8	0.17	> 0.002	1.08	0.03	13	83	10.8	93	65	48	17						
River Roe, Gaitsgill																								
Max.	16.4	7.6	8	363	371	5.0	5.2	0.63	0.070	6.59	0.05	30	202	13.6	109	248	200	48						
Min.	6.0	7.4	6	298	304	2.2	1.7	0.09	0.013	2.96	< 0.02	24	152	9.7	82	175	143	32						
Mean	10.3	7.5	7	322	329	3.3	3.0	0.30	0.032	4.72	0.03	26	175	11.4	100	203	164	39						
River Caldew u/s Dalston																								
Max.	16.3	7.8	22	166	180	4.5	2.8	0.32	0.008	2.31	0.04	16	108	12.4	103	92	73	21						
Min.	6.8	7.5	5	158	163	0.3	1.2	0.13	0.004	1.45	< 0.02	13	90	10.3	96	88	68	19						
Mean	10.6	7.7	12	161	172	2.2	1.8	0.20	0.006	1.78	0.03	15	99	11.3	100	90	70	20						
Pow Beck u/s River Caldew																								
Max.	9.3	7.7	12	408	420	7.9	3.9	1.05	0.144	12.5	0.08	39	126	9.1	78	166	135	31						
Min.	5.7	7.5	5	307	312	5.0	3.0	1.05	0.005	6.6	< 0.02	33	110	8.6	68	126	100	26						
Mean	7.5	7.6	9	358	366	6.5	3.4	1.05	0.075	9.6	0.05	36	118	8.8	73	146	118	29						
River Caldew u/s Cummersdale																								
Max.	18.8	7.8	23	169	186	2.9	1.6	0.18	0.014	2.47	0.04	17	114	12.6	104	99	78	21						
Min.	7.0	7.5	2	163	166	1.2	1.0	0.11	0.008	1.19	< 0.02	13	92	10.0	94	88	70	17						
Mean	11.5	7.7	11	165	176	2.0	1.2	0.13	0.010	1.79	0.03	15	101	11.2	100	92	73	19						

Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonie Detergents	Chloron	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
		Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium						
River Caldew, Holmehead																							
Max.	18.8	8.3	14	172	186	2.9	3.6	0.18	0.014	2.80	0.15	17	116	13.3	139	106	83	29					
Min.	6.0	7.7	3	160	163	1.9	2.0	0.13	0.003	1.05	0.02	14	92	10.6	90	77	58	19					
Mean	11.1	7.9	8	167	175	2.3	2.5	0.15	0.009	1.85	0.09	16	102	12.0	108	96	72	24					
River Caldew, Caldewgate																							
Max.	19.4	8.2	6	180	186	2.8	5.0	0.26	0.017	1.84	0.18	17	116	13.3	132	99	76	23					
Min.	5.8	7.6	6	154	160	2.1	2.8	0.11	> 0.002	1.32	> 0.02	15	94	12.4	106	91	70	21					
Mean	12.6	7.9	6	167	173	2.5	3.9	0.19	0.010	1.58	0.10	16	105	12.9	119	95	73	22					
Little Caldew, Caldewgate																							
Max.	21.2	7.9	19	251	265	5.3	13.0	3.69	0.053	2.96	0.28	27	152	13.2	107	132	105	27					
Min.	6.4	7.6	8	153	161	3.1	2.6	0.09	< 0.002	1.32	0.05	16	102	3.7	40	84	65	19					
Mean	12.1	7.8	14	194	208	3.9	7.5	1.44	0.022	2.00	0.15	20	119	9.1	78	104	82	23					
River Caldew, Bitts Park																							
Max.	19.0	8.7	21	192	198	6.0	4.1	0.47	0.025	2.96	0.24	32	120	17.1	153	111	85	31					
Min.	5.8	7.4	< 1	136	144	1.5	1.9	< 0.01	< 0.002	1.05	0.02	15	84	10.1	90	75	53	16					
Mean	11.0	8.0	11	173	183	3.0	3.2	0.24	0.013	1.73	0.12	20	105	12.3	111	95	73	22					
River Eden u/s Willowholme																							
Max.	18.5	8.5	20	181	190	4.2	3.5	0.35	0.025	2.64	0.14	18	126	14.7	135	140	100	40	0.07	0.47	0.32	3.61	20
Min.	6.4	7.3	2	153	157	1.4	2.2	< 0.01	> 0.002	0.92	0.02	13	84	11.6	93	67	45	12	0.03	0.16	0.19	2.25	5
Mean	11.4	7.9	9	165	174	2.5	2.9	0.18	0.010	1.58	0.07	17	105	12.7	115	84	63	21	0.05	0.25	0.25	2.8	11.3
River Eden, Beaumont																							
Max.	19.1	8.5	29	186	194	5.2	3.4	0.29	0.025	2.50	0.15	19	130	14.7	136	127	90	35					
Min.	6.6	7.3	< 1	144	156	1.7	2.4	< 0.01	0.008	1.19	0.03	13	86	10.8	86	69	50	16					
Mean	11.7	7.9	12	160	172	2.8	2.9	0.14	0.014	1.57	0.07	17	107	12.3	112	91	69	22					
River White Lyne, Whitelyne Bridge																							
Max.	12.0	8.0	104	482	488	12	4.4	0.34	0.002	0.66	0.07	24	154	12.0	102	306	295	41					
Min.	4.9	7.1	< 1	130	142	3.9	0.5	< 0.01	< 0.002	0.05	< 0.02	10	54	10.9	92	76	64	12					
Mean	7.3	7.6	31	273	303	7.7	2.1	0.20	< 0.002	0.38	0.05	16	107	11.5	95	184	177	25					
River Black Lyne, Blacklyne Bridge																							
Max.	11.8	8.1	155	259	278	18	4.4	0.53	< 0.002	0.79	0.05	17	146	12.1	92	177	138	39					
Min.	4.1	7.1	2	93	107	6.4	1.2	0.01	< 0.002	0.10	< 0.02	9	26	10.0	91	43	33	10					
Mean	6.8	7.6	44	167	211	12	2.2	0.27	< 0.002	0.45	0.02	13	76	11.1	91	103	80	23					

