

BUCKNELL BROS. (HOLDINGS) LTD.

Foudry Brook

**PROPOSED NEW CHANNEL
M4 TO RIVER KENNET**

Technical Report

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June 1984

CONTENTS

1. Report
2. Diagrams (A4 size):-
 - Aerial photograph of Smallmead area
 - Diagram of old flood area
 - Catchment Area Plan (A3)
 - 1:250,000 River Kennet Catchment Area
 - 1:50,000 Theale-Reading catchment of R. Kennet and Foudry Brook
 - Diagram of areas raised within flood area
 - Diagram of Proposed New Channel
 - Longitudinal section showing existing and proposed flood levels
 - Land Ownership
 - Reduced drawing of plan and sections
 - Reduced drawing of cross-sections
3. Appendices:-
 1. Drawings
 - 2.(a) Run-off calculations
 - 2.(b) Backwater analyses

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DIGEST

This report sets out engineering proposals to enable the development of the Kennet Valley Park area of upwards of 80 hectares as suggested in the current County Council Structure Plan Review Consultation Document to proceed without adversely affecting the flood risk of adjacent areas.

It is proposed to construct a new channel with adjacent flood strip from the M4 motorway to the River Kennet to duplicate the existing Foudry Brook, to maintain some flood storage within the landscaped area of the proposed development and provide improved storm water drainage of the whole area, including areas south of the M4.

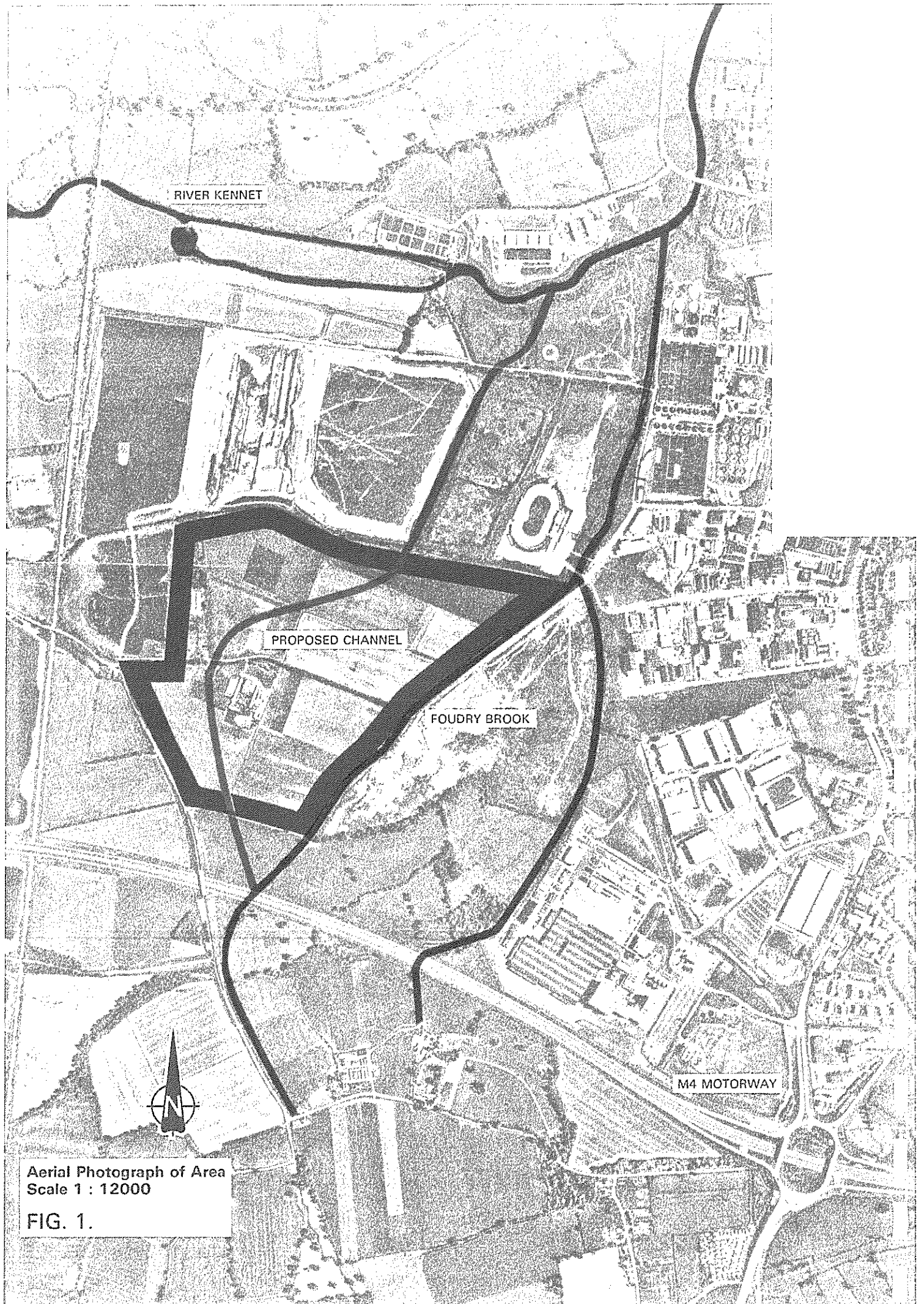
The result will be to reduce the incidence of flooding and generally benefit the drainage of existing and future developments by rectifying adverse decisions which have already been implemented.

RECOMMENDATIONS

Our recommendation is that this report be submitted to the Thames Water Authority as soon as possible for their formal approval.

Concurrently, a planning application for outline consent for the Kennet Valley Park development as a whole should be lodged so that all other major planning features, including transportation, can be approved in principle.

The negotiations with the Reading Corporation for the use of their land should be completed. The scheme should then be implemented by the letting of construction contracts concurrent with the initial development works.

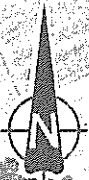


RIVER KENNET

PROPOSED CHANNEL

FOUDRY BROOK

M4 MOTORWAY



Aerial Photograph of Area
Scale 1 : 12000

FIG. 1.

TOPOGRAPHY OF KENNET VALLEY PARK AREA

The Kennet Valley Park area lies within the valley of the River Kennet about 2 miles south of the centre of Reading and immediately north of the M4 motorway. It is generally bounded by the A33 development on the east and by the Basingstoke-Reading railway on the west.

The area is flat and low lying, subject to flooding from the River Kennet and also from its major tributary, the Foudry Brook, which flows from south to north through the area.

The Foudry Brook is the main drainage artery of an important industrial and residential area of Reading Borough and also an extensive area south of the M4 motorway including Three Mile Cross, Tadley and Burghfield, all areas of probable future development.

The sub-soil of the area is gravel and thus water bearing.

HISTORICAL CHANGES IN THE AREA

The area has changed dramatically over the last 50 years in keeping with the prosperity of Reading as a centre of business and industrial development.

Whilst formerly a farming area, it has provided sites for mineral extraction, the major sewage treatment plant, sludge disposal and the primary refuse tip for the Borough. These uses have resulted in the raising of ground levels.

The changes continue as large areas of refuse disposal are now currently being tipped in the exhausted mineral extraction areas.

