

File ref 860/100/00 Upper Nene Structures

NRA ANGLIAN 206



National Rivers Authority  
Anglian Region

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PROJECT No. 57047

UPPER NENE STRUCTURES

ELTON

DETAILED APPRAISAL REPORT

MARCH 1992

09 JUL 1993



Balfour Maunsell

Consulting Engineers

Sackville Place, 44 Magdalen Street, Norwich NR3 1JU



# National Rivers Authority Anglian Region

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Consulting Engineers

Sackville Place 44 The Green St. Letchworth, Herts. SG8 1JU

ENVIRONMENT AGENCY



136113

PROJECT GROUP MEMBERSHIPDETAILED APPRAISAL

This report was prepared in consultation with the following Project Group

PROJECT GROUP MEMBERS

	<u>NAME</u>	<u>FUNCTION/DEPARTMENT</u>	<u>SIGNATURE</u>
PROJECT MANAGER	R WEEDEN	Principal Engineer	.....
PROJECT ENGINEER	P COWIE / <i>M. HOWELL</i>	Senior Engineer	.....
FINANCE REP	A BATCHELOR	Contract Accountant	.....
OPS REP	T YODAN	District Engineer	.....
OTHER REPS	P BARHAM	Conservation and Recreation Officer	.....

In addition to the members of the project group, assistance was given by and consultation took place with

<u>NAME</u>	<u>FUNCTION/DEPARTMENT</u>
J EAST	Assistant Hydrologist

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## 1.0 SUMMARY

### 1.1 Object

To maintain statutory navigation level above the Elton lock. To provide adequate control structure capacity for a 1 in 1 year return period flood which will allow the practice of lock reversal to be discontinued. Also to investigate the provision of control structures at *ELTON* to increase the bankful capacity to a 1 in 5 year return period flood.

### 1.2 Problem

The weirs and sluices at Elton are in need of refurbishment or replacement.

The weirs and sluices have insufficient capacity to pass a 1 year return period flood; when large river flows occur the lock has to be 'reversed' to prevent bank overtopping. This practice is undesirable from safety, structural and manpower considerations.

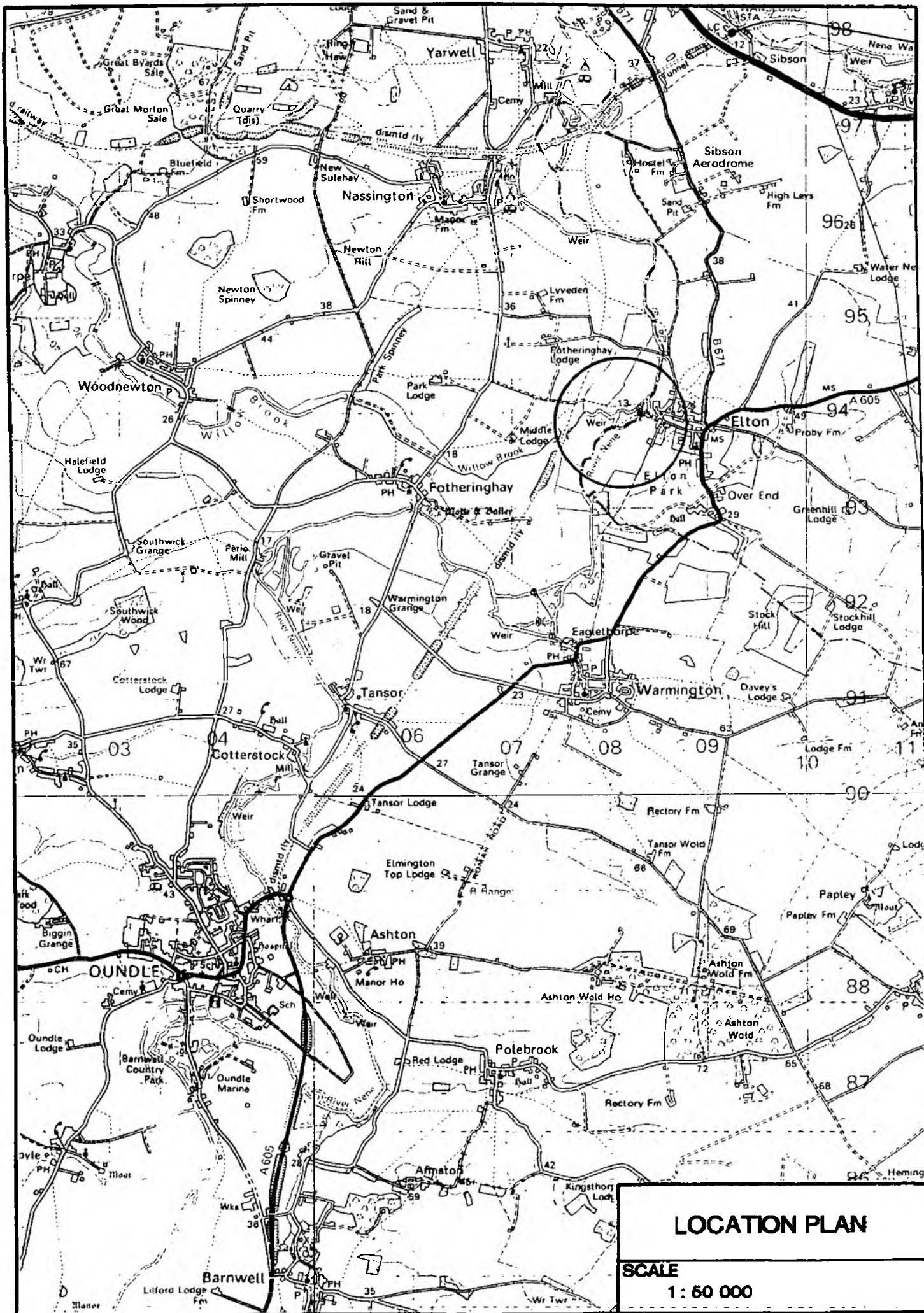
### 1.3 Options

The following options have been considered:-

- a) Do Nothing
- b) Refurbish Existing Structures
- c) Refurbish and Extend Existing Structures
- d) Construct New Weirs at Weir No. 1 Site and Sluices *site*
- e) Refurbish Weir No. 1, Construct Weir to Replace Sluices

### 1.4 CONCLUSIONS & RECOMMENDATIONS

*To be finalised*



## 2.0 DESCRIPTION OF PROBLEM

### 2.1 Statement of Need

- 2.1.1 The NRA has a statutory obligation to safeguard navigation on the River Nene. The water retention levels in each reach are maintained by locks and control structures for the purpose of navigation.
- 2.1.2 Locks provide the means of navigation between adjacent reaches, whilst the retention of river levels and the means to discharge flood flows should be provided by weirs and sluices.
- 2.1.3 At Elton, the maximum flows that can pass over the weirs and through the sluices are insufficient and the lock has to be 'reversed' to pass even moderate flood flow.
- 2.1.4 The weirs and sluices are in need of either refurbishment or replacement.
- 2.1.5 The requirement for capital investment to increase the discharge through control structures (para 2.1.3) and improve the condition of retained structures (para 2.1.4) has been established.

### 2.2 Statement of Fact

- 2.2.1 Elton lock and weirs are located to the west of the village of Elton approximately midway between Oundle and Peterborough (NGR TL 083940) - see Appendix A for location plan. The site represents one of the 38 river control sites on the navigable length of the River Nene between Northampton and Peterborough.
- 2.2.2 At this site the following structures maintain the navigation levels and allow the discharge of river and flood waters. Refer to layout plan in Appendix B and photographs in Appendix C.
  - a) Lock comprising mitre gates upstream and guillotine gate downstream.
  - b) Large and small sluice gates (total width 3.9m) immediately upstream of the lock.

- c) High level weir (No.2) 19.8m wide, immediately upstream of sluices above.
- d) Low level weir (No.1) 7.5m wide, situated 300m upstream of the lock.
- e) Minor sluices in and adjacent to the mill.

2.2.3 The lock and Weir No. 1 were constructed in the 1930's. The sluice gates adjacent to the lock were installed in the early 1940's and concrete aprons downstream of sluice and lock were laid in the early 1960's. Weir No.2 was constructed in 1976 largely as a result of serious flooding.

The old mill and its associated sluices are in excess of 100 years old.

A report on the structural condition of the structures is provided in Appendix D and a report on the mechanical condition in Appendix E.

2.2.4 The following is a brief summary of the condition of the structures:-

- a) Lock - satisfactory condition.
- b) Sluices - satisfactory condition but *difficult to operate and* requires safety guards to gear mechanisms, and downstream bank protection requires repair.
- c) Weir No. 2 - satisfactory condition but note above re. bank protection applies.
- d) Weir No. 1 - satisfactory condition - masonry requires some repointing and footbridge handrail requires attention.
- e) Mill sluices - ~~unknown~~ but assumed to be in poor condition. *not accessible for inspection*

2.2.5 Whereas the operation and maintenance of the lock, main sluice and weirs are the responsibility of the NRA; the sluices at the old mill are owned by the millowner and are his responsibility. The mill sluices are currently not being operated and only a very small flow of water passes through the mill wheel race.



