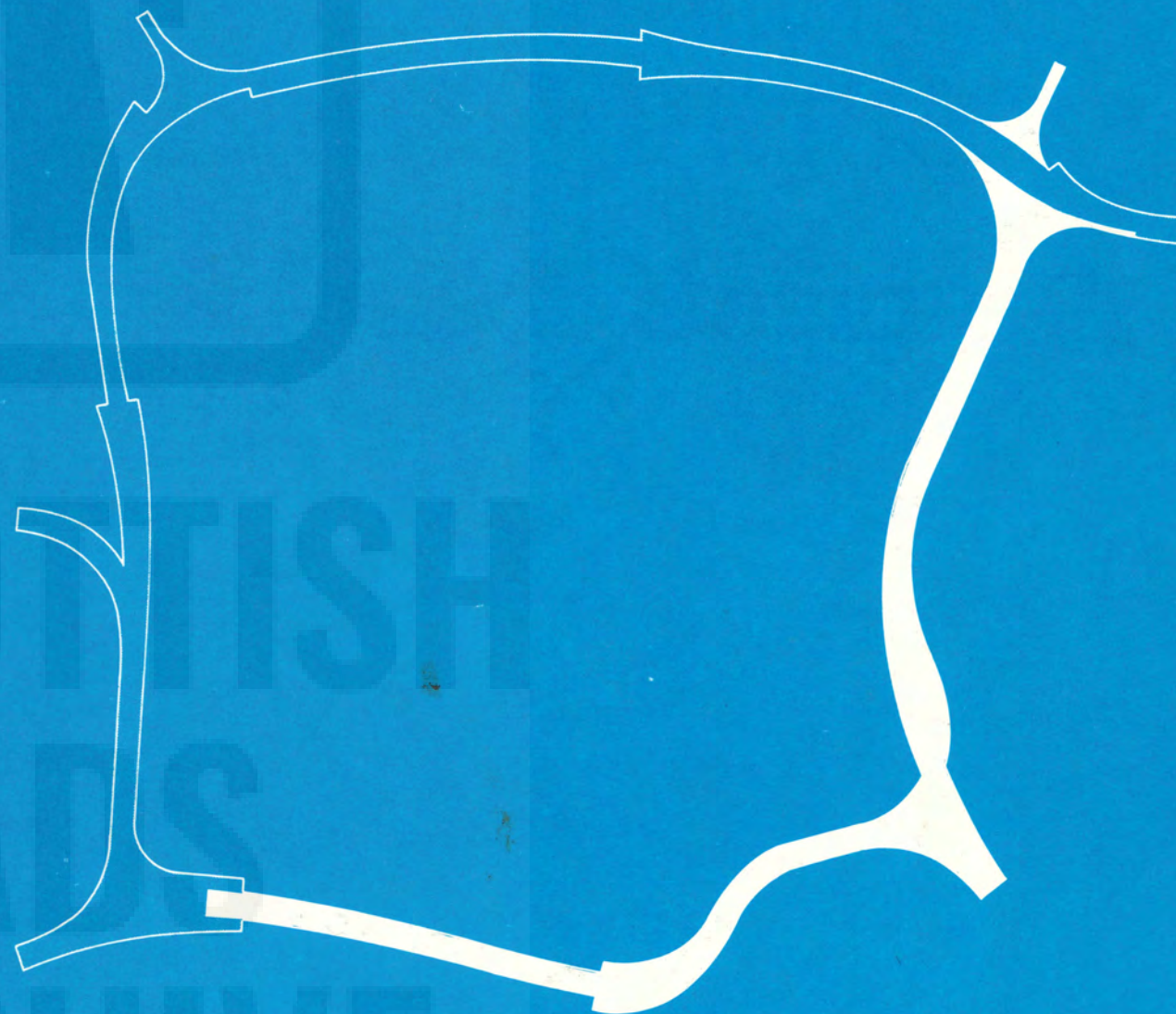


GLASGOW INNER RING ROAD

South and East Flanks Revised Design



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The Divisional Engineer—Glasgow
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GLASGOW G2 1DU

Dear Sir

SOUTH AND EAST FLANKS OF INNER RING ROAD REVISED DESIGN

In July 1975 we submitted to you a report entitled "Revised Highway Plan—South and East Flanks of Inner Ring Road—Preliminary Report", which we understand received your general approval. The report which we now submit presents these same proposals with certain modifications which are listed in Section 1.3 of this report.

We have completely re-estimated the construction costs. We recommend that revised property acquisition costs be prepared for each stage of the new proposals.

This report completes the work on the revised design of the South and East Flanks, which was partially completed when the reorganisation of local government took place in May 1975.

Yours faithfully



SCOTT WILSON KIRKPATRICK & COMPANY (SCOTLAND)

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	Scale
Ultimate Scheme	1/10,000 approx
Stage III (Main Intermediate Stage)	1/10,000 approx
South Flank	1/5000
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East Flank	1/5000
East Flank	1/5000
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1. INTRODUCTION

1.1 *Extent of Study*

This study covers the East and South Flanks of the Inner Ring Road and extends from Townhead Interchange immediately south of the St Rollox Railway Bridge at Springburn Road to the Interchange with the Renfrew Motorway. It also includes the west end of the Hamilton Motorway.

1.2 *Object of Study*

The object of this study is to redesign the ultimate South and East Flanks of the Inner Ring Road in the light of current circumstances and to design it in such a way that it can be built in reasonably sized stages.

1.3 *History*

The Ring Road was reported on in the "Interim Report on the Inner Ring Road" dated June 1962. It was formally presented to Glasgow Corporation in January 1963 on a set of 1/1250 scale plan and profile drawings, and these same proposals were incorporated in the "Highway Plan for Glasgow" report published in 1965.

Growing public concern about the adverse environmental effects of the original East Flank proposals led to an examination of alternative lines for the East Flank and a public participation exercise.

Subsequently, we prepared a report dated December 1973, jointly with William Holford & Associates, which recommended a new scheme for the East Flank—Scheme 4N. This recommendation was accepted by Glasgow Corporation. Further studies led to a modified and improved scheme—Scheme 4U.

In July 1975, we presented a preliminary report on the redesign of the East and South Flanks which we understand had your general acceptance.

The proposals contained in this Report are substantially the same but a number of refinements have been made as follows:

- (i) We have prepared a minimal cost scheme for Townhead Interchange Stage II.
- (ii) We have modified the surface street systems in Laurieston-Gorbals mainly to satisfy environmental requirements.
- (iii) We now recommend three lanes only in each direction on the elevated South Flank Motorway and four lanes in each direction over the River Clyde.
- (iv) We have modified the ultimate East Flank scheme so as to achieve a further simplification of the first stage of the East Flank.
- (v) We have eliminated the on-loop at George Street and substituted an on-ramp at Gallowgate.
- (vi) We have moved realigned Cathedral Street further north and extended the cut and cover section to this new road crossing.
- (vii) We have made use of the westernmost pair of roadways as the first stage of the East Flank between Cathedral Street and Ingram Street to minimise property damage and to simplify construction problems in the area of High Street south of George Street. One of the blocks of property thus avoided is the block of red sandstone tenements on the west side of High Street north of George Street. As a result of this new layout, it appears that it may not be necessary to construct the long pedestrian tunnel and new ticket office at George Street that is associated with the new High Street Railway Station.

2. OUTLINE DESIGN—DESIGN FACTORS

2.1 *Environment*

Because of the sensitive areas through which much of the motorway passes and the wide public interest generated, we have given the highest consideration to this factor.

There are three areas of special environmental importance. These are as follows:

- (i) Glasgow Cathedral—Strathclyde University area, extending from George Street to somewhat north of Cathedral Street.
This area is of such environmental importance that in our opinion the Ring Road should be in cut and cover over most of this section. Apart from providing full protection to the area, this would permit full linking between the University area and the Cathedral precinct area. The area on top of the Ring Road could be used by the University, as proposed in an earlier report by William Holford & Associates.
- (ii) Glasgow Cross — Glasgow Green area.
The objective in this area is to locate the motorway sufficiently far from Glasgow Cross and St Andrew's Parish Church to have minimal environmental impact. For the Ring Road to cross Glasgow Green and for the Hamilton Motorway to skirt Glasgow Green, there must inevitably be an environmental impact which we have sought to minimise.
- (iii) The area through Laurieston-Gorbals.
The elevated motorway should not cause undue problems in this area since the entire area, including the Ring Road, was planned as one operation as part of the Laurieston-Gorbals CDA. However, these revised proposals include new surface streets which require special care.

2.2 *Flexibility of Implementation*

The GGTS Volume V Report gives the cost of the Inner Ring Road, South and East Flanks, as £52 million (in terms of mid-1973 prices). Since the South and East Flanks could not be fully utilised without the construction of the Hamilton Motorway (estimated cost—£24 million), a "package" costing some £76 million is involved. We believe it is fundamentally undesirable to have a single package of such size in any credible construction programme.