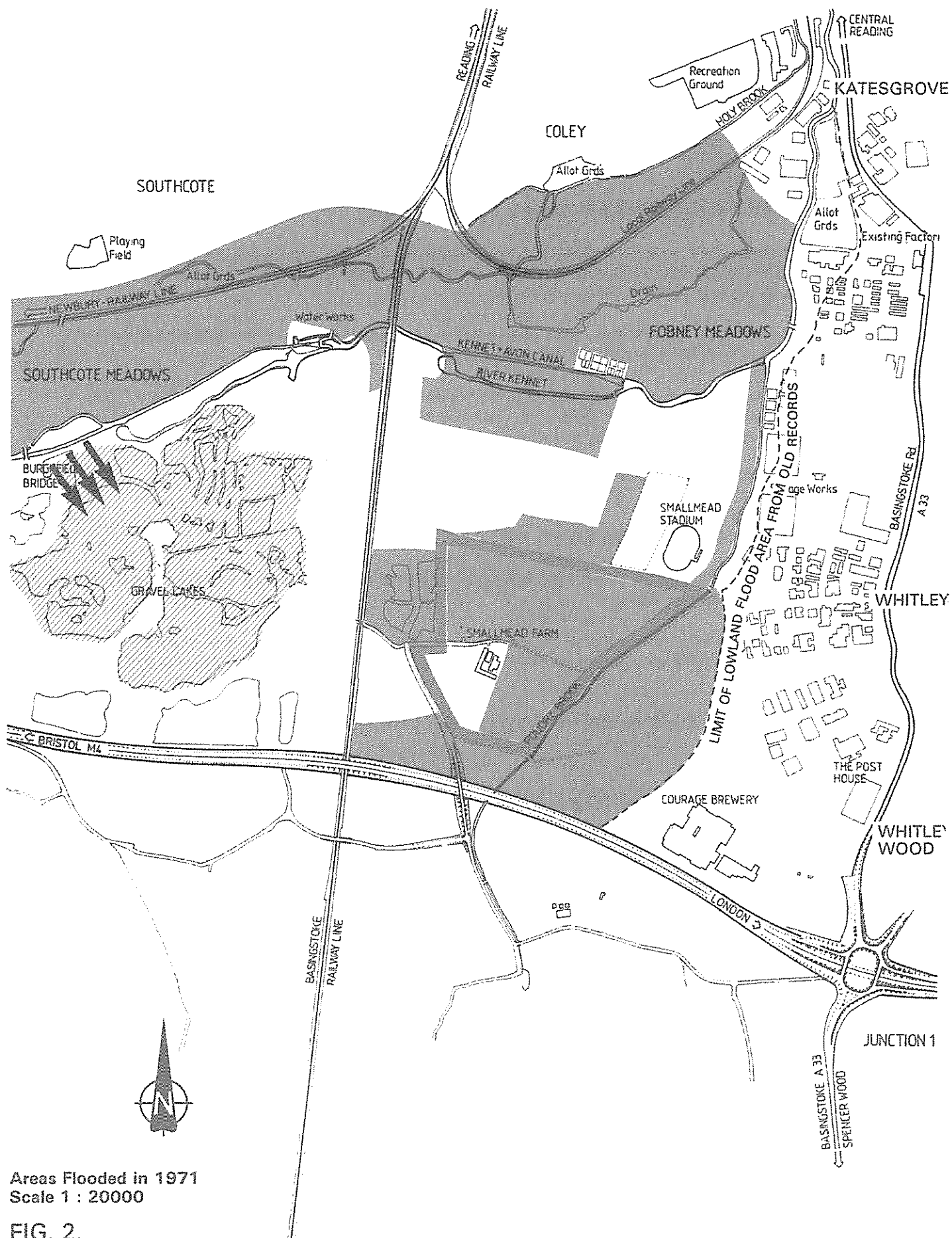
PROPOSED CHANGES IN THE AREA

In addition to current changes, there is a proposal to construct a large bankside storage reservoir over an area of 20 hectares and also recently the County Council Structure Plan Review Consultation Document identifies upwards of 80 hectares (200 acres) for future industrial development. The proposed development area has currently been termed as the Kennet Valley Park.

The continuing raising of levels of land subject to flooding will have an impact on the operation of both the River Kennet and Foundry Brook River systems.

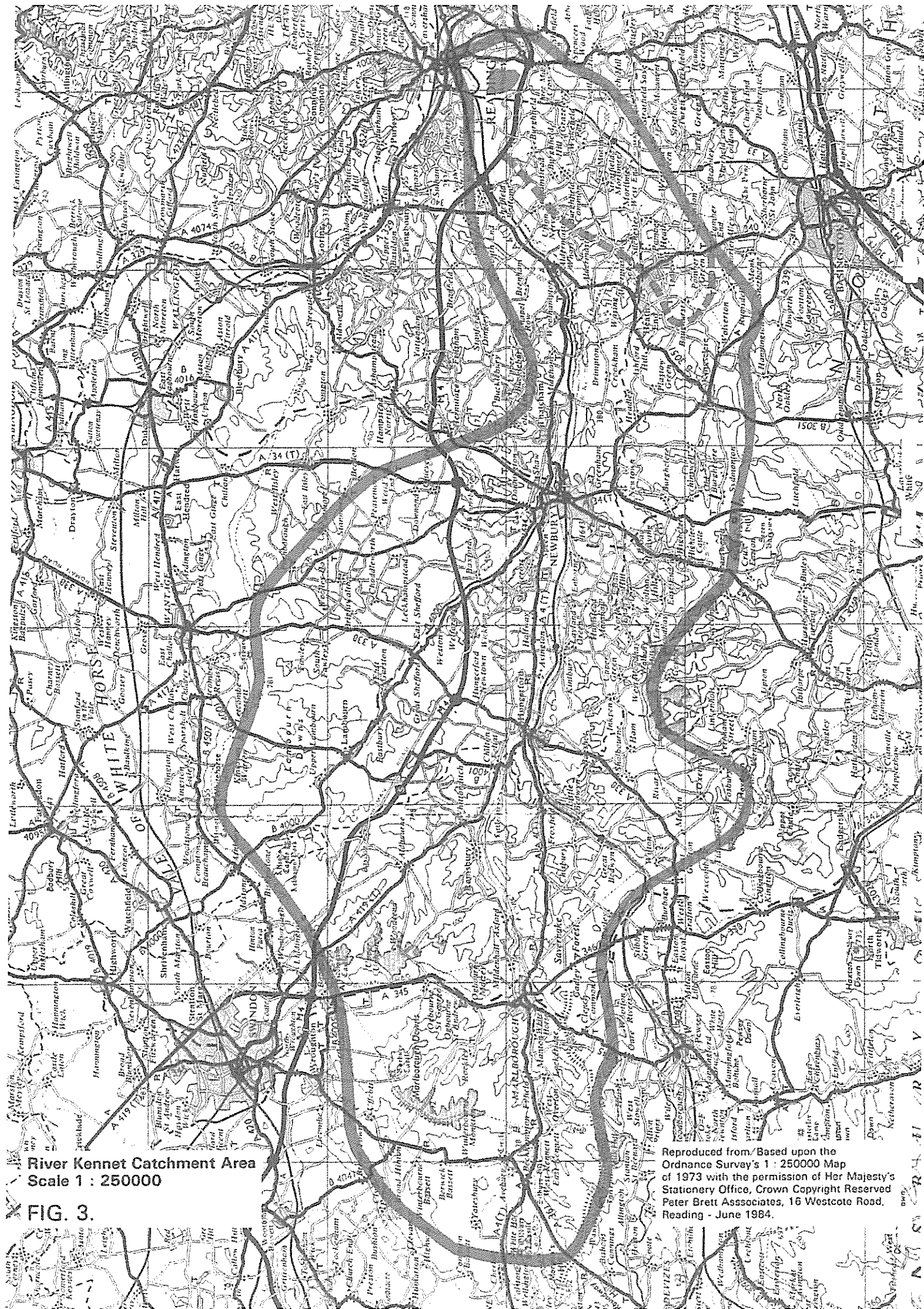
The landowners of the Smallmead Farm, which is part of the proposed development area, have therefore instructed us to consider the matter and put forward engineering proposals which will ensure a satisfactory development plan and will not affect the river operations of the area or give adverse effects on existing development and adjacent landowners.

The present document gives details of this scheme, with supporting engineering calculations, and drawings.



Areas Flooded in 1971
Scale 1 : 20000

FIG. 2.



River Kennet Catchment Area
Scale 1 : 250000

FIG. 3.

Reproduced from/Based upon the
 Ordnance Survey's 1 : 250000 Map
 of 1973 with the permission of Her Majesty's
 Stationery Office, Crown Copyright Reserved
 Peter Brett Associates, 16 Westcote Road,
 Reading - June 1984.