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonic Detergents	Chlorion	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga-nese as Mn	Iron as Fe	Phos-phate as PO ₄	Sil-ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium						
River Lyne, Whiteholme																								
Max.	11.8	8.1	148	273	276	18	4.2	0.58	> 0.002	0.59	0.04	18	138	12.0	92	194	155	39						
Min.	4.7	7.1	2	96	109	6.3	1.2	> 0.01	> 0.002	0.10	0.02	9	26	10.0	90	35	27	8						
Mean	7.1	7.6	42	176	218	12	2.2	0.26	> 0.002	0.43	0.02	13	82	11.1	91	107	84	24						
River Lyne, Rosebank																								
Max.	13.4	8.3	124	361	365	15	4.4	0.42	> 0.002	0.86	0.08	17	140	12.0	106	268	225	44						
Min.	4.9	7.1	4	116	130	5.6	1.3	> 0.01	> 0.002	0.13	0.02	10	42	11.2	93	65	53	12						
Mean	6.1	7.8	37	239	276	9.6	2.4	0.21	> 0.002	0.49	0.05	13	91	11.7	97	164	136	28						
River Lyne, Clift Bridge																								
Max.	14.0	8.4	33	301	305	15	3.7	0.37	< 0.002	1.45	0.08	19	142	12.5	118	279	233	46						
Min.	4.6	7.2	1	96	123	5.0	1.5	0.08	< 0.002	0.53	0.03	10	46	11.7	90	57	45	12						
Mean	7.9	7.9	17	236	253	8.5	1.4	0.24	< 0.002	0.85	0.05	14	104	12.1	101	168	138	30						
River Lyne, Lynefoot																								
Max.	15.2	8.2	40	255	259	16	4.0	0.42	0.011	2.14	0.14	20	136	12.1	94	209	168	41						
Min.	4.3	7.4	> 1	116	156	6.8	1.6	0.13	< 0.002	0.34	0.02	13	42	8.8	86	69	53	16						
Mean	8.7	7.7	18	208	226	9.3	2.5	0.25	0.004	1.07	0.06	16	98	10.4	90	145	113	31						
River Esk at Netherby																								
Max.	15.4	8.7	71	175	176	11.4	4.4	0.26	< 0.002	0.66	0.06	15	124	12.8	126	154	115	40						
Min.	5.4	7.2	< 1	63	84	1.1	1.5	< 0.01	< 0.002	0.34	0.03	9	36	11.9	93	41	28	13						
Mean	8.8	8.0	23	124	147	6.6	2.3	0.13	< 0.002	0.49	0.04	13	83	12.3	105	101	72	29						
River Esk at Burnfoot																								
Max.	14.2	8.4	103	167	264	11	5.3	0.32	< 0.002	0.79	0.04	15	126	12.2	114	154	115	43						
Min.	5.2	7.3	1	72	93	3.1	1.2	0.04	< 0.002	0.33	0.02	9	32	11.5	95	40	27	13						
Mean	8.4	7.9	32	137	169	7.0	2.4	0.18	< 0.002	0.56	0.03	12	87	11.9	101	102	72	30						
River Esk at Metal Bridge																								
Max.	15.4	8.4	90	255	330	15	4.5	0.37	0.010	1.98	0.07	20	132	12.3	104	208	163	45						
Min.	5.2	7.4	3	119	179	6.8	1.8	0.13	< 0.002	0.42	< 0.02	14	48	10.5	90	48	36	12						
Mean	8.8	7.9	39	217	256	9.9	2.7	0.25	0.004	1.01	0.04	18	97	11.5	97	134	105	29						
River Wampool, Crofton Bridge																								
Max.	13.9	7.6	211	307	402	18.0	7.4	1.12	0.046	3.13	0.22	45	152	11.8	90	214	128	86						
Min.	4.8	6.6	12	191	306	1.5	4.4	0.29	< 0.002	2.37	0.08	22	52	8.9	76	81	64	17						
Mean	9.1	7.1	72	268	340	11.0	5.7	0.74	0.023	2.69	0.14	30	120	9.9	83	138	95	44						

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Anionic Detergents	Chlorine	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manganese as Mn	Iron as Fe	Phosphate as PO ₄	Silica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium						
Whinnow Beck, Crofton Farm																								
Max.	15.0	7.4	351	503	854	28.0	22.0	13.0	0.240	10.5	1.52	178	164	8.9	71	142	116	34						
Min.	4.4	6.6	44	314	475	12.0	5.8	0.86	0.010	1.45	0.22	37	72	3.8	35	107	85	22						
Mean	9.5	7.1	138	380	518	19.3	12.6	6.69	0.096	4.67	0.80	77	128	6.6	56	125	96	29						
River Wiza, Wigton																								
Max.	14.3	7.9	266	336	441	21	6.2	1.19	0.074	2.90	0.23	77	160	12.4	95	192	135	57						
Min.	4.5	7.0	5	175	265	0.8	1.7	0.24	< 0.002	1.58	0.04	20	58	9.5	82	72	58	14						
Mean	9.1	7.5	74	258	332	9.8	4.4	0.62	0.027	2.36	0.10	41	124	10.7	90	131	99	33						
River Wiza, Dockray																								
Max.	14.3	7.8	252	320	454	20.0	< 15	1.12	0.061	3.16	0.37	92	128	10.8	98	154	106	48						
Min.	4.5	7.0	11	202	331	6.2	2.8	0.32	< 0.002	2.14	< 0.02	25	60	5.7	53	86	71	15						
Mean	9.3	7.3	95	272	367	13.3	7.6	0.62	0.026	2.81	0.16	53	95	9.1	77	133	84	29						
River Wampool, Moorhouse																								
Max.	14.8	7.4	216	296	435	19.0	9.4	1.32	0.140	3.69	0.26	43	162	9.8	86	174	117	57						
Min.	4.7	6.9	12	219	303	2.0	4.8	0.34	< 0.002	2.80	0.05	27	64	8.0	74	93	75	18						
Mean	9.5	7.2	74	271	345	10.0	6.4	1.01	0.061	3.27	0.17	33	125	9.1	78	135	98	37						
Bampton Beck, Biglands																								
Max.	12.8	7.2	14	412	416	9.7	5.6	2.64	0.068	11.2	0.16	42	180	7.2	57	229	156	73						
Min.	5.7	6.8	4	331	345	3.0	1.0	0.21	0.027	0.92	0.06	29	78	3.2	30	118	99	19						
Mean	9.4	7.0	9	377	385	7.1	3.9	1.64	0.039	4.25	0.10	35	138	5.3	45	171	129	42						
River Wampool, Laythes																								
Max.	14.2	7.4	224	308	442	19.0	9.0	2.57	0.140	6.32	0.18	34	150	9.5	75	187	122	65						
Min.	4.7	6.9	13	218	298	2.7	3.4	0.34	0.010	2.80	0.07	29	70	5.6	53	72	58	14						
Mean	9.4	7.2	89	270	358	11.0	2.8	1.72	0.067	4.05	0.14	32	119	7.4	62	132	94	38						
River Wampool, Whitrigglees																								
Max.	14.4	7.4	148	334	372	14.0	9.0	3.13	0.086	6.85	0.23	36	146	9.3	74	179	122	57						
Min.	4.7	7.0	4	224	312	1.4	3.4	0.37	0.030	2.96	0.03	28	70	5.2	49	82	66	16						
Mean	9.6	7.2	48	292	340	7.8	6.3	1.56	0.060	4.20	0.10	33	122	7.3	62	137	99	38						
River Waver, Bolton-low-Houses																								
Max.	15.4	7.8	22	254	258	9.9	3.6	0.86	0.018	2.14	0.05	22	174	12.4	93	190	153	37						
Min.	4.8	6.9	4	187	209	0.2	1.2	0.13	0.003	1.32	0.04	14	70	8.9	84	90	79	11						
Mean	9.2	7.4	14	214	228	5.9	2.0	0.46	0.011	1.69	0.05	18	121	10.5	88	122	103	24						