2.2.6 The theoretical combined bankfull capacity of the control structures at this site is 34.8 cumecs. The capacity is based on a bankfull level of 14.6m at Weir No. 1 according to measurements taken during a recent topographical survey and is made up as below:-

a) Lock, over closed mitre gates	3.1 cumecs
b) Sluices	16.2 cumecs
c) Weir No. 1	11.6 cumecs
d) Weir No. 2	3.4 cumecs
e) Mill sluices	estimated at 0.5 cumecs

---

TOTAL 34.8 cumecs

These bankfull capacities are substantially less than the one year return flood flow of 70 cumecs (approximately 50% of 1 year flood).

2.2.7 It has become common practice at this site to 'reverse' the lock, i.e. tie back the mitre gates and operate the guillotine gate as an undershot gate, to allow the passage of high river flows.

This practice has allowed a maximum bankfull capacity of 57 cumecs made up as below:-

a) Lock, "reversed" condition (fully open)	26.9 cumecs
b) Sluices	15.7 cumecs
c) Weir No. 1	11.6 cumecs
d) Weir No. 2	2.3 cumecs
e) Mill sluices	estimated at 0.5 cumecs

---

57.0 cumecs

This capacity is still less than the one year return flood flow of 70 cumecs.

This practice of lock reversal is undesirable for the following reasons:-

- a) Manual operation is required meaning repeated visits to the site for observation and adjustment.
- b) The reversing operation is a safety hazard to the operators.
- c) The high water velocities through the 'open' lock constitute a hazard to passers by and any would-be navigators.
- d) The high velocities generated below the lock have produced scour of the banks on either side of the river.

## 2.3 Forecasts and Design Criteria

2.3.1 There are no specific significant proposed developments which will affect the water flows at the Elton site. River Nene growth curve factors have been adopted to compute the design flood flows.

### 2.3.2 Design Flows

The theoretical design flows on the River Nene at Elton have been provided by the assistant hydrologist of NRA, Anglian Region, and are as follows:-

<u>Return Period</u> years	<u>Flow</u> cumecs
1	70
5	94
10	114
20	131
50	166
100	250

### 2.3.3 Design Criteria

The following criteria have been adopted:-

- a) The replaced and refurbished control structures should require minimal attention from operational staff.
- b) The proposed improvements will provide additional discharge capacity such that the undesirable practice of 'lock reversal' can be discontinued.

- c) The design bankfull discharge capacities for the whole of the site shall be <sup>investigated</sup> for two alternative criteria:-
- i) 1 year return period flood (i.e. 70 cumecs)
  - ii) 5 year return period flood (i.e. 94 cumecs)

#### 2.3.4 Environmental Considerations

- 2.3.4.1 The Elton site is visually attractive and in the 1979 Nene Valley report the area of riverine meadows was highlighted as of outstanding importance. Any proposed structures or channel amendments should be compatible and sympathetic with the existing landscape.
- 2.3.4.2 The land surrounding the Elton structures is largely used as pasture.
- 2.3.4.3 It is understood that the Countryside Commission are encouraging landowners of riverine pastures in this area to apply for "countryside stewardship". This entails payment to the landowner for "conservation and enhancement of the landscape and its wildlife habitats". Any appreciable reduction in flooding of riverine pastures may alter the present landscape and therefore may render the land unacceptable for "stewardship".
- 2.3.4.4 There is a footpath combined with vehicular access across the lock and sluice channel. The footpath follows the western bank of the river both upstream and downstream and the new proposals must allow for the continuity of this path with footbridges where necessary.

2.3.4.5 The design retention level of the reach above Elton, i.e. 13.66m A.O.D, will be the same as the existing lowest retention level. It has been the practice to raise the retention level during dry weather by inserting stop logs at Weir No.1. but it is believed that there will be no appreciable detrimental effect if this operation is discontinued.

2.3.4.6 The old water mill at Elton is of great historical interest and is a Grade 2 listed building. There have been suggestions that it may be converted to a museum or "heritage centre" etc but, as yet, no definite plans are available.

The channels under the mill, along with their controlling sluices, are currently in a <sup>doubtful</sup> ~~very dubious~~ condition and the flow capacity has been largely ignored in the proposals for upgrading of control structures at Elton. With development or restoration of the mill in doubt and anyway in the hands of its private owner it is considered in the NRA's best interests to ignore any potential capacity that may be available through the mill. If the mill is subsequently developed and the waterways and sluices are restored, the capacity of these can only improve the overall situation by reducing the amount of water flowing over or through NRA's weirs and sluices.

As the condition of the channels and sluices at the mill are in a doubtful condition it is recommended that the NRA safeguard the navigation water levels by informing the mill owner of his obligations to "maintain the works in a proper state of repair" and arrange such inspections as may be required.

2.3.4.7 The following environmental organisations have been contacted:-

English Nature  
Countryside Commission  
Northamptonshire Naturalist Trust  
English Heritage

General details of proposals were given to the above organisations and their comments requested. (typical letter included in Appendix)

English Heritage stated that they would only become involved if there were any proposals that affected listed structures or buildings. None of the proposals in this study affect the old mill and therefore English Heritage will not become involved at this stage.

+ Further comments from CC, English Nature and NNT.  
+ Nene Valley Project



Generally concerned about water level changes  
or changes in flooding regime

### 3.0 FORMULATION OF OPTIONS AND PROPOSED SOLUTIONS

#### 3.1 Key Objectives

The key objectives are:-

- a) Maintain statutory navigation level.
- b) Recommend modifications that will provide 1 in 1 year discharge capacity without the need to 'reverse' the lock.
- c) Investigate structures that would be required for a 1 in 5 year discharge capacity.

#### 3.2 Options Considered and Evaluated

##### 3.2.1 Option 1 - Do Nothing

This option does not satisfy any of the key objectives. The structures are ageing and refurbishment of some of the structures is required as a minimum measure to maintain safe and reliable statutory navigation rights on the River Nene. This option is therefore not considered further.

##### 3.2.2 Option 2 - Refurbish Existing Structures

3.2.2.1 This option would satisfy the first key objective of maintaining statutory navigation levels. However, the continued use of the lock will be necessary to pass flood flows and therefore the second key objective is not satisfied.

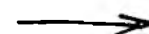
3.2.2.2 The structures are generally in reasonable condition and refurbishments would be straightforward. The sluice gates would be ~~refurbished~~ <sup>REBUILT</sup> and automated such that they would operate to maintain a predetermined upstream water level. A power supply, motor drives and logical control system would be required as well as a telemetry connection to provide remote information about the local status.

3.2.2.3 The estimated costs of refurbishing the structures and automating the sluices is £60,000 with capitalized operating costs of £----- (refer Appendix H1 for detailed breakdown).

3.2.3 Option 3 - Refurbish Sluice and Extend/Reconstruct Weir No. 1

3.2.3.1 Weir No. 1 can be extended (or reconstructed) to increase the bankfull capacity to a 1 year flood flow as below:-

a) Lock, over closed mitre gates	2.6 cumecs
b) Sluices	16.1 cumecs
c) Weir No. 1 <u>extended</u>	47.5 cumecs
d) Weir No. 2	3.3 cumecs
e) Mill sluices	assumed 0.5 cumecs



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70.0 cumecs

3.2.3.2 The capacity of Weir No. 1 must be increased substantially. The crest length must be increased to 27.5m to provide the required capacity of 47.5 cumecs. Because of the large increase in dimensions and because it would be appropriate to extend the weir in both directions, it has been assumed that the weir will be totally reconstructed to the extended length. *by 20m*

3.2.3.3 The existing diversion channel downstream of Weir No. 1 has a bankfull capacity of 28.5 cumecs. This channel also takes the flow of Willow Brook which drains a catchment of some 100 square kilometres. To increase the capacity of this channel a new direct channel is recommended to produce more efficient hydraulic conditions and therefore least channel ~~diversions~~ *dimensions* (refer to Appendix F for proposal plan).

The existing diversion channel could be enlarged to cater for the increased flow along its existing path but it would involve much greater widening along its entire length.

The footbridge at the confluence of the diversion channel and navigation channel will need replacement for this option. A new high level footbridge approximately 50m upstream is recommended.

3.2.3.4 The estimated cost of refurbishing the sluices, reconstructing Weir No. 1 and increasing the diversion channel capacity is £331,000 with capitalized operating costs of £----- (refer Appendix H2 for detailed breakdown).

3.2.3.5 For options 3 to 5, alternative schemes have also been investigated and costed to allow the passage of flows from a 5 year flood. The river channel between Warmington and Elton has insufficient capacity to pass a five year flood and enlargement of this channel has been allowed for as an additional cost for all '5 year' schemes.

3.2.3.6 To accommodate a 5 year flood the length of Weir No. 1 would require to be 41.5m and the diversion channel enlarged even more. The estimated capital cost of this scheme is £555,000 with capitalized operating costs of £-----.