ADJACENT AREA SOUTH OF M4

In addition to the proposed changes in the Kennet Valley Park area, large residential developments are also proposed in the adjacent areas south of the M4 motorway. Unless suitable improvements to the present river systems are provided in the Kennet Valley Park area, the results of such developments will be to increase both the height of flood water and the frequency with which flooding occurs. Such adverse affects would be unacceptable and a flood relief scheme is therefore an essential feature of such development.

We would draw attention to the noticeable increase in bed gradient of the Foudry Brook south of the M4 motorway.

HISTORY OF FLOODING

The Kennet Valley Park area is affected by flooding in two distinct ways: one being the result of flood flow in the River Kennet and the other the result of high flows in the Foudry Brook.

The River Kennet drains an area upstream of Reading of about 1,200 sq. kilometres and its flood plain extends into the Kennet Valley Park. The highest known level to date in the area from this source is 38.95m above O.D. Flood from the Foundry Brook itself occurs when the flow from its catchment area of 67 sq. kilometres exceeds the capacity of the normal channel and overtops the banks into adjacent land.

Flooding affects some portions of the Kennet Valley Park area several times annually.

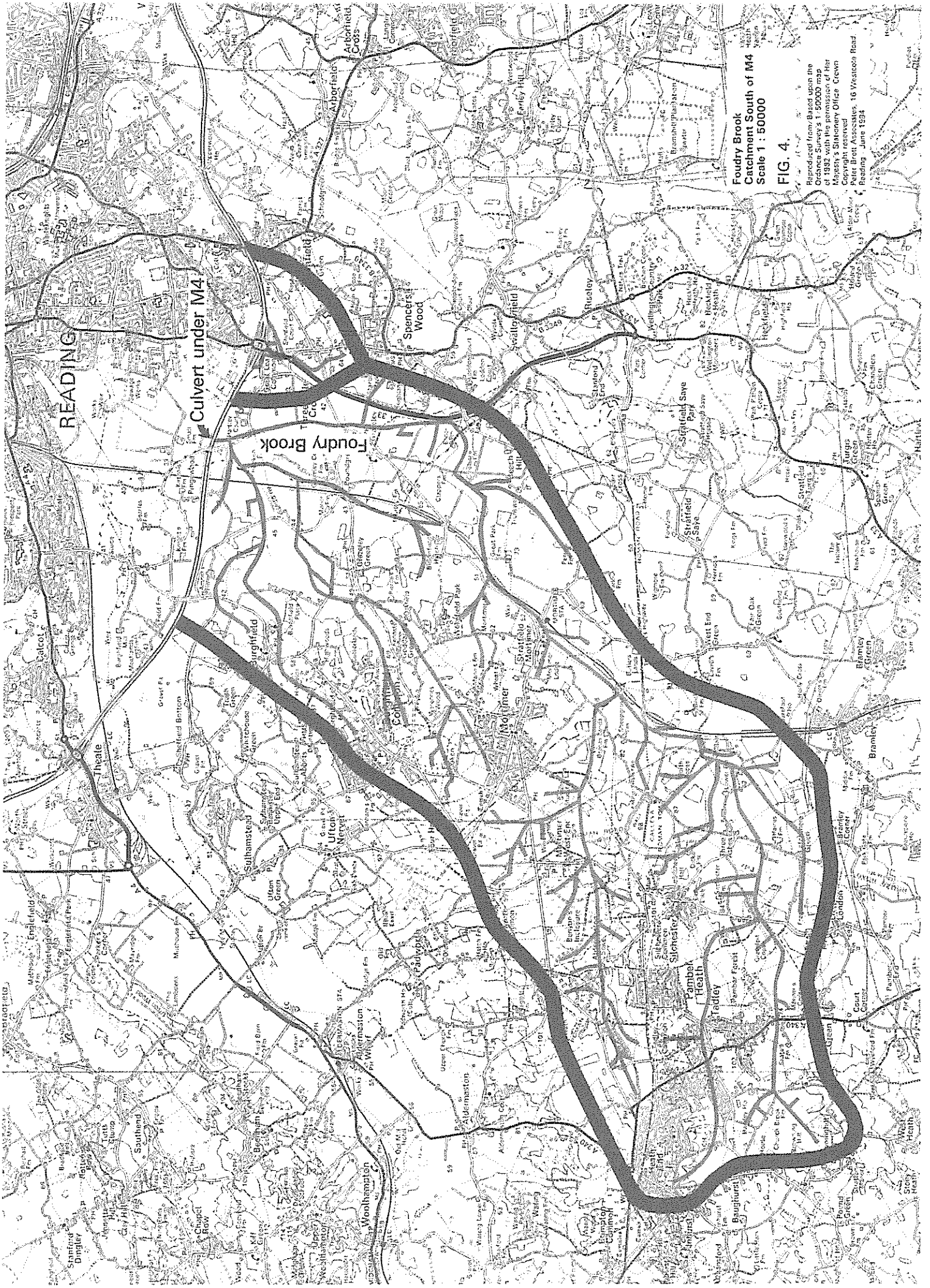
THAMES WATER AUTHORITY FLOOD POLICY

As a general policy, the Thames Water Authority opposes development within the flood plain which results in an obstruction to the passage of flood water or reduces the volume of flood storage.

In applying this policy the attempt of the Authority is to maintain a "status quo" which neither worsens nor improves the flood situation in the area under consideration or adversely affects any adjacent interests.

The application of this policy would preclude development of the Kennet Valley Park area.

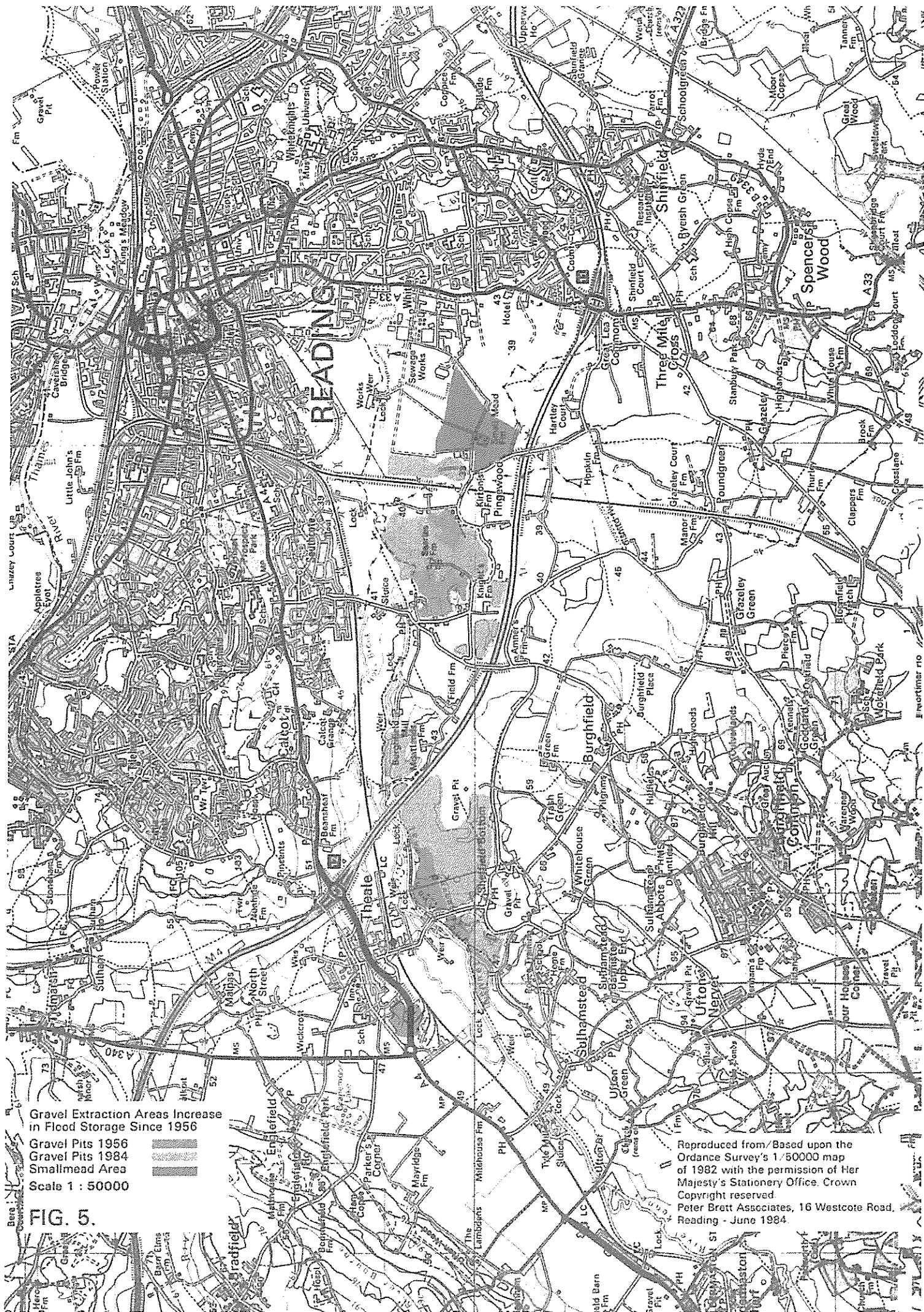
The alternative engineering solution which will not worsen the flooding situation or adversely affect adjacent areas is proposed in this report.