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonie Detergents	Chlorion	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂	
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium							
River Waver, Waverbridge																									
Max.	15.3	7.8	112	260	277	13	8.1	1.05	0.030	2.64	0.13	30	158	11.6	113	178	143	35							
Min.	5.0	7.1	3	165	232	<0.1	1.6	0.21	> 0.002	1.45	> 0.02	17	72	8.4	82	87	65	14							
Mean	9.8	7.5	4	220	259	7.8	4.3	1.55	0.016	2.05	0.05	22	117	10.5	91	120	98	23							
Holme Dub Beck, Abbeystown																									
Max.	15.2	7.7	110	283	363	15	8.8	1.45	0.045	5.27	0.10	37	150	10.0	94	198	122	76							
Min.	5.4	7.1	6	253	280	3.9	1.4	0.04	> 0.002	1.71	0.02	30	74	7.6	73	76	63	13							
Mean	10.0	7.3	50	269	317	11	4.1	0.59	0.016	2.87	0.06	33	117	9.3	80	130	90	40							
River Waver, Abbeystown																									
Max.	15.4	7.3	110	1689	1749	14	7.8	1.84	0.046	3.29	0.13	792	162	9.6	76	352	153	199							
Min.	4.8	7.1	27	250	293	7.4	3.0	0.29	0.010	1.58	0.02	23	84	5.7	54	114	86	19							
Mean	10.0	7.2	57	619	676	11	5.2	0.76	0.027	2.31	0.06	217	122	8.1	69	176	107	69							
Black Dub Beck near Oldkiln																									
Max.	16.2	7.7	19	465	483	5.3	1.7	0.79	0.051	4.28	0.05	63	164	12.9	116	166	110	58							
Min.	7.2	7.2	12	274	293	3.2	0.9	0.42	0.008	1.45	0.02	31	110	9.9	86	41	30	11							
Mean	10.3	7.5	16	331	347	4.0	1.3	0.62	0.033	3.16	0.04	40	136	11.2	99	126	83	44							
Crookhurst Beck, Allonby																									
Max.	16.6	8.1	26	338	350	3.9	3.9	2.96	0.067	6.26	0.07	39	186	16.7	158	215	155	67							
Min.	6.9	7.2	6	268	294	3.0	0.4	0.10	0.039	4.28	0.04	28	92	8.6	72	139	88	6							
Mean	11.0	7.6	16	317	332	3.5	2.4	1.57	0.050	5.02	0.06	34	123	11.0	99	167	119	48							
River Ellen, Boltongate																									
Max.	14.6	7.5	14	351	365	2.9	1.9	0.53	0.022	2.14	0.07	19	172	12.7	104	161	143	26							
Min.	6.5	7.1	3	176	184	<0.1	1.0	0.22	0.010	1.45	0.02	15	120	8.9	85	127	110	17							
Mean	9.3	7.3	9	235	244	1.8	1.4	0.32	0.017	1.79	0.05	17	153	11.2	96	145	125	21							
River Ellen, Harriston																									
Max.	16.2	8.1	13	239	251	5.2	2.6	0.34	0.037	2.31	0.06	20	170	16.0	147	160	143	29							
Min.	6.5	7.1	3	197	200	1.4	1.9	0.10	0.009	1.58	<0.02	15	150	11.5	96	143	118	17							
Mean	10.1	7.6	9	224	233	2.8	2.2	0.20	0.025	1.90	0.03	18	162	13.0	115	153	131	22							
River Ellen, Arkleby Mill																									
Max.	15.8	8.0	15	258	265	3.0	5.8	0.37	0.036	3.29	0.04	25	170	13.9	128	219	195	27							
Min.	6.5	7.3	5	234	244	1.6	1.4	0.10	0.012	1.71	0.02	19	166	10.6	96	116	105	11							
Mean	10.0	7.7	9	249	258	2.4	3.2	0.18	0.025	2.26	0.03	22	169	12.1	107	160	139	21							

Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonie Detergents	Chlorion	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
		Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium						
River Ellen, Ellen Villa																							
Max.	16.1	7.9	22	297	314	5.7	5.8	0.42	0.073	3.29	0.19	28	176	12.5	114	219	195	33					
Min.	5.5	7.3	5	240	251	1.6	3.2	0.14	0.025	1.98	0.02	19	166	9.0	89	157	133	18					
Mean	9.8	7.7	14	268	282	3.3	4.0	0.32	0.041	2.51	0.10	24	171	11.2	98	188	163	25					
River Ellen at Dearham																							
Max.	16.0	7.7	19	351	362	3.5	4.0	0.53	0.064	3.95	0.10	27	192	12.8	108	271	238	41					
Min.	6.2	7.3	7	285	292	1.7	2.0	0.23	0.033	1.98	0.04	21	164	7.9	78	88	78	10					
Mean	10.2	7.5	13	320	333	2.6	2.9	0.37	0.047	2.74	0.07	25	175	10.8	95	180	152	29					
River Ellen at Maryport																							
Max.	16.2	8.0	17	332	341	3.4	3.0	0.34	0.055	3.95	0.07	31	174	12.8	104	206	180	42					
Min.	7.0	7.5	6	283	290	0.8	1.3	0.10	0.028	1.98	0.03	23	158	8.8	86	56	50	6					
Mean	10.2	7.7	10	306	316	2.2	2.4	0.23	0.042	2.61	0.06	27	164	11.4	95	155	129	26					
River Derwent, Grange-in-Borrowdale																							
Max.	16.0	7.1	7	57	60	4.6	2.3	0.32	0.003	0.66	1.85	9	30	12.5	99	13	10	3					
Min.	4.8	6.2	<1	38	39	<0.1	<0.1	0.04	<0.002	0.26	<0.02	5	14	9.4	94	7	6	1					
Mean	11.9	6.7	4	46	50	1.5	1.1	0.15	<0.002	0.47	0.48	7	22	10.6	96	11	9	2					
River Greta, Keswick																							
Max.	16.6	7.1	10	85	87	6.8	2.7	0.18	0.003	0.79	0.80	11	32	12.1	99	40	31	9					
Min.	5.0	6.6	<1	56	60	0.6	<0.1	0.12	<0.002	0.33	<0.02	8	22	9.3	94	19	14	5					
Mean	12.6	6.8	4	70	74	3.1	1.5	0.15	<0.002	0.53	0.23	10	29	10.5	96	28	21	7					
River Derwent u/s Bassenthwaite Lake																							
Max.	18.0	6.8	8	82	84	4.7	3.0	0.23	0.015	0.82	0.51	15	26	12.4	96	22	18	5					
Min.	5.2	6.5	<1	34	42	2.0	0.4	0.03	<0.002	0.20	<0.02	12	16	8.9	93	12	9	3					
Mean	13.4	6.7	4	64	68	3.2	1.6	0.10	0.007	0.49	0.14	13	23	10.2	95	17	14	4					
Newlands Beck u/s Bassenthwaite Lake																							
Max.	16.4	6.8	9	51	51	6.1	2.4	0.42	<0.002	0.59	0.38	12	18	12.1	98	12	9	4					
Min.	5.3	6.4	<1	24	33	<0.1	0.1	0.01	<0.002	0.10	<0.02	8	16	9.3	93	9	6	2					
Mean	12.4	6.6	4	40	43	2.3	1.4	0.14	<0.002	0.25	0.11	10	16	10.4	95	10	7	3					
River Derwent at Ouse Bridge																							
Max.	19.4	7.0	9	82	91	5.7	2.8	0.32	<0.002	0.86	0.51	16	40	11.8	100	43	33	10					
Min.	5.0	6.7	2	53	53	1.6	1.4	0.05	<0.002	0.23	<0.02	11	16	8.7	90	15	11	4					
Mean	13.5	6.8	6	68	68	3.2	2.2	0.19	<0.002	0.47	0.16	14	27	10.2	95	26	19	7					

