(b) Recording Stations—water levels

Station	*National Grid Reference*	*River*	*Type*	*Duration of records*
Fosdyke, Spalding	TF 318 323	Welland	Tidal	19 years
Marsh Road, Spalding ..	TF 259 241	Welland	Tidal	Intermittent from December 1953
Marsh Road, Spalding ..	TF 260 240	Welland	Freshwater	15 years
Cowbit Road, Spalding ..	TF 246 217	Welland	Freshwater	16 years
Surfleet	TF 280 293	Glen	Freshwater	From March 1969
Dog-in-a-Doublet Lock and Sluices	TL 272 993	Nene	Tidal	Intermittent 1946-56. Continuous from December 1957
Dog-in-a-Doublet Lock and Sluices	TL 272 993	Nene	Freshwater	From June 1968
Lynn Road Piling, Wisbech‡ ..	TF 460 103	Nene	Tidal	11 years
Sutton Bridge	TF 482 210	Nene	Tidal	Records substantially complete 1937-48 Continuous from May 1958

‡ Intermittent records are available for an adjacent site (TF 459 103) from 1946 to 1956.

(c) Staff Gauges

Station	*National Grid Reference*	*Normal water level to Newlyn Datum*	*Duration of records*
Dog-in-a-Doublet Lock and Sluices	TL 272 993	9.5	30 years
Guyhirne Sluice, upstream and downstream ..	TF 397 029	Varies with season	30 years
Little Bridge (Moreton's Leam) Whittlesey ..	TL 273 984	Varies with season	29 years
Stanground Sluice	TL 209 974	D/S varies with season U/S 9.5	63 years
Peterborough Bridge	TL 193 982	9.5	32 years
Water Newton, upstream and downstream ..	TL 110 974	U/S 26.5 D/S 20.7	31 years
Nene Wharf, Oundle	TL 043 888	61.5	36 years
Nene Wharf, Wellingborough	SP 898 663	129.4	35 years
Northampton Generating Station	SP 762 599	183.6	33 years
Northampton South Bridge	SP 755 597	187.7	35 years
Weedon*	SP 632 598	253.3	30 years
Surfleet	TF 279 293	Varies with season	29 years

Water levels are read daily at 09.00 hours G.M.T. at these stations.

* Break in records, February 1967 to March 1969, due to road bridge works.

(d) Low Flow Weirs

Station	*River*	*National Grid Reference*	*Duration of Records*
Ashley	Welland	SP 819 916	6 years
[1]Burton Coggles ..	West Glen ..	SK 987 261	3 years
Empingham	Gwash	SK 955 084	6 years
[2]Ketton	Chater	SK 982 042	7 years
Langton Brook ..	Langton Brook ..	SP 741 910	3 years
Lubenham	Welland	SP 715 871	6 years
Medbourne Brook ..	Medbourne Brook ..	SP 799 931	3 years
*River Jordan	River Jordan ..	SP 741 867	2 years
[3]North Brook	Gwash	SK 957 089	5 years
Stonton Brook ..	Stonton Brook ..	SP 754 924	3 years
North Stream ..	Willow Brook ..	SP 895 901	3 years
Central Stream ..	Willow Brook ..	SP 895 890	3 years
Morcott Brook ..	Chater	SK 917 011	2 years
[4]River Tham	West Glen	SK 998 180	2 years
Fineshade Brook ..	Fineshade Brook ..	SP 980 999	2 years
King Street, North ..	King Street Drain ..	TF 106 140	2 years
King Street, South ..	King Street Drain ..	TF 108 113	2 years
Little Oakley	Harper's Brook ..	SP 891 857	2 years
Billing Brook ..	Billing Brook ..	TL 116 947	1 year
Grendon Brook ..	Grendon Brook ..	SP 883 632	1 year

Readings from these low flow weirs were taken twice weekly from June to October.
* No readings for 1967.
[1]Became permanent Gauging Station February 1969.
[2]Superseded by Foster's Bridge Gauging Station, January 1968.
[3]Became permanent Gauging Station, February 1969.
[4]Superseded by Little Bytham Gauging Station February 1969.

Note: No observations were made during the summer of 1968 due to the exceptionally high discharges which occurred.