We have therefore developed proposals that can be implemented in a series of contracts of reasonable size, the completion of each leading to large immediate benefits and such that the completion of each stage does not call for the completion of further major sections to justify its cost.

2.3 *Minimising Weaving*

We have always emphasised the potential danger of major weaving movements on motorways since these reduce capacity, speed and safety of operation. The original South and East Flank proposals, although designed to carry the assigned volumes, were never entirely satisfactory from this point of view.

2.4 *Increased Traffic due to Elimination of South Link Motorway*

It has become increasingly clear in the last few years that it may prove to be impossible in practice to achieve the South Link Motorway proposed in the Highway Plan. In this event, much higher volumes must be accommodated on the South and East Flanks of the Inner Ring Road. Fortunately, the high capacity of the braided section of the Renfrew Motorway, the relatively high capacity of the Monkland Motorway and the potentially high capacity of the Hamilton Motorway, which all link with the Inner Ring Road, allow the reassignment of a relatively high proportion of the South Link Motorway traffic to the South and East Flanks.

2.5 *Traffic Basis of Design*

We recommend generally that firm road proposals should be based upon the recent GGTS traffic assignment of 1990 traffic to the recommended 1985 network. This assignment assumes no significant change in total population in the study area and a car ownership of 245 cars per 1000 population. Car ownership could rise to 300 cars per 1000 population by the year 2000, but it is by no means certain that this level will ever be reached.

Our proposals are based on the lower car ownership predictions and options kept open, where feasible, to cope with the higher car ownership figure.

3. OUTLINE DESIGN—ULTIMATE PROPOSALS

3.1 *Ultimate Scheme—East Flank*

The ultimate scheme is braided between Townhead Interchange and the Hamilton Motorway. There is therefore no weaving of the major traffic streams. To achieve this relatively simply and economically, no provision has been made for movement between the Monkland Motorway and Hamilton Motorway. Since both the Monkland and Hamilton Motorways run in the same general direction, there is no significant disadvantage to the road user in not permitting movements between these motorways.

The East Flank connections to the Hamilton Motorway pass under the St John's Link railway at Gallowgate, whilst those to the South Flank pass over the railway. This facilitates the vertical geometry arrangement at the interchange with the Hamilton Motorway and enables the elevated connecting roadways to be kept to a reasonable level but controlled by the St John's Link rail level. It also means that the first stage of the East Flank will have only a minimal length of road on structure, thus reducing the initial cost. In addition, it allows the first stage to be conveniently connected to the surface street system in the Gallowgate area.

The movement from the North Flank and Springburn Expressway to the South Flank is provided for by the motorway roadway on the east of the motorway complex. This roadway exits to the east in preference to those shown in earlier schemes, which exited to the west. The revised layout minimises the weaving on this section of the East Flank since a smaller proportion of the traffic from the North Flank travels to the South Flank than is the case with the Springburn Expressway traffic.

In the Townhead area, we have eliminated the ramps that connected Monkland Motorway to Cathedral Street, also the crossings of Ramps L and D, and as a consequence the cost of Townhead Stage II scheme (old scheme) is reduced by £0.80 million (September 1976 prices). These changes enable the Martyrs' School (St Mungo's Academy Annex) to be avoided in the ultimate scheme while permitting the proposed decking over the motorway to be extended north of Cathedral Street if desired.

Elimination of these ramps also improves the operating characteristics of the motorway but, in so doing, the traffic on the surface street system will increase, particularly since the next available connection is on the South Flank at Hospital Street. However, our present traffic estimates show that the surface street system can handle this additional volume. (The ultimate volumes in Castle Street between Cathedral Street and Realigned Alexandra Parade will be about 21,000 vehicles per day.)

The East Flank roadways, that join with the North Flank and Springburn Expressway, have connections to the central area surface street system at Ingram Street and also with Bell Street via Watson Street and London Road.

A bus-only route linking Gallowgate at Ross Street to London Road at Glasgow Cross passing between the East Flank carriageway is proposed and it is envisaged that a pedestrian route would run through adjacent to the south side of the bus route.

At the south end of the East Flank, changes from Scheme 4N have been made. These are mainly:

- (i) The link between Gallowgate and Saltmarket is now via Bain Street and Greendyke Street.
- (ii) The whole road complex has been moved east to avoid the main building of the Camp Coffee Works and a site of adequate area has been left to accommodate the replacement of the eastern building of these works. This shift also moves the elevated roadways appreciably further away from St Andrew's Church.
- (iii) The elevated roadways of the East Flank have been moved to the east side of the Charlotte Street SSEB electricity substation, where they can be built with minimum interference to previously built roadways which will be carrying large traffic volumes.

It must be stated that the gains achieved by these changes are accompanied by an increased encroachment onto Glasgow Green.

To make the East Flank environmentally acceptable in the vicinity of the Cathedral and Strathclyde University, we believe the decking is justified. Its main function will be to reduce noise and visual intrusion in the Cathedral precinct area and the Strathclyde University area. It will also permit the University campus to link with the Cathedral precinct.

We have shown approximately the same extent of deck as was proposed by William Holford & Associates, but the exact extent of the decking and its treatment is obviously something requiring further study.

The decking would also allow for the provision of access from Cathedral Street to Dean Street, and thereby directly to any car parking that might be proposed by the University adjacent to the Ring Road.

3.2 *Ultimate Scheme—South Flank*

In general, the new South Flank proposals are based on the principle that the South Flank Motorway runs from the Hamilton Motorway to the Renfrew Motorway without intermediate connections.

Each approach motorway is separately connected to the surface distribution system beyond the limit of the South Flank Motorway, except the half diamond that connects to Hospital Street. It is intended that road markings would be provided so that connections to this half diamond are made only from the East Flank of the Ring Road.

The half diamond has been provided primarily to reduce the amount of traffic passing through the potentially critical intersection on Greendyke Street-Gallowgate where the one-way distributor roads of the East Flank join, and to reduce the traffic on the Albert and Victoria Bridges.

Restricting the motorway connections to beyond the limits of the South Flank Motorway has the following advantages:

- (i) Since certain local traffic movements are displaced from the motorway to the surface system, the capacity of the South Flank Motorway is greatly increased and can cope adequately with the increased traffic load resulting from the abandonment of the South Link Motorway.
- (ii) As there is virtually no movement from the West Flank of the Ring Road through the South Flank to the East Flank (the only movement likely is from the Clydeside Expressway to the Monkland Motorway when the North Flank is overloaded), it is possible with the appropriate ramp configuration at each end to virtually eliminate weaving on the South Flank Motorway.
- (iii) It is feasible to introduce as a major stage in the development of the Ring Road the construction of one carriageway only.
- (iv) The surface street distributor system which forms part of the ultimate proposals can be developed for use in the immediate future.
- (v) The elevated structures, being of constant width, are simpler and cheaper to construct, as well as being more elegant through the elimination of ramp approaches.

New housing developments have been completed or are planned on both north and south sides of the motorway line. Because of the high volumes of traffic on the parallel surface roads, it will probably be necessary for environmental reasons to partially depress them and create earth mounds on each side.

In this case, it would be natural to carry one or more pedestrian bridges over these roads to provide for the north-south pedestrian movement generated by these developments. This movement was possible in the "Highway Plan" Scheme, where the overlapping ramp crossed sufficiently high above the ground for a pedestrian route to pass under at ground level.

4. OUTLINE DESIGN — STAGING PROPOSALS

4.1 General

As previously stated, the greatest advantage of these new proposals is that the development of the South and East Flanks can be sub-divided into five stages, each of which produces large immediate traffic benefits at minimal cost. The completion of each stage produces a road system that could be left indefinitely, should traffic growth cease at any point during the period of the development of the whole system.

The completion of each stage allows each subsequent stage to be built with minimum interference to traffic operating on completed sections, and with a minimum of abortive work.

4.2 Stage 1 — South Flank Surface Street System

This stage consists of a one-way pair of streets on the line of the South Flank using existing surface streets, where possible:

Eastbound, using existing Wallace Street and a new street east of Eglinton Street; and westbound, using existing Clelland Street/a new road to Eglinton Street/Cook Street/Gloucester Street.

Ramps from the east end of Renfrew I will connect to this system.

On the east, the east-west one-way pair connects to the north-south one-way pair, utilising the Victoria and Albert Bridges. The northbound route would be Gorbals Street and Victoria Bridge, and the southbound route would be Saltmarket, Albert Bridge, Crown Street and Hospital Street, all of which are existing. We show a traffic management scheme for the area north of the river, using Bridgegate and Clyde Street but these proposals may require further study.

It is our opinion that if Stage I is constructed it would be possible to eliminate all traffic other than buses from the main shopping section of Argyle Street.