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Anionic Detergents	Chlorine	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃			Manganese as Mn	Iron as Fe	Phosphate as PO ₄	Silica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂	
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium	Magnesium							
River Cocker in Cockermouth																									
Max.	18.6	6.8	7	80	83	3.7	2.6	0.20	0.023	0.99	0.08	13	24	11.9	99	29	23	6							
Min.	5.6	6.5	>1	41	47	0.4	0.8	0.05	> 0.002	0.33	> 0.02	11	22	9.3	94	8	5	3							
Mean	13.3	6.7	4	62	66	2.3	1.3	0.15	0.008	0.63	0.05	12	23	10.4	97	18	13	5							
River Derwent, Cockermouth																									
Max.	20.4	7.0	12	140	152	3.5	5.9	0.18	0.013	2.96	0.03	18	30	11.7	104	30	23	7							
Min.	5.2	6.6	<1	54	54	2.0	0.8	0.01	> 0.002	0.20	< 0.02	12	18	9.1	91	16	12	4							
Mean	13.7	6.8	9	86	97	2.7	2.5	0.11	0.005	1.08	0.02	15	28	10.3	97	21	16	5							
River Marron, Little Clifton																									
Max.	17.8	7.7	64	179	234	11.0	8.7	0.42	0.035	2.96	0.08	19	114	11.6	98	113	100	27							
Min.	5.8	7.1	1	126	133	0.9	1.0	0.05	> 0.002	1.19	< 0.02	16	58	8.8	88	67	58	8							
Mean	12.9	7.4	20	163	183	4.4	3.0	0.22	0.010	1.93	0.05	17	76	10.0	93	103	79	17							
River Derwent, Ribton Hall																									
Max.	20.2	7.5	208	233	441	15.0	8.8	0.29	0.016	1.45	0.07	20	68	11.8	102	91	79	12							
Min.	5.4	7.0	3	65	75	2.2	1.1	0.04	< 0.002	0.33	< 0.02	14	20	8.2	86	17	12	4							
Mean	14.2	7.2	58	117	175	5.9	3.3	0.19	0.007	0.83	0.03	17	42	10.1	95	41	34	7							
River Derwent, Workington																									
Max.	18.8	7.3	44	103	147	3.7	3.5	0.18	0.026	1.32	0.07	18	48	11.9	102	59	51	8							
Min.	5.4	6.9	3	62	68	1.2	1.0	0.08	< 0.002	0.36	< 0.02	14	24	9.0	92	22	16	5							
Mean	13.6	7.1	18	80	96	2.4	1.9	0.13	0.010	0.80	0.04	16	35	10.3	96	35	28	7							
River Ehen, Ennerdale Bridge																									
Max.	16.0	7.1	9	66	71	1.2	1.4	0.09	< 0.002	0.59	0.05	16	24	12.4	98	13	8	5							
Min.	4.4	6.6	5	38	47	< 0.1	0.4	< 0.01	< 0.002	0.30	< 0.02	9	11	9.6	94	9	5	4							
Mean	10.5	6.9	8	49	56	0.4	0.9	0.05	< 0.002	0.45	0.03	11	18	11.0	95	11	7	4							
River Ehen at Wath Brow																									
Max.	15.3	6.8	13	104	113	4.2	1.6	0.24	0.005	1.05	0.03	24	54	12.7	100	51	40	11							
Min.	4.4	6.7	6	56	67	0.1	0.2	0.01	< 0.002	0.46	< 0.02	10	26	10.1	94	24	18	6							
Mean	10.2	6.7	9	75	83	1.8	1.0	0.09	0.003	0.74	0.02	15	38	11.3	98	37	28	9							
River Keekle u/s River Ehen																									
Max.	16.8	7.1	34	407	441	6.0	8.5	1.58	0.129	6.30	0.35	105	92	11.4	89	146	113	52							
Min.	5.0	6.8	14	237	260	1.7	2.7	0.33	0.014	2.47	0.20	23	74	7.9	80	78	60	18							
Mean	10.6	6.9	23	320	343	4.4	5.0	0.93	0.074	4.05	0.30	45	82	9.8	84	126	93	33							

	Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N			Antonie Detergents	Chlorion	Alkalinity to M.O. ₂ as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃		Magnesium	Manga- nese as Mn	Iron as Fe	Phos- phate as PO ₄	Sil- ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
			Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised				mg/l	% Sat.	Total	Calcium							
River Ehen u/s River Keekle																								
Max.	15.3	7.2	11	131	134	3.0	2.6	0.20	0.005	0.92	0.03	26	50	12.6	100	47	36	11						
Min.	4.6	6.9	3	54	65	0.3	0.6	0.04	<0.002	0.46	<0.02	8	28	9.6	94	25	19	6						
Mean	10.3	7.1	8	82	90	1.9	1.3	0.12	0.002	0.73	>0.02	14	37	11.1	96	35	26	9						
River Ehen d/s River Keekle																								
Max.	16.0	7.1	17	236	253	2.5	3.6	0.53	0.029	1.84	0.08	57	60	12.5	100	80	60	30						
Min.	4.6	6.9	7	73	82	2.0	1.2	0.13	0.004	0.72	0.02	11	32	9.5	93	37	28	9						
Mean	10.4	7.0	12	135	148	2.3	2.2	0.33	0.015	1.33	0.05	24	45	11.0	95	64	45	19						
River Ehen at Rothersyke																								
Max.	16.5	7.2	10	178	182	3.1	2.6	0.37	0.033	2.00	0.10	33	68	12.1	102	94	64	30						
Min.	4.8	7.0	2	94	103	0.7	1.1	0.11	0.002	0.82	0.04	11	32	10.0	93	41	29	11						
Mean	10.5	7.1	6	130	136	1.9	1.9	0.26	0.020	1.53	0.06	19	51	11.2	98	65	48	18						
River Calder at Calder Bridge																								
Max.	16.0	7.2	7	81	82	3.4	1.3	0.14	<0.002	1.05	0.02	20	38	12.7	100	43	35	12						
Min.	4.6	6.9	1	46	53	0.4	0.4	0.04	<0.002	0.33	<0.02	11	18	10.1	95	19	12	7						
Mean	9.9	7.0	5	62	67	1.4	1.0	0.09	<0.002	0.74	<0.02	15	29	11.3	97	31	22	9						
River Calder at Calder Hall																								
Max.	18.0	7.3	13	112	115	4.0	1.8	0.13	<0.002	1.32	0.05	43	52	12.8	106	82	54	28						
Min.	5.3	6.7	3	45	48	0.1	0.3	0.01	<0.002	0.66	<0.02	15	26	10.3	97	37	25	12						
Mean	11.1	7.2	7	79	86	1.6	0.9	0.07	<0.002	1.06	0.03	23	39	11.5	101	52	36	16						
River Bleng near Hall Bolton																								
Max.	17.2	7.3	8	54	57	3.8	1.3	0.13	<0.002	0.72	0.02	20	40	12.7	104	31	21	10						
Min.	4.9	6.6	<1	48	53	0.7	0.5	<0.01	<0.002	0.20	<0.02	10	14	10.2	98	15	10	5						
Mean	10.5	7.1	4	52	55	1.9	0.9	0.06	<0.002	0.51	<0.02	14	25	11.5	100	21	14	7						
River Irt near Strands																								
Max.	15.5	7.1	8	71	74	2.3	1.4	0.29	0.003	0.92	0.04	14	32	12.1	100	30	21	9						
Min.	5.6	6.6	<1	25	29	0.1	0.4	0.01	<0.002	0.33	<0.02	6	9	9.6	95	5	3	2						
Mean	11.1	6.9	4	42	45	1.0	0.8	0.10	<0.002	0.64	0.03	13	18	10.9	97	16	11	5						
River Irt, Holmrook																								
Max.	15.4	7.0	10	93	98	2.9	1.4	0.29	0.004	1.25	0.05	24	34	12.1	100	39	33	10						
Min.	5.8	6.5	1	32	42	0.3	0.6	0.03	<0.002	0.49	<0.02	9	14	9.9	94	15	9	6						
Mean	10.7	6.8	5	61	65	1.4	1.1	0.17	0.003	0.88	0.03	15	24	11.0	97	29	21	8						

Temp. °C	pH	Solids			P.V. 4 hrs.	B.O.D. 5 days	Nitrogen as N				Anionic Detergents	Chlorion	Alkalinity to M.O. as CaCO ₃	Dissolved Oxygen		Hardness as CaCO ₃		Magnesium	Manga-nese as Mn	Iron as Fe	Phos-phate as PO ₄	Sil-ica as SiO ₂	Colour Hazen Units	Turbidity as SiO ₂
		Suspended	Dissolved	Total			NH ₃	Nitrite	Total Oxidised	mg/l				% Sat.	Total	Calcium								
River Mite at Thornflatt																								
Max.	17.6	6.8	11	106	116	4.4	1.4	0.34	0.013	1.71	0.04	33	38	12.5	110	44	31	13						
Min.	5.4	6.4	4	59	70	0.9	0.6	0.01	< 0.002	0.46	< 0.02	14	17	10.2	93	15	9	6						
Mean	10.8	6.7	8	84	92	2.4	1.1	0.18	0.006	1.12	0.03	23	27	11.4	100	29	20	9						
River Esk at Ellerbeck																								
Max.	17.2	6.8	200	210	410	4.1	1.8	0.37	< 0.002	0.86	0.03	106	32	12.2	94	44	15	29						
Min.	5.0	6.3	< 1	48	55	0.1	0.7	0.03	< 0.002	0.53	< 0.02	15	13	8.8	90	19	12	5						
Mean	10.5	6.5	54	96	149	2.0	1.1	0.16	< 0.002	0.73	0.02	40	23	10.7	93	26	14	12						
River Annas at Annaside																								
Max.	18.0	8.1	8	85	92	6.5	2.0	0.32	0.004	1.32	0.06	25	34	12.2	125	31	19	12						
Min.	6.3	6.4	< 1	61	68	0.7	1.0	0.13	< 0.002	0.66	< 0.02	15	15	9.6	94	20	11	9						
Mean	11.4	6.9	4	73	77	2.8	1.4	0.23	< 0.002	0.99	< 0.02	21	24	11.4	103	26	15	11						

PART VII

OTHER GENERAL INFORMATION

SECTION 1 – RECREATIONAL FACILITIES

The rivers and lakes within the area provide a means for all forms of water-based recreation to be enjoyed by thousands of people each year. In common with other parts of the country pressures on water space for recreation are increasing. The Authority does not own or manage any reservoir or lake and has not provided any recreational facilities on inland waters.

