WELLAND AND NENE RIVER AUTHORITY

FOURTH ANNUAL REPORT 1968-1969

WELLAND AND NENE RIVER AUTHORITY

FOURTH

ANNUAL REPORT

1968-1969

Chairman

T. R. PICK, Esq., O.B.E.

Vice Chairman

COUNTY ALDERMAN H. C. L. WARWICK

OUNDLE
Peterborough

D. S. AKROYD
Clerk of the Authority

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PREFACE

This Report is published as required by section 110 of the Water Resources Act 1963, and is in the form and contains particulars as directed by the Minister of Agriculture, Fisheries and Food and the Minister of Housing and Local Government.

The Welland and Nene River Authority were constituted by the Welland and Nene River Authority Constitution Order 1964 (S.I. No. 1030) made by the Minister of Housing and Local Government and the Minister of Agriculture, Fisheries and Food in exercise of the powers conferred on them by sections 3, 7 and 134 of the Water Resources Act, 1963.

That Order provided that the number of local authority members should be as follows:

County	*No. of Members*
Bedford	None
Buckingham	None
Cambridgeshire and Isle of Ely	One
Huntingdon and Peterborough	Two
Leicester, Rutland	One jointly
Lincoln, Parts of Holland	One
Lincoln, Parts of Kesteven	One
Norfolk	None
Northampton	Six
County Borough	
Northampton	Two

One of the two members appointed by Huntingdon and Peterborough County Council shall be from among persons nominated by Peterborough Municipal Borough Council.

One of the six members appointed by Northampton County Council shall be from among persons nominated by Corby Urban District Council.

The Minister of Agriculture, Fisheries and Food in accordance with the provision of section 6 (3) of the Water Resources Act, 1963 made five appointments of persons qualified in respect of land drainage, two appointments of persons qualified in respect of fisheries, and two appointments of persons qualified in respect of agriculture.

The Minister of Housing and Local Government in accordance with the provision of that section made two appointments of persons qualified in respect of public water supply and two appointments of persons qualified in respect of industry other than agriculture.

The River Authority came into existence on the 15th October, 1964 (S.I. No. 1267) and took over the functions assigned to them on the 1st April, 1965. The first meeting was held at Peterborough on the 17th November, 1964. The first re-constitution took place on the 1st November, 1967, and the present appointments will expire on the 31st October, 1970.

The Area comprises 1,547 square miles, of which 934 square miles are in the Nene Hydrometric area and 613 square miles are in the Welland Hydrometric area. The total length of main river on the 31st March 1969 was 492 miles, the length of the River Nene and tributaries being 258 miles and the length of the River Welland and tributaries being 234 miles. The estimated penny rate product for 1968-69 was £130,222. The precept of the County and County Borough Councils for the year ended 31st March 1969 was 2.35 pence, and produced £306,022. The contribution required of internal drainage boards amounted to £65,509. Annual loan charges amounted to £174,635.

MEMBERSHIP

1. MEMBERSHIP OF THE AUTHORITY

CHAIRMAN OF THE AUTHORITY

T. R. Pick Esq., O.B.E.

VICE CHAIRMAN OF THE AUTHORITY

County Alderman H. C. L. Warwick

MEMBERS AND APPOINTING AUTHORITIES

Appointed by Cambridgeshire and Isle of Ely County Council

County Councillor M. H. T. Carter

Appointed by Huntingdon and Peterborough County Council

County Alderman Lt. Col. the Hon. P. E. Brassey, J.P., D.L.
Councillor G. A. Foster (*appointed on the nomination of Peterborough Municipal Borough Council*)

Appointed by Leicester and Rutland County Councils, jointly

County Alderman J. A. E. Bryan, O.B.E.

Appointed by Lincoln (Parts of Holland) County Council

County Alderman H. Waltham

Appointed by Lincoln (Parts of Kesteven) County Council

County Councillor G. A. Griffin

Appointed by Northampton County Council

County Alderman P. Campion, M.B.E.
Councillor J. R. Carr (*appointed on the nomination of Corby Urban District Council*)
Alderman C. E. Goode
County Alderman Mrs. D. P. Oxenham, C.B.E., J.P.
County Alderman H. C. L. Warwick
County Alderman E. E. Wright, M.B.E.

