



A 74

reconstruction

LONDON – CARLISLE – GLASGOW –
INVERNESS TRUNK ROAD

Gretna Diversions



**LONDON-CARLISLE -
GLASGOW-INVERNESS
TRUNK ROAD A74**

**Gretna to Beattock
Summit**

**Gretna Diversions
Phase 1**

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Agent Authority

for
Scottish Development Department
Department of the Environment
Dumfries County Council

The Engineer

R M Howitt, C Eng., M I C E
F I Mun. E County Surveyor

Contractor

Brims & Company Limited
Contract Manager : J Dean
Project Manager : K F Morrison

**COUNTY SURVEYOR'S
DEPARTMENT STAFF
County Surveyor**

R M Howitt, C Eng., M I C E, F I Mun E.

Depute County Surveyor

I MacNiven, C Eng., M I C E, M I W E, M Inst. H E

Chief Engineer

John L Deacon Aldridge, B Sc. (Eng), C Eng., F I C E

Principal Engineer-Roads

A Galbraith, B Sc., C Eng., M I C E, A M Inst. H E

Principal Engineer-Bridges

J F Mackenzie, C Eng., M I C E, M I Mun E., A M Inst. H E

**Principal Traffic and
Transportation Engineer**

J Burgess, B Sc., C Eng., M I C E., M I Mun E., A M Inst. H E

Resident Engineer

W N Alexander, C Eng, M I C E, M I Mun E., A M Inst. H E

INTRODUCTION

The Route

The whole of the Carlisle — Glasgow length of Trunk Road A74 has now been reconstructed either to all purpose dual carriageway or to motorway standards and Gretna Diversions is the final link in this project.

Agent Authority

All works in Dumfriesshire have been undertaken by Dumfries County Council as Agent Authority for the Scottish Development Department.

Dumfriesshire Section

The length of dual carriageway constructed by Dumfries County Council is about thirty-nine miles of which one and a quarter miles are in Cumberland being part of Gretna Diversions.

Bridges

New bridges forming part of the reconstruction include forty-two road bridges, nine railway bridges and six river bridges.

Fifteen Years

The work of reconstructing route A74 in Dumfriesshire commenced in 1958 so that fifteen years have elapsed since the first section, Johnstonebridge to Upper Murthat, Beattock was started.

By-Passes

The original route passed through Beattock, Lockerbie, Ecclefechan, Kirtlebridge, Kirkpatrick-Fleming and Gretna but the new road by-passes these communities.

Contracts

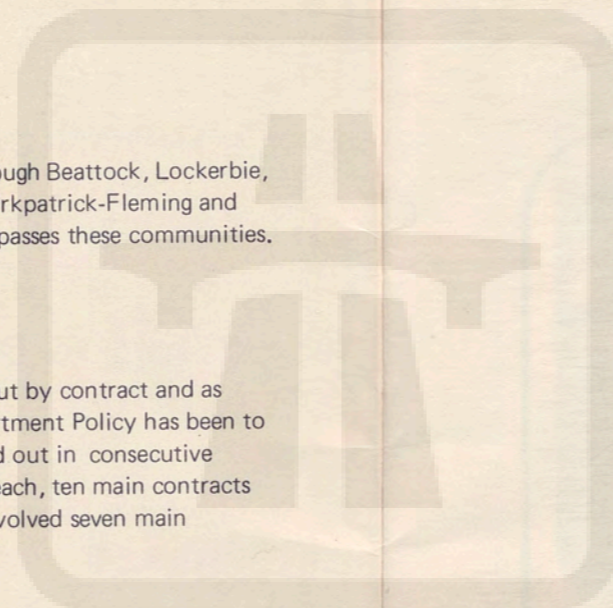
The work has been carried out by contract and as Scottish Development Department Policy has been to have the construction carried out in consecutive lengths of about four miles each, ten main contracts have been let and this has involved seven main contractors.

Design Standards & Layout

Since the work has been spread over a period of fifteen years it is not surprising that technical design standards and general layout have improved progressively. For example in the initial sections it had been considered reasonable to allow right-turning traffic and for traffic to cross the main carriageways at grade. Present policy is to eliminate such inconveniences where economically feasible by the construction of interchanges incorporating grade separation.