When the Minister of Housing and Local Government gave his decision in 1966 on Manchester Corporation's proposals for the abstraction of water from Ullswater and Windermere he stated that he would require the Corporation to give an undertaking that they would, in consultation with the Lake District Planning Board, prepare a detailed programme for allowing further public access to the Corporation's Haweswater reservoir and adjoining land when the Watchgate Treatment Plant had been constructed and was in operation. A programme was submitted in 1968 and, with minor modifications, incorporated proposals put forward by the Planning Board in 1965.

Members of Manchester Corporation and the Cumberland River Authority met in September 1973 to discuss the proposals having regard to the statutory duty which the Water Act 1973 would place on the North West Water Authority. It was agreed that the Planning Board and the Northern Sports Council should be requested to participate with the Authority and the Corporation in appointing a Working Party of officers to review the proposals and to submit, for consideration by the four bodies, any additional proposals for access or recreational facilities at Haweswater.

A Working Party of such officers was established and officers of the Nature Conservancy and the Royal Society for the Protection of Birds attended two of the Meetings to give advice on conservation interests.

The Working Party produced its Report in March, 1974. Unfortunately this was too late for the River Authority to make any comment on the recommendations. The Report was formally received by the Authority and it was agreed that it be submitted to the North West Water Authority. Any action on the Report will be a matter for that Authority.

PART VIII
INFORMATION ABOUT EXPENDITURE AND INCOME

PART VIII: INFORMATION

Statement of Income and Expenditure on Loan and

TABLE

WATER

1972-73 £			Revenue Account £	Loan Account £	Grand Total £
EXPENDITURE					
Capital Transactions:-					
17,246	Grant Aided Works— Hydrometric Works (For details see Table 3)	...	25,946	—	25,946
—	Non-Grant Aided Works— Hydrometric Works (For details see Table 3)	...	—	—	—
40,669	Water Conservation Works (For details see Table 3)	...	16,295	Cr. 10,642	5,653
12,799	Other Items (For details see Table 3)	...	1,605	—	1,605
<u>70,714</u>			<u>43,846</u>	<u>Cr. 10,642</u>	<u>33,204</u>
Revenue Transactions:-					
Loan Charges					
13,145	Principal Repaid	...	14,271		
9,020	Interest	...	9,802		24,073
12,490	Maintenance of Works	...	19,565		19,565
Administrative Charges—					
45,619	Staff Salaries, Insurance and Superannuation	...	51,771		
5,322	Travelling and Subsistence etc.	...	5,488		
595	Consultant's Fees	...	97		
<u>156,905</u>	Carried forward	...	<u>144,840</u>	<u>Cr. 10,642</u>	<u>76,842</u>

ABOUT EXPENDITURE AND INCOME

Revenue Accounts — Year Ended 31st March, 1974

1

RESOURCES

1972-73 £				Revenue Account £	Loan Account £	Grand Total £
INCOME						
Capital Transactions:-						
Grant Aided Works—						
—	Loans Raised	...	...	
8,623	Exchequer Grant Etc.	...	...	9,596	—	9,596
	Contributions	...	...	1,000	—	1,000
19,930	Water Conservation Works Grant Etc.	...	...	6	—	—
5,510	Other Items	...	...	—	—	—
	Sale of Vehicle	...	...	—	—	—
34,063				10,602	—	10,602
Revenue Transactions:-						
1,682	Licence Fees	...	...	1,766		
103,873	Charges for Licensed Abstractions	...	...	105,380		107,146
	Contributions from other accounts under Section 83(2)(b) of the Water Resources Act 1963					
1,250	Land Drainage	...	...	1,250		
250	Fisheries & Water Recreation	...	...	250		1,500
141,118	Carried forward	...	...	119,248	—	119,248

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
156,905	Brought Forward	144,840	Cr. 10,642	76,842
1,313	Office Expenses (Postages & Telephones £269; Furniture and Equipment £340; Printing, Stationery and Advertising £557; Surveying Equipment £295; Radio Equipment £190)	1,651		59,007
1,783	Other Items (Computer Time £391, Legal Expenses £217, Insurances £197, Miscellaneous £306)	1,111		
—	Proportion of cost of oil spills emergency equipment etc.	540		540
10,000	Transfer to Reserve Fund	—		
6,740	Proportion of General Administrative Charges	6,408		8,059
Cr. 588	General Charges	Cr. 1,412		Cr. 1,412
—		—		—
176,153	Total — WATER RESOURCES ...	153,138	Cr. 10,642	142,496
—	BALANCE — Income in excess of Expenditure for the year	1,090	10,642	11,732
176,153		154,228	—	154,228

Loan and Revenue Accounts — Continued

1 — Continued

1972-73 £			Revenue Account £	Loan Account £	Grand Total £
	INCOME				
141,118	Brought forward	... ..	119,248	—	119,248
20,767	Receipts from inter-Authority adjustments - Water Resources in the North	... ..	24,931		24,931
42	Other Income	... ..	49		49
—	Rechargeable Items Recovered by Percentage on cost of Rechargeable Works	... ..	—		—
	Transfer from Reserve Fund	... ..	10,000		10,000
—	Rechargeable Works		—		—
161,927	Total — WATER RESOURCES	... ..	154,228	—	154,228
14,226	BALANCE — Expenditure in excess of Income for the year		—	—	—
176,153			154,228	—	154,228

PART VIII: INFORMATION ABOUT EXPENDITURE

Statement of Income and Expenditure on Loan and

TABLE

1972-73 £			Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE				
	LAND DRAINAGE				
	Capital Transactions:-				
36,851	Grant Aided Works, etc. (For details see Table 4)	...	37,538	Cr. 2,628	34,912
10,210	Non-Grant Aided Works, etc. (For details see Table 4)	...	17,738	—	17,738
47,061			55,276	Cr. 2,628	52,650
	Revenue Transactions:-				
	New Works & Impt. Schemes —				
	Loan Charges—				
12,979	Principal Repaid	...	12,748		
5,945	Interest	...	5,965		18,713
	Maintenance of Works —				
75,934	Watercourses	...	91,880		
333	Flood Warning Stations	...	465		92,345
1,250	Contributions to Water Resources Account under Section 83(2)(b) of the Water Resources Act, 1963	...	1,250		1,250
143,502	Carried Forward	...	167,584	Cr. 2,628	164,958

AND INCOME (OTHER THAN FOR WATER RESOURCES)

Revenue Accounts — Year Ended 31st March, 1974

2

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	INCOME			
	LAND DRAINAGE			
	Capital Transactions:-			
	Grant Aided Works—			
9,000	Loan Raised ...			—
5,049	Contributions from Local Authorities, Private frontagers, etc. ...	4		4
23,057	Exchequer Grant — Schemes financed from Revenue ...	19,047		19,047
	Non-Grant Aided Works—			
2,942	Loan Raised ...	—		—
875	Sale of Motor Vehicle and Heavy Plant ...	672		672
<hr/> 40,923		<hr/> 19,723	<hr/> —	<hr/> 19,723
	Revenue Transactions:-			
10,475	New Works & Impt. Schemes—			
	Exchequer Grant towards Loan Charges ...	9,898		9,898
	Maintenance of Works—			
137	Contr. from Local Authys. Private Frontagers, etc. ...	150		150
	Rechargeable Items—			
99	Recovered by Percentage on cost of Rechargeable Works	81		81
<hr/> 51,634	Carried forward ...	<hr/> 29,852	<hr/> —	<hr/> 29,852