RIVER DISCHARGE

(Details of these stations are included on page 29)

NENE HYDROMETRIC AREA

	ORTON (near Peterborough)								
	1966-67			1967-68			1968-69		
	cusec	*m.g.d.*	*m³/sec.*	*cusec*	*m.g.d.*	*m³/sec.*	*cusec*	*m.g.d.*	*m³/sec.*
April	776.4	417.7	21.9721	453.8	244.1	12.8425	192.2	103.5	5.4441
May	335.6	180.5	9.4975	922.3	496.2	26.1011	217.7	117.2	6.1665
June	150.9	81.18	4.2705	236.4e	127.2e	6.6901e	140.1	75.39	3.9671
July	118.1	63.54	3.3422	104.0e	55.95e	2.9432e	723.2	389.3	20.4823
August ..	173.8	93.50	4.9185	94.07e	50.61e	2.6622e	484.4	260.7	13.7176
September ..	202.7	109.1	5.7364	94.25e	50.71e	2.6673e	738.4	397.4	20.9123
October	600.9	323.3	17.0055	245.6	132.1	6.9505	557.9	300.3	15.8007
November ..	455.9	245.3	12.9020	339.3	182.5	9.6022	818.7	440.7	23.1861
December ..	1,112	598.3	31.4696	353.9	190.4	10.0154	747.5	402.3	21.1696
January ..	552.0	297.0	15.6216	789.3	424.6	22.3372	1,245	670.3	35.2688
February ..	614.8	330.8	17.3988	497.3	267.5	14.0736	1,125	605.5	31.8589
March	626.2	336.9	17.7215	199.1	107.1	5.6345	1,166	627.8	33.0333
Monthly Av'ge.	476.6	256.4	13.4878	360.8e	194.1e	10.2106e	679.7	365.9	19.2506
*1940-60 Av'ge.	304 cusec—163.5 m.g.d.—8.6032 m³/sec.								

e=estimated due to reconstruction of gauging station.

	UPTON (Kislingbury Branch)								
	1966-67			1967-68			1968-69		
	cusec	*m.g.d.*	*m³/sec*	*cusec*	*m.g.d.*	*m³/sec*	*cusec*	*m.g.d.*	*m³/sec*
April ..	124.8	67.14	3.5318	45.98	24.74	1.3012	28.62	15.40	0.8099
May	54.05	29.08	1.5296	115.7	62.25	3.2743	34.18	18.39	0.9673
June	29.24	15.73	0.8275	36.38	19.57	1.0295	24.07	12.95	0.6812
July ..	21.77	11.71	0.6161	23.00	12.37	0.6509	77.75	41.83	2.2003
August ..	24.76	13.32	0.7007	18.15	9.76	0.5136	31.66	17.03	0.8960
September ..	22.77	12.25	0.6444	15.46	8.32	0.4375	45.96	24.73	1.3007
October ..	92.57	49.80	2.6197	34.99	18.82	0.9902	56.59	30.45	1.6015
November ..	63.20	34.00	1.7886	55.71e	29.97e	1.5766e	95.72	51.50	2.7089
December ..	172.1	92.59	4.8704	74.33e	39.99e	2.1035e	104.1	56.01	2.9460
January ..	79.52	42.78	2.2504	138.1	74.30	3.9082	178.3	95.93	5.0459
February ..	98.97	53.25	2.8009	74.43	40.04	2.1064	149.3	80.32	4.2252
March ..	88.09	47.39	2.4929	33.21	17.87	0.9398	97.25	52.32	2.7522
Monthly Av'ge.	72.65	39.09	2.0560	55.45e	29.83e	1.5692e	76.96	41.40	2.1780
*1940-60 Av'ge.	45 cusec — 24.21 m.g.d. — 1.2735 m³/sec.								

e=estimated Unable to visit gauging station due to foot and mouth epidemic restrictions.

	ST. ANDREWS (Brampton Branch)								
	1966-67			1967-68			1968-69		
	cusec	*m.g.d.*	*m³/sec.*	*cusec*	*m.g.d.*	*m³/sec.*	*cusec*	*m.g.d.*	*m³/sec.*
April ..	87.48	47.06	2.4757	47.32	25.46	1.3391	23.48	12.63	0.6645
May	41.99	22.59	1.1883	119.7	64.40	3.3875	25.96	13.97	0.7347
June	21.79	11.72	0.6167	30.74	16.54	0.8699	18.66	10.04	0.5281
July	13.88	7.47	0.3928	13.50	7.26	0.3821	40.54	21.81	1.1473
August ..	20.29	10.92	0.5742	10.42	5.61	0.2949	22.93	12.34	0.6489
September ..	18.77	10.10	0.5312	12.00	6.46	0.3396	31.39	16.89	0.8883
October ..	61.14	32.89	1.7303	26.40	14.20	0.7471	38.23	20.57	1.0819
November ..	47.15	25.37	1.3343	38.30	20.61	1.0839	69.02	37.13	1.9533
December ..	112.8	60.69	3.1922	44.45	23.91	1.2579	69.22	37.24	1.9589
January ..	54.97	29.57	1.5557	84.53	45.48	2.3922	117.9	63.43	3.3366
February ..	75.36	40.54	2.1327	57.40	30.88	1.6244	123.5	66.44	3.4951
March ..	63.79	34.32	1.8053	29.85	16.06	0.8447	119.8	64.45	3.3903
Monthly Av'ge.	51.62	27.77	1.4608	42.88	23.07	1.2135	58.39	31.41	1.6524
*1940-60 Av'ge.	45 cusecs—24.21 m.g.d.—1.2735 m³/sec.								