Foudry Brook
Catchment South of M4
Scale 1 : 50000

FIG. 4.

Reproduced from Based upon the
Ordnance Survey 1 : 50000 map
of 1932 with the permission of Her
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1. Introduction

2. Methodology

3. Results

4. Discussion

5. Conclusion

6. References

7. Appendix

8. Acknowledgments

9. Contact Information

10. Declaration of Interest

11. Data Availability Statement

12. Ethics Statement

13. Author Contributions

14. Funding

15. Conflict of Interest

16. Supplementary Material

17. References

18. Appendix

19. Acknowledgments

20. Contact Information

21. Declaration of Interest

RECENT CHANGES IN THE RIVER KENNET FLOOD PLAIN

The policy of preventing development due to flooding considerations is not always applied and T.W.A. policy is not adhered to in every instance.

What has happened in this area?

Without wishing to comment on any planning reasons which may have been put forward as overriding considerations, we list below areas in the vicinity of Kennet Valley Park which have been, or are, being raised above flood level without any relief works being considered and are thus lost to Kennet Valley flood storage.

Sewage sludge beds and stadium	25 hectares	
Smallmead tip	50 hectares	1972
Refuse tip adjacent to river	15 hectares	
Refuse tip now in use	30 hectares	1984
Ordinary fill near river	1 hectares	1984

In addition, there is proposed:

T.W.A. Bankside reservoir	20 hectares	—
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The effect of loss of this flood storage would be to increase flows through Reading unless there is some compensating effect occurring elsewhere.

It is our opinion that the large lake areas remaining after gravel extraction between Reading and Theale supply this compensating effect.

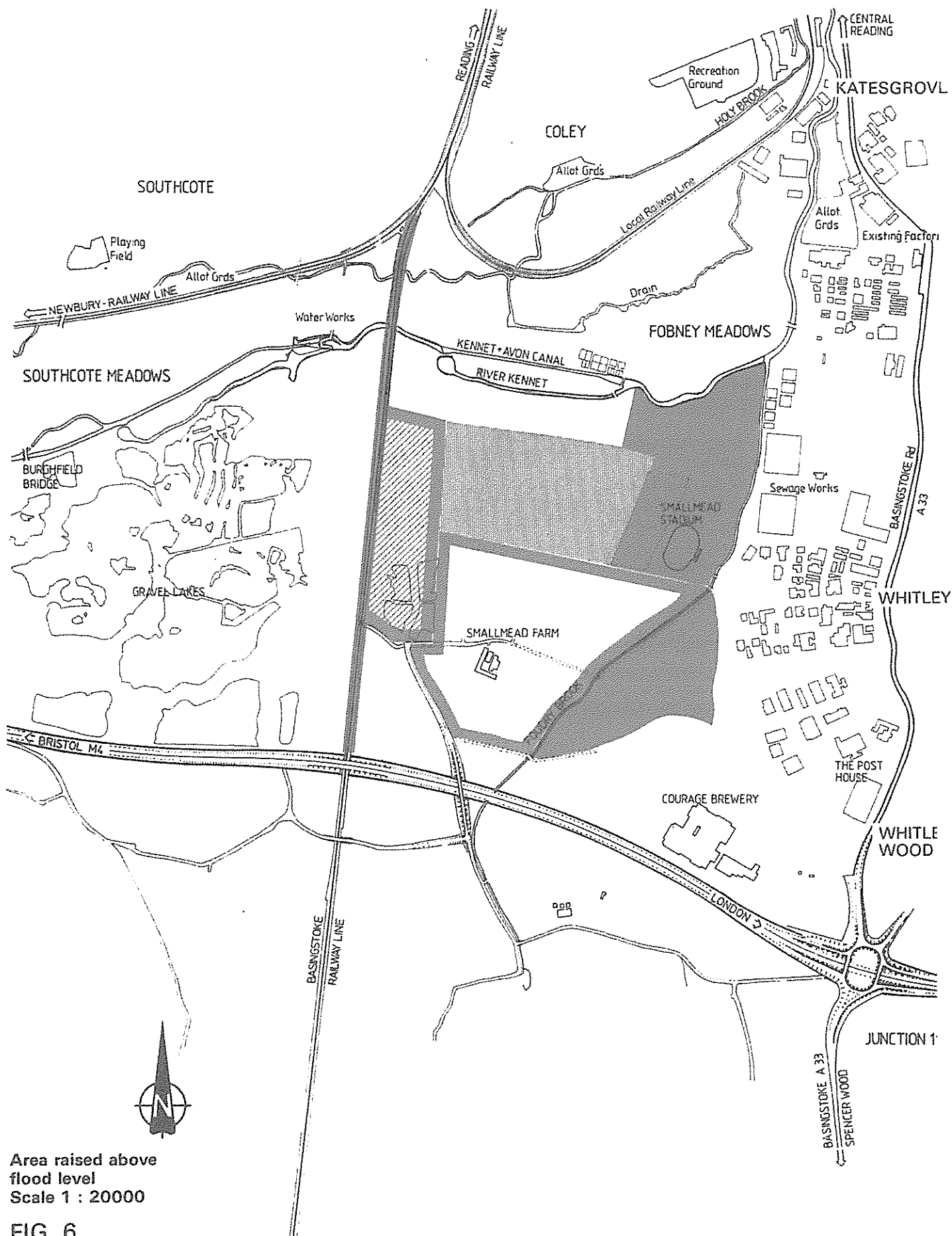
The Water Authority will, as a matter of policy, have ensured that the lakes are not surrounded by high bunds above flood level and the areas are therefore operating as large additional flood storage volume.

An assessment of the increase in area of these lakes since 1956 is 160 hectares.

The loss of the above listed Kennet Valley Park areas from the River Kennet flood storage does not therefore appear to be critical.

Flood flow parallel to the River Kennet is of no significance across the Kennet Valley Park area as the railway embankment already forms a continuous obstruction.

This aspect of Water Authority policy is therefore inapplicable.



Area raised above
flood level
Scale 1 : 20000

FIG. 6.

CHANGES IN THE FOUDRY BROOK FLOOD PLAIN

The Kennet Valley Park area, as already mentioned, also operates as part of the flood plain of the Foundry Brook in addition to the River Kennet.

Due to the different characteristics of the catchment areas these different uses are not at their maximum coincidentally and thus each use has to be considered independently. Our observation is that losses in the flood storage volume from this aspect are absolute and no compensation storage or engineering works to alleviate the loss have been provided.