Statement of Income and Expenditure on

TABLE

1972-73 £		£	Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE				
143,502	Brought forward	...	167,584	Cr. 2,628	164,958
—	Contributions to Internal Drainage Boards				
3,510	Salaries etc. Rechargeable to Internal Drainage Boards	...	4,541		4,541
	Subsidiary Accounts—				
	Motor Transport & Plant—				
17,493	Maintenance and Operating Costs	... 21,425			
	Loan Charges—				
1,859	Principal	... 2,009			
650	Interest	... 543			
	Debit Balance on—				
—	Light Plant Tools and Equipment	... 509			
276	Oncost	... 1,191			
56	Stores Oncost	... —			
43	Stores Account	... —			
		<u>25,677</u>			
	Deduct—				
28,526	Motor Transport & Plant — Hiring Charges	... 32,750			
14	Rebate on Purchases	... 18			
	Credit balance on:-				
623	L.P.T.E.	... —			
—	Oncost	... —			
—	Stores Oncost	... 83			
		<u>32,851</u>	Cr. 7,174		Cr. 7,174
138,226	Carried forward	...	164,951	Cr. 2,628	162,325

Loan and Revenue Accounts — Continued

2 — Continued

1972-73 £			Revenue Account £	Loan Account £	Grand Total £
	INCOME				
51,634	Brought forward	...	29,852	—	29,852
2,731	Charged to Internal Drainage Boards administered by the Authority	... ...	3,571		3,571
176	Other Items	... ...	143		143
<hr/>			<hr/>		
54,541			33,566	—	33,566
<hr/>			<hr/>		

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
138,226	Brought forward	164,951	Cr. 2,628	162,325
	Estates—			
717	Rent, Rates & Ins. £715)			
814	Repairs & Renewals £280)	995		995
	Administrative Charges—			
39,455	Staff Salaries, Insurance & Superannuation	45,590		
2,811	Travelling, Subsistence, etc.	3,498		
180	Office Accommodation ...	248		
1,796	Office Expenses (Engineer's.. Requisites £351; Furniture & Equipment £370; Printing, Stationery & Advertising £593; Postages £45; Telephones £578)	1,937		
—	Legal Charges	214		
6,054	Proportion of General Administrative Charges	5,695		57,182
Cr. 529	General Charges	Cr. 1,255		Cr. 1,255
213	Other Items — Pay & Productivity — Charge for Work Services Unit	580		
1,573	— Main River & Other Surveys ...	1,345		
103	— Miscellaneous	865		2,790
<u>191,413</u>	Total — LAND DRAINAGE (A)	<u>224,663</u>	Cr. 2,628	<u>222,037</u>
191,413	Carried Forward (A)	224,663	Cr. 2,628	222,037

2 – Continued

77

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
191,413	Brought forward (A) ...	224,663	Cr.2,628	222,037
	FISHERIES & WATER RECREATION			
12,595	Capital Transactions:- Non-Grant Aided Works (For details see Table 4) ...	29,133	Cr.1,264	27,869
12,595		29,133	Cr.1,264	27,869
	Revenue Transactions:-			
1,922	Hatchery	3,861		3,861
	Water Bailiffs & Inspectorate—			
16,148	Wages, Nat. Ins. & Superan.	18,924		
3,586	Travelling, Subsistence, etc.	5,025		
71	Appointment Expenses	308		
543	Housing	1,085		
148	Requisites and Protective Clothing	311		
51	Supplementary Pensions Allowance	100		
1,117	Transport — Maintenance & Operating Costs	1,448		27,201
2,038	Maintenance and Development of Fisheries	2,950		2,950
38,219	Carried Forward (FISHERIES & W.R.)	63,145	Cr.1,264	61,881
191,413	Carried Forward (A)	224,663	Cr.2,628	222,037

Loan and Revenue Accounts — Continued

2 — Continued

1972-73 £		Revenue Account £	Loan Account £	Grand Total £	"
	INCOME				
54,541	Brought forward (A)	33,566	—	33,566	
	FISHERIES & WATER RECREATION				
	Capital Transactions:-				
	Non-Grant Aided Works—				
1,425	Loans Raised		—	—	
—	Sale of Investments	10,000		10,000	
5,050	Contribution by Manchester Corporation	—			
	Application of Manchester Corporation Investment				
2,241	Income	8,547		8,547	
746	Sale of Vehicles	5		5	
9,462		18,552	—	18,552	
	Revenue Transactions:-				
	Fishing Licences—				
13,751	Salmon & Migratory Trout	14,464			
11,466	Trout (including Migratory Trout) ...	12,558			
212	Trout (excluding Migratory Trout) ...	277		27,299	
	Other Items—				
158	Bailiffs' Cottages—				
	Rent & Rates	335			
100	Contributions	100			
195	Interest on Investments	195			
34,891	Carried forward (FISHERIES & W.R.)	46,481	—	45,851	
54,541	Carried forward (A)	33,566	—	33,566	

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
EXPENDITURE				
191,413	Brought Forward (A)	224,663	Cr.2,628	222,037
38,219	Brought Forward (FISHERIES & W.R.)	63,145	Cr.1,264	61,881
—	Fish Disease	—		
483	Equipment	907		
337	Radio Equipment	138		1,045
250	Contribution to Water Resources Account under Section 83(2)(b) of the Water Resources Act, 1963	250		
	Administrative Charges—			
24,634	Staff Salaries, Insurance and Superannuation	28,332		
2,260	Travelling & Subsistence etc.	2,683		
105	Office Furniture & Equipment	736		
	Office Expenses—			
956	Postages & Telephones £600)			
	Printing, Stationery &)	1,031		33,032
	Advertising £431)			
	Legal and Parliamentary Expenses etc.			
878	Prosecutions	1,166		1,166
	Other Items—			
1,008	Commission on Licences	1,090		
415	Insurances £247; Subscriptions £43;)	525		
	Miscellaneous £235)			
7,491	Proportion of General Administrative Charges	6,169		7,784
Cr. 654	General Charges	Cr. 1,359		Cr. 1,359
	Other Items — Proposed Coarse Fish Order	—		—
76,382	Total — FISHERIES & WATER RECREATION (B)	104,813	Cr.1,264	103,549
267,795	Carried Forward (A. & B.)	329,476	Cr.3,892	325,586

Loan and Revenue Accounts — Continued

2 — Continued

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	INCOME			
54,541	Brought Forward (A)	33,566	—	33,566
34,891	Brought Forward (FISHERIES & W.R.)	46,481	—	45,851
274	Penalties — Advocates' Fees, Costs, etc. ...	443		
10	Water Abstraction	10		
25	Miscellaneous	107		
191	Investment Interest applied —purchases of eyed ova ...	—		1,190
<hr/> 35,844	Total — FISHERIES & WATER RECREATION (B)	<hr/> 47,041	<hr/> —	<hr/> 47,041
90,385	Carried Forward (A. & B.) ...	80,607	—	80,607

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
267,795	Brought forward (A. & B.) ...	329,476	Cr.3,892	325,586
	POLLUTION PREVENTION			
725	Capital Transactions:- Non-Grant Aided Works (For details see Table 4) ...	4,000	—	4,000
725		4,000	—	4,000
	Revenue Transactions:-			
	Laboratories—			
8,172	Salaries, Insurance & Superannuation ...	9,056		
1,839	Equipment	1,487		
578	Other Items	317		10,860
—	Analysts' Fees	—		—
—	Oil Spills — Emergency Equipment	1,081		1,081
	Administrative Charges—			
15,833	Salaries, Insurance & Superannuation ...	19,014		
2,721	Travelling, Subsistence, etc.	3,226		
281	Office Accommodation	48		
170	Office Expenses ...	220		
—	Legal Charges	—		
115	Other Items	227		
6,472	Proportion of General Administrative Charges ...	5,457		28,192
Cr. 565	General Charges	Cr. 1,202		Cr. 1,202
—	Other Items	—		—
36,341	Total — POLLUTION PREVENTION (C)	42,931	—	42,931
304,136	Carried forward (A - C) ...	372,407	Cr.3,892	368,517