To achieve the road system proposed at Stage I, it will be necessary to lower Cook Street to give adequate clearance to the roadway below the existing rail links to the Central Station. Since it does not appear possible to implement this before the opening of Renfrew Motorway or the partial closing of Argyle Street required for the construction of the new Clyderail station, it will be necessary to operate an alternative system while Cook Street is being lowered. We understand that this alternative is being examined by the Region.

4.3 Stage II — Townhead Interchange

This scheme is designed to complete the Townhead Interchange at minimum cost so as to handle the increased traffic volumes expected when Monkland Motorway Stage II and Springburn Expressway are completed. It does not in itself imply a commitment to the East Flank of the Ring Road.

4.4 Stage III — First Stage of East Flank

This scheme connects from Townhead Interchange to the surface street system in the Gallowgate area which, in turn, connects to the one-way pair system crossing the River Clyde and continues on the line of the South Flank.

This stage consists entirely of parts of the ultimate scheme, except for the southbound carriageway between Ingram Street and Bell Street which is abortive but close to ground level and not expensive, and a small amount of abortive work in forming connections to the ultimate Townhead Interchange north of Cathedral Street.

The roadways pass under the existing St John's Link railway and the new High Street railway loop. The new High Street railway loop is part of the third stage of the Clyderail project and planned for construction in the late seventies. If the loop is constructed as planned, and this stage of the Ring Road constructed a few years later, then it would seem to us sensible to construct the railway with openings to accommodate the future roads, with the road authority meeting the additional cost at the time of railway construction.

Scheme III shown on Drawing No12 B shows our original proposal for a traffic management scheme to adequately distribute the traffic volumes to and from the end of the motorway. This scheme makes use of Saltmarket and Glasgow Green. However, the Glasgow District Planning Department wish to pedestrianise Glasgow Cross and Saltmarket. To achieve this objective, we have produced an alternative scheme shown on Drawing No12 A. This scheme makes a section of Greendyke Street two-way and takes northbound traffic on a new road on the line of Lanark Street on the west side of Our Lady and St Francis School. This scheme would affect some of the school buildings but we have been told that this school is to be closed, so that the demolition of these buildings may be acceptable.

Referring to the two-way section of Greendyke Street, it is possible that a better arrangement would be to leave Greendyke Street to carry the eastbound traffic and to build a separate roadway located a short distance inside Glasgow Green so as to affect only a few trees. However, we concluded that there was no point in pursuing this matter at present.

4.5 Stage IV — First Stage of South Flank

The main feature of this stage is the construction of one carriageway only of the elevated South Flank which would operate with traffic in both directions. There are various possibilities regarding the ultimate and interim geometric cross-section of the road. The section over the River Clyde is ultimately to be four lanes, so clearly this section could operate as two lanes in each direction. One possibility is that, in the interim arrangement, there would be two lanes in each direction, all 3.65 metres wide, no clearance on the outside to the face of the kerb, and a central reserve of 1 metre. A 60 kph (40 mph) speed limit would probably be applied.

The main length of the elevated motorway is ultimately to be three lanes. If it was ultimately to be provided with a shoulder, this would permit two lanes to operate in each direction to minimal standards. There are, of course, other possibilities but we would suggest that a firm decision need not be made now but can be made at a later date when traffic predictions are better known.

The abortive connection at each end of this section should not be unduly difficult or expensive.

We have shown stage IV A joining the East Flank to the South Flank but another possibility is the direct connection of both the East Flank and the South Flank to the Hamilton Motorway. We have designated this alternative Scheme IV B.

4.6 Stage V — Completion of South and East Flanks

These ultimate proposals are described earlier in the Report.

5. TRAFFIC FLOWS

Drawings Nos 19 and 20 show the traffic flows produced by assigning 1990 traffic to the 1985 recommended network. They also show the proposed number of lanes. This assignment is based on a car ownership rate of 245 per 1000 and therefore traffic flows would, in general, require to be increased by 20% to represent the volumes in the year 2000, assuming a car ownership level of 300 per 1000 at that time.

This straight factoring up is somewhat over-simplified in that the increased volumes on the North and West Flanks are beyond the limit of capacity and it is possible that because of this there would be some switch of traffic to the South and East Flanks. However, we do not see any real likelihood of exceeding dual three lanes on the South Flank so that it is academic at this time to consider flows which exceed the capacity of dual three lanes. The other roadways which connect to the South Flank have their lane numbers determined by balanced capacity and, therefore, would only be changed if the number of lanes on the South Flank were to be altered.

Should future circumstances demand it, it would of course be possible to revert to dual four lanes on the South Flank.

6. COSTS

The following table shows our estimate of construction costs. They do not include property acquisition costs which will be significant. The total acquisition cost for the South and East Flanks might be of the order of £10 million. We recommend that property acquisition costs be obtained in order that a realistic total cost be achieved.

These costs include the cost of Townhead Stage II.

The removal of the ramps on the South Flank has resulted in a saving of £0.5 million (September 1976 costs).

This latest proposal for the East Flank has the same construction cost as Scheme 4N, recommended in our East Flank Report dated December 1973.

TABLE OF COSTS

(September 1976 prices)

<i>Stage I</i>	South Flank — Major Traffic Management Scheme	£1,970,000
<i>Stage II</i>	Townhead Interchange — Second Stage	£2,210,000
<i>Stage III</i>	(Drawings 4 and 12B) First Stage of the East Flank	£13,210,000
<i>Stage IV-A</i>	First Elevated Structure of South Flank including temporary connection to First stage of East Flank without Hamilton Motorway	£13,390,000
<i>Stage V</i>	Completion of South and East Flanks	£30,020,000
	Total	£60,800,000

Note: Property acquisition costs are not included.

