11. Market Place,
SPALDING. .Lincs.

20th February. 1940

To the Chairman and Members of the River Welland Catchment Board.

Mr Chairman, my Lords & Gentlemen,

In view of the recent discussions as to the advisability of allowing further waters (from the Bourne South Fen District) to enter the River Glen, the dangerous flood of last year and the subsequent letters of warning from owners and occupiers of lands in the Deeping Fen Area, a survey was made of the River Glen and its banks from Surfleet Reservoir to Kate's Bridge.

From the Survey it is apparent that the banks, though strong in appearance and by calculation, have lost in height since the last operation of raising & strengthening. I have, therefore, prepared an Estimate for the repairs necessary to cope with the present discharge of the River. It is most essential that the banks should be raised without delay.

The height of the peak of the flood levels has been lowered progressively; this is shewn by observations taken in recent years when compared with the figures given in the Report of Messrs Kingston & Harrison in 1883. However, all works taken into account since their day, namely, the widening of bridges, and gradual dredging of the river from Tongue End to the Outfall Sluice, together with the Welland Outfall Scheme and its consequent lowering of the low water level in the Welland, it has not been possible to reduce the peak flood level at Wooley's Mill by 2 feet. The actual reduction seems to be from plus 20'60 O.D. in 1877 to plus 19' O.D. in 1939.

In this connection, it should be borne in mind that improvements in the river above Kate's Bridge may have reduced the benefits derived from the works in the lower reaches, set out above.

Taking the flood level of January 1939 as a standard it would point to the necessity for banks with a height of 20 feet above Ordnance Datum (Liverpool) for a minimum of safety. This is the height taken into account in the estimate given below. The back slope would be run out at 2½ to 1 which is approximately the same slope as at present. The top width recommended is 8 feet, an increase in most cases of 2 feet.

The increased height and top of the bank will result in a widening of the base of the bank of about 4 feet thereby reducing the liability to subsidence in level due to the compression of the subsoil by the weight of the superimposed Embankment. The form of bank thus arrived at should give an adequate factor of safety, even remembering that from the Bars Bridge or therabouts to above Wooley's Mill, the bank has a peat foundation on a clay sub-foundation, a very dangerous base, which in the case of the last breach of 1910, was responsible for allowing a piece of bank of nearly 300 tons to be thrust bodily into the field behind.

It is not certain what caused the sudden rupture, but pressure alone would not account for the breach. It has been suggested that the peat foundation gave way owing to erosion and allowed the bank above to split. Mr H. Bain's theory was to increase the width of bank base and to weight the bank by raising it to 20 feet above O.D. from time to time, that is, to make up the settlement when it occurred, thus compressing the peat layer more and more until the base of the solid bank formed a key into the clay below the peat. The Sections taken last year prove that in nearly all the length from Pinchbeck Bars to Kate's Bridge on the South side and from Tongue End to Kate's Bridge on the North side, needs attention in varying amounts. On the South side of the River the lowest spots occur about half a mile above below the Tongue End Sluice and between the Bourne Fen Bridge and Wooley's Mill: on the North side the worst length is between the Bourne Eau Sluice and Watt's Farm, or in other words on the Bourne South Fen frontage.

These low spots are all in the danger zone as regards the high flood peak level, and it was here that in January 1939 it was found necessary to cradge against overflow.

In addition to the Raising and Strengthening explained above and estimated for hereafter, it would be advisable, in view of the still present threats of floods and the increasing demand for a better discharge from the Upper Reaches, to keep in mind the recommendations set out in the Report of Messrs Kingston & Harrison mentioned before; to dredge progressively in the lower reaches until the River bottom has an allmost flat grade from the Outfall Sluice Sill to the bottom end of the Tares. This would probably mean Toe Piling through Pinchbeck i.e., from Pinchbeck Bars Bridge to at least Herring Bridge, perhaps to Surfleet Bridge. I would rather have time to consider the works shewn necessary from observations, the sections taken and from comparison of all data with that of Messrs Kingston & Harrison. A report would then be made to the Board on the matter as to the work still to be done and the estimated cost.

I cannot overstress the urgency of the work covered in this estimate, however, especially in the Tongue End section as the floods in January 1939. plus 19 feet O.D. and that of February of this year plus 17.1^{8} O.D. shew.

Estimate for the Raising & Strengthening of the Glen Banks as under.

	£	
To Raise and Strengthen the South Bank from Pinchbeck Bars Bridge to 11¼ miles above the Outfall Sluice to 20 ft above O.D. with an 8 ft top and a 2½ to 1 back slope, and Raising that level by 1'-4" per mile in the remaining bank above to about 15 miles above the Outfall Sluice would require 129,374 cu yds @ 3/- per yard	19,406	23400
A deficiency of spoil of 98,153 cu yds would be found and land would have to be purchased to make up this amount. It is estimated that 11½ acres, taking a depth of 6 ft as an average cut, would be necessary. At, say, £100 per acre.	1,150	1000
To Raise and Strengthen the North Bank as above, a distance of 2 miles 50 chains would require 45,209 cu yds @ 3/-	6,782	8788
4.67 acres would have to bought in all probability, in addition to spoil obtained from the slipe. At the above price this would cost	467	454
To Raise and Strengthen Bourne South Fen Bank from Tongue End to Watt's farm. 116 chains 23,088 cu yds @ 3/-	3,465	4447
and the purchase of 2.38 acres for spoil at the above price.	238	230
	31,508	
Contingencies 10 %	3,151	
	£ 34,659	

Say £35,000.

To Raise and strengthen parts of the North Bank between Pbcs Bars Bridge and Tongue End, would require 5554 cu yds @ 4/- 1111

and the purchase of ·57 acres for spoil @ £100 per acre 57

(contingencies 10% 3949

£43,436

Say £43,450

N.B.- If Bourne South Fen are held responsible for the bank on their frontage, then the estimate would be reduced by £4073. and would then amount to say, £30,500.

I am, Gentlemen,

Your obedient Servant,