Loan and Revenue Accounts – Continued

2 – Continued

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	INCOME			
90,385	Brought forward (A. & B.)	80,607	—	80,607
	POLLUTION PREVENTION			
578	Capital Transactions:- Non-Grant Aided Works Loans Raised	—	—	—
578		—	—	—
449	Revenue Transactions:- Fees for Analyses ...	174		174
—	Transfer of Proportion of costs of oil spills emergency equipment : Water Resources	540		540
—	Other Income	50		50
1,027	Total – POLLUTION PREVENTION (C)	764	—	764
91,412	Carried forward (A - C) ...	81,371	—	81,371

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
304,136	Brought forward (A - C) ...	372,407	3,892	368,517
	GENERAL CHARGES			
713	Subscriptions	470		
3,592	Members' Allowances & Chairman's Remuneration	2,933		
98	Insurances	193		
375	Audit Stamp Duty	400		
71	Other Items— Hospitality	150		4,146
4,849	Total — GENERAL CHARGES (D)	4,146	—	4,146
	GENERAL ADMINISTRATIVE CHARGES (not directly allocated to Services)			
2,892	Capital Transactions:- Non-Grant Aided Works (For details see Table 4)	—	—	—
2,892	Carried forward — GENERAL ADMINISTRATIVE CHARGES	—	—	—
308,985	Carried forward (A - D) ...	376,553	Cr. 3,892	372,663

Loan and Revenue Accounts — Continued

2 — Continued

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	INCOME			
91,412	Brought forward (A - C) ...	81,371	—	81,371
	GENERAL CHARGES			
6,563	Interest — Deposit Accounts	8,579		
603	Assisted Car Purchase Scheme	782		
19	Loan to Internal Drainage Board	13		
	Allocation to Main Services etc.,			
Dr.588	Water Resources	Dr. 1,412		
Dr.529	Land Drainage	Dr. 1,255		
Dr.654	Fisheries & Water Recreation	Dr. 1,359		
Dr.565	Pollution Prevention	Dr. 1,202		4,146
4,849	Total — GENERAL CHARGES (D)	4,146	—	4,146
	GENERAL ADMINISTRATIVE CHARGES			
	Capital Transactions:-			
—	Non-Grant Aided Works	—	—	—
—	Carried forward — GENERAL ADMINISTRATIVE CHARGES	—	—	—
96,261	Carried forward (A - D) ...	85,517	—	85,517

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
308,985	Brought forward (A - D) ...	376,553	Cr.3,892	372,663
2,892	Brought forward – GENERAL ADMINISTRATIVE CHARGES	—	—	—
	Revenue Transactions:-			
	Office Accommodation			
9,173	Rent & Rates £1,944; Heating) Lighting & Cleaning £4,710;) Repairs and Maintenance) £1,290; Miscellaneous £211)	8,155		
7,553	Loan Charges	7,553		
	Office Expenses			
773	Furniture & Equipment	755		
5,188	Postages £706; Printing) Stationery & Advertising £1,943) Telephones £2,534)	5,183		
1,307	Other Items	2,231		23,877
26,886	Total – GENERAL ADMINISTRATIVE charges (E)	23,877	—	23,877
335,871	Carried forward (A - E) ...	400,430	Cr. 3,892	396,540

Loan and Revenue Accounts — Continued

2 — Continued

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	INCOME			
96,261	Brought forward (A - D) ...	85,517	—	85,517
—	Brought forward — GENERAL ADMINISTRATIVE CHARGES	—	—	—
	Revenue Transactions:-			
108	Sundry Rents	120		120
21	Miscellaneous Income ...	28		28
	Allocated to Main Services etc.			
6,740	Water Resources	6,408		
6,054	Land Drainage	5,695		
7,491	Fisheries & Water			
	Recreation	6,169		
6,472	Pollution Prevention	5,457		23,729
<u>26,886</u>	Total — GENERAL ADMINISTRATIVE CHARGES (E)	<u>23,877</u>	—	<u>23,877</u>
123,147	Carried forward (A - E) ...	109,394		109,394

Statement of Income and Expenditure on

TABLE

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	EXPENDITURE			
335,871	Brought forward (A - E) ...	400,430	Cr. 3,892	396,540
	GENERAL			
—	Capital Transactions:- Non-Grant Aided Works (For details see Table 4) ...	—	—	—
—			—	—
2,117	Revenue Transactions:- Rechargeable Works ..	591		591
2,117	Total — GENERAL	591		591
337,988	GRAND TOTALS	401,021	Cr. 3,892	397,131
24,091	Balances — Income in Excess of Expenditure for the Year ...	—	3,892	3,892
362,079		401,021	—	401,021

Loan and Revenue Accounts — Continued

2 — Continued

1972-73 £		Revenue Account £	Loan Account £	Grand Total £
	INCOME			
123,147	Brought forward (A - E) ...	109,394	—	109,394
	GENERAL			
—	Capital Transactions:- Non-Grant Aided Works	—		—
—		—		—
2,117	Revenue Transactions:- Rechargeable Works ...	591		591
225,480	Precepts— Councils of Counties and County Boroughs (for details see Table 5)	232,963		
3,668	Internal Drainage Boards (for details see Table 5)	4,022		236,985
231,265	Total — GENERAL	237,576	—	237,576
354,412	GRAND TOTALS	346,970	—	346,970
7,667	Transfer from Precept Adjustment Account ...	47,401	—	47,401
	Balance — Expenditure in Excess of Income for the Year	6,650	—	6,650
362,079		401,021	—	401,021

Table 3
WATER RESOURCES

Particulars of Transactions during the year in respect of Capital Works

Starting Date	Probable Date of Completion	Brief Description of Works	Total Estimated Cost	EXPENDITURE		Total to 31st March 1974	LOANS RAISED		Source of Loan
				During year covered by Report			During year covered by Report	Total to 31st March 1974	
			£	Revenue £	Loan £	£	£	£	£
		HYDROMETRIC WORKS							
		Grant Aided Expenditure:-							
		Gauging Stations—							
Nov. 1972	Completed	River Ehen — Ennerdale	5,950	6,574		10,295			
May 1972	Completed	St. John's Beck — Thirlmere	9,029	110		9,029			
June 1972	Completed	River Derwent — Camerton	2,710	385		2,596			
June 1972	Completed	Camerton Gauging Station							
		— Telemetric Equipment	1,080	Cr323		960			
06 Sept. 1973	1974	River Cocker — Southwaite G.S.	1,860	182		182			
July 1973	Dec. 1973	River Calder — Calderbridge	6,800	7,568		7,568			
Sept. 1973	1974	River Ehen — Braystones	3,400	3,314		3,314			
Sept. 1973	1974	River Lowther — Eamont Bridge	1,800	1,164		1,164			
April 1973	Completed	Ousebridge Gauging Station Impt.	750	769		769			
Feb. 1974	1974	River Cocker — Scalehill G.S.	800	841		841			
July 1973	1974	River Esk — Netherby							
Jan. 1974	1974	Reconstruction	3,350	4,911		4,911			
		Metreological Equipment ...	1,800	350		350			
		Floodwarnings —							
	1974	Cockermouth Scheme	1,470	101		1,461			
				25,946	—				
		WATER CONSERVATION WORKS							
March 1971	Completed	Haweswater & Thirlmere etc.							
		Investigations	81,180	8,997	Cr. 6,587	86,664		74,000	P.W.L.B.
		Bassenthwaite Temporary Scheme	218,500	6,786	Cr. 4,055	26,786		20,000	P.W.L.B.
Dec. 1972	Completed	Derwent Catchment Study	7,500	12		7,304			
March 1974	1974	Groundwater Network Scheme	1,000	500		500			
				16,295	Cr.10,642				
		Carried Forward		42,241	Cr.10,642				