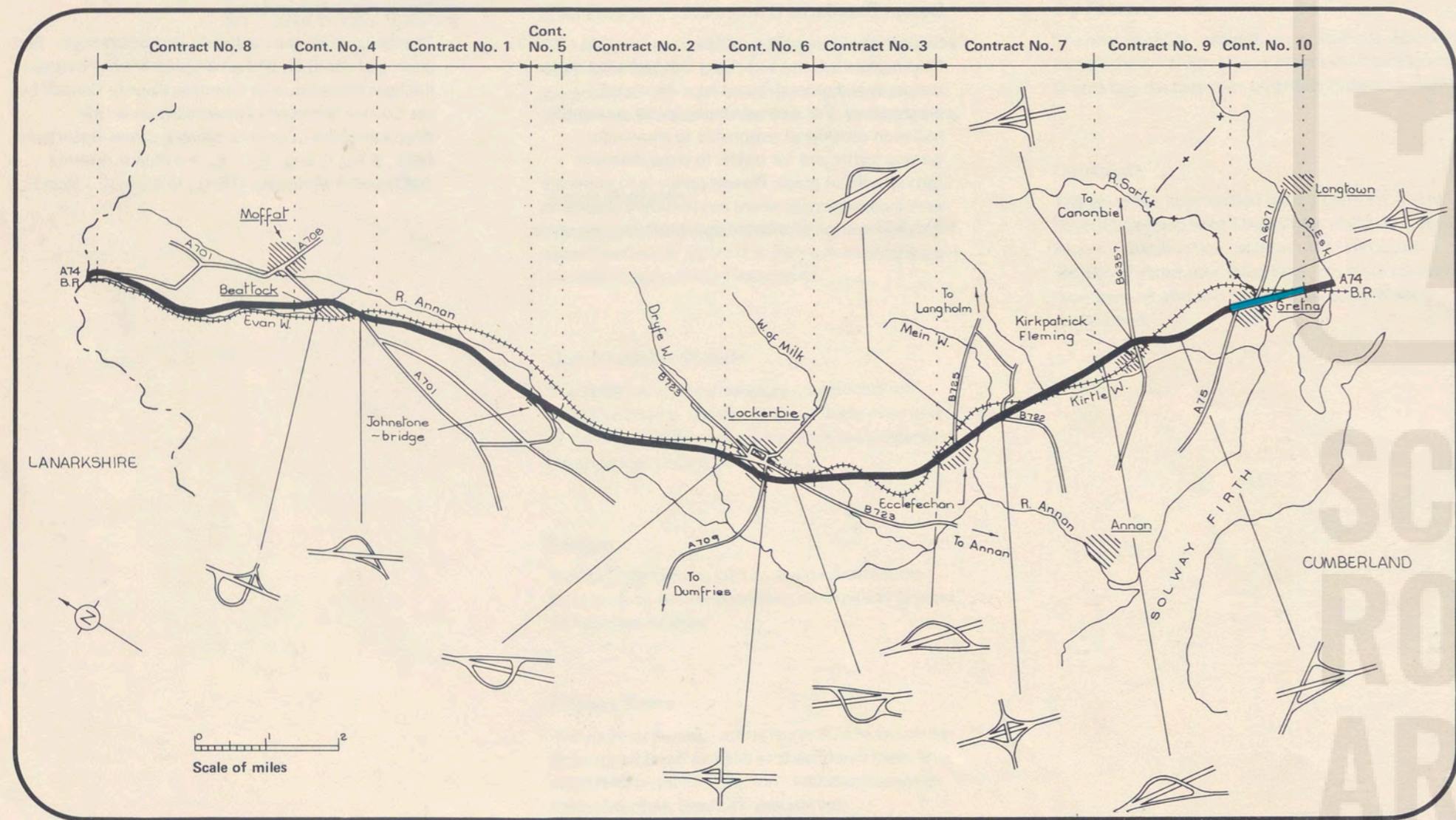
Design and Supervision

The design of all the roadworks and bridgeworks, the placing of contracts and supervision of construction has been carried out for Dumfries County Council by the County Surveyor's Department under the direction of the County Surveyors, James Robertson, OBE., B Sc., C Eng., F I C E., F I M u n E. (retired 1967) and R M Howitt, C Eng., M I C E., F I M u n E.

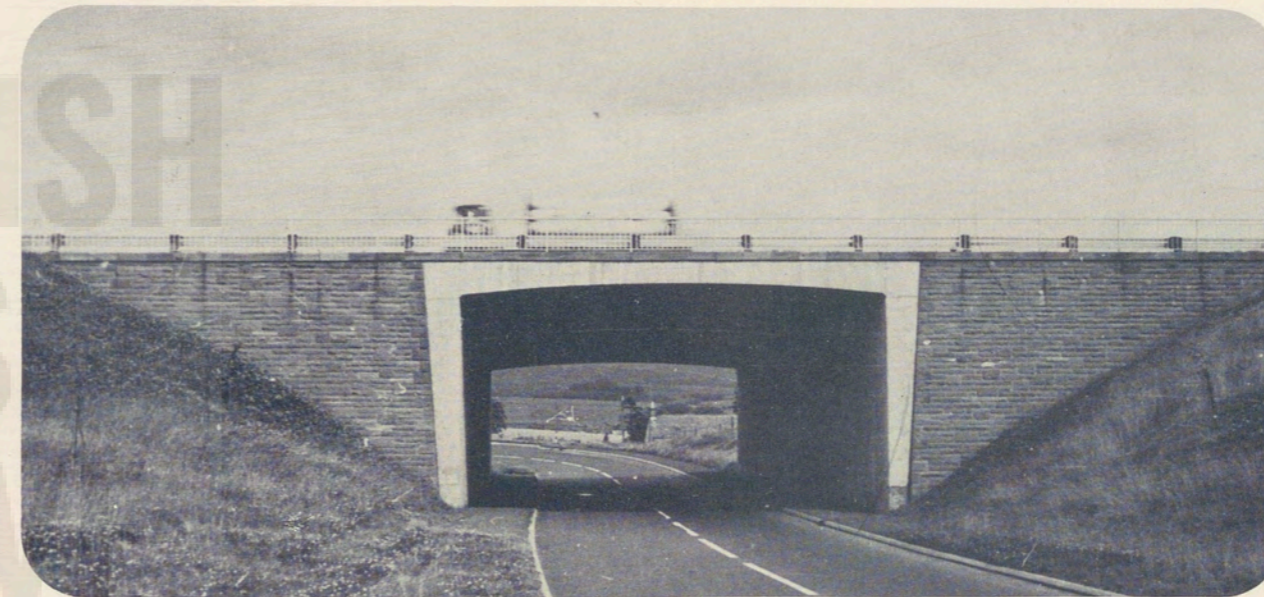


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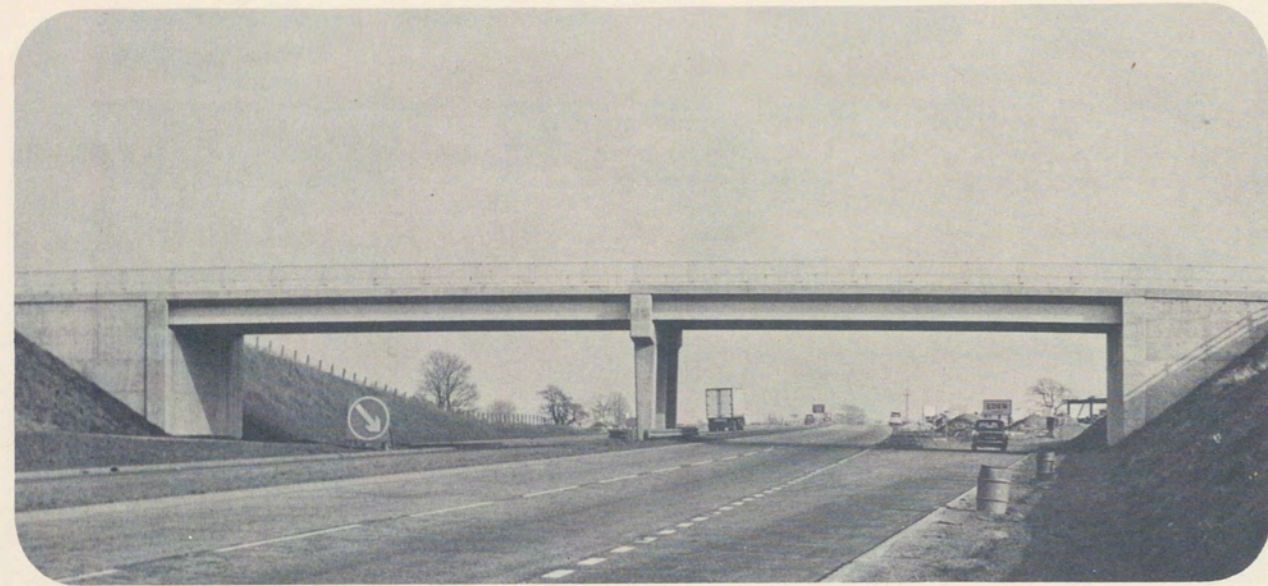
Plan of route, Gretna – Beattock showing position of each contract.