3.2.4 Option 4 - Construct New Weir<sup>s</sup> at Weir No. 1 site and Sluices Site

3.2.4.1 This option is similar to Option 3 except that the sluices and Weir No. 2 are abandoned and replaced with a low level weir providing similar capacity.

3.2.4.2 This option simplifies operation of the site with no mechanical or electrical installations for controlling the river flows.

3.2.4.3 The new weir at the sluices site requires a crest length of 12m to give the 19.4 cumecs capacity (refer to capacities in para 3.2.3.1).

3.2.4.4 The estimated cost of the two new weirs and the enlargement of the diversion channel is £400,000 (refer to Appendix H3 for detailed breakdown).



3.2.4.5 To accommodate for a 5 year flood the length of Weir No. 1 and diversion channel are increased as in Option 3. The estimated capital cost of this scheme is £612,000.

3.2.5 Option 5 - Refurbish Weir No. 1 and Construct New Weir at Sluices Site

3.2.5.1 This option allows the existing Weir No. 1 and diversion channel to be retained as at present and the increased flows to be concentrated at a new low level weir to replace Weir No. 2 and the sluices (refer Appendix G for plan of proposals).

3.2.5.2 The new weir at the sluices site requires a crest length of 39m and the various flows through the structures are given below:-

a) Lock, over closed mitre gates	2.4 cumecs
b) Weir No. 1	11.7 cumecs
c) Weir No. 2 <u>new weir</u>	55.4 cumecs
d) Mill sluices	assumed 0.5 cumecs

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70.0 cumecs

3.2.5.3 The flows of water from this new weir <sup>is</sup> ~~are~~ substantially increased from the flow through the existing sluices. Consequently the sides of the existing sluices channel and access bridge abutments will require a high degree of protection for this option.

3.2.5.4 The estimated cost of refurbishment of Weir No. 1 and the new weir at the sluices site is-£303,000 -(refer to Appendix H4 for detailed breakdown).

3.2.5.5 To accommodate ~~for~~ a 5 year flood the length of the new weir would require to be 51.5m. The estimated cost of this scheme is £501,000.

### 3.3 Selection of Option

3.3.1 The summary table in Appendix H5 sets out the estimated costs of the various options.

3.3.2 Of the three options that meet the key objectives, i.e. 3, 4 and 5 the most cost effective option is option 5 (refurbish Weir No. 1 and replace Weir No. 2 and sluices with a new low level fixed weir).

The total cost of this option for 1 year capacity is £303,000.

If 5 year capacity is required then the total cost is estimated at £501,000 which includes ~~for~~ £110,000 for main river channel enlargement between Warmington and Elton.

3.3.3 Option 5 appears to satisfy all the design criteria and key objectives with the least disruption and environmental consequences.

3.3.4 <sup>Both</sup> Option <sup>s</sup> 4 and 5 include for replacing the sluices with a fixed weir thereby removing all mechanically operated control structures and the requirement for automation. These options, therefore, would substantially simplify the river control management at Elton.

3.3.5 The new and enlarged diversion channel of Options 3 and 4 across existing pasture would constitute a significant change to the landscape. Option 5 concentrates all the structural alterations to the sluices area and requires no changes ~~at~~ all to Weir No. 1 and the diversion channel.

### 3.4 Project Timing

3.4.1 A possible programme for the reconstruction works at *ELTON* is:-

Detailed Appraisal complete  
Detailed Design  
Construction

3.4.2 Expenditure Profile (in £000) for the above programme if Option 3B is adopted would be:-

	91/92	92/93	93/94	94/95	95/96	Total
Works						
Fees						
Salaries						

*To be finalized*

#### 4.0 MAFF GRANT AID POSITION AND SCHEME JUSTIFICATION

To be finalized

#### 5.0 CONCLUSIONS AND RECOMMENDATIONS

To be finalized

# National Rivers Authority Anglian Region

**Meeting:** WELLAND AND NENE  
LOCAL FLOOD DEFENCE  
COMMITTEE  
**Date:** 13 MARCH 1992

<b>Item No.</b>	13	<b>Report No.</b>	09/92
<b>Subject:</b>	UPPER NENE CONTROL STRUCTURES - DESIGN STANDARDS		

## SUMMARY

This report recommends that design standards for control structures on the Upper Nene are set to maintain the status quo in terms of return periods. It also recommends that where such structures are replaced the opportunity should be taken to eliminate the need for lock reversal.

## REPORT

With the exception of those structures at Perio, Upper Ringstead and Lower Wellingborough which have been designed to a "5 year return period" standard the bankfull capacity of the remaining control structures on the Upper Nene is to "1 year return period" or less. The NRA proposes not to increase this standard for the following reasons:-

- (a) the raising of standards and improvements to structures will only yield marginal benefits - much of the existing flood plain is either pasture or gravel workings.
- (b) landowners are being encouraged to apply for "Countryside Stewardship" which will involve them maintaining the present landscape.
- (c) the NRA has a duty under Section 16 of the Water Resources Act 1991 to conserve and enhance the natural beauty of physical geographical features - such as flood plains.
- (d) Until a comprehensive computer model of flows in the Nene is available the effects of increasing the existing standard is uncertain - it could conceivably lead to an increased flooding risk in Peterborough.

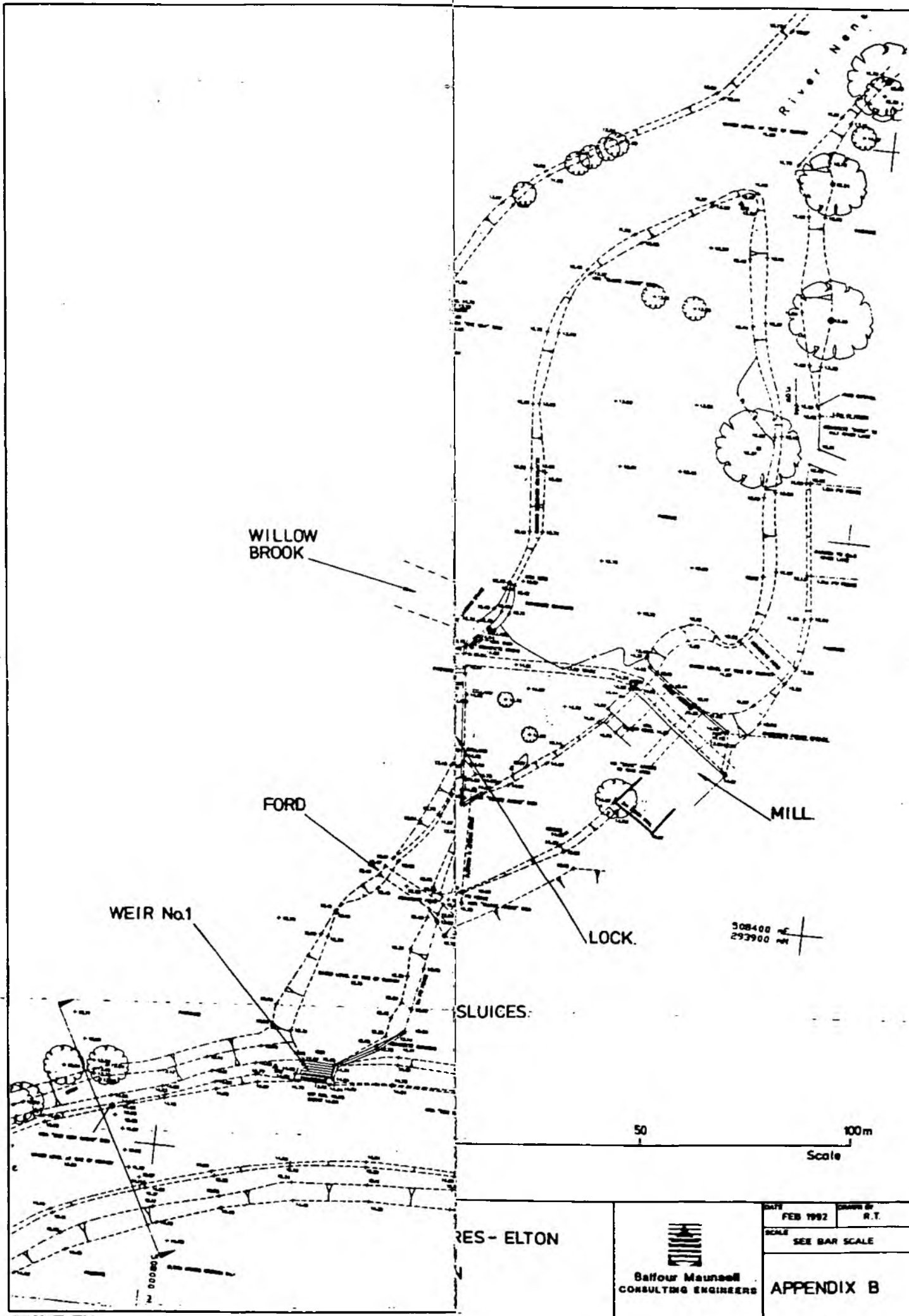
Further, it is suggested that in order that the NRA minimise future maintenance costs, and to make structures safer and more manageable during periods of high flows - those structures where lock reversal is currently necessary should be redesigned such that the by-pass weir capacity is increased to facilitate the discharge of flood flows, thereby making the operation of lock reversal unnecessary during flood events. The structures which come into this category are:- Hardwater, Ditchford, Titchmarsh, Wadenhoe, Warmington, Elton, Cottestock and Yarwell.