*Average based on Water Year.
m³/sec.=cubic metre/second.

Comparative Table

Year	*Per cent of average*
1968-69	207
1967-68	117
1966-67	153
1965-66	121
1964-65	45

RIVER DISCHARGE

WELLAND HYDROMETRIC AREA

	River Glen discharge at KATE'S BRIDGE (including KING STREET)								
	1966-67			1967-68			1968-69		
	cusec	*m.g.d.*	*m³/sec.*	*cusec*	*m.g.d.*	*m³/sec.*	*cusec*	*m.g.d.*	*m³/sec.*
April ..	143.7	77.31	4.0667	46.32	24.92	1.3109	23.30	12.53	0.6594
May	66.21	35.62	1.8737	101.4	54.55	2.8696	43.33	23.31	1.2262
June	30.71	16.52	0.8691	34.36	18.49	0.9724	11.26	6.06	0.3187
July	16.95	9.12	0.4797	17.62	9.48	0.4986	51.78	27.86	1.4654
August ..	20.86	11.22	0.5903	13.91	7.48	0.3937	43.15	23.21	1.2211
September ..	26.09	14.04	0.7383	11.13	5.99	0.3150	66.18	35.60	1.8729
October ..	36.23	19.49	1.0253	12.79	6.88	0.3619	66.32	35.68	1.8769
November	50.27	27.05	1.4226	27.00	14.53	0.7641	148.3	79.79	4.1969
December ..	103.3	55.57	2.9234	25.32	13.62	0.7165	80.23	43.16	2.2705
January ..	64.14	34.51	1.8152	61.03	32.83	1.7271	133.6	71.88	3.7809
February ..	59.61	32.07	1.6870	46.34	24.93	1.3114	150.2	80.81	4.2507
March ..	59.53	32.03	1.6847	37.07	19.94	1.0491	186.7	100.4	5.2836
Monthly Av'ge	56.47	30.38	1.5981	36.19	19.47	1.0242	83.69	45.03	2.3684
*1961-65 Av'ge.	25.09 cusecs—13.50 m.g.d.—0.7100 m³/sec.								

*Average based on water year

m³/sec—cubic metre/second

Comparative Table

Year	*Per cent of average*
1968-69	333
1967-68	144
1966-67	225
1965-66	234
1964-65	97

LAND DRAINAGE

1. CAPITAL WORKS

(i) General Account and Progress Report

Welland Outfall, LDW: 17319, 17638, 18568, 18821, 19656, 20307, 21011, 21803, 21940, 22606, 22875, 23552. *Estimated Cost:* £480,276, or £461,897.

The scheme for extending the left hand (or north) training wall referred to in the Third Annual Report was approved by the Ministry, and during the year half a mile was constructed through the deepest water with crest about two feet below design level.

More stone was placed to remedy settlement, and to strengthen the length between Bank End and Holbeach Sluice.

When bad weather prevented work in exposed places stoning was continued in the sheltered reach upstream of Holbeach Sluice.

Some 14,800 tons of stone were loaded into barges at Fosdyke.

River Welland, Crowland and Cowbit Washes Pumping Station, LDW: 22920. *Estimated cost:* £27,473. *New River Improvement Works—LDW* 24246—*Estimated Cost* £15,142.

The Crowland and Cowbit Pumping Station was operational shortly before the exceptional storm of 10/11 July, and as that was followed by frequent heavy rain for most of the summer the scheme's remarkable benefit was quickly demonstrated.

Most of the dredging on the New River (which drains to the pumping station) was completed, but remedial work on a number of slips is outstanding.

Kirton and Frampton Sea Banks. LDW 20360. *Estimated Cost:* £40,016.

The disused outfall, adjacent to the Black Sluice Internal Drainage Boards pumping station at Kirton Triangle was sealed off.

Sea Bank (1948) *Holbeach Marsh*

Reference was made in the First and Second Annual Reports to the Famliner sheeting installed on an exposed and friable length of the 1948 Sea Bank. Damage caused by the storm and high tide on 11th July was repaired, but on 19th February a gale force Northerly wind combined with a tide to levels approaching those experienced on 31st January 1953 destroyed the whole length of the sheeting. Remedial work to safeguard the bank was put in hand immediately, and a Scheme providing for stone revetment to a higher level in place of the Famliner was submitted to the Ministry.

Welland Fascine Works, South Bank. LDW 21682, 22104, 22870 *and* 24206. *Total Estimated Cost: for sections* 2, 3, 4 and 5—£15,237.