Appointed by Northampton County Borough Council

Alderman J. B. Corrin
Councillor R. P. Dilleigh

Appointed by the Minister of Agriculture, Fisheries and Food as being qualified in respect of Land Drainage

R. J. Berry, Esq.
G. H. Hoyles, Esq.
T. R. Pick, Esq., O.B.E.
A. C. Pyrah, Esq., J.P.
H. Cole Tinsley, Esq., M.B.E.

Appointed by the Minister of Agriculture, Fisheries and Food as being qualified in respect of Fishery Interests

P. H. Tombleson, Esq., F.Z.S.
L. G. Turnill, Esq.

Appointed by the Minister of Agriculture, Fisheries and Food as being qualified in respect of Agriculture

H. J. T. Carter, Esq., J.P.
D. Whittome, Esq.

Appointed by the Minister of Housing and Local Government as being qualified in respect of Public Water Supply

Councillor C. S. Bowering
L. H. Brown, Esq., B.Sc., F.I.C.E., M.I.W.E.

Appointed by the Minister of Housing and Local Government as being qualified in respect of Industry other than Agriculture

G. C. S. Oliver, Esq.
N. A. Pearce, Esq., B.E.M.

2. MEMBERSHIP OF STATUTORY AND STANDING COMMITTEES

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H. J. T. Carter, Esq.
Alderman J. B. Corrin
Councillor R. P. Dilleigh
County Alderman Mrs. D. P. Oxenham
N. A. Pearce, Esq.
H. Cole Tinsley, Esq.
L. G. Turnill, Esq.
County Alderman H. Waltham
County Alderman E. E. Wright

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Councillor G. A. Griffin
G. H. Hoyles, Esq.
T. R. Pick, Esq.
A. C. Pyrah, Esq.
County Alderman H. Waltham
County Alderman H. C. L. Warwick
D. Whittome, Esq.

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Councillor J. R. Carr
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T. R. Pick, Esq.
County Alderman H. C. L. Warwick

Rutland Project Committee

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L. H. Brown, Esq., Vice-Chairman

R. J. Berry, Esq.
T. R. Pick, Esq.
County Alderman H. Waltham
County Alderman H. C. L. Warwick
County Alderman E. E. Wright

STAFF

1. PRINCIPAL OFFICERS

Office	Name
Clerk of the Authority ..	D. S. Akroyd, LL.B., Solicitor.
Chief Engineer	H. W. Clark, A.M.I.Struct.E., M.I.W.E.
Associate Chief Engineer ..	R. L. G. Baxter, B.Sc., A.C.G.I., F.I.C.E., M.I.W.E. (*retired 30th September*)
Deputy Chief Engineer ..	G. E. Bowyer, B.Sc., M.I.C.E., A.M.I.W.E.
Treasurer	A. E. Lane.
Chief Fisheries and Pollution Prevention Officer	R. E. Field, A.M.Inst.W.P.C.

2. OTHER OFFICERS
(*as at 31st March*, 1969)

Clerk's Department and General Administration

Chief Assistant	Senior Officer
Clerical Assistant	Clerical 2/3
Secretary	Clerical 1
Field Officers (2)	Misc. 5/6
Typists (7)	Scale as appropriate
Telephonist	Scale as appropriate

Chief Engineer's Department

Senior Engineer	Principal Officer I
Divisional Engineers (5)	Senior Officer
Hydrologist	Principal Officer I
Engineer i/c Rutland Project ..	Principal Officer I
Senior Assistant Engineer ..	Senior Officer
Assistant Engineers (5)	AP 3/4/5 or T5/6
Assistant Hydrologist	AP 3/4
Chief Draughtsman	Tech. 5
Junior Draughtsmen and Engineering Assistants (17)	Tech. 1 to 5
Pupil Engineers	As approved
Chief Clerk	AP 3
Clerks and Machine Operators (3)	Clerical 1
Typists/General Clerk (2) ..	Scales as appropriate

Treasurer's Department

Senior Assistants (2)	AP 3
Clerical Assistants (4)	Clerical 1/2/3
General Clerk/Machine Operator (1)	Clerical 1
Junior Assistants (2)	Clerical 1