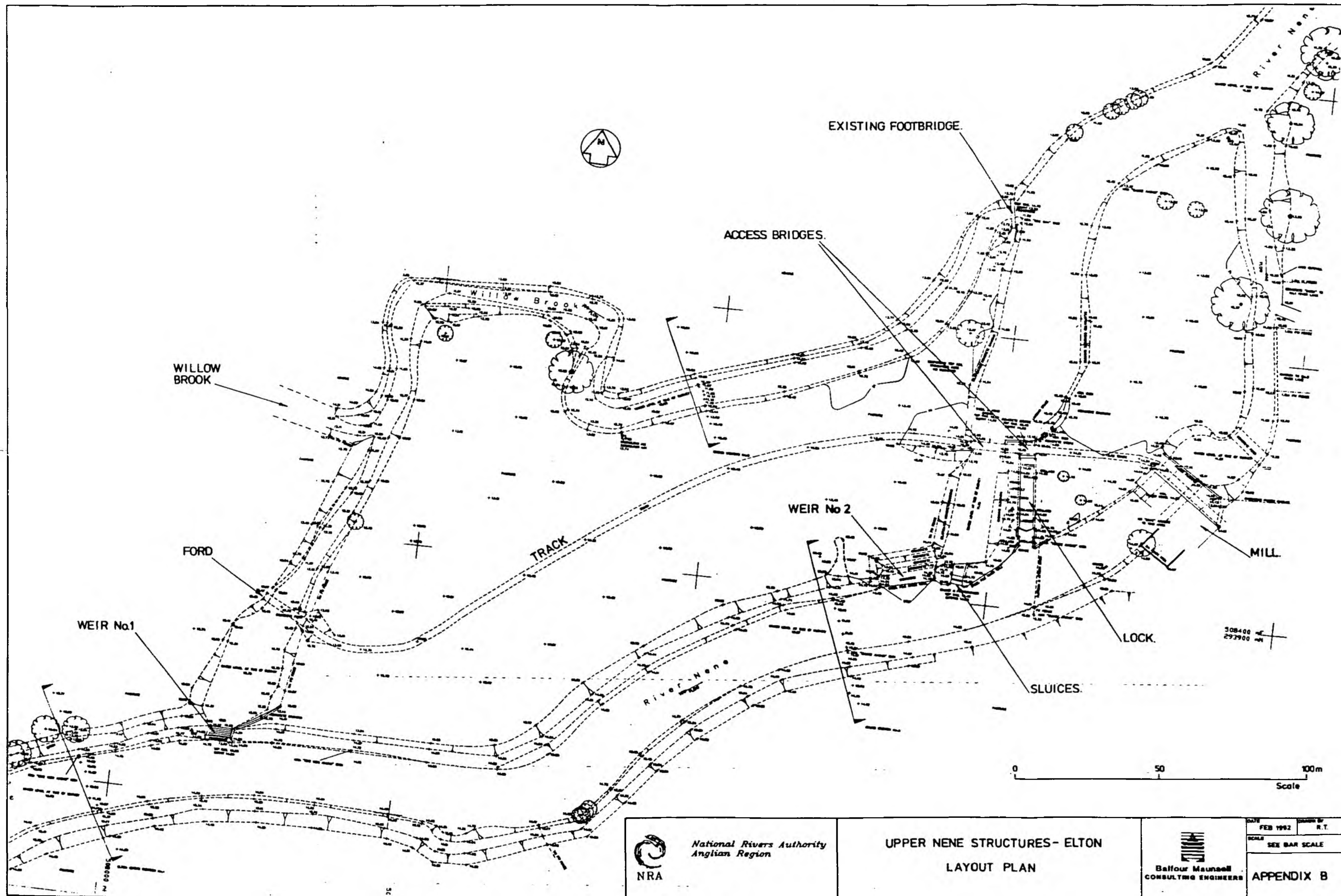
The NRA intends to apply to MAFF for grant aid towards these schemes.

## RECOMMENDATION

The Committee is asked to approve the approach recommended in this respect.

Bryan Utteridge  
Operations Manager (Northern)





National Rivers Authority  
Anglian Region

# UPPER NENE STRUCTURES- ELTON LAYOUT PLAN

**Balfour Maunsell**  
CONSULTING ENGINEERS

DATE FEB 1992  
DRAWN BY R.T.  
SCALE SEE BAR SCALE  
APPENDIX B



Upstream view of Elton Mill and control structures  
Note Weir No. 2, sluices, and lock guillotine gate



Downstream view of Elton Mill  
Note 2 of the 3 arches under mill, guillotine gate and access bridges





Elton Lock - view upstream



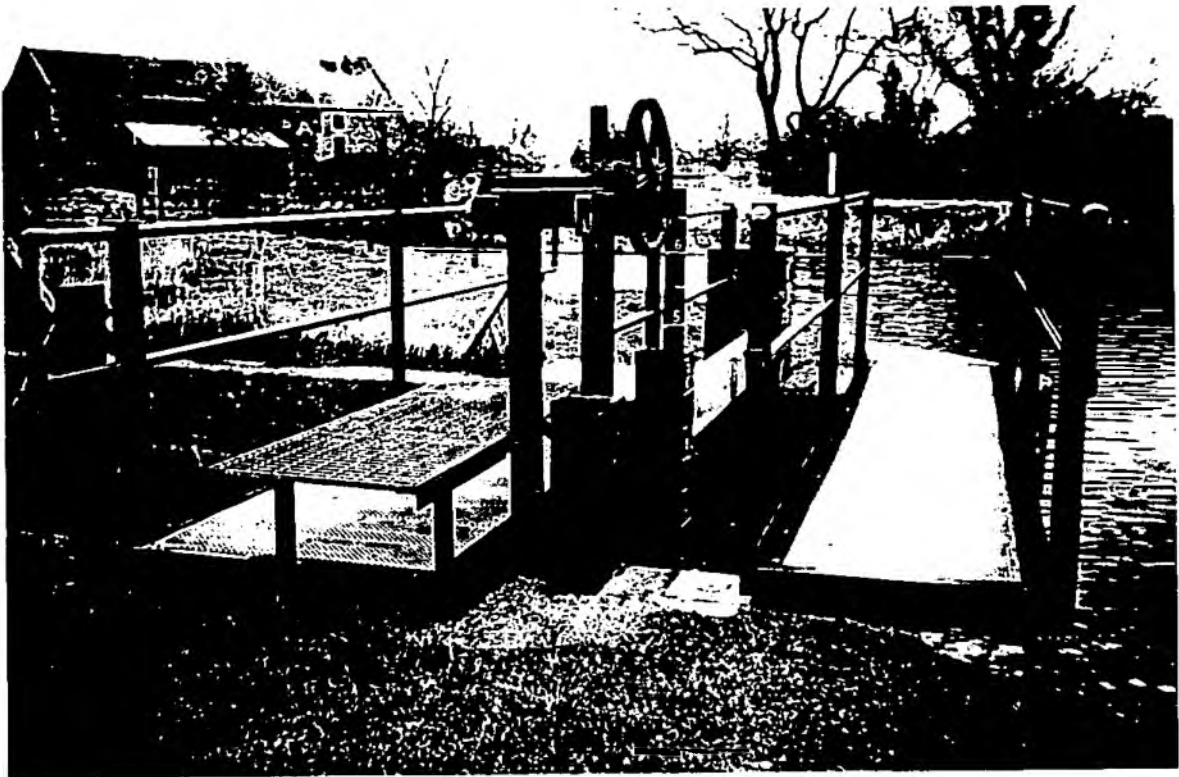
Elton Lock - view downstream  
Note safety boom on right



Elton Weir No. 1  
Viewed from downstream west bank



Diversion channel viewed from bridge over Weir No. 1  
Note ford in centre of picture



Elton Sluices - headgear and access bridges



Elton Sluices - viewed from downstream



Sluice and Weir No. 2 discharge channel  
Note severe bank deterioration



Sluice discharge channel and access bridge  
Viewed downstream

SURVEY REPORT - STRUCTURAL CONDITION

R Huggard visited the Elton site on Wednesday 7 August 1991. Also in the survey team were N Smith and J Ward of the Balfour Maunsell Norwich office and D Nunn of the Balfour Maunsell Sheffield office. They were accompanied by G Davies and M Shilling of the National Rivers Authority.