The schemes are to provide fagot protection on the tidal river upstream of Fosdyke Bridge. Schemes Nos. 2 and 4 were completed, and some work was done on Scheme No. 3 in the vicinity of Surfleet.

River Welland, Tidal Section Pumping Stations. *LDW* 17755, 17756, 18051 and 18059. *Estimated Cost:* £240,462.

It was not possible to complete work on the concrete apron at Risegate Eau Pumping Station Outfall as the pumps were in frequent operation from July onwards.

River Welland, Locks Mill to Folly River Fascines. *LDW* 20784, 21428, 22103, 23050, 23747, 24418. *Estimated Cost:* £31,339.

Fagot protection along the frontage of the Cowbit Wash Cradge Bank was carried out in the Spring and Autumn. Scheme No. 4 (LDW 23050) was completed, and work was in progress on Schemes No. 5 and 6.

River Glen Improvement. *LDW* 16111. *Estimated Cost:* £205,279.

Remedial work was completed on slips downstream of Surfleet Road Bridge. Work commenced on the flood protection wall adjacent to Brownlow Crescent, Pinchbeck, and on the clay cut off to reduce bank seepage near Counter Drain Railway Bridge.

Car Dyke, North Arm. *LDW* 21012. *Estimated Cost:* £20,390.

The scheme as originally approved was completed during the year, but some limited work is required to raise the head wall and bank adjacent to the main road culvert east of Bourne.

River West Glen. *LDW* 21683. *Estimated Cost:* £21,518.

The dredging scheme was substantially completed, and there was a substantial benefit at the upstream end near Little Bytham, while downstream flood water was controlled up to design capacity. Flooding on the undredged lengths upstream was even more noticeable during the sustained and heavy rainfall in July and subsequently.

Cowbit Road Sluices. *LDW* 24041. *Estimated Cost:* £6,500.

For several years there has been some scour on the downstream side of Cowbit Road sluice at the entrance to the Coronation Channel. The Wallingford Hydraulics Research Laboratory advised that to correct the flow pattern would require complex and expensive constructional work and suggested instead that willow mattress should be laid to protect the bank. The Ministry approved the Scheme and it was substantially completed.

River Welland, Market Harborough Flood Alleviation. *LDW* 17460. *Estimated Cost:* £176,088.

Most of the outstanding direct labour work was completed up to Welland Park, but the reconstruction of St. Mary's Road Bridge by Leicestershire County Council was deferred until the Spring of 1969. Although there was still this restriction a succession of high flood discharges were contained. The scheme was designed to the maximum economic channel capacity which could be provided through the town, and as that is less than the maximum flood which might occur it is perhaps prudent to record that flood risk in Market Harborough has not been entirely eliminated.

Car Dyke, Newark Hill to Eye. *LDW* 22752. *Estimated Cost:* £44,078.

As explained in the Third Annual Report, the Car Dyke Scheme will provide much needed capacity to drain surface water from Peterborough. About half the work, including a series of culverts installed by thrust boring, was completed. Unstable clayey-silt through high ground at Eye created difficulties which had been anticipated.

River Welland, Stamford to Market Harborough. *LDW* 18106, 24768. *Estimated Cost:* £170,000.

Part I of the Scheme approved by the Ministry included work upsteam of Welham, where

demolition of a railway bridge provided an opportunity for channel improvement, and also work at Barrowden where storm and flood damage had endangered high level river banks.

Discussions with Stamford Corporation on the preservation of an adequate flow in Kings Mill Stream, " which has been enjoyed since the days of Edward the Confessor ", were not concluded. Dredging commenced further upstream near Tinwell, and was completed to the confluence of the R. Chater.

Part II comprising the length upstream of the R. Chater confluence to Barrowden and costing £70,500 was submitted to the Ministry in March.

The Country Land Owners Association and the Stamford and Rutland Branch of the National Farmers Union asked for a meeting at which they urged more rapid progress, as at the current rate of expenditure it would be over six years before the Scheme was completed. They expressed their concern that the Market Harborough Flood Alleviation Scheme would aggravate flooding downstream. It is hoped to accelerate work from 1970.

River Chater. *LDW* 24751. *Estimated Cost:* £11,600.

The Ministry approved an Improvement Scheme for this tributary from its confluence with the River Welland to Ketton, and work commenced in February.

Wingland (1954) *Sea Bank.* *LDW* 22702. *Estimated Cost:* £2,074.
Sea Bank Improvements. *LDW* 23237. *Estimated Cost:* £29,503.

Shaping to final profile of the Wingland 1951 and 1954 Sea Banks was substantially completed, and material was rough placed along about a mile of the Gedney Enclosure Bank.

River Nene, Foul Anchor Improvement. *LDW* 23492. *Estimated Cost:* £145,294.