The location of the raised areas also form a complete obstruction to the Foudry Brook flood plain and obstruct the flow of water overland parallel to the brook. Both aspects of T.W.A. policy and good river management have therefore been either overlooked or ignored.

If the Kennet Valley Park were to be developed with the same lack of observance of the principles applicable, the result would be adverse in the extreme to existing landowners and developments in the area and with possible effects extending to land south of the M4 motorway.

It is for this reason that our clients as major landowners in the area seek to promote a scheme which will meet river engineering requirements, protect existing adjacent landowners and development and allow major development of the Kennet Valley Park area.

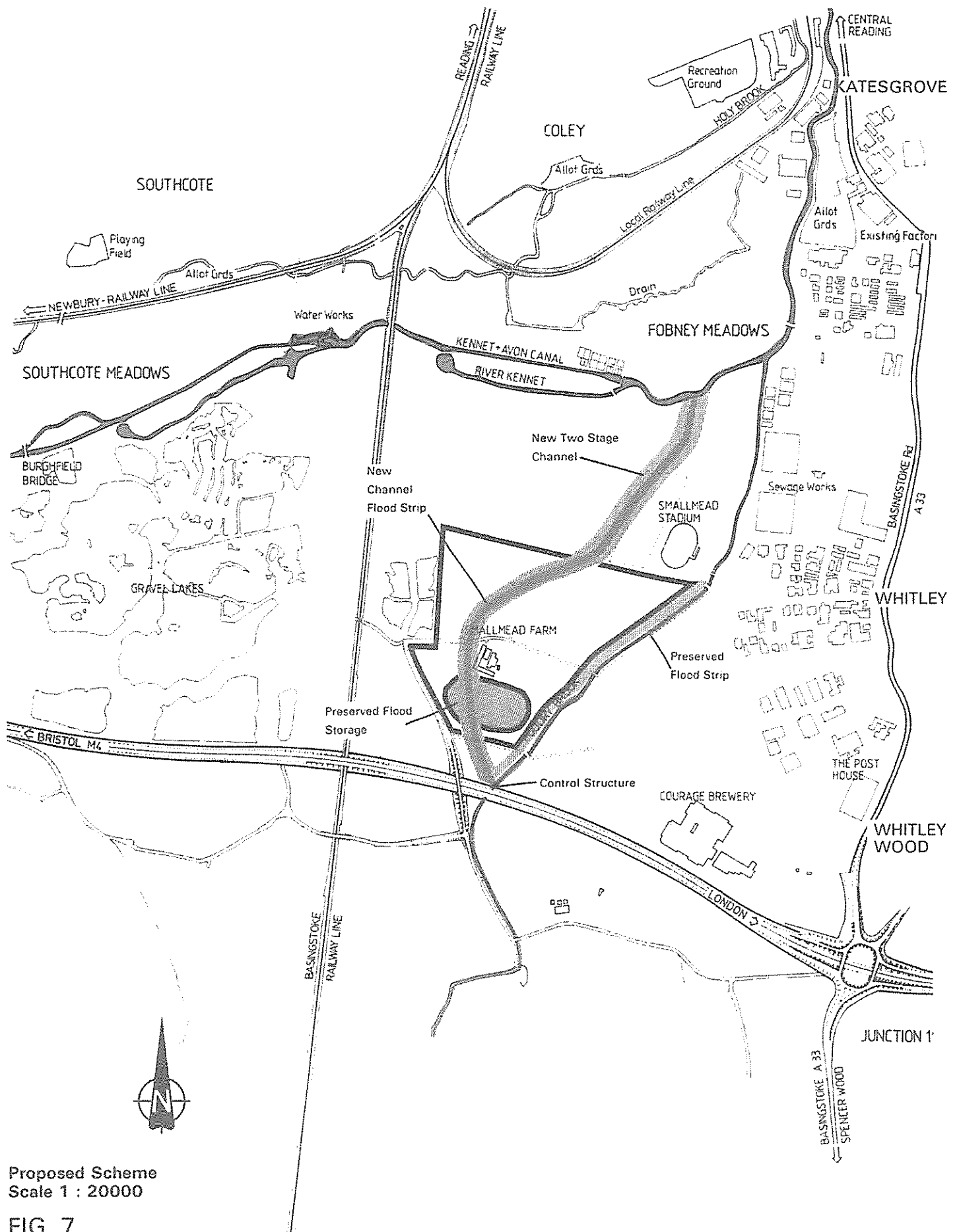
OBJECTIVES OF THE PROPOSED SCHEME

As described above, the raising of the flood plain area of the Kennet Valley Park has no impact on floods arising in the main Kennet Valley but it could have a severe adverse affect on the Foudry Brook system.

If indiscriminate filling and closure of flood routes continues, flood levels in the vicinity of the M4 motorway will rise .

At present the flood level pertaining in the River Kennet at Southcote Lock is the governing factor.

Our calculations show that peak flows down the Foudry Brook at present overspill into the Kennet Valley Park and are accommodated in the flood plain at lower flood levels than those resulting from the River Kennet.



Proposed Scheme
 Scale 1 : 20000

FIG. 7.

OBJECTIVES OF THE PROPOSED SCHEME (continued)

However, calculations also show that if the Kennet Valley Park area were raised and the existing Foudry Brook channel were retained with only a 25 metre adjacent flood plain, as exists at the downstream end, continued to the motorway, then maximum flood levels at the motorway would rise 0.5 metres. This would severely affect existing property and adjacent land and be quite unacceptable.

The proposed scheme is to construct a duplicate flood channel and adjacent flood strip to more than double the capacity of the existing Foudry Brook system. This channel will approximately follow the line of the historic overland flood route through the area to the River Kennet.

The scheme ensures that floods of a frequency of 1 in 200 years will not cause flood levels higher than those generated by the River Kennet which will thus remain the governing factor.

In addition, the scheme provides an improved discharge for normal storm water drainage at times other than those of maximum flood.

This benefit is of particular interest when development south of the motorway is considered.

The duplicate watercourse will remove a maintenance problem which exists on the present Foudry Brook and re-open a normal drainage route which has recently been filled in.

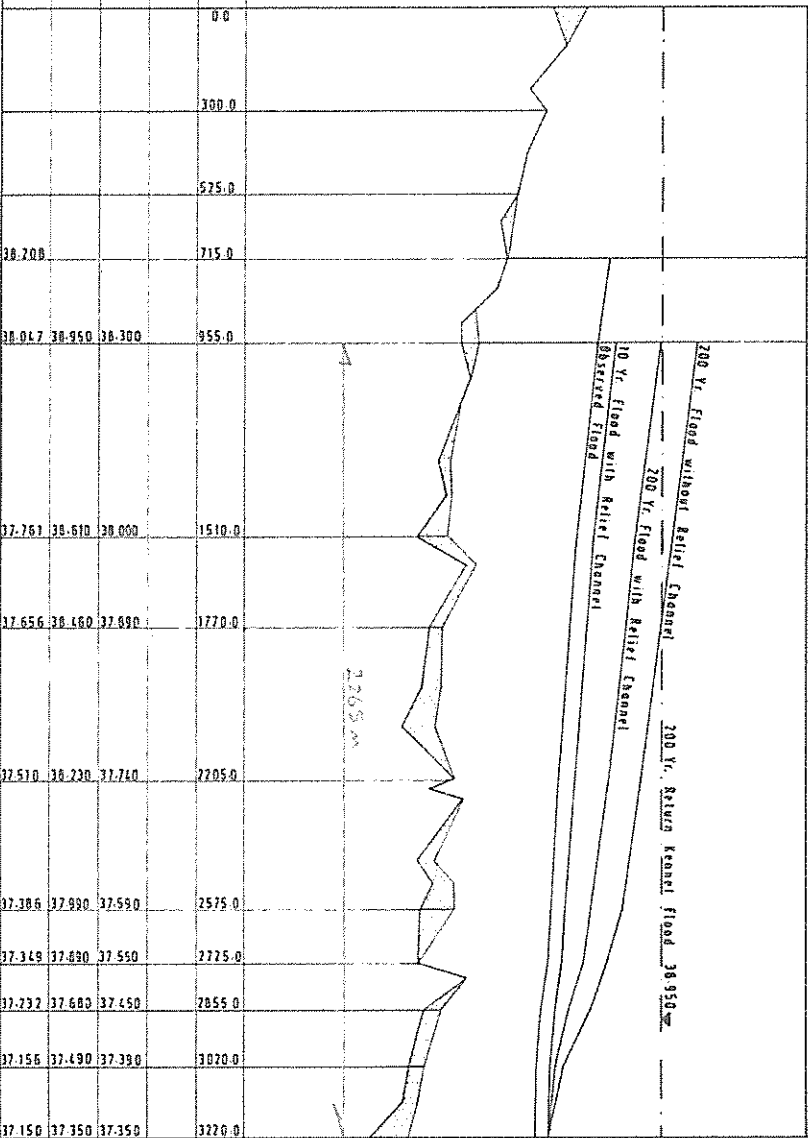
The duplicate watercourse will also provide means of drainage of areas of agricultural land which remain during the possible extended period of development of so large an area.