1. Site Conditions

1.1 There was flow over or through all the structures at Elton, except for the Weir No. 2.

1.2 No underwater inspection took place and no drawdown of the water level was possible. Hence the condition of the underwater parts of the structures and any scour problems cannot be commented upon.

2. Weir No. 1 *(refer to Appendix C3 for photographs)*

2.1 Water was flowing over this weir and so close inspection was not possible. However it was observed that the surface of the weir was in need of repointing and so also were the side walls. This work should be done as soon as possible in order to avoid further damage.

2.2 The handrail of the footbridge was loose and so in a hazardous condition. This handrail should be strengthened or replaced without delay.

3. Weir No. 2 *(refer to Appendix C5 for photographs)*

3.1 This weir was dry and an inspection of it revealed that both the cribwork concrete slabs and the toe had been eroded. These should both be repaired in the near future so that further erosion does not occur.

4. Sluices *(refer to Appendix C4 for photographs)*

4.1 Water was flowing over the sluice and so a close inspection was not possible. It was observed that the sheet pile retaining walls were bulging. Since it is not known whether this is an ongoing movement or happened some time ago, the walls should be monitored for movement.

5. Elton Lock

5.1 There was a vertical crack in the face of each side wall but the cracks were not leaking at the time of the visit.

6. Mill Structures

6.1 It was not in the brief of this project to inspect the arches crossing the mill stream. However they did not appear to be in excellent condition and so if they are used for vehicular traffic they should be inspected and their load carrying capacity assessed.

SURVEY REPORT - MECHANICAL EQUIPMENT CONDITION

D. Nunn visited Elton on Wednesday 7 August 1991. Also in the survey team were Messrs Smith, Huggard and Ward of BM Norwich Office. We were accompanied by Messrs Davis and Shilling of NRA.

## 1. Elton Mill

- 1.1 Flows pass below the mill in 3 No. mill races (Photograph Appendix <sup>c1</sup>). Entry to the mill was not available so ~~I cannot~~ comment on the control mechanism but what could be seen was derelict. Flow was only passing through one end race.

## 2. Elton Lock

- 2.1 A navigation lock comprising at the downstream end a vertical lift gate and upstream mitre gates (Photograph Appendix <sup>c2</sup>).
- 2.2 The vertical lift gate is of Glenfield manufacture and is operated by two chains passing over high level sprockets to a counter balance. The chain sprockets are connected through gears to a horizontal shaft. The horizontal shaft is driven by bevel gears from a vertical drive shaft coupled to a gear box. Manual operation is by a permanently fitted hand crank locked by an 'Abloy' key operated shoot bolt.

Gearbox Glenfield.  
General Condition - Good.  
Safety - Satisfactory.

- 2.3 The vertical gate has side seals which are resiliently covered tubes. Their effectiveness was not observed.

- 2.4 The steel fabricated mitre gates leak at the sides.

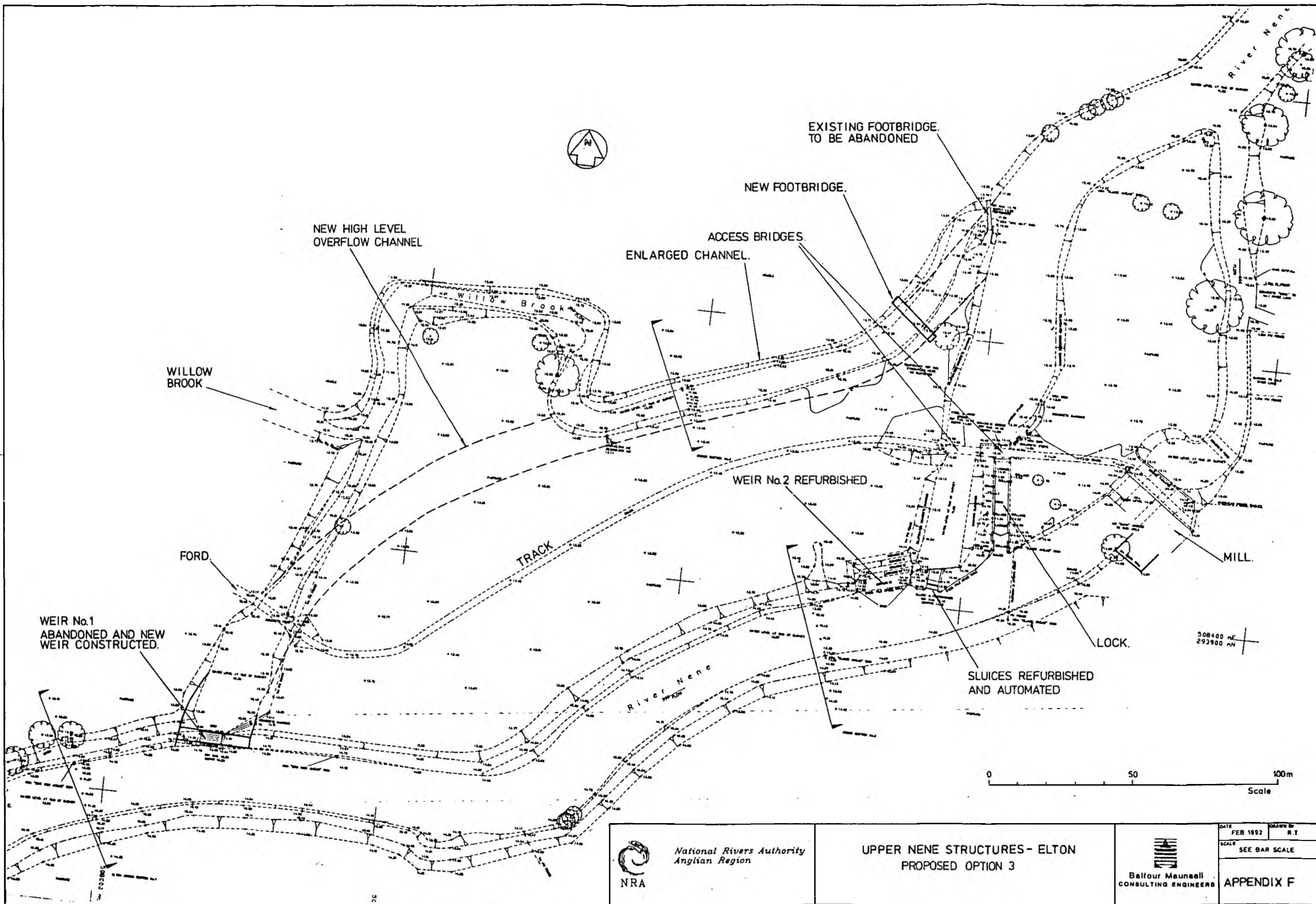
## 3. Elton Sluice

- 3.1 The works here comprise two vertical gates manually operated through rack and pinion drives. (Photograph Appendix <sup>c4</sup>) (Drawings NRA 32/9/620/0153/0155/0156).
- 3.2 The wide gate has two rack and pinion drives operated through a common shaft from a gearbox. The gearbox has a square input shaft for crank handle operation.
- 3.3 The narrow gate has a single rack and pinion drive operated through gears by a crank handle.
- 3.4 Both mechanisms <sup>s</sup>are in good order. However there are no guards on the gears and pinions. This is a safety risk especially as they are adjacent to a public footpath.