This Scheme, described in the Third Annual Report, dealt only with the right hand (or East) Bank and progress was regulated by the limited funds available. A stone toe was laid along about half of the length near the Sewage Farm House, and the first rows of fagots were placed.

River Nene, Slips near Baths Cottage, Wisbech. *LDW* 22580. *Estimated Cost:* £66,034. *Extension of Works* £16,249.

Progress was limited by the funds available. Work on the right (or East) bank was completed downstream of Crab Marsh Depot. Further fagots were placed on the left bank, and excavated material was levelled and re-seeded.

River Nene, Cromwell Road (Upstream) Improvement. *LDW* 23419. *Estimated Cost:* £109,600.

The Scheme, described in the Third Annual Report, was confined to the left (or West) side. A stone toe was laid along the whole length and four rows of fagots were placed on about half the length, but the sustained high flood discharges restricted progress.

River Nene, North Barrier Bank (Bank House Farm) Improvements. *LDW* 23080. *Estimated Cost:* £10,877.

This scheme, described in the Third Annual Report, was completed. The Ministry agreed that the provision of stone and fagot protection should be the subject of a future scheme.

River Nene, Cross Guns Pumping Station. *LDW* 23803. *Estimated Cost:* £21,000.

This Scheme described in the Third Annual Report provides for an improved discharge pipeline. Tidal river dams were driven, and preparations were made to disconnect the pipe during the summer, but the severe rainfall (in excess of 4.5 inches) on July 10th made it necessary to withdraw the dams and suspend all work. Regular operation of the pumping station through-

out the summer produced " winter conditions " and the work had to be deferred in the hope that 1969 would bring better weather.

River Nene, Bank Protection upstream Dog-in-a-Doublet Sluice. *LDW* 22540, 23417/4, 24736. *Estimated Cost:* £11,304 *for Sections* 1, 2 *and* 3.

As was explained in the Second Annual Report the Scheme will arrest erosion along the non-tidal length of the North Barrier Bank and on the opposite Whittlesey Wash Cradge Bank. The first two sections were completed.

River Nene, Barnwell Improvement. *LDW* 22605. *Estimated Cost:* £19,833.

The scheme, incorporating air controlled siphonic weirs, was explained in the Second Annual Report. Work was completed and flood conditions quickly demonstrated that the scheme was entirely satisfactory to design capacity.

River Nene, Lilford Improvements. *LDW* 24955. *Estimated Cost:* £19,225.

This scheme, referred to in the Third Annual Report, was submitted to the Ministry for grant aid, and it is hoped to commence work in the coming months.

River Nene, Denford Improvement Scheme. *LDW* 23416. *Estimated Cost:* £14,970.

This scheme, described in the Third Annual Report, was substantially completed.

River Nene Dredging at Northampton. *LDW* 23615. *Estimated Cost:* £11,919.

This scheme, also described in the Third Annual Report, was substantially completed.

River Nene, Upton to Flore Improvement. *LDW* 33764. *Estimated Cost:* £39,538.

Severe flood conditions occurring for long periods in the vicinity of Upton Mill delayed progress, but by the end of the year the channel improvement work had been completed to the vicinity of Kislingbury.

Pages Mill, Wellingborough. *LDW* 24279.. *Estimated Cost:* £7,400.

As British Railways relinquished their right to a water supply from Pages Mill head, there was no longer any need to install a siphonic weir. A stone pitched slope to provide for difference in water level was constructed.

Work, including dredging, was substantially completed.

Chelveston Brook. *LDW* 24730. *Estimated Cost:* £8,400.

The Scheme comprises improvement on two miles of channel. A railway embankment near the outfall restricts flood discharges from the rather steep stream and causes prolonged flooding, but as the railway is now closed it is hoped that improvements may be carried out which hitherto have been impossible. Application for grant aid was sent to the Ministry.

Alledge Brook. *LDW* 24766. *Estimated Cost:* £12,570.

The Scheme extends along a five mile reach of the brook from its confluence with the river Nene near Thrapston, and the principal work is the removal of heavy growth in and across the channel. It has been approved by the Ministry, and work will commence in 1969.

(ii) Future works agreed in principle

River Jordan—Little Bowden. *Estimate* £42,500.

Severe flooding at Little Bowden in November (to which reference is made elsewhere in this report) made it necessary to expedite this flood alleviation scheme, and it was submitted to the Ministry for approval. As a long length of river is within a built up area which restricts any widening, it is intended to provide a regulating reservoir upstream to hold peak flood discharges.

River Welland, Crowland and Cowbit Wash

Experimental work on a model air controlled siphonic weir (to which reference was made in the Third Annual Report) was delayed, as it was necessary to move the apparatus to another site.

River Nene, Whittlesey Wash. *Provisional Estimate:* £120,000.