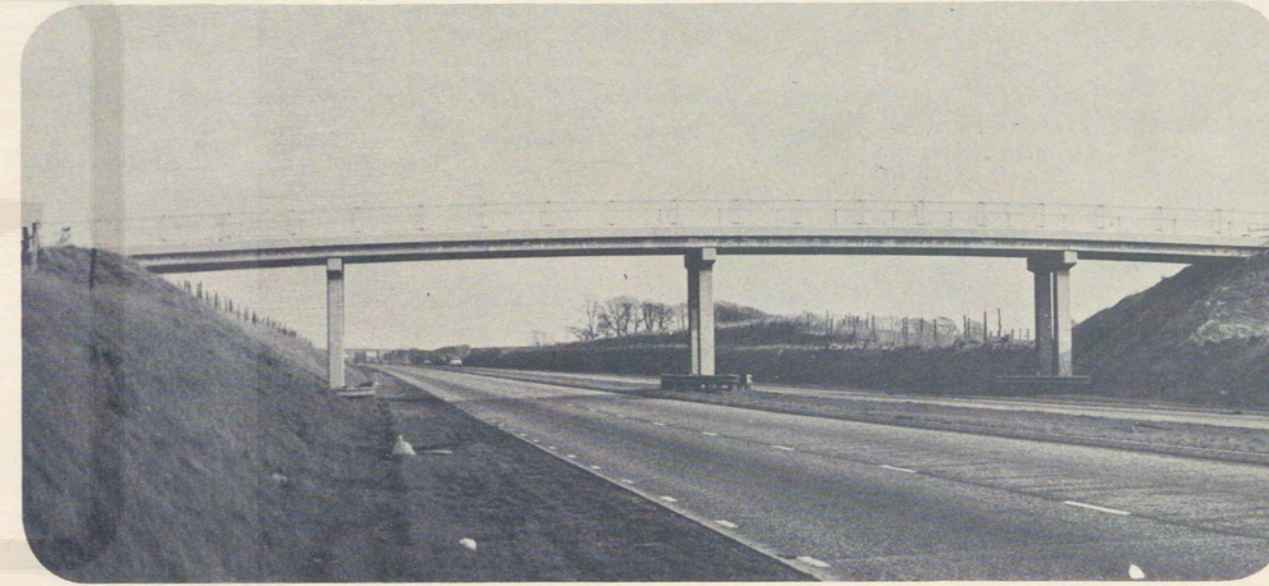
Mein Water Bridge



South Underpass Beattock



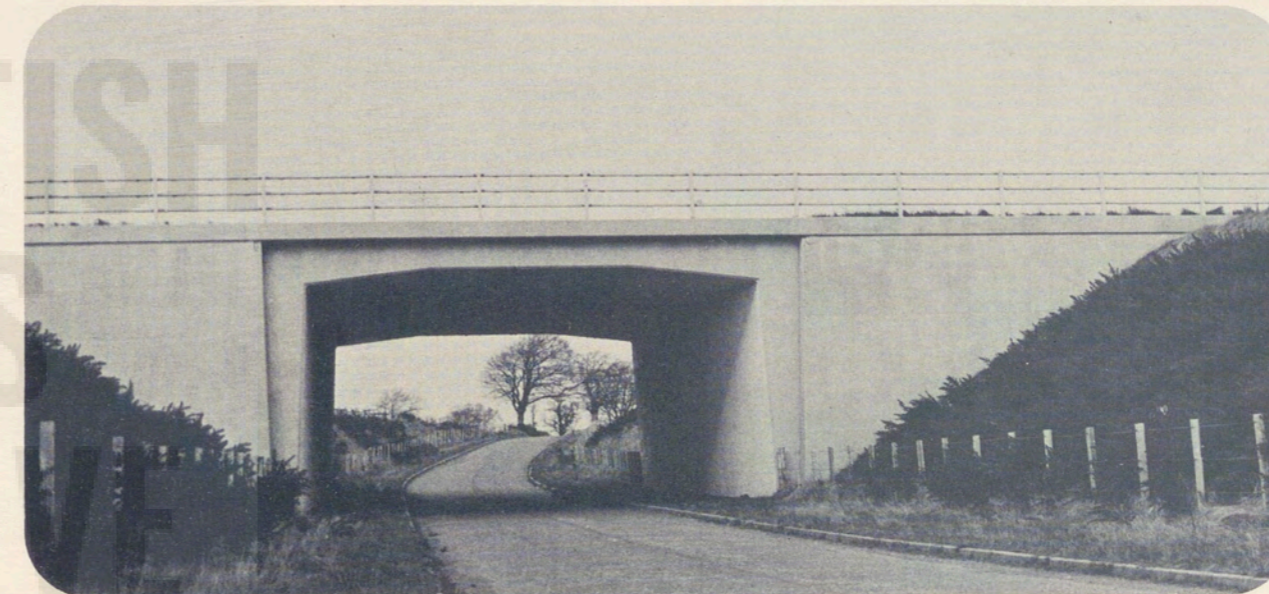
Douglas
Farm
Overpass



Nouthill
Overpass



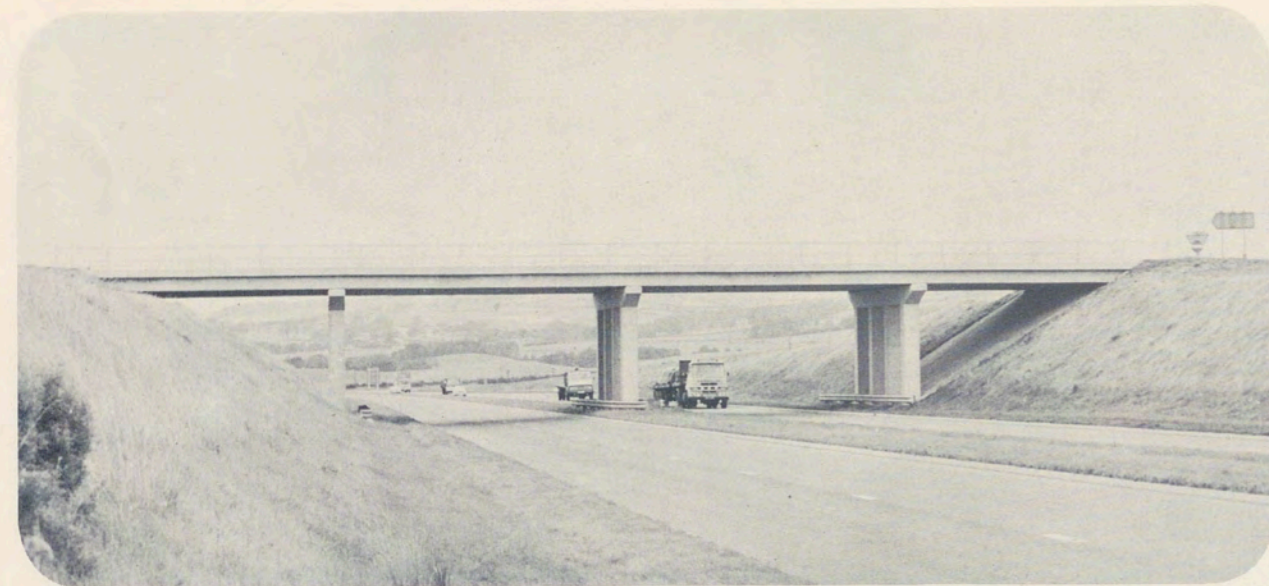
Grahamshill
Bridge



Dunskenly
Bridge



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Galls Road Bridge



Kirtle Water Bridge

DETAILS OF CONTRACTS

Contract No.	Length (Miles)	Completion Date	Total Cost	Cost of Bridgeworks	Total Cost Per Mile	Dimensions of Trunk Road	Carriageway Construction			Bridges	Contractor
							Surfacing	Road base	Sub-base		
Contract No. 1 Johnstonebridge - Upper Murthat	5.11	24th April 1961	£0.611 million	£20,000	£119,600	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (55% stone content) on 2½" of hot rolled asphalt base course (70% stone)	8" of 20:1 lean concrete	6" to 12" granular material	Farm Accom. 3 Underpasses 2 Culverts 2 Total 5	Farrans Ltd.
Contract No. 2 Lockerbie - Dinwoodie Lodge	4.77	16th Oct. 1961	£0.451 million	£45,000	£94,500	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (55% stone content) on 2½" of hot rolled asphalt base course (70% stone)	8" of 18:1 lean concrete	6" to 12" granular material	Underbridges (River) 1 Farm Accom. 2 Underpasses 2 Culverts 4 Total 7	Kings & Co.
Contract No. 3 Ecclefechan - Lockerbie	4.35	22nd Nov. 1961	£0.563 million	£100,000	£129,400	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	2" of hot rolled asphalt wearing course (55% stone content) on 2" of hot rolled asphalt (70% stone)	8" of 18:1 lean concrete	12" granular material	Underbridges (River) 1 (Railway) 1 Total 2	W. & J.R. Watson Ltd.
Contract No. 4 Beattock Diversion	2.50	24th April 1963	£0.623 million	£160,000	£249,200	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	2" of hot rolled asphalt wearing course (55% stone content on 2½" of hot rolled asphalt base course (70% stone)	8" of 18:1 lean concrete	6" to 12" granular material	Underbridges (Road) 2 (River) 1 (Railway) 2 Farm Accom. 3 Underpasses 3 Culverts 1 Total 9	James Miller & Partners Ltd.
Contract No. 5 Dinwoodie Lodge - Johnstonebridge	1.11	23rd June 1962	£0.057 million	-	£51,400	Dual 24' C'ways 6'-15' Central Reserves 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (25% stone content) with ¾" precoated chips on 2½" of hot rolled asphalt base course (70% stone)	8" of 18:1 lean concrete	12" granular material	-	James Miller & Partners Ltd.

Contract No.	Length (Miles)	Completion Date	Total Cost	Cost of Bridgeworks	Total Cost Per Mile	Dimensions of Trunk Road	Carriageway Construction			Bridges	Contractor
							Surfacing	Road base	Sub-base		
Contract No. 6 Lockerbie Diversion	2.09	17th July 1964	£0.777 million	£100,000	£371,800	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (25% stone content) with ¾" precoated chips on 2½" of hot rolled asphalt base course (70% stone)	10" of 18:1 lean concrete	12" granular material	Underbridges (Railway) 1 Overbridges (Road) 3 Farm Accom. 2 Underpasses 2 Total 6	A.M. Carmichael Ltd.
