

RESPLAN MODELLING Supplementary Report No 7 March 1994

NATIONAL RIVERS AUTHORITY

WATER RESOURCES DEVELOPMENT STRATEGY THE RESPLAN MODELL

Supplementary Report No.7

March 1994 Version 1

Prepared by: C. Page

PREFACE

This report is the Seventh in a series of nine supplementary reports which provide supporting information for the National Rivers Authority Water Resources Development Strategy document:

"An Environmentally Sustainable Water Resources Strategy for England and Wales".

The other reports in the series are as follows:

- 1. Methodology and Assumptions for Public Water Supply Demand Scenarios
- 2. Review of Public Water Supply Yields
- 3. Marginal Demands
- 4. Other Options
- 5. Hydrological Modelling
- 6. Resource Scheme Costings
- 8. Environmental Assessment of Strategic Options
- 9. National Strategic Overview

NATIONAL WATER RESOURCES DEVELOPMENT STRATEGY

The RESPLAN Model

CONTENTS

1	INTR	ODUCTION	2
2	STRU	ICTURE OF RESPLAN	2
	2.1	Network components	2
	2.2	Other basic concepts	
	2.3	Allocation and costing modes	
	2.4	Input data	4
	2.5	Output	
3	APPL	LICATION OF RESPLAN TO THE NATIONAL STRATEGY	6
	3.1	Data acquisition	6
	3.2	Network diagram	
	3.3	Input data used for model runs	8
	3.4	Model runs	
4	REF	ERENCES	9
Appen	dix 1:	Schedule of RESPLAN data source documents and assumptions	10
Appen	dix 2:	Summary of results from RESPLAN runs	19
Appen	dix 3:	Input data for the National Strategy	22
Appen	dix 4:	Results for the National Strategy	39

NATIONAL WATER RESOURCES DEVELOPMENT STRATEGY

The RESPLAN Model

1 INTRODUCTION

RESPLAN is a computer model which is used to analyse the costs of development plans to meet future demands for water. It is essentially concerned with the choice and timing of long term strategic capital investments, and does not include hydrological or water quality aspects, which are considered in other types of model.

The main reasons for using a model such as RESPLAN are:

- the amount of work involved in manually costing a plan;
- the large number of options to be considered;
- the interlinked nature of water resource systems, in which apparently local decisions may influence opportunities for the rest of the system;
- the ease with which sensitivity analyses can be carried out; and
- the ease with which plans can be updated as data are changed.

Following the development of two similar models⁽¹⁾⁽²⁾ by the Water Resources Board in the early seventies, the RESPLAN model was developed by Page, Warn and Brew of Anglian Water Authority⁽³⁾⁽⁴⁾ in 1975 to overcome deficiencies in the earlier models, and has been used regularly since then. In 1989 the original version, written in Fortran for a mainframe computer, was updated to run on a PC and a graphics interface was added to improve the input and output of results.

When the NRA started work on its National Strategy, RESPLAN was considered to be the most suitable tool for analysing strategic water resource development options, and has been used extensively during the project.

The purpose of this report is to explain the main features of RESPLAN used during the National Strategy work, and to document the data used and the results obtained. More detailed documentation of RESPLAN is available in references 3,4 and 5.

2 STRUCTURE OF RESPLAN

2.1 Network components

RESPLAN idealises a water resources system as a network comprising:

Sources:

These can be reservoirs, groundwater schemes, or any other scheme which will provide additional yield. They can be new sources or existing sources which can be redeployed.

Demand centres: These are water supply areas which are sufficiently

integrated that any potential source can meet demands

throughout the area.

Link elements: These are the means of transporting water from sources

to demand centres, and in the present study comprise mainly pipelines and associated pumping equipment.

The network used for the National Strategy is illustrated in Figure 1.

2.2 Other basic concepts

Feasible routes by which sources can meet demands are called links, each link is defined by one source, one demand centre and a series of link elements. These link elements may each feature in a number of links. There can be only one link between a given source and demand centre. (To overcome this restriction when it is necessary to represent two routes between a source and a demand, an additional dummy source, known as a twin source, has to be used.)

The last year of the time span over which the plan is required is called the **planning** horizon. The span is divided up into periods of one or more years, each of which is identified by a base year.

The model considers both capital and operating costs. The only operating costs being considered in the present study are those for power and pumping. Costs are all discounted back to the first base year using a discount factor. This enables all the costs of a plan to be summed to a total discounted cost (alternatively known as net present value).

When the yield of a source is allocated to meet a demand, the amount of demand met is referred to as a demand flow, or throughout this report as a flow.

Flows do not necessarily correspond to actual flows in link components because of the use of various factors. The load factor is a factor applied to the flow to determine the average flow in a link element. The yield factor is applied to the flow to determine the amount of source yield used; eg if a source yield is specified as a direct supply yield, the amount of direct supply yield used when a flow is allocated to a link using river regulation will be less than the flow, the difference being represented by the yield factor. The capacity factor is a similar factor applied to the flow which determines the amount of link element capacity used.

The concept of discounted unit cost is used throughout RESPLAN. This is the total discounted cost divided by the total discounted flow, and can be applied to any individual component. It is a measure of the relative cost attractiveness of different components, and reflects the time which the component takes to be fully utilised.

A plan is a costed allocation providing details of the flow allocated from each source to each demand for each period, the timing of introduction of each source and link element, and the associated discounted capital and operating costs.

2.3 Allocation and costing modes

The model can be used in two different ways. When it is used in the allocation mode, a series of plans is produced for a predefined number of iterations, the allocation for each iteration being derived from discounted unit costs obtained from the previous allocation. Although the objective of this procedure is to find the least cost allocation, the algorithm used does not converge to a least cost solution; however the plan with the least discounted cost is usually a good approximation to the optimal allocation. Descriptions of the algorithms used for allocating flows to links within an iteration and for updating unit costs between iterations are given in Chapter 4 of the user manual⁽⁵⁾.

To determine the cost of a particular allocation, the costing mode is used. In such cases the allocation is usually based on a plan produced by the allocation mode and amended manually. The costing mode is normally used to answer "what if" questions, eg to determine the sensitivity of the plan costs to, say, a particular source being excluded, or the costs of a link element being increased.

2.4 Input data

The principal data requirements for RESPLAN, as used in the National Strategy, are given below. The descriptions are not intended to match the input formats used by the model, and for more detailed information on the overall data requirements and format, reference should be made to the user manual⁽⁵⁾.

General data: number of periods;

base years; discount rate;

number of iterations (for allocation mode);

control parameters determining level of detail in output and

how costs are updated between iterations.

Demand centres: name of demand centre;

forecast marginal demand for each base year.

Sources: name of source;

yield (Where the yield varies according to how the source is used eg direct supply v. river regulation, one yield value is entered here, and yield factors based on links

are used to provide the alternative values.);

capital cost in £M (This can be the total cost of an indivisible scheme, or the unit cost in £M/Mld for sources such as groundwater schemes which can be developed incrementally.); operating cost in £M/Mld/annum.

Link elements: link element reference number (a unique number used in defining which link elements are used by each link);

link element name; maximum capacity; operating cost (This can be either a unit cost in £/Mid/annum, or a total cost in £/annum where the cost is independent of the flow.):

load factor; capacity factor.

Links:

link name (eg Sourcename to Demandname);

yield factor;

link element reference number of each link element used in the link.

2.5 Output

The results from the model are produced partly in graphical and partly in tabular form. Examples of both are given in Appendix 4.

The graphical output takes the form of a network diagram with the flows in each link element for four selected base years shown against the element. This provides a quick visual summary of the allocation.

The text output takes the form of a series of tables:

Source development, showing for each source, year of introduction, yield, capital cost, discounted capital and operating costs;

Unused yields of developed sources, showing the unallocated yield for each source for each period;

Demand flows through link elements for all selected links for all periods;

Link element development, showing for each link element, year of introduction, capital cost, discounted capital and operating costs, discounted unit cost;

Unit Costs of Links, showing for each demand centre, the discounted total cost, total flow and unit cost of the supply from each source;

Development of Links, showing the flows through each link for each period;

Cost summaries, showing the capital and operating costs for each period and the total discounted capital and operating costs of the plan.

Validity checks, indicating whether all demands have been exactly met and whether source outputs are within their yields.

3 APPLICATION OF RESPLAN TO THE NATIONAL STRATEGY

3.1 Data acquisition

The accumulation of data for the application of RESPLAN to the National Strategy

was carried out over an 18 month period between May 1992 and November 1993. It involved considerable input from NRA regional and head office staff and consultants, including:

- selecting the demand centres to be used for each Region;
- production of consistent demand forecasts across all demand centres;
- identification of potential sources and transfer schemes (link elements) and their classification as 'strategic' or 'local' to determine whether they should be included in the RESPLAN analysis;
- studies to determine the feasibility and costs of potential strategic developments;
- extraction of data from reports and interpretation for use in RESPLAN;
- hydrological modelling studies to determine yields, yield factors and load factors;
- vetting of all cost data to ensure the use of a consistent cost base for all options.

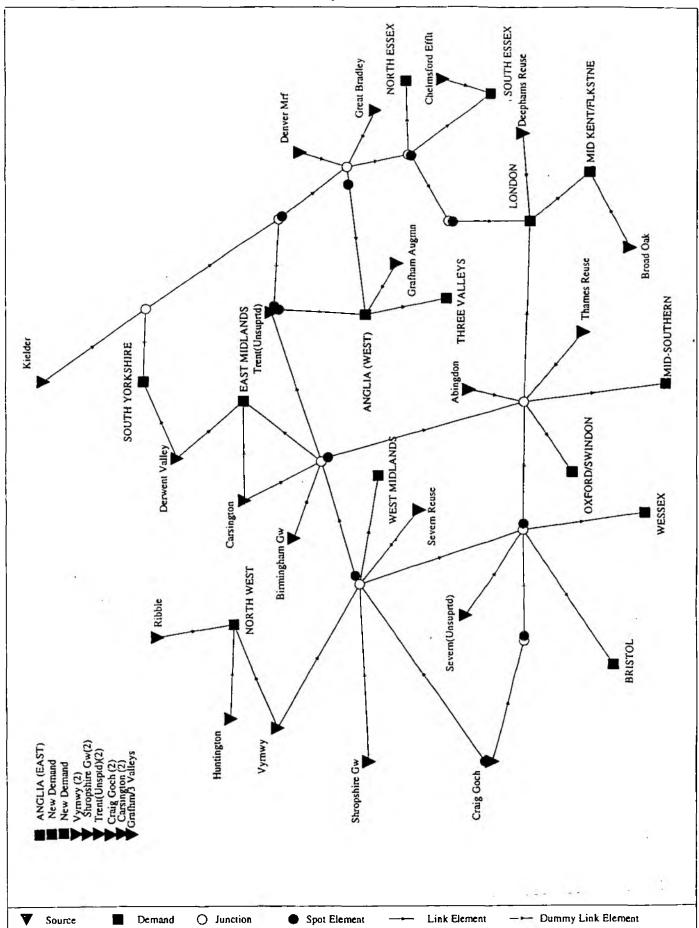
3.2 Network diagram

The RESPLAN network diagram used for the model runs is shown in Figure 1. Sources are shown as triangles, demand centres as squares and link elements as lines. The empty circles are merely junctions joining two link elements and have no significance in RESPLAN. The solid black circles, called spot elements, are dummy link elements. The unconnected squares and triangles in the top left corner of the diagram are either sources and demand centres which were not used or twin sources. The use of dummy link elements and twin sources is described in Section 3.3 below.

Most of the components of the network are described in other National Strategy reports⁽⁶⁾⁽⁷⁾, or can be recognised from the input data. Other features are further described below.

The demand centres Anglia (West), Anglia (East), Three Valleys and Mid-Southern were all included when the model data was set up, but were then found to have zero marginal demands for the high and medium demand scenarios modelled and do not feature in the results. The North West and South Yorkshire demand centres, although they also have zero marginal demands, were included so that the possible redeployment of their existing sources (Vyrnwy and Derwent Valley) could be modelled.

Figure 1: RESPLAN network diagram



The source Denver MRF was included in the original model data, but was later excluded because its feasibility was not proven. Deephams Reuse was similarly excluded, except for one model run to test the sensitivity of programme costs to its inclusion. Severn Reuse and Thames Reuse reflect the additional yield available through the return of effluent to the Severn and the Thames from the West Midlands and Oxford/Swindon demand centres respectively. Shropshire GW, although originally included, was subsequently reclassified as a local source and assumed to have zero capital and operating costs.

The link elements Craig Goch - R.Wye and R.Wye - R.Severn, although shown on Figure 1, were not included, and all transfers from Craig Goch were assumed to be direct to R.Severn.

3.3 Input data used for model runs

A schedule of the data values and the data source documents is given in Appendix 1. The input data files used for the baseline model cases in the high and medium scenarios are listed in Appendix 3.

The information in Appendix 1 together with Figure 1 and the outline description of RESPLAN in Section 2 above provides an explanation of the input data files listed in Appendix 3.

However, there are three further features of the input data files which require further explanation:

Twin Sources: A number of sources in the input data are duplicated, the second instance of each name being followed by '(2)'. As described in Section 2.2, this is to allow two links between the same source and demand centre. In each case, the reference number of the twinned source is shown in the input data for that source. (This feature has been used for Shropshire GW, Vyrnwy and Craig Goch, where links to the Thames demand centres can be either via a Severn-Thames transfer, or by a combined Severn-Trent and Canal transfer, and for Trent (Unsupported) and Carsington, where links to Anglian demand centres can be either via a Trent-Witham-Nene-Ouse transfer or a Trent-Rutland transfer.)

Maximum link element capacity: RESPLAN was designed to operate with cost functions for link element components (pipelines, pumps, bankside storage etc). The model then selects as big a link element as is required to meet demands. In the present study, cost functions have not been used (although they still have to be included in the input data) as consultants' studies have been used to determine fixed costs for fixed capacities. To prevent the model from attempting to develop capacity in excess of the fixed capacity, a dummy link element was introduced in series with each fixed capacity element. The dummy element has an 'existing' capacity equal to the fixed capacity and an excessively high dummy cost. This cost prevents the dummy element from being replicated, and hence the original element can also not be extended beyond the fixed capacity. Where a dummy element is used, the names of the dummy element and the real element in the input data are followed by '(1)' and '(2)' respectively.

Effluent Reuse Sources: The yields of two sources, Severn Reuse and Thames Reuse, are expressed as the percentage of the demands of different demand centres. These are coded in the input data as negative decimal numbers, of which the integer part is the demand centre number and the decimal part is the percentage.

3.4 Model runs

Over the period of the study, a vast number of model runs were carried out as new options were considered or as data were updated. In Appendix 2 a table is given of the model runs which were used to provide information used in the final report of the National Strategy, together with the principal features of the results for each case.

For each of the runs listed in the table, Appendix 4 shows the tabular and graphical output of the results. The graphical outputs show the flows in each link element for the four base years 1991, 2001, 2011 and 2021. The flow for 1991 is shown nearest the 'downstream' end of the element. The flow for 2021 is shown in bold nearest the 'upstream' end of the element.

4 **REFERENCES**

- 1 'Water resource planning in South East England' Armstrong R B and Clarke K F 1972 JIWE Vol 26 p11
- 2 'A mathematical programming model for planning a regional water resource system' O'Neill P G 1972 JIWE Vol 26 p47
- 3 'Economic planning model of water resources' Page C Internal Anglian Water report 1984
- 4 'Water Resource Planning Model Technical Report and User Manual' Warn A E Internal Anglian Water report 1986
- 5 'RESPLAN user manual' Anglian Water Services 1993
- 6 'An environmentally sustainable water resources development strategy for England and Wales' National Rivers Authority 1994
- 7 'Water Resources Development Strategy: Marginal Demands' National Rivers Authority 1994

13.318

Appendix 1: Schedule of RESPLAN data source documents and assumptions

SOURCES

DATA ITEM	VALUE	REFERENCE	COMMENTS
DENVER MRF	Yield=18 CC=£2M OC=0	1: Table A.2.2 2:	Case 18 - Case 1. MRF=114 (MRF=50 assumed not feasible.) CC assumed to include capitalised OCs
GREAT BRADLEY	Yield = 174 CC = £69.4M OC = 0	28: Table A1.3 29: Table 3	Capacity assumed to be 46mcm. Kennet pump capacity assumed as 681. OC assumed to be included in Ely Ouse-Essex link element.
CHELMSFORD EFFLUENT	Yield = 30	3: p34	Note: Ref 1 Table A2.2 gives yield as 40. Costs included on link element Chelmsford Effluent - South Essex
DEEPHAMS REUSE	Yield = 100	25: Table I	Costs included on link element Deephams Reuse - London
GRAFHAM AUGMENTATION	Yield = 100	3: Table 11-2	(Brownshill Intake) Costs included on link element Gratham Augmentation
TRENT (UNSUPPORTED)	Yield=210 (105) CC=0 OC=0	43: 28: Table A1.3	Case 2 - Case 1. (699-489) Assumes Trent transfer capacity = 400, Kennett capacity = 681; Gt Bradley developed first and Trent MRF = 2500. Figure in brackets is yield with Kennett = 681 but no Gt Bradley ie Case 3 - Case 0 (503-398). Costs all attributed to link elements.
ABINGDON	Yield=350 CC=£400M OC=£0.023M/MId	30 & 27: Thi 7	Note: yield reduced to 262 (350+337-425) when introduced after supported Severn-Thames transfer.
CARSINGTON	Yield = 140 CC = 0 OC = 0	9: p3	Yield is 200, of which 60 is already committed and used. Increased yield through conjunctive use with Trent specified through yield factors on links. Costs all attributed to link elements.
DERWENT VALLEY	Yield = 40 CC = 0 OC = 0	10:	Amount currently used by Yorkshire Water which could be reallocated to Severn Trent Water. Costs all attributed to link elements.

KJELDER	Yield = 525 CC = 0 OC = 0	17:	Note: Ref 5 p10-1 gives 325. Costs all attributed to link elements.
SEVERN (UNSUPPORTED)	Yield=146 (100) CC=0 OC=0	27: Table 5	Figures for 400 Mld transfer (200 Mld transfer in brackets) Costs all attributed to link elements.
VYRNWY	Yield = 147 CC = 0 OC = 0	37: 5:	Yield for direct supply is 212. As it is an existing source this is reduced by 2.5% to 207. Of this 60 must be used for direct supply and is not reallocable. Hence 147 (=207-60). Yields for Severn Regulation and Thames transfers are calculated using YFs on links. CC taken as 0, as per Option 1 in Ref 5.
HUNTINGTON	Yield = 74 CC = £36.9M OC = £0.0259M/MId	37: 40:	Costs produced using TR61 Atkins/Halcrow method Treatment costs included as alternative TW for Vyrnwy already exists.
RIBBLE	Yield = 40 CC = £27.9M OC = £0.0404M/Mld	37: 40:	Costs produced using TR61 Atkins/Halcrow method Treatment costs included as alternative TW for Vyrnwy already exists.
CRAIG GOCH	Yield = 629 CC = £60.5M OC = 0	5: Table 8-4 35:	775-146 (146 = yield of Severn (Unsupported)).
SHROPSHIRE GW	Yield = 155 CC = £0.0845M/MId OC = £0.0059M/MId	29:	
THAMES REUSE	Yield = 90% of Oxford / Swindon demand		Assumes 90% of water supplied to Oxford/Swindon from Thames Regulation options can be reused for London.
SEVERN REUSE	Yield = 44% of West Midlands demand	10:	Assumes 63% of West Midlands demand occurs in Severn catchment, of which 70% is returned and can be reused eg for transfer to Thames.
BROAD OAK	Yield = 40	30:	Costs included on link element Broad Oak - Mid Kent/Folkestone

BIRMINGHAM GW	Yield=50 Mld	35:	
	CC = £0.088M/Mld		
	OC = £0.0059M/Mld		

LINK ELEMENTS

DATA ITEM	VALUE	REFERENCE	COMMENTS				
TRENT-RUTLAND	Capacity = 100 (200) CF = 104 CC = £32M (£46M) OC = £0.0208M/Mld LF = 47(51)	13: p.32 28: Table A1.3 13: Table 6.2 28: (Supp)	Route 2.1a. 104=100/96: 96 is additional Rutland yield from 100 Mld transfer. £1.3M*2/1.25/100.				
TRENT-WITHAM	Capacity=400 (200) CC = £18M (£8M) OC = £0.0010M/MId LF = 31	3: Table 12 29: 28: Table A1.3	Case 4 - Case 1: (103-31)/(791-558)				
WITHAM-ELY OUSE	Capacity = 400 (200) CC = £149M (£100M) OC = £0.0104M/Mld (£0.0144M/Mld) LF = 33	3: Table 12 21: 29: 28: Table A1.3	Includes increases to Kennett and Wixoe capacities. £134M (£85M) plus £13.3M for Kennett and £1.3M for Wixoe. Case 4 - Case 1: 78/(791-558)				
ELY OUSE-ESSEX	CC = 0 OC = £0.0112M/Mld LF = 79	29: 28: Table A1.3	CC=0 - existing transfer 50% of water assumed to transfer to Stour and not to Pant. Case 3 - Case 1: (224.9-98.7)/(558-398)				
CHELMSFORD EFFLT - SOUTH ESSEX	CC = £13.5M OC = £0.280M	3: Table 11-4 34: p.56	CC is £8.98 in WH report; increased to £13.5 for additional Langford intake capacity.				
DEEPHAMS REUSE - LONDON	CC = £37M OC = £1.05M	35:					

SEVERN-TRENT	Capacity = 300 (100) CC = £70M (£26M) OC = £0.0202M/Mld (£0.0163M/Mld)	29:	
WITHAM- GRAFHAM/RUTLAND	Capacity = 150 CF = 104 LF = 33 CC = £37M OC = £0.0196M/MId	28:	Case 6 - Case 1: Additional Rutland/Grafham yield = 159 (=150*1.04) LF assumed to be same as Witham-Ely Ouse.
SEVERN-THAMES	Capacity = 400 (200) CF = 94 (80) CC = £92M (£57M) OC = £0.0315M/Mld LF = 12(8)	27: Table 7 29: 42: Table 1	Max demand which can be met is 425 = 400/0.94 (249=200/0.80) Same OC and LF used for unregulated as for regulated Severn, as model can use only one OC and LF per element. (Additional costs of a Severn-London transfer are £120M (£60M).)
WYE-SEVERN	Capacity = 400 CC = £47.5M OC = 0.015M/MId LF = 12	29:	LF assumed to be same as for Severu-Thames transfer.
CRAIG GOCH-SEVERN	Capacity = ? CC = £44.5M OC = 0	35:	
CRAIG GOCH-WYE	CC=£11.5M OC=0	35:	
R.TRENT-EAST MIDLANDS	Capacity = 300 CC = £50M OC = £0.0016M/MId	22: & 33:	Temporary assumption that all Carsington supply to E.Midlands is via 'conjunctive use' link, as cost data is only available for this option
DERWENT VALLEY- EAST MIDLANDS	CC=£13.3M OC=£0.025M/MId	30:	
YORKSHIRE OUSE - SHEFFIELD	Capacity = 40 CC = £23.5M OC = £0.037M/Mld LF = 100	36:	LF taken to be 100, as OC has built-in assumption that transfer will be used 250 days/yr.

KIELDER-SWALE	Capacity = 325 (40) CC = £48M (£8.2M) OC = £0.0305M/MId (£0.034M/MId) LF = 100	36:	Figures in brackets relate to supply required from Kielder if Derwent Valley redeployed to Severn Trent. LF taken to be 100, as OC has built in assumption that Kielder-Tees used 31 days/yr and Tees-Swale used 100 days/yr.						
YORKSHIRE OUSE- WITHAM	Capacity = 325 CC = £107M OC = £0.0165M/Mld LF = 100	36:	LF taken to be 100, as OC has built in assumption that Ouse-Witham is used 100 days/yr.						
LONDON-MID KENT / FOLKESTONE	Capacity = 50 CC = £67.2M OC = £0.0216M/Mld LF = 25	29:	(London-Canterbury costs) LF assumed to be same as for Broad Oak-Mid Kent/Folkestone.						
PANT-CHELMER- RODING	Capacity = 100(200) CC = £24M(£39M) OC = £0.0103M/MId CF = 123(113) LF = 1!	29: 27: Table I	Sum of Pant-Chelmer and Chelmer-Roding; ie 13+11 (21+18). Transfer capacity of 100(200) gives yield of 81(176)						
RODING-STORT	Capacity = 100(200) CC = £11M(£16M) OC = £0.0029M/MId CF = 123(113) LF = 12	29: 27: Table 1	Transfer capacity of 100(200) gives yield of 81(176)						
CANAL TRANSFER	Capacity = 100 CC = £23.1M OC = £0.02M/MId LF = 12	30:	LF assumed to be same as Severn-Thames transfer						
BROAD OAK - MID KENT/FOLKESTONE	CC=£47.5M OC=£0.025M/MId LF=25	30:							

GRAFHAM	CC = £35M	3: Table 11-2	(Brownshill Intake)
AUGMENTATION	OC = £0.0091M/Mld	31:	
	LF=33		LF assumed to be the same as Witham-Grafham/Rutland

LINKS (with yield factors different from 1)

DATA ITEM	VALUE	REFERENCE	COMMENTS
CARSINGTON to all demands involving conjunctive use with Trent.	YF=80	10: 33:	Yield of Carsington = 140, when used as at present, but increased by 35 to 175 (=140/0.80) when used conjunctively with Trent.
VYRNWY to all demands using Severn-Thames transfer	YF=83 (53)	12: Table 4 & 27: Table 7 37: J.Oldman 15/11	Yield = 229 when 69 of Vyrnwy is redeployed. Of this, 146 (100) is available from Unsupported Severn. YF = 69/(229-146) for 400 transfer, or 69/(229-100) for 200 transfer.
VYRNWY to demands on Severn not using Severn- Thames transfer	YF=56	12: Table 4	Using NW Case 9, 154 of yield is available when minimum Vyrnwy supply to NWW is 120, ie when 87=207-120 is available for redeployment. YF=87/154.
SHROPSHIRE GW, CRAIG GOCH and SEVERN REUSE to all demands using Severn Thames transfer.	YF=100	,	Used in the absence of better information! Yield is limited by the capacity of Severn-Thames pipeline.
DERWENT VALLEY - EAST MIDLANDS	YF=57	10:	Current yield of Derwent Valley to South Yorkshire is 40, but could be increased to 70 (40/0.57) if used for river regulation to meet East Midlands demand.
TRENT (UNSUPPORTED) - ANGLIA (WEST)	YF=38	28: Table A1.3	= 61/159: additional yield of 159 (90 Rutland + 69 Grafham) at expense of 61 (791-730) Ely Ouse - Essex yield. Same YF assumed to apply to Trent-Rutland direct route.

GREAT BRADLEY - LONDON & MID KENT / FOLKESTONE	YF=64 (67)	28: Table A1.3 27: Table 1	= 52/81 (118/176): additional yield of 81 (176) for London at expense of 52 (118) yield to Essex - for transfer capacity of 100 (200).
--	------------	-------------------------------	--

DEMANDS - These are taken from Ref 38, except as detailed below.

DATA ITEM	VALUE	REFERENCE	COMMENTS
NORTH WEST (SCZ)	81 - 191	37:	Vyrnwy, Ribble, Huntington taken as allocable sources. Existing sources taken as Dee, Rivington, Boreholes ie 0.975 * (390+43+171) = 589. Vyrnwy yield is 207 (=0.975 * 212), of which 60 must go to NWW (not reallocable). Therefore existing sources increased to 649 (=589+60). Marginal demands for high scenario become: 81, 70, 94, 118, 141, 166, 191.
NORTH WEST (RR)	0	37:	Demand of up to 102 assumed to be met by other means than sources available for NW (SCZ).
UPPER TRENT	0		Demand of up to 12 assumed to be met from local sources.
SOUTHERN - S. EAST	0		Demand of 2 assumed to be met from local sources.
SLOUGH / WYCOMBE / AYLESBURY	0	39:	Demand of up to 22 assumed to be met from local sources.
LONDON /SUTTON	94 - 567 (HIGH) 46 in 2021 (MED)	39:	Sutton demands incorporated in London figures, except that for MEDIUM case it is assumed that Sutton demands will not trigger a strategic demand before London, and Sutton demands to 2016 have been assumed to be met from local sources.
SOUTH WEST	0		Demand of 17 assumed to be met from local sources.
SOUTH YORKSHIRE	40 (1991-2021)		Included to allow modelling of Derwent Valley redeployment option.

Key CC Capital cost YF Yield factor

0C

Operating cost / annum (power cost only)

CF Capacity factor

References

- Preliminary modelling of water storage and transfers in Anglian Region' NRA Anglian May 1993
- 2. Verbal communication David Evans Anglian Region
- 3. 'Water Resource Strategy Consultation Draft' NRA Anglian April 1993
- National Water Resources Development Strategy Water Company Consultation Paper* NRA HO June 1993
- 5. 'Water Resources Strategy Other Options Report Draft Report' Halcrow Apr 1993
- 6. 'Water Resources Development Options Final Report' NRA Thames/Humphrey Apr 1992
- 7. Memo from NRA Thames (Brian Arkell) 15/12/92 (Superseded by Ref 25)
- 8. Memo from NRA Thames (Brian Arkell) 28/05/93
- *Calculation of Marginal Demands for PWS* NRA Severn Trent May 1993 (Incorporated in Ref 26)
- 10. Telephone conversation CP / Gordon Davies (NRA Severn Trent) 24/5/93
- 11. Report on modelling of transfers by NRA Thames. May 1993
- 12. "Lake Vyrnwy Redeployment Study Phase 2 Report" NRA Severn Trent May 1993
- 'Regional Strategic Options Study Final Report Component 7 R.Trent to Rutland Water Transfer' Atkins Apr 1993
- 14. 'Regulation of the R. Trent for transfer to Anglian Region' NRA Severn Trent. May 1993.
- Proforma for reporting of modelling associated with inter-regional transfers' NRA North West May 1993
- Vyrnwy Redeployment Options Potential Impact on Water Supplies in North West England' NRA North West Mar 1993
- 17. Memo from NRA Northumbria (Dave Archer) 13/05/93 (Incorporated in Ref 26)
- 18. Memo from NRA Thames (Alison Brook) 26/05/93 (Incorporated in Ref 26)
- 19. Memo from NRA Southern (Rache) Skidmore) 14/05/93 (Incorporated in Ref 26)
- 20. Memo from NRA Wessex (Richard Symonds) 14/05/93 (Incorporated in Ref 26)
- 21. Memo from NRA Anglian (Bob Hillier) 15/06/93
- 22. Notes of meeting at Solihull 23/06/93 Gordon Davies, Paul Crockett, Chris Page
- Severn-Trent Transfer Options Feasibility and Outline Engineering Appraisal Study' NRA Severn Trent / Atkins Apr 1993
- 24. Memo from NRA Wessex (Richard Symonus) 24/06/93 and telephone conversation 29/06/93.
- Water Resources Strategic Scheme Development Options Technical Overview¹ NRA Thames June 1993
- 26. Derivation of Marginal Demands Audit Review NRA Head Office June 1993
- National Water Resources Strategy Inter-Regional Transfers Modelling Report NRA Thames July 1993

Appendix 1 - RESPLAN data source documents and assumptions

- 28. 'Stage 2 Modelling of Water Storage and Transfers in the Anglian Region' NRA Anglian Aug 1993
- 29. 'NRA Water Resources Strategy Technical Note Costings' Halcrow Aug 1993
- Water Resources Project Management Costings' Memos from Halcrow (l'im Turner) 25/08/93, 01/09/93, 16/09/93
- 31. Memo from NRA Anglian (Bob Hillier) 21/07/93
- 'NRA National Water Resources Strategy Broad Oak Reservoir Costs' Memo from NRA Southern to Halcrow 27/08/93
- 33. Memo from NRA Severn Trent (Paul Crockett) 22/09/93
- 34. Report on Chelmsford-Witham Effluents: Essex Water / Watson Hawksley 1992
- 35. Letter from Halcrow (Fill Rankin) 03/11/93
- 36. Letter from Halcrow (Jill Rankin) 17/11/93
- Notes on NW Region Marginal Demands and Vyrmwy Redeployment' NRA Head Office 08/11/93
- 38. "Marginal Demands Calculations' NRA Head Office (Mark Sitton) 11/11/93
- 39. Memo from NRA Thames (Brian Arkell) 13/09/93
- 40. Fax from Halcrow to MS (Rcf: WE/RPMA/62/331; 07/12/93). (Costs in letter WE/RPM/25/329 to CP on 02/12/93 are incorrect.)
- 41. Memo from Graham Wilson to MS (Ref: GMW/IJ/654/16; 15/12/93 alternative size Bradley.
- 42. Letter from Jill Rankin to MS (Ref: WIE/RPM/62/332; 13/12/93) changes to Severn-Thames costings.
- 43. Memo from NRA Anglian Region (Steve Cook) 16/02/94

Appendix 2: Summary of results from RESPLAN runs

Appendix 2 - Summary of results from RESPLAN model runs

CASE	DISC	ADJ ¹ DISC	DATE NEW SOURCES INTRODUCED			DATE NEW TRANSFERS INTRODUCED					COMMENTS ²			
		COST	GREAT BRDLY	SHROP GW	VRNWY RDPMT	CRAIG GOCH	ABGDN	DPHMS REUSE	SEV- THMS	SEV- TRENT	G BRD LNDN	TRNT- ANGLN	CANAL	
HIGH SC	IGH SCENARIO													
HIGH1	415	353	2006	2001	2006	2011	2021	•	1996	2016	2006	_	-	Baseline case: Involves uses of Vyrnwy Redeployment (until Vyrnwy full required by NWW), use of Great Bradley in London from 2006.
H1GH2	677	637	2006	2001	•	2016	1996	•	2011	2016	-	-	•	Abingdon first for London with no use of Vyrmwy and Shropshire GW from 2001.
H1GH3	519	417	2006	2001	2006	2011	2021	-	1996 ³	2016	2006	-	•	As case HIGH1 but with Severn-Thames replaced by Severn-London at an additional cost of £120M.
HIGH4	349	330	2006	2001	•	2011	•	1996	2011	2016	2006	-	-	Least cost allocation when Deephams is included as an option.
H1GH5	490	398	<u> </u>	2001	2006	2006	2016	-	1996	2016	-	2006	-	As case HIGH1 but with Great Bradley replaced by Trent (Unsupported).
MEDIUM	SCENARIO)												
MED1	115	65	2011	•	2001	•	-	• 	2016	•	•	•	•	Baseline Case: Involves use of Vyrnwy Redeployment for Bristol and W.Midlands in preference to Shropshire GW.
MED2	150	59	-	•	2001	•	•	•	2016		•	2011	-	As case MED1 but with Great Bradley replaced by Trent (Unsupported) (Assumes Trent-Witham-Ouse capacity of 237.)
MED3	206	129	2011	-	2001	•	2016	•	-	-	•	•	•	Least cost allocation with forced selection of Abingdon first for London.
MED4	132	72	2011	•	2001	•	-	-	2016³	•	-	•	•	As case MED1 but with Severn-Thames transfer replaced by Severn-London pipeline at additional cost of £60M (200 Mld capacity).
MED5	113	63	2011	2001	•	•			2016	<u>.</u>	•			As case MED1 but with Vyrnwy replaced by Shropshire GW with zero CC and OC.

Appendix 2 - Summary of results from RESPLAN model runs

- Notes: 1 Adjusted Discounted Cost calculated from Total Discounted Cost less an allowance for developed, but unused, capacity in major sources and transfers.

 (Allowance calculated by subtracting (proportion of capacity unused) * (capital cost) * (discount factor for 2021) for sources, and (proportion of unused capacity) * (capital cost) * (discount factor for year of introduction) for transfers.
 - Features common to <u>all</u> the high forecast runs are:
 Use made of Broad Oak, conjunctive use of Carsington/Trent.
 Use <u>not</u> made of Kielder, transfers from London to Mid Kent/Folkestone, reallocation of Derwent Valley.
 - 3 Costs are for Severn-London transfer rather than Severn-Thames transfer.
 - 4 All runs assume the use of Shropshire GW as a local option with CC and OC set to zero and automatic first selection.