Outline proposals for a more rapid discharge of flood water from Whittlesey Wash and for improvements to the protective cradge bank were prepared, and an application for grant aid on the cradge bank works estimated to cost £24,750 was sent to the Ministry.

River Nene, Grendon Brook. *Estimated Cost:* £26,400.

An improvement scheme for Grendon Brook to alleviate sustained flooding of farm land and of houses at Grendon was sent to the Ministry.

River Nene, Northampton and Wellingborough

Reference was made in the Third Annual Report to proposed schemes to control flood discharges at Northampton and Wellingborough. Further discussions with the Development Authorities took place, and outline plans were prepared for works near Rush Mills and at Wellingborough.

Nene Tributaries

Survey work was carried out preparatory to the design of improvement schemes for Willow Brook, Harpers Brook, Billing Brook, Knuston Brook, and tributaries of the River Ise.

(iii) Other matters relating to grant aided or other works

(*a*) *Capital Expenditure Ceiling—Grant Aid*

As was stated in the Third Annual Report, the Capital Expenditure Programme was unduly and seriously penalised by an underspending of £75,000 as a result of the decision to abandon the Market Harborough Flood Control Reservoir in favour of a " through the town scheme " and the subsequent introduction of the Rolling Average formula by Circular LD.188.

If the Rolling Average had been introduced before 1965/6 the Capital Expenditure Ceilings calculated on the expenditure of the two River Boards and projected on the assumption that the targets had been attained (as they would have been if Circular LD.188 had been published earlier) would have been as follows:

1965/6	£322,227	(No ceiling)
1966/7	£281,969	(No ceiling)
1967/8	£274,949	(Actual £250,113)
1968/9	£270,167	(Actual £245,808)
1969/70	£271,976	(Actual £250,368)

The Capital Expenditure Programme put forward by the Land Drainage Committee in November when making their recommendations for 1969-70 was as follows:

	£
River Glen	2,000
Welland Outfall	35,000
Welland Fascines	9,000
Sea Banks	4,000
Cromwell Road to Bevis Hall	35,000
Foul Anchor	28,000
Car Dyke, Eye	22,000
Stamford—Market Harborough	25,000
Lilford	13,000
Market Harborough	10,000
River Jordan	20,000
Upton—Flore	10,000
New River	3,000
Bell Row Culvert	2,000
Cowbit Road Sluice	3,400
Cross Guns Pumping Station	10,000
Denford	3,000
Pages Mill	2,400
Tributaries (Nene)	20,000
Caldecott Sluices	1,200
	£258,000

Subsequently representations were made by Nene Wash Lands Commissioners, supported by Sir Harry Legge-Bourke Member of Parliament for the Isle of Ely, about the condition of the cradge bank. The cost of improvement work was estimated at £18,850. Urgency arose from a danger of a breach in the bank, long lengths of which had settled. A breach upstream of Dog-in-a-Doublet would affect the cooling water system at Peterborough Generating Station, and any over-topping of the low lengths adds to the flood water accumulating on the Wash to the detriment of such seasonal arable cropping as is possible having regard to the fact that the Wash is intended for holding flood water.

Northamptonshire County Council expressed their concern about flooding of premises at Yardley Hastings and Grendon on at least four occasions in the past eight months when widespread disruption has been caused in the villages. The late Mr. Harry Howarth, Member of Parliament for Wellingborough, had taken up the matter. The cost of additional main river improvements is estimated at £25/30,000.

Mr. John Farr, Member of Parliament for Market Harborough complained about flooding at Little Bowden from the Jordan. In November 1968 conditions were reported as " the worst in living memory ", when as many as 28 properties, including 24 houses, were flooded. The cost of preventative work was estimated at £50,000.

Farmers downstream of Market Harborough complained that they were suffering more frequent and more extensive flooding in consequence of the Market Harborough Scheme having been completed before an adequate channel was provided below the town. The complaint had been taken up by the Country Land Owners' Association. The Stamford to Market Harborough Scheme is estimated to cost £170,000, and with the present resources is programmed over seven years. If the scheme is not speeded up there will be considerable dis-satisfaction.

In consequence of the complaints it was decided to make a further £37,000 available for Capital Works.

It was considered foolish to keep expensive outfall plant standing idle, and in view of other commitments it was decided that these urgent Schemes could not be provided for by cutting back elsewhere. It had also become apparent that in the next year or so provision would have to be made for main river works consequent upon major improvements in the North Level and in

the South Holland District, and it seemed unlikely that the financial position would become easier.

The Chairman of the Authority and the Chairman and Vice Chairman of the Land Drainage Committee attended on the Ministry's Under Secretary and urged that the Capital Expenditure Ceiling should be increased to enable the Land Drainage Committee's recommendations to be augmented as follows:

Nene Wash Cradge Bank	Additional £19,000
Nene Tributaries	Increased by £15,000
River Jordan (Little Bowden)	Increased by £10,000
River Welland—Stamford to Market Harborough	Increased by £25,000

The representations were strongly supported by the Members of Parliament concerned, and a question was tabled in the House of Commons by the late Member for Wellingborough.