Contract No. 7 Under Woodhouse-Ecclefechan.	5.85	30th Dec. 1966	£2.98 million	£520,000	£343,100	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (30% stone content) with ¾" precoated chips on 2½" of hot rolled asphalt base course (65% stone)	3" dense bituminous macadam on 7" lean concrete	12" granular material or as required	Underbridges (Road) 1 (River) 2 (Railway) 2 Overbridges (Road) 2 Farm Accom. 7 Underpasses 7 Total 14	A.M. Carmichael Ltd.
Contract No. 8 Beattock-Lanarkshire Boundary	6.17	30th Dec. 1966	£1.631 million	£25,000	£264,300	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (30% stone content) with ¾" precoated chips on 2½" of hot rolled asphalt base course (65% stone)	3" dense bituminous macadam on 7" lean concrete	12" granular material or as required	Culverts 3 Total 3	Murdoch MacKenzie Ltd.
Contract No. 9 Gretna-Under Woodhouse	3.84	21st Feb. 1970	£1.7 million	£398,000	£444,000	Dual 24' C'ways 13' min. Central Reserve 13' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (30% stone content) with ¾" precoated chips on 2½" of hot rolled asphalt base course (65% stone)	3" dense bituminous macadam on 7" lean concrete	12" granular material or as required	Underbridges (Road) 3 (Railway) 1 Overbridges (Road) 2 Farm Accom. 3 Underpasses 3 Farm Accom. 2 Overpasses 2 Total 11	W. & J.R. Watson Ltd.
Contract No. 10 Gretna Diversion	4 dual 1½ single	1974 (proposed)	£2.9 million	£440,000	single £220,000 dual £660,000	Dual 24' C'ways 15' min. Central Reserve 12' Verges 87' Overall Width.	1½" of hot rolled asphalt wearing course (30% stone content) with ¾" precoated chips on 2½" of hot rolled asphalt base course (65% stone)	3" dense bituminous macadam on 7" lean concrete	12" granular material or as required	Underbridges (Road) 2 (Railway) 2 (River) 1 Overbridges (Road) 2 Farm Accom. 4 Underpasses 4	Brims & Co. Ltd.
Total Length of Dual Carriageway Trunk Road A74 in Dumfriesshire = 36.94 miles.										Total 11	

DETAILS OF BRIDGES

Key of bridge types

1. DECKS

- DA — Continuous reinforced concrete slab.
- DB — Simply supported reinforced concrete slab.
- DC — Continuous reinforced concrete beam and slab.
- DD — Simply supported composite slab of RSJs encased in reinforced concrete.
- DE — Simply supported composite deck of post-tensioned pre-stressed concrete beams and reinforced concrete slab.
- DF — Simply supported composite slab of pre-cast pretensioned prestressed concrete beams and infill concrete.
- DG — Continuous reinforced concrete slab integral with pier columns.
- DH — Simply supported composite deck of steel universal beams and reinforced concrete slab.