LEGEND



Important existing
surface street



One way street



One way street
with contra-flow
bus lane



Buses only

④

Profile equation
point

SCOTTISH
ROADS
ARCHIVE



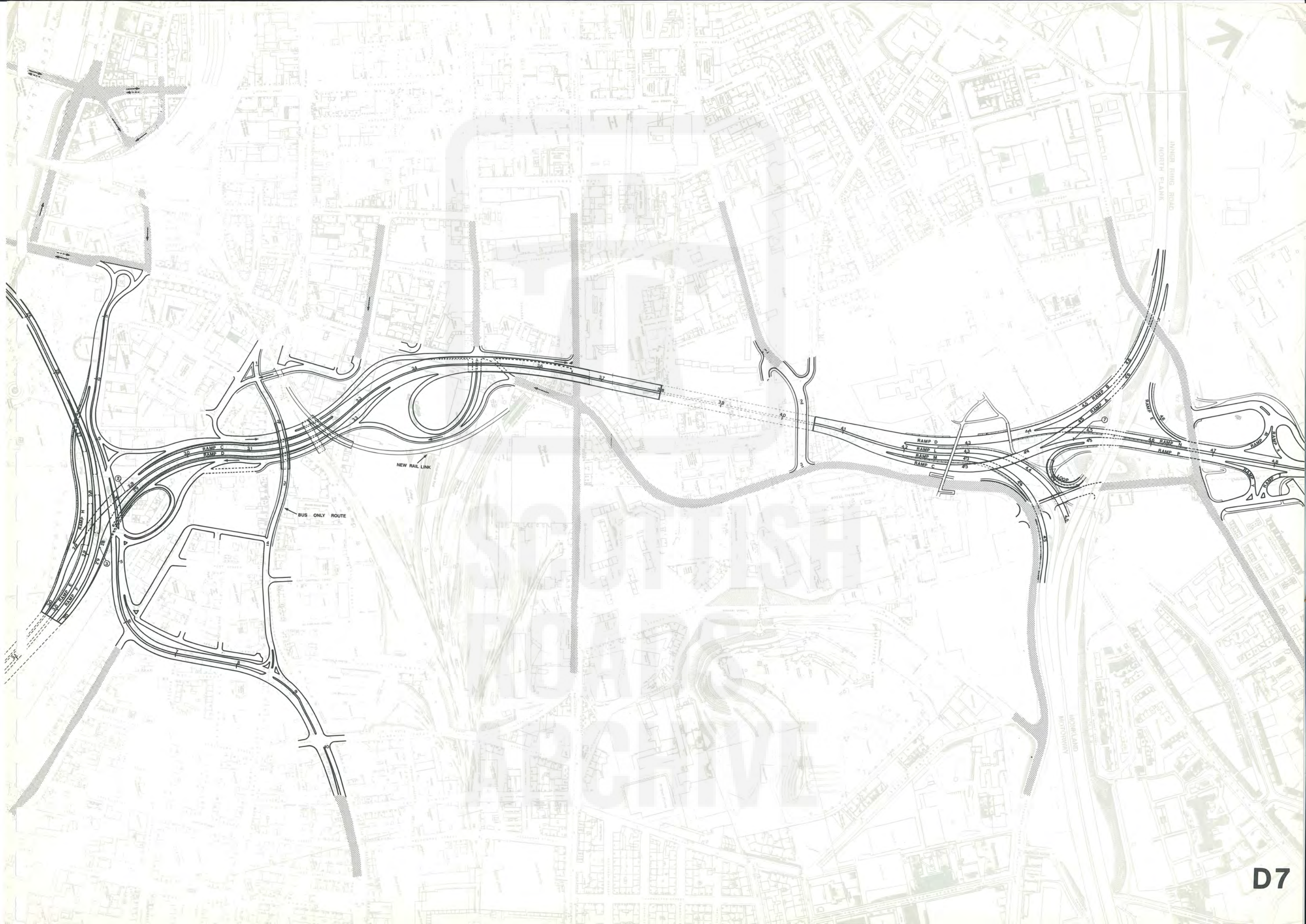


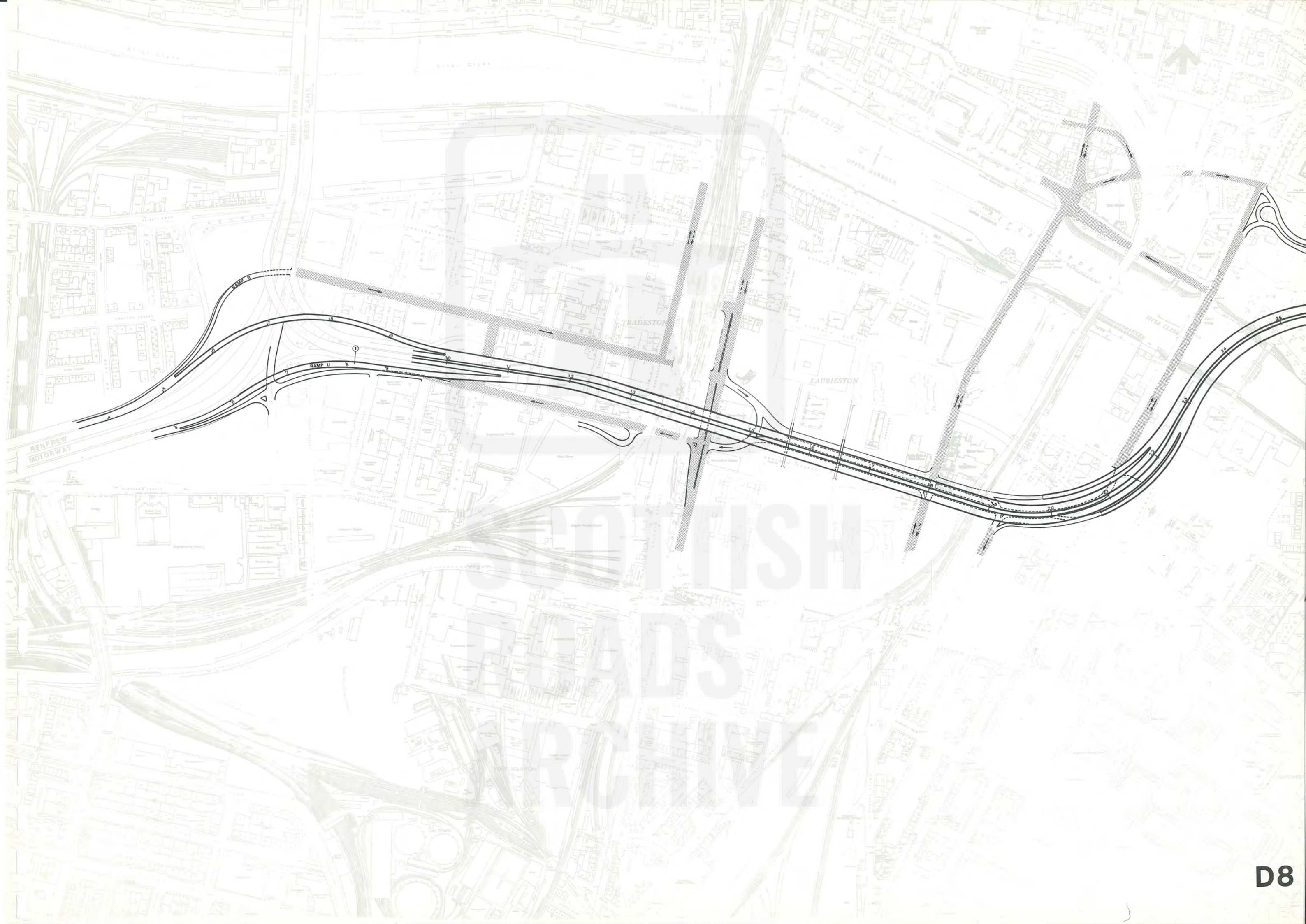




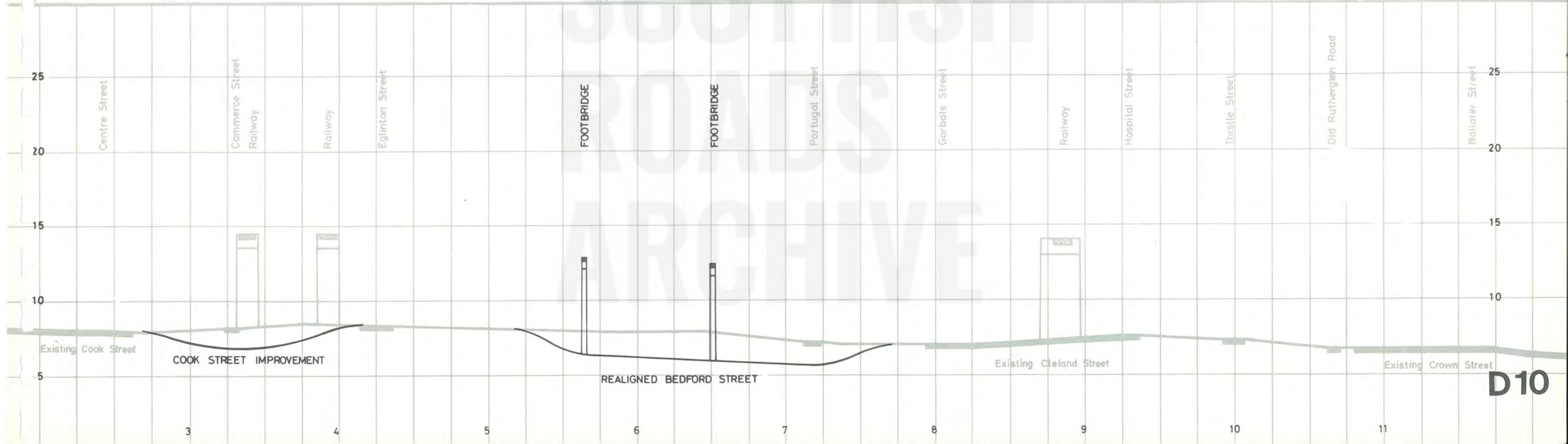
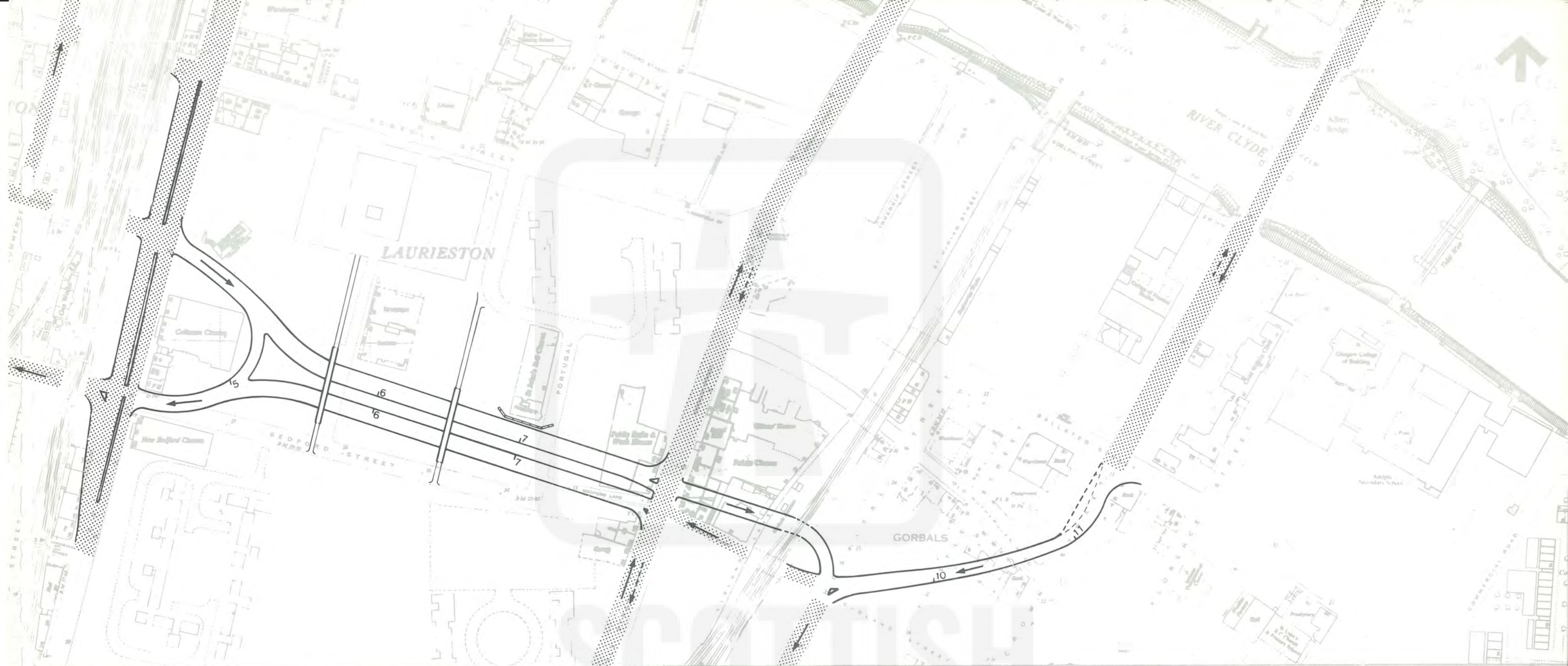