Fisheries and Pollution Prevention Department

Chemist	AP 5
Assistant Chemist	T5/6
Senior Assistant Inspector	AP 5
Assistant Inspector (1)	AP 3/4
Junior Assistant Inspector (1)	Tech. 4
Trainee Inspector	Tech. 3/4
Laboratory Assistants (2)	Tech. 1
Shorthand Typist	Scale as appropriate

3. WATER BAILIFFS

Water Bailiffs (2)	Misc. 4
Honorary Water Bailiffs (77)	

4. LABOUR FORCE
(*as at* 31.3.69)

Tradesmen	15
Foremen and Under Foremen	24
Plant Drivers	45
Storekeepers, Sluicekeepers, Toll-keepers, etc.	6
Labourers	83
	173

LIONEL BAXTER

Mr. Baxter retired on the 30th September under the provisions of section 106 of the Water Resources Act, 1963.

Apart from a short period overseas he spent 32 years as a land drainage engineer on the Rivers Nene and Welland. Appointed Divisional Engineer to the Nene Catchment Board in 1936, he served that Board until going to the Welland Area as Deputy Engineer in 1948, and he became Chief Engineer of the Welland River Board in 1959. He was thus closely associated with the major Nene Improvement Scheme carried out between 1936 and 1940, and he had much responsibility for the major Welland Scheme carried out between 1947 and 1954, two of the largest land drainage schemes then undertaken.

On the establishment of the Authority he was appointed Associate Chief Engineer, but he chose to stay at the Spalding Office as his special interest and concern was with fenland drainage work.

He can look back with pride and satisfaction at having made such a valuable contribution to improving the drainage of his native fenland, and in the Fens that is perhaps the most fundamental contribution that can be made to the economic well being of the community.

WATER RESOURCES

1. GENERAL REVIEW

The Rutland Project (referred to on page 19) dominated water conservation work in the past year, but routine, although nevertheless important, work continued so that a fuller appreciation could be made of what is required " for securing the protection and proper use of inland waters and water in underground strata ". When the installation of hydrometric works has been completed and sufficient data has been accumulated, it will be possible to move to a more constructive stage and to develop the policies and proposals which are shewn to be necessary.

Close co-operation with the Water Resources Board continued, and their guidance and assistance is valued.

The Minister's decision to proceed with a desk study on a Wash Barrage was received with satisfaction, as it was the Chairman of the Water Conservation Committee who suggested to him when he received a deputation from the Water Resources Board and the River Authorities in East Anglia on the 4th July 1967 that, if a full feasibility study could not be undertaken at that time, it might at least be possible to authorise a desk study. The first meeting of representatives of the Water Resources Board, the Wash River Authorities and others concerned was held at Oundle on the 16th May 1968. Information as required by the Water Resources Board's Consulting Engineers has been provided, and their Report is awaited with great interest.

The opinion appears to be widely held by many who are opposed to the proposed Empingham Reservoir that it would not be necessary if this Authority, when established in 1965 had given immediate consideration to the construction of a Wash Barrage, and that indeed it was still not too late for the Reservoir to be thereby avoided. It is also suggested that desalination is another alternative that could make the Reservoir unnecessary. A project of the magnitude of the Wash Barrage, like the Channel Tunnel, must be considered in relation to the national economy, as its benefits would extend far beyond the Areas of the four Wash River Authorities. It can not be emphasized too strongly that since River Authorities were established in 1965 the Wash Barrage has never been an alternative to reservoirs required to meet immediate demands in the South East's Central Area.

Proposals for substantial " New Town " expansion at Northampton and Peterborough were announced in the South East Survey published by the Ministry of Housing and Local Government in 1964. Although the two Development Corporations were not established, and expansion will not commence as soon as had been intended, there will be a substantial increase in the demand for water long before it could be met by a Wash Barrage.