The Ministry were unable to depart from Circular LD.188, although it was hoped that on the " stitch in time principle " additional funds might be made available for work on the Nene Wash Cradge Bank. Subsequently the Ministry were unable to agree that the Cradge Bank Scheme was urgent and they considered that there was time for a more comprehensive examination of the problem. The Ministry could only offer an increase in the Capital Investment Allocation.

It appears that consideration will have to be given as to the economics of undertaking works in excess of the Capital Expenditure Ceiling but within the Capital Investment Allocation and thereby suffering a reduction in the over-all rate of grant, but having regard to geographical and financial factors to adopt such a policy would be a decision of great moment. Nevertheless, the pressure for increased standards of drainage and flood protection, particularly from the uplands, cannot be easily resisted.

Neither the Welland River Board nor the Nene River Board had cause to complain about " worthwhileness tests ", and it will be very many years—if ever—before land drainage engineers in this Area are looking for work.

The Clerk of the Nene River Board wrote in 1964:

> " With the tremendous demands on our limited national resources some assessment of " worthwhileness " is as necessary for land drainage as for railways, roads, education and every other aspect of national expenditure. But a true and comprehensive assessment can only be made by those with intimate local knowledge. What is required is not complicated formulae, but confidence that those who have made the assessment did so after due and careful consideration on the best technical advice and experience available, conscious of their fiduciary obligation to ensure that the funds entrusted to them, whether by the central government, the general ratepayers, or the drainage ratepayers, are wisely and properly spent.
>
> Those charged with drainage administration are themselves taxpayers, general ratepayers and (in some cases) drainage ratepayers, and have every incentive to be prudent. They must justify the confidence reposed in them by the authorities and interests they represent, and they will then deserve the confidence of those who control central government expenditure. If river authorities can establish this mutual confidence then worthwhileness will present no problems."

Perhaps the River Boards Association paid too high a price in trading the " worthwhileness test " for Circular LD 188 and the Rolling Average formula. It is embarrassing that Internal Drainage Boards can obtain grant aid approvals on the merits of the Schemes without delay and frustration while River Authorities are shackled to an inflexible formula.

(*b*) *Nene Outfall*

The annual survey of the Outfall showed a continuation of the tendency towards accretion

in the channel north of Big Tom Beacon. At the elbow bend north east of Big Annie Beacon the ebb channel has broken through and a sand bar at level minus 10 (river bed level at Wisbech about 16 miles upstream) obstructs the tidal flood channel. Deep water in the Old Lynn channel in the vicinity of the Whiting Beacon does not extend so far south as there is a tendency to silt up at the landward end.

(*c*) *Welland Outfall*

In co-operation with the Lincolnshire River Authority survey work was carried out seawards of the confluence of the River Welland and River Witham at Tabs Head. In the short time available fixed points were established for sextant readings and nine sounding runs were made which will provide a basis for work in the coming year.

2. MAINTENANCE

Grass and weedcutting was carried out along 339 miles of main river, of which 62 miles was cut twice to meet local requirements. 10 weedcutting launches and 6 floating elevators were operated. Most of the work was undertaken by direct labour, but some contract labour was employed.

Maintenance dredging was carried out along the lower reaches of the East Glen where extensive shoals had developed. An angle-dozer was used to clear shoals in Maxey Cut, downstream of Peakirk Road Bridge. In the Nene sub-catchment the principal dredging was for the removal of shoals at Castor, Willow Brook, Perio, Harpers Brook, Titchmarsh, Irthlingborough and on the upper reaches of the Brampton Branch. The hydraulic excavators had a greater output than dragline dredgers, but the shorter outreach restricted their use to the narrower channels.

Regular inspections were made of Sea and Barrier Banks, and the work on destruction of vermin was continuous. More fencing was erected on these Banks but the relatively high initial cost for a narrow area is justified by a reduction in the acreage to be mown.

Thorn fagots to sustain the side slopes of the tidal banks were obtained from the uplands as many hedges in the Fens have been removed. The heavy demand for fagots for grant aided schemes means that they have to be obtained from further afield and at increased cost. Inspection, repair and servicing of all sluices and the thirty eight locks on the Nene Navigation was carried out. Steel pointing doors were installed at Doddington Lock.

The work of the fitters and carpenters continues to expand, and the usual high standard was maintained.

Works were carried out at South Holland Land Drainage Board workshops as necessary, and this assistance was appreciated.