D Nunn  
30.08.91

Cannot be  
made





National Rivers Authority  
Anglian Region

# UPPER NENE STRUCTURES - ELTON PROPOSED OPTION 3

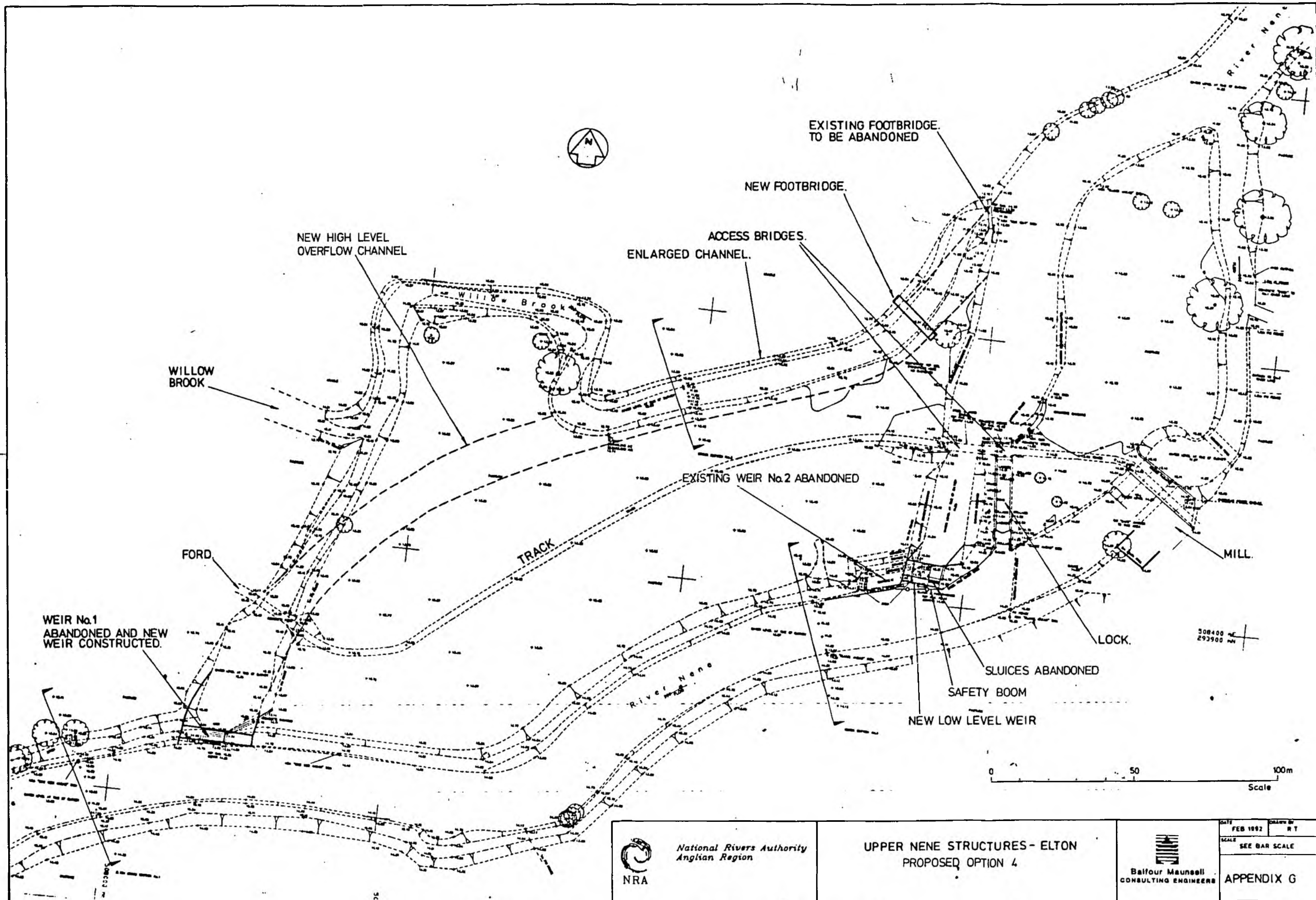


Balfour Maunsell  
CONSULTING ENGINEERS

DATE FEB 1992 DRAWN BY R.T.

SCALE SEE BAR SCALE

APPENDIX F



National Rivers Authority  
Anglian Region

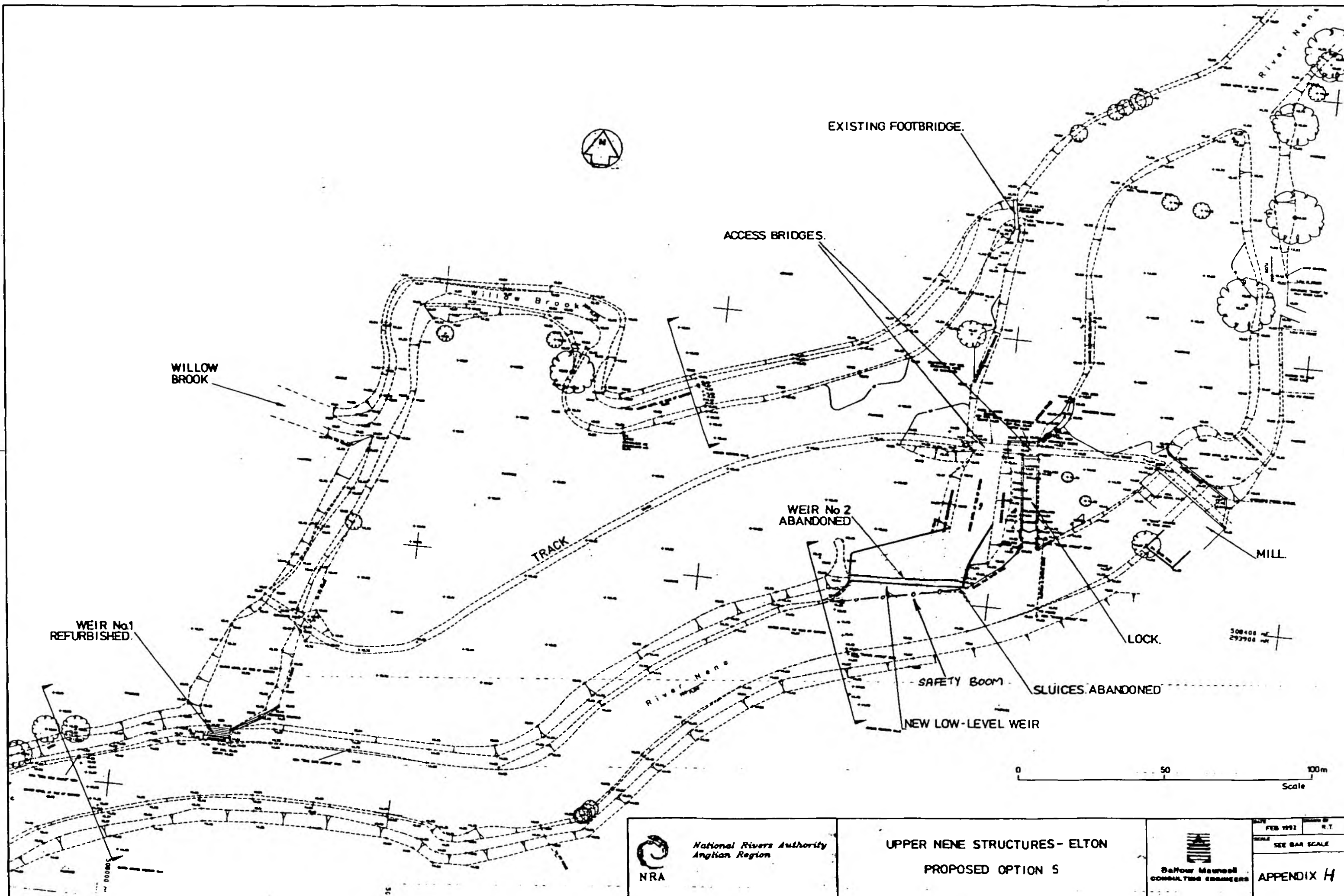
# UPPER NENE STRUCTURES - ELTON PROPOSED OPTION 4



Balfour Maunsell  
CONSULTING ENGINEERS

DATE	FEB 1992	DRAWN BY	R T
SCALE	SEE BAR SCALE		
APPENDIX G			





National Rivers Authority  
Anglian Region

# UPPER NENE STRUCTURES - ELTON PROPOSED OPTION 5



DATE FEB 1992 DRAWN BY R.T.  
SCALE SEE BAR SCALE  
APPENDIX H

OPTION 2 - COST ESTIMATE

## Refurbish Weirs and Automate Sluices

<u>Item</u>	<u>Description</u>	<u>Cost £'s</u>
1.	Refurbish Weir No. 1 - repoint weir and brickwork - fill scour hole - provide additional bank protection - replace bridge handrail	7,000
2.	Refurbish and automate sluices - renovate sluice gates and machinery - provide motor drive to gates (+ guards) - provide electricity supply - provide control box - provide telemetry <del>local</del> station	20,000
3.	Bank protection downstream of sluices and Weir No. 2	6,000
	sub total	33,000
	Add 10% contingencies	3,300
	Add 25% preliminaries (items 1-3)	8,250
	Contract Cost	44,550
	Design, Supervision and Project Management (15%)	6,683
		51,233
	Fees and salaries for Project Appraisal	8,400
		59,633
	say £60,000	

OPTION 3 - COST ESTIMATE

Refurbish Sluices, Reconstruct Weir No. 1 27.5m Crest Length

<u>Item</u>	<u>Description</u>	<u>Cost £'s</u>
1.	Refurbish and automate sluices (as items 2 & 3 of option 2)	26,000
2.	Demolition of Weir No. 1	2,000
3.	Excavation of new weir 825m <sup>3</sup>	4,000
4.	Sheetpiling 330m <sup>2</sup>	33,000
5.	Concrete including formwork and reinforcement 470m <sup>3</sup>	61,000
6.	Bank protection below weir 500m <sup>2</sup>	12,500
7.	Excavation to be channel 7150m <sup>3</sup>	36,000
8.	New footbridge 20m span	12,000
9.	Bank protection to new channel 500m <sup>2</sup>	12,500
10.	Provide upgraded ford below new weir	9,000
sub total		208,000
Add 10% contingencies		20,800
Add 25% preliminaries (items 1-10)		52,000
Contract Cost		280,000
Design, Supervision and Project Management (15%)		42,120
		322,920
Fees and salaries for Project Appraisal		8,400
		331,320
say £331,000		

OPTION 4 - COST ESTIMATE

New Weir to Replace Sluices (12m Crest Length)  
Reconstruct Weir No. 1 (27.5m Crest Length)