It is believed that before the end of the century this Area will contain the largest population expansion of any Area in the Country. The present proposals are that the population of Northampton will increase from 130,000 to 300,000, and that of Peterborough from 100,000 to 220,000. Expansion of Corby New Town continues, and the population may rise by another 50,000 in the next 30 years. Overspill development by the Greater London Council is taking place at Wellingborough, and by Birmingham City Council at Daventry. The present estimate is that the population to be supplied from the water resources of the Area will increase from 741,000 to 1,064,000 in 1981, and to 1,389,000 in 2001, but there may be still further expansion

beyond that now planned. If a third London Airport is established at Thurleigh, just over the southern boundary, its effect on Wellingborough, Rushden and Northampton will have an even greater impact on the water requirements in this Area.

At the same time, it is estimated that the present consumption per capita of 51 gallons per day will increase to 96 gallons per day by 2001. The demand can only be met by a pumped storage reservoir such as is proposed at Empingham, and that will only suffice to 1990. Unless water can then be obtained from a Wash Barrage, de-salination has become an economic proposition, or further research shews that some of the tentative possibilities now mentioned are practicable, a second pumped storage reservoir will then be required to make the maximum use of the water in the Welland and Nene. As is mentioned on page 13, investigation of the resources of the Lincolnshire Limestone is proceeding, and the possibility of its conjunctive use is being examined, but otherwise the Nene and the Welland are the last major exploitable sources in the Area, and the two rivers have almost been exploited to the full.

2. PERIODIC SURVEY

Work continued on the first of the Periodic Surveys, which it is hoped will be available in draft by the end of 1969. Preparation of evidence for the Committee Stage of the Empingham Bill involved a re-examination and analysis of much of the work which had been done.

3. HYDROMETRIC SCHEMES

Expenditure on Part I of the Hydrometric Scheme amounted to £16,625, bringing the aggregate to £55,287, and leaving an estimated expenditure of £23,000 to complete that Part.

Work on new gauging stations and on the improvement of existing gauging stations continued. The construction of a Crump weir 16 feet wide to replace the broad crested weir installed at Wollaston (River Nene) in 1944 was almost completed, and flows up to 80 cusecs will then be measured.

At present no low-flow measurements are made on the River Nene between Wollaston (Wellingborough) and Orton (Peterborough). Preparatory work is in hand to remedy that defect by the construction of a gauging station at Lilford upstream of Oundle. It will comprise a Crump weir 20 feet wide to measure river flows up to 100 cusecs, and will provide valuable information on low-flow characteristics. The estimated cost is £3,970.

Upton Mill Byepass Gauging Station on the Kislingbury Branch of the River Nene was almost completed. It replaces the original broad-crested weir by a Crump weir in re-inforced concrete. New instruments were installed there and on the Mill flume. The station will provide more accurate information over a greater range of flows than that installed by the Catchment Board in 1939.

River Gauging Stations installed by the River Nene Catchment Board some 30 years ago did not afford sufficient information as to the low-flow characteristics of the minor tributaries and streams. There were no records at all for the minor tributaries of the River Welland.

Consequently, the River Gauging Scheme provides for the construction of a number of low-flow stations for the lesser streams comprising a pre-fabricated sheet steel Crump weir, with conventional digital and visual recording instruments. Two sizes have been installed with crestlengths of 6 feet and 8 feet, and nominal capacities of 20 cusecs and 30 cusecs respectively. For greater discharges observations are being made by current meters to establish stage/discharge relationships at adjacent river sections.

These pre-fabricated weirs have been constructed on the Wootton Brook at Ladybridge, on the East and West Glens at Irnham, Burton Coggles, Little Bytham, Grimsthorpe, and Shillingthorpe, on the Gwash (North Brook) at Empingham, and on the River Chater at Ridlington.

Satisfactory progress was made on other Hydrometric work. A portable current meter with cableway was acquired to provide greater flexibility in river gauging observations.

Continuous water level recorders were installed on the River Glen at Surfleet and on the River Nene at Dog-in-a-Doublet.

The rain gauge net work was expanded by three more gauges, two of which are automatic recorders.

4. INVESTIGATION OF WATER IN UNDERGROUND STRATA

Field work was carried out in association with the Lincolnshire River Authority and the South Lincolnshire Water Board under the guidance of the Water Resources Board for their Report on the Ground Water Resources of the Lincolnshire Limestone. The Report is awaited with great interest, as it will provide a basis for further investigations essential if proper use is to be made of ground water.