PROPOSED ENGINEERING WORKS

The proposed scheme includes the following works:

1. Preservation of the existing Foudry Brook and adjacent 25 metres wide flood strip.
2. Provision of an additional duplicate channel with approximately 5 metre bed width and adjacent flood strip up to 100 metres wide through the Kennet Valley Park.
3. The construction of a two stage flood channel 30 metres wide through the filled areas between Kennet Valley Park and the River Kennet (thus opening a filled in watercourse).
4. Building a suitable river control structure at the upstream division of the existing and duplicate channels to ensure correct division of flows.
5. The retention of a landscaped flood storage area within the Kennet Valley Park.
6. Raising all other areas within Kennet Valley Park above maximum flood level.

33,000 m A.O.B. W				
Chainage (m)	0.0	300.0	525.0	715.0
Brd Level (m)				
Water Level (10yr Flood)				
Water Level (200yr Flood)				
Water Level (Observed Flood)				



Burgfield Brook
M1 Motorway Bridge

River Kennet

KENNET VALLEY PARK			
FOUDRY BROOK			
BACKWATER CURVES			
Peter Brett Associates Consulting Engineers			
16 Westcote Road, Reading, RG3 2DE			
Scale 1/50 VERT. 1/10,000 HORZ.		Date MAY 01	
Checked <i>MB</i>		Drawn B.A.	
No. 2942/SK1		Passed	

TECHNICAL CRITERIA

The proposed scheme has been designed to cater for flows from the Foudry Brook which occur once in 200 years. The maximum flood level generated in the area is 38.95 O.D., also at an estimated recurrence of 1 in 200 years.

The discharges are calculated for floods of return periods of 10, 50 and 200 years and are based on research and methods published in the Flood Studies Report issued by the Natural Environment Research Council in 1975.

On-site gaugings and levels have been taken recently as opportunity has arisen and use made of the records of the Thames Water Authority.

The longitudinal and cross-sections of the existing Foudry Brook have been supplied by the Thames Water Authority for our use.

For normal channel discharges a rugosity factor of 0.035 has been taken whilst values of 0.100 and 0.080 have been taken for different types of overland flow.

Details of flood discharge calculations, backwater curves and drawings of the proposed works are attached in Appendix 2.

DISCUSSION ON SELECTION OF CRITERIA

In designing flood relief measures the absolute maximum cannot be determined and it is normal practice to cater for floods which occur with certain frequencies: the larger the flood and higher the flood levels, the less often it occurs. These floods are predicted from catchment area data on a mathematical basis, and confirmed by records available.

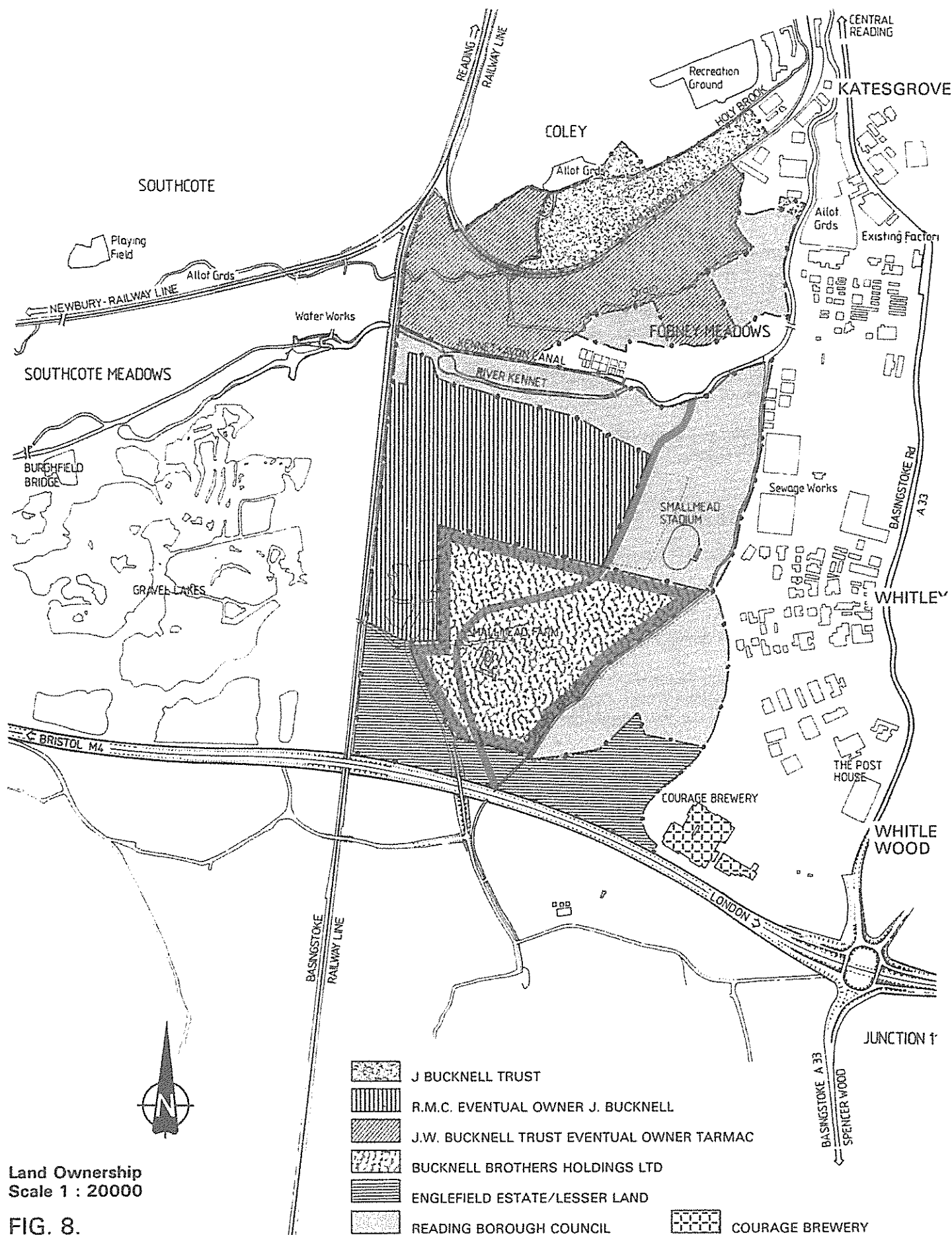
Peak flows from areas are governed by two main characteristics, namely, impermeability of the surface and size of area. Very intense storms occur over a relatively small area and last for a short time, prolonged less intense rainfall produces maximum flows from a large area. The peak discharges which cause maximum flooding therefore occur under different meteorological conditions for different sized areas. For this reason the Foudry Brook has to be considered as a separate entity from the River Kennet when the effects on the Kennet Valley Park are being assessed.