Appendix 3: Input data for the National Strategy

```
O NUMBER LINES HEADING
    ***ABOVE DATA ARE USED AS HEADINGS IN THE OUTPUT, GENERAL DATA FOLLOW***
  7 1991 NUMBER PERIODS & FIRST BASE YEAR
   1996 2001 2006 2011 2016 2021 BASE YEARS AFTER FIRST BASE YEAR
 1991 DISCOUNT YEAR
 1991 FIRST YEAR IN PLAN
   O DATA TESTING(0 = FOR NORMAL RUN,1 = NO ALLOCATION,2 = NULL ALLOCATION
   O NO COSTING BUT ALLOCATION CHECKED (1 = NO COSTING, ZERO OTHERWISE)

1 (1 = CONDENSED OUTPUT, 0 = FULL OUTPUT)
     (1 = NO TABLE OF PEAK FACTORS, 0 = FULL OUTPUT)
    1 (1 = NO TABLES OF INPUT DATA IN OUTPUT, ZERO OTHERWISE)
    1 (1 = NO EXPLANATORY NOTES IN OUTPUT, ZERO OTHERWISE)
   0 (1 = TABULATED MONITORING OUTPUT FOR ALLOCATION, ZERO OTHERWISE)
   0 (1 = STEPWISE MONITORING OUTPUT FOR ALLOCATION, ZERO OTHERWISE)
        30
             PIPE STAGING VARIABLES
 0.83 PROGRAM CONTROL PARAMETER RHO
 0.17 PROGRAM CONTROL PARAMETER RHO2
 0.06 DISCOUNT RATE
 0.06 INTEREST RATE
 1.000 INFLATION INDEX FOR NON-STANDARD CAPITAL ITEMS
 1.000 INFLATION INDEX FOR NON-STANDARD COSTS OF OPN
100 NUMBER OF ITERATIONS REQUIRED
    O SELECT PARTICULAR GROUPS OF DEMAND CENTRES
    1 ) GROUPS TO BE SELECTED-
     ) WHEN DEMAND SELECT VARIABLE=11
    1 SELECT PARTICULAR TYPES OF DEMAND CENTRES
 1.00 SCALING FACTOR FOR SELECTED DEMAND CENTRE TYPES
17 NUMBER DEMAND CENTRES
 DEMAND CENTRE NAME
                     DEMAND CENTRE REFERENCE NO
                         DEMAND CENTRE REORDER NO
                         . REGION REF NO
                         . . TYPE REF NO
                         . . . YIELD OF EXISTING RESOURCES
                                     DEMANDS FOR YEARS SHOWN
                                    1985 1990 1995 2000 2005 2010
                                                    0
                         000
                                           0
                                                 0
'ANGLIA (EAST)
                                 0
                                       O
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                         000
                                 0
'NORTH ESSEX
                     3
                                                                    28
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                           0 16 39 62
'SOUTH ESSEX
                         0 0 0
                                                              80
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                     5
                         0 0 0
                                           0
                                                0
                                                     0
'ANGLIA (WEST)
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                          96 193 307 423 501 567
LONDON
                     6
                         0 0 0
                                       U
                                   1.00 1.00 1.00 1.00 1.00 1.00 1.00
                     7
                         000
                                 0
                                                     0
'THREE VALLEYS
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'MID-SOUTHERN
                         000
                                 0
                                           0
                                                0
                                                     0
                                                          0
                                       0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                  O
                                                         20
'OXFORD/SWINDON
                    10
                         0 0 0
                                       O
                                           0
                                                Ω
                                                     2
                                                              31
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'WESSEX
                         0 0 0
                                 0
                                           0
                                                0
                                                     0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                                    72 139 195 258
WEST MIDLANDS
                    12
                         0 0 0
                                           0
                                               12
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'EAST MIDLANDS
                    13
                         000
                                           44 112 158 206 258 310
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                                    40
'SOUTH YORKSHIRE '
                         0 0 0
                                      40
                                          40
                                               40
                                                         40 40
                     14
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                  0
                                                                    31
                         0 0 0
'MID KENT/FLKSTNE'
                    16
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
0 0 17 34 49 58 6
'BRISTOL
                     17
                         0 0 0
                                  0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                    18
                         000
                                           0
                                                0
                                                     0
                                                          0
'New Demand
                                   1.00 1.00 1.00 1.00 1.00 1.00 1.00
'New Demand
                    19
                         000
                                  0
                                       Λ
                                            n
                                                ٥
                                                      O
                                                          0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
81 70 94 118 141 166 191
'NORTH WEST
                         000
                    20
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
****SOURCE DATA FOLLOW
 26 NUMBER SOURCES
 SOURCE NAME
```

SOURCE REF NO

```
SOURCE REORDER NO
                                SOURCE PEAK FACTOR
                                      YIELD
                                            INCREMENTAL YIELD
                                                  LUMP SUM CAPITAL COST
                                                          INCREMENTAL CAPITAL COST
                                                                CONSTRUCTION PERIOD
                                                                   ECONOMIC LIFETIME
                                                                        OPERATING COST
                                                                               TWIN SOURCE 2/3
                                                                                   TWIN SOURCE REF NO
                                                                                        SOURCE ENTRY YEAR
                                                                                              SOURCE EXIT YEAR
                                                   2.00 0.000
'Denver Mrf
                           0
                               0.00
                                      18.
                                           0.00
                                                                    0
                                                                       .00000
                                                                                   0
                                                  69.40 0.000
'Great Bradley
                      22
                           0
                               0.00
                                     174.
                                           0.00
                                                                       .00000
                      23
                           0
                               0.00
                                      30.
                                           0.00
                                                   0.00 0.000
                                                                       .00000
'Chelmsford Efflt'
'Deephams Reuse
                      25
                           0
                               0.00
                                     100.
                                           0.00
                                                   0.00 0.000
                                                                      ,00000
                                                                                   0
                                           0.00
                                                   0.00 0.000
                                                                    0
                                                                       .00000
                                                                               0
                                                                                   0
                                                                                              0
'Grafham Augmn
                      26
                           0
                              0.00
                                     100.
                                           0.00
'Trent(Unsuprtd)
                      28
                           0
                              0.00
                                     105.
                                                   0.00 0.000
                                                                    0
                                                                       .00000
                                                                                        0
                                                                                              ۵
                                                                      .02300
'Abingdon
                      29
                           n
                              0.00
                                     262.
                                           0.00 400.00 0.000
                                                                    0
                                                                               n
                                                                                   n
                                                                                        n
                                                                                              Ω
'Carsington
                      30
                           0
                               0.00
                                     140.
                                           0.00
                                                   0.00 0.000
                                                                0
                                                                    0
                                                                       .00000
                                                                                        0
                                                                                              0
                           0
                               0.00
                                           0.00
                                                   0.00 0.000
                                                                      .00000
'Derwent Valley
                                      40.
'Kielder
                      32
                           0
                               0.00
                                     525.
                                           0.00
                                                   0.00 0.000
                                                                       .00000
                                                                                   0
                                                                                        0
                               0.00
                                           0.00
                                                   0.00 0.000
                                                                       .00000
'Severn(Unsuprtd)
                      33
                                                                    0
                                                                                   0
                           0
                                     146.
                                                                       .00590
                      34
                                      50.
                                           0.00
                                                   0.00 0.088
                                                                               0
                                                                                   0
'Birmingham Gw
                           Û
                              0.00
                                                                0
                                                                    0
                                                                                        0
                                                                                              ٥
                      35
                           0
                               0.00
                                     147
                                           0.00
                                                   0.00 0.000
                                                                0
                                                                    0
                                                                       .00000
                                                                                  36
                                                                                        O
                                                                                              D
'Vyrnwy
                                                   0.00 0.000
                                                                      .00000
'Vyrnwy (2)
                      36
                           0
                              0.00
                                     147
                                           0.00
'Craig Goch
                      37
                           0
                              0.00
                                     629.
                                           0.00
                                                  60.50 0.000
                                                                    0
                                                                       .00000
                                                                                  38
                                           0.00
                                                  60.50 0.000
                                                                       .00000
'Craig Goch (2)
                      38
                           0
                              0.00
                                     629.
                                                                    0
                                                                                  37
                                           0.00
                                                                       .00000
                      39
                           0
                                     155.
                                                   0.00 0.000
                                                                    0
                                                                                  40
                                                                                              Ó
'Shropshire Gw
                               0.00
                                                                                        0
                                           0.00
                      40
                           0
                              0.00
                                     155.
                                                   0.00 0.000
                                                                       .00000
                                                                                  39
'Shropshire Gw(2)'
                                                                    0
                                                                       .00000
                                                                               0
'Broad Oak
                      42
                           0
                              0.00
                                      40.
                                           0.00
                                                   0.00 0.000
                                                                    ٥
                                                                                   0
                                                                                              ٥
'Huntington
                      43
                           0
                               0.00
                                      74.
                                           0.00
                                                  36.90 0.000
                                                                n
                                                                    ۵
                                                                       .02590
                                                                               Λ
                                                                                   n
                                                                                              n
'Trent(Unsptd)(2)'
                           0
                               0.00
                                     105.
                                           0.00
                                                   0.00 0.000
                                                                0
                                                                    0
                                                                       .00000
                                                                                  28
                                                                                        0
                                                                                              0
                           0
                                           0.00
                                                   0.00 0.000
                                                                       .00000
'Carsington (2)
                      45
                              0.00
                                     140.
                                                                    0
                                                                                  30
'Thames Reuse
                      46
                           0
                              0.00
                                    -10.90 0.00
                                                   0.00 0.000
                                                                       .00000
                      47
                                                                       .00000
                                                                               0
                                                                                   0
                           0
                              0.00
                                    -12.44 0.00
                                                   0.00 0.000
                                                                    0
                                                                                              0
'Severn Reuse
                                      45. 0.00
                                                                      .00000
'Grafhm/3 Valleys'
                     -68
                              0.00
                                                   0.00 0.000
                                                                0
                                                                               0
                                                                                              0
                           ٥
                                                                    0
                                                                                   0
'Ribble
                           0.00
                                      40.
                                           0.00
                                                 27.90 0.000
                                                                    n
                                                                       -04040
                                                                                   0
                                                                                              0
****LINK DATA FOLLOW****
 93 NUMBER LINKS
 LINK NAME
                                                  SOURCE REF NO
                                                      DEMAND REF NO
                                                            YIELD FACTOR
                                                                     SOURCE OPERATION COST FACTOR
  LINK ELEMENT REFERENCE NUMBERS (SECOND LINE)
                                                                     100
'Great Bradley To SOUTH ESSEX
                                                             100
                                                 22
  55
                                                                               Û
                                                                                                    0
                                                                                                          0
                                                                                                               0
                                                                                                                    Ω
       57
            62
                    0
                         0
                               0
                                         0
                                                    Ð
                                                         0
                                                               0
                                                                    0
                                                                         0
                                                                                    Û
                                                                                          0
                                                                                               0
     0
          0
               O
                     0
                           0
                                     0
'Chelmsford Efflt To SOUTH ESSEX
                                                             100
                                                                     100
                                                    0
                                                         0
                                                                    0
                                                                         0
                                                                               0
                                                                                    Q
                                                                                          0
                                                                                               0
                                                                                                    0
                                                                                                          ٥
                                                                                                                    0
         0
              0
                    0
                         0
                               0
                                                               0
   63
     0
               D
          Ω
                     ٥
                          0
                               Ð
                                     Ð
'Trent(Unsuprtd) To SOUTH ESSEX
                                                 28
                                                             100
                                                                     100
                       55
   53 103 54 110
                                    0
                                                    0
                                                         0
                                                                    0
                                                                               0
                                                                                    0
                                                                                          0
                                                                                               0
                                                                                                    0
                                                                                                          0
                                                                                                               0
                                                                                                                    0
                                                               0
     ٥
          0
                    a
                                     0
'Carsington To SOUTH ESSEX
                                                              80
                                                                     100
                                                    0
                                   55
                                                         ٥
                                                                    0
                                                                               ٥
                                                                                          0
                                                                                               0
                                                                                                    0
                                                                                                          0
                                                                                                               0
                                                                                                                    0
   99
       97
            53 103
                        54
                            110
                                        62
                                               0
                                                               0
                                                                         0
                                                                                    0
                                     0
    Ω
         0
               0
                     Đ
                          ٥
                               0
'Kielder to SOUTH ESSEX
                                                 32
                                                             100
                                                                     100
  105 106
             54 110
                        55
                             62
                                    0
                                                         0
                                                               0
                                                                    0
                                                                               0
                                                                                    0
                                                                                          0
                                                                                               0
                                                                                                    0
                                                                                                          0
                                                                                                               0
                                                                                                                    0
               0
    ٥
          0
                                     0
'Vyrnwy To SOUTH ESSEX
                                                 35
                                                              83
                                                                     100
                        53 103
                                                                               0
                                                                                    0
                                                                                          0
                                                                                               0
                                                                                                    0
                                                                                                          0
                                                                                                               0
                                                                                                                    0
                                       110
                                             55
                                                                    0
                                                                         0
   90
        60
            93
                  97
                                                   62
                                                               ٥
              Ω
                     n
                          0
                                     0
     ٥
          Ω
                               0
'Shropshire Gw To SOUTH ESSEX
                                                             100
                                                                     100
            93 97
                       53 103
                                                                               0
                                                                                    0
                                                                                          0
                                                                                               0
                                                                                                    0
                                                                                                          0
                                                                                                               0
                                                                                                                    0
       60
                                       110
               0
                     0
    0
          0
                          0
                               0
                                     0
'Craig Goch To SOUTH ESSEX
                                                             100
                                                                     100
             93
0
                             53
                                 103
                                                                                    n
                                                                                               0
                                                                                                    0
                                                                                                         0
                                                                                                                    n
                                            110
                                                   55
                                                                    ۵
                                                                               Ω
                                                                                          O.
  116 117
            60
                       97
                                        54
                                                               0
                                                                         Ω
    0 0
                   0
                        0
                               0
                                     0
'Denver Hrf To SOUTH ESSEX
                                                 21
                                                             100
                                                                     100
```

56 55 62 0 0 0 0 0	1	0	()	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'GRAFHM/3 VALLEYS TO SOUTH ESSEX	,		68	4)	100	100									
69 0 0 0 0 0 0	l	0	()	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'Great Bradley To NORTH ESSEX	•		22	_ 3		100	100	_	_	_		_	_	_	_	_
55 57 58 0 0 0 0 0	,	0	()	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0	,		34	7	,	100	100									
'Denver Nrf To NORTH ESSEX 56 55 58 0 0 0 0 0		0	21	3	0	100 0	100	0	0	0	Ó	0	0	0	0	n
	,	U	•	,	U	U	U	U	٠	U	U	U	U	U	U	U
'Trent(Unsuprtd) To NORTH ESSEX	,		28	3		100	100									
53 103 54 110 55 58 0 0)	0		ס כ	0		0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0		-				•	•	•	•	•	•	•	•	•	_	-
'Grafham Augmn To ANGLIA (WEST)	•		26	5	i	100	100									
67 0 0 0 0 0 0)	0	()	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'Trent(Unsuprtd) To ANGLIA (WEST)	. '		28	. 5	100	38	100	_	_	_		_		_		_
53 103 54 110 66 51 0 0	,	0	()	0	0	0	0	0	0	0	0	0	0	0	0
	,		70	5		80	100									
'Carsington To ANGLIA (WEST) 99 97 53 103 54 110 66 51		0	30	, ס	0	80 0	100	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0	'	U	•	•	٠	U	٠.	U	v	U	U	U	U	U	U	•
'Trent(Unsptd)(2) To ANGLIA (WEST)	,		44	5		38	100									
15 41 0 0 0 0 0 0		0		ດ ້	0	_	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0		•					•	•	•	•	•	•	•	•	•	•
'Grafham Augmn To THREE VALLEYS	•		26	7	,	100	100									
67 27 0 0 0 0 0 0)	0		0	0		0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'Trent(Unsuprtd) To THREE VALLEYS	•		28	7		38	100									
53 103 54 110 66 51 27 0)	0	(0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0				_												
'Carsington To THREE VALLEYS	•		30	. 7		80	100	_		_		_	_	_	_	_
99 97 53 103 54 110 66 51	l	27	(כ	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0			,,	-	,	70	100									
'Trent(Unsptd)(2) To THREE VALLEYS	. '		44	, 7		38	100	^	0	0	0	0	^	0	0	^
15 41 27 0 0 0 0 0 0 0 0 0 0 0 0 0	•	0	•	0	0	0	U	0	U	Ų	U	U	0	U	U	U
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,		25	6		100	100									
70 0 0 0 0 0 0 0 0		0		ס כ	, a		0	0	0	0	0	0	0	0	0	۵
		•		•	Ĭ		•	•	•	•	•	•	Ū	•	•	•
'Abingdon To LONDON	,		29	6	•	100	100									
74 73 0 0 0 0 0 0)	0		0	0		0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'Great Bradley To LONDON	•		22	é	,	64	100									
55 57 111 112 113 114 0 0)	0	(0	0	O.	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'Trent(Unsuprtd) To LONDON	. '		28	٠ 6	_	100	100		•	•	•	^	•	^	•	^
53 103 54 110 55 111 112 113		114	,	0	C	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,		32	4		100	100									
'Kielder To LONDON 105 106 54 110 55 111 112 113					, 0		0	٥	0	0	0	0	0	0	٥	Λ
0 0 0 0 0 0 0 0	•	114	,		٠	•	•	•	٠	J	v	J	·	•	Ū	•
'Thames Reuse To LONDON	,		46	ć		100	100									
59 73 0 0 0 0 0 0		0		ָס כ	Ć		0		0	0	0	0	0	0	0	0
		•		•	•	-	•	-	•			•	-		•	
'Severn(Unsuprtd) To LONDON	,		33	6	5	100	100									
79 77 78 73 0 0 0 0)	0	(0	C	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0			_													
'Craig Goch To LONDON	′		37	. 6		100	100		_	_	_	_	_	_	_	_
116 117 86 77 78 73 0 0)	0	(0	C	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0			7.0		,		444									
'Shropshire Gw To LONDON	•		39	_ 6		100	100		^	_	^	•	•	^	•	
88 86 77 78 73 0 0 0	,	0	,	0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0	,		35	_		07	100									
'Vyrnwy To LONDON 90 86 77 78 73 0 0 0		0		0	, (83 0		0	0	0	0	0	0	0	0	٥
0 0 0 0 0 0 0 0	•	J		-	٠		•	•	•	•	-	-	•	-	•	•
'Craig Goch (2) To LONDON	,		38	6	5	100	100									
116 117 60 93 64 65 73 0		0		ָס `	, c		0		0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0		•		-	•	•	-	-	•	-	-	-	-		-	-
'Shropshire Gw (2) To LONDON	,		40	6	5	100	100									
88 60 93 64 65 73 0 0)	0		0	C			0 -	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0																
'Vyrnwy (2) To LONDON	,		36	. 6		83	100			_		_				
90 60 93 64 65 73 0 0)	0	(0	C	0	0	0	0	0	0	0	0	0	0	0

0 0 0 0 0 0 0 0 ('Severn Reuse To LONDON)	, 47 6	100	100								
8 86 77 78 73 0 0	0		0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0)				_		-	•	-	_		_
'Carsington To LONDON		′ 30 6	80	100	_	_	_	_	_	_	_	_
		112 113 114	4 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 ('Birmingham Gw To LONDON	,	, 34 6	100	100								
1 64 65 73 0 0 0	0		0 0	ه ``` ه	0	0	0	0	0	0	0	٥
)			•	•	•	•	•	•	•	•	•
'Abingdon To MID-SOUTHERN		' 29 9	100	100								
74 75 0 0 0 0 0	-	0 0 (0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0)											
'Severn(Unsuprtd) To MID-SOUTHERN	^	′ 33 9	100	100	•	_				_	_	•
79 77 78 75 0 0 0	•	0 0 (0 0	0 0	0	0	0	0	0	0	0	0
'Vyrnwy To MID-SOUTHERN	•	, 35 9	83	100								
90 86 77 78 75 0 0	0		0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0)											
'Shropshire Gw To MID-SOUTHERN	_	' 39 9	100	100	_	_	_	_	_	_	_	_
88 86 77 78 75 0 0	_	0 0	0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 ('Craig Goch To MID-SOUTHERN	,	, 37 9	100	100								
116 117 86 77 78 75 0	0		0 0	0 0	0	0	0	0	0	0	0	0
) `		-	•	-	•	•	_	-	•	-	
'Vyrnwy (2) To MID-SOUTHERN		4 36 9	83	100								
90 60 93 64 65 75 0	0	0 0 (0 0	0 0	0	0	0	0	0	0	0	0
)		400	***								
'Shropshire Gw (2) To MID-SOUTHERN 88 60 93 64 65 75 0	0	7 40 9	100	100 0 0	0	0	٥	٥	0	0	0	0
	, ,	0 0		0 0	U	٠	U	U	·	U	U	U
'Craig Goch (2) To MID-SOUTHERN	•	, 38 9	100	100								
116 117 60 93 64 65 75	0		0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0)											
'Severn Reuse To MID-SOUTHERN	_	47 9	100	100	_	_		_	_	_	_	_
B 86 77 78 75 0 0		0 0	0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)	, 34 9	100	100								
1 64 65 75 0 0 0	0		0 0	0 0	0	0	0	0	O	0	0	0
)		•	•	•	•	•	•	-	•	-	•
'Abingdon To OXFORD/SWINDON		′ 29 10	100	100								
74 24 0 0 0 0 0		0 0	0 0	0 0	0	0	0	0	0	0	0	0
)		400	400								
'Severn(Unsuprtd) To OXFORD/SWINDON 79 77 78 24 0 0 0	0	' 33 10 0 0 1	100 0 0	100 0 0	0	0	Λ	0	0	0	0	a
)				J	•	•	J	·	٠	•	•
'Vyrnwy To OXFORD/SWINDON		4 35 10	83	100								
90 86 77 78 24 0 0	0	0 0	0 0	0 0	0	0	0	0	0	0	0	0
)											
'Shropshire Gw To OXFORD/SWINDON		7 39 10	100	100	_	_	_		_			_
88 86 77 78 24 0 0	_	0 0	0 0	0 0	0	0	O	U	0	Ū	U	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0)	, 37 10	100	100								
116 117 86 77 78 24 0	0	0 0 0		0 0	0	0	0	0	0	0	0	0
)				-	•	•	-	-	·	•	
'Severn Reuse To OXFORD/SWINDON		47 10	100	100								
8 86 77 78 24 0 0	-	0 0	0 0	0 0	0	0	0	0	0	0	0	0
• • • • • •)	. 25 44	100	400								
'Deephams Reuse To MID KENT/FLKSTNE 70 108 0 0 0 0 0		, 25 16 0 0 (100 0 0	100 0 0	0	0	0	0	0	0	0	٥
	_	• • •		0 0	J	٠	J	U	•	U	•	٠
'Abingdon To MID KENT/FLKSTNE		' 29 16	100	100								
74 73 108 0 0 0 0	0		0 0	0 0	0	0	0	0	0	0	0	0
)											
'Great Bradley To MID KENT/FLKSTNE		, 22 16	64	100			_		_	_	_	_
55 57 111 112 113 114 108		0 0	0 0	0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 ('Trent(Unsuprtd) To MID KENT/FLKSTNI		′ 28 16	100	100								
53 103 54 110 55 111 112	113	114 108		0 0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0)				-	-	-	-		•		-
'Kielder To MID KENT/FLKSTNE		4 32 16	100	100								
105 106 54 110 55 111 112		114 108	0 0	0 0	0	0	0	0	0	0	0	0
)	. ,,	400	400								
'Thames Reuse To MID KENT/FLKSTNE 59 73 108 0 0 0 0	^	, 46 16 0 0	100 0 0	100 0 0	0	0	0	٥	0	0	۵	0
	ט נ	0 0		· ·	U	J	v	U	U	U	v	U
	•											

'Severn(Unsuprtd) 79 77 78	73 108	NT/FLKSTNE 0 0	0	0 33	16 0	0	100 0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 'Craig Goch To MI 116 117 86		0 0 STNE 73 108	0	37 0	' 16 0	0	100 0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 'Shropshire Gw To	0 0 MID KENT/	0 0 FLKSTNE	,	39	16		100	100			•	•				•	•
88 86 77 0 0 0 0 'Vyrnwy To MID KE		0 0	0	0 35	0 16	0	0 83	100	0	0	0	-	0	0	0	0	0
 90 86 77	78 73 0 0	108 0	0 ,	0	0	0	0	_	0	0	0	0	0	0	0	0	0
'Craig Goch (2) 1 116 117 60 0 0 0 0	93 64 0 0	65 73 0 0		0	0	0	100	0	0	0	0	0	0	0	0	0	0
'Shropshire Gw (2 88 60 93 0 0 0 0			0 '	0 40	0	0	100	10 0 0	0	0	0	0	0	0	0	0	0
'Vyrmy (2) To MI 90 60 93	ID KENT/FLK	STNE 73 108	0	36 0	16 0	0	83 0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 'Severn Reuse To 8 86 77			0	47 0	' 16 0	0	100 0	100	0	0	0	0	0	0	0	0	0
0 0 0 0 'Carsington To Mi			,		16		80	100	0	0	0	0	0	0	0	0	0
99 97 53 0 0 0 0 'Birmingham Gw To	0 0	0 0	,	112 1 34	16		108	100	U	v	U	u	U	U	Ū	U	J
1 64 65 0 0 0 0 'Broad Oak To MIE	73 108 0 0 NEMT/FLKS	0 0 0 0	0	0 42	0 2 16	0	0 100	0 100	0	0	0	0	0	0	0	0	0
109 0 0 0 0 0 0	0 0	0 0	0	0	0	0	Ö	0	0	0	0	0	0	0	0	0	0
'Vyrnwy To WEST I 90 87 0 0 0 0 0	41DLANDS 0 0 0 0	0 0	0	0	0	0	53 0	0	0	0	0	0	0	0	0	0	0
'Shropshire Gw To 88 87 0 0 0 0 0	0 0	ANDS 0 0 0 0	0 '	0 0) 12 0	0	100 0	100 0	0	0	0	0	0	0	0	0	0
'Craig Goch To Wi 116 117 87	EST MIDLAND 0 0	s 0 0	0 '	37 0	7 12 0	0	100 0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 'Carsington (2) 1 95 0 0		LANDS 0 0	,	45 0	5 13 0	0	100 -0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 'Derwent Valley		0 0 LANDS 0 0	,	31 0	1 13 0	0	57 0	100	0	0	0	0	0	0	0	0	0
101 0 0 0 0 0 0 'Shropshire Gw To	0 0	0 0	,	-	9 13	•	100	100	•	ŭ	U	U	U	U	U	U	Ū
88 60 93 0 0 0 0 'Craig Goch To E		0 0	0,	0 37	0 7 13	0	0 100	0 100	0	0	0	0	0	0	0	0	0
116 117 60 0 0 0 0	93 100 0 0		0	0	0	0	0	0	0	0	0	0 .	0	0	0	0	0
'Vyrnwy To EAST I 90 60 93 0 0 0 0	100 0	0 0	0	0	5 13 0	0	5 3 0	100 0	0	0	0	0	0	0	0	0	0
'Carsington To E/ 99 100 0 0 0 0 0	0 0	os 0 0 0 0	0	0	0 13	0	80 0 -	100	0	0	0	0	0	0	0	0	0
0 0 0 0 'Birmingham Gw To 1 100 0	O EAST MIDL	ANDS 0 0	0	34 0	4 13 0	0	100 0	100 0		0	0	0	0	0	0	0	0
0 0 0 0 'Derwent Valley' 102 0 0		O O RKSHIRE O O	,	31 0	1 14	0	100	100	0	0	0	0	0	0	0	0	0
0 0 0 0 'Kielder To SOUT	O O H YORKSHIRE		,	32	_ 2		100	100	•	•	•	0	0	0	0	•	^
105 107 0 0 0 0 0 'Severn Reuse To	WESSEX	0 0	0	0 47	0 7 11		0 100	0 100		0	D	-	-	-		0	0
8 86 80 0 0 0 0 'Shropshire Gw Te		0 0	0 ,	0 39	0 9 11	0	0 100	0 100	_	0	0	0	0	0	0	0	0
88 86 80 0 0 0 0	0 0	0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 -	0
'Craig Goch To W	ESSEX		,	37	7 11		100	100									

```
116 117
             86
                        0
                             0
                                  0
                                       0
                                                  0
                                                                                                     0
                                                                                                                0
    0
         0
                              0
                                   0
'Vyrnwy To WESSEX
                                               35
                                                           53
                                                                  100
                                        0
                        0
                             ٥
                                  0
                                                       0
                                                                            a
                                                                                                           0
                                                                                                      0
                                                                                                                0
  90
       86
             80
                                                            0
    Ð
         0
               0
                    0
                         0
                              0
                                   0
'Severn Reuse To BRISTOL
                                                          100
                                                                  100
   8 86
           52
                  0
                        0
                             0
                                  0
                                                       0
                                                                            0
                                                                                                0
                                                                                                      0
                                                                                                           0
                                                                                                                0
    0
              0
                   0
                         0
                              0
                                   0
'Shropshire Gw To BRISTOL
                                                          100
                             0
                                   0
                                        0
                                                  0
                                                                       0
                                                                            0
                                                                                 0
                                                                                      0
                                                                                           0
                                                                                                0
                                                                                                     0
                                                                                                           0
                                                                                                                0
                   O
                        0
  88
       86
            52
                                                            0
                              0
                                    0
    0
         0
               O
                    0
'Craig Goch To BRISTOL
                                                          100
                                                                   100
                             0
                                   0
                                                       0
                                                                            0
                                                                                      O
                                                                                           0
                                                                                                     0
                                                                                                           0
                                                                                                                0
 116 117
            86
                  52
                                                            0
                                                                                 0
                                                                                                0
    0
         0
               0
                              Q
                                    0
'Vyrnwy To BRISTOL
                                                           53
                                                                   100
  90
                                                                            0
                                                                                                0
                                                                                                                0
      86
            52
                   0
                                                            0
    0
         0
               0
                    0
                         0
                              0
                                    0
                                                           100
                                                                   100
'Ribble To NORTH WEST
                                                  0
                                                                       0
                                                                                                           0
                                                                                                                0
                                                       ٥
                                                                                                0
                                                                                                      0
  89
        0
              0
                   0
                        0
                             O
                                   ٥
                                                                            0
    0
         0
               0
                    0
                         0
                              0
                                    0
'Kuntington To NORTH WEST
                                                  20
                                                          100
                                                                   100
        0
              0
                   0
                             0
                                   0
                                                                                                           0
                                                                                                                0
    0
          0
               0
                   0
                         0
                              0
                                    0
'Vyrmwy To NORTH WEST
                                               35
                                                  20
                                                          100
                                                                   100
                                                                                                0
                                                                                                      0
                                                                                                           0
                                                                                                                0
                        0
                             0
                                   0
                                                                            0
                                                                                           0
  92
        D
              0
                   0
                                    0
          0
               0
                    0
                         0
                              0
****END OF LINK DATA: LINK ELEMENT DATA FOLLOW********************
```

```
61 NUMBER LINK ELEMENTS
LINK ELEMENT REFERENCE NO
```

LINK ELEMENT NAME

DIAMETER EXISTING PIPELINE
EXISTING CAPACITY
EXISTING USE
CONSTRUCTION PERIOD
EXISTING USE
EXISTING USE
EXISTING USE

. . . . PIPELINE LENGTH FRICTION LENGTH

CAPITAL COST

OPERATING COST

LOAD FACTOR

CAPACITY FACTOR

LINK ELEMENT DEFINITION

	F														
1 'BIRMINGHAM GW				,	0	0 00	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	10
8 'SEVERN REUSE				•	0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
15 'R.TRENT - RUTLA	ND (1)				0	100 0 0	0	0 0							
1000000 0	100 104	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
24 'R.THAMES - OXFO	RD/SWINDON				0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
27 'GRAFHAM - THREE	VALLEYS			•	0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
41 'R.TRENT - RUTLA	ND (2)			•	0	0 0 0	0	0 0							
32000 -20800	47 104	0	0	0 0	0	0 0 0 0	O	0 0	0 0	0	0	0	0	0	0
51 'DENVER - GRAFHA	M (1)			•	0	150 0 0	0	0 0							
1000000 0	100 104	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
52 'R.SEVERN - BRIS	TOL			,	0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
53 'R.TRENT - R.WIT	'HAM (1)			,	0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
54 'R.WITHAM - R.EL	Y OUSE (1)			,	0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
55 'ELY OUSE - ESSE	X			•	0	0 0 0	0	0 0							
0 -11200	79 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
56 'DENVER MRF				•	0	0 0 0	0	0 0							
0 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0
57 'GREAT BRADLEY				,	0	0 0 0	0	0 0							_
0 0	100 100	0	0	0 0	0	0 0 0 0	0		0 0	0	0	0	0	0	0
58 'ELY QUSE ESSEX	- NORTH ESSEX			•	0	0 0 0	0	0 0							_
0 0	100 100	0	0	0 0	0	0 0 0 0	0	• • •	0 0	0	0	0	0	0	0
59 'THAMES REUSE				,	0	0 0 0	0	0 0					_	_	_
0 0	100 100	0	0	0 0	_0	0 0 0 0	0		0 0	0	0	0	0	0	0
	RENT (1)			•	0	100 0 0	0	0 0						_	_
1000000 0	100 100	0	0	0 0	0	0 0 0 0	0	0 0	0 0	0	0	0	0	0	0

62 'ELY OUSE ESSEX - SO	OUTH 100	ESSEX 100	0	0	0	٥	0	0 0	00	0	0	0	0	0	0	0	a	0	0
63 'CHELMSFORD EFFLT -	SOU1	H ESSEX	0	0	, 0	0	0	0 0	0 0	0	0	0	0	0	0	0	0	0	0
64 'CANAL TRANSFER (1)			_	_	•		Ŏ	100	0 0	Ó	0	Ŏ.		-	_	_		•	•
65 'CANAL TRANSFER (2)	100	100	0	0	0,	0	0	0 0	0 0	0	0	0 0	0	0	0	0	0	0	0
23100 -20000 66 'DENVER - GRAFHAM (2	12 2)	100	0	0	٥,	0	0	0 0	00	0 0	0	0 0	0	0	0	0	0	0	0
37000 -19600 67 'GRAFHAM AUGMN	33	104	0	0	٥,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
35000 -9100	33	100	0	0	0,	0	0	o o		•	0	0 0	0	0	0	0	0	0	0
	100	100	0	0	0	0	Ō	0 0	0 (οŏ	0	0 0	0	0	0	0	0	0	0
70 'DEEPHAMS REUSE - LC 37000 1050000	ONDOA 100	100	0	0	o	0	0	0 0	00	0 0	0	0 0	0	0	0	0	0	0	0
73 'R.THAMES 0 0	100	100	0	0	o'	0	0	0	00	0	0	0	0	0	0	0	0	0	0
74 'ABINGDON - R.THAMES	S 100	100	0	0	0	0	0	0 0	0 0	0	0	0	0	0	0	٥	0	0	0
75 'R.THAMES - MID SOU'	THERM	1	•		•	-	Ö	0	0 0	0	0	0	-	•	-	•	-		
77 'R.SEVERN - R.THAMES	100 S (1)	100	0	0	0,	0	-	0 0 400	0 0	0 0	0	0 0	0	0	0	0	0	0	0
1000000 0 1 78 'R.SEVERN - R.THAMES	100 S (2)	94	0	0	٥,	0	0	0 0	00	0 0	0	0 0	0	0	0	0	0	0	0
92000 -31500 79 'R.SEVERN (UNSUPRID	12	100	0	0	0,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
0 0	100	100	0	0	٥,	0	Ō	0 0	0 (0 0	0	0 0	0	0	0	0	0	0	0
	100	100	0	0	0	0	0	0 0	-	0 0	0	0 0	0	0	0	0	0	0	0
82 'R.WYE - R.SEVERN (1) 100	100	0	0	o,	0	0	400 0 0	000	0 0	0	0 0	0	0	0	0	0	0	0
83 'R.WYE - R.SEVERN (7 47500 15000	2) 12	100	0	0	0	0	0	0 0	00	0	0	0	0	0	0	0	0	0	0
84 'CRAIG GOCH - R.WYE	100	100	0	0	, 0	0	0	0 0	0 0	0	0	0	0	0	0	0	0	0	0
86 'R.SEVERN			_		•	_	0	0	0 0	0	0	0	Ī		Ī			_	
0 0 87 'R.SEVERN - W.MIDLAI	100 NDS	100	0	0	٥,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
	100 SEVEF	100 RN	0	0	٥,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
0 0 89 'RIBBLE - NORTH WEST	100	100	0	0	٥,	0	0	0 0	0 (0 0	0	0 0	0	0	0	0	0	0	0
0 0	100	100	0	0	٥.	0	Ŏ	0 0	0 (0 0	0	0 0	0	0	0	0	0	0	0
90 'VYRNWY - R.SEVERN 0 178000	100	100	0	0	o	0	0	0 0		0 0	0	0 0	0	0	0	0	0	0	0
91 'HUNTINGTON - NORTH	WES1 100	100	0	0	o'	0	0	0 0	00	0 0	0	0 0	0	0	0	0	0	0	0
92 'VYRNWY - NORTH WES'	T 100	100	0	n	0	n	0	0	00	0	0	0	0	0	Ω	n	Ω	n	ο
93 'R.SEVERN - R.TRENT	(2)		^	_	ζ,	•	Ō	Ö	0 0	0	Ō	0	0	•		_	_	•	•
26000 - 16300 95 'CARSINGTON - EAST I		ANDS	U	0	0,	0	0	0 0	0 0	0 0	0	0	-	-	0	0	0	0	0
1000000 0 97 'R.TRENT	100	100	0	0	٥,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
0 0 99 'CARSINGTON - R.TRE	100 NT	100	0	0	٥,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
	100	100	0	0	٥,	0	0	0 0		0 0	0	0 0	0	0	0	0	0	0	0
50000 -1600	100	100	0	0	0	0	0	0 0	0 (0 0	0	0 0	0	0	0	0	0	0	0
101 'DERWENT VALLEY - E/ 13300 -25000		11DLANDS 100	0	0	o,	0	0	0 0	00	0 0	0	0 0	0	0	O	0	0	0	0
102 'DERWENT VALLEY - SO		YORKSHIR 100	E O	٥	0	0	0	0	00	0	0	0	0	0	0	0	0	0	0
103 'R.TRENT - R.WITHAM	(2)		_		•		0	0	0 0	0	0	0	-	0		0	0	0	0
18000 -1000 105 'KIELDER - R.SWALE	-	100	0	0	0,	0	0	0 0	0 0	0 0	0	0 0	•	·	0	•	-	•	
8200 -30500 106 'R.OUSE - R.WITHAM	100	100	0	0	٥,	0	0	0 0	00	0 0	0	0 0	0	0	0	0	0	0	0
107000 -16500 107 'R.OUSE - SHEFFIELD	100	100	0	0	٥,	0	0	0 0	0 0	0 0	0	0 0	0	0	0	0	0	0	0
	100		0	0	٥,	0	0	0 0		_	0	0 0	0	0	O	0	0	0	0
67200 -21600	25	100	0	0	0	0	0	0 0	0	0 0	0	0 0	0	0	0	0	0	0	0
109 'BROAD OAK - MID KEI 47500 -25000	-	LKSTNE 100	0	0	o'	0	0	0 0	00	0 0	0	0 0	0	0	0	0	0	0	0

```
110 'R.WITHAM - R.ELY CUSE (2)
                                                      0
                                                          0 0
           -10400
                        33 100
  149000
                                      0
                                         0
                                           0 0
                                                     0 0 0 0
                                                                    0 0
                                                                          0
                                                                            0 0 0
                                                                 0
                                                                                      0 0
 111 'R.PANT - R.CHELMER - R.RODING (1)
                                                  0 100
                                                          0 0
                                                                     0
                                                                         0
                       100 123
                                         0
                                                        0 0
  1000000
                0
                                      0
                                            0
                                               0
                                                              0
                                                                    0
                                                                       0
                                                  0
                                                     0
                                                                 0
                                                                          O
                                                                             0
 112 'R.PANT - R.CHELMER - R.RODING (2)
                                                      0
                                                          0 0
                                                                     0
                                                                         0
   24000
           - 10300
                        11
                             100
                                      0
                                         0
                                               0
                                                     0
                                                       0
                                                          0
                                                              0
                                                                    0
                                                                       0
                                                                          0
                                                                             0
 113 'R.RODING - R.STORT (1)
                                                    100
                                                          0 0
                                                                     0
                0
                       100 123
                                                       0 0 0
                                                                    0
  1000000
                                                  0
                                                     0
                                                                 0
                                                                       0
                                                                          0
                                                                             0
 114 'R.RODING - R.STORT (2)
                                                      0
                                                          0 0
                                                                     0
            -2900
                             100
                                               0
                                                     0
                                                       0
                                                             0
   11000
                                            0
                                                                   0
                                                                       0
                                                                          n
                         12
                                                  O
                                                           Ω
                                                                0
                                                                             0
 116 'CRAIG GOCH - R.SEVERN (1)
                                                      0
                                                          0 0
                                                                     0
                                                  n
                                                                 0
                                                                         n
                0
                                                       0 0 0 0
       0
                        100
                             100
                                               0
                                                  0
                                                     0
                                                                   0
                                                                       0
                                                                          0
                                                                             0
 117 'CRAIG GOCH - R.SEVERN (2)
                                                      0
                                                          0 0
                                                                 0
                                                                     0
                                                                         0
   44500
                0
                       100 100
                                         O
                                            0 0
                                                  0
                                                    0 0 0
                                                             0 0
                                                                   0
                                                                       0
****END OF LINK ELEMENT DATA: COST FUNCTION DATA FOLLOWS*********
14 NUMBER COST FUNCTIONS
12 NUMBER COST FUNCTION COEFFICIENTS
GENERAL FORM (CONF ARE 80% CONFIDENCE LIMIT MULTIPLIERS) :
      ь
                          h
                            ) * rZ (SEEMANUAL)
    (aY + c(Y+d)
COST FUNCTION
                            CONF INFL
                                     h
                                1.000
                                                      0.79
1-INTAKE
                          1.0
                                        .0176
                                                                                   1.0
                                                                                                               0
                                    1.0
                                                  0.0
                                                                0.0
                                                                               0.0
                                 1.000 0.1036
                                                      1.0
                                                                     1.362
                                                                                   1.0
'2-GAC/OZONE
                            1.0
                                                                                                 0.0
-0.0000737
              1.0
                            2.0
                                          1.0
                                                        0.0
                                                                       0.0
                                                                                     0.0
'3-BANKSIDE STORAGE
                          1.0
                                 1.000
                                        0.021036
                                                      1.0
                                                                    3.967
                                                                                   1.0
                                                                                                 0.0
-0.0000124
                            2.0
                                          1.0
                                                        0.0
                                                                       0.0
                                                                                     0.0
              1.0
                                 1.000
                                                      0.64
                                        1.246
                                                                    0.0
'4-WATER TREATMENT
                            1.0
                                                                                   1.0
                                                                                                 1.0
                                                                                                               0.0
                                    1.0
        1.0
                                                  0.0
                                                                0.0
                                                                               0.0
                                        .0026
'5-PUMPS
                          1.0
                                 1.000
                                                       . 81
                                                                     0.0
                                                                                                                0
                                    1.0
                                                                0.0
                                                                               0.0
'6-PUMPHOUSE
                                 1.000
                          1.0
                                        .012
                                                      .79
                                                                    0.0
                                                                                   1.0
                                                                                                               0.0
                                    1.0
                                                  0.0
                                                                0.0
                                                                               0.0
        1.0
                                 1.000
                                        .00027
                                                                    ٥
                                                                                                               0.0
7-PIPELINE
                                                      1.04
                                                                                   1.0
                          1.0
        1.0
                                    1.0
                                                   1.0
                                                                0.0
                                                                               0.0
'8-TUNNEL
                          1.0
                                 1.000 3.000000
                                                      1.0
                                                                     0.00000
                                                                                   1.0
                                                                                                               0.0
        1.0
                                    1.0
                                                  0.0
                                                                               0.0
'9-TERMINAL STORAGE
                          1.0
                                 1.000 0.0676131
                                                      1.0
                                                                     -0.1281
                                                                                   1.0
                                                                                                 0.0
-0.0000727
                            2.0
                                                        0.0
              1.0
                                                                       0.0
                                                                                     0.0
                                 1.000
                          1.0
                                        .00081
                                                      1.0
                                                                     0.0
                                                                                                               0.0
                                                                                                 1.0
'10-POWER (ELECTRICITY)
                                                                                   1.0
        1.0
                      1.0
                                    1.0
                                                  0.0
                                                                0.0
                                                                               0.0
'11A-WATER TREATMENT CHEMS' 1.0
                                 2.234 0.00169
                                                      1.0
                                                                    0.0
                                                                                   1.0
                                                                                                 1.0
                                                                                                               0.0
        1.0
                      1.0
                                    1.0
                                                  0.0
                                                                 0,0
                                                                               0.0
'11B-WATER TREATMENT POWER'
                            1.0
                                 2.940 0.0001751
                                                      1.0
                                                                     0.0
                                                                                   1.0
                                                                                                                0.0
                                    1.0
                                                  0.0
                                                                 0.0
                                                                               0.0
        1.0
                      1.0
                                 2.234 0.000533
                                                                     0.0
                                                                                                               0.0
'13-RAW WATER CHLORINATION' 1.0
                                                      1.0
                                                                                   1.0
                                                                                                 1.0
                                                                               0.0
        1.0
                      1.0
                                    1.0
                                                   0.0
                                                                 0.0
13-EXTRA SOFTENING
                          1.0
                                 2.234 0.000934
                                                                     0.0
                                                                                                                0.0
        1.0
                      1.0
                                    1.0
                                                                 0.0
                                                                               0.0
      ********END OF COST FUNCTION DATA: END OF
DATAFILE********
```

```
O NUMBER LINES HEADING
  *****ABOVE DATA ARE USED AS HEADINGS IN THE OUTPUT. GENERAL DATA FOLLOW***
  7 1991 NUMBER PERIODS & FIRST BASE YEAR
  1996 2001 2006 2011 2016 2021 BASE YEARS AFTER FIRST BASE YEAR
 1991 DISCOUNT YEAR
 1991 FIRST YEAR IN PLAN
   0 DATA TESTING(0 = FOR NORMAL RUN,1 = NO ALLOCATION,2 = NULL ALLOCATION
   0 NO COSTING BUT ALLOCATION CHECKED (1 = NO COSTING, ZERO OTHERWISE)
     (1 = CONDENSED OUTPUT, 0 = FULL OUTPUT)
     (1 = NO TABLE OF PEAK FACTORS, 0 = FULL OUTPUT)
   1 (1 = NO TABLES OF INPUT DATA IN OUTPUT, ZERO OTHERWISE)
   1 (1 = NO EXPLANATORY NOTES IN OUTPUT, ZERO OTHERWISE)
0 (1 = TABULATED MONITORING OUTPUT FOR ALLOCATION, ZERO OTHERWISE)
     (1 = STEPWISE MONITORING OUTPUT FOR ALLOCATION, ZERO OTHERWISE)
       30
             PIPE STAGING VARIABLES
0.85 PROGRAM CONTROL PARAMETER RHO
0.15 PROGRAM CONTROL PARAMETER RHO2
0.06 DISCOUNT RATE
0.06 INTEREST RATE
 1.000 INFLATION INDEX FOR NON-STANDARD CAPITAL ITEMS
 1.000 INFLATION INDEX FOR NON-STANDARD COSTS OF OPN
100 NUMBER OF ITERATIONS REQUIRED
   O SELECT PARTICULAR GROUPS OF DEMAND CENTRES
   1 ) GROUPS TO BE SELECTED-
     ) WHEN DEMAND SELECT VARIABLE=11
    1 SELECT PARTICULAR TYPES OF DEMAND CENTRES
1.00 SCALING FACTOR FOR SELECTED DEMAND CENTRE TYPES
17 NUMBER DEMAND CENTRES
DEMAND CENTRE NAME
                     DEMAND CENTRE REFERENCE NO
                         DEMAND CENTRE REORDER NO
                         . REGION REF NO
                         . . TYPE REF NO
                         . . . YIELD OF EXISTING RESOURCES
                                    DEMANDS FOR YEARS SHOWN
                                    1985 1990 1995 2000 2005 2010
                         . . . .
                                     0
                                              0
                                         0
                                                   ٠,
                                                        · o
                         000
                                 0
'ANGLIA (EAST)
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'NORTH ESSEX
                         0 0 0
                                           0
                                               0
                                                     0
                                                         0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'SOUTH ESSEX
                         000
                                               2 17 32
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'ANGLIA (WEST)
                     5
                         000
                                 ٥
                                               0
                                                    0
                                           0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'LONDON
                         000
                                           ٥
                                                n
                                                     0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                                    0
'THREE VALLEYS
                         000
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'MID-SOUTHERN
                     Q
                         000
                                 Ð
                                               0
                                      Ω
                                           ٥
                                                    0
                                                         O
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'OXFORD/SWINDON
                         000
                                               0
                                                    0
                                                         0
                                                              13
                    10
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                    11
                         000
                                               0
'WESSEX
                                                         0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                               0
                         000
                                 ٥
                                                     0
                                                         11
'WEST MIDLANDS
                    12
                                      0
                                           0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                                    72 104 141
'EAST MIDLANDS
                    13
                         0 0 0
                                      0
                                           0
                                               40
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
'SOUTH YORKSHIRE '
                    14
                         000
                                      40
                                          40
                                               40
                                                    40
                                                        40
                                                             40
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                         0 0 0
'MID KENT/FLKSTNE'
                    16
                                 Λ
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                         000
                                                   18 30 37
'BRISTOL
                    17
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                         000
                                               0
                                                         0
'New Demand
                    18
                                 0
                                      ٥
                                           0
                                                    0
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                    19
                         000
                                      0
                                          0
                                               0
                                                    0
                                                         0
                                                              0
'New Demand
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
                                                    34
                    20
                         000
                                 0
                                      81
                                          55
                                               28
                                                         48
'NORTH WEST
                                  1.00 1.00 1.00 1.00 1.00 1.00 1.00
****SOURCE DATA FOLLOW**********
26 NUMBER SOURCES
 SOURCE NAME
```

SOURCE REF NO

```
SOURCE REORDER NO
                                SOURCE PEAK FACTOR
                                      YIELD
                                           INCREMENTAL YIELD
                                                 LUMP SUN CAPITAL COST
                                                          INCREMENTAL CAPITAL COST
                                                                CONSTRUCTION PERIOD
                                                                   ECONOMIC LIFETIME
                                                                        OPERATING COST
                                                                              TWIN SOURCE 2/3
                                                                                   TWIN SOURCE REF NO
                                                                                        SOURCE ENTRY YEAR
                                                                                             SOURCE EXIT YEAR
'Denver Mrf
                           0
                              0.00
                                      18.
                                           0.00
                                                   2.00 0.000
                                                                   0
                                                                      .00000
'Great Bradley
                      22
                           0
                              0.00
                                     174.
                                           0.00
                                                 69.40 0.000
                                                                    0
                                                                      .00000
                                                                                   0
                                                                                             0
                              0.00
                                           0.00
                                                   0.00 0.000
Chelmsford Efflt
                      23
                           0
                                      30.
                                                                    0
                                                                      .00000
                                                                                   0
                                                                                        0
                                                                                             0
                                           0.00
                     - 25
                           Ω
                                                                       00000
'Deephams Reuse
                              0.00
                                     100.
                                                   0.00 0.000
                                                                    n
                                                                              n
                                                                                   n
                                                                                        n
                                                                                             0
'Grafham Augmn
                      26
                           0
                              0.00
                                     100.
                                           0.00
                                                   0.00 0.000
                                                               0
                                                                    0
                                                                      .00000
                                                                              0
                                                                                   O
                                                                                        0
                                                                                             0
'Trent(Unsuprtd)
                      28
                           0
                              0.00
                                     105.
                                           0.00
                                                   0.00 0.000
                                                                    0
                                                                      .00000
                                                                                             0
'Abingdon
                      29
                           0
                              0.00
                                     262.
                                           0.00 400.00 0.000
                                                                    0
                                                                      .02300
                                                                                   0
                                                                                        0
                              0.00
                                                   0.00 0.000
                                                                      .00000
'Carsington
                                     140.
                                           0.00
Derwent Valley
                      31
                              0.00
                                      40.
                                           0.00
                                                   0.00 0.000
                                                                    0
                                                                      .00000
                                                                                             0
                      32
                           0
                              0.00
                                           0.00
                                                   0.00 0.000
                                                                      .00000
'Kielder
                                     525.
                                                                    0
                                                                                   0
                                                                                             0
                                                                                        0
                                                                      .00000
                                                                                   0
'Severn(Unsuprtd)
                      33
                           0
                              0.00
                                     146.
                                           0.00
                                                   0.00 0.000
                                                                    0
                                                                              0
                                                                                        Û
                                                                                             Û
                                           0.00
                                                                      .00590
'Birminghem Gw
                      34
                           n
                              0.00
                                      50.
                                                   0.00 0.088
                                                                    0
                                                                                   a
                                                                                        n
                                                                                             O
                                                                      .00000
'Vyrnwy
                      35
                           0
                              0.00
                                     147
                                           0.00
                                                  0.00 0.000
                                                                    0
                                                                                  36
                                                                                        0
                                                                                             0
'Vyrnwy (2)
                           0
                              0.00
                                     147
                                           0.00
                                                   0.00 0.000
                                                                    0
                                                                      .00000
                                                                                  35
                                                                                        0
                                                                                             0
                                                 60.50 0.000
'Craig Goch
                      37
                           0
                              0.00
                                     629.
                                           0.00
                                                                      .00000
'Craig Goch (2)
                      38
                           0
                              0.00
                                     629.
                                           0.00
                                                 60.50 0.000
                                                                      .00000
                                                                                  37
                                                                                             0
Shropshire Gw
                      39
                           0
                              0.00
                                     155.
                                           0.00
                                                  0.00 0.085
                                                                      .00590
                                                                                  40
                                           0.00
                                                   0.00 0.085
                                                                      .00590
                           Ð
                                                                                  39
'Shropshire Gw(2)'
                      40
                              0.00
                                     155.
                                                                    ٥
                                                                                             0
Broad Oak
                      42
                           0
                              0.00
                                      40.
                                           0.00
                                                   0.00 0.000
                                                               0
                                                                    0
                                                                      .00000
                                                                                   0
                                                                                        0
                                                                                             0
                                      74.
Huntington
                      43
                           0
                              0.00
                                           0.00
                                                 36.90 0.000
                                                                    0
                                                                      .02590
                              0.00
                           0
                                     105.
                                           0.00
                                                   0.00 0.000
                                                                      .00000
'Trent(Unsptd)(2)'
                      45
                           0
                              0.00
                                     140.
                                           0.00
                                                   0.00 0.000
                                                                      .00000
                                                                                  30
Carsington (2)
                              0.00
                                    -10,90 0.00
                                                                      .00000
                                                                              0
'Thames Reuse
                      46
                           0
                                                  0.00 0.000
                                                                    0
                                                                                   0
                                                                                             0
                                                   0.00 0.000
                      47
                              0.00 -12.44 0.00
                                                               0
                                                                      .00000
'Severn Reuse
                           O
                                                                    a
                                                                              0
                                                                                   a
                                                                                        O
                                                                                             0
                                                                      .00000
'Grafhm/3 Valleys'
                      68
                           0
                              0.00
                                      45. 0.00
                                                  0.00 0.000
                                                               0
                                                                    0
                                                                              0
                                                                                   0
                                                                                             0
                      71
                           0
                              0.00
                                      40.
                                           0.00
                                                 27.90 0.000
                                                                    0.04040
                                                                              0
                                                                                   0
                                                                                             0
****LINK DATA FOLLOW******
93 NUMBER LINKS
LINK NAME
                                                  SOURCE REF MO
                                                      DEMAND REF NO
                                                            YIELD FACTOR
                                                                     SOURCE OPERATION COST FACTOR
 LINK ELEMENT REFERENCE NUMBERS (SECOND LINE)
'Great Bradley To SOUTH ESSEX
                                                 22
                                                             100
                                                                     100
      57
            62
                   0
                         0
                              0
                                    n
                                                    O
                                                         0
                                                              0
                                                                    O
                                                                         0
                                                                               0
                                                                                                    0
                                                                                                         0
                                                                                                              0
                                                                                                                    0
         0
               0
                    0
                          0
                                     0
                               0
'Chelmsford Efflt To SOUTH ESSEX
                                                             100
                                                                     100
         0
              0
                    0
                         0
                              Ď
                                    0
                                               0
                                                    0
                                                         0
                                                              0
                                                                    0
                                                                         0
                                                                               0
                                                                                    0
                                                                                         0
                                                                                              0
                                                                                                    0
                                                                                                         0
                                                                                                               0
                                                                                                                    0
  63
          0
               0
                     0
                          O
    ٥
                               0
                                     0
'Trent(Unsuprtd) To SOUTH ESSEX
                                                             100
                                                                     100
   53 103
                 110
                                    0
                                                         0
                                                               0
                                                                    0
                                                                         n
                                                                               0
                                                                                    0
                                                                                         0
                                                                                              0
                                                                                                    0
                                                                                                         0
                                                                                                              0
                                                                                                                    0
            54
                       55
    0
         Đ
               0
                    0
                                     0
'Carsington To SOUTH ESSEX
                                                              80
                                                                     100
                                   55
                            110
                                                    0
                                                                    0
                                                                         0
                                                                              0
                                                                                         0
                                                                                                    0
                                                                                                         0
                                                                                                              0
                                                                                                                    0
       97
                                               0
                                                              0
            53 103
                        54
                                        62
         0
               0
                               0
                                     0
    0
                     0
                          0
'Kielder To SOUTH ESSEX
                                                             100
                                                                     100
                                                    n
 105 106 54 110
                        55
                             62
                                    0
                                               n
                                                         0
                                                              ٥
                                                                    0
                                                                         n
                                                                               0
                                                                                    0
                                                                                         0
                                                                                              0
                                                                                                    0
                                                                                                         0
                                                                                                              0
                                                                                                                    0
         0
              0
                               0
                                     0
Vyrnwy To SOUTH ESSEX
                                                              83
                                                                     100
        60
             93
                       53
                            103
                                   54
                                       110
                                             55
                                                              0
                                                                         0
                                                                               0
                                                                                    0
                                                                                         0
                                                                                              0
                                                                                                    0
                                                                                                         0
                                                                                                              0
                                                                                                                    0
   90
                  97
         0
              0
                    0
                          0
                               0
                                     0
    0
'Shropshire Gw To SOUTH ESSEX
                                                             100
                                                                     100
       60
             93 97
                       53
                            103
                                   54
                                       110
                                             55
                                                   62
                                                              0
                                                                    0
                                                                         0
                                                                              0
                                                                                    D
                                                                                         0
                                                                                              0
                                                                                                    0
                                                                                                         0
                                                                                                              0
                                                                                                                    0
   88
    0
         0
               0
                    0
                               0
                                     0
'Craig Goch To SOUTH ESSEX
                                                             100
                                                                     100
         17 60
                                                                                                    0
                             53
                                  103
                                            110
                                                  55
                                                                         Û
                                                                              0
                                                                                    0
                                                                                         0
                                                                                               0
                                                                                                              0
                                                                                                                    O
                  93 97
                                                                    0
 116 117
                                                        62
                                                              0
               0
                    0
    0
                          0
                               0
                                     0
'Denver Mrf To SOUTH ESSEX
                                                 21
                                                             100
                                                                     100
```

56 55 62 0 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
'GRAFHM/3 VALLEYS TO SOUTH ESSEX 69 0 0 0 0 0 0	, 0	68 0	0	•	100 0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	, o	22 0	0	s	100	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	,	21 0	0 3	5 0	100	100	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 1 O 1 O 1 O 1 O	,	28	3	5	100	100		_	-						•
53 103 54 110 55 58 0 0 0 0 0 0 0 0 0 'Grafham Augmn To ANGLIA (WEST)	o ,	0 26	0 !	, c	100	100	0.	0	0	0	0	0	0	0	0
67 0 0 0 0 0 0 0 0 0 0 0 0 0 0 'Trent(Unsuprtd) To ANGLIA (WEST)	0,	0 28	0	0 5	0 38	0 100	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
'Carsington To ANGLIA (WEST) 99 97 53 103 54 110 66 5 0 0 0 0 0 0 0	1	0	0		80 0	100 0	0	0	0	0	0	0	0	0	0
'Trent(Unsptd)(2) To ANGLIA (WEST) 15 41 0 0 0 0 0	'	0 44	0 !	5	38 0	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	, 0	26 0	0	7	100	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 'Trent(Unsuprtd) To THREE VALLEYS 53 103 54 110 66 51 27	,	28 0	0	,	38	100	0	0	0	0	0	٥	0	0	0
0 0 0 0 0 0 0 0 0 0 0 /Carsington To THREE VALLEYS	,	30		7	80	100			_						•
99 97 53 103 54 110 66 5 0 0 0 0 0 0 0 0 'Trent(Unsptd)(2) To THREE VALLEYS	i1 ,	27 44	0	7	38	0 100	0	0	0	0	0	0	0	0	0
15 41 27 0 0 0 0 0 0 0 0 0 0 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
'Deephams Reuse To LONDON 70 0 0 0 0 0 0 0 0 0 0 0 0 0	o '	25 0	o '	5	100	100 0	0	0	0	0	0	0	0	0	0
'Abingdon To LONDON 74 73 0 0 0 0 0 0 0 0 0 0 0 0 0	۰ ′	0 0	0	5	_	100 0	0	0	0	0	0	0	0	0	0
'Great Bradley To LONDON 55 57 111 112 113 114 0	0	0 22	0	5 (64	100 0	0	0	0	0	0	0	0	0	0
D 0 0 0 0 0 0 0 0 'Trent(Unsuprtd) To LONDON 53 103 54 110 55 111 112 11	,		0	5 (100	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 ′Kielder To LONDON	,	32		5	100	100	•	0	•	•	•	0	•	0	•
105 106 54 110 55 111 112 11 0 0 0 0 0 0 0 0 0 'Thames Reuse To LONDON	,			, 5	100	0 100	u	0	0	0	0	0	0	0	0
59 73 0 0 0 0 0 0 0 0 0 0 0 0 0	0,	0 33	0	(100	0 100	0	0	0	0	0	0	0	0	0
'Severn(Unsuprtd) To LCMDON 79 77 78 73 0 0 0 0 0 0 0 0 0 0	0	0	o '	5		0	0	0	0	0	0	0	0	0	0
'Craig Goch To LONDON 116 117 86 77 78 73 0 D 0 0 0 0 0 0 0	0	37 0	0	5 (100	100		0	0	0	0	0	0	0	0
'Shropshire Gw To LONDON 88 86 77 78 73 0 0	o <i>'</i>	39 0	0	5	100	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 'Vyrnwy To LONDON 90 86 77 78 73 0 0	,	35 0	0	5	83	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0	38 0	0	5 (100	100	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 /Shropshire Gw (2) To LONDON	,	40	•	5	100	100									
88 60 93 64 65 73 0 0 0 0 0 0 0 0 0 'Vyrnwy (2) To LONDON	0	0 36	0	, S	0 83	0		0	0	0	0	0	0	0	0
90 60 93 64 65 73 0	0	0	0	,			0	0	0	0	0	0	0	0	0

	0		_													
'Severn Reuse To LONDON		,	47	6		100	100									
8 86 77 78 73 0 0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Carsington To LONDON		,	30	6		80	100									
	111	112			14	0		0	0	0	0	0	0	0	0	a
	_			,	17	U	٧	•	U	U	v	J	•	U	•	•
• • • • • • • • • • • • • • • • • • • •	0	-	٠,			400	400									
'Birmingham Gw To LONDON		•	34	6		100	100									
1 64 65 73 0 0 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Abingdon To MID-SOUTHERN		,	29	9		100	100									
74 75 0 0 0 0 0	0	0		0	0	Ö		0	0	0	0	0	0	0	0	0
	0	•		•	•	•	·	•	·	•	•	•	•	•	•	•
	5			_		400	400									
'Severn(Unsuprtd) To MID-SOUTHERN		'	3 3	. 9	- 1	100	100	_	_	_	_	_	_	_	_	
79 77 78 75 0 0 0	0	O		0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Vyrnwy To MID-SOUTHERN		•	35	9		83	100									
90 86 77 78 75 0 0	0	0		0	0	0	0	0	a	0	0	0	0	0	0	n
	0	•		•			•	•	•	•	•	•	•	•	•	•
•	U	,	70	_		100	400									
'Shropshire Gw To MID-SOUTHERN	12		39	٠,		100	100	_	_	_	_	_	_	_	_	_
88 86 77 78 75 0 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Craig Goch To MID-SOUTHERN		,	37	9		100	100									
116 117 86 77 78 75 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	Ð
	0	•		•		•	•	•	•	•	•	•	•	•	•	_
	-		•	_			400									
'Vyrnwy (2) To MID-SOUTHERN		,	36	9		83	100	_	_	_	_	_	_	_	_	_
90 60 93 64 65 75 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Shropshire Gw (2) To MID-SOUTHERN		,	40	9		100	100									
88 60 93 64 65 75 0	0	0		0	0	0		0	0	0	0	0	0	0	0	0
	0	•		•	٠	•	•	•	•	•	·	•	•	•	•	•
	U	_		_		400	400									
'Craig Goch (2) To MID-SOUTHERN		'	38	9		100	100	_	_	_	_	_	_	_	_	
116 117 60 93 64 65 <i>7</i> 5	0	Q		0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Severn Reuse To MID-SOUTHERN		,	47	9		100	100									
8 86 77 78 75 0 0	0	0		0	0	0		0	0	0	0	0	0	0	0	0
	0			•		•	•	•	•	•	•	•	•	•	•	•
	v		77	_		100	400									
'Birmingham Gw To MID-SOUTHERN	- 2	'	34	٠,	-	100	100	_		_	_	_	_	_	_	
1 64 65 75 0 0 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0	0															
'Abingdon To OXFORD/SWINDON		•	29	10		100	100									
74 24 0 0 0 0 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
	0	•		•	•		•	•	•	•	•	-	-	•	•	
	•	,	77	10		100	100									
'Severn(Unsuprtd) To OXFORD/SWINDON				_10		100	100	_	_		_	_	•			_
79 77 78 24 0 0 0	-	0		0	0	0	0	0	0	0	0	0	0	0	0	U
0 0 0 0 0 0	0															
'Vyrnwy To OXFORD/SWINDON		,	35	10		83	100									
90 86 77 78 24 0 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
	0			_			-	-								
'Shropshire Gw To OXFORD/SWINDON	•	,	70	10		100	100									
	•		-	17		, •••	0	^	0	0	^	^	^	0	0	0
88 86 77 78 24 0 0		U		U	U	U	· U	U	U	U	U	U	U	V	U	U
• • • • • •	0															
'Craig Goch To OXFORD/SWINDON		•	37	10		100	100									
116 117 86 77 78 24 0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0
	0															
'Severn Reuse To OXFORD/SWINDON	-	,	47	10		100	100									
	0		41			0	0		0	0	0	0	0	0	0	0
		U		v	0	J	J	•	J	J	J	J	•	v	~	•
	0			_												
'Deephams Reuse To MID KENT/FLKSTNE		,	25	16		100	100									
70 108 0 0 0 0		0		0	0	0	0	0	0	0	0	0	0	0	0	0
	0															
	0															
Abingdon to MID YENT/FIYETHE		,	20	14		100	100									
'Abingdon To MID KENT/FLKSTNE	0			16	0	100	100		n	n	n	n	0	0	0	O
74 73 108 0 0 0 0	0				0	-	100 0		0	0	0	0	0	0	0	0
74 73 108 0 0 0 0	0 0	0		0		0	0	0	0	0	0	0	0	0	0	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 'Great Bradley To MID KENT/FLKSTNE	0 0	,	22	0 16		64	0 100	0		_						
74 73 108 0 0 0 0	0 0	0	22	0 16		0	0	0	0	0	0	0	0	0	0	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 'Great Bradley To MID KENT/FLKSTNE 55 57 111 112 113 114 108	0 0	,	22	0 16		64	0 100	0		_						
74 73 108 0 0 0 0 0 0 0 0 0 0 0 'Great Bradley To MID KENT/FLKSTNE 55 57 111 112 113 114 108 0 0 0 0 0 0	0 0	, , 0	22	0 16 0	0	64	0 100 0	0		_						
74 73 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0	, , ,	22	0 16 0	0	64 0 100	0 100 0 100	0	0	0	a	0	0	0	O	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 E 113	, , ,	22	0 16 0	0	64 0 100	0 100 0	0		_						
74 73 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 E 113	0 , 0 , 114	22 28	0 16 0 16	0	0 64 0 100 0	0 100 0 100 0	o o o	0	0	a	0	0	0	O	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 E 113	0, 0, 114,	22 28 10	0 16 0 16 18	0	64 0 100	0 100 0 100	o o o	0	0	a 0	0	0	0	0	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 E 113	0, 0, 114,	22 28 10	0 16 0 16 18	0	0 64 0 100 0	0 100 0 100 0	0	0	0	a	0	0	0	O	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 'Great Bradley To MID KENT/FLKSTNE 55 57 111 112 113 114 108 0 0 0 0 0 0 'Trent(Unsuprtd) To MID KENT/FLKSTN 53 103 54 110 55 111 112 0 0 0 0 0 0 0 'Kielder To MID KENT/FLKSTNE 105 106 54 110 55 111 112	0 0 0 0 0 E 113	0, 0, 114,	22 28 10	0 16 0 16 18	0	0 64 0 100 0	0 100 0 100 0	0	0	0	a 0	0	0	0	0	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 'Great Bradley To MID KENT/FLKSTNE 55 57 111 112 113 114 108 0 0 0 0 0 0 0 'Trent(Unsuprtd) To MID KENT/FLKSTN 53 103 54 110 55 111 112 0 0 0 0 0 0 0 'Kielder To MID KENT/FLKSTNE 105 106 54 110 55 111 112 0 0 0 0 0 0	0 0 0 0 0 0 E 113 0	0, 114,	22 28 10 32	0 16 0 16 18 16	0	0 64 0 100 0 100 0	0 100 0 100 0	0 0	0	0	a 0	0	0	0	0	0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 'Great Bradley To MID KENT/FLKSTNE 55 57 111 112 113 114 108 0 0 0 0 0 0 0 'Trent(Unsuprtd) To MID KENT/FLKSTN 53 103 54 110 55 111 112 0 0 0 0 0 0 'Kielder To MID KENT/FLKSTNE 105 106 54 110 55 111 112 0 0 0 0 0 0 0 'Thames Reuse To MID KENT/FLKSTNE	0 0 0 0 0 E 113 0	0, 0, 114, , 114,	22 28 10 32 10	0 16 0 16 18 16 18	0	0 64 0 100 0 100 0	0 100 0 100 0 100 0	0 0 0	0 0	0 0	0	o o o	0	0	o o o	0 0
74 73 108 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 E 113 0	0, 0, 114, , 114,	22 28 10 32 10	0 16 0 16 18 16 18	0	0 64 0 100 0 100 0	0 100 0 100 0	0 0 0	0	0	a 0	0	0	0	0	0

'Severn(Unsuprtd) To MID KENT/FLK 79 77 78 73 108 0	STNE 0 0	, 0	33	_	0 1	00	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			37		0 1	00	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 E 0 0		39	_	0 1	00	100 0	0	0	n	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 ° Vyrnwy To MID KENT/FLKSTNE	0	,	35	16		83	100			^	•	-	-			•
90 86 77 78 73 108 0 0 0 0 0 0 0 0 'Craig Goch (2) To MID KENT/FLKST			38	16		0	0 _100	_	0	U	0	0	0	0	0	
116 117 60 93 64 65 0 0 0 0 0 0 0 0 'Shropshire Gw (2) To MID KENT/FL	73 108 0 KSTNE	,		0 16	0 1	0	0 100		0	0	0	0	0	0	0	0
88 60 93 64 65 73 1 0 0 0 0 0 0 0 0 'Vyrnwy (2) To MID KENT/FLKSTNE	0	,	36		0	0 83	0 100	0	0	0	0	0	0	0	0	0
90 60 93 64 65 73 1 0 0 0 0 0 0 0 'Severn Reuse To MID KENT/FLKSTNE	0		47		0 1	0	0 100	0	0	0	0	0	0	0	0	0
8 86 77 78 73 108 0 0 0 0 0 0 0 0 'Carsington To MID KENT/FLKSTNE	0 0	,	30		0	0 80	100	0	0	0	0	0	0	0	0	0
99 97 53 103 54 110 0 0 0 0 0 0 0	55 111 0		11:	3 11		08	0	0	0	0	0	0	0	0	0	0
'Birmingham Gw To MID KENT/FLKSTN 1 64 65 73 108 0 0 0 0 0 0 0 0	0 0	0		0	0	00		0	0	0	0	0	0	0	0	0
'Broad Oak To MID KENT/FLKSTNE 109 0 0 0 0 0 0 0 0 0 0 0 0	0 0	0		0	0	0		0	0	0	0	0	0	0	0	0
'Vyrmy To WEST MIDLANDS 90 87 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	0	35	12 0	0	53 0	100 0	0	0	0	0	0	0	0	0	0
'Shropshire Gw To WEST MIDLANDS 88 87 0 0 0 0 0 0 0 0 0 0 0	0 0	0	39	_	0	00	1 00 0	0	0	0	0	0	0	0	0	0
'Craig Goch To WEST MIDLANDS 116 117 87 0 0 0 0 0 0 0 0 0	0 0	0		12 0	0	0	100 0	0	0	0	0	0	0	0	0	0
'Carsington (2) To EAST MIDLANDS 95 0 0 0 0 0 0 0 0 0 0 0 0	-	0	45		0	0	100 0	0	0	0	0	0	0	0	0	0
Derwent Valley To EAST MIDLANDS 101 0 0 0 0 0	0 0	, 0	31	13 0	0	57 0	100 0	0	0	0	0	0	0 ,	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0		39	13 0	0	00	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	, 0		13 0	0 1	00	100 0	0	0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	, 0	35		0	53 0	100 0		0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0	,	30		0	80 0	100		0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0		34	13		100	100		0	0	0	0	0	0	0	0
0 0 0 0 0 0 0 0 0 0 O O O O O O O O O O	0 E	,	31	14	•	100	100			0	0	0	0	0		0
102 0 0 0 0 0 0 0 0 0 0 0 0 'Kielder To SOUTH YORKSHIRE	0	,	32	14		0	0 _100		_							
105 107 0 0 0 0 0 0 0 0 0 0 0 'Severn Reuse To WESSEX		,	47	11		0	100		0	0	0	0	0	0	0	0
8 86 80 0 0 0 0 0 0 0 0 0 0 'Shropshire Gw To WESSEX	0 0	,	39		0 1	0	100	0	0	0	0	0	0	0	0	0
88 86 80 0 0 0 0 0 0 0 0 0 0 'Craig Goch To WESSEX	0 0	0		0	0		100	0	0	0 .	0 = =	0	0	0	0	0
Tidig door to medden				••												

```
116 117
                                                                                                   0
                                                                                                        0
                                                                                                             0
           86
                 80
                       0
                            0
                                 0
                                           0
                                                0
                                                                0
                                                                              0
                                                                                   0
                                                                                        0
                                                                                              0
   0
        0
              a
                   0
                        0
                             0
                                  0
'Vyrnwy To WESSEX
                                                                 100
  90
           80
                                 0
                                                                                                             0
      86
   0
        0
             0
                   0
                        0
                             0
                                  0
'Severn Reuse To BRISTOL
                                                 17
                                                         100
                                                                 100
                       n
                            0
                                 0
                                                0
                                                                     0
                                                                          0
                                                                               Ò
                                                                                   0
                                                                                                   0
                                                                                                        a
                                                                                                             0
           52
                  0
                                                                                        0
                                                                                             0
   8 86
                                                           0
   0
                   0
        0
            0
                        0
                             0
                                  0
'Shropshire Gw To BRISTOL
                                                 17
                                                         100
                                                                 100
  88 86
0 0
           52
                  0
                            0
                                 0
                                                0
                                                                                   0
                                                                                        0
                                                                                              0
                                                                                                   0
                                                                                                        0
                                                                                                             0
                                  0
             0
                   0
                        0
                             0
'Craig Goch To BRISTOL
                                                         100
                                                                 100
                            0
                                                     0
                                                                0
                                                                          0
                                                                                              0
                                                                                                   0
                                                                                                        0
                                                                                                             ٥
 116 117
            86
                52
                                 O
                                                           0
                                                                               0
                                                                                   0
                                                                                        0
   0
         0
              n
                        0
                             0
                                  0
                                                          53
'Vyrnwy To BRISTOL
                                             35
                                                                 100
  90 86 52
                            0
                                 0
                                                                          0
                                                                               0
                                                                                   0
                                                                                         0
                                                                                              0
                                                                                                   0
                                                                                                        0
                                                                                                             0
   0
        0
             0
                   0
                        0
                             0
                                  0
'Ribble To NORTH WEST
                                                 20
                                                         100
                                                                 100
                       0
                            0
                                 0
                                                0
                                                                     0
                                                                          0
                                                                               0
                                                                                   0
                                                                                        0
                                                                                              0
                                                                                                   0
                                                                                                        0
                                                                                                             0
        0
  89
             0
                  0
   ถ
        0
             n
                   n
                        O
                             0
                                  0
'Huntington To NORTH WEST
                                             43
                                                20
                                                         100
                                                                100
            0
              0
                                                                                                             0
  91
        0
                  0
                            0
                                 0
                                                     0
                                                           0
                                                                          0
                                                                                   0
                                                                                        0
                                                                                              0
                                                                                                   0
                                                                                                        0
   0
        0
                   0
                             0
                                  0
'Vyrnwy To NORTH WEST
                                                20
                                                         100
                                                                100
                       0
                            0
                                 0
                                                                         0
                                                                                   0
                                                                                              0
                                                                                                   0
                                                                                                        0
                                                                                                             0
  92
        0
            0
                  0
                        0
                                  0
              Ô
                   ٥
                             0
         n
    n
```

****END OF LINK DATA: LINK ELEMENT DATA FOLLOW********************

```
61 NUMBER LINK ELEMENTS
 LINK ELEMENT REFERENCE NO
        LINK ELEMENT NAME
```

DIAMETER EXISTING PIPELINE

EXISTING CAPACITY

EXISTING USE . CONSTRUCTION PERIOD

STATIC HEAD

PIPELINE LENGTH FRICTION LENGTH

CAPITAL COST

OPERATING COST

LOAD FACTOR

CAPACITY FACTOR

LINK ELEMENT DEFINITION

1 'BIRMINGHAM GW				•		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
8 'SEVERN REUSE				•		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
15 'R.TRENT - RUTLAND	(1)			,		0	100		0 0		0	0	0							
1000000 0	100 104	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
24 'R.THAMES - OXFORD	O/SWINDON			,		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
27 'GRAFHAM - THREE \	VALLEYS			,		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
41 'R.TRENT - RUTLAND	(2)			,		0	0		0 0		0	0	0							
32000 -20800	47 104	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
51 'DENVER - GRAFHAM	(1)			,		0	150		0 0		0	0	0							
1000000 0	100 104	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
52 'R.SEVERN - BRISTO	DL			,		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
53 'R.TRENT - R.WITH	M (1)			,		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0
54 'R.WITHAM - R.ELY	OUSE (1)			,		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	O	0	0 0	0	0	0	0	0	0	0	0
55 'ELY OUSE - ESSEX				,		0	0		0 0		0	0	0							
0 -11200	79 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	0	0
56 'DENVER MRF				,		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	0	0	Q	0
57 'GREAT BRADLEY				•		0	0		0 0		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	-	0	0	0 (-	0	0	0	0	0	0	0
58 'ELY OUSE ESSEX -	NORTH ESSEX			,		0	0		00		0	0	0							
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 0	0	0	0	0	0	0	0	0
59 'THAMES REUSE				,		0	0		00		0	0	0					-0		
0 0	100 100	0	0	0	0	0	0	0	0	0	0	0 0		0	0	0	0	Q	0	0
60 'R.SEVERN - R.TREI	NT (1)			,		0	100		0 0		0	0	0							
1000000 0	100 100	0	0	0	0	0	0	0	0	0	0	0 (0	0	0	0	Û	0	0	0

62 'ELY OUSE ESSEX - SOUTH ESSEX 0 0 100 100	0	0	0	O	0	0 0 0	0	0 0	0	٥	0	0	0	0	0
63 'CHELMSFORD EFFLT - SOUTH ESSEX	Ü	U	٠,	٠	ŏ	0 00	ŏ	0 0	U	U	U	U	U	U	U
13500 28000 100 100 64 'CANAL TRANSFER (1)	0	0	Ο,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
1000000 0 100 100	0	0	0	0	Ō	0 0 0 0	Ō	0 0 0	0	0	0	0	0	0	0
65 'CANAL TRANSFER (2) 23100 -20000 12 100	0	0	0	0	0	0 0 0	0	0 0	0	0	0	0	0	0	0
66 'DENVER - GRAFHAM (2)	-	-	•		Ō	0 00	Ō	0 0	-	_	-	-		_	•
37000 -19600 33 104 67 'GRAFHAM AUGMN	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
35000 -9100 33 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
69 'GRAFHM/3 VALLEYS - SOUTH ESSEX 0 0 100 100	0	0	o	0	0	0 00	0	0 0	0	0	0	0	0	0	0
70 'DEEPHAMS REUSE - LONDON	^	^	,	_	0	0 0 0	0	0 0	0	0	0	^	^	^	•
37000 1050000 100 100 73 'R.THAMES	0	0	٥,	0	0	0 0 0 0	0	0 0	U	U	U	0	0	0	0
0 0 100 100 74 'ABINGDON - R.THAMES	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
0 0 100 100	0	0	0	0	ŏ	0 0 0 0	Ö	$\tilde{0}$	0	0	0	0	0	0	0
75 'R.THAMES - MID SOUTHERN 0 0 100 100	0	0	o,	0	0	0 0 0	0	0 0	٥	0	0	0	a	0	0
77 'R.SEVERN - R.THAMES (1)	_		•		0	400 0 0	Ō	0 0	_	•			_	_	•
1000000 0 100 94 78 'R.SEVERN - R.THAMES (2)	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
92000 -31500 12 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
79 'R.SEVERN (UNSUPRID) D 0 100 100	0	0	o'	0	0	0 0 0	0	0 0	0	0	0	0	0	٥	0
80 'R.SEVERN - WESSEX			•	-	0	0 0 0	Ō	0 0	_	_		_	_	_	_
0 0 100 100 82 'R.WYE - R.SEVERN (1)	0	0	٥,	0	0	0 0 0 0 400 0 0	0	0 0 0	0	0	0	0	0	0	0
0 0 100 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
83 'R.WYE - R.SEVERN (2) 47500 15000 12 100	0	0	0	0	0	0 0 0	0	0 0	0	0	0	0	0	0	0
84 'CRAIG GOCH - R.WYE 11500 0 100 100	^	^	0	0	0	0 0 0	0	0 0	0	0	0	0	٥	0	.0
13500 0 100 100 86 'R.SEVERN	0	0	٠,	v	Ŏ	0 0 0 0	0	000	U	U	U	v	U	U	•
0 0 100 100 87 'R.SEVERN - W.MIDLANDS	0	0	0,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
0 0 100 100	0	0	0	0	ŏ	0 0 0 0	Ö	0 0 0	0	0	0	0	0	0	0
88 'SHROPSHIRE GW - R.SEVERN 0 0 100 100	0	0	o,	0	0	0 0 0	0	0 0	0	O	ū	0	۵	٥	0
89 'RIBBLE - NORTH WEST			•		Ŏ	0 00	Ō	0 0	_	_		_	_		•
0 0 100 100 90 'YYRNWY - R.SEVERN	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	U	0
0 178000 100 100	0	0	0,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
91 'HUNTINGTON - NORTH WEST 0 0 100 100	0	0	o	0	0	0 0 0	Ô	0 0 0	0	O	0	0	0	0	0
92 'VYRNWY - NORTH WEST 0 0 100 100	0	0	0	0	0	0 0 0	0	0 0	0	a	0	0	٥	٥	0
93 'R.SEVERN - R.TRENT (2)	Ü	U	٠,	v	Ö	0 00	Ö	0 0	_	_	٠	٠	٠	Ü	٠
26000 -16300 33 100 95 'CARSINGTON - EAST MIDLANDS	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
1000000 0 100 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	٥	0	0
97 'R.TRENT 0 0 100 100	0	0	o,	0	0	0 00	0	0 0	0	0	0	0	٥	0	0
99 'CARSINGTON - R.TRENT			•		Ŏ	0 0 0	0	0 0	_	_	_	_		_	_
0 0 100 100 100 'R.TRENT - E.MIDLANDS	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	O	0	0	0	0	0
50000 -1600 100 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
101 'DERWENT VALLEY - EAST MIDLANDS 13300 -25000 100 100	0	0	0	0	0	0 0 0	0	0 0	0	0	0	0	0	0	0
102 'DERWENT VALLEY - SOUTH YORKSHIR	_	^	,'		0	0 0 0	0	0 0	^	0	٥	۵	^	Ò	:0
0 0 100 100 103 'R.TRENT - R.WITHAM (2)	0	0	0,	0	0	0 0 0 0	0	0 0	U	U	U	u	0	U	
18000 -1000 31 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
105 'KIELDER - R.SWALE 8200 -30500 100 100	0	0	o	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
106 'R.OUSE - R.WITHAM 107000 -16500 100 100	0	0	0	٥	0	0 0 0	0	0 0	n	0	0	0	0	0	0
107 'R.OUSE - SHEFFIELD					0	0 0 0	0	0 0	-	_	_	•	-	-	
23500 -37000 100 100 108 'LONDON - MID KENT/FLKSTNE	0	0	٥,	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
67200 -21600 25 100	0	0	0	0	0	0 0 0 0	0	0 0 0	0	0	0	0	0	0	0
109 'BROAD OAK - MID KENT/FLKSTNE 47500 -25000 25 100	0	0	o'	0	0	0 0 0	0	0 0	0	0	0	0	0	0	0
	-	-	-	-	-		-		-	-	-	-			

```
110 'R.WITHAM - R.ELY OUSE (2)
                                                      0
                                                          0 0
                                                                     0
                        33 100
                                            0 0
                                                    0 0 0
                                                             0 0
                                                                    0 0
                                                                               0 0 0
   149000
           - 10400
                                     0 0
                                                  0
                                                                          0 0
 111 'R.PANT - R.CHELMER - R.RODING (1)
                                                  0 100
                                                         0 0
                                                                     0
                                                                         0
                                                                 0
                                              0
                                                       0
 1000000
                0
                       100 123
                                      O
                                         0
                                            0
                                                  0
                                                    0
                                                           0
                                                              0
                                                                 0
                                                                    0
                                                                       0
                                                                          0
 112 'R.PANT - R.CHELMER - R.RODING (2)
                                                         0 0
                                                  0
                                                      0
                                                                     0
                                                                         0
   24000
           - 10300
                        17
                            100
                                         0
                                            0
                                               0
                                                  0
                                                       0
                                                           0
                                                             0
                                                                 0
                                                                    0
                                                                       0
                                                                          0
 113 'R.RODING - R.STORT (1)
                                                    100
                                                         0 0
                                                                     0
  1000000
                0
                       100
                            123
                                            0
                                               0
                                                     0 0
                                                           0
                                                             0
                                                                 0
                                                                    0
                                                                       0
                                                                          0
                                                                             0
 114 'R.RODING - R.STORT (2)
                                                      0
                                                         0 0
                                                                     0
                                                                         0
            -2900
                            100
                                            0
                                               0
                                                     0
                                                       0
                                                             0
                                                                    0
                                                                       0
   11000
                                                  0
                                                           0
                                                                 0
                                                                          0
                                                                             0
                                                                                0
                                                                                   0
                                                                                               0
                         12
 116 'CRAIG GOCH - R.SEVERN (1)
                                                      0
                                                         0 0
                                                                     0
                                                                         ٥
                                                  0
                                                                 0
                0
                                                       0
       n
                        100
                            100
                                            0
                                               0
                                                  0
                                                    0
                                                           0 0 0 0
                                                                       0
                                                                          Ω
                                                                             0
                                                                                0
 117 'CRAIG GOCH - R.SEVERN (2)
                                                  0
                                                      0
                                                         0 0
                                                                 0
                                                                     0
                                                                         0
   44500
                0
                                         0
                                           0 0 0 0 0 0 0 0
                       100 100
                                                                       0
****END OF LINK ELEMENT DATA: COST FUNCTION DATA FOLLOWS*********
14 NUMBER COST FUNCTIONS
12 NUMBER COST FUNCTION COEFFICIENTS
GENERAL FORM (CONF ARE 80% CONFIDENCE LIMIT MULTIPLIERS) :
                         h
    (aY + c(Y+d) + f(gY)) + rZ (SEEMANUAL)
COST FUNCTION
                            CONF INFL
                                                                               c
                                                                                             đ
                                        .0176
                                                      0.79
                                                                                  1.0
11-INTAKE
                          1.0
                                1.000
                                                                    0
                                                                                                               0
                                    1.0
                                                  0.0
                                                                0.0
                      1.0
                                                                              0.0
                          , 1.0
                                 1.000 0.1036
                                                      1.0
                                                                    1.362
                                                                                  1.0
'2-GAC/OZONE
                                                                                                0.0
-0.0000737
              1.0
                           2.0
                                          1.0
                                                        0.0
                                                                      0.0
                                                                                    0.0
'3-BANKSIDE STORAGE
                          1.0
                                 1.000
                                       0.021036
                                                      1.0
                                                                    3.967
                                                                                   1.0
                                                                                                 0.0
                                                                      0.0
                                                                                    0.0
-0.0000124
                            2.0
                                          1.0
                                                        0.0
              1.0
4-WATER TREATMENT
                                 1.000
                                        1.246
                                                      0.64
                                                                    0.0
                                                                                  1.0
                                                                                                 1.0
                                                                                                               0.0
                           1.0
                                    1.0
                                                  0.0
                                                                0.0
                                                                              0.0
        1.0
'5-PUMPS
                                        .0026
                                 1.000
                          1.0
                                                       .81
                                                                    0.0
                                                                                   1.0
                                                                                                               0
                                    1.0
                                                  0.43
                                                                0.0
                                                                              0.0
                                                                                  1.0
'6-PUMPHOUSE
                                 1.000
                                        .012
                                                      .79
                                                                    0.0
                                                                                                               0.0
                          1.0
                                                  0.0
                                                                0.0
        1.0
                                    1.0
                                                                              0.0
7-PIPELINE
                                 1.000
                                        .00027
                                                      1.04
                           1.0
                                                                    0
                                                                                  1.0
                                                                                                               0.0
                                                  1.0
                                                                0.0
                                                                              0.0
                                    1.0
        1.0
                                 1.000 3.000000
                                                                    0.00000
'8-TUNNEL
                          1.0
                                                      1.0
                                                                                  1.0
                                                                                                 1
                                                                                                               0.0
        1.0
                                    1.0
                                                  0.0
                                                                0.0
                                                                              0.0
'9-TERMINAL STORAGE
                          1.0
                                 1.000 0.0676131
                                                      1.0
                                                                    -0.1281
                                                                                  1.0
                                                                                                 0.0
-0.0000727
                                                        0.0
                                                                      0.0
                                                                                    0.0
              1.0
                            2.0
                                          1.0
                                 1.000
                                        .00081
                                                                    0.0
                                                                                                 1.0
                                                                                                               0.0
                            1.0
                                                                                   1.0
'10-POWER (ELECTRICITY)
                                                      1.0
                      1.0
                                                  0.0
                                                                0.0
                                                                              0.0
        1.0
                                    1.0
'11A-WATER TREATMENT CHEMS' 1.0
                                 2.234 0.00169
                                                      1.0
                                                                    0.0
                                                                                  1.0
                                                                                                 1.0
                                                                                                               0.0
        1.0
                      1.0
                                    1.0
                                                  0.0
                                                                0.0
                                                                              0.0
                                 2.940 0.0001751
'11B-WATER TREATMENT POWER'
                            1.0
                                                      1.0
                                                                    0.0
                                                                                   1.0
                                                                                                 1.0
                                                                                                               0.0
                                    1.0
                                                  0.0
                                                                0.0
                                                                              0.0
        1.0
                      1.0
                                                                    0.0
'13-RAW WATER CHLORINATION' 1.0
                                2.234 0.000533
                                                      1.0
                                                                                   1.0
                                                                                                 1.0
                                                                                                               0.0
                                                  0.0
                                                                              0.0
                                    1.0
                                                                0.0
       1.0
                      1.0
13-EXTRA SOFTENING
                          1.0
                                 2.234 0.000934
                                                      1.0
                                                                    0.0
                                                                                  1.0
                                                                                                 1.0
                                                                                                               0.0
                      1.0
                                    1.0
```

DATAFILE***********

Appendix 4: Results for the National Strategy

WATER RESOURCE PLANNING MODEL.

DATE : 28- 2-1994 TIME : 10:10:35.90

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

	FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
			(TCMD) (EM)	(EM)	(EH)	(EH)	(EM)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
١		Vyrnwy	147	.000	.000	.000	.000	.000
		Broad Oak	40	.000	.000	.000	.000	.000
	1996	Carsington	140	.000	.000	.000	.000	.000
		Severn(Unsuprtd)	146	.000	.000	.000	.000	.000
۱		Chelmsford Efflt	30	.000	.000	.000	.000	.000
,	2001	Shropshire Gw	155	,000	.000	.000	.000	.000
	2001		114	.000	.000	.000	.000	.000
	2006	Great Bradley	174	69.400	34.504	.000	.000	34.504
١		Thames Reuse	36	.000	.000	.000	.000	.000
,	2011	Birmingham Gw	50	4.400	1.478	.769	.856	3.103
	2011	Craig Goch	629	60.500	22.477	.000	.000	22.477
	2016	Huntington	74	36.900	10.244	1.109	3.307	14.661
)	2021	Abingdon	262	400.000	82.982	.701	4.338	88.021
	TOTAL	S FOR SOURCES		571.200	151.686	2.579	8.501	162.766

UNUSED YIELDS OF DEVELOPED SOURCES

_	SOURCE NAME	1.0	SPARE	YIELDS	THROL	IGH TIM	E (TCMD)	
			1991	1996	2001	2006	2011	2016	2021
	Great Bradley		174	174	174	113	79	51	34
	Chelmsford Efflt		30	30	14	0	0	0	0
	Abingdon		262	262	262	262	262	262	197
	Carsington		140	105	50	14	0	0	0
	Derwent Valley		0	0	0	0	0	0	0
	Severn(Unsuprtd)		146	50	Ō	0	0	0	0
V	Birmingham Gw		50	50	50	50	19	0	0
	Vyrnwy		66	77	53	0	0	0	0
	Craig Goch		629	629	629	629	459	269	138
	Shropshire Gw		155	155	84	47	0	0	0
	Broad Oak		38	35	32	28	24	16	9
	Huntington		74	74	74	74	74	55	30
	Thames Reuse		0	0	0	0	0	0	0
	Severn Reuse		0	0	0	0	0	0	0

DEMAND FLOWS THROUGH LINK ELEMENTS

	LINK ELEMENT NAME	FLOWS	THROUG	H TIME	(TCHD)				
		1991	1996	2001	2006	2011	2016	2021	
	ELY OUSE - ESSEX	0	0	0	90	124	152	169	
	GREAT BRADLEY	ŏ	Ö	ă	90	124	152	169	
	ELY OUSE ESSEX - NORTH ESSEX	ŏ	Ö	ŏ	0	11	21	28	
	ELY OUSE ESSEX - SOUTH ESSEX	ŏ	ŏ	ŏ	ÿ	32	50	60	
-	CHELMSFORD EFFLT - SOUTH ESSEX	ŏ	Õ	16	30	30	30	30	
	CARSINGTON - R. TRENT	Ŏ	44	112	158	175	175	175	
	VYRNWY - R.SEVERN	ŏ	Ď		46	7		ő	
	R.SEVERN - R.TRENT (1)	ŏ	ŏ	Õ	ő	Ó	3 3	85	
•	R.SEVERN - R.TRENT (2)	ŏ	ŏ	ō	Ŏ	ŏ	33	85	
	CRAIG GOCH - R.SEVERN (1)	ŏ	ŏ	ŏ	ŏ	170	360	491	
	CRAIG GOCH - R.SEVERN (2)	Ŏ	Ö	ō	ŏ	170	360	491	
	SHROPSHIRE GW - R.SEVERN	ō	Ŏ	71	108	155	155	155	
	R.PANT - R.CHELMER - R.RODING (1)	Ō	Ŏ	0	81	81	81	81	
	R.PANT - R.CHELMER - R.RODING (2)	Ö	Ö	Ō	81	81	81	81	
	R.RODING - R.STORT (1)	0	Ō	0	81	81	81	81	
	R.RODING - R.STORT (2)	0	0	0	81	81	81	81	
•	ABINGDON - RITHAMES	0	0	0	0	0	0	65	
	R.THAMES	0	96	193	226	342	420	486	
	R.SEVERN (UNSUPRID)	0	96	146	146	146	146	146	
	R.SEVERN - R.THAMES (1)	0	96	193	226	344	423	425	
	R.SEVERN - R.THAMES (2)	0	96	193	226	344	423	425	
	BIRMINGHAM GW	0	0	0	0	31	50	50	
	R.SEVERN	0	0	64	114	254	373	417	
	THAMES REUSE	0	0	. 0	2	18	28	36	
	SEVERN REUSE	0	0	5	32	61	86	114	
	R.THAMES - OXFORD/SWINDON	0	0	0	2	20	31	40	
	R.SEVERN - WESSEX	0	0	0	0	7	38	71	
	R.SEVERN - W.MIDLANDS	0	0	12	72	139	1 9 5	258	
	R.TRENT - E.MIDLANDS	0	44	112	158	206	258	310	
	DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40	
	BROAD OAK - MID KENT/FLKSTNE	2	5	8	12	16	24	31	
	R.SEVERN - BRISTOL	0	0	17	34	49	58	67	
	VYRNWY - NORTH WEST	81	70	94	118	141	147	147	
	HUNTINGTON - NORTH WEST	0	0	0	0	0	19	44	

LINK ELEMENT DEVELOPMENT

•	YEAR FIRST USED	ELEMENT NAME	TOTAL CAPITAL COST	DISCOUNTED CAPITAL COST		DUNTED COST PERATION	r	UNIT COST OF	TOTAL DISCO	DUNTED	BASE YEARS FOR REPLICATION	1
	0025		(£H)	(£4)	TO 20	021 BEYOND (EM)	2021		(EM)		AVG P	EAK
•	2006	ELY OUSE - ESSEX	.000	.000	5.657	4.339	(2	.42) 9	-996	20 C ELEM	06 169 169 ENT TOTALS)	
	2006	GREAT BRADLEY GREAT BRADLEY	.000	.000	.000	.000		.00)	.000	20 (ELEM	06 169 169 Ent totals)	
_	2011	ELY OUSE ESSEX - NORTH ESSEX	.000	.000			•	,		20	•	
	2011	ELY OUSE ESSEX - NORTH ESSEX	.000	.000	.000	.000	(.00)	.000		ENT TOTALS)	-
	2006	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000	.000	.000	.000	(.00)	.000	20 (ELEM	06 60 60 ENT TOTALS)	
•	2001	CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX		8.720 8.720	.227	.081	(.29) 9	.028	20 (ELEM	01 30 30 ENT TOTALS)	
									4.4	+ 0	7	
	1996	CARSINGTON - R.TRENT	.000	.000	000	000		001	000	19		
		CARSINGTON - R.TRENT	.000	.000	.000	.000	(.00)	.000	(CLEM	ENT TOTALS)	

•	2006	VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000	.000	. 651	.000	(1.66)	.651	2006 46 46 (ELEMENT TOTALS)
•	2016	R.SEVERN - R.TRENT (1) R.SEVERN - R.TRENT (1)	.000	.000	.000	.000	(.00)	.000	2016 100 100 (ELEMENT TOTALS)
•	2016	R.SEVERN - R.TRENT (2) R.SEVERN - R.TRENT (2)	26.000 26.000	7.008 7.008	.422	1.327	(1.47)	8.756	2016 85 85 (ELEMENT TOTALS)
•	2011	CRAIG GOCH - R.SEVERN (1) CRAIG GOCH - R.SEVERN (1)	.000	.000 .000	.000	.000	(.00)	.000	Z011 491 491 (ELEMENT TOTALS)
•	2011	CRAIG GOCH - R.SEVERN (2) CRAIG GOCH - R.SEVERN (2)	44.500 44.500	16.051 16.051	.000	.000	(.00)	16.051	2011 491 491 (ELEMENT TOTALS)
•	2001	SHROPSHIRE GW - R.SEVERN SHROPSHIRE GW - R.SEVERN	.000	.000	.000	.000	(.00)	.000	2001 155 155 (ELEMENT TOTALS)
•	2006	R.PANT - R.CHELMER - R.RODING (1) R.PANT - R.CHELMER - R.RODING (1)	.000	.000	.000	.000	(.00)	.000	2006 81 100 (ELEMENT TOTALS)
•	2006	R.PANT - R.CHELMER - R.RODING (2) R.PANT - R.CHELMER - R.RODING (2)		11.585 11.585	.486	.266	(.31)	12.337	2006 81 81 (ELEMENT TOTALS)
•	2006	R.RODING - R.STORT (1) R.RODING - R.STORT (1)	.000	.000	.000	.000	(.00)	.000	2006 81 100 (ELEMENT TOTALS)
•	2006	R.RODING - R.STORT (2) R.RODING - R.STORT (2)	11.000 11.000	5.310 5.310	. 149	.082	(.10)	5.541	2006 81 81 (ELEMENT TOTALS)
•	2021	ABINGDON - R.THAMES ABINGDON - R.THAMES	.000	.000	.000	.000	(.00)	.000	2021 65 65 (ELEMENT TOTALS)
•	1996	R.THAMES R.THAMES	.000	.000	.000	.000	(.00)	.000	1996 486 486 (ELEMENT TOTALS)
•	1996	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000	.000	.000	.000	(.00)	.000	1996 146 146 (ELEMENT TOTALS)
•	1996	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	1996 425 400 (ELEMENT TOTALS)
•	1996	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)		79.529 79.529	9.850	4.662	(1.04)	94.040	1996 425 425 (ELEMENT TOTALS)
•	2011	BIRMINGHAM GW BIRMINGHAM GW	.000	.000	.000	.000	(.00)	.000	2011 50 50 (ELEMENT TOTALS)
•	2001	R.SEVERN R.SEVERN	.000	.000	.000	.000	(.00)	.000	2001 417 417 (ELEMENT TOTALS)
•	2006	THAMES REUSE THAMES REUSE	.000	.000	.000	.000	(.00)	.000	2006 36 36 (ELEMENT TOTALS)
•	2001	SEVERN REUSE SEVERN REUSE	.000	.000	.000	.000	(.00)	.000	2001 114 114 (ELEMENT TOTALS)

TOTALS	FOR LINK ELEMENTS	308.5	00 218.925	20.83	34 12.759)	252. 5	17
2016	HUNTINGTON - NORTH WEST HUNTINGTON - NORTH WEST	.000	.000 .000	.000	.000	(.00)	. 000	2016 44 44 (ELEMENT TOTALS)
1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000	.000	-000	(-00)	.000	1991 147 147 (ELEMENT TOTALS)
2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000	.000 .000	.000	-000	(.00)	.000	2001 67 67 (ELEMENT TOTALS)
1991	BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE	47.500 47.500		.866	.562	(1.71)	48.928	1991 31 31 (ELEMENT TOTALS)
1991	DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
1996	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS	50.000 50.000	43.222 43.222	2.526	1.439	(.44)	47.187	1996 310 310 (ELEMENT TOTALS)
2001	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	,000 .000	.000 .000	.000	.000	(.00)	.000	2001 258 258 (ELEMENT TOTALS)
2011	R.SEVERN - WESSEX R.SEVERN - WESSEX	.000	.000 .000	.000	.000	(.00)	.000	2011 71 71 (ELEMENT TOTALS)
2006	R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	.000 .000	.000	.000	(.00)	.000	2006 40 40 (ELEMENT TOTALS)

UNIT COSTS OF LINKS

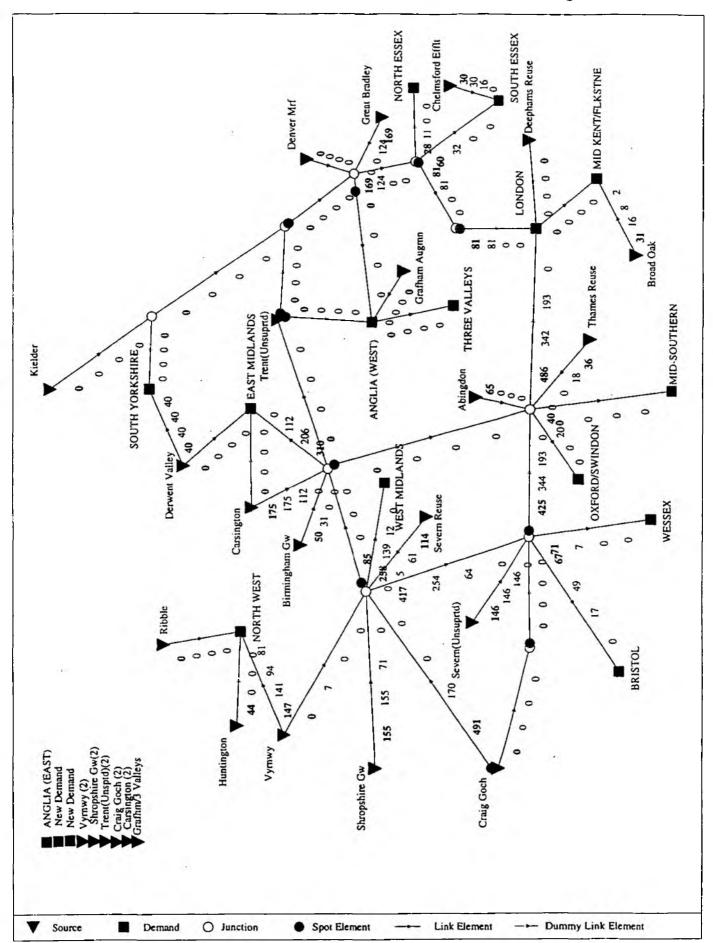
		DISCOUNTED (EM/TCHD)	UNIT COSTS (P/N3)	DISCOUNTED TOTAL COST (£M)	DISCOUNTED TOTAL FLOW (TCHD)
1.	NORTH ESSEX				
	Great Bradley TOTAL:	.04 753 .04 7 53	13.02 13.02	6.47 6.47	136.13 136.13
2.	SOUTH ESSEX				
	Great Bradley	.04753	13.02	15.67	329.59
	Chelmsford Efflt	.03105	8.51	9.03	290.76
	TOTAL:	.03981	10.91	24.69	620.35
3.	LONDON				
	Great Bradley	.06060	16.60	40.24	664.02
	Abingdon	.40178	110.08	36.56	91.00
	Severn(Unsuprtd)	.02450	6.71	48.16	1965.90
	Vyrnwy	.03057	8.37	1.29	42.36
	Craig Goch	.04095	11.22	38.45	938.87
	Shropshire Gw	.02450	6.71	4.47	182.58
	Thames Reuse	.00000	.00	.00	186.42
	Severn Reuse	.02450	6.71	15.45	630.88
	TOTAL:	.03927	10.76	184.63	4702.03
4.	OXFORD/SWINDON				
	Abingdon	.40178	110.08	51.46	128.08
	Craig Goch	.04095	11.22	2.77	67.53
	Shropshire Gw	.02450	6.71	.10	4.19
	Severn Reuse	.02450	6.71	.17	6.74
	TOTAL:	. 26383	72.28	54.49	206.54

5. WESSE	X				
Shrop	shire Gw	.00000	.00	.00	271.08
Sever	n Reuse	.00000	.00	.00	23.59
TOTAL	:	.00000	.00	.00	294.68
6. WEST	MIDLANDS				
Vyrna		.00607	1.66	.39	64.91
	Goch	.01645	4.51	16.62	1010.26
	shire Gw	.00000	.00	.00	424.22
TOTAL	.:	.01135	3.11	17.02	1499.38
7	MIDI ANDO				
	MIDLANDS	04007	E 27	75 75	1077 01
	ngton	.01904	5.22	35.75 8.35	1877.81
	ngham Gw	.03030	8.30		275.48
_	Goch	.06243	17.10	20.29	325.07
TOTAL	. :	.02598	7.12	64.40	2478.35
8 SOUTH	YORKSHIRE				
	ent Valley	.00000	.00	.00	683.02
TOTAL	•	.00000	.00	.00	683.02
	•	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	•••	• • • • • • • • • • • • • • • • • • • •	***************************************
9. MID K	ENT/FLKSTNE				
Broad	Oak	.21411	58.66	48.93	228.51
TOTAL	.:	.21411	58.66	48.93	228.51
10. BRIST	OL				
Shrop	shire Gw	.00000	.00	.00	489.11
TOTAL	.:	.00000	.00	.00	489.11
14 NORTH	LIECT				
11. NORTH		.00000	.00	.00	1849.25
Vyrni	,	.08598	23.56	14.66	170.51
TOTAL	ngton	.00726	1.99	14.66	2019.76
IUIAL	. ‡	.00740	1.77	14.00	2017.70
TOTAL				415.28	
	•				

DEVELOPMENT OF LINKS

SOURCE NAME	DEMAND NAME	FLOWS 1991	THROU 1996	GH TIM 2001	E(TCMD 2006) 2011	2016	2021
Casas Casallan	NODIU FECEV	٥	0	0	0	11	21	28
Great Bradley	NORTH ESSEX SOUTH ESSEX	0	0	0	9	32	50	60
Great Bradley Chelmsford Efflt		0	0	16	30	30	30	30
		Ö	Û	0	30 81	30 81	30 81	81
Great Bradley	LONDON	0	0	0	0		0	27
Abingdon	LONDON	-	•	•	-	0	•	
Severn(Unsuprtd)		0	96	146	146	146	146	146
Vyrnwy	LONDON	0	0	0	15	7	0	0
Craig Goch	LONDON	0	0	0	0	110	160 0	172 0
Shropshire Gw	LONDON	0	0	42	31	0	-	-
Thames Reuse	LONDON	0	0	0	2	18	28	36
Severn Reuse	LONDON	0	0	5	32	61	86	105
Abingdon	OXFORD/SWINDON	0	0	0	0	0	_0	38
Craig Goch	OXFORD/SWINDON	0	0	0	0	20	31	0
Shropshire Gw	OXFORD/SWINDON	0	0	0	2	0	0	0
Severn Reuse	OXFORD/SWINDON	0	0	0	0	0	0	2
Shropshire Gw	WESSEX	0	0	0	0	7	38	64
Severn Reuse	WESSEX	0	0	0	0	0	0	7
Vyrnwy	WEST MIDLANDS	0	0	0	31	0	0	0
Craig Goch	WEST MIDLANDS	0	0	0	0	40	136	234
Shropshire Gw	WEST MIDLANDS	0	0	12	41	99	59	24
Carsington	EAST MIDLANDS	0	44	112	158	175	175	175
Birmingham Gw	EAST MIDLANDS	0	0	0	0	31	50	50
Craig Goch	EAST MIDLANDS	0	0	0	0	0	33	85
Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
Broad Oak	MID KENT/FLKSTNE	2	5	8	12	16	24	31
Shropshire Gw	BRISTOL	0	0	17	34	49	58	67
Vyrnwy	NORTH WEST	81	70	94	118	141	147	147
Huntington	NORTH WEST	0	0	0	0	0	19	44
TOTALS		123	255	492	782	1114	1412	1693

SUMMARY OF CAPITAL COSTS; TOTAL CAPITAL COST INCURRED IN PERIODS (EM) CATEGORY 1991 1996 2001 2006 2011 2016 2021 .0 .0 .0 69.4 63.2 38.6 400.0 47.5 142.0 13.5 35.0 44.5 26.0 .0 SOURCES LINK ELEMENTS 47.5 142.0 13.5 104.4 107.7 64.6 400.0 SUMMARY OF TOTAL COSTS OF OPERATION; TOTAL COSTS OF OPERATION THROUGH TIME (EM/PERIOD) CATEGORY 1991 1996 2001 2006 2011 2016 2021 .9 3.9 14.6 SOURCES .0 .0 2.3 4.9 11.5 15.8 19.2 22.0 LINK ELEMENTS .0 2.3 4.9 11.5 16.7 23.1 36.6 TOTALS COST SUMMARY TOTAL DISCOUNTED COST FOR PLAN = £M 415.283 TOTAL DISCOUNTED CAPITAL COST = EM 370.611 = £M 44.673 (ALLOWANCE INCLUDED FOR BEYOND 2021 = £M 21.260) TOTAL DISCOUNTED COSTS OF OPERATION = £M 879.700 TOTAL CAPITAL OUTLAY TO 2021 = £M 95.217 TOTAL COSTS OF OPERATION TO 2021 TOTAL DISCOUNTED DEMANDS = 13357.870 TCMD RESULTS OF CHECKS ON VALIDITY OF ALLOCATION; A. ALL SUPPLY DEFICIENCIES MET IN FULL. B. NO DEMAND CENTRES OVER SUPPLIED. C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.



WATER RESOURCE PLANNING MODEL.

DATE : 28- 2-1994 TIME : 10:12:12.96

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYONS 2021	TOTAL DISCOUNT COST	TED
		(TCM	D) (£M)	(EM)	(EH)	(£N)	(£M)	
1991	Derwent Valley	40	.000	.000	.000	.000	.000	
1991	Vyrnwy	147	.000	.000	.000	.000	.000	
1991	Broad Oak	40	.000	.000	.000	.000	.000	
1996	Abingdon	350	400.000	356.150	61.278	23.360	440.788	
1996	Carsington	140	.000	.000	.000	.000	.000	
2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000	
2001	Shropshire Gw	155	.000	.000	.000	.000	.000	•
2001	Severn Reuse	114	.000	.000	.000	.000	.000	
2006	Great Bradley	174	69.400	34.504	.000	.000	34.504	
2006	Thames Reuse	36	.000	.000	.000	.000	.000	
2011	Severn(Unsuprtd)	176	.000	.000	.000	.000	.000	
2011	Birmingham Gw	50	4.400	1,478	.769	.856	3.103	
2016	Craig Goch	629	60.500	16.796	.000	.000	16.796	
2016	Huntington	74	36.900	10.244	1.109	3.307	14.661	
TOTALS	S FOR SOURCES		571.200	419.172	63.157	27.523	509.852	

UNUSED YIELDS OF DEVELOPED SOURCES

_	SOURCE NAME	SPARE	YIELDS	THROU	IGH TIM	E(TCMD	•)	
•		1991	1996	2001	2006	2011	2016	2021
	Great Bradley	174	174	174	165	131	103	86
	Chelmsford Efflt	30	30	14	D	0	0	0
	Abingdon	350	254	157	43	0	0	0
	Carsington	140	105	50	14	0	0	0
	Derwent Valley	0	0	0	0	0	0	0
	Severn(Unsuprtd)	176	176	176	176	101	22	0
	Birmingham Gw	50	50	50	50	19	0	0
_	Vyrnwy	66	77	53	29	6	0	0
	Craig Goch	629	629	629	629	629	546	372
-	Shropshire Gw	155	155	131	81	16	0	0
	Broad Oak	38	35	32	28	24	16	9
_	Huntington	74	74	74	74	74	55	30
	Thames Reuse	0	0	0	0	0	0	0
	Severn Reuse	ō	Ō	Ŏ	Ō	5	0	0

DEMAND FLOWS THROUGH LINK ELEMENTS

	LINK ELEMENT NAME	FLOWS	THROUG	H TIME	(TCMD)			
		1991	1996	2001	2006	2011	2016	2021
	ELY OUSE - ESSEX	0	0	0	9	43	71	88
	GREAT BRADLEY	0	0	0	9	43	71	88
_	ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	11	21	28
	ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	9	32	50	60
	CHELMSFORD EFFLT - SOUTH ESSEX	0	O	16	30	30	30	30
	CARSINGTON - R.TRENT	0	44	112	158	175	175	175
	R.SEVERN - R.TRENT (1)	0	0	0	0	0	33	85
	R.SEVERN - R.TRENT (2)	0	0	0	0	0	33	85
	CRAIG GOCH - R.SEVERN (1)	0	0	0	0	0	83	257
	CRAIG GOCH - R.SEVERN (2)	0	0	0	0	0	83	257
	SHROPSHIRE GW - R.SEVERN	0	0	24	74	139	155	155
	ABINGDON - R.THAMES	0	96	193	307	350	350	350
	R.THAMES	0	96	193	307	423	501	567
	R.SEVERN (UNSUPRTD)	0	0	0	0	75	154	176
	R.SEVERN - R.THAMES (1)	0	0	0	0	75	154	221
	R.SEVERN - R.THAMES (2)	0	0	0	0	75	154	221
	BIRMINGHAM GW	0	0	0	0	31	50	50
	R.SEVERN	0	0	17	34	56	96	183
	THAMES REUSE	0	0	0	2	18	28	36
	SEVERN REUSE	0	0	5	32	56	86	114
	R.THAMES - OXFORD/SWINDON	0	0	0	2	20	31	40
	R.SEVERN - WESSEX	0	0	0	0	7	38	71
	R.SEVERN - W.MIDLANDS	0	0	12	72	139	195	258
	R.TRENT - E.MIDLANDS	0	44	112	158	206	258	310
	DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40
	BROAD OAK - MID KENT/FLKSTNE	2	5	8	12	16	24	31
	R.SEVERN - BRISTOL	0	0	17	34	49	58	67
	VYRNWY - NORTH WEST	81	70	94	118	141	147	147
	HUNTINGTON - NORTH WEST	0	0	0	0	0	19	44

LINK ELEMENT DEVELOPMENT

YEAR FIRST USED	ELEMENT NAME	TOTAL CAPITAL COST	DISCOUNTED CAPITAL COST	OF OPE	UNTED COST ERATION 21 BEYOND		UNIT COST OF OPERATION	TOTAL DISCO COST	XUNTED	FO	LICAT	
		(EM)	(EM)		(EM)	2021	(P/M3)	(EM)				(TCMD)
2006	ELY OUSE - ESSEX	.000	.000						20	006	88	88
	ELY OUSE - ESSEX .	.000	.000	1.861	2.259	(2	.42) 4	.121	(ELE	ENT	TOTAL	.S)
2006	GREAT BRADLEY	.000	.000						_	006	88	88
	GREAT BRADLEY	.000	.000	.000	.000	(.00)	.000	(ELE	1ENT	TOTAL	.\$)
2011	ELY OUSE ESSEX - NORTH ESSEX	.000	.000						20)11	28	28
	ELY OUSE ESSEX - NORTH ESSEX	.000	.000	.000	.000	(.00)	.000	(ELEI	ENT	TOTAL	.s)
2006	ELY OUSE ESSEX - SOUTH ESSEX	.000	.000						20	006	60	60
	ELY OUSE ESSEX - SOUTH ESSEX	.000	.000	.000	.000	(.00)	.000	(ELEI	1ENT	TOTAL	.S)
2001	CHELMSFORD EFFLT - SOUTH ESSEX	13.500	8.720						20	001	30	30
	CHELMSFORD EFFLT - SOUTH ESSEX	13.500	8.720	.227	.081	(.29) 9	0.028	(ELE)	ÆNT	TOTAL	.\$)
1996	CARSINGTON - R.TRENT	.000	.000						19	96	175	175
	CARSINGTON - R.TRENT	.000	.000	.000	.000	(.00)	.000	(ELEP	ENT	TOTAL	.S)
2016	R.SEVERN - R.TRENT (1)	.000	.000				-		- 20	016	100	100
	R.SEVERN - R.TRENT (1)	.000	.000	.000	.000	(.00)	.000	(ELE		TOTAL	.s)

,								
2016	R.SEVERN - R.TRENT (2) R.SEVERN - R.TRENT (2)	26.000 26.000	7.008 7.008	.422	1.327	(1.47)	8.756	2016 85 85 (ELEMENT TOTALS)
2016	CRAIG GOCH - R.SEVERN (1) CRAIG GOCH - R.SEVERN (1)	.000	.000	.000	.000	(.00)	.000	2016 257 257 (ELEMENT TOTALS)
2016	CRAIG GOCH - R.SEVERN (2) CRAIG GOCH - R.SEVERN (2)	44.500 44.500	11.994 11.994	.000	.000	(.00)	11.994	2016 257 257 (ELEMENT TOTALS)
2001	SHROPSHIRE GW - R.SEVERN SHROPSHIRE GW - R.SEVERN	.000	.000	.000	.000	(.00)	.000	2001 155 155 (ELEMENT TOTALS)
1996	ABINGDON - R.THAMES ABINGDON - R.THAMES	.000	.000	.000	.000	(.00)	.000	1996 350 350 (ELEMENT TOTALS)
1996	R.THAMES R.THAMES	.000	.000	.000	.000	(.00)	.000	1996 567 567 (ELEMENT TOTALS)
2011	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000	.000	.000	.000	(.00)	.000	2011 176 176 (ELEMENT TOTALS)
2011	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	2011 425 400 (ELEMENT TOTALS)
2011	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)	92.000 92.000	33.184 33.184	1.516	2.424	(1-04)	37.124	2011 221 221 (ELEMENT TOTALS)
2011	BIRMINGHAM GW BIRMINGHAM GW	.000	.000	.000	.000	(_00)	.000	2011 50 50 (ELEMENT TOTALS)
2001	R.SEVERN R.SEVERN	.000	.000	_000	.000	(.00)	.000	2001 183 183 (ELEMENT TOTALS)
2006	THAMES REUSE THAMES REUSE	.000	.000	.000	.000	(.00)	.000	2006 36 36 (ELEMENT TOTALS)
2001	SEVERN REUSE SEVERN REUSE	.000	.000 .000	_000	.000	(.00)	.000	2001 114 114 (ELEMENT TOTALS)
2006	R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	.000	.000	.000	(.00)	.000	2006 40 40 (ELEMENT TOTALS)
2011	R.SEVERN - WESSEX R.SEVERN - WESSEX	.000	.000	.000	.000	(.00)	.000	2011 71 71 (ELEMENT TOTALS)
2001	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000	.000	.000	.000	(.00)	.000	2001 258 258 (ELEMENT TOTALS)
1996	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS		43.222 43.222	2.526	1.439	(.44)	47.187	1996 310 310 (ELEMENT TOTALS)
1991	DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
1991	BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE		47.500 47.500	.866	.562	(1.71)	48.928	1991 31 31 (ELEMENT TOTALS)

TOTALS	S FOR LINK ELEMENTS	273.500	151.629	7.417	8.093		167.140	
2016	HUNTINGTON - NORTH WEST HUNTINGTON - NORTH WEST	.000 .000	.000	.000	.000	(.00)	.201 .000 (ELEME	6 44 44 NT TOTALS)
1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000 .000	.000	.000	(.00)	199 .000 (ELEME	1 147 147 NT TOTALS)
2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000 .000	.000 .000	.000	.000	(.00)	.000 (ELEME	1 67 67 NT TOTALS)

UNIT COSTS OF LINKS

		DISCOUNTED (£M/TCMD)		DISCOUNTED TOTAL COST (ÉM)	DISCOUNTED TOTAL FLOW (TCMD)
	NORTH ESSEX				
١.	Great Bradley	.08294	22.72	11.29	136.13
	TOTAL:	.08294	22.72	11.29	136.13
4	TOTAL.	.00274		11167	150.15
2.	SOUTH ESSEX				
	Great Bradley	.08294	22.72	27.33	329.59
	Chelmsford Efflt	.03105	8.51	9.03	290.76
	TOTAL:	. 05862	16.06	36.36	620.35
3.	LONDON				
	Abingdon	.11978	32.82	440.29	3675.72
	Severn(Unsuprtd)	.03562	9.76	24.51	688.23
	Craig Goch	.06551	17. 9 5	9.94	151.67
	Thames Reuse	.00000	.00	.00	186.42
	TOTAL:	. 10096	27.66	474.74	4702.03
4.	OXFORD/SWINDON				
	Abingdon	.11978	32.82	.50	4.19
	Severn(Unsuprtd)	.03562	9.76	7.21	202.35
	TOTAL:	.03733	10.23	7.71	206.54
5.	WESSEX				
	Craig Goch	.02989	8.19	.10	3.51
	Severn Reuse	.00000	.00	.00	291.17
	TOTAL:	.00036	.10	.10	294.68
100					
6.	WEST MIDLANDS	02000	0.40	14 77	707 03
	Craig Goch Shropshire Gw	.02989 .00000	8.19 .00	11.77 .00	393.92 1105.47
	TOTAL:	.00785	2.15	.00 11.77	1499.38
	IOIAL:	.00765	2.13	11.77	1477,30
7.	EAST MIDLANDS	04004	5.22	35.75	1877.81
	Carsington	.01904 .03030	3.22 8.30	33.73 8.35	275.48
	Birmingham Gw Craig Goch	.03030	20.79	24.66	325.07
	TOTAL:	.02775	7.60	68.76	2478.35
	IUIAL:	.02773	7.00	56.75	2476.33
8.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
9.	MID KENT/FLKSTNE				
	Broad Oak	.21411	58.66	48.93	228.51
	TOTAL:	.21411	58.66	48.93	228.51
10.	BRISTOL				
	Craig Goch	.02989	8.19	2.66	89.07
	Shropshire Gw	.00000	.00	.00	37.81
	Severn Reuse	.00000	.00	.00	362.22
	TOTAL:	.00544	1.49	2.66	489.11

						A	nnen	dix 4 -	Results for High Sce	nario Case HIGH2
							PPCII	41	ACSUMS FOR TINES OF	nario case mone
11. NORTH W	EST									
Vyrnwy		.00000	.00			00	1849	2.25		
Hunting		.08598	23.56		14.).51		
TOTAL:		.00726	1.99		14.	66	2019	7.76		
TOTAL					676.	99				
									2.2	
									24	
*******	*********	*****	*****	*****	*****	*****	*****	****	***	***
DEVELOPMENT OF	LINKS ****									
SOURCE NAME	DEMAND NAME	FLOW	S THROU	IGH TIM	E (TCMD)			- Y	
		1991	1996			2011	2016	2021		
Great Bradley	NORTH ESSEX	0	0	0	0	11	21	28		
Great Bradley	SOUTH ESSEX	Ō	_	Ŏ	9	32	50	60		
Chelmsford Effl	t SOUTH ESSEX	0	0	16	30	30	30	30		
Abingdon	LONDON	0	96	193	305	350	350	350		
Severn(Unsuprtd) LONDON	0	0	0	0	55	123	136		
Craig Goch	LONDON	0	0	0	0	0	0	45		
Thames Reuse	LONDON	0	0	0	2	18	28	36		
Abingdon	OXFORD/SWINDON	0	0	0	2	0	0	0		
Severn(Unsuprtd) OXFORD/SWINDON	0	0	0	0	20	31	40		
Craig Goch	WESSEX	0	0	0	0	0	3	0		100
Severn Reuse	WESSEX	0	0	0	0	7	35	71		
Craig Goch	WEST MIDLANDS	0	0	0	0	0	40	103		
Shropshire Gw	WEST MIDLANDS	0	0	12	72	139	155	155		
Carsington	EAST MIDLANDS	0	44	112	158	175	175	175		
Birmingham Gw	EAST MIDLANDS	0		0	0	31	50	50		
Craig Goch	EAST MIDLANDS	Ö		ō	Ŏ	Ö	33	85		
Derwent Valley	SOUTH YORKSHIR	E 40	-	40	40	40	40	40		
Broad Oak	MID KENT/FLKST			8	12	16	24	31		
			•					= :		

0 2 32

782 1114 1412 1693

43 147

12 5 94

492

0

70

255

0

123

SUMMARY OF CAPITAL COSTS;

Craig Goch

Huntington TOTALS

Vyrnwy

Shropshire Gw

Severn Reuse

SUMMARY OF TOTAL COSTS OF OPERATION;

BRISTOL

BRISTOL

BRISTOL

MORTH WEST

NORTH WEST

COST SUMMARY

TOTAL DISCOUNTED COST FOR PLAN = £M 676.991 TOTAL DISCOUNTED COST FOR PERM TOTAL DISCOUNTED COSTS OF OPERATION TOTAL CAPITAL OUTLAY TO 2021 TOTAL COSTS OF OPERATION TO 2021 = EM 570.802 = EM 106.190 (ALLOWANCE INCLUDED FOR BEYOND 2021 = EM 35.616) = EM 844.700 = EM 234.762

TOTAL DISCOUNTED DEMANDS = 13357.870 TCMD

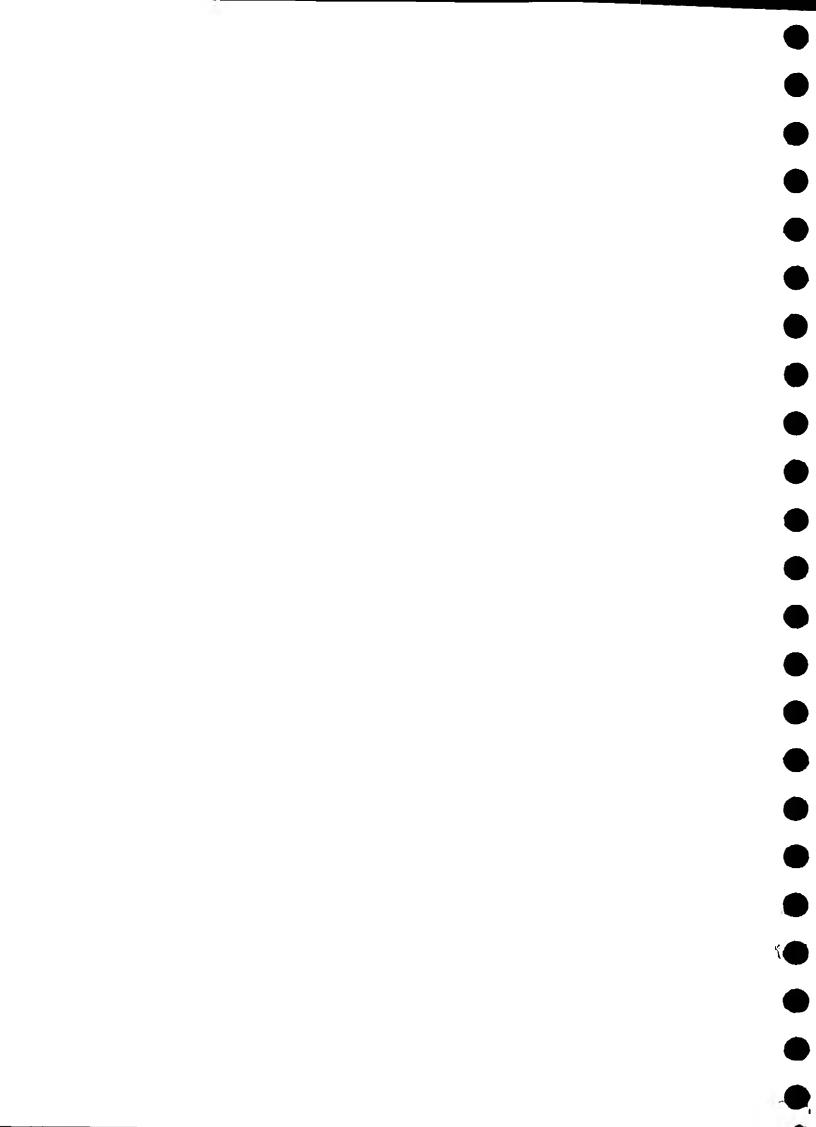
RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;
A. ALL SUPPLY DEFICIENCIES MET IN FULL.

B. NO DEMAND CENTRES OVER SUPPLIED.

C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.

53

Appendix 4 - Results for High Scenario Case HIGH2



WATER RESOURCE PLANNING MODEL.

DATE: 28- 2-1994 TIME: 10:13:22.93

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

	FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
			(TCM	(M3) (C	(EM)	(EM)	(£II)	(EM)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
١	1991	Vyrnwy	147	.000	.000	.000	.000	.000
,	1991	Broad Oak	40	.000	.000	.000	.000	.000
	1996	Carsington	140	.000	.000	.000	.000	.000
	1996	Severn(Unsuprtd)	146	.000	.000	.000	.000	.000
١	2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
	2001	Shropshire Gw	155	.000	.000	.000	.000	.000
	2001	Severn Reuse	114	.000	.000	.000	.000	.000
	2006	Great Bradley	174	69.400	34.504	.000	.000	34.504
1		Thames Reuse	36	.000	.000	.000	.000	.000
	2011	Birmingham Gw	50	4.400	1.478	.769	.856	3.103
		Craig Goch	629	60.500	22.477	.000	.000	22.477
		Huntington	74	36,900	10.244	1.109	3.307	14.661
)		Abingdon	262	400.000	82.982	.701	4.338	88.021
	TOTAL	S FOR SOURCES		571.200	151.686	2.579	8.501	162.766

UNUSED YIELDS OF DEVELOPED SOURCES

	SOURCE NAME		SPARE	YIELDS	THROL	IGH TIM	E (TCMD)	
			1991	1996	2001	2006	2011	2016	2021
	Great Bradley		174	174	174	113	79	51	34
	Chelmsford Efflt		30	30	14	0	0	0	0
	Abingdon		262	262	262	262	262	262	197
	Carsington		140	105	50	14	0	0	0
	Derwent Valley		0	0	0	0	0	0	0
	Severn(Unsuprtd))	146	50	0	0	0	0	0
	Birmingham Gw		50	50	50	50	19	0	0
	Vyrnwy		66	77	53	0	0	0	0
	Craig Goch		629	629	629	629	459	269	138
	Shropshire Gw		155	155	84	47	0	0	0
	Broad Oak		38	35	32	28	24	16	9
-	Huntington	•	74	74	74	74	74	55	30
	Thames Reuse		0	0	0	0	0	0	0
	Gevern Reuse		0	0	0	0	0	0	0

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME	FLOWS THROUGH TIME(TCMD)							
	1991	1996	2001	2006	2011	2016	2021	
ELY OUSE - ESSEX	0	0	0	90	124	152	169	
GREAT BRADLEY	0	0	0	90	124	152	169	
ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	11	21	28	
ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	9	32	50	60	
CHELMSFORD EFFLT - SOUTH ESSEX	0	0	16	30	30	30	30	
CARSINGTON - R.TRENT	0	44	112	158	175	175	175	
VYRNWY - R.SEVERN	0	0	0	46	7	0	0	
R.SEVERN - R.TRENT (1)	0	0	0	0	0	33	85	
R.SEVERN - R.TRENT (2)	0	0	0	0	0	33	85	
CRAIG GOCH - R.SEVERN (1)	0	0	0	0	170	360	491	
CRAIG GOCH - R.SEVERN (2)	0	0	0	0	170	360	491	
SHROPSHIRE GW - R.SEVERN	0	0	71	108	155	155	155	
R.PANT - R.CHELMER - R.RODING (1)	0	0	0	81	81	81	81	
R.PANT - R.CHELMER - R.RODING (2)	0	0	0	81	81	81	81	
R.RODING - R.STORT (1)	0	0	0	81	81	81	81	
R.RODING - R.STORT (2)	0	0	. 0	81	81	81	81	
ABINGDON - R.THAMES	Ó	0	0	0	0	0	65	
R.THAMES	Ō	96	193	226	342	420	486	
R.SEVERN (UNSUPRTD)	Ō	96	146	146	146	146	146	
R.SEVERN - R.THAMES (1)	Ŏ	96	193	226	344	423	425	
R.SEVERN - R.THAMES (2)	Ō	96	193	226	344	423	425	
BIRMINGHAM GW	Ŏ	0.	0	0	31	50	50	
R.SEVERN	ō	Ŏ	64	114	254	373	417	
THAMES REUSE	Ŏ	ŏ	Ó	2	18	28	36	
SEVERN REUSE	Ö	Ŏ	5	32	61	86	114	
R.THAMES - OXFORD/SWINDON	ō	Ŏ	ō	2	20	31	40	
R.SEVERN - WESSEX	Ŏ	ŏ	ŏ	ō	7	38	71	
R.SEVERN - W.MIDLANDS	Ŏ	ŏ	12	72	139	195	258	
R. TRENT - E. MIDLANDS	ŏ	44	112	158	206	258	310	
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40	
BROAD OAK - MID KENT/FLKSTNE	2	5	8	12	16	24	31	
R.SEVERN - BRISTOL	ō	ó	17	34	49	58	67	
VYRNWY - NORTH WEST				_~	77	,0	01	
TIRREL RUNIN WEST	-	70	0/4	112	141	147	147	
HUNTINGTON - NORTH WEST	81 0	70 0	94 0	118 0	141 0	147 19	147 44	

LINK ELEMENT DEVELOPMENT

•	YEAR FIRST USED	ELEMENT NAME		TOTAL CAPITAL COST	DISCOUNTED CAPITAL COST		OUNTED COST PERATION		UNIT COST OF	TOTAL DISCO COST	L DUNTED	BASE YEA FOR REPLICAT	
				(£M)	(£4)	TO 20)21 BEYOND : (£M)	2021	OPERATION (P/M3)	(£M)			G PEAK TCMD)
	2006	ELY OUSE - ESSEX		.000	.000	5.657	4.339	(2	.42) 9	9.996		06 169 ENT TOTAL	
	2006	GREAT BRADLEY		.000	.000				•••			06 169	
		GREAT BRADLEY		.000	.000	.000	.000	(-00)	.000	(ELEM	ENT TOTAL	5)
	2011	ELY OUSE ESSEX - NORTH ESSEX		.000	.000						20	11 28	28
		ELY DUSE ESSEX - NORTH ESSEX		.000	.000	.000	.000	(.00)	.000	(ELEM	ENT TOTAL	\$ }
	2006	ELY OUSE ESSEX - SOUTH ESSEX		.000	.000						20	06 60	60
	2000	ELY OUSE ESSEX - SOUTH ESSEX		.000	.000	.000	.000	(.00)	.000		ENT TOTAL	s)
	2001	CHELMSFORD EFFLT - SOUTH ESSEX		13.500	8.720						20	01 30	30
7		CHELMSFORD EFFLT - SOUTH ESSEX	•	13.500	8.720	.227	.081	(.29) 9	2.028	(ELEM	ENT TOTAL	S)
-	4004	CARCALICATON D TRENT		000	000						10	96 175	175
	1996	CARSINGTON - R.TRENT CARSINGTON - R.TRENT		.000 .000	.000	.000	.000	(.00)	.000	-	96 175 ENT TOTAL	

•	2006	VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000 .000	.000	.651	.000	(1.66)	.651	2006 46 46 (ELEMENT TOTALS)
•	2016	R.SEVERN - R.TRENT (1) R.SEVERN - R.TRENT (1)	.000	.000	.000	.000	(.00)	.000	2016 100 100 (ELEMENT TOTALS)
•	2016	R.SEVERN - R.TRENT (2) R.SEVERN - R.TRENT (2)	26.000 26.000	7.008 7.008	.422	1.327	(1.47)	8. <i>7</i> 56	2016 85 85 (ELEMENT TOTALS)
•	2011	CRAIG GOCH - R.SEVERN (1) CRAIG GOCH - R.SEVERN (1)	.000	.000	.000	.000	(.00)	.000	2011 491 491 (ELEMENT TOTALS)
•	2011	CRAIG GOCH - R.SEVERN (2) CRAIG GOCH - R.SEVERN (2)	44.500 44.500	16.051 16.051	.000	.000	(.00)	16.051	2011 491 491 (ELEMENT TOTALS)
•	2001	SHROPSHIRE GW - R.SEVERN SHROPSHIRE GW - R.SEVERN	.000	.000 .000	.000	.000	(.00)	.000	2001 155 155 (ELEMENT TOTALS)
•	2006	R.PANT - R.CHELMER - R.RODING (1) R.PANT - R.CHELMER - R.RODING (1)	.000 .000	.000 .000	.000	.000	(.00)	.000	2006 81 100 (ELEMENT TOTALS)
•	2006	R.PANT - R.CHELMER - R.RODING (2) R.PANT - R.CHELMER - R.RODING (2)		11.585 11.585	.486	.266	(.31)	12.337	2006 81 81 (ELEMENT TOTALS)
•	2006	R.RODING - R.STORT (1) R.RODING - R.STORT (1)	.000 .000	.000	.000	.000	(.00)	.000	2006 81 100 (ELEMENT TOTALS)
•	2006	R.RODING - R.STORT (2) R.RODING - R.STORT (2)	11.000 11.000	5.310 5.310	.149	.082	(.10)	5.541	2006 81 81 (ELEMENT TOTALS)
•	2021	ABINGDON - R.THAMES ABINGDON - R.THAMES	.000	.000	.000	.000	(.00)	.000	2021 65 65 (ELEMENT TOTALS)
•	1996	R.THAMES R.THAMES	.000	.000	.000	.000	(.00)	.000	1996 486 486 (ELEMENT TOTALS)
•	1996	R.SEVERN (UNSUPRID) R.SEVERN (UNSUPRID)	.000	.000	.000	.000	(.00)	.000	1996 146 146 (ELEMENT TOTALS)
•	1996	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	1996 425 400 (ELEMENT TOTALS)
•	1996	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)	212.000 212.000		9.850	4.662	(1.04)	197.773	1996 425 425 (ELEMENT TOTALS)
•	2011	BIRMINGHAM GW BIRMINGHAM GW	.000	.000	.000	.000	(.00)	.000	2011 50 50 (ELEMENT TOTALS)
•	2001	R.SEVERN R.SEVERN	.000	.000	.000	.000	(.00)	.000	2001 417 417 (ELEMENT TOTALS)
•	2006	THAMES REUSE THAMES REUSE	.000	.000	.000	.000	(.00)	.000	2006 36 36 (ELEMENT TOTALS)
	2001	SEVERN REUSE SEVERN REUSE	.000	.000 .000	.000	.000	(.00)	.000	2001 114 114 (ELEMENT TOTALS)

2006	R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000 .000	.000 .000	.000	.000	(.00)	.000	2006 40 40 (ELEMENT TOTALS)
2011	R.SEVERN - WESSEX R.SEVERN - WESSEX	.000	.000 .000	.000	.000	(.00)	.000	2011 71 71 (ELEMENT TOTALS)
2001	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000	.000 .000	.000	.000	(.00)	.000	2001 258 258 (ELEMENT TOTALS)
1996	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS	50.000 50.000		2.526	1.439	(.44)	47.187	1996 310 310 (ELEMENT TOTALS)
1991	DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
1991	BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE	47.500 47.500	47.500 47.500	.866	.562	(1.71)	48.928	1991 31 31 (ELEMENT TOTALS)
2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000	.000	.000	.000	(.00)	.000	2001 67 67 (ELEMENT TOTALS)
1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000	.000	.000	(.00)	.000	1991 147 147 (ELEMENT TOTALS)
2016	HUNTINGTON - NORTH WEST HUNTINGTON - NORTH WEST	.000 .000	.000 .000	.000	.000	(.00)	.000	2016 44 44 (ELEMENT TOTALS)
TOTALS	FOR LINK ELEMENTS	428.5	00 322.658	20.83	12.759	•	356.25	o

UNIT COSTS OF LINKS

		DISCOUNTED (£M/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (£M)	• • • •
1.	NORTH ESSEX				
73	Great Bradley	.04753	13.02	6.47	136.13
	TOTAL:	.04753	13.02	6.47	136.13
2.	SOUTH ESSEX				
	Great Bradley	.04753	13.02	15.67	329.59
	Chelmsford Efflt	.03105	8.51	9.03	290.76
	TOTAL:	.03981	10.91	24.69	620.35
3.	LONDON				
	Great Bradley	.06060	16.60	40.24	664.02
	Abingdon	.40178	110.08	36,56	91.00
	Severn(Unsuprtd)	.05152	14.11	101.28	1965.90
	Vyrnwy	.05759	15.78	2.44	42.36
	Craig Goch	.06797	18.62	63.81	938.87
	Shropshire Gw	.05152	14.11	9.41	182.58
	Thames Reuse	.00000	.00	.00	186.42
	Severn Reuse	. 05 152	14.11	32.50	630.88
	TOTAL:	.06088	16.68	286.24	4702.03
4.	OXFORD/SWINDON				
	Abingdon	.40178	110.08	51.46	128.08
	Craig Goch	.06797	18.62	4.59	67.53
	Shropshire Gw	.05152	14.11	.22	4.19
	Severn Reuse	.05152	14.11	.35	6.74
	TOTAL:	.27410	75.10	56.61	206.54

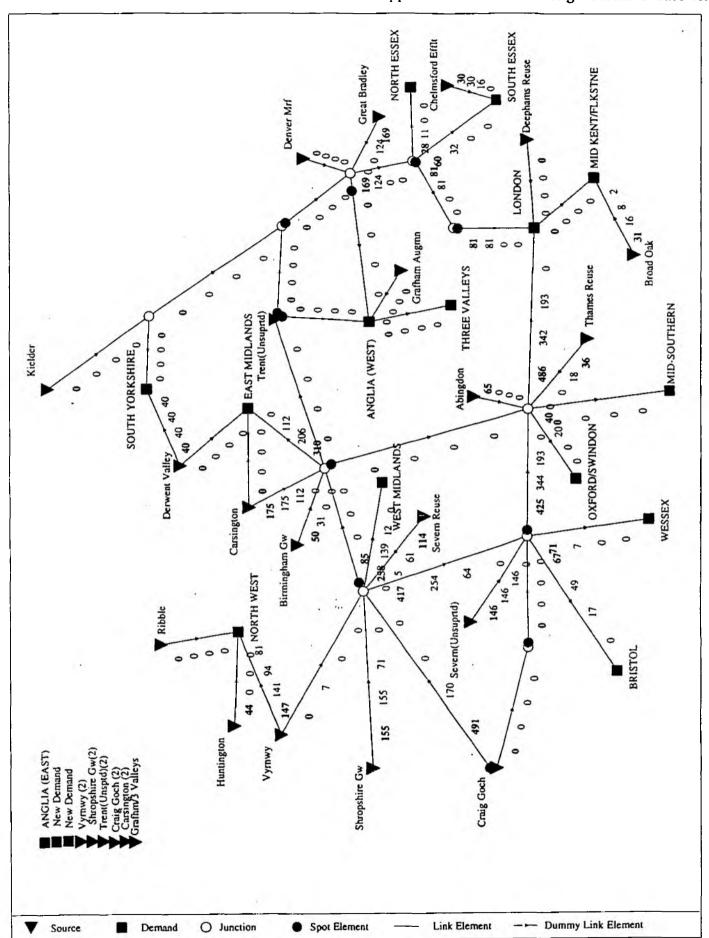
5. WESSEX		20		
Shropshire	. 00000	-00	.00	271.08
Severn Reu			.00	23.59
TOTAL:	.00000		.00	294.68
IOIALI			***	274.00
6. WEST MIDLA	ANDS			
Vyrnwy	. 00607		.39	64.91
Craig Gool			16.62	1010.26
Shropshire	.00000 Gw		.00	424.22
TOTAL:	.01135	3.11	17.02	1499.38
7. EAST MIDL	ANDS			
Carsington	.01904	5.22	35.75	1877.81
Birminghar	n G₩ .03030	8.30	8.35	275.48
Craig Goot	1 .06243	17.10	20.29	325.07
TOTAL:	.02598	7.12	64.40	2478.35
8. SOUTH YORK	CSHIRE			
Derwent Va		.00	.00	683.02
TOTAL:	.00000	-	.00	683.02
TOTAL	70000			333333
9. MID KENT/	FLKSTNE			
Broad Oak	.21411	58.66	48.93	228.51
TOTAL:	.21411	58.66	48.93	228.51
10. BRISTOL				
Shropshire	e Gw .00000	.00	.00	489,11
TOTAL:	.00000	.00	.00	489.11
11. NORTH WEST				- :
Vyrnwy	.00000	.00	.00	1849.25
Huntingto			14.66	170.51
TOTAL:	.00726		14.66	2019.76
TOTAL.	.00720	1.77	14.00	2017.70
TOTAL			519.02	

DEVELOPMENT OF LINKS

	SOURCE NAME	DEMAND NAME				E (TCMD			
			1991	1996	2001	2006	2011	2016	2021
	Great Bradley	NORTH ESSEX	0	0	0	0	11	21	28
	Great Bradley	SOUTH ESSEX	0	0	0	9	32	50	60
	Chelmsford Efflt	SOUTH ESSEX	0	Đ	16	30	30	30	30
	Great Bradley	LONDON	0	Ð	0	81	81	81	81
	Abingdon	LONDON	0	0	0	0	0	0	27
•	Severn(Unsuprtd)	LONDÓN	0	96	146	146	146	146	146
	Vyrnwy	LONDON	0	0	0	15	7	0	0
	Craig Goch	LONDON	0	0	0	0	110	160	172
	Shropshire Gw	LONDON	0	0	42	31	0	0	0
	Thames Reuse	LONDON	0	0	0	2	18	28	36
	Severn Reuse	LONDON	0	0	5	32	61	86	105
	Abingdon	OXFORD/SWINDON	0	0	0	0	0	0	38
	Craig Goch	OXFORD/SWINDOM	0	0	0	0	20	31	0
	Shropshire Gw	DXFORD/SWINDON	0	0	0	2	0	0	0
	Severn Reuse	OXFORD/SWINDON	0	0	0	0	0	0	2
	Shropshire Gw	WESSEX	0	0	0	0	7	38	64
	Severn Reuse	WESSEX	0	0	0	0	0	0	7
	Vyrnwy	WEST MIDLANDS	0	0	0	31	0	0	0
	Craig Goch	WEST MIDLANDS	0	0	0	0	40	136	234
	Shropshire Gw	WEST MIDLANDS	0	0	12	41	99	59	24
	Carsington	EAST MIDLANDS	0	44	112	158	175	175	175
	Birmingham Gw	EAST MIDLANDS	0	0	0	0	31	50	50
_	Craig Goch	EAST MIDLANDS	0	0	0	0	0	33	85
	Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
	Broad Oak	MID KENT/FLKSTNE	2	5	8	12	16	24	31
	Shropshire Gw	BRISTOL	0	0	17	34	49	58	67
•	Vyrnwy	NORTH WEST	81	70	94	118	141	147	147
	Huntington	NORTH WEST	0	0	0	0	0	19	44
	TOTALS		123	255	492	782	1114	1412	1693

SUMMARY OF CAPITAL COSTS; CATEGORY TOTAL CAPITAL COST INCURRED IN PERIODS (EM) 1991 1996 2001 2006 2011 2016 2021 .0 .0 .0 69.4 63.2 38.6 400.0 47.5 262.0 13.5 35.0 44.5 26.0 .0 SOURCES LINK ELEMENTS 47.5 262.0 13.5 104.4 107.7 64.6 400.0 TOTALS SUMMARY OF TOTAL COSTS OF OPERATION: TOTAL COSTS OF OPERATION THROUGH TIME (EM/PERIOD) CATEGORY 1991 1996 2001 2006 2011 2016 2021 4.9 11.5 15.8 19.2 22.0 LINK ELEMENTS .0 2.3 TOTALS .0 2.3 4.9 11.5 16.7 23.1 36.6 COST SUMMARY = £M 519.016 TOTAL DISCOUNTED COST FOR PLAN TOTAL DISCOUNTED CAPITAL COST = EM 474.343 TOTAL DISCOUNTED COSTS OF OPERATION . # EM 44.673 (ALLOWANCE INCLUDED FOR BEYOND 2021 = EM 21.260) TOTAL CAPITAL OUTLAY TO 2021 = EM 999.700 TOTAL COSTS OF OPERATION TO 2021 = EM 95.217 TOTAL DISCOUNTED DEMANDS = 13357.870 TCMD RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;
A. ALL SUPPLY DEFICIENCIES MET IN FULL. B. NO DEMAND CENTRES OVER SUPPLIED. C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.

.



WATER RESOURCE PLANNING MODEL.

DATE : 28- 2-1994 TIME : 10:14:58.34

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

FIRS BASE YEAR		YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
		(TCMD) (EH)	(EH)	(EH)	(EN)	(EM)
199	1 Derwent Valley	40	.000	.000	.000	.000	.000
199	1 Vyrnwy	147	.000	.000	.000	.000	-000
199	1 Broad Oak	40	.000	.000	.000	.000	.000
199	6 Deephams Reuse	100	.000	.000	.000	.000	.000
199	6 Carsington	140	.000	.000	.000	.000	.000
200	1 Chelmsford Efflt	30	.000	.000	.000	.000	.000
200	1 Severn(Unsuprtd)	146	.000	.000	.000	.000	.000
	1 Shropshire Gw	155	.000	.000	.000	.000	.000
200	1 Severn Reuse	114	.000	.000	.000	-000	.000
200	6 Great Bradley	174	69.400	34.504	.000	.000	34.504
200	6 Thames Reuse	36	.000	.000	.000	.000	.000
201	1 Birmingham Gw	50	4.400	1.478	.769	.856	3.103
201	1 Craig Goch	629	60.500	22.477	.000	-000	22.477
201	6 Huntington	74	36.900	10.244	1.109	3.307	14,661
TOTA	LS FOR SOURCES		171.200	68.703	1.879	4.163	74.745

UNUSED YIELDS OF DEVELOPED SOURCES

_	SOURCE NAME	SPARE YIELDS THROUGH TIME(TCMD)							
		1991	1996	2001	2006	2011	2016	2021	
	Great Bradley	174	174	174	127	79	51	34	
	Chelmsford Efflt	30	30	14	0	0	0	0	
	Deephams Reuse	100	4	0	0	0	0	0	
	Carsington	140	105	50	14	0	0	0	
	Derwent Valley	0	0	0	0	0	0	0	
	Severn(Unsuprtd)	146	146	53	0	0	0	0	
	Birmingham Gw	50	50	50	50	19	0	0	
	Vyrnwy	66	77	53	29	6	0	0	
	Craig Goch	629	629	629	629	552	369	173	
	Shropshire Gw	155	155	131	79	0	0	0	
	Broad Oak	38	35	32	28	24	16	9	
	Huntington	74	74	74	74	74	55	30	
	Thames Reuse	0	0	0	0	0	0	0	
	Severn Reuse	0	0	0	0	0	0	0	

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME	FLOWS THROUGH TIME(TCMD)						
	1991	1996	2001	2006	2011	2016	2021
ELY OUSE - ESSEX	0	0	0	68	124	152	169
GREAT BRADLEY	0	0	0	68	124	152	169
ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	11	21	28
ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	9	32	50	60
CHELMSFORD EFFLT - SOUTH ESSEX	0	0	16	. 30	30	30	30
CARSINGTON - R.TRENT	0	44	112	158	175	175	175
R.SEVERN - R.TRENT (1)	0		D	0	0	33	85
R.SEVERN - R.TRENT (2)	0	0	0	0	0	33	85
CRAIG GOCH - R.SEVERN (1)	0	0	0	0	77	260	456
CRAIG GOCH - R.SEVERN (2)	0	0	0	0	77	260	456
SHROPSHIRE GW - R.SEVERN	0		24	76	155	155	155
R.PANT - R.CHELMER - R.RODING (1)	0	-	0	59	81	81	81
R.PANT - R.CHELMER - R.RODING (2)	0		0	59	81	81	81
R.RODING - R.STORT (1)	. 0	-	0	59	81	81	81
R.RODING - R.STORT (2)	0		0	59	81	81	81
DEEPHAMS REUSE - LONDON	0	96	100	100	100	100	100
R.THAMES	0		93	148	242	320	386
R.SEVERN (UNSUPRTD)	0		93	146	146	146	146
R.SEVERN - R.THAMES (1)	0		93	148	244	323	390
R.SEVERN - R.THAMES (2)	0	-	93	148	244	323	390
BIRMINGHAM GW	0		0	0	31	50	50
R.SEVERN	0	_	17	36	154	273	382
THAMES REUSE	0		0	2	18	28	36
SEVERN REUSE	0		5	32	61	86	114
R.THAMES - OXFORD/SWINDON	0		0	2	20	31	40
R.SEVERN - WESSEX	0	0	0	0	7	38	71
R.SEVERN - W.MIDLANDS	0	0	12	72	139	195	258
R.TRENT - E.MIDLANDS	0	44	112	158	206	258	310
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40
BROAD OAK - MID KENT/FLKSTNE	2	5	8	12	16	24	31
R.SEVERN - BRISTOL	Ō		17	34	49	58	67
VYRNWY - NORTH WEST	81	70	94	118	141	147	147
HUNTINGTON - NORTH WEST	0		0	0	0	19	44

LINK ELEMENT DEVELOPMENT

YEAR FIRST	ELEMENT NAME		DISCOUNTED		JNTED COST	r	UNIT		L OUNTED	FOR	-
USED		COST (EM)	COST (EM)		21 BEYOND (£M)	2021	OF OPERATION (P/M3)	COST I (EH)		KEP	PLICATION AVG PEAK (TCMD)
2006	ELY OUSE - ESSEX ELY OUSE - ESSEX	.000 .000	.000 .000	5.249	4.339	(2	.42)	9.588			169 169 TOTALS)
2006	GREAT BRADLEY GREAT BRADLEY	.000	.000	.000	.000	(.00)	000			169 169 TOTALS)
2011	ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000 .000	.000	.000	.000	(.00)	.000		11 ENT	28 28 TOTALS)
2006	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000 .000	.000	.000	.000	(.00)	.000	20 (ELEM	06 ENT	60 60 TOTALS)
2001	CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX		8.720 8.720	.227	.081	(. 29)	9.028		01 IENT	30 30 TOTALS)
1996	CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000	.000	.000	.000	(.00)	.000		-	175 175 TOTALS)

2016	R.SEVERN - R.TRENT (1) R.SEVERN - R.TRENT (1)	.000 .000	.000	.000	.000	(.00)	.000	2016 100 100 (ELEMENT TOTALS)
2016	R.SEVERN - R.TRENT (2) R.SEVERN - R.TRENT (2)	26.000 26.000	7.008 7.008	.422	1.327	(1.47)	8.756	2016 85 85 (ELEMENT TOTALS)
2011	CRAIG GOCH - R.SEVERN (1) CRAIG GOCH - R.SEVERN (1)	.000	.000	.000	.000	(.00)	.000	2011 456 456 (ELEMENT TOTALS)
2011	CRAIG GOCH - R.SEVERN (2) CRAIG GOCH - R.SEVERN (2)	44.500 44.500	16.051 16.051	.000	.000	(.00)	16.051	2011 456 456 (ELEMENT TOTALS)
2001	SHROPSHIRE GW - R.SEVERN SHROPSHIRE GW - R.SEVERN	.000	.000	.000	.000	(.00)	.000	2001 155 155 (ELEMENT TOTALS)
2006	R.PANT - R.CHELMER - R.RODING (1) R.PANT - R.CHELMER - R.RODING (1)	.000	.000	.000	.000	(.00)	.000	2006 81 100 (ELEMENT TOTALS)
2006	R.PANT - R.CHELMER - R.RODING (2) R.PANT - R.CHELMER - R.RODING (2)	24.000 24.000	11.585 11.585	.434	.266	(.31)	12.285	2006 81 81 (ELEMENT TOTALS)
2006	R.RODING - R.STORT (1) R.RODING - R.STORT (1)	.000	.000	.000	.000	(.00)	.000	2006 81 100 (ELEMENT TOTALS)
2006	5 R.RODING - R.STORT (2) R.RODING - R.STORT (2)	11.000 11.000	5.310 5.310	.133	.082	(.10)	5.525	2006 81 81 (ELEMENT TOTALS)
1996	5 DEEPHAMS REUSE - LONDON DEEPHAMS REUSE - LONDON		31.984 31.984	12.440	3.047	(2.91)	47.471	1996 100 100 (ELEMENT TOTALS)
2001	R.THAMES R.THAMES	.000 .000	.000	.000	.000	(.00)	.000	2001 386 386 (ELEMENT TOTALS)
200	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	,000 .000	.000	.000	.000	(.00)	.000	2001 146 146 (ELEMENT TOTALS)
200	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	2001 425 400 (ELEMENT TOTALS)
200	I R.SEVERN - R.THAMES (2)	92.000	59.428		4.278	(1.04)	69.424	2001 390 390 (ELEMENT TOTALS)
201	R.SEVERN - R.THAMES (2) 1 BIRMINGHAM GW	.000	.000					2011 50 50
200	BIRMINGHAM GW R.SEVERN	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS) 2001 382 382
2006	R.SEVERN 5 THAMES REUSE	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS) 2006 36 36
	THAMES REUSE	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
200	SEVERN REUSE Severn Reuse	.000	.000	.000	.000	(.00)	.000	2001 114 114 (ELEMENT TOTALS)
200	S R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	.000	.000	.000	(.00)	000	2006 40 40 (ELEMENT TOTALS)

2011	R.SEVERN - WESSEX R.SEVERN - WESSEX	.000	.000 .000	.000	.000	(.00)	.000	2011 71 71 (ELEMENT TOTALS)
2001	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000	.000 .000	.000	.000	(.00)	.000	2001 258 258 (ELEMENT TOTALS)
1996	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS		43.222 43.222	2.526	1.439	(.44)	47.187	1996 310 310 (ELEMENT TOTALS)
1991	DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000 .000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
1991	BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE		47.500 47.500	.866	.562	(1.71)	48.928	1991 31 31 (ELEMENT TOTALS)
2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000	.000	.000	,000	(.00)	.000	2001 67 67 (ELEMENT TOTALS)
1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000	.000	.000	(.00)	.000	1991 147 147 (ELEMENT TOTALS)
2016	HUNTINGTON - NORTH WEST HUNTINGTON - NORTH WEST	.000	.000	.000	.000	(.00)	.000	2016 44 44 (ELEMENT TOTALS)
TOTALS	FOR LINK ELEMENTS	345.50	00 230.809	28.014	15.422		274.24	5

UNIT COSTS OF LINKS

		DISCOUNTED (£M/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (EM)	DISCOUNTED TOTAL FLOW (TCMD)
1.	NORTH ESSEX				
	Great Bradley	.04884	13.38	6.65	136.13
	TOTAL:	.04884	13.38	6.65	136.13
2.	SOUTH ESSEX				
	Great Bradley	.04884	13.38	16.10	329.59
	Chelmsford Efflt	.03105	8.51	9.03	290.76
	TOTAL:	.04050	11.10	25.13	620.35
3.	LONDON				
	Great Bradley	.06336	17.36	39.15	617.96
	Deephams Reuse	.03252	8.91	47.47	1459,92
	Severn(Unsuprtd)	. 02625	7.19	38.26	1457.45
	Craig Goch	.04590	12.57	19.76	430.41
	Thames Reuse	.00000	.00	.00	186.42
	Severn Reuse	.02625	7.19	14.44	549.87
	TOTAL:	. 03383	9.27	159.08	4702.03
4.	OXFORD/SWINDON				
	Craig Goch	.04590	12.57	7.90	172.02
	Shropshire Gw	.02625	7.19	.11	4.19
	Severn Reuse	.02625	7.19	.80	30.33
	TOTAL:	.04261	11.68	8.80	206.54
5.	WESSEX				
	Shropshire Gw	.00000	.00	.00	294.68
	TOTAL:	.00000	.00	.00	294.68
6.	WEST MIDLANDS				
	Craig Goch	.01964	5.38	20.31	1033.85

	Shropshire Gw TOTAL:	.00000 .01354	.00 3.71	.00 20.31	465.53 1499.38
7.	EAST MIDLANDS				
	Carsington	.01904	5.22	35.75	1877.81
	Birmingham Gw	.03030	8.30	8.35	275.48
	Craig Goch	.06562	17.98	21.33	325.07
	TOTAL:	.02640	7.23	65.43	2478.35
8.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
9.	MID KENT/FLKSTNE				
	Broad Oak	.21411	58.66	48.93	228.51
	TOTAL:	.21411	58.66	48.93	228.51
10.	BRISTOL				
	Shropshire Gw	.00000	.00	.00	408.10
	Severn Reuse	.00000	.00	.00	81.01
	TOTAL:	.00000	.00	.00	489.11
11.	NORTH WEST				
	Vyrnwy	.00000	.00	.00	1849.25
	Huntington	.08598	23.56	14.66	170.51
	TOTAL:	.00726	1.99	14.66	2019.76
	TOTAL			348.99	

DEVELOPMENT OF LINKS

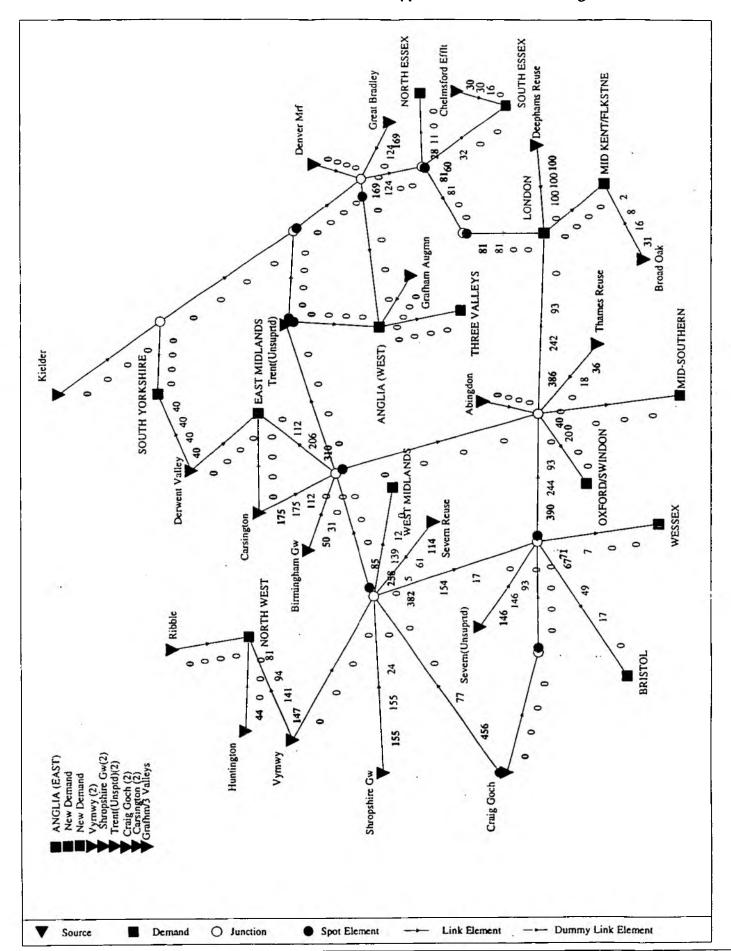
	SOURCE NAME	FLOWS THROUGH TIME(TCMD)							
			1991	1996	2001	2006	2011	2016	2021
,	Great Bradley	NORTH ESSEX	0	0	0	0	11	21	28
1	Great Bradley	SOUTH ESSEX	0	0	0	9	32	50	60
	Chelmsford Efflt	SOUTH ESSEX	0	0	16	30	30	30	30
	Great Bradley	LONDON	0	0	0	59	81	81	81
,	Deephams Reuse	LONDON	0	96	100	100	100	100	100
	Severn(Unsuprtd)	LONDON	0	0	93	146	146	146	146
	Craig Goch	LONDON	0	0	0	0	17	60	99
	Thames Reuse	LONDON	0	0	0	2	18	28	36
,	Severn Reuse	LONDON	0	0	0	0	61	86	105
	Craig Goch	OXFORD/SWINDON	0	0	0	0	20	31	31
	Shropshire Gw	OXFORD/SWINDON	0	0	0	2	0	0	0
•	Severn Reuse	OXFORD/SWINDON	0	0	0	0	0	0	9
,	Shropshire Gw	WESSEX	0	0	0	0	7	38	71
	Craig Goch	WEST MIDLANDS	0	0	0	0	40	136	241
	Shropshire Gw	WEST MIDLANDS	0	0	12	72	99	59	17
•	Carsington	EAST MIDLANDS	0	44	112	158	175	175	175
,	Birmingham Gw	EAST MIDLANDS	0	0	0	0	31	50	50
	Craig Goch	EAST MIDLANDS	0	0	0	0	0	33	85
	Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
•	Broad Dak	MID KENT/FLKSTNE	2	5	8	12	16	24	31
,	Shropshire Gw	BRISTOL	0	0	12	2	49	58	67
	Severn Reuse	BRISTOL	0	0	5	32	0	0	0
	Vyrnwy	NORTH WEST	81	70	94	118	141	147	147
	Huntington	NORTH WEST	0	0	0	0	0	19	44
,	-								
	TOTALS		123	255	492	782	1114	1412	1693

SUMMARY OF CAPITAL COSTS;

CATEGORY TOTAL CAPITAL COST INCURRED IN PERIODS (£M) 1991 1996 2001 2006 2011 2016 2021

SOURCES .0 .0 .0 69.4 63.2 38.6 .0

Appendix 4 - Results for High Scenario Case HIGH4 LINK ELEMENTS 47.5 87.0 105.5 35.0 44.5 26.0 .0 47.5 87.0 105.5 104.4 107.7 64.6 SUMMARY OF TOTAL COSTS OF OPERATION; CATEGORY TOTAL COSTS OF OPERATION THROUGH TIME (EM/PERIOD) 1991 1996 2001 2006 2011 2016 2021 SOURCES .0 .0 .0 .0 .9 3.9 7.2 .0 5.8 8.3 13.3 18.2 22.5 26.6 .9 LINK ELEMENTS .0 5.8 8.3 13.3 19.1 26.5 33.7 COST SUMMARY TOTAL DISCOUNTED COST FOR PLAN = £M 348.990 = £M 299.512 TOTAL DISCOUNTED CAPITAL COST = £M 49.477 (ALLOWANCE INCLUDED FOR BEYOND 2021 = £M 19.585) TOTAL DISCOUNTED COSTS OF OPERATION = £M 516.700 TOTAL CAPITAL OUTLAY TO 2021 TOTAL COSTS OF OPERATION TO 2021 = £M 106.705 = 13357.870 TCMD TOTAL DISCOUNTED DEMANDS RESULTS OF CHECKS ON VALIDITY OF ALLOCATION; A. ALL SUPPLY DEFICIENCIES MET IN FULL. B. NO DEMAND CENTRES OVER SUPPLIED. C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.



DATE : 28- 2-1994 TIME : 10:33:57.66

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

7	FIRST	SOURCE NAME	YIELD	CAPITAL	DISCOUNTED	DISCOUNTED	DISCOUNTED	TOTAL
	BASE		IN	COST	CAPITAL	OPERATING	OPERATING	DISCOUNTED
	YEAR		2021		COST	COST TO	COST BEYOND	COST
١						2021	2021	
,			(TCM)) (£4)	(ĐI)	(EM)	(£4)	(£M)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
١	1991	Vyrnwy	147	.000	.000	.000	.000	.000
,	1991	Broad Oak	40	.000	.000	.000	.000	.000
	1996	Carsington	140	.000	.000	.000	.000	.000
	1996	Severn(Unsuprtd)	146	.000	.000	.000	.000	.000
۱	2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
,	2001	Shropshire Gw	155	.000	.000	.000	.000	.000
	2001	Severn Reuse	114	.000	.000	.000	.000	.000
	2006	Trent(Unsuprtd)	105	.000	.000	.000	.000	.000
١	2006	Craig Goch	629	60.500	30.079	.000	.000	30.079
ÿ	2006	Thames Reuse	36	.000	.000	.000	.000	.000
	2011	Birmingham Gw	50	4.400	1.478	.769	.856	3.103
		Abingdon	262	400,000	111.049	3.752	9.744	124.545
)		Huntington	74	36.900	10.244	1.109	3.307	14,661
	TOTALS	S FOR SOURCES		501.800	152.851	5.630	13.907	172.388

UNUSED YIELDS OF DEVELOPED SOURCES

SOURCE NAME	SPARE	YIELDS	THROU	IGH TIM	E(TCMD)	
	1991	1996	2001	2006	2011	2016	2021
Chelmsford Efflt	30	30	14	0	0	0	0
Trent(Unsuprtd)	105	105	105	96	62	34	17
Abingdon	262	262	262	262	262	181	116
Carsington	140	105	50	14	0	0	0
Derwent Valley	0	0	0	0	0	0	0
Severn(Unsuprtd)	146	50	0	0	0	0	0
Birmingham Gw	50	50	50	50	19	0	0
Vyrnwy	66	77	53	0	0	0	0
Craig Goch	629	629	629	548	378	269	138
Shropshire Gw	155	155	84	47	0	0	0
Broad Oak	38	35	32	28	24	16	9
Huntington	74	74	74	74	74	55	30
Thames Reuse	0	0	0	0	0	0	0
Severn Reuse	0	0	0	0	D	0	0

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME	FLOWS THROUGH TIME(TCND)						
	1991	1996	2001	2006	2011	2016	2021
ELV MIDE FOREY	•		0		43	71	
ELY OUSE - ESSEX	0	0	0	9	43 11	71 21	88 28
ELY OUSE ESSEX - NORTH ESSEX	0	ŏ	ŏ	9	43	71	26 88
R.TRENT - R.WITHAM (1)	0	0	Ö	9	43 43	71	88
R.TRENT - R.WITHAM (2)	0	0	0	9	43	71	88
R.WITHAM - R.ELY OUSE (1) R.WITHAM - R.ELY OUSE (2)	Ŏ	ŏ	Ö	9	43	71	88
ELY OUSE ESSEX - SOUTH ESSEX	ŏ	ŏ	Ö	9	32	50	60
CHELMSFORD EFFLT - SOUTH ESSEX	ŏ	ŏ	16	30	30	30	30
CARSINGTON - R.TRENT	Ď	44	112	158	175	175	175
VYRNWY - R.SEVERN	Ö	0	0	46	7	173	0
R.SEVERN - R.TRENT (1)	Ŏ	ŏ	ŏ	0	ó	33	85
R.SEVERN - R.TRENT (2)	ŏ	ŏ	ŏ	ŏ	Ö	33	85
CRAIG GOCH - R.SEVERN (1)	ŏ	ő	ŏ	81	251	360	491
CRAIG GOCH - R.SEVERN (1)	ŏ	ŏ	Ö	81	251	360	491
SHROPSHIRE GW - R.SEVERN	ŏ	ŏ	71	108	155	155	155
ABINGDON - R.THAMES	ŏ	o	' o	108	133	81	146
R.THAMES	0	96	193	307	423	501	567
	Ö	96	146	146	146	146	146
R.SEVERN (UNSUPRID)	0	96	193	307	425	423	425
R.SEVERN - R.THAMES (1)	0	96	193	307	425	423	425
R.SEVERN - R.THAMES (2)	•		193	307 0	31	50	425 50
BIRMINGHAM GW	0	0	64	195	335	373	417
R.SEVERN	_	0		2	333 18		
THAMES REUSE	0	0	0 5	_		28	36
SEVERN REUSE	0	0	0	32	61	86	114 40
R. THAMES - OXFORD/SWINDON	0	0	0	2	20 7	31 38	71
R.SEVERN - WESSEX	0	0	12	72	139	30 195	258
R.SEVERN - W.MIDLANDS	0	_				258	256 310
R.TRENT - E.MIDLANDS	•	44	112	158	206		
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40 31
BROAD OAK - MID KENT/FLKSTNE	2	5	. 8	12	16	24	
R.SEVERN - BRISTOL	0	0	17	34	49	58	67
VYRNWY - NORTH WEST	81	70	94	118	141	147	147
HUNTINGTON - NORTH WEST	0	0	0	0	0	19	44

YEAR FIRS USED	ELEMENT NAMÉ T	TOTAL CAPITA COST	DISCOUNTED L CAPITAL COST		UNTED COST ERATION		UNIT COST OF	TOTA DISC COST	OUNTED	FOR	E YEAR	_
		(£H)	(£H)		21 BEYOND (£4)	2021	OPERATION (P/M3)	(£M)	•		AVG	PEAK CMD)
2006	ELY OUSE - ESSEX	.000	.000 .000	1.861	2.259	(2	.42) 4	. 121	20 (ELEM		88 TOTALS	88
2011	ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000	.000 .000	.000	.000	ć	.00)	.000	20 (ELEM			2 8 ;)
2006	R.TRENT - R.WITHAM (1) R.TRENT - R.WITHAM (1)	.000	.000 .000	.000	.000	•	.00)	.000	20 (ELEM	-		88 ;)
2006	R.TRENT - R.WITHAM (2) R.TRENT - R.WITHAM (2)	18.000 18.000	8.689 8.689	.065	.079	(.08) 8	3.833	20 (ELEM			88
2006	R.WITHAM - R.ELY OUSE (1) R.WITHAM - R.ELY OUSE (1)	.000	.000	.000	.000	C	.00)	.000	20 (ELEM			88 i)
2006	R.WITHAM - R.ELY OUSE (2) R.WITHAM - R.ELY OUSE (2)		71.922 71.922	.722	.876	(.94) 73	3.521	20 (ELEM			88

Appendix 4 - Results for High Scenario Case HIGH5

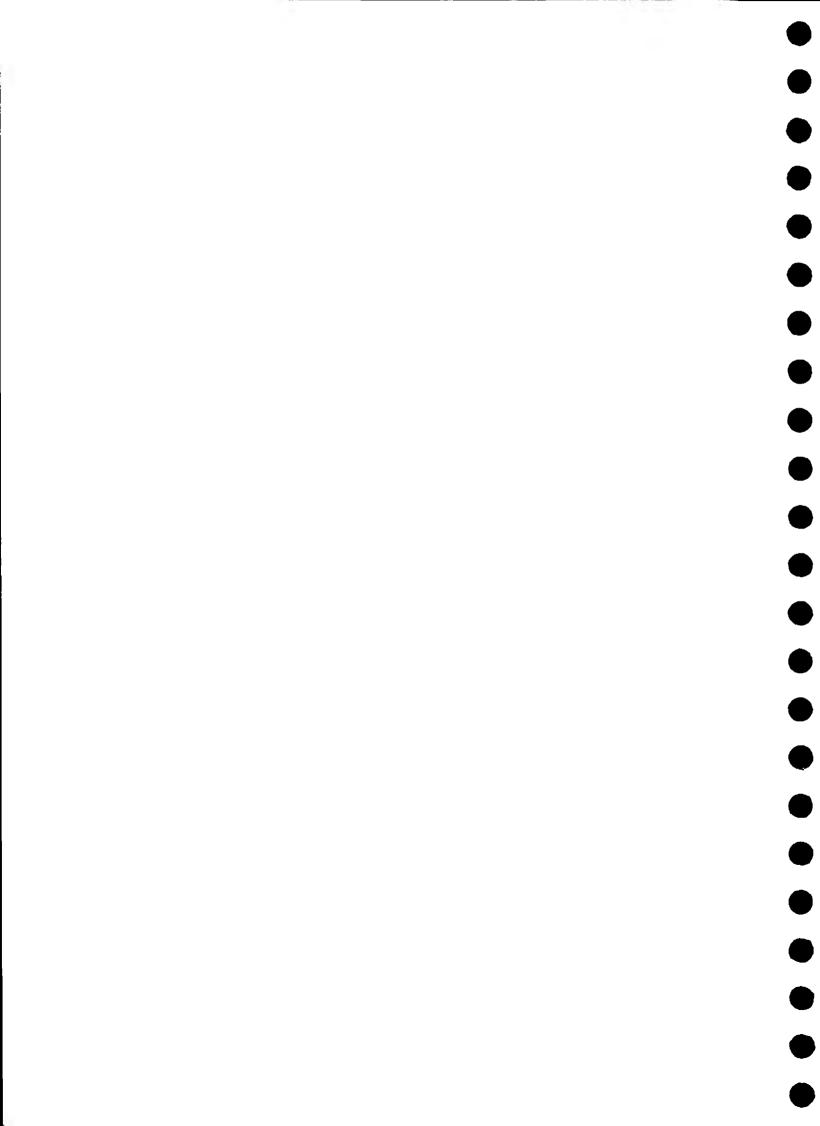
2006	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000 .000	.000	.000	.000	(.00)	.000	2006 60 .60 (ELEMENT TOTALS)
2001	CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX	13.500 13.500	8.720 8.720	.227	.081	(-29)	9.028	2001 30 30 (ELEMENT TOTALS)
1996	CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000	.000 .000	.000	.000	(.00)	.000	1996 175 175 (ELEMENT TOTALS)
2006	VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000 .000	.000	.651	.000	(1.66)	.651	2006 46 46 (ELEMENT TOTALS)
2016	R.SEVERN - R.TRENT (1) R.SEVERN - R.TRENT (1)	.000	.000	.000	.000	(.00)	.000	2016 100 100 (ELEMENT TOTALS)
2016	R.SEVERN - R.TRENT (2) R.SEVERN - R.TRENT (2)	26.000 26.000	7.008 7.008	.422	1.327	(1.47)	8.756	2016 85 85 (ELEMENT TOTALS)
2006	CRAIG GOCH - R.SEVERN (1) CRAIG GOCH - R.SEVERN (1)	.000	.000 .000	.000	.000	(.00)	.000	2006 491 491 (ELEMENT TOTALS)
2006	CRAIG GOCH - R.SEVERN (2) CRAIG GOCH - R.SEVERN (2)	44.500 44.500	21.480 21.480	.000	.000	(.00)	21.480	2006 491 491 (ELEMENT TOTALS)
2001	SHROPSHIRE GW - R.SEVERN SHROPSHIRE GW - R.SEVERN	.000	.000 .000	.000	.000	(.00)	.000	2001 155 155 (ELEMENT TOTALS)
2016	ABINGDON - R.THAMES ABINGDON - R.THAMES	.000	.000 .000	.000	.000	(.00)	.000	2016 146 146 (ELEMENT TOTALS)
1996	R.THAMES R.THAMES	.000	.000	.000	.000	(-00)	.000	1996 567 567 (ELEMENT TOTALS)
1996	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000	.000	.000	.000	(.00)	.000	1996 146 146 (ELEMENT TOTALS)
1996	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	1996 425 400 (ELEMENT TOTALS)
1996	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)	92.000 92.000	79.529 79.529	10.970	4.662	(1.04)	95.160	1996 425 425 (ELEMENT TOTALS)
2011	BIRMINGHAM GW	.000 .000	.000	.000	.000	(.00)	.000	2011 50 50 (ELEMENT TOTALS)
2001	R.SEVERN R.SEVERN	.000	.000 .000	.000	.000	(.00)	.000	2001 417 417 (ELEMENT TOTALS)
2006	THAMES REUSE THAMES REUSE	.000	.000	.000	.000	(.00)	.000	2006 36 36 (ELEMENT TOTALS)
2001	SEVERN REUSE SEVERN REUSE	.000	.000 .000	.000	.000	(.00)	.000	2001 114 114 (ELEMENT TOTALS)
2006	R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	.000	.000	.000	(.00)	.000	2006 40 40 (ELEMENT TOTALS)

Appendix 4 - Results for High Scenario Case HIGH5

R.SEVERN - WESSEX	.000	.000					2011 71 71
R.SEVERN - WESSEX	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
R.SEVERN - W.MIDLANDS	.000	.000					2001 258 258
R.SEVERN - W.MIDLANDS	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
R.TRENT - E.MIDLANDS	50.000	43.222					1996 310 310
R.TRENT - E.MIDLANDS	50.000	43.222	2.526	1.439	(.44)	47.187	(ELEMENT TOTALS)
DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000					1991 40 40
DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
BROAD OAK - MID KENT/FLKSTNE	47.500	47.500					1991 31 31
BROAD OAK - MID KENT/FLKSTNE	47.500	47.500	.866	.562	(1.71)	48.928	(ELEMENT TOTALS)
R.SEVERN - BRISTOL	.000	.000					2001 67 67
R.SEVERN - BRISTOL	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
VYRNWY - NORTH WEST	.000	.000					1991 147 147
VYRNWY - NORTH WEST	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
HUNTINGTON - NORTH WEST	.000	.000					2016 44 44
HUNTINGTON - NORTH WEST	.000	.000	.000	.000	(.00)	.000	(ELEMENT TOTALS)
FOR LINK ELEMENTS	440.5	00 288.070	18.3	10 11,28	6	317.6	66
	R.SEVERN - WESSEX R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS R.TRENT - E.MIDLANDS DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE R.SEVERN - BRISTOL R.SEVERN - BRISTOL VYRNWY - NORTH WEST HUNTINGTON - NORTH WEST	R.SEVERN - WESSEX .000 R.SEVERN - W.MIDLANDS .000 R.TRENT - E.MIDLANDS .000 R.TRENT - E.MIDLANDS .000 DERWENT VALLEY - SOUTH YORKSHIRE .000 DERWENT VALLEY - SOUTH YORKSHIRE .000 BROAD OAK - MID KENT/FLKSTNE 47.500 BROAD OAK - MID KENT/FLKSTNE 47.500 R.SEVERN - BRISTOL .000 VYRNWY - NORTH WEST .000 HUNTINGTON - NORTH WEST .000 HUNTINGTON - NORTH WEST .000	R.SEVERN - WESSEX .000 .000 R.SEVERN - W.MIDLANDS .000 .000 R.TRENT - E.MIDLANDS .000 .000 R.TRENT - E.MIDLANDS .50.000 43.222 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 R.SEVERN - BRISTOL .000 .000 R.SEVERN - BRISTOL .000 .000 VYRNWY - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000	R.SEVERN - WESSEX .000 .000 .000 R.SEVERN - W.MIDLANDS .000 .000 .000 R.TRENT - E.MIDLANDS .000 .000 .000 R.TRENT - E.MIDLANDS .50.000 43.222 R.TRENT - E.MIDLANDS .50.000 43.222 2.526 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 .000 BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 .866 R.SEVERN - BRISTOL .000 .000 R.SEVERN - BRISTOL .000 .000 VYRNWY - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000 .000	R.SEVERN - WESSEX .000 .000 .000 .000 R.SEVERN - W.MIDLANDS .000 .000 .000 .000 R.TRENT - E.MIDLANDS .000 .000 .000 .000 R.TRENT - E.MIDLANDS .50.000 43.222 .526 1.439 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 .000 .000 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 .000 .000 BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 .866 .562 R.SEVERN - BRISTOL .000 .000 .000 .000 VYRNWY - NORTH WEST .000 .000 .000 HUNTINGTON - NORTH WEST .000 .000 .000 HUNTINGTON - NORTH WEST .000 .000 .000	R.SEVERN - WESSEX .000 .000 .000 .000 (.00) R.SEVERN - W.MIDLANDS .000 .000 .000 .000 (.00) R.TRENT - E.MIDLANDS .000 .000 .000 .000 (.00) R.TRENT - E.MIDLANDS .50.000 43.222 2.526 1.439 (.44) DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 .000 .000 .000 (.00) BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 47.500 .866 .562 (1.71) R.SEVERN - BRISTOL .000 .000 .000 .000 .000 (.00) VYRNWY - NORTH WEST .000 .000 .000 .000 .000 .000 .000 VYRNWY - NORTH WEST .000 .000 .000 .000 .000 .000 .000 HUNTINGTON - NORTH WEST .000 .000 .000 .000 .000 .000 .000	R.SEVERN - WESSEX .000 .000 .000 .000 .000 (.00) .000 R.SEVERN - W.MIDLANDS SO.000 .000 .000 .000 .000 (.00) .000 R.TRENT - E.MIDLANDS SO.000 43.222 S.526 1.439 (.44) 47.187 DERWENT VALLEY - SOUTH YORKSHIRE .000 .000 .000 .000 .000 (.00) .000 BROAD OAK - MID KENT/FLKSTNE 47.500 47.500 .000 .000 .000 (.00) .000 R.SEVERN - BRISTOL .000 .000 .000 .000 .000 (.00) .000 VYRNWY - NORTH WEST .000 .000 VYRNWY - NORTH WEST .000 .000 HUNTINGTON - NORTH WEST .000 .000 .000 .000 .000 .000 (.00) .000 HUNTINGTON - NORTH WEST .000 .000 .000 .000 (.00) .000

UNIT COSTS OF LINKS

		DISCOUNTED (£M/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (£M)	DISCOUNTED TOTAL FLOW (TCMD)
1.	NORTH ESSEX				
	Trent(Unsuprtd) TOTAL:	. 18568 . 18568	50.87 50.87	25.28 25.28	136.13 136.13
2.	SOUTH ESSEX				
	Chelmsford Efflt	.03105	8.51	9.03	290.76
	Trent(Unsuprtd)	. 18568	50.87	61.20	329.59
	TOTAL:	.11320	31.01	70.23	620.35
3.	LONDON				
	Abingdon	. 21225	58.15	97.36	458.70
	Severn(Unsuprtd)	. 02301	6.30	45.24	1965.90
	Vyrnwy	.02908	7.97	1.23	42.36
	Craig Goch	. 04256	11.66	52.56	1235.19
	Shropshire Gw	.02301	6.30	4.20	182.58
	Thames Reuse	.00000	.00	.00	186.42
	Severn Reuse	.02301	6.30	14.52	630.88
	TOTAL:	.04575	12.53	215.11	4702.03
4.	OXFORD/SWINDON				
	Abingdon	.212 2 5	58.15	27.18	128.08
	Craig Goch	.04256	11.66	2.87	67.53
	Shropshire Gw	.02301	6.30	.10	4.19
	Severn Reuse	.02301	6.30	.16	6.74
	TOTAL:	. 14675	40.21	30.31	206.54
5.	WESSEX				
	Shropshire Gw	.00000	.00	.00	271.08
	Severn Reuse	.00000	.00	.00	23.59
	TOTAL:	.00000	.00	.00	294.68



Appendix 4 - Results for High Scenario Case HIGH5

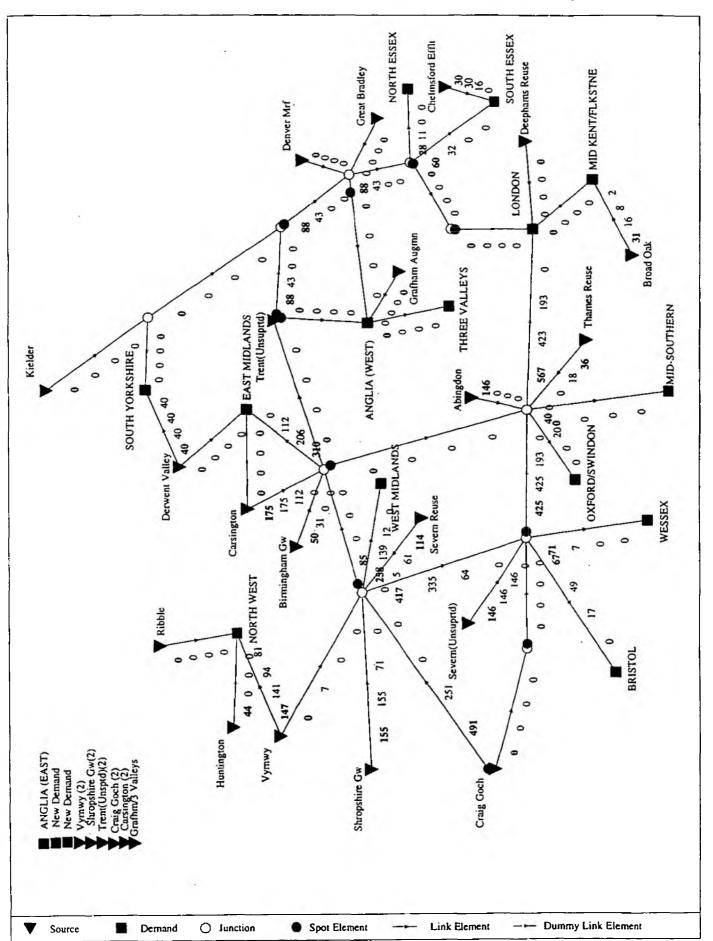
6.	WEST MIDLANDS	.00607	1.66	.39	64.91
	Craig Goch	.01954	5.35	19.75	1010.26
	Shropshire Gw	.00000	.00	.00	424.22
	TOTAL:	.01343	3.68	20.14	1499.38
	TOTAL.	.01343	3.00	20.14	1477.30
7.	EAST MIDLANDS				
	Carsington	.01904	5.22	35.75	1877.81
	Birmingham Gw	.03030	8.30	8.35	275.48
	Craig Goch	.06552	17.95	21.30	325.07
	TOTAL:	.02639	7.23	65.40	2478.35
8.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
			,,,,		33333
9.	MID KENT/FLKSTNE				
	Broad Oak	.21411	58.66	48.93	228.51
	TOTAL:	.21411	58.66	48.93	228.51
10.	BRISTOL				
	Shropshire Gw	.00000	.00	.00	489.11
	TOTAL:	.00000	.00	.00	489.11
11.	NORTH WEST				
	Vyrnwy	.00000	.00	.00	1849.25
	Kuntington	.08598	23.56	14.66	170.51
	TOTAL:	-00726	1.99	14.66	2019.76
	T W 1 F 1 M 2				20.7.10
	TOTAL			490.05	

DEVELOPMENT OF LINKS

_	SOURCE NAME	DEMAND NAME	FLOWS	INKOU	IGH TIM	F(ICMD)		
			1991	1996	2001	2006	2011	2016	2021
	Trent(Unsuprtd)	NORTH ESSEX	0	0	0	0	11	21	28
	Chelmsford Efflt	SOUTH ESSEX	0	0	16	30	30	30	30
V	Trent(Unsuprtd)	SOUTH ESSEX	0	0	0	9	32	50	60
	Abingdon	LONDON	0	0	0	0	0	81	108
1 200	Severn(Unsuprtd)	LONDON	0	96	146	146	146	146	146
	Vyrnwy	LONDON	0	0	0	15	7	0	0
	Craig Goch	LONDON	0	0	0	81	191	160	172
	Shropshire Gw	LONDON	0	0	42	31	0	0	0
12	Thames Reuse	LONDON	0	0	0	2	18	28	36
	Severn Reuse	LONDON	0	0	5	32	61	86	105
v	Abingdon	OXFORD/SWINDON	0	0	0	. 0	0	0	38
	Craig Goch	OXFORD/SWINDON	0	0	0	0	20	31	0
_	Shropshire Gw	OXFORD/SWINDON	0	0	0	2	0	Đ	0
	Severn Reuse	OXFORD/SWINDON	0	0	0	0	0	0	2
v	Shropshire Gw	WESSEX	0	0	0	0	7	38	64
	Severn Reuse	WESSEX	0	0	0	0	0	0	7
75.0	Vyrnwy	WEST MIDLANDS	0	0	0	31	0	0	0
	Craig Goch	WEST MIDLANDS	0	0	0	0	40	136	234
	Shropshire Gw	WEST MIDLANDS	0	0	12	41	99	59	24
	Carsington	EAST MIDLANDS	0	44	112	158	175	175	175
	Birmingham Gw	EAST MIDLANDS	0	0	0	0	31	50	50
	Craig Goch	EAST MIDLANDS	0	0	0	0	0	33	85
	Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
	Broad Oak	MID KENT/FLKSTNE	2	5	8	12	16	24	31
	Shropshire Gw	BRISTOL	0	0	17	34	49	58	67
	Vyrnwy	NORTH WEST	81	70	94	118	141	147	147
	Huntington	NORTH WEST	0	0	0	0	0	19	44
	TOTALS		123	255	492	782	1114	1412	1693
			1						

SUMMARY OF CAPITAL COSTS;

					Appe		xesuits io	r rigii 3	cellal lo Cas	HIG
	CATEGORY		TAL COST INC 2001 2006							
	SOURCES LINK ELEMENTS	.0 .0 47.5 142.0	.0 60.5 13.5 211.5	5 2.7 5 .0	438.6 26.0	.0 .0				
	TOTALS		13.5 272.0							
SUMMARY OF	F TOTAL COSTS OF OPER/									
	CATEGORY		S OF OPERATION))			
	SOURCES LINK ELEMENTS	.0 .0 .0 2.3			13.3 16.3					
	TOTALS	.0 2.3	4.9 9.0	14.8	29.6	43.4				
******	TOTAL DISCOUNTED CO: TOTAL DISCOUNTED CA: TOTAL DISCOUNTED CO: TOTAL CAPITAL OUTLA' TOTAL COSTS OF OPER	PITAL COST STS OF OPERAT	≖EM HG = EM	440.92°	1 4 (ALLOW	ANCE INCLUDI	ED FOR BEYO	ND 2021 =	EM 25.194)	
*****	TOTAL DISCOUNTED DE	MANDS	= 13	3357.87	O TCMD	****	*****	******	****	****
RESULTS OF	F CHECKS ON VALIDITY (A. ALL SUPPLY DEFIC B. NO DEMAND CENTRE: C. TAKE FROM SOURCE:	IENCIES MET : S OVER SUPPL:	IN FULL. IED.	D YIELD						
********	*******	****	*****	****	*****	****	*****	*****	****	****



DATE : 28- 2-1994 TIME : 10:24:41.15

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

	FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
			(TCMD) (£H)	(EH)	(ĐI)	(£4)	(EH)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
,	1991	Vyrnwy	147	.000	.000	.000	.000	.000
	2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
	2001	Carsington	140	.000	.000	.000	.000	.000
	2011	Great Bradley	174	69.400	25.784	.000	.000	25.784
,	2011	Broad Oak	40	.000	.000	.000	.000	.000
2	2011	Severn Reuse	26	.000	.000	.000	.000	.000
	2016	Severn(Unsuprtd)	146	.000	.000	-000	.000	.000
	2021	Birmingham Gw	3	.264	.055	.008	.051	.114
	2021	Thames Reuse	18	.000	.000	.000	.000	.000
	TOTAL	S FOR SOURCES		69.664	25.838	.008	.051	25.898

UNUSED YIELDS OF DEVELOPED SOURCES

SOURCE NAME	SPARE TIELUS THROUGH TIME(TCMD)						
	1991	1996	2001	2006	2011	2016	2021
Great Bradley	174	174	174	174	172	152	132
Chelmsford Efflt	30	30	28	13	0	0	0
Carsington	140	140	108	82	57	27	0
Derwent Valley	0	0	0	0	0	0	0
Severn(Unsuprtd)	146	146	146	146	146	133	98
Birmingham Gw	50	50	50	50	50	50	47
Vyrnwy	66	92	115	103	80	56	27
Broad Oak	40	40	40	40	39	36	34
Thames Reuse	0	0	0	0	0	12	0
Severn Reuse	0	0	0	0	0	0	0

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME

FLOWS THROUGH TIME(TCMD)

1991 1996 2001 2006 2011 2016 2021

ELY QUSE - ESSEX	0	0	0	0	2	22	42
GREAT BRADLEY	0	0	0	0	2	22	42
ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	0	4	14
ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	0	2	18	28
CHELMSFORD EFFLT - SOUTH ESSEX	0	0	2	17	30	30	30
CARSINGTON - R.TRENT	0	0	40	72	104	141	175
VYRNWY - R.SEVERN	0	0	7	18	36	51	75
R. THAMES	0	0	0	0	0	0	46
R.SEVERN (UNSUPRTD)	0	0	0	0	0	13	48
R.SEVERN - R.THAMES (1)	0	0	0	0	0	13	48
R.SEVERN - R.THAMES (2)	0	0	0	0	0	13	48
BIRMINGHAM GW	0	0	0	0	0	0	3
R.SEVERN	0	0	7	18	30	37	43
THAMES REUSE	0	0	0	0	0	0	18
SEVERN REUSE	0	0	0	0	5	11	26
R.THAMES - OXFORD/SWINDON	0	0	0	0	0	13	20
R.SEVERN - W.MIDLANDS	0	0	0	0	11	25	58
R.TRENT - E.MIDLANDS	0	0	40	72	104	141	178
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40
BROAD OAK - MID KENT/FLKSTNE	0	0	0	0	1	4	6
R.SEVERN - BRISTOL	0	0	7	18	30	37	43
VYRNWY - NORTH WEST	81	55	28	34	48	64	80

YEA FIR USE		TOTAL CAPITAL COST	DISCOUNTED CAPITAL COST	OF OP	ERATION		UNIT COST OF	TOTAL DISCO COST	UNTED	FOR	YEAI	ION
		(EM)	(£M)		21 BEYOND (EM)	2021	OPERATION (P/M3)	(EM)				G PEAK (CMD)
201	1 ELY OUSE - ESSEX ELY OUSE - ESSEX	.000 .000	.000 .000	.429	1.078	(2	.42) 1	.508	201 ELEME	•	42 OTAL	
201	1 GREAT BRADLEY GREAT BRADLEY	.000 .000	.000	.000	.000	(.00)	.000	201 C ELEME		42 OTAL	
201	6 ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000	.000 .000	.000	.000	(.00)	.000	201 (ELEME		14 TOTAL	
201	1 ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000	.000	.000	.000	(.00)	.000	201 (ELEME		28 TOTAL:	
200	1 CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX		8.720 8.720	.227	.081	(.38) 9	.028	200 (ELEME		30 FOTAL:	
200	1 CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000 .000	.000	.000	.000	(.00)	.000	200 (ELEME		175 TOTAL:	
200	1 VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000	.000	1.441	.517	(1	.26) 1	.958	200 (ELEME		75 TOTAL	
202	1 R.THAMES R.THAMES	.000	.000	.000	.000	(.00)	.000	202 (ELEME		46 TOTAL	
201	6 R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000	.000	.000	.000	(.00)	.000	201 (ELEME		48 TOTAL	
201	6 R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	201 (ELEME		425 TOTAL	

Appendix 4 - Results for Medium Scenario Case MED1

•	2016	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)		24.797 24.797	. 142	.527	(1.04)	25.466	2016 48 48 (ELEMENT TOTALS)
•	2021	BIRMINGHAM GW BIRMINGHAM GW	.000 .000	.000 .000	.000	.000	(.00)	.000	2021 3 3 (ELEMENT TOTALS)
•	2001	R.SEVERN R.SEVERN	.000 .000	.000 .000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
•	2021	THAMES REUSE THAMES REUSE	.000 .000	.000 .000	.000	.000	(.00)	.000	2021 18 18 (ELEMENT TOTALS)
•	2011	SEVERN REUSE SEVERN REUSE	.000	.000 .000	.000	.000	(.00)	.000	2011 26 26 (ELEMENT TOTALS)
•	2016	RETHAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000 .000	.000 .000	.000	.000	(.00)	.000	2016 20 20 (ELEMENT TOTALS)
•	2011	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000	.000	. 000	.000	(.00)	.000	2011 58 58 (ELEMENT TOTALS)
•	2001	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS		32.298 32.298	1.078	.826	(_44)	34.203	2001 178 178 (ELEMENT TOTALS)
•	1991	DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000 .000	.000 .000	-000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
•	2011	BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE		17.133 17.133	.057	.109	(1.71)	17.299	2011 6 6 (ELEMENT TOTALS)
•	2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000	.000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
•	1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000	-000	.000	(.00)	.000	1991 81 81 (ELEMENT TOTALS)
	TOTALS	FOR LINK ELEMENTS	203.0	000 82.949	3.375	3.138		89.462	

UNIT COSTS OF LINKS

	DISCOUNTED (EM/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (EM)	
1. NORTH ESSEX	3-1			
Great Bradley	. 16015	43.88	8.31	51.86
TOTAL:	.16015	43.88	8.31	51.86
2. SOUTH ESSEX				
Great Bradley	.16015	43.88	18. 99	118.54
Chelmsford Efflt	.04025	11.03	9.03	224.32
TOTAL:	.08171	22.39	28.01	342.86
3. LONDON				
Severn(Unsuprtd)	.14390	39.42	13.58	94.37
Thames Reuse	.00000	.00	-00	60.67
TOTAL:	.08759	24.00	13.58	155.04

4.	OXFORD/SWINDON				
	Severn(Unsuprtd)	.14390	39.42	11.89	82.61
	TOTAL:	.14390	39.42	11.89	82.61
5.	WEST MIDLANDS				
	Vyrnwy	.00460	1.26	1.11	241.92
	TOTAL:	.00460	1.26	1.11	241.92
6.	EAST MIDLANDS				
	Carsington	.02873	7.87	33.91	1180.20
	Birmingham Gw	.04005	10.97	.40	10.11
	TOTAL:	.02883	7.90	34.32	1190.31
7.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
8.	MID KENT/FLKSTNE				
	Broad Oak	.65368	179.09	17.30	26.4 6
	TOTAL:	.65368	179.09	17.30	26.46
9.	BRISTOL .	i.			
	Vyrnwy	.00460	1.26	.85	184.11
	Severn Reuse	.00000	.00	.00	108.31
	TOTAL:	.00289	.79	.85	292.42
10.	NORTH WEST				
	Vyrnwy	.00000	.00	.00	963.86
	TOTAL:	.00000	.00	.00	963.86
	TOTAL			115.36	

DEVELOPMENT OF LINKS

	SOURCE NAME	DEMAND NAME	FLOWS	THROU	IGH TIM	E(TCMD)		
			1991	1996	2001	2006	2011	2016	2021
	Great Bradley	NORTH ESSEX	0	0	0	0	0	4	14
	Great Bradley	SOUTH ESSEX	0	0	0	0	2	18	28
2	Chelmsford Efflt	SOUTH ESSEX	0	0	2	17	30	30	30
	Severn(Unsuprtd)	LONDON	0	0	0	0	0	0	28
	Thames Reuse	LONDON	0	0	0	0	0	0	18
	Severn(Unsuprtd)	OXFORD/SWINDON	0	0	0	0	0	13	20
	Vyrnwy	WEST MIDLANDS	0	0	0	0	11	25	58
	Carsington	EAST MIDLANDS	Ó	Ō	40	72	104	141	175
,	Birmingham Gw	EAST MIDLANDS	0	0	0	0	0	0	3
77	Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
	Broad Dak	MID KENT/FLKSTNE	0	0	0	0	- 1	4	6
	Vyrnwy	BRISTOL	Ō	Ò	7	18	25	26	17
•	Severn Reuse	BRISTOL	Ô	0	0	0	5	11	26
	Vyrnwy	NORTH WEST	81	55	28	34	48	64	80
	TOTALS		121	95	117	181	266	376	543

SUMMARY OF CAPITAL COSTS;

CATEGORY			_		RRED I 2011		00S (E4) 2021
SOURCES LINK ELEMENTS	.0 .0				69.4 47.5		.3
TOTALS	.0	.0	63.5	.0	116.9	92.0	.3

SUMMARY OF TOTAL COSTS OF OPERATION;

TOTAL COSTS OF OPERATION THROUGH TIME (EM/PERIOD) 1991 1996 2001 2006 2011 2016 2021 SOURCES .0 .0 .0 .0 LINK ELEMENTS .0 .0 1.4 1.6 2.0 3.5 .0 .0 TOTALS 1.4 1.6 2.0 3.5 5.5

COST SUMMARY

TOTAL DISCOUNTED COST FOR PLAN
TOTAL DISCOUNTED CAPITAL COST
TOTAL DISCOUNTED COSTS OF OPERATION
TOTAL CAPITAL OUTLAY TO 2021
TOTAL COSTS OF OPERATION TO 2021

272.664
13.935

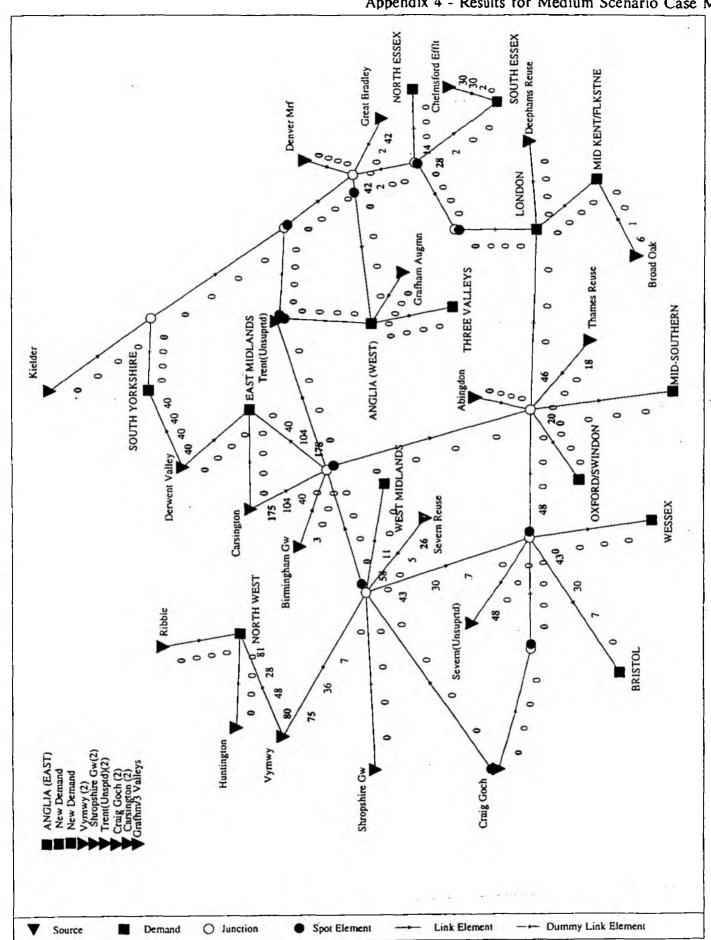
TOTAL DISCOUNTED DEMANDS = 4030.372 TCMD

RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;

A. ALL SUPPLY DEFICIENCIES MET IN FULL.

B. NO DEMAND CENTRES OVER SUPPLIED.

C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.



DATE : 28- 2-1994 TIME : 10:26:17.33

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

)	FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
)			(TCMD)	(EM)	(EH)	(EM)	(£H)	(EM)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
	1991	Vyrnwy	147	.000	.000	.000	.000	.000
)	2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
	2001	Carsington	140	.000	.000	.000	.000	.000
	2011	Trent (Unsuprtd)	105	.000	.000	.000	.000	.000
	2011	Broad Oak	40	.000	.000	.000	.000	.000
)	2011	Severn Reuse	26	.000	.000	.000	.000	.000
	2016	Severn(Unsuprtd)	146	.000	.000	.000	.000	.000
	2021	Birmingham G₩	3	.264	. 055	.008	.051	.114
١	2021	Thames Reuse	18	.000	,000	.000	.000	.000
	TOTAL	S FOR SOURCES		.264	.055	.008	.051	.114

UNUSED YIELDS OF DEVELOPED SOURCES

SOURCE NAME	SPARE	YIELDS	THROU	IGH TIM	E (TCMD)	
	1991	1996	2001	2006	2011	2016	2021
Chelmsford Efflt	30	30	28	13	0	0	0
Trent(Unsuprtd)	105	105	105	105	103	83	63
Carsington	140	140	108	82	57	27	0
Derwent Valley	0	0	0	0	0	0	0
Severn(Unsuprtd)	146	146	146	146	146	133	98
Birmingham Gw	50	50	50	50	50	50	47
Vyrnuy	66	92	115	103	80	56	27
Broad Oak	40	40	40	40	39	36	34

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME

Thames Reuse

Severn Reuse

FLOWS THROUGH TIME(TCMD)

1991 1996 2001 2006 2011 2016 2021

ELY OUSE - ESSEX

0 0 0 0 2 22 42

12

	ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	0	4	14
d	R.TRENT - R.WITHAM (1)	0	0	0	0	2	22	42
١	R.TRENT - R.WITHAM (2)	0	0	0	0	2	22	42
	R.WITHAM - R.ELY OUSE (1)	0	0	0	0	2	22	42
	R.WITHAM - R.ELY OUSE (2)	0	0	0	0	2	22	42
	ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	0	2	18	28
١	CHELMSFORD EFFLT - SOUTH ESSEX	0	0	2	17	30	30	30
,	CARSINGTON - R.TRENT	0	0	40	72	104	141	175
	VYRNWY - R.SEVERN	0	0	7	18	36	51	75
	R.THAMES	0	0	0	0	0	0	46
١	R.SEVERN (UNSUPRTD)	0	0	0	0	0	13	48
,	R.SEVERN - R.THAMES (1)	0	0	0	0	0	13	48
	R.SEVERN - R.THAMES (2)	0	0	0	0	0	13	48
	BIRMINGHAM GW	0	0	0	0	0	0	3
١	R.SEVERN	0	0	7	18	30	37	43
,	THAMES REUSE	0	0	0	0	0	0	18
	SEVERN REUSE	0	0	0	0	5	11	26
	R.THAMES - OXFORD/SWINDON	0	0	0	0	0	13	20
١	R.SEVERN - W.MIDLANDS	0	0	0	0	11	25	58
,	R.TRENT - E.MIDLANDS	0	0	40	72	104	141	178
	DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40
	BROAD OAK - MID KENT/FLKSTNE	0	0	0	0	1	4	6
١	R.SEVERN - BRISTOL	0	0	7	18	30	37	43
,	VYRNWY - NORTH WEST	81	55	28	34	48	64	80

YEAR FIRST USED	ELEMENT NAME	TOTAL CAPITA COST (£M)	DISCOUNTED L CAPITAL COST (ÉM)	OF OP	UNTED COST ERATION 21 BEYOND (£M)		UNIT COST OF OPERATION (P/M3)	COST	OUNTED		
2011	ELY OUSE - ESSEX ELY OUSE - ESSEX	.000 .000	.000	.429	1.078	(2	.42)	1.508	201 (ELEME	1 42 4 NT TOTALS	
2016	ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000	.000 .000	.000	.000	(.00)	.000	2016 (ELEME	5 14 1 NT TOTALS	
2011	R.TRENT - R.WITHAM (1) R.TRENT - R.WITHAM (1)	.000 .000	.000 .000	.000	.000	(.00)	.000	201 (ELEME	1 42 4 NT TOTALS	
2011	R.TRENT - R.WITHAM (2) R.TRENT - R.WITHAM (2)	18.000 18.000	6.493 6.493	.015	.038	(. 08)	6.545	201 (ELEME	1 42 4 NT TOTALS	
2011	R.WITHAM - R.ELY OUSE (1) R.WITHAM - R.ELY OUSE (1)	.000 .000	. 000 . 000	.000	.000	(.00)	.000	201 (ELEME	1 42 4 NT TOTALS	
2011	R.WITHAM - R.ELY OUSE (2) R.WITHAM - R.ELY OUSE (2)	149_000 149_000		.167	.418	(.94)	54.329	201 (ELEME	1 42 4 NT TOTALS	_
2011	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000	.000 .000	.000	.000	(.	.00)	.000	201 (ELEME	1 28 2 NT TOTALS	28
2001	CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX	13.500 13.500	8.720 8.720	.227	.081	(.	.38)	9.028	200	1 30 3 NT TOTALS	30
2001	CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000	.000	.000	.000	•	.00)	.000		1 175 17 NT TOTALS	
2001	VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000	.000	1.441	.517	(1.	.26)	1.958	200 (ELEME	1 75 7 NT TOTALS	75)

Appendix 4 - Results for Medium Scenario Case MED2

			•	•				
2021	R.THAMES R.THAMES	.000	.000 .000	.000	.000	(.00)	.000	2021 46 46 (ELEMENT TOTALS)
2016	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000 .000	.000	.000	.000	(.00)	.000	2016 48 48 (ELEMENT TOTALS)
2016	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000	.000	.000	(.00)	.000	2016 425 400 (ELEMENT TOTALS)
2016	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)	92.000 92.000	24.797 24.797	.142	.527	(1.04)	25.466	2016 48 48 (ELEMENT TOTALS)
2021	BIRMINGHAM GW BIRMINGHAM GW	,000 ,000	.000 .000	.000	.000	(.00)	.000	2021 3 3 (ELEMENT TOTALS)
2001	R.SEVERN R.SEVERN	.000	.000 .000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
2021	THAMES REUSE THAMES REUSE	.000	.000 .000	.000	.000	(.00)	.000	2021 18 18 (ELEMENT TOTALS)
2011	SEVERN REUSE SEVERN REUSE	.000	.000	.000	.000	(.00)	.000	2011 26 26 (ELEMENT TOTALS)
2016	R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	, 000 , 000	.000	.000	(.00)	.000	2016 20 20 (ELEMENT TOTALS)
2011	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000	.000 .000	.000	.000	(.00)	.000	2011 58 58 (ELEMENT TOTALS)
2001	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS	50.000 50.000	32.298 32.298	1.078	.826	(.44)	34.203	2001 178 178 (ELEMENT TOTALS)
1991	DERWENT VALLEY - SOUTH YORKSH DERWENT VALLEY - SOUTH YORKSH		.000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
2011	BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE	47.500 47.500	17.133 17.133	.057	.109	(1.71)	17.299	2011 6 6 (ELEMENT TOTALS)
2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000	.000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000	.000	.000	(.00)	.000	1991 B1 B1 (ELEMENT TOTALS)
TOTALS	FOR LINK ELEMENTS	370.0	00 143.186	3.556	3.594		150.336	5

UNIT COSTS OF LINKS

DISCOUNTED UNIT COSTS (£M/TCHD) (P/M3)

DISCOUNTED DISCOUNTED TOTAL COST TOTAL FLOW (EM) (TCMD)

1. NORTH ESSEX Trent(Unsuprtd)

.36608 100.30

18.99

51.86

	TOTAL:	.36608	100.30	18.99	51.86
2.	SOUTH ESSEX				
	Chelmsford Efflt	.04025	11.03	9.03	224.32
	Trent(Unsuprtd)	.36608	100.30	43.40	118.54
	TOTAL:	. 15290	41.89	52.43	342.86
	TOTAL		4	72.143	542100
3.	LONDON				
	Severn(Unsuprtd)	. 14390	39.42	13.58	94.37
	Thames Reuse	.00000	.00	.00	60.67
	TOTAL:	.08759	24.00	13.58	155.04
4.	OXFORD/SWINDON				
	Severn(Unsuprtd)	. 14390	39.42	11.89	82.61
	TOTAL:	.14390	39.42	11.89	82.61
5.	WEST MIDLANDS				
	Vyrnwy	.00460	1.26	1.11	241.92
	TOTAL:	.00460	1.26	1.11	241.92
6.	EAST MIDLANDS				
٠.	Carsington	. 02873	7.87	33.91	1180.20
	Birmingham Gw	.04005	10.97	.40	10.11
	TOTAL:	.02883	7.90	34.32	1190.31
	701761	.02,000		54.52	
. 7.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.0 0	.00	683.02
A	MID KENT/FLKSTNE				
٠.	Broad Oak	.65368	179.09	17.30	26.46
	TOTAL:	.65368	179.09	17.30	26.46
	I O I NE I	102300	.,,,,,,		201.12
9.	BRISTOL				
	Vyrnwy	.00460	1.26	.85	184.11
	Severn Reuse	.00000	.00	.00	108.31
	TOTAL:	.00289	.79	.85	292.42
10	NORTH WEST				
10.	Vyrnwy	.00000	.00	.00	963.86
	TOTAL:	.00000	.00	.00	963.86
	IVIAL.	.00000	.00	.00	,00,00
	TOTAL			150.45	

DEVELOPMENT OF LINKS

SOURCE NAME	DEMAND NAME	FLOWS	THROU	GH TIM	E (TCMD)		
		1991	1996	2001	2006	2011	2016	2021
Trent(Unsuprtd)	NORTH ESSEX	0	0	0	0	0	4	14
Chelmsford Efflt	SOUTH ESSEX	0	0	2	17	30	30	30
Trent(Unsuprtd)	SOUTH ESSEX	0	0	0	0	2	18	28
Severn(Unsuprtd)	LONDON	0	0	0	0	0	0	28
Thames Reuse	LONDON	0	0	0	0	0	0	18
Severn(Unsuprtd)	OXFORD/SWINDON	0	0	0	0	0	13	20
Vyrnwy	WEST MIDLANDS	0	0	0	0	11	25	58
Carsington	EAST MIDLANDS	0	٥	40	72	104	141	175
Birmingham Gw	EAST MIDLANDS	0	0	0	0	0	0	3
Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
Broad Oak	MID KENT/FLKSTNE	Ö	Ó	0	0	1	4	6
Vyrnwy	BRISTOL	0	0	7	18	25	26	17.
Severn Reuse	BRISTOL	Ô	Ó	0	0	5	11	26
Vyrnwy	NORTH WEST	81	55	28	34	48	64	80
TOTALS		121	95	117	181	266	376	543

SUMMARY OF CAPITAL COSTS;

CATEGORY		1996					(00\$ (£4) 2021	-	
SOURCES	. (0.	.0	.0	.0	.0	.3		
LINK ELEMENTS		0.	63.5	.0	214.5	92.0	.0		
TOTALS	.(0.	63.5	.0	214.5	92.0	.3		
**********	*****	****		****	*****	***	*****	*************	****

SUMMARY OF TOTAL COSTS OF OPERATION;

CATEGORY				2006				PERIOD)
SOURCES LINK ELEMENTS	.0 .0			.0 1.6				
TOTALS	.0	.0	1.4	1.6	2.0	3.9	6.3	

COST SUMMARY

TOTAL DISCOUNTED COST FOR PLAN
TOTAL DISCOUNTED CAPITAL COST
TOTAL DISCOUNTED COSTS OF OPERATION
TOTAL CAPITAL OUTLAY TO 2021

TOTAL COSTS OF OPERATION TO 2021

7.210 (ALLOWANCE INCLUDED FOR BEYOND 2021 = £M 3.645)
3.645)
3.645

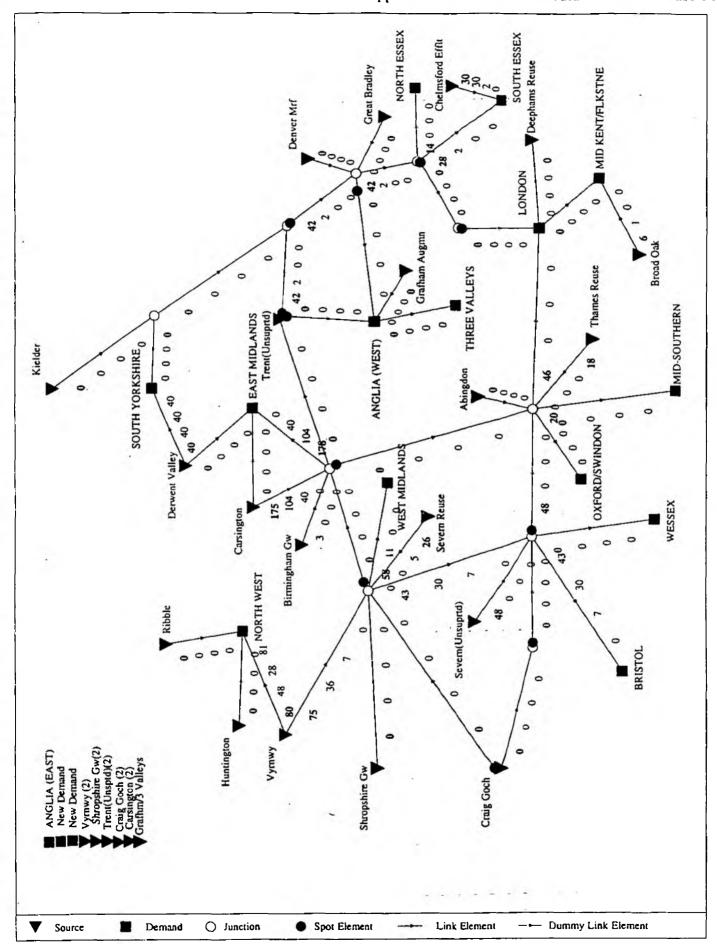
TOTAL DISCOUNTED DEMANDS = 4030.372 TCMD

RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;

A. ALL SUPPLY DEFICIENCIES MET IN FULL.

B. NO DEMAND CENTRES OVER SUPPLIED.

C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.



DATE : 28- 2-1994 TIME : 10:28:12.12

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
		(TCM	D) (£M)	(£H)	(EM)	(ĐI)	(EM)
1991	Derwent Valley	40	.000	.000	.000	.000	.000
1991	Vyrnwy	147	.000	.000	.000	.000	.000
2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
2001	Carsington	140	.000	.000	.000	.000	.000
2011	Great Bradley	174	69.400	25.784	.000	.000	25.784
2011	Broad Oak	40	,000	.000	.000	.000	.000
2011	Severn Reuse	26	.000	.000	.000	.000	.000
2016	Abingdon	262	400.000	111.049	1.061	4.405	116.515
2021	Birmingham Gw	3	.264	.055	.008	-051	.114
TOTAL	S FOR SOURCES		469.664	136.888	1.069	4.456	142,413

SPARE VIELDS THROUGH TIME(TOWN)

UNUSED YIELDS OF DEVELOPED SOURCES

SOURCE MAME

SOURCE NAME	STARE HELDS (TROUGH HALLICAD)									
	1991	1996	2001	2006	2011	2016	2021			
Great Bradley	174	174	174	174	172	152	132			
Cheimsford Efflt	30	30	28	13	0	0	0			
Abingdon	262	262	262	262	262	249	196			
Carsington	140	140	108	82	57	27	0			
Derwent Valley	0	0	0	0	0	0	0			
Birmingham Gw	50	50	50	50	50	50	47			
Vyrnwy	66	92	115	103	80	56	27			
Broad Oak	40	40	40	40	39	36	34			
Severn Reuse	0	0	0	0	0	0	0			
	Great Bradley Chelmsford Efflt Abingdon Carsington Derwent Valley Birmingham Gw Vyrnwy Broad Oak	Great Bradley 174 Cheimsford Effit 30 Abingdon 262 Carsington 140 Derwent Valley 0 Birmingham Gw 50 Vyrnwy 66 Broad Oak 40	1991 1996	1991 1996 2001 Great Bradley	1991 1996 2001 2006 Great Bradley	1991 1996 2001 2006 2011	1991 1996 2001 2006 2011 2016 Great Bradley			

DEMAND FLOWS THROUGH LINK ELEMENTS

ELY-OUSE ESSEX - NORTH ESSEX

	LINK ELEMENT HAURE	rtoms inkoodn limeticady								
)		1991	1996	2001	2006	2011	2016	2021		
	ELY OUSE - ESSEX GREAT BRADLEY	0	0	0	0	2		42		
	UKEAI DRADLEI	V	U	v	u	_	~~	72		

14

ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	0	2	18	28
CHELMSFORD EFFLT - SOUTH ESSEX	0	0	2	17	30	30	30
CARSINGTON - R.TRENT	0	0	40	72	104	141	175
VYRNWY - R.SEVERN	0	0	7	18	36	51	75
ABINGDON - R.THAMES	0	0	0	0	0	13	66
R.THAMES	0	0	0	0	0	0	46
BIRMINGHAM GW	0	0	0	0	0	0	3
R.SEVERN	0	0	7	18	30	37	43
SEVERN REUSE	0	0	0	0	5	11	26
R.THAMES - OXFORD/SWINDON	0	0	0	0	0	13	20
R.SEVERN - W.MIDLANDS	0	0	0	0	11	25	58
R.TRENT - E.MIDLANDS	0	0	40	72	104	141	178
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40
BROAD OAK - MID KENT/FLKSTNE	0	0	0	0	1	4	6
R.SEVERN - BRISTOL	0	0	7	18	30	37	43
VYRNWY - NORTH WEST	81	55	28	34	48	64	80

YEAR FIRST USED	ELEMENT NAME	TOTAL CAPITAL COST	DISCOUNTED CAPITAL COST	OF OPI	ERATION		UNIT COST OF	COST	OUNTED	FOR	YEAR	ON
		(EH)	(£H)		21 BETOND (£M)	2021	OPERATION (P/M3)	(EN)				PEAK CMD)
2011	ELY OUSE - ESSEX ELY OUSE - ESSEX	.000 .000	.000	.429	1.078	(2	.42)	1.508	20 (ELEM		42 Otals	
2011	GREAT BRADLEY GREAT BRADLEY	.000	.000	.000	.000	(.00)	.000	20 (ELEM		42 Otals	-
2016	ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000	.000	.000	.000	(.00)	.000	20 (ELEM		14 OTALS	
2011	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000	.000	.000	.000	(.00)	.000	20 (ELEM			28
2001	CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX		8.720 8.720	.227	.081	(.38)	9.028	20 (ELEM		30 Otals	
2001	CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000 .000	.000	.000	.000	(.00)	.000	204 (ELEM		75 1 OTALS	
2001	VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000	.000	1.441	.517	(1 .	.26)	1.958	20 (ELEM		75 OTALS	
2016	ABINGDON - R.THAMES ABINGDON - R.THAMES	.000	.000	.000	.000	(.00)	.000	20 (ELEM		66 Otals	
2021	R.THAMES R.THAMES	.000	.000	.000	.000	(.00)	.000	20 (ELEM		46 OTALS	-
2021	BIRMINGHAM GW BIRMINGHAM GW	.000	.000	.000	.000	(.00)	.000	20 (ELEM		3 Otals	3
2001	R.SEVERN R.SEVERN	.000	.000	.000	.000	(.	.00)	.000	20 (ELEM		43 Otals	
2011	SEVERN REUSE SEVERN REUSE	.000	.000	.000	.000	(.	.00)	.000	20 (ELEM			26

Appendix 4 - Results for Medium Scenario Case MED3

2016	R.THAMES - OXFORD/SWINDON	.000	.000					2016	20 20
	R.THAMES - OXFORD/SWINDON	.000	.000	.000	.000	(.00)	.000	(ELEMENT	TOTALS)
2011	R.SEVERN - W.MIDLANDS	.000	.000					2011	58 58
	R.SEVERN - W.MIDLANDS	.000	.000	.000	.000	(.00)	.000	(ELEMENT	TOTALS)
2001	R.TRENT - E.MIDLANDS	50.000	32.298					2001	178 178
	R.TRENT - E.MIDLANDS	50.000	32.298	1.078	.826	(.44)	34.203	(ELEMENT	TOTALS)
1991	DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000					1991	40 40
	DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000	.000	.000	(.00)	.000	(ELEMENT	TOTALS)
2011	BROAD OAK - MID KENT/FLKSTNE	47.500	17.133					2011	6 6
	BROAD OAK - MID KENT/FLKSTNE	47.500	17.133	.057	.109	(1.71)	17.299	(ELEMENT	TOTALS)
2001	R.SEVERN - BRISTOL	.000	.000					2001	43 43
	R.SEVERN - BRISTOL	.000	.000	.000	.000	(.00)	.000	(ELEMENT	TOTALS)
1991	VYRNWY - NORTH WEST	.000	.000					1991	81 81
	VYRNWY - NORTH WEST	.000	.000	.000	.000	(.00)	.000	(ELEMENT	TOTALS)
TOTALS	FOR LINK ELEMENTS	111.0	00 58.152	3.23	2 2.61	1	63.99	95	

UNIT COSTS OF LINKS

	÷	DISCOUNTED (£M/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (EM)	DISCOUNTED TOTAL FLOW (TCMD)
1.	NORTH ESSEX				
	Great Bradley TOTAL:	.16015 .16015	43.88 43.88	8.31 8.31	51.86 51.86
2.	SOUTH ESSEX				
	Great Bradley	. 16015	43.88	18.99	118.54
	Chelmsford Efflt	.04025	11.03	9.03	224.32
	TOTAL:	.08171	22.39	28.01	342.86
3.	LONDÓN				
	Abingdon	.49029	134.33	76.01	155.04
	TOTAL:	.49029	134.33	76.01	155.04
4.	OXFORD/SWINDON				
	Abingdon	.4 9 029	134.33	40.50	82.61
	TOTAL:	.49029	134.33	40.50	82.61
5.	WEST MIDLANDS				
	Vyrnwy	.00460	1.26	1.11	241.92
	TOTAL:	.00460	1.26	1.11	241.92
6.	EAST MIDLANDS				
	Carsington	.02873	7.87	33.91	1180.20
	Birmingham Gw	.04005	10.97	.40	10.11
	TOTAL:	.02883	7.90	34.32	1190.31
7.	SOUTH YORKSHIRE				400.00
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
8.	HID KENT/FLKSTNE		470.00	48.85	
	Broad Oak	.65368	179.09	17.30	26.46
	TOTAL:	.65368	179.09	17.30	26.46

						App	oendi	x 4 -	Results for Medium Scena	ario Case MED3
9. BRISTOL										
Vyrnwy		460	1.26			85		.11		
Severn R		000	.00			00		3.31		
TOTAL:	.00	289	.79		•	85	292	2.42		1.0
10. NORTH WE	ST									
Vyrnwy	.00	000	.00			.00	963	.86		
TOTAL:	.00	000	.00			.00	963	.86		
TOTAL					206.	41				
	*****	*****		****		*****	*****			
DEVELOPMENT OF L	INKE									
******	***									
·										
SOURCE NAME	DEMAND NAME				IE (TCMD		224	2024		
		1991	1996	2001	2006	2011	2016	2021		
Great Bradley	NORTH ESSEX	0	0	0	0	0	4	14		
Great Bradley	SOUTH ESSEX	0	0	0	0	2	18	28		
Chelmsford Efflt	SOUTH ESSEX	0	0	2	17	30	30	30		•
Abingdon	LONDON	0	0	0	0	0	0	46		
Abingdon	OXFORD/SWINDON	0	0	0	0	0	13	20		
Vyrnwy	WEST MIDLANDS	0	0	0	0	11	25	58		
Carsington	EAST MIDLANDS	0	0	40	72	104	141	175		
Birmingham Gw	EAST MIDLANDS	0	0	0	0	0	0	3		
Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40		
Broad Oak	MID PERT/EIPETRE	Λ.	Λ.		Ù	1	4	4		

25 5

266

376

6 17

26

80

543

34

181

28

117

0

81

121

SUMMARY	ΩF	CAPITAL	COSTS.
JOHNN I	~	ONE LINE	,

Broad Oak

Vyrnwy

Уугпжу

TOTALS

Severn Reuse

CATEGORY						IN PERI 2016	00S (EM) 2021
SOURCES	.0	.0	.0	.0	69.4	400.0	.3
LINK ELEMENTS	.0	.0	63.5	.0	47.5	.0	.0
TOTALS	.0	.0	63.5	.0	116.9	400.0	.3

55

95

SUMMARY OF TOTAL COSTS OF OPERATION;

BRISTOL

BRISTOL

NORTH WEST

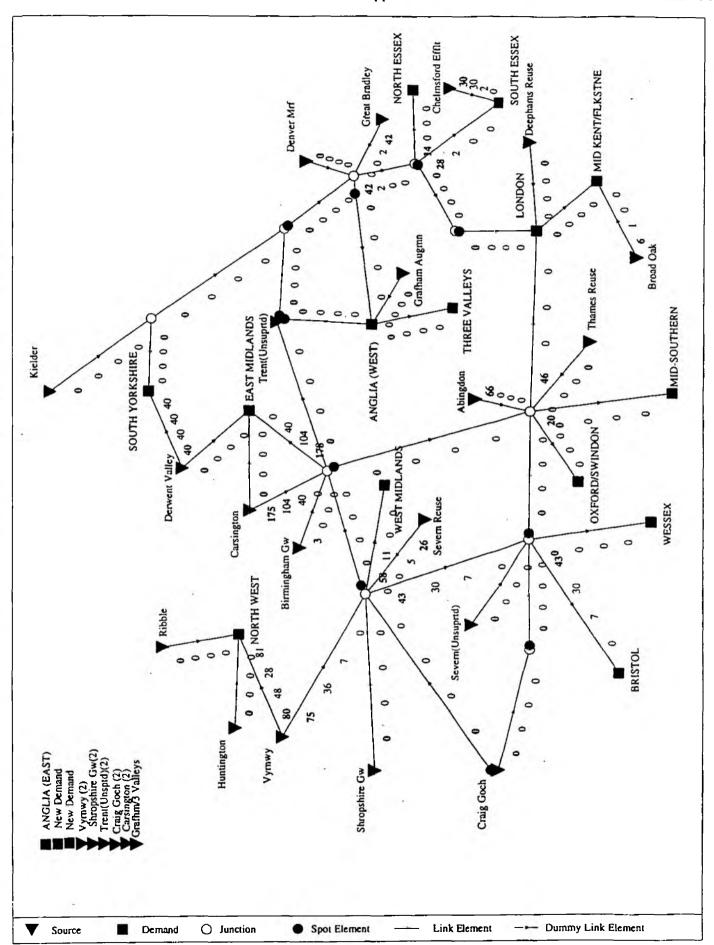
MID KENT/FLKSTNE

CATEGORY					N THRC 2011		ME (£M/F 2021	ERIOD)
SOURCES LINK ELEMENTS	.0				.0 2.0			
TOTALS	.0	.0	1.4	1.6	2.0	4.8	12.2	

COST SUMMARY

TOTAL DISCOUNTED COST FOR PLAN = £4 206.408 TOTAL DISCOUNTED CAPITAL COST = £M 195.039 TOTAL DISCOUNTED COSTS OF OPERATION = £M 11.369 (ALLOWANCE INCLUDED FOR BEYOND 2021 = £M 7.068) TOTAL CAPITAL OUTLAY TO 2021
TOTAL COSTS OF OPERATION TO 2021 = £M 580.664 = £M 21.867

TOTAL DISCOUNTED DEWARDS - 4030.3772 TOMO SULTS OF CHECKS ON WALDDITY OF ALLOCATION; A. ALL SUPEN PERCICENCES NET IN MULL. 5. NO DEMAND CENTES OVER SUPPLED. C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.	RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;	4050.572 TCND	******	*****	****	* ****
A. ALL SUPPLY DEFICIENCIES MET IN FULL. B. NO DEMAND CENTRES OVER SUPPLIED. C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.	RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;					
	B. NO DEMAND CENTRES OVER SUPPLIED.	ED YIELD.		£ .	1	
	**************************************	*******	******	******	****	*****
					-1	
		•				
			i			
	4					
				1.1		
	*					



DATE : 28- 2-1994 TIME : 10:29:40.50

DECLU VE

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

	FIRST BASE YEAR	SOURCE NAME	YIELD IN 2021	CAPITAL COST	DISCOUNTED CAPITAL COST	DISCOUNTED OPERATING COST TO 2021	DISCOUNTED OPERATING COST BEYOND 2021	TOTAL DISCOUNTED COST
			(TCMD) (EM)	(£H)	(£M)	(£4)	(EM)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
ì	1991	Vyrnwy	147	.000	.000	.000	.000	.000
•	2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
	2001	Carsington	140	.000	.000	.000	.000	.000
	2011	Great Bradley	174	69.400	25.784	.000	.000	25.784
ì	2011	Broad Oak	40	.000	.000	.000	.000	.000
1	2011	Severn Reuse	26	.000	.000	.000	.000	.000
	2016	Severn(Unsuprtd)	146	-000	.000	.000	.000	.000
	2021	Birmingham Gw	3	.264	. 055	.008	.051	.114
)	2021	Thames Reuse	18	.000	.000	.000	.000	.000
	TOTALS	S FOR SOURCES		69.664	25.838	.008	.051	25.898

UNUSED YIELDS OF DEVELOPED SOURCES

COLIDCE NAME	COARE VICIRE TURNICU TIUE/TOUR!

	1991	1996	2001	2006	2011	2016	2021	
Great Bradley	174	174	174	174	172	152	132	
Chelmsford Efflt	30	30	28	13	0	0	0	
Carsington	140	140	108	82	57	27	0	
Derwent Valley	0	0	0	0	0	0	0	
Severn(Unsuprtd)	146	146	146	146	146	133	98	
Birmingham Gw	50	50	50	50	50	50	47	
Vyrnwy	66	92	115	103	80	56	27	
Broad Oak	40	40	40	40	39	36	34	
Thames Reuse	0	0	0	0	0	12	0	
Severn Reuse	0	0	0	0	0	0	0	

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME

FLOWS THROUGH TIME(TCMD)

1991 1996 2001 2006 2011 2016 2021

ELY OUSE - ESSEX 0 0 0 0 2 22 42

GREAT BRADLEY	0	0	0	0	2	22	42	
ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	0	4	14	
ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	0	2	18	28	
CHELMSFORD EFFLT - SOUTH ESSEX	0	0	2	17	30	30	30	
CARSINGTON - R.TRENT	0	0	40	72	104	141	175	
VYRNWY - R.SEVERN	0	0	7	18	36	51	75	
R.THAMES	0	0	0	0	0	0	46	
R.SEVERN (UNSUPRID)	0	0	0	0	0	13	48	
R.SEVERN - R.THAMES (1)	0	0	0	0	0	13	48	
R.SEVERN - R.THAMES (2)	0	0	0	0	0	13	48	
BIRMINGHAM GW	0	0	0	0	0	0	3	
R.SEVERN	0	0	7	18	30	37	43	
THAMES REUSE	0	0	0	0	0	0	18	
SEVERN REUSE	0	0	0	0	5	11	26	
R.THAMES - OXFORD/SWINDON	Û	0	0	0	0	13	20	
R.SEVERN - W.MIDLANDS	0	0	0	0	11	25	58	
R.TRENT - E.MIDLANDS	0	0	40	72	104	141	178	
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40	
BROAD OAK - MID KENT/FLKSTNE	0	0	0	0	1	4	6	
R.SEVERN - BRISTOL	0	0	7	18	30	37	43	
VYRNWY - NORTH WEST	81	55	28	34	48	64	80	
27.00								

	YEAR FIRST USED	ELEMENT NAME	TOTAL CAPITA COST	DISCOUNTED L CAPITAL COST		INTED COST	T UNIT COST OF	TOTAL DISCOUNTED COST	BASE YEARS FOR REPLICATION
			(EII)	(ĐI)		1 BEYOND (EM)	2021 OPERATION (P/M3)	(EN)	AVG PEAK (TCMD)
•	2011	ELY OUSE - ESSEX ELY OUSE - ESSEX	.000 .000	.000	.429	1.078	(2.42)		011 42 42 Ment Totals)
•	2011	GREAT BRADLEY GREAT BRADLEY	.000	.000 .000	.000	-000	(.00)	_	011 42 42 MENT TOTALS)
•	2016	ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000	.000 .000	.000	.000	(.00)		016 14 14 MENT TOTALS)
•	2011	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000 .000	.000 .000	.000	.000	(.00)	_	011 28 28 MENT TOTALS)
•	2001	CHELMSFORD EFFLT - SOUTH ESSEX CHELMSFORD EFFLT - SOUTH ESSEX	13.500 13.500	8.720 8.720	.227	.081	(.38)	_	001 30 30 MENT TOTALS)
•	2001	CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000	.000 .000	.000	.000	(.00)	_	001 175 175 MENT TOTALS)
•	2001	VYRNWY - R.SEVERN VYRNWY - R.SEVERN	.000	.000 .000	1.441	.517	(1.26)		001 75 75 MENT TOTALS)
•	2021	R.THAMES R.THAMES	.000	.000 .000	.000	.000	(.00)	_	021 46 46 MENT TOTALS)
•	2016	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000	.000	.000	.000	(.00)		016 48 48 Ment Totals)
•	2016	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	.000	.000 .000	.000	.000	(.00)		016 425 400 MENT TOTALS)
•	2016	R.SEVERN - R.THAMES (2) R.SEVERN - R.THAMES (2)	152.000 152.000		.142	.527	(1.04) 4	_	016 48 48 Ment Totals)

	2021	BIRMINGHAM GW BIRMINGHAM GW	.000 .000	.000	.000	.000	(.00)	.000	2021 3 3 (ELEMENT TOTALS)
•	2001	R.SEVERN	.000 .000	.000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
•	2021	THAMES REUSE THAMES REUSE	.000	.000 .000	.000	.000	(.00)	.000	2021 18 18 (ELEMENT TOTALS)
•	2011	SEVERN REUSE SEVERN REUSE	.000	.000	.000	.000	(.00)	_000	2011 26 26 (ELEMENT TOTALS)
•	2016	R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	.000	.000	.000	(.00)	.000	2016 20 20 (ELEMENT TOTALS)
•	2011	R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000 .000	.000 .000	.000	.000	(.00)	.000	2011 58 58 (ELEMENT TOTALS)
•	2001	R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS	50.000 50.000		1.078	.826	(.44)	34.203	2001 178 178 (ELEMENT TOTALS)
•	1991	DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000 .000	.000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
•	2011	SROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE		17.133 17.133	.057	. 109	(1.71)	17.299	2011 6 6 (ELEMENT TOTALS)
•	2001	R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000	.000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
•	1991	VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000 .000	.000 .000	.000	.000	(.00)	.000	1991 81 81 (ELEMENT TOTALS)
•	TOTALS	FOR LINK ELEMENTS	263.0	00 99.121	3.375	3.138		105.634	

UNIT COSTS OF LINKS

		DISCOUNTED ((EM/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (EM)	DISCOUNTED TOTAL FLOW (TCMD)
	NORTH ESSEX				
٠.	Great Bradley	. 16015	43.88	8,31	51.86
	TOTAL:	. 16015	43.88	8.31	51.86
,	SOUTH ESSEX				
	Great Bradley	. 16015	43.88	18,99	118.54
	Chelmsford Efflt	.04025	11.03	9.03	224.32
	TOTAL:	.08171	22.39	28.01	342.86
3.	LONDON				
	Severn(Unsuprtd)	.23528	64.46	22.20	94.37
	Thames Reuse	.00000	.00	.00	60.67
	TOTAL:	. 14321	39.24	22.20	155.04
4.	OXFORD/SWINDON				
	Severn(Unsuprtd)	.23528	64.46	19.44	82.61
	TOTAL:	.23528	64.46	19.44	82.61

5.	WEST MIDLANDS				
	Vyrnwy	.00460	1.26	1.11	241.92
	TOTAL:	.00460	1.26	1.11	241.92
6.	EAST MIDLANDS				
	Carsington	.02873	7.87	33.91	1180.20
	Birmingham Gw	. 04005	10.97	.40	10.11
	TOTAL:	.02883	7.90	34.32	1190.31
7.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
8.	MID KENT/FLKSTNE				
	Broad Oak	.65368	179.09	17.30	26.46
	TOTAL:	.65368	179.09	17.30	26.46
9.	BRISTOL				
	Vyrnwy	. 00460	1.26	.85	184.11
	Severn Reuse	.00000	.00	.00	108.31
	TOTAL:	.00289	.79	.85	292.42
10.	NORTH WEST				
	Vyrnwy	.00000	.00	.00	963.86
	TOTAL:	.00000	.00	.00	963.86
	TOTAL			131.53	

DEVELOPMENT OF LINKS

,	SOURCE NAME	DÉMAND NAME	FLOWS	THROU	IGH TIM	E (TCMD)		
			1991	1996	2001	2006	2011	2016	2021
	Great Bradley	NORTH ESSEX	0	0	0	0	0	4	14
4	Great Bradley	SOUTH ESSEX	0	0	0	0	2	18	28
	Chelmsford Efflt	SOUTH ESSEX	0	0	2	17	30	30	30
	Severn(Unsuprtd)	LONDON	0.	0	0	0	0	0	28
	Thames Reuse	LONDON	Ō	Ò	0	0	Ô	Ō	18
,	Severn(Unsuprtd)	OXFORD/SWINDON	0	0	Ō	Ō	Ō	13	20
	Vyrnwy	WEST MIDLANDS	Ö	Ŏ	Ó	0	11	25	58
	Carsington	EAST MIDLANDS	0	0	40	72	104	141	175
1	Birmingham Gw	EAST MIDLANDS	Ō	Ō	0	0	0	0	3
,	Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
	Broad Oak	MID KENT/FLKSTNE	0	0	0	0	1	4	6
	Vyrnwy	BRISTOL	0	0	7	18	25	26	17
	Severn Reuse	BRISTOL	Ō	0	. 0	Ō	5	11	26
'	Ууглыу	NORTH WEST	81	55	28	34	48	64	80
	TOTALS		121	95	117	181	266	376	543
	Vугл ш у		81	55	28	34	48	64	4

SUMMARY OF CAPITAL COSTS;

CATEGORY						2016	2021
SOURCES LINK ELEMENTS						.0 152.0	.3 .0
TOTALS	.0	.0	63.5	.0	116.9	152.0	.3

SUMMARY OF TOTAL COSTS OF OPERATION;

CATEGORY

TOTAL COSTS OF OPERATION THROUGH TIME (£M/PERIOD) 1991 1996 2001 2006 2011 2016 2021

 SOURCES
 .0
 .0
 .0
 .0
 .0
 .1

 LINK ELEMENTS
 .0
 .0
 1.4
 1.6
 2.0
 3.5
 5.4

 TOTALS
 .0
 .0
 1.4
 1.6
 2.0
 3.5
 5.5

COST SUMMARY

TOTAL DISCOUNTED COST FOR PLAN = EN 131.532
TOTAL DISCOUNTED CAPITAL COST = EM 124.960

TOTAL DISCOUNTED COSTS OF OPERATION = EM 6.572 (ALLOWANCE INCLUDED FOR BEYOND 2021 = EM 3.189)

TOTAL CAPITAL OUTLAY TO 2021 = EM 332.664
TOTAL COSTS OF OPERATION TO 2021 = EM 13.935

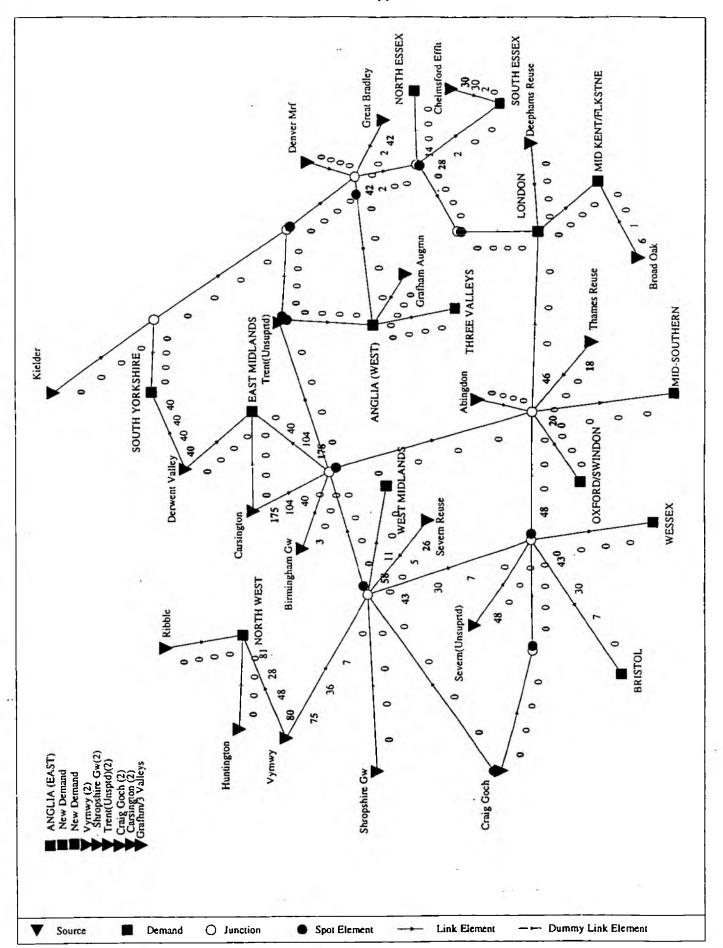
TOTAL DISCOUNTED DEMANDS = 4030.372 TCMD

RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;

A. ALL SUPPLY DEFICIENCIES MET IN FULL.

B. NO DEMAND CENTRES OVER SUPPLIED.

C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.



DATE : 1- 3-1994 TIME : 17:18:24.78

RESULTS

(CONDENSED OUTPUT)

SOURCE DEVELOPMENT

1	BASE	SOURCE NAME	YIELD IN	CAPITAL COST	DISCOUNTED CAPITAL	DISCOUNTED OPERATING	DISCOUNTED OPERATING	TOTAL DISCOUNTED
١	YEAR		2021		COST	COST TO 2021	COST BEYOND 2021	COST
			(TCMD) (£M)	(£H)	(EN)	(EM)	(EN)
	1991	Derwent Valley	40	.000	.000	.000	.000	.000
۱	1991	Vyrnwy	147	.000	.000	.000	.000	.000
7	2001	Chelmsford Efflt	30	.000	.000	.000	.000	.000
	2001	Carsington	140	.000	.000	.000	.000	.000
	2001	Shropshire Gw	155	.000	.000	.000	.000	.000
١	2011	Great Bradley	174	69.400	25.784	.000	.000	25.784
,	2011	Broad Oak	40	.000	.000	.000	.000	.000
	2011	Severn Reuse	26	.000	.000	.000	.000	.000
	2016	Severn(Unsuprtd)	146	.000	.000	.000	.000	.000
ì		Birmingham Gw	3	.264	.055	.008	.051	.114
•	2021	Thames Reuse	18	.000	.000	-000	.000	.000
	TOTALS	S FOR SOURCES		69.664	25.838	.008	.051	25.898

UNUSED YIELDS OF DEVELOPED SOURCES

SOURCE NAME	SPARE YIELDS THROUGH TIME(TCMD)							
	1991	1996	2001	2006	2011	2016	2021	
Great Bradley	174	174	174	174	172	152	132	
Chelmsford Efflt	30	30	28	13	0	0	0	
Carsington	140	140	108	82	57	27	0	
Derwent Valley	0	0	0	0	0	0	0	
Severn(Unsuprtd)	146	146	146	146	146	133	98	
Birmingham Gw	50	50	50	50	50	50	47	
Vyrnwy	66	92	119	113	99	83	67	
Shropshire Gw	155	155	148	137	119	104	80	
Broad Oak	40	40	40	40	39	36	34	
Thames Reuse	0	0	0	0	0	12	0	
Severn Reuse	0	0	0	0	0	0	0	

DEMAND FLOWS THROUGH LINK ELEMENTS

LINK ELEMENT NAME

FLOWS THROUGH TIME(TCMD)

1991 1996 2001 2006 2011 2016 2021

ELY OUSE - ESSEX	0	0	0	0	2	22	42
GREAT BRADLEY	0	0	0	0	2	22	42
ELY OUSE ESSEX - NORTH ESSEX	0	0	0	0	0	4	14
ELY OUSE ESSEX - SOUTH ESSEX	0	0	0	0	2	18	28
CHELMSFORD EFFLT - SOUTH ESSEX	0	0	2	17	30	30	30
CARSINGTON - R.TRENT	0	0	40	72	104	141	175
SHROPSHIRE GW - R.SEVERN	0	0	7	18	36	51	75
R.THAMES	0	0	0	0	0	0	46
R.SEVERN (UNSUPRTD)	0	0	0	0	0	13	48
R.SEVERN - R.THAMES (1)	0	0	0	0	0	13	48
R.SEVERN - R.THAMES (2)	0	0	0	0	0	13	48
BIRMINGHAM GW	0	0	0	0	0	0	3
R.SEVERN	0	0	7	18	30	37	43
THAMES REUSE	0	0	0	0	0	0	18
SEVERN REUSE	0	0	0	0	5	11	26
R.THAMES - OXFORD/SWINDON	0	0	0	0	0	13	20
R.SEVERN - W.MIDLANDS	0	0	0	0	11	25	58
R.TRENT - E.MIDLANDS	0	0	40	72	104	141	178
DERWENT VALLEY - SOUTH YORKSHIRE	40	40	40	40	40	40	40
BROAD OAK - MID KENT/FLKSTNE	0	0	0	0	1	4	6
R.SEVERN - BRISTOL	0	0	7	18	30	37	43
VYRNWY - NORTH WEST	81	55	28	34	48	64	80

•	YEAR FIRST USED	ELEMENT NAME	TOTAL CAPITAL COST (EM)	DISCOUNTED CAPITAL COST (EM)	OF OPE TO 202	RATION		UNIT COST OF OPERATION (P/M3)	TOTAL DISCO COST (EH)	DUNTED	BASE ' FOR REPLI	YEARS CATION AVG PEA (TCMD)	
•	2011	ELY OUSE - ESSEX	.000 .000	.000	.429	1.078	(2	.42)	1.508	201 (ELEME		2 42 TALS)	
•	2011	GREAT BRADLEY GREAT BRADLEY	.000	.000 .000	.000	.000	(.00)	.000	201 (ELEME		2 42 TALS)	
•	2016	ELY OUSE ESSEX - NORTH ESSEX ELY OUSE ESSEX - NORTH ESSEX	.000 .000	.000	.000	.000	(.00)	.000	201 (ELEME		•	
•	2011	ELY OUSE ESSEX - SOUTH ESSEX ELY OUSE ESSEX - SOUTH ESSEX	.000 .000	,000 .000	.000	.000	(.00)	.000	201 (ELEME			
•	2001			8.720 8.720	.227	.081	(.38)	9.028	200 (ELEME	-		
•	2001	CARSINGTON - R.TRENT CARSINGTON - R.TRENT	.000	.000	.000	.000	(.00)	.000	200 (ELEME		5 175 TALS)	
•	2001	SHROPSHIRE GW - R.SEVERN SHROPSHIRE GW - R.SEVERN	.000 .000	.000 .000	.000	.000	(.00)	.000	200 (ELEME			
•	2021	R.THAMES R.THAMES	.000 .000	.000	.000	.000	(.00)	.000	202 (ELEME		6 46 Tals)	
•	2016	R.SEVERN (UNSUPRTD) R.SEVERN (UNSUPRTD)	.000	.000 ,000	.000	.000	(.00)	.000	201 (ELEME			
•	2016	R.SEVERN - R.THAMES (1) R.SEVERN - R.THAMES (1)	,0 00 ,000	.000 .000	.000	.000	(.00)	.000	201 (ELEME		5 400 Tals)	
	2016	R.SEVERN - R.THAMES (2)	22.000 2	4.797						201	6 41	8 48	

Appendix 4 - Results for Medium Scenario Case MED5

	R.SEVERN - R.THAMES (2)	92.000	24.797	. 142	.527	(1.04)	25.466	(ELEMENT TOTALS)
202	1 BIRMINGHAM GW BIRMINGHAM GW	.000	.000 .000	.000	.000	(.00)	.000	2021 3 3 (ELEMENT TOTALS)
200	1 R.SEVERN	.000	.000					2001 43 43
	R.SEVERN	.000	.000	.000	.000	(,00)	.000	(ELEMENT TOTALS)
202	1 THAMES REUSE THAMES REUSE	.000	.000 .000	.000	.000	(.00)	.000	2021 18 18 (ELEMENT TOTALS)
201	1 SEVERN REUSE SEVERN REUSE	.000 .000	.000 .000	.000	.000	(.00)	.000	2011 26 26 (ELEMENT TOTALS)
201	6 R.THAMES - OXFORD/SWINDON R.THAMES - OXFORD/SWINDON	.000	.000	.000	.000 .	(.00)	.000	2016 20 20 (ELEMENT TOTALS)
201	1 R.SEVERN - W.MIDLANDS R.SEVERN - W.MIDLANDS	.000 .000	.000	.000	.000	(.00)	.000	2011 58 58 (ELEMENT TOTALS)
200	1 R.TRENT - E.MIDLANDS R.TRENT - E.MIDLANDS	50.000 50.000	32.298 32.298	1.078	. 826	(.44)	34.203	2001 178 178 (ELEMENT TOTALS)
199	1 DERWENT VALLEY - SOUTH YORKSHIRE DERWENT VALLEY - SOUTH YORKSHIRE	.000	.000	.000	.000	(.00)	.000	1991 40 40 (ELEMENT TOTALS)
201	1 BROAD OAK - MID KENT/FLKSTNE BROAD OAK - MID KENT/FLKSTNE	47.500 47.500	17.133 17.133	.057	.109	(1.71)	17.299	2011 6 6 (ELEMENT TOTALS)
200	1 R.SEVERN - BRISTOL R.SEVERN - BRISTOL	.000 .000	.000 .000	.000	.000	(.00)	.000	2001 43 43 (ELEMENT TOTALS)
199	1 VYRNWY - NORTH WEST VYRNWY - NORTH WEST	.000	.000	.000	.000	(.00)	.000	1991 81 81 (ELEMENT TOTALS)
TOTA	LS FOR LINK ELEMENTS	203.0	000 82.949	1.93	3 2.621	1	87.5	04

UNIT COSTS OF LINKS

		DISCOUNTED (EM/TCMD)	UNIT COSTS (P/M3)	DISCOUNTED TOTAL COST (EM)	DISCOUNTED TOTAL FLOW (TCMD)
1.	NORTH ESSEX				
	Great Bradley	., 16015	43.88	8.31	51.86
	TOTAL:	. 16015	43.88	8.31	51.86
2.	SOUTH ESSEX				
	Great Bradley	. 16015	43.88	18.99	118.54
	Chelmsford Efflt	.04025	11.03	9.03	224.32
	TOTAL:	.08171	22.39	28.01	342.86
3.	LONDON				
	Severn(Unsuprtd)	.14390	39.42	13.58	94.37
	Thames Reuse	.,00000	.00	.00	60.67
	TOTAL:	. 08759	24.00	13.58	155.04

^{4.} OXFORD/SWINDON

	Severn(Unsuprid)	.14390	39.42	11.89	82.61
	TOTAL:	. 14390	39.42	11.89	82.61
5.	WEST MIDLANDS				
	Shropshire Gw	.00000	.00	.00	241.92
	TOTAL:	.00000	.00	.00	241.92
6.	EAST MIDLANDS				
	Carsington	.02873	7.87	33.91	1180.20
	Birmingham Gw	. 04005	10.97	.40	10.11
	TOTAL:	.02883	7.90	34.32	1190.31
7.	SOUTH YORKSHIRE				
	Derwent Valley	.00000	.00	.00	683.02
	TOTAL:	.00000	.00	.00	683.02
8.	MID KENT/FLKSTNE				
	Broad Cak	.65368	179.09	17.30	26.46
	TOTAL:	.65368	179.09	17.30	26.46
9.	BRISTOL				
	Shropshire Gw	.00000	.00	.00	184.11
	Severn Reuse	.00000	.00	.00	108.31
	TOTAL:	.00000	.00	.00	292.42
10.	NORTH WEST				
	Vyrnwy	.00000	.00	.00	963.86
	TOTAL:	.00000	.00	.00	963.86
	TOTAL			113.40	

DEVELOPMENT OF LINKS

	SOURCE NAME	DEMAND NAME	FLOWS	THROU	GH TIM	E(TCMD)		
			1991	1996	2001	2006	2011	2016	2021
	•								
	Great Bradley	NORTH ESSEX	0	0	0	0	0	4	14
	Great Bradley	SOUTH ESSEX	0	0	0	0	2	18	28
	Chelmsford Efflt	SOUTH ESSEX	0	0	2	17	30	30	30
	Severn(Unsuprtd)	LONDON	0	0	0	0	0	0	28
	Thames Reuse	LONDON	0	0	0	0	0	0	18
	Severn(Unsuprtd)	OXFORD/SWINDON	0	0	0	0	0	13	20
	Shropshire Gw	WEST MIDLANDS	0	0	0	0	11	25	58
	Carsington	EAST MIDLANDS	0	0	40	72	104	141	175
	Birmingham Gw	EAST MIDLANDS	0	0	0	0	0	0	3
	Derwent Valley	SOUTH YORKSHIRE	40	40	40	40	40	40	40
U	Broad Oak	MID KENT/FLKSTNE	0	0	0	0	1	4	6
-	Shropshire Gw	BRISTOL	0	0	7	18	25	26	17
	Severn Reuse	BRISTOL	0	0	0	0	5	11	26
	Vyrnwy	NORTH WEST	81	55	28	34	48	64	80
	TOTALS		121	95	117	181	266	376	543

SUMMARY OF CAPITAL COSTS;

CATEGORY						N PERI 2016	00\$ (£4) 2021
SOURCES LINK ELEMENTS						.0 92.0	
TOTALS	.0	.0	63.5	.0	116.9	92.0	.3

SUMMARY OF TOTAL COSTS OF OPERATION;

CATEGORY	–			2006			ME (£M/PERIO 2021	D)
SOURCES LINK ELEMENTS	.0 .0			.0 .7		-		
TOTALS	.0	.0	.5	.7	1.1	2.6	4.6	

COST SUMMARY

= £M 113.402 TOTAL DISCOUNTED COST FOR PLAN TOTAL DISCOUNTED CAPITAL COST = £4 108.788

TOTAL DISCOUNTED COSTS OF OPERATION TOTAL CAPITAL OUTLAY TO 2021 = £M 4.614 (ALLOWANCE INCLUDED FOR BEYOND 2021 = EM 2.673)

= EM 272.664 TOTAL COSTS OF OPERATION TO 2021 = £M 9.485

= 4030.372 TCMD TOTAL DISCOUNTED DEMANDS

RESULTS OF CHECKS ON VALIDITY OF ALLOCATION;
A. ALL SUPPLY DEFICIENCIES MET IN FULL.

B. NO DEMAND CENTRES OVER SUPPLIED.

C. TAKE FROM SOURCES NEVER EXCEEDS DEVELOPED YIELD.