2. PIERS

- PA — Reinforced concrete columns with capping beams.
- PB — Reinforced concrete columns integral with deck.

3. ABUTMENTS

- AA — Reinforced concrete cantilever.
- AB — Open reinforced concrete counterfort.
- AC — Reinforced concrete vertical beam.
- AD — Prestressed concrete vertical beam.
- AE — Reinforced concrete counterfort.
- AF — Mass concrete.
- AG — Reinforced concrete cellular.

4. FRAMES

- FA — Single span reinforced concrete portal frame with fixed base.
- FB — Single span two hinged reinforced concrete portal frame.

5. PILED FOUNDATIONS - Denoted by (P)

ROAD OVERBRIDGES

BRIDGE	CONTRACT	TYPE	NO. OF PILES	TENDER DATE	TOTAL COST	EFFECTIVE SPAN (FT)	OVERALL WIDTH (FT)	SKEW ANGLE °
ASHTON	6	DA; PA; AA	—	JAN. 1962	£18,500	35; 45; 45; 35	43	—
DUMFRIES ROAD	6	DA; PA(P); AB(P)	129	JAN. 1962	£38,000	35; 45; 45; 35	43	10
KIRKBURN	6	DA; PA; AB	—	JAN. 1962	£20,600	35; 50; 50; 31	37	27
GREENFIELD	7	DF; PA; AB	—	FEB. 1964	£25,400	30; 46; 46; 40	38.5	18
LANGLANDS	7	DF; PA(P); AA(P)	108	FEB. 1964	£32,000	31; 44; 44; 44	39	9
GALLS ROAD	7	DA; PA; AB	—	FEB. 1964	£24,600	35; 45; 45; 35	43	—
MOSSKNOWE	9	DF; PA; AB	—	JAN. 1968	£29,200	34; 46; 46; 34	37	12
CANONBIE ROAD	9	DF; PA; AB	—	JAN. 1968	£32,400	29; 45; 45; 29	43	—
WICKETTHORN	9	DA; PA; AA	—	JAN. 1968	£31,100	40; 45; 45; 40	43	—
DOUGLAS FARM	9	DH; PA; AE	—	MAR. 1969	£35,200	69; 66	35.5	—
GRETNA STATION	10	DG; PB(P); AA(P)	113	MAY 1971	£65,700	56; 55; 64	43	27 (AV)
GUARDS MILL	10	DF; PA; AB	—	MAY 1971	£45,600	37; 45; 45; 37	43	—

ROAD UNDERBRIDGES

BRIDGE	CONTRACT	TYPE	NO. OF PILES	TENDER DATE	TOTAL COST	EFFECTIVE SPAN (FT)	OVERALL WIDTH (FT)	SKEW ANGLE °
BEATTOCK NORTH	4	FB	—	OCT. 1960	£19,600	40	92	3
BEATTOCK SOUTH	4	FB	—	OCT. 1960	£20,000	40	98	—
GRAHAMSHALL	7	FB(P)	170	FEB. 1964	£39,500	36	98	23
DUNSKELLYRIGG	9	FB	—	JAN. 1968	£28,000	35	91	—
GRAHAMSHILL	9	FB	—	JAN. 1968	£70,000	43	261	60
GRETNA LOANING	10	FB	—	MAY 1971	£40,000	41	92	14
A75/A74 UNDERPASS	10	DA; AA	—	MAY 1971	£65,100	68 (AVERAGE)	90	52 (AV)

RIVER UNDERBRIDGES

BRIDGE	CONTRACT	TYPE	NO. OF PILES	TENDER DATE	TOTAL COST	EFFECTIVE SPAN (FT)	OVERALL WIDTH (FT)	SKEW ANGLE °
CASTLEMILK	3	DC; PA; AB; AF	—	SEPT. 1959	£43,600	46; 60; 46	90	5
EVAN WATER	4	DE; AB	—	OCT. 1960	£54,900	113	90	29
MEIN WATER	7	DE; AE(P)	230	FEB. 1964	£81,700	53	115	—
KIRTLE WATER	7	DE; AE	—	FEB. 1964	£82,516	65	92	23
SARK RIVER	10	DH; AA(P)	83	MAY 1971	£73,500	70	115	10

RAILWAY UNDERBRIDGES

BRIDGE	CONTRACT	TYPE	NO. OF PILES	TENDER DATE	TOTAL COST	EFFECTIVE SPAN (FT)	OVERALL WIDTH (FT)	SKEW ANGLE °
COWDENS	3	DD; AC	—	SEPT. 1959	£54,000	32	430	69
BROOMLANDS	4	DD; AC	—	OCT. 1960	£34,200	33	245	60
MOFFAT BRANCH	4	DB; AC	—	OCT. 1960	£10,800	17	96	9
BECKTON	6	DB; AC	—	JAN. 1962	£15,300	18	113	22
GALLS	7	DF; AD(P)	480	FEB. 1964	£108,000	33	250	56
EAGLESFIELD	7	DF; AD	—	FEB. 1964	£20,000	33	45	—
KIRKPATRICK	9	DD; AC	—	JAN. 1968	£40,600	47	91	41
GRETNA	10	DF; AC(P)	88	MAY 1971	£75,500	38	90	24
GRETNA JUNCTION	10	DF; AG	—	MAY 1971	£47,000	36	42	2

ACCOMMODATION BRIDGES

BRIDGE	CONTRACT	TYPE	NO. OF PILES	TENDER DATE	TOTAL COST	EFFECTIVE SPAN (FT)	OVERALL WIDTH (FT)	SKEW ANGLE °
MOFFAT BRANCH RLY CATTLE CREEP	4	DB; AC	—	OCT. 1960	£ 5,300	11	97	9
EVAN WATER C.C.	4	DB; AC	—	OCT. 1960	£ 3,500	11	90	—
BROOMLANDS C.C.	4	DB; AC	—	OCT. 1960	£ 4,300	11	90	—
MUIRHEAD U/PASS	6	DB; AC	—	JAN. 1962	£ 4,700	13	114	—
QUASS U/PASS	6	FA	—	JAN. 1962	£ 6,500	13	106	7
CAULDWELLKNOWE U/PASS	7	FA	—	FEB. 1964	£17,900	16	94	—
LANGSHAW U/PASS	7	FA	—	FEB. 1964	£13,700	16	97	—
PENNERSAUGHS C.C.	7	FA	—	FEB. 1964	£11,100	11	98	—
BROADLEA C.C.	7	FA	—	FEB. 1964	£10,400	11	117	—
WYSEBY MAINS C.C.	7	FA	—	FEB. 1964	£10,300	11	104	—
UNDERWOODHOUSE C.C.	7	FA	—	FEB. 1964	£ 9,500	11	93	—
WOODHOUSEMAINS C.C.	7	FA	—	FEB. 1964	£12,100	11	93	—
RAECLEUCH	8	DB; AC	—	JULY 1964	£ 4,400	14	95	3
CROSS BURN	8	DB; AF	—	JULY 1964	£ 6,600	14	92	6
BLACKLAW	8	DB; AF	—	JULY 1964	£ 5,700	14	100	24
FAULDINGCLEUCH	9	DA; PA; AA; AE	—	JAN. 1968	£11,200	27; 45; 45; 27	18	—

ACCOMMODATION BRIDGES (contd.)