Particulars of Transactions during the year in respect of Capital Works

TABLE 3 – Continued

Starting Date	Probable Date of Completion	Brief Description of Works	Total Estimated Cost	EXPENDITURE		Total to 31st March 1974	LOANS RAISED		Source of Loan
				During year covered by Report	Loan		During year covered by Report	Total to 31st March 1974	
		Brought forward:	£	Revenue £ 42,241	Loan £ Cr.10,642	£	£	£	
		OTHER ITEMS							
		Radio Equipment		764		2,295		1,222	P.W.L.B.
		New Vehicle		841		841			
				1,605	—				
		GRAND TOTAL – CAPITAL EXPENDITURE		43,846	Cr. 10,642				

Table 4

**Particulars of Transactions during the year in respect of Capital Works
(Other than for Water Resources)**

Starting Date	Probable Date of Completion	Brief Description of Works	Total Estimated Cost	EXPENDITURE		Total to 31st March 1974	LOANS RAISED		Source of Loan
				During year covered by Report			During year covered by Report	Total to 31st March 1974	
			£	Revenue £	Loan £	£	£	£	
		LAND DRAINAGE							
		Grant Aided Expenditure:							
July 1969	1974	Waver – Part III	21,956	6	Cr. 6	22,462		13,302	P.W.L.B.
August 1971	1974	River Eden – Carlisle							
		Floodbanks	58,130	587	Cr. 555	57,580		28,552	P.W.L.B.
Sept. 1972	1974	Carmoss Sough Impt.	2,600	59	Cr. 25	2,185		1,000	P.W.L.B.
August 1973	1974	Rumbling Bridge Sough Impt.	14,199	14,154		14,154			
Sept. 1973	1974	Cuddyarch & Dale Sough Impt.	27,900	13,307		13,307			
Sept. 1973	1974	Rook Beck Improvement	7,580	5,181		5,181			
Dec. 1973	1974	River Eden – Floodwarning Scheme Stage II	2,260	2,101		2,101			
Dec. 1972	1974	Cockermouth Flood Warning Scheme	2,010	976	Cr. 875	1,713			P.W.L.B.
		Radio Equipment		1,167	Cr.1,167	3,059		2,442	
				37,538	Cr.2,628				
		Non-Grant Aided Expenditure:							
		New Vehicles		4,178					
		New Plant		12,496					
		Radio Equipment		764					
		Fitters House	3,800	300	—	3,800		3,500	P.W.L.B.
				17,738	—				
		TOTAL – LAND DRAINAGE		55,276	Cr.2,628				
		Carried Forward		55,276	Cr.2,628				

Particulars of Transactions during the year in respect of Capital Works – Continued
(Other than for Water Resources)

Table 4 – Continued

Starting Date	Probable Date of Completion	Brief Description of Works	Total Estimated Cost	EXPENDITURE		Total to 31st March 1974	LOANS RAISED		Source of Loan
				During year covered by Report			During year covered by Report	Total to 31st March 1974	
			£	Revenue £	Loan £	£	£	£	
		Brought forward		55,276	Cr.2,628				
		FISHERIES & WATER RECREATION							
Oct. 1972	Uncertain	Holmwrangle Hatchery ...	31,190	25,800		26,294			
August 1972	Completed	Eamont Fish Pass, Trap and Counter	7,205	369		5,419			
Nov. 1972	Completed	Lowther Fish Trap ...	2,300	178		1,925			
Dec. 1972	Completed	Liza Fish Trap	1,300	1,502	Cr.1,264	1,502			
March 1974	1974	Irt Fish Trap	1,310	781		781			
		Radio Equipment		255		255			
		New Vehicles		248		248			
		TOTAL – FISHERIES AND WATER RECREATION ...		29,133	Cr.1,264				
		POLLUTION PREVENTION							
		Auto-Analyser Equipment	4,000	4,000	—	4,000			
		TOTAL – POLLUTION PREVENTION	4,000	4,000	—				
		GRAND TOTAL—CAPITAL EXPENDITURE		88,409	Cr.3,892				

Table 5

Precept on (a) Councils of Counties and County Boroughs and
(b) Internal Drainage Boards

						Acreage within River Authority Area £	Appropriate Penny Rate Product £	Amount of Precept £	Equivalent Rate in the Pound
(a)	County Councils:								
	Cumberland	...	...	...	...	882,105	280,606	165,680	
	Westmorland	...	...	...	...	237,066	19,394	11,451	
	Northumberland	...	...	...	...	12,480	193	114	
	North Riding of Yorkshire	...	...	...	...	512	—	—	
						1,132,163	300,193	177,245	
	County Borough Council:								
	Carlisle	...	...	...	...	6,092	94,368	55,718	
					TOTALS	1,138,255	394,561	232,963	0.59p
(b)	Internal Drainage Boards:								
	Allonby Bay and River Ellen	...	...	...				1,028	
	Waver and Wampool	...	...	...				2,994	
							GRAND TOTAL	236,985	

TABLE 6

Income from Drainage Charges

NONE

TABLE 7

Loan Statement

	Water Resources £	Other than Water Resources £
(a) Loans Raised and Repaid during the year:		
Total loans outstanding at Beginning of year—1st April, 1973	140,026	204,650
Add—Loans raised during the year (for details see Tables 3 & 4)	—	—
	<hr/>	<hr/>
	140,026	204,650
Deduct—Principal repaid during the year	14,271	17,740
	<hr/>	<hr/>
Total loans outstanding at the end of the year — 31st March, 1974	125,755	186,910
	<hr/>	<hr/>
(b) Sinking or Redemption Funds — NONE		

TABLE 8

Contributions to Internal Drainage Boards

 NIL

CUMBERLAND RIVER AUTHORITY
NET EXPENDITURE AND PRECEPTS

Year	NET EXPENDITURE					PRECEPTS					
	Land Drainage	Pollution Prevention	Fisheries and Water Recreation	Total	Increase (I) or Decrease (D) over Previous Year	Local Authority	I.D.A.'s	Total	Increase (I) or Decrease (D) over Previous Year	Deficit	Surplus
	£	£	£	£	%	£	£	£	%	£	£
OTHER FUNCTIONS											
1965-66	60,389	7,518	1,654	69,561	6.8(D)	76,611	2,783	79,394	8.6(I)		9,833
1966-67	66,549	9,468	5,078	81,095	16.6(I)	80,658	3,187	83,845	5.6(I)		2,750
1967-68	73,524	10,516	9,449	93,489	15.9(I)	82,876	3,398	86,274	2.9(I)	7,215	
1968-69	93,858	13,139	11,247	118,244	26.5(I)	110,424	3,753	114,177	32.3(I)	4,067	
1969-70	105,084	16,143	22,193	143,420	21.3(I)	138,222	4,047	142,269	24.6(I)	1,151	
1970-71	114,933	22,806	27,716	165,455	15.4(I)	155,455	4,420	159,875	12.4(I)	5,580	
1971-72	121,842	27,690	28,351	177,883	7.5(I)	191,768	3,217	194,985	22.0(I)		17,102
1972-73	139,978	35,168	39,749	214,895	20.8(I)	225,480	3,668	229,148	17.5(I)		14,253
1973-74	191,097	42,167	57,772	291,036	35.4(I)	232,963	4,022	236,985	3.4(I)	54,051	

WATER RESOURCES ACCOUNT

1965-66		26,081				25,120	Charge	25,120		961	
1966-67		32,493	24.6(I)			39,543		39,543	57.4(I)		7,050
1967-68		31,722	2.4(D)			40,452		40,452	2.3(I)		8,730
1968-69		35,601	12.2(I)			43,117		43,117	6.6(I)		7,516
1969-70		64,445	81.0(I)				112,725				48,280
1970-71		98,460	52.8(I)				74,841		33.6(D)	23,619	
1971-72		95,676	2.8(D)				105,879		41.5(I)		10,203
1972-73		115,420	20.6(I)				103,873		1.9(D)	11,547	
1973-74		104,290	9.6(D)				105,380		1.5(I)		1,090