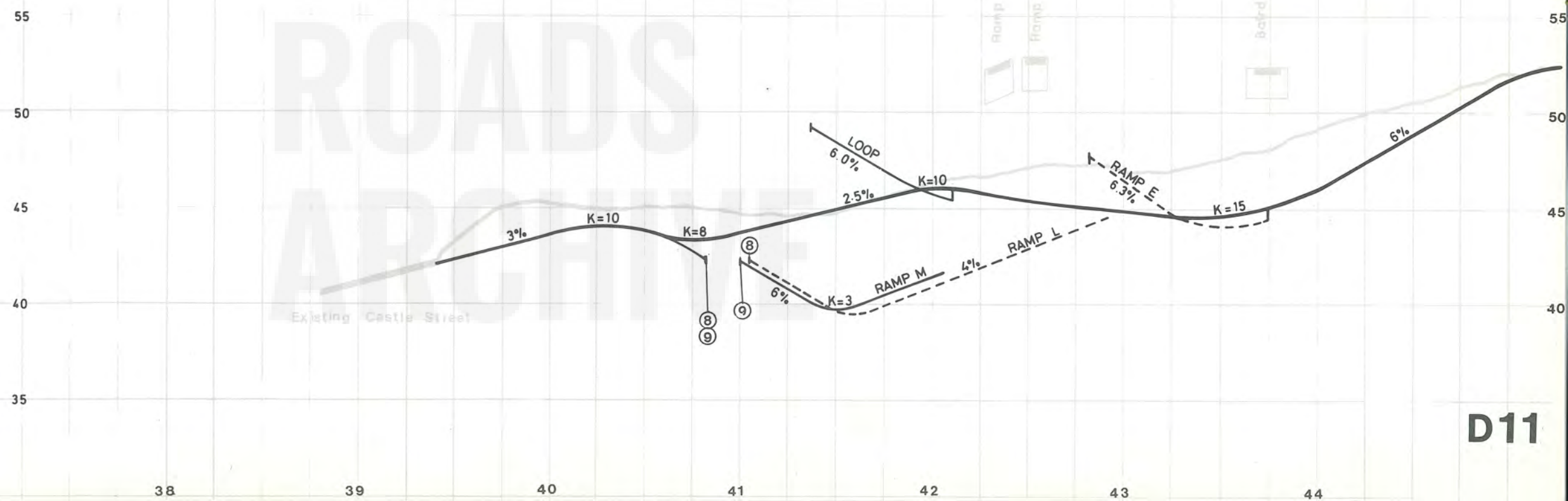


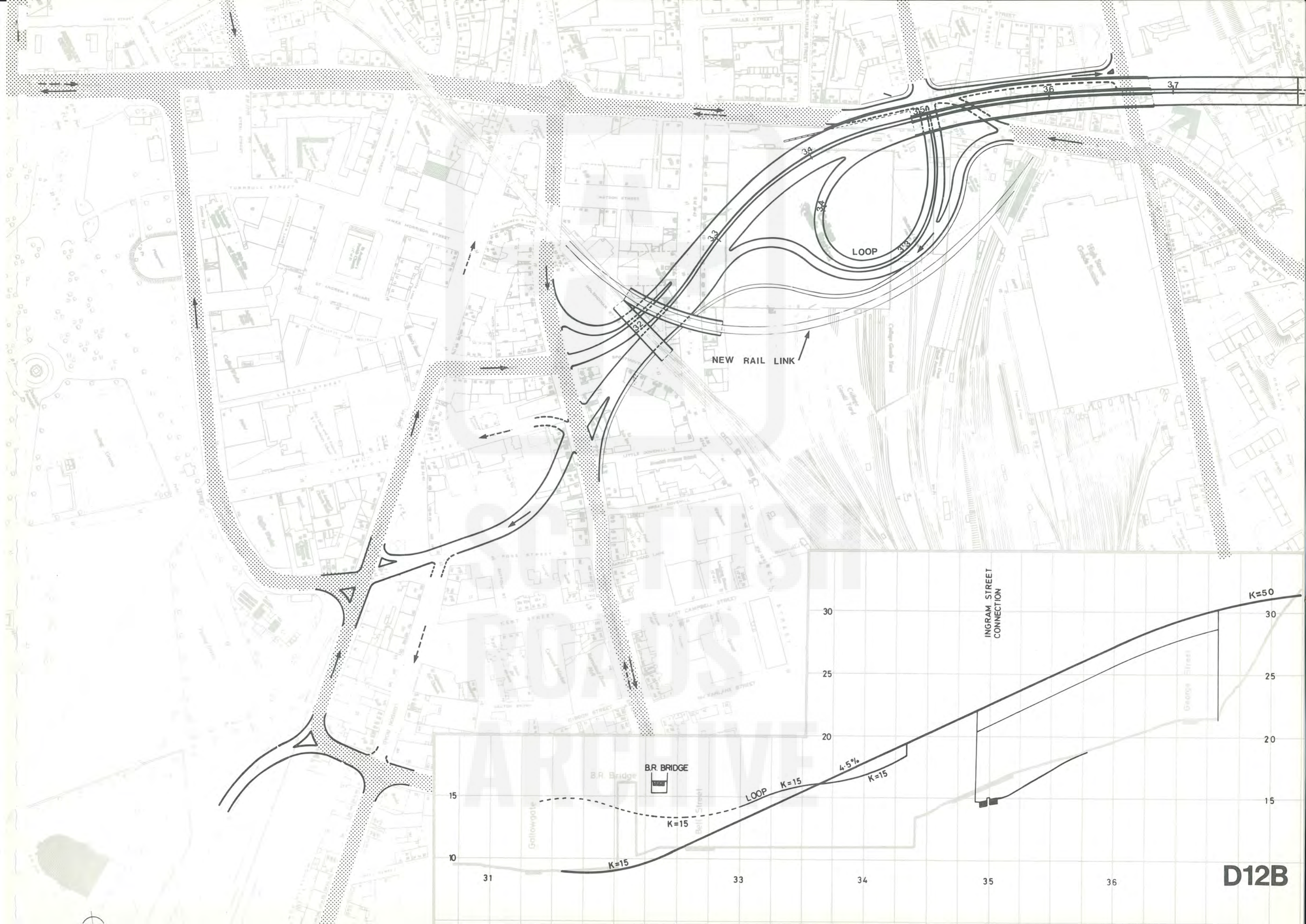