BRIDGE	CONTRACT	TYPE	NO. OF PILES	TENDER DATE	TOTAL COST	EFFECTIVE SPAN (FT)	OVERALL WIDTH (FT)	SKEW ANGLE °
REDHOUSE U/PASS	9	FB	—	JAN. 1968	£14,500	16	88	—
NOUTHILL	9	DA; PA; AE	—	JAN. 1968	£11,200	27; 45; 45; 27	18	—
HILL U/PASS	9	21' DIAM. ARMCO	—	JAN. 1968	£14,000	21	140	—
GUARDS FARM U/PASS SOUTH	10	R.C. BOX	—	MAY 1971	£16,100	16	93	—
GUARDS FARM U/PASS NORTH	10	R.C. BOX	—	MAY 1971	£ 8,100	9	126	24
VICTORY U/PASS	10	R.C. BOX	—	MAY 1971	£ 9,000	9	103	—
BURNSIDE U/PASS	10	R.C. BOX	—	MAY 1971	£10,500	13	108	—

GRETNA DIVERSIONS

London to Glasgow

Gretna Diversions form part of the London — Carlisle — Glasgow — Inverness Trunk Road and the opening of Phase I of the project completes the construction of dual carriageways between London and Glasgow.

Bridging the Gap

The project eliminates the gap in the two-lane dual carriageways of trunk road A74 which joins the three-lane motorway M6. The project literally "Bridges the Gap" between England and Scotland since the crossing of the border by the new River Sark Bridge forms part of the project.

Acknowledgements

The project consisted of extensive roadworks and bridgeworks both in Cumberland and Dumfriesshire and the design, preparation and construction of these works could not have been successfully concluded without the co-operation of the four Highway Authorities. The list of other public authorities, staff, landowners, contractors and members of the public affected by or connected with the project and who lent their support is too long for inclusion in this document.

However it is felt that special reference must be made to the wholehearted support and co-operation afforded by J A Davison, B Sc., C Eng., F I C E., F I Mun E., M I H E., County Surveyor and Bridgmaster, Cumberland County Council and Staff.

The Works

The Works include the construction of dual carriageways from Mossband Railway Viaduct, south-east of Gretna for a distance of 2¼ miles in a north-westerly direction to Hill Toll Bar, Gretna and from Gretna Hill for a distance of 1¼ miles in a westerly direction to Newhouse, Gretna. The length of dual carriageway constructed is 4 miles and includes diversions of Gretna Township and Gretna Green by both trunk roads A74 and A75.

Also included is the construction of 1¼ miles of principal road A6071 on a new line between Blackbank on the existing A6071 and the new trunk road A74 at Guards Mill Bridge.

The main structural work consists of the construction of eleven bridges including one river bridge, two railway bridges, eight road bridges and the dismantling of one river bridge.

DESIGN AND CONTRACT DETAILS

The design of the works, the preparation of the Contract details and supervision of construction have been carried out by Dumfriesshire County Council as Agent Authority, the County Surveyor being Engineer for the Works. One exception to this is that the new road A6071 was designed by the County Surveyor and Bridgmaster of Cumberland County Council.

The Works have been based on the requirements of the Scottish Development Department and the Department of the Environment and are generally in conformity with the specification for Road and Bridge Works, 1969 edition and Road Note 29 although modifications to these documents have been made when required.

Tenders were invited for flexible and rigid pavement construction and the lowest was accepted. This proved to be a flexible pavement using granular sub-base, lean concrete and bitumen macadam roadbase and asphalt surfacing.

CONTRACT DETAILS

Contract Value	£2.6 m
Contract Period	2½ years

The Contract provides for the following completion periods:

	Time for completion
Phase I Carriageways of Trunk Road A74 and Guards Mill Interchange and all carriageways in England	18 months
Phase II Completion of remaining works	30 months

GROUND CONDITIONS

Pre-contract soil investigations were carried out and subsequent excavations during construction confirmed the accuracy of the investigations.

The superficial deposits are glacial materials on siltstones and sandstones also some alluvial soils and a small quantity of made ground.

Very few true clays occur and the boulder clays are mixed with silts or clayey silts with varying proportions of sands and gravels. The alluvial deposits of peats and silts occur in Cumberland near the southern end of the project and in small areas east of Newhouse. The made ground is near Gretna Railway Station and at the south end in Cumberland.

The volume of fill material required greatly exceeds that available from cuttings so that the greater part of the earthworks is constructed of imported filling much of this being free draining material.

Fortunately the right to obtain filling material from borrow areas adjoining the site of the works was granted and both ordinary suitable fill and free draining fill are obtained from these sources.

The foundations of three of the bridges are piled, bearing piles being driven into the underlying dense sandy silt, sandstones and siltstones. The other bridges are founded on strip footings except in one case where, in order to reduce bearing stresses, a large base carrying cellular abutments is used.

CARRIAGEWAYS Drainage

Generally the drainage of the sub-soil is combined with drainage of the carriageway surfaces. Sub-soil drainage is by french drains consisting of perforated clay pipes on concrete beds the trenches being filled with graded filter material. Surface water drainage is positive using gullies with outlets connected to the french drain pipes which then act as a combined drain. Where a pipe of greater diameter than twelve inches is required a two pipe system is adopted.

To maintain stability of the sub-grade the sub-base is continued beneath the verges into the filter media of the french drains.

Carriageway construction

This is of flexible construction throughout. The specification permits Granular Sub-base Material Types 1 or 2, Roadbase Group F, Dense Tarmacadam, Dense Bitumen Macadam or Rolled Asphalt Base-course with Rolled Asphalt Wearing Course.

The materials actually used are as follows with any increase in construction necessary because of low CBR values provided by sub-base material:

Sub-base	12" Granular Type 2
Roadbase	7" Lean concrete 3" Dense bitumen macadam
Surfacing	2½" Dense bitumen macadam basecourse 1½" Rolled asphalt wearing course with pre-coated chippings

Bridges

Of the eleven new bridges in the contract six carry the dual carriageways over other routes, two carry other routes over the dual carriageways, two are road over rail bridges and one a river bridge. In addition the contract includes for removing the Callendar — Hamilton Bridge over the River Sark.