3. WORK IN INTERNAL DRAINAGE DISTRICTS

Administered Boards

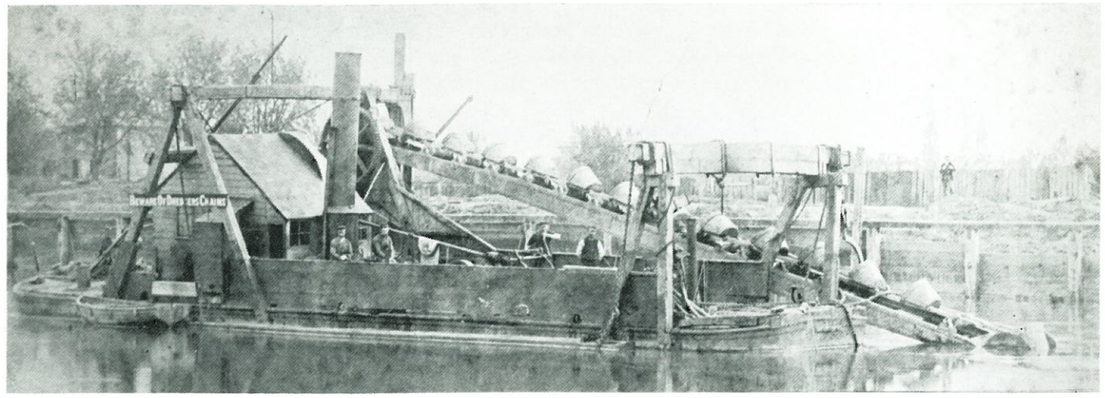
Two Internal Drainage Boards are administered, namely the Nene Valley Drainage and Navigation Improvement Commissioners (First District) with jurisdiction above Northampton, and the Nene Valley Drainage and Navigation Improvement Commissioners (Second District) with jurisdiction from Northampton to Peterborough.

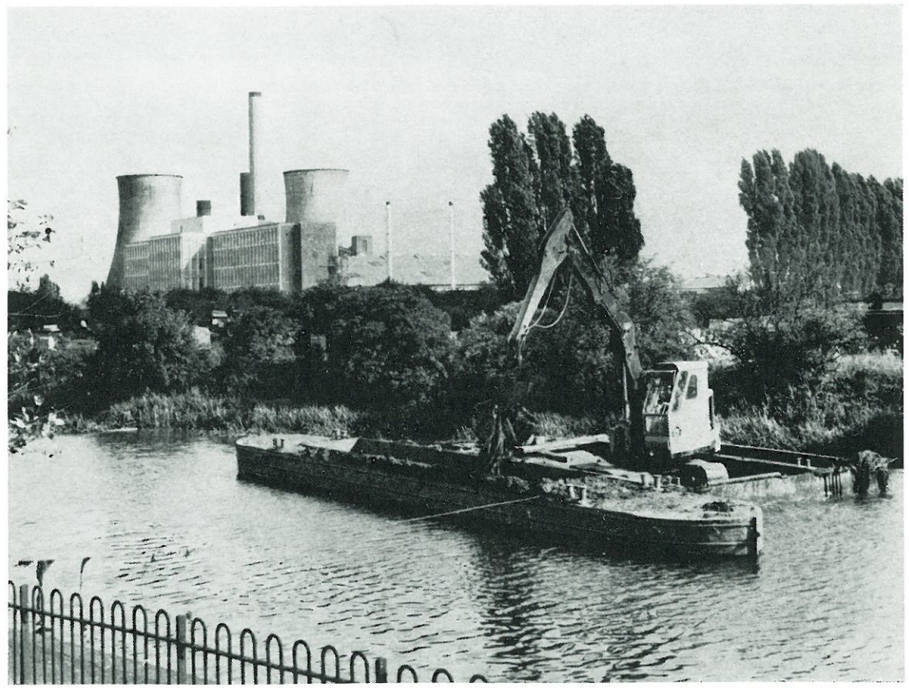
Weedcutting and routine clearance work was done on 1½ miles of First district main drains, and on 13½ miles of Second District drains.

Work commenced on a drainage scheme adjacent to Hog Dyke, Raunds. A new discharge was provided by a culvert beneath the old railway line to an outfall which will be by means of a siphon beneath the river to the low level overfall channel north of Upper Ringstead Mill.

River Welland—Stamford to Market Harborough Improvement upstream of Barrowden Mill

(*Photographs by Gordon Turnill, A.I.I.P. and S. R. and P. Beesley*)





(*above*) **Dredging River Nene at Wisbech 1900**
(*Photograph by courtesy of Mrs. R. Everett*)

(*below*) **Dredging River Nene at Northampton 1968**

(*above*) **Sea Bank—Lawyer's Creek**
Applying grass seed in a protective coating

(*below*) **River Welland—Coronation Channel**
Fascine mattresses being placed downstream of Cowbit Road Sluice