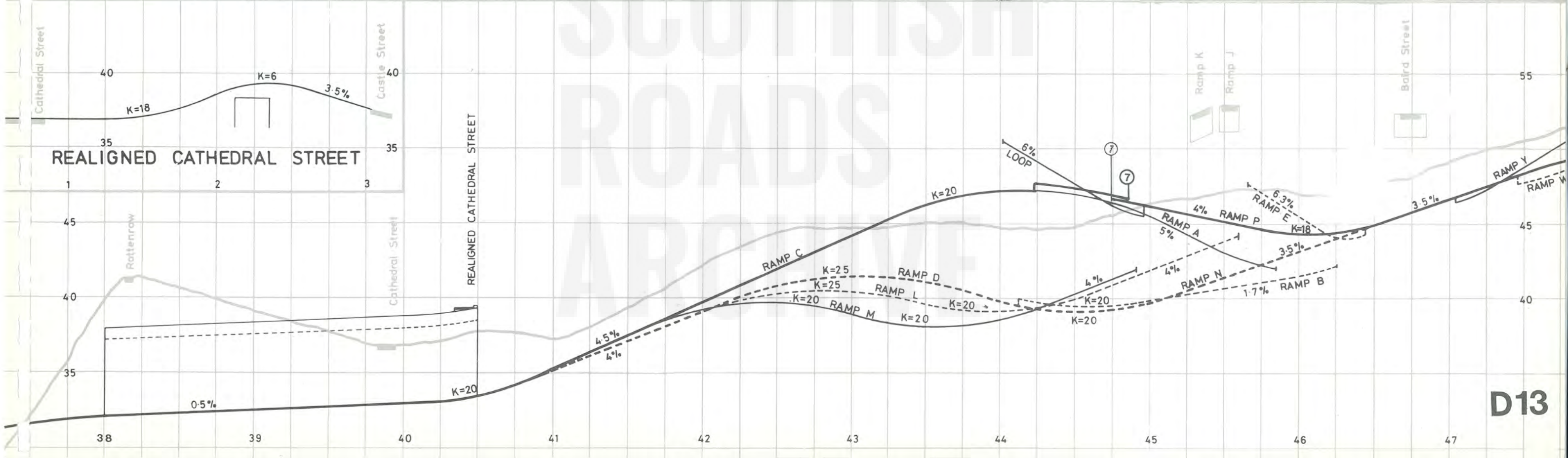


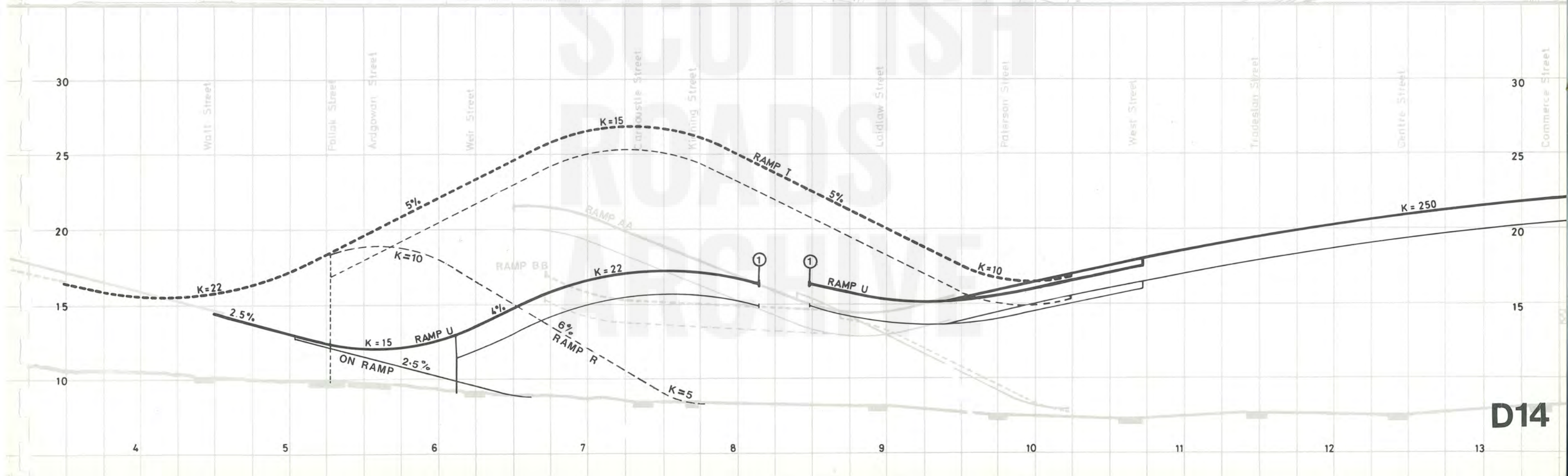
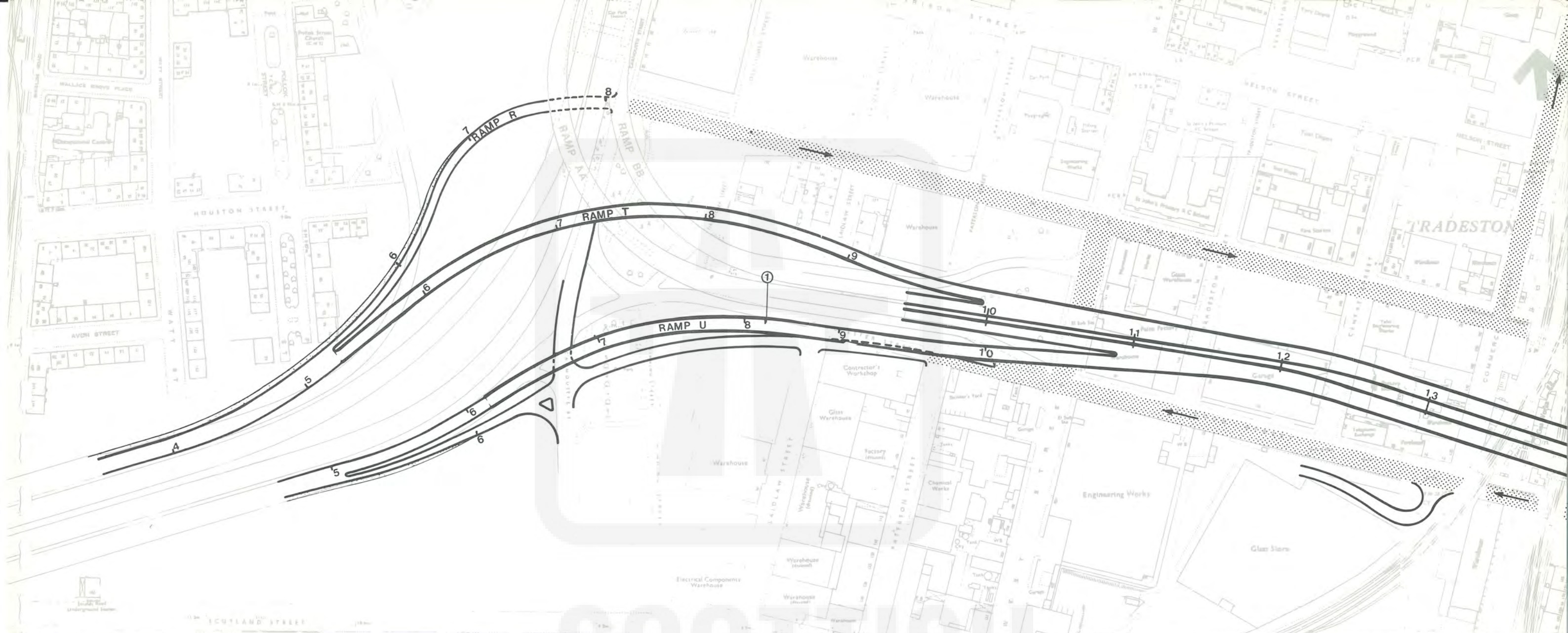