The bridges incorporate various design principles including rigid frames, simply supported decks of single and multiple spans and continuous multiple span decks.

Three of the bridges have piled foundations and in the other cases the ground bearing capacity is sufficient to allow the use of strip footings or rafts.

The structural materials used consist of mass and reinforced concrete both precast and insitu, precast prestressed reinforced concrete and structural steel.

Masonry facing is used on one bridge only, Gretna Junction Bridge. The Masonry is from Knowehead Quarries, Locharbriggs, Dumfries.

TESTING

Control testing of materials is carried out during the construction period. Testing is generally carried out in the laboratory of the County Surveyor's Department which is situated at Heathhall, Dumfries.

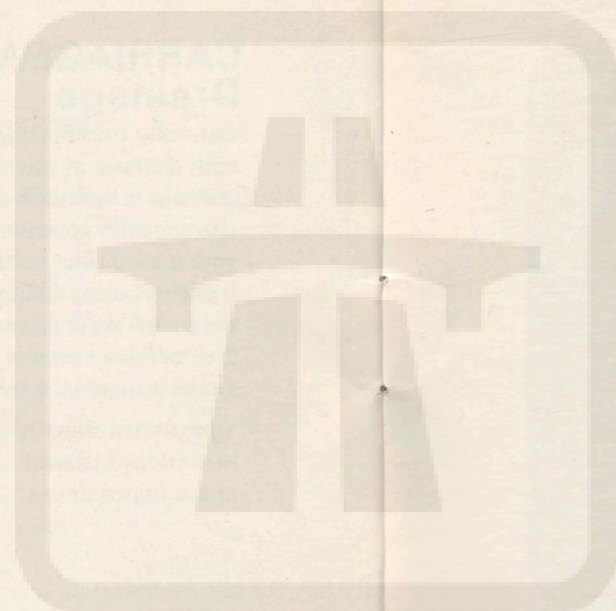
The tests carried out in this laboratory determine the suitability and strength of soils, filter materials, aggregates, concrete and bituminous materials. On-site testing by the laboratory staff includes compaction testing of soils and concrete, determination of moisture contents and the measurement of paint film thickness.

Testing of materials such as structural steel, prestressing steel, structural aluminium and prestressed precast beams together with control testing of methods of fabrication are carried out off site by arrangement with manufacturers and fabricators.

STATISTICS

1 Main Contract Quantities

Earthworks	Excavation to formation	688,000 cu yd
	Total fill	858,000 cu yd
	Unsuitable material	125,000 cu yd
Drainage	Intercepting ditches	11,500 lin yd
	french drains	31,000 lin yd
	closed drains	12,000 lin yd
	culverts	250 lin yd
Carriageways	sub-base	160,000 ton
	lean concrete roadbase	58,000 ton
	bitumen roadbase	22,000 ton
	surfacing	36,000 ton
Bridges	insitu concrete	9,000 cu yd
	structural steel	205 ton
	reinforcement	530 ton
	precast beams	650 ton

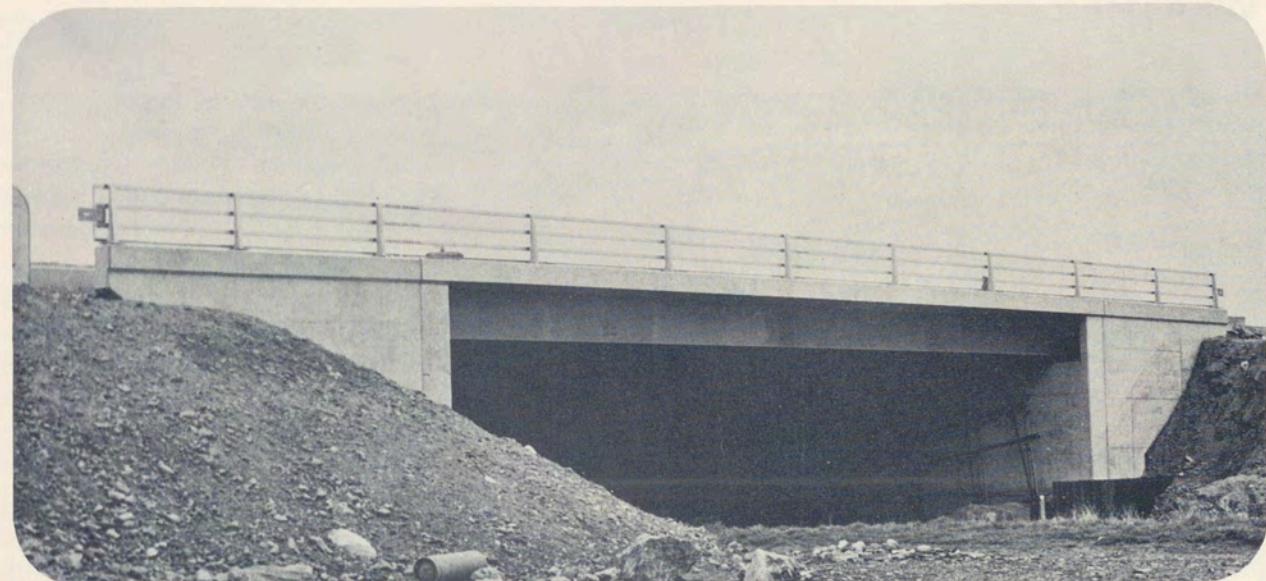


SCOTTISH
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WEATHER

The following are recorded figures for the eighteen months contract period for phase I of the project leading to the opening of the carriageways of A74 and A6071:

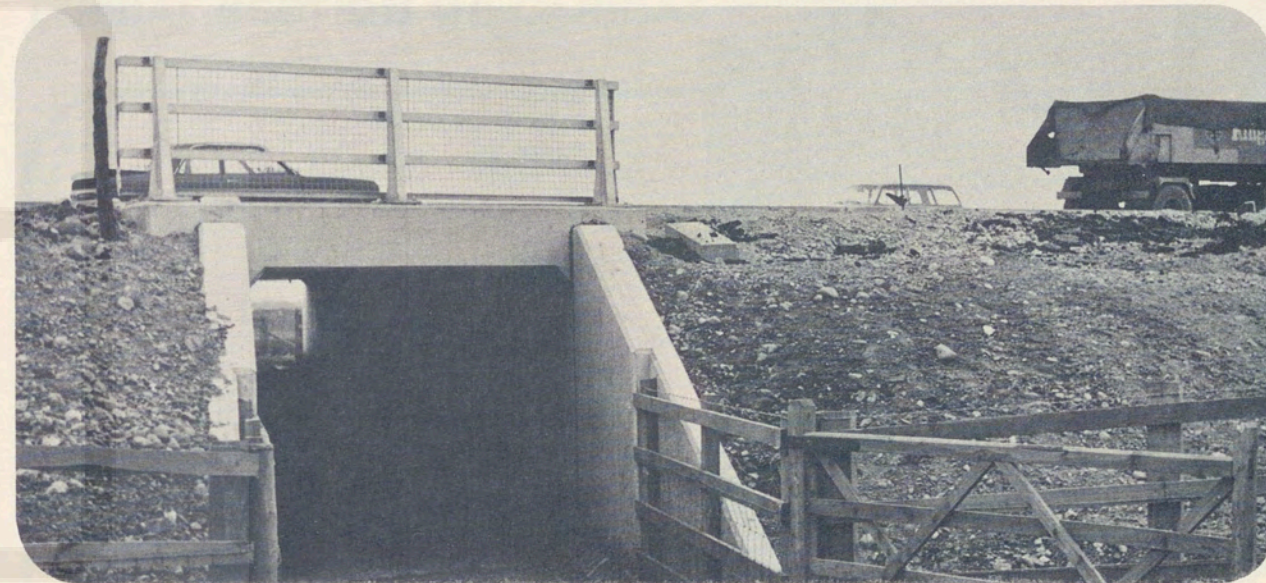
Rainfall	37.25 inches
Maximum temperature	27°C
Minimum temperature	- 8°C
Maximum wind (over 24 hours)	16.1 mph
* Days of Rain	104 days
* Days of Snow	10 days
* Days of Fine	400 days
* There are no records for days when the site was closed.	



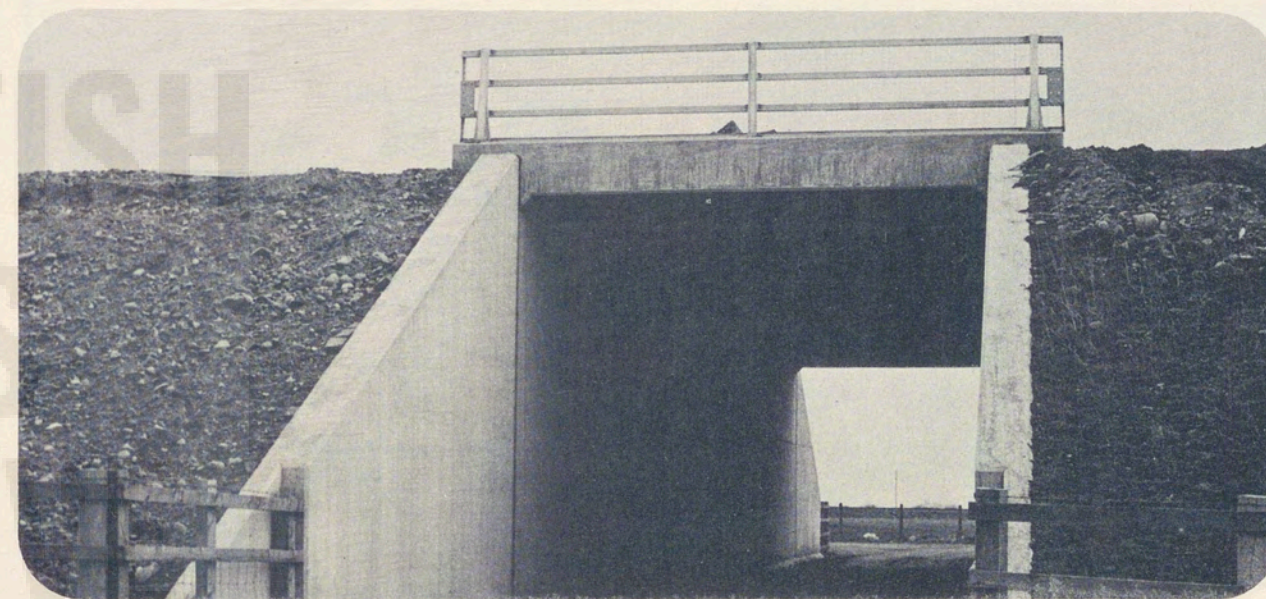
Sark
Bridge



Gretna
Loaning
Bridge



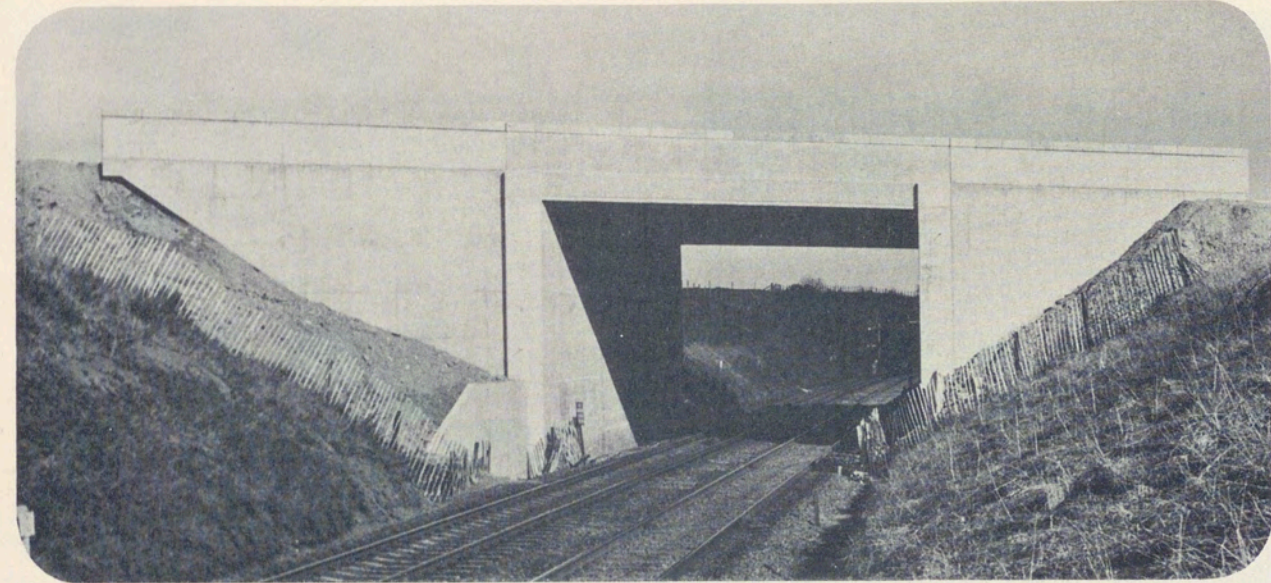
Guards
Farm
Underpass
South