A summary of the Report's broad conclusions was received in February, and they are of such importance that it is appropriate to refer to them without awaiting the publication of the full Report. It must be emphasized that the Report is by the Water Resources Board. Appreciation of the valuable work by their geologists is recorded, and this extensive reference to the Report is not an encroachment on that work. South Lincolnshire in the context of the Report includes part of this Area and part of the Lincolnshire River Authority's Area, and the statistics quoted are an aggregate for the two Areas.

The Report will point out that, once the demand for groundwater in South Lincolnshire exceeds the natural annual replenishment of the aquifer, two possible choices are available; the first involves the conjunctive use of the two rivers and ground water from the Lincolnshire Limestone, and the second involves artificial re-charge of the Limestone with water from the two rivers. Conjunctive use of surface and ground water would require development of the Welland or Nene, or both of them, by direct river abstractions as the demand for water exceeds that available from the aquifer. As the demand increased a supply would be taken from the rivers for progressively longer periods, while the aquifer was pumped for shorter periods at higher rates.

The proposed Empingham Reservoir (the Rutland Project) will utilise a considerable proportion of the water available from the two rivers to meet the requirements of the water undertakings. The Report will suggest that part of the storage could be used to regulate flows in the River Welland, and thus provide a reliable direct supply for the South Lincolnshire Water Board. The first intention was that water released from the reservoir might be abstracted from the Welland near Market Deeping, and (after treatment) taken directly into supply. But, as will be explained below, the present intention is that reservoir water shall be used to maintain an adequate flow in the rivers to enable the Water Board to make the maximum use of ground water (requiring no treatment other than chlorination) which provides an essential and substantial part of the flow in the Lincolnshire streams and fenland drains through the many springs and artesian bores.

Artificial re-charge of the Lincolnshire Limestone would be through injection wells, and (as the hydrostatic pressure is above ground level over an appreciable area of South Lincolnshire) water levels would have to be lowered systematically to provide storage space. As the demand for water is greatest in Unit IV (the district between Bourne and Peterborough), the Report will suggest that re-charge should be restricted to that Unit.

The scale of artificial re-charge would be limited by:

(i) the availability of surplus river water for recharge, and the possible need for bank side storage:

(ii) the maximum amount of water that could be re-charged, which would depend—inter alia—upon the cost of providing adequate pump and chemical treatment capacity, and

(iii) the minimum water level that can be accepted in the aquifer without producing deleterious effects, as for example westerly movement of saline water.

The Report will state that the demand for water by the South Lincolnshire Water Board is likely to exceed the ground water available from natural replenishment by 1978, and the total demand for water by the end of the century—primarily from that Board—is estimated to be about 50 m.g.d., an increase of 35 m.g.d. The Water Resources Board considers that the additional demand can be met if ground water in the limestone can be developed successfully in conjunction with surface water from the two rivers.

As is pointed out in the Summary, if the ground water level in the Lincolnshire Limestone were to be lowered to develop the resources more efficiently, ground water discharges would be reduced, and that would affect particularly the River Glen and (in the Lincolnshire River Authority's Area) the South Forty Foot Drain. The flow could be maintained by pumping compensation water from the Limestone whenever it fell below a prescribed minimum, but the use of good quality ground water for compensating purposes would be at the expense of the total resources.

An Empingham Reservoir would avoid this use of good quality ground water by enabling water to be released from the reservoir down the River Gwash (on which the Reservoir is sited) in dry periods and diverted by a short connection to the River Glen, from where it could be fed to the South Forty Foot Drain when necessary.

The Report will summarise the ground water resources of the Lincolnshire Limestone in relation to South Lincolnshire as follows:

	mgd	m³/d
Theoretical resources	22	100,000
Licensed at end of 1967 ..	30	136,000
Abstracted in 1965	15	68,000

It is estimated that there is no additional reliable yield available for development, as the quantity of water authorised to be abstracted exceeds the theoretical resources by 8 m.g.d. (36 000 m³/d), but actual abstractions in 1965 amounted only to 15 m.g.d. Provided the present pattern of ground water use remains unchanged, 4 m.g.d. more than that abstracted in 1965 could be abstracted without noticeably affecting the flows.