D10

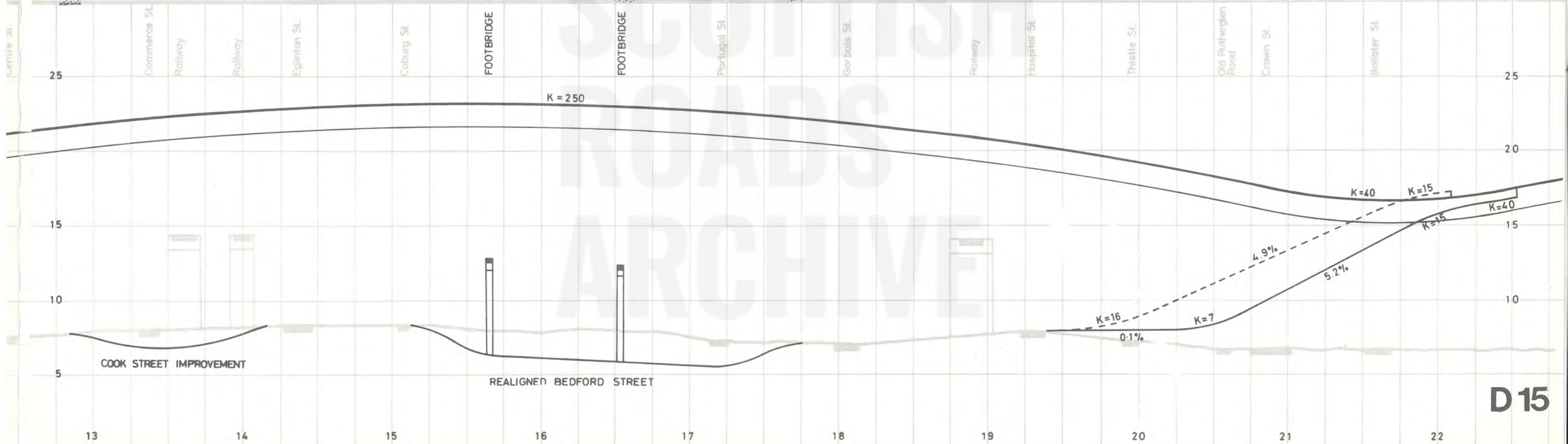
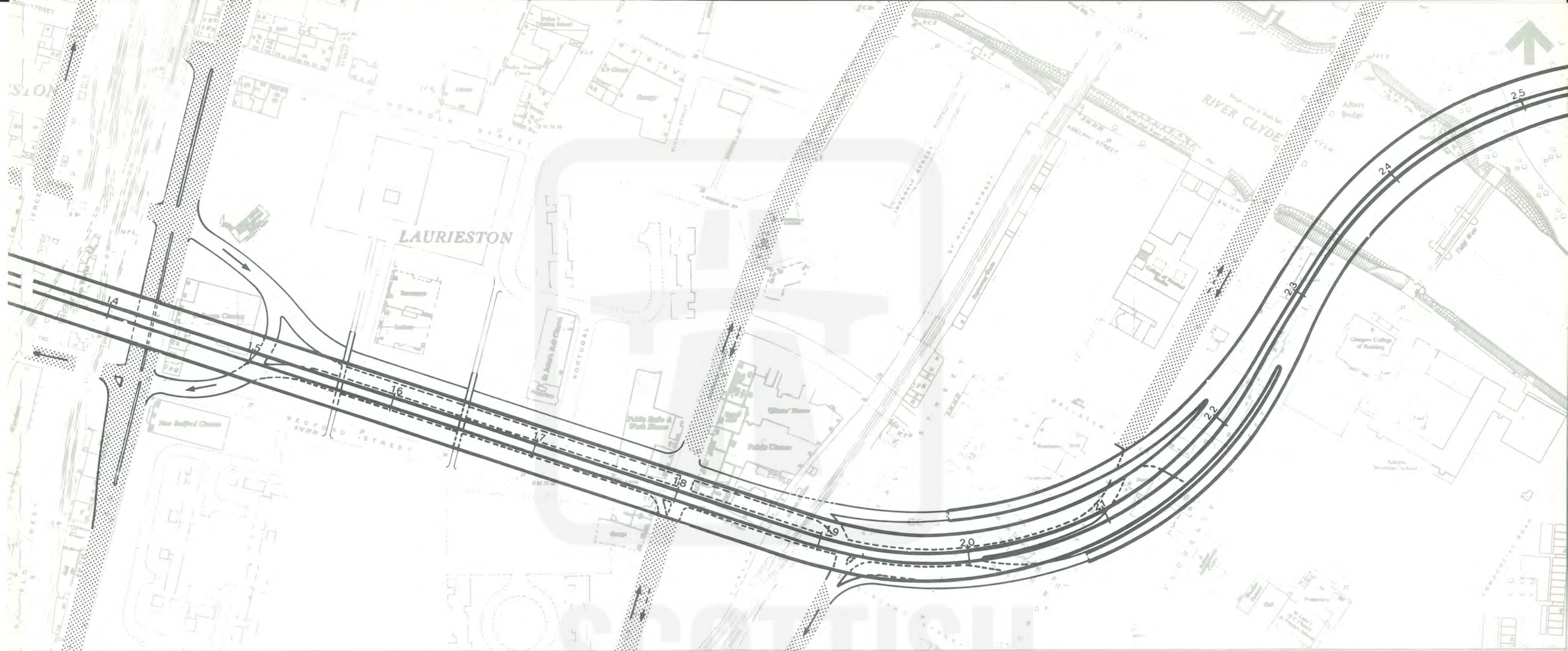