The above principle applies in the consideration of normal peak run-off of storm water from a development when very intense rainfall affects a limited but highly impermeable area.

The consideration of Major Flood Flows and Storm Water Discharge from development are then to be considered as separate conditions.

For the purposes of determining the major flood for an industrial development where severe losses could arise from flooding a return period of 1 in 200 years is considered reasonable and accepted by Insurance Companies and Major funding Institutions. This figure has been used in the present assessment.

In order to cater for the effects of future development in the Foudry Brook catchment an assessment of the urbanisation has to be made. A figure of 15% urbanisation has been arrived at by inspection of Ordnance Sheets and proposed development plans. This has been used in calculating the design flood flows. The effects of an abnormally large increase in urbanisation to 20% and 25% have also been applied and these result in maximum increases in flood levels of only 35 and 55 millimetres respectively. It is not considered that anything exceeding this growth is likely within the next 50 years.



DISCUSSION ON SELECTION OF CRITERIA (continued)

In addition to the calculation of water levels for the 1 in 200 year flood those applicable for the less frequent occurrences of 1 in 1, 10 and 50 years have also been calculated and tabulated in Appendix 2.

For clarity only the 1 in 200 and 1 in 10 years floods are shown on the diagrammatic longitudinal section included here and for comparison the levels observed in March 1984 are also plotted. This was a flood of approximately 1 year return period.

The diagram shows flood levels for the 1 in 200 year flood if the Kennet Valley Park were developed without a relief channel and also those with the proposed scheme. It should be noted that the change in valley gradient at the M4 motorway limits the extension of flood levels upstream. This change also draws attention to the necessity for catering for increased Storm Water from development south of the M4 motorway across the flat flood plain area of the Kennet Valley Park. The duplicate channel provides this requirement.

LAND OWNERSHIP

The implementation of the scheme will require the co-operation of landowners between the M4 and River Kennet, of which our clients own the major portions.

The following schedule sets out the sections involved:

SECTION	LANDOWNER	LENGTH	WIDTH
Proposed	Channel		
A-B	Englefield Estates, under option to Rickworth Securities	210m	55m
B-D	Bucknell Bros. (Holdings) Ltd	1035m	up to 100m
D-E	R.M.C. (with Bucknell option)	530m	30m (alternative route in R.B.C. property)
E-F	Reading Borough Council	90m	30m
F-G	Reading Borough Council	200m	30m

Extension of Existing Foudry Brook Flood Strip

A-W	Englefield Estates, under option to Rickworth Securities	25m
W-X	Bucknell Bros. (Holdings) Ltd	25m

Access for construction for all the works is either from public highway or over land owned by Bucknell Bros. (Holdings) Ltd.

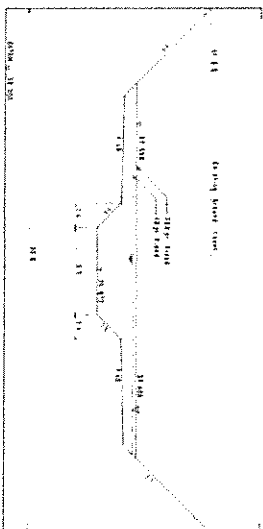
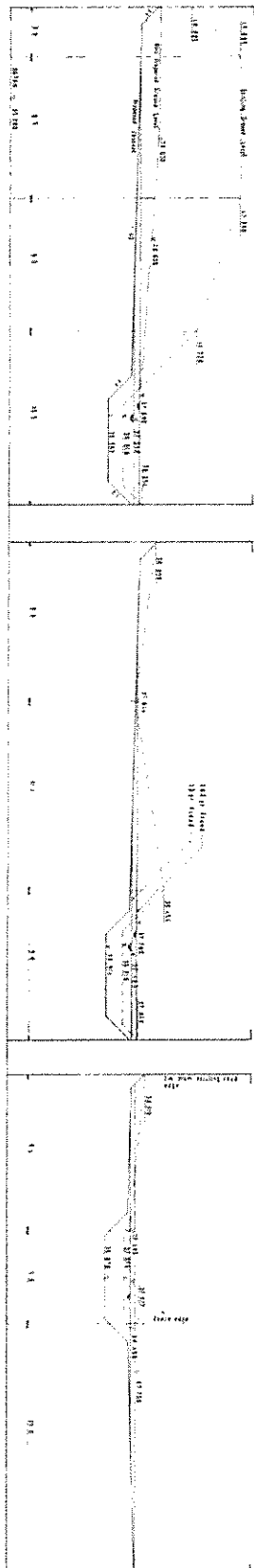
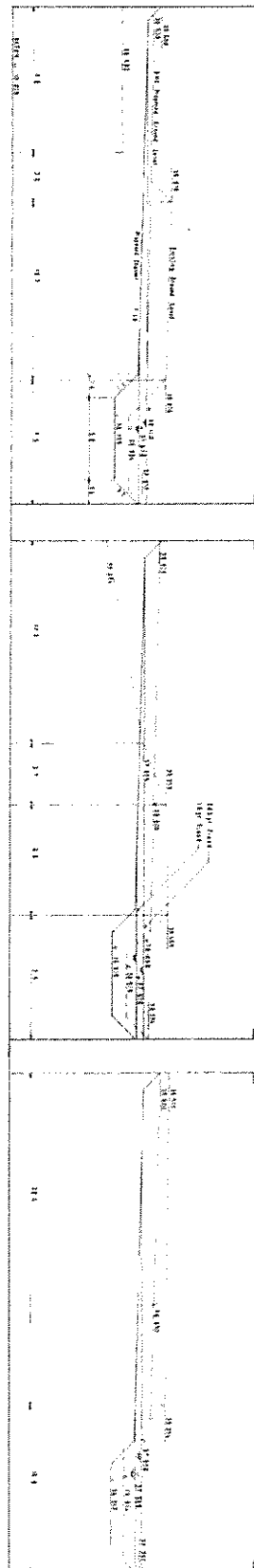
FINANCIAL CONSIDERATIONS AND IMPLEMENTATIONS

As part of the necessary infrastructure required for the development of the Kennet Valley Park a major portion of the works can be carried out with minimum disruption to normal land use and largely at the developers own cost.

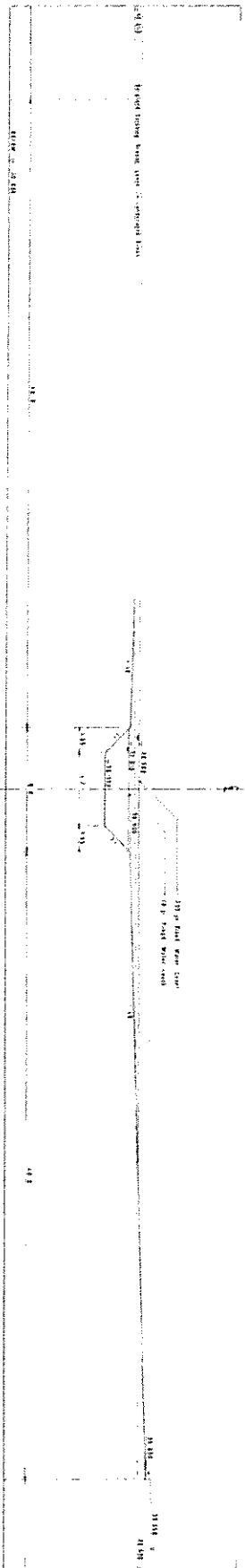
It is assumed that as the scheme is beneficial to other parties contributions from these will be forthcoming and that the public authorities, Reading Borough Council and Thames Water Authority, will give their co-operation in the use of land and any other contributions and assistance to implement the scheme which it is in their interest and authority to provide.

In this connection certain of the works may have to be undertaken under the statutory powers of these authorities.

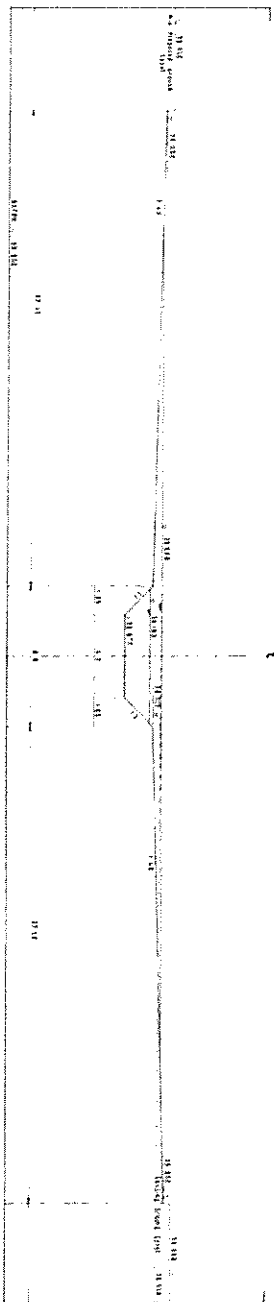
An allowance of £500,000 has been estimated for the relief channel works, but this will be subject to a detailed site investigation.



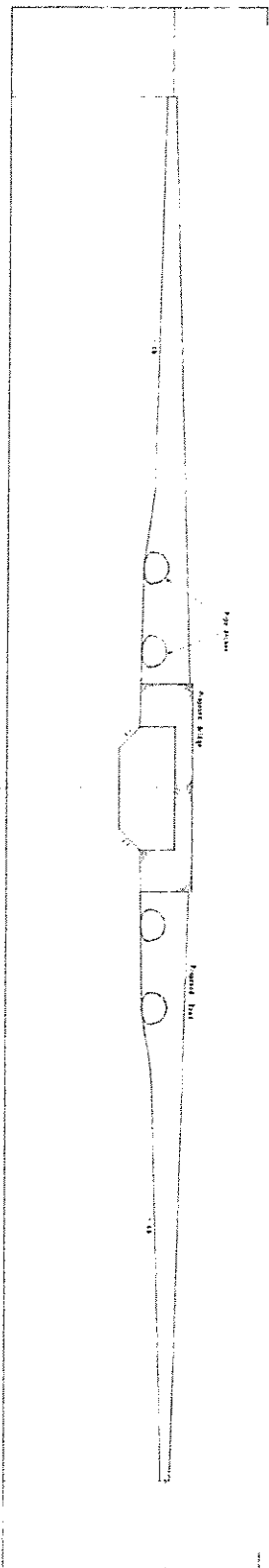
Project Name	KERNET VALLEY PARK
Project Description	FOODRY BROOK RELIEF CHANNEL
Channel Cross-Sections	1-7



Section 1
(Opposite Side View)



Section 2
(Opposite Side View)



Section 3
(Opposite Side View)

Project Name	KENNEL VALLEY PARK
Location	FOURRY BROOK BELICE CHANNEL
Channel Cross-Sections	8-9
Proposed Road Crossing	

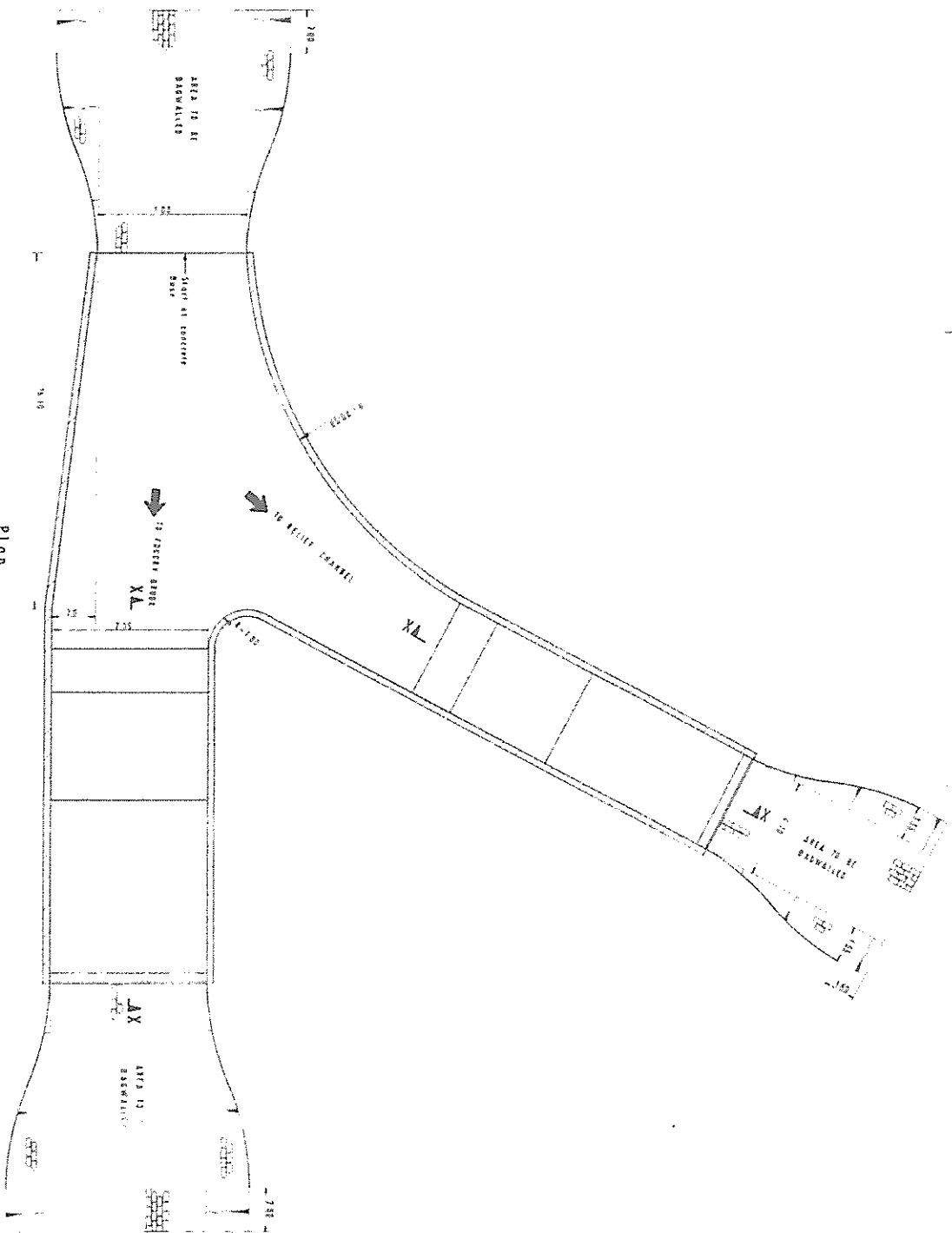
Project Engineer: Consulting Engineer

Project Manager: Consulting Engineer

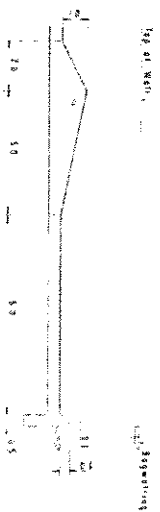
Project Number: 2947702

NOTES

1. ALL DIMENSIONS IN FEET
2. ON 80% SCALE THIS DRAWING



PLAN



Section X-X

KENNET VALLEY PARK
FOUDRY BROOK RELIEF CHANNEL
CONTROL STRUCTURE

Peter Brett Associates Consulting Engineers

2942/301

PROGRAMME

The programme for construction of these works is, of course, largely dependent on the timing of planning permission for the development.

Assuming that this can be obtained shortly after the acceptance of the revised Berkshire Structure Plan, it would be possible to commence construction of the scheme in late 1985.

APPENDICES

The following appendices accompany the report:

No. 1 Drawings

- 2942/ 101 1/2,500 General Plan and Long Section of Scheme
- 201 Cross Sections 1-7
- 201 Cross Sections 8-9
- 301 Control Structure

No. 2 Calculations

- Determination of Flood Discharge
- Calculation of Flood Levels