When the demand for water in South Lincolnshire exceeds the 22 m.g.d. of ground water available from natural replenishment of the limestone augmented by 3 m.g.d. which could be transferred from North Lincolnshire, it may be possible to take greater advantage of the storage capacity of the limestone by using ground water in conjunction with artificial re-charge from surface sources.

The Report will recommend that the optimum method of developing ground water resources in South Lincolnshire should be investigated, and that a pilot scheme to study the problem of artificial re-charge should be carried out. The Water Resources Board expect the Authority to consider what steps need to be taken in respect of the over licensing of theoretical ground water resources. Mathematical and analogue studies need to be made to derive a better understanding of ground water flow problems and the inter relationship between surface and ground water.

Seven gauging stations have been installed on the East and West Glen, and preparations are in hand for an automatic climatological station in the locality of the outcrop.

Nearly 400 wells and boreholes in the Lincolnshire Limestone were inspected with a view to selecting a small number suitable for observations on rest water levels by both continuous water level recorders and manual measurements. This important work is continuing.

A preliminary assessment has been made of the yield from the Greatford Cress Beds. The

boreholes there provide a substantial part of the flow of the Glen in a normal summer, and almost the entire flow in times of drought. South Lincolnshire Water Board are seeking to acquire the boreholes.

If the yield from the boreholes were to be taken for public water supply and discharged as effluent to other streams it would have a serious effect on the Glen. Subject to formal application and to due consideration of any objections, the proposal is that the Water Board shall be licensed to take water to meet their present needs, provided that sufficient is discharged to the Glen as required to sustain a minimum acceptable flow. If and when Empingham Reservoir is built a regulated discharge can be made down the Gwash and diverted to the Glen by means of a short aqueduct near Belmesthorpe (for which power is sought in the Bill) to sustain the Glen with water of inferior quality, so that the Water Board's abstraction of good quality water from the boreholes may be increased to the optimum. It is believed that this proposal was first suggested by the Water Engineer of the former Peterborough City Water Undertaking, and it is an excellent application of the conjunctive use of ground water and surface water made possible by the Water Resources Act, 1963. When the yield from the boreholes is no longer sufficient to meet the Water Board's requirements the Board will be able to take water released by river regulation at Empingham directly from the Welland, but the necessity for providing expensive treatment will have been postponed.

Because of the wet summer and autumn, pumping tests and observations on the river gravels could only be continued at Fotheringhay, Perio, Elton, Warmington and Oundle.

Forty "Jetwells" used for de-watering were simple to install and reliable in operation. An interim report on the technique and on the results was sent to the Water Resources Board in November, and the investigation was approved for grant aid under section 90(b).

As mentioned in the Third Annual Report, the yield from the river gravels at any one place is small. The assessed yield of 1.5 m.g.d. from the Earls Barton source is not regarded as wholly gravel water, as it is thought that the long river side face of the gravel pit probably allows substantial infiltration from the river.

The following table records the progress and results of the gravel investigation to the end of the year.

GROUND WATER—GRAVEL INVESTIGATIONS

Site	*Grid Reference*	*Length of Test*	*Yield m.g.d.*	*Year*	*Remarks*
NENE SUB-CATCHMENT					
Stibbington (Wansford)	089 992	27 days 13 days	0.15 0.20	1967	Two tests made in a dis-used gravel pit.
Perio	049 925	27 days 10 days	0.6 0.75	1967 1968	First test made at new excavation. Second test made using well point system.
Fotheringhay	061 928	11 days	0.27	1968	Test made using well point system.
Elton	084 945		Nil	1968	Unsuitable, no gravel was found in the quantity required.
Warmington	070 919	8 days	0.15	1968	Test made using well point system.
Oundle	043 893	12 days	0.06	1968	Test made from an existing Nene and Ouse Water Board source.
Earls Barton	865 615	52 days	1.5	1967	Test made at a working gravel pit. Output from two pumps discharging into river was metered, output from third pump on intermittent use was estimated.
WELLAND SUB-CATCHMENT					
Deeping St. James	117 076	6 hours	Nil	1967	From new excavation—no infiltration.
Kings Street	115 108	40 days	0.125	1967	Test made in disused gravel pit.