<u>Item</u>	<u>Description</u>	<u>Cost £'s</u>
1.	New weir to replace sluices	
	a) Demolition and excavation	5,000
	b) Sheetpiling 250m <sup>2</sup>	25,000
	c) Concrete 205m <sup>3</sup>	26,500
	d) Downstream bank protection	6,000
	e) Footbridge	7,500
2.	Items 2-10 as option 3	182,000
		<hr/>
	sub total	252,000
	Add 10% contingencies	25,200
	Add 25% preliminaries (items 1-2)	63,000
		<hr/>
	Contract <del>Price</del> <i>Cost</i>	340,200
	Design, Supervision and Project Management (15%)	51,030
		<hr/>
		391,230
	Fees and salaries for Project Appraisal	8,400
		<hr/>
		399,630
	say £400,000	

OPTION 5 - COST ESTIMATE

Refurbish Weir No. 1 and New Weir at Sluice/Weir No. 2 Position  
(39m crest length)

<u>Item</u>	<u>Description</u>	<u>Cost £'s</u>
1.	Refurbish Weir No. 1 - as Option 2	7,000
2.	Demolition of sluices and Weir No. 2	5,000
3.	Excavation for new weir and outlet channel 1600m <sup>3</sup>	8,000
4.	Sheetpiling 470m <sup>2</sup>	47,000
5.	Concrete including formwork and reinforcement 665m <sup>3</sup>	86,500
6.	Bank protection 500m <sup>2</sup>	12,500
7.	Footbridge	24,000
	sub total	190,000
	Add 10% contingencies	19,000
	Add 25% preliminaries (items 1-7)	47,500
	Contract <del>Price</del> Cost	256,500
	Design, Supervision and Project Management (15%)	38,475
		294,975
	Fees and salaries for Project Appraisal	8,400
		303,375
	say £303,000	

SUMMARY TABLE OF OPTIONS

(weir lengths and cost estimates)

Option	Description	Comments	Existing Capacity	1 in 1 Year Capacity Scheme	1 in 5 Year Capacity Scheme Includes £110,000 for channel enlargement between Warmington and Elton.	Capitalized Operating Costs
1	Do Nothing	key objectives not satisfied				
2	Refurbish Structures	key objectives not satisfied	£60,000			
3	Refurbish Sluices Reconstruct Weir No.1		£352K	27.5m      £331,000	41.5m      £555,000	
4	Weir to Replace Sluices Reconstruct Weir No.1		£373K <del>£373K</del>	12m 27.5m      £400,000	12m 41.5m      £612,000	
5	Refurbish Weir No.1 Weir at Sluices Position		£227K	39m      £303,000	51.5m      £501,000	

### Scheme Justification - Economic Appraisal

The following appraisal has been carried out to help justify work on the Upper Nene. It is assumed that all income from navigation will eventually be lost after a period of 5 years as a result of the deterioration in condition of river control structures, and the subsequent loss of retention levels.

Details of Craft and Licence fees were obtained from the NRA's Licencing Department, and details of Mooring fees from the Estates & Recreation Department.

The 3 classes of craft used are the most popular classes on this river. The assumed distribution of craft size and number is considered the most appropriate.

The number of licences are for use on the R Nene only, no allowance has been made for losses incurred through craft that hold licences for the whole region.

No. of Craft licenced to use R Nene alone in 1992 = 1273.

#### Licence Fees

Length	Rate £	No.	Total £
< 7.5m	129	764	98556
<10.0m	167	254	42418
<15.0m	284	255	72420
		1273	213394 per annum

#### Mooring Fees

Length	Rate £	No.	Total £
< 7.5m	Assumed to be trailer mounted		0
<10.0m	260	254	66040
<15.0m	345	255	87975
		509	154015 per annum

#### Registration Fee

$$\text{Annual Income} = £2.00 \times 1273 = \underline{£2546}$$

#### Total Loss of Annual Income Due to Fees

Licence Fees	213394	
Mooring Fees	154015	
Registration Fees	2546	
	£369955	(Year 5 onwards)

### Compensation

This has been taken as the cost of moving craft to new moorings on other rivers. The rate is to cover the cost of a low loader to move the craft.

£250 x 509 no. = £127,250 (Over the 1st 5 Years)

### Loss of Income During Years 1-5

		£	
Year 1	Fees	369955 / 5 =	73,991
	Compensation	127250 / 5 =	25,450
			<hr/>
		99,441	per annum
			<hr/>
Year 5	Fees	369,955	
	Compensation	25,450	
			<hr/>
		395,405	per annum
			<hr/>

### Actual Annual Damage

Discounted at 6% over the 50 year scheme life:-

Year 1 :	99441	x	0.9434	=	93,813
Year 2 :	173432	x	0.8900	=	154,354
Year 3 :	247423	x	0.8396	=	207,736
Year 4 :	321414	x	0.7921	=	254,592
Year 5 :	395405	x	0.7473	=	295,486
Year 6-50 :	369955	x	11.5497	=	4,272,869

Thus Total = £5,278,851



Cost of Control Structure Improvements

Total number of structures on river is 39. Four have already had improvements undertaken; Wellingborough, Woodford, Perio, Upper Ringstead. The cost of these were as follows:-

Wellingborough	£ 300,000	
Woodford	£ 310,000	
Perio	£ 180,000	
Upper Ringstead	£ 165,000	
	<hr/>	
	£ 955,000	Average cost £250,000

It is stated within the strategy for the River Nene model, that the remaining structures would be improved over the next 20 years.

35 structures over the next 20 years equates to a rate of 1.75 structures per annum, each at a cost of £250,000.

Therefore, the annual cost of rehabilitating the structures is:  
 $1.75 \times 250,000 = £437,000$

This cost to be discounted at 6% over the 20 year period i.e.  
 $£437,000 \times 11.4701 = £ 5.02 \times 10^6$

Benefit:Cost Ratio

$$\frac{5.28 \times 10^6}{5.02 \times 10^6} = 1.05$$

Conclusions

1. As can be seen from the above figures, the Benefit:Cost ratio is above unity.
2. In addition to the tangible costs calculated above, the following intangible costs should be considered as a result of the loss of navigation levels:
  - a) The Authority's inability to provide the required statutory navigation levels.
  - b) Loss of environmental habitats.
  - c) Loss of fishing amenity (also income from National Fishing licences).
  - d) Loss of amenity and scenic value of the river and the surrounding area.
  - e) Reduction in riverside property prices, both residential and commercial.

Balfour Maunsell Limited  
Consulting Engineers



Balfour Maunsell

Our Ref: NAS/SLF/901451

20 May 1992

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Eastern Region Headquarters  
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Resident Manager:  
N J Bowers

For the attention of Ms R Parslow

Dear Madam

#### PROPOSED RECONSTRUCTION OF ELTON SLUICE AND WEIRS

Further to our letters of 16 December 1991 and 19 February 1992 with details of proposals at Cotterstock and Stanwick we now enclose details of proposals for work at Elton. We understand that you have visited the sites with Mr Youdan of the NRA and we look forward to receiving your comments.

The options under consideration at Elton are:-

- a) Option 1 - Do nothing.
- b) Option 2 - Repair and refurbish weirs and sluices.
- c) Option 3 - Refurbish sluice and extend/reconstruct Weir No.1.
- d) Option 4 - Construct new weirs at Weir No.1 site and sluices site.
- e) Option 5 - Refurbish Weir No.1 and construct new weir at sluices site.

The three enclosed plans indicate the location of the various structures and the modifications necessary for each option.

The preferred option is No.5 which will have least effect on the overflow channel and in fact is essentially a direct exchange of a new long weir for the existing sluices and high level weir.

We are aware that the landowner has applied for "Countryside Stewardship" for pasture land immediately to the north of the Elton weirs and we believe that Option 5 would have a negligible effect on these pastures.

Please notify us if you can envisage any significant consequences of the above proposals.

If you require any clarification please contact Mr Neil Smith at 0603 633549.

Yours faithfully

N A SMITH  
for BALFOUR MAUNSELL

encl.



## NENE VALLEY PROJECT

Mr N A Smith  
Balfour Maunsell Ltd  
Suite 2  
Sackville Place  
44 Magdalen St  
Norwich NR3 1JU

DIRECTOR	
PROJ ENG	
ACTR	NAS
08 APR 1992	
FILE	
COPY TO NJB / NOBZ	

Nene Valley Project Officer  
c/o Planning and Transportation Department  
Northamptonshire County Council  
Northampton House  
Northampton NN1 2HZ

Tel: (0604) 236633

Fax: (0604) 236644

Date: 6th April 1992

Dear Mr Smith

### UPPER NENE STRUCTURES, COTTERSTOCK, STANWICK AND ELTON

Thank you for your letter of 10 March 1992 following my request for information. I apologise for the delay in replying, but I trust that my comments will still be valid and that they have not been overtaken by events. I note that you are now at the recommendations stage and that you have not sent information on the other, presumably rejected, options.

I have discussed the proposals with the Countryside Commission, English Nature and Northamptonshire Wildlife Trust who, I understand, have already been consulted on a range of options. I am generally in agreement with their observations.