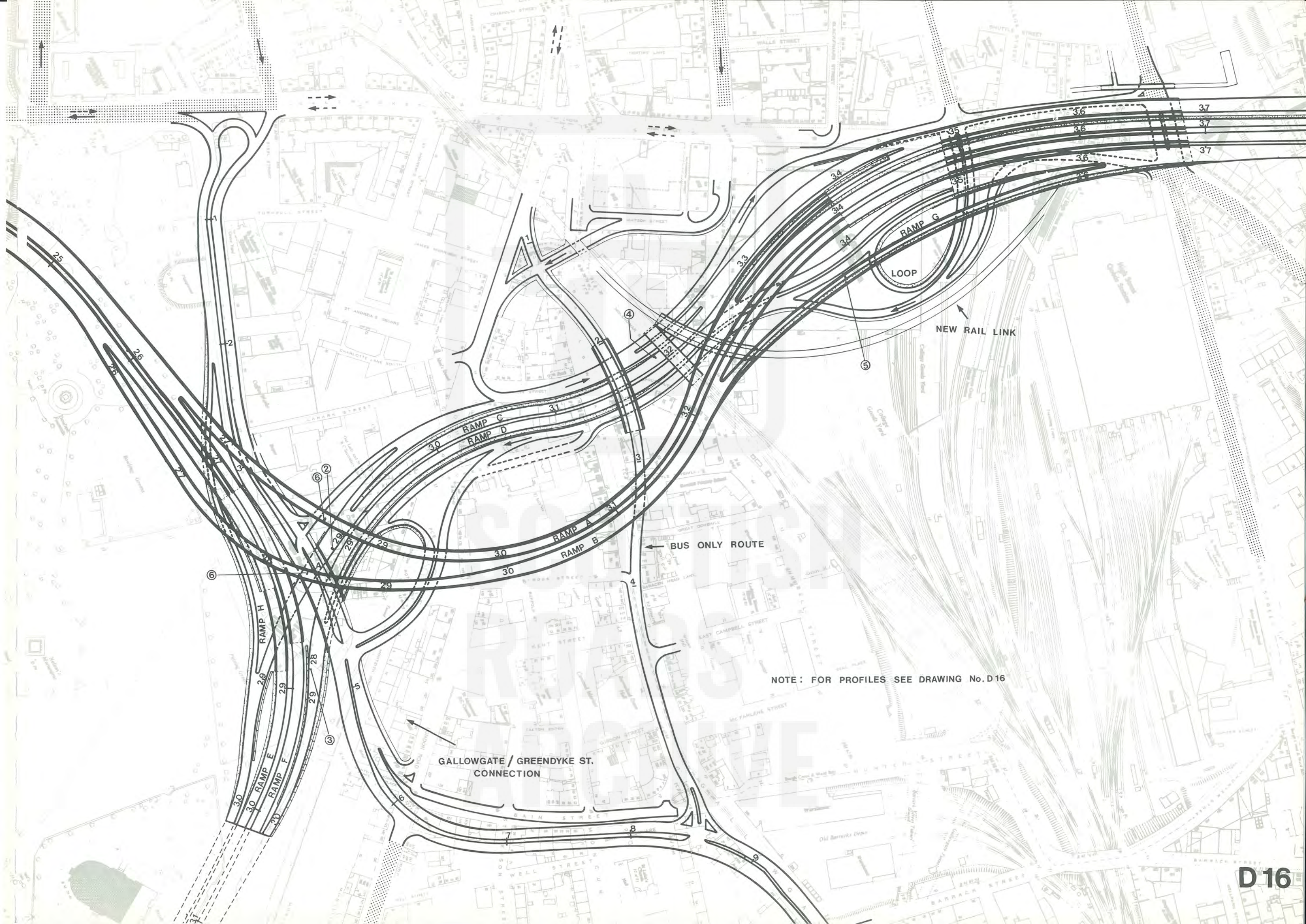




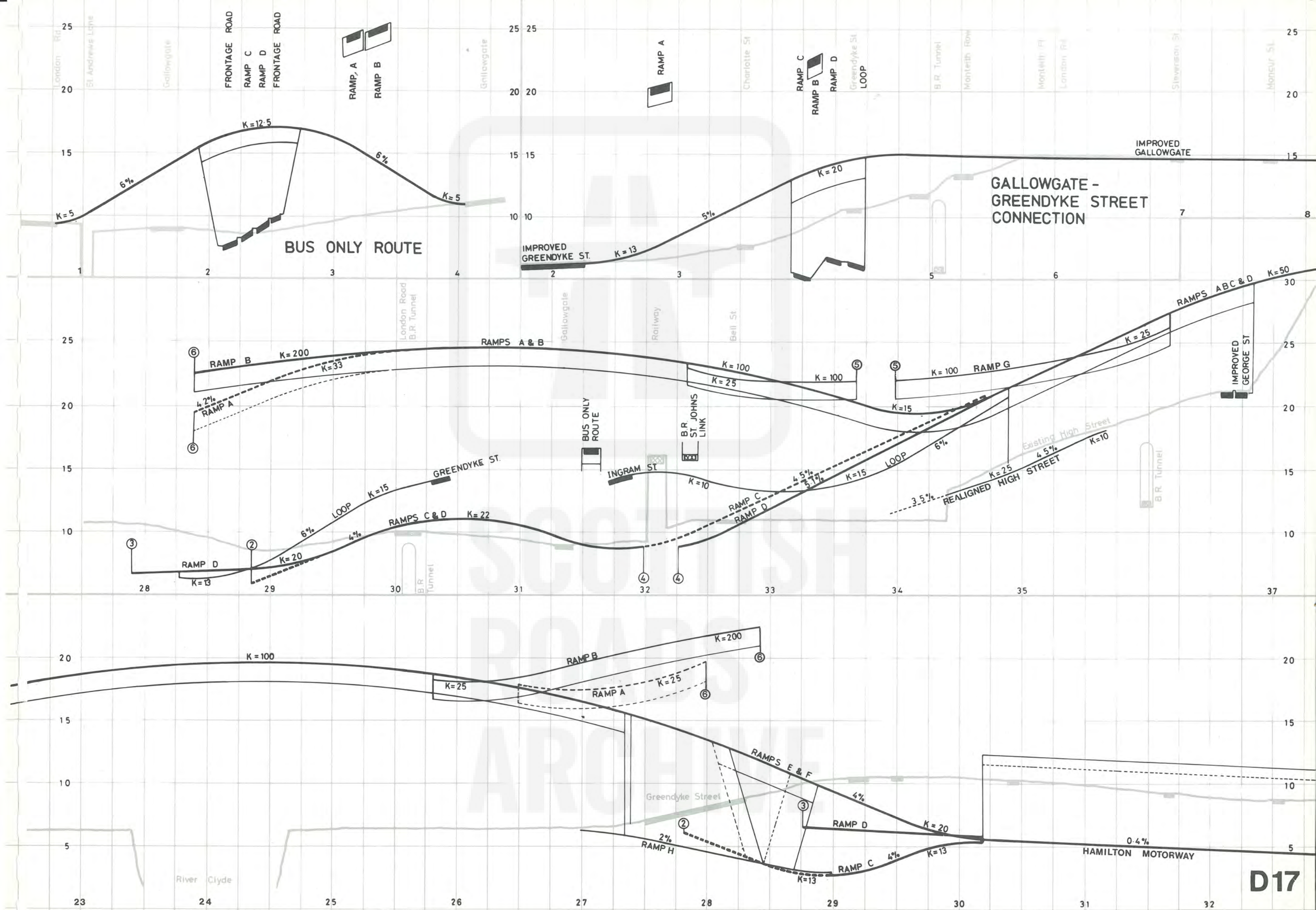


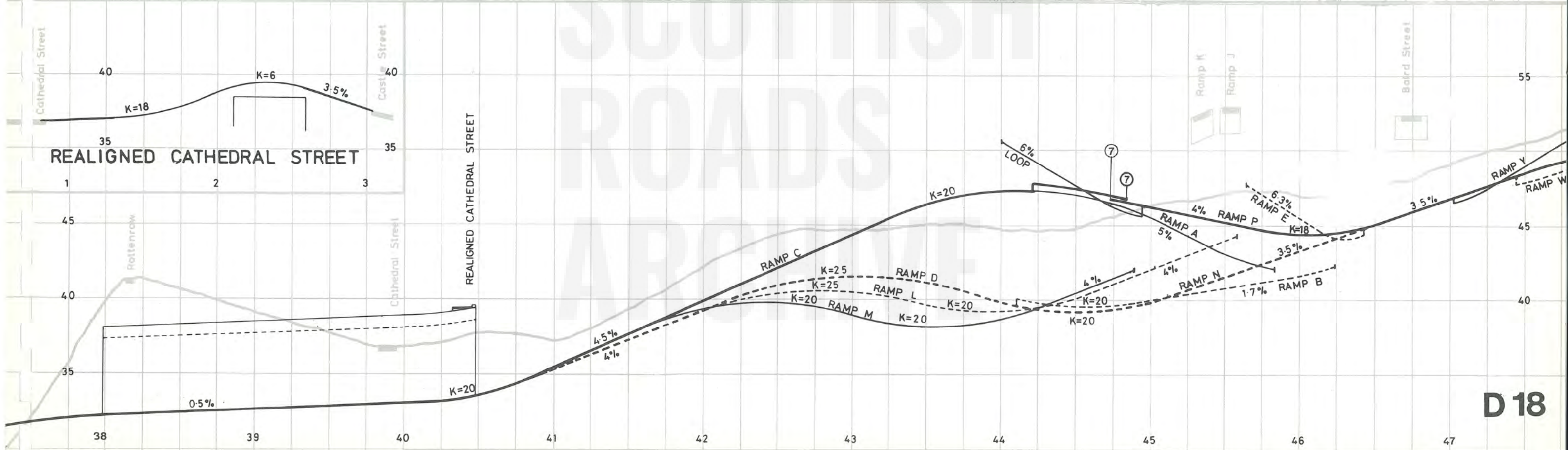
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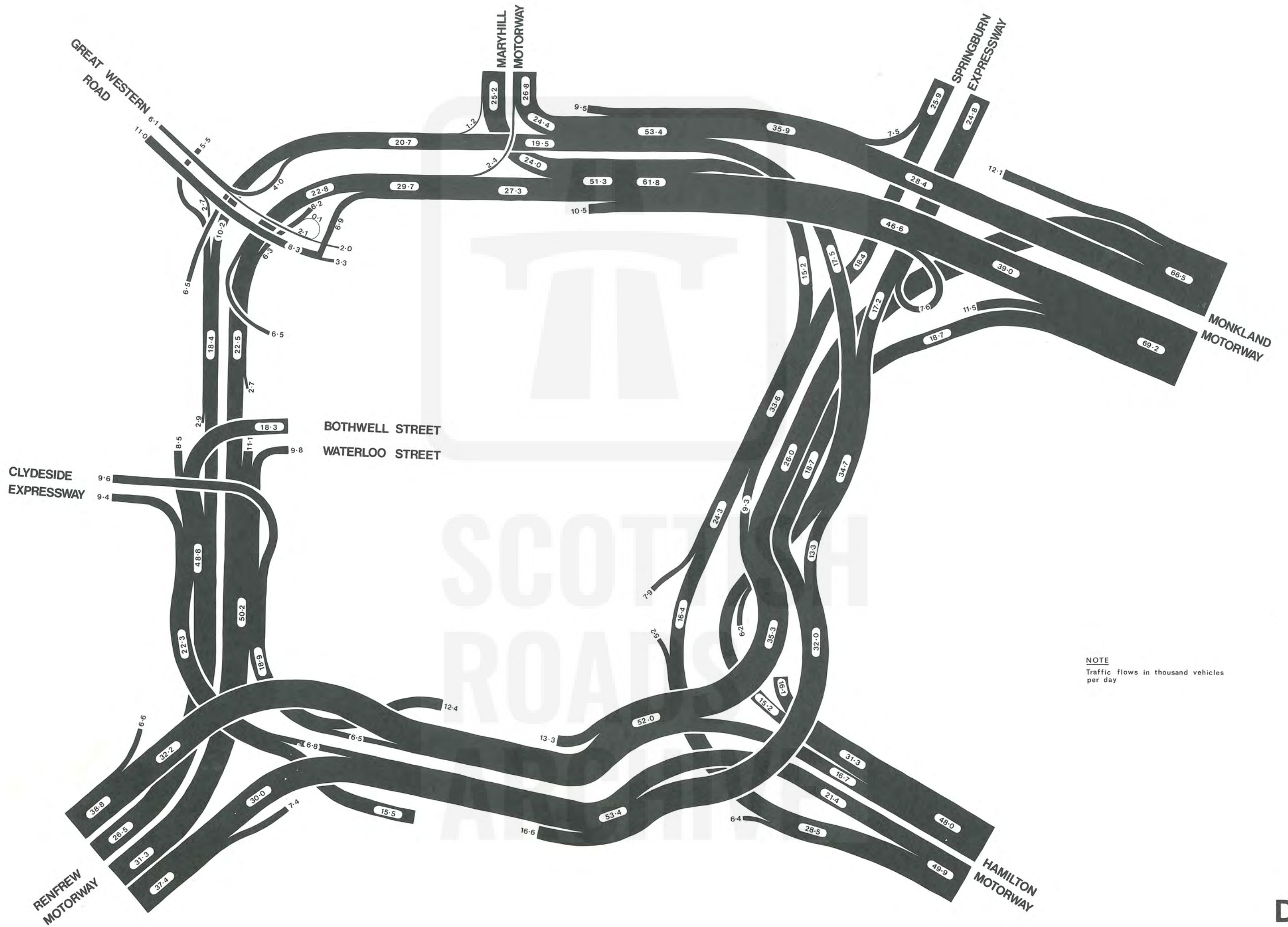




NOTE: FOR PROFILES SEE DRAWING No. D16







NOTE
Traffic flows in thousand vehicles
per day