As a general principle I would NOT like to see any changes to the structures that would result in:

1. A lowering in the level of ground water.
2. A reduction in the frequency of flooding.

There are a number of sensitive sites adjacent to the river that rely on winter flooding to maintain their interest. There are a few Sites of Special Scientific Interest, but there are many more Sites of Nature Conservation Value. SSSI, as you know, have statutory protection, whilst SNCV do not. SNCV, however, are recognised in the Northamptonshire County Structure Plan and in the District Council Local Plans.

The Countryside Commission have informed me that you are aware of the Countryside Stewardship Schemes in the Nene Valley. If the 'general principle' is adhered to these schemes will not be affected.

I would concur with the comments of English Nature regarding the original options for the Cotterstock and Elton structures.

Continued.....

Supported by:

Countryside Commission East Northamptonshire District Council Nature Conservancy Council Northampton Borough Council



Rosemary Parslow informs me that EN have not been formally consulted on the proposals at Stanwick despite the potential effect of the works on the nearby Higham Ferrers SSSI. EN will obviously have comments to make, but your statement that the preferred option "will affect the water levels.....although apparently the SSSI was designed for lower water levels" needs careful consideration. There are benefits to be gained by maintaining the water at its current level and benefits to be gained by lowering levels. Lowering levels will attract more wading birds on migration before the bare edges become colonised by willow scrub and there will be a greater area of island which will provide nesting places for wildfowl. However lowering the levels will also dry out two large areas of marsh one of which is an SNCV.

On balance maintenance of the current water levels is the best course of action from a nature conservation perspective, although it is contrary to your recommendations. If the NRA were to undertake this option then remedial works to ensure that the marshes remain wet are essential.

I trust that these comments have not arrived too late to be fully considered. If you require any clarification please do not hesitate to contact me.

Yours sincerely



Steve Brayshaw  
Nene Valley Project Officer

cc. Tom Youdan, NRA  
Rosemary Parslow, English Nature

Our ref. M/216/14  
 Your ref.  
 Date 28 May 1992

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**COUNTRYSIDE  
 COMMISSION**

*Dear Mr Smith,*

**PROPOSED RECONSTRUCTION OF ELTON AND SLUICE AND WEIRS**

Thank you for your letter of 20 May concerning the above.

The land to the north of this site although still in Northamptonshire has been incorporated into part of a Countryside Stewardship scheme by our Cambridge Office, as the majority of land involved actually occurs within Cambridgeshire. We have therefore passed details of your letter onto the Cambridge Stewardship Adviser, Sally Nicholson, for her separate consideration. Apparently the scheme at this site involves raising water levels in conjunction with NRA, so the weir work may have a possible effect on this. You may wish to contact Sally Nicholson directly on 0223 354462 or c/o Countryside Commission, Eastern Regional Office, 13-15 Hills Road, Cambridge, CB2 1NL.

There are also some existing Stewardship agreements already signed up at sites 1 and 2 on the attached map, but it is not anticipated that the work you are proposing to undertake on the weir will have an adverse effect this far downstream. There may also be a potential Stewardship agreement at site 3 where the proposal includes restoring a reed bed and wetland areas so the changing water levels here if the Stewardship agreement is concluded could have an adverse effect.

Finally, I also understand that there may be an application later this year for land situated near Yarwell Mill, but at the present time we have no specific details, so I am unable to comment on whether or not this proposal will be affected.

DIRECTOR
PROJECT
ACCOMPLISHED <i>NAS</i>
01 JUN 1992
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COUNTRYSIDE  
COMMISSION

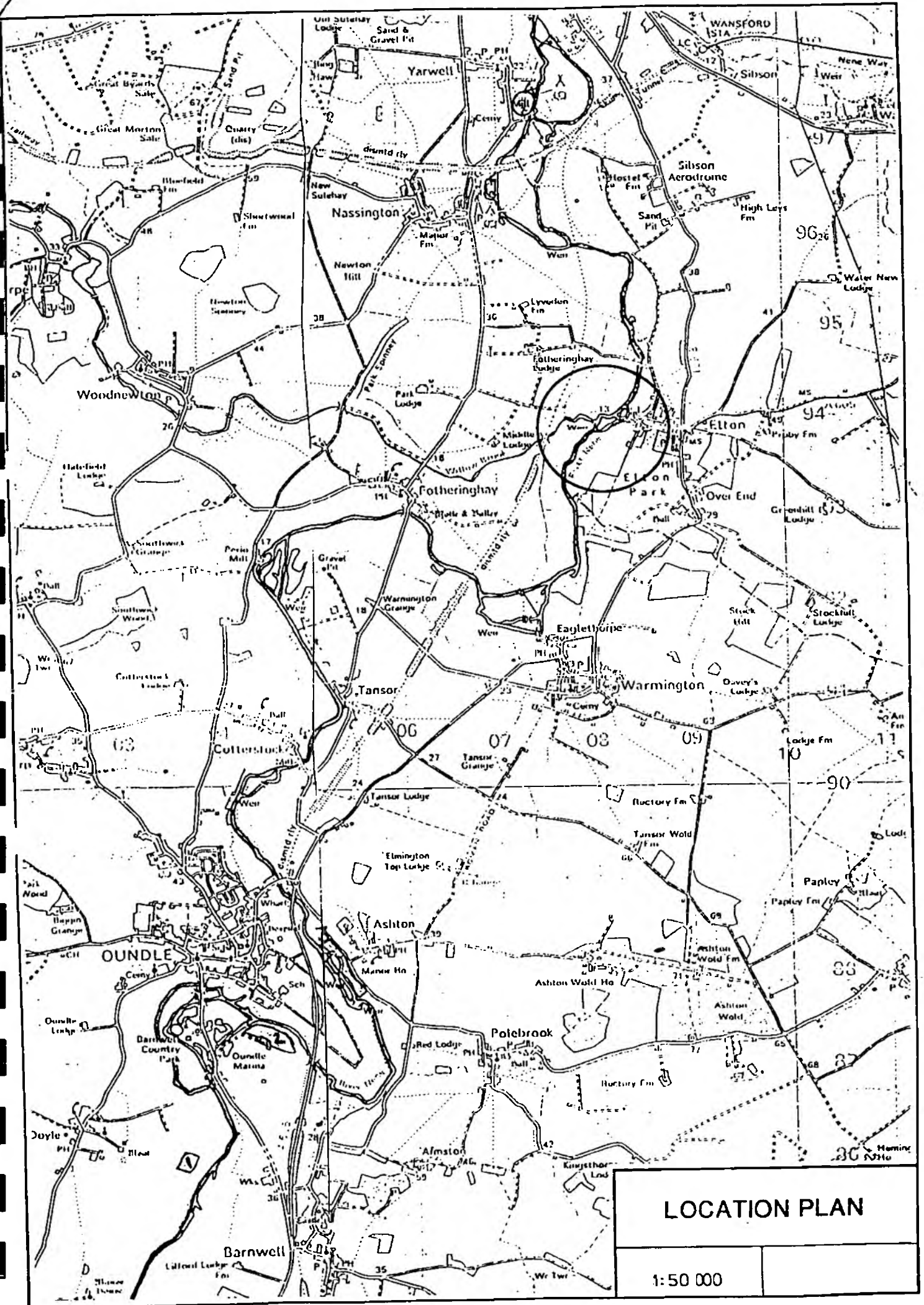
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I have copied this letter to Steve Brayshaw, the Nene Valley Project Officer and to Sally Nicholson, the Cambridge Stewardship Adviser for information, together with a copy of the map I have enclosed for your attention.

*Truismally**David W. Lepper*

DAVID W LEPPER  
Senior Countryside Officer

cc Steve Brayshaw, Nene Valley Project Officer  
Sally Nicholson, Cambridge Stewardship Adviser







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Our ref: B3. 1.7.1

11 June 1992

For the attention of Mr. N.A. Smith

Dear Sir

**PROPOSED RECONSTRUCTION OF SLUICES ETC. AT COTTERSTOCK & ELTON.**

I apologise for the delay in replying to you on the above. As you know I went out to look at the areas with Tom Youdan (NRA).

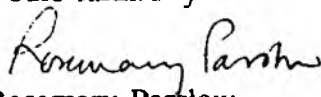
Our concern relates to any changes in the level of the river or flooding pattern of the flood plain. As the work on the structures will not change this, then we have no comments on design etc. From a nature conservation point of view more flooding, rather than less, would be desirable!

So as far as the Elton scheme, we cannot see anything to concern us there.

At Cotterstock there are a number of options and of which No. 2 seems favoured. We would wish to ensure that the backwater still remains open. There is a suggestion that backwater could be filled in to make the field one unit. We would rather see only part (the now dry section) filled in and the rest left open.

I hope this answers your questions and will be happy to make any detailed comments later should this prove necessary.

Yours faithfully

  
Rosemary Parslow  
Conservation Officer  
Northants

DIRECTOR	
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12 JUN 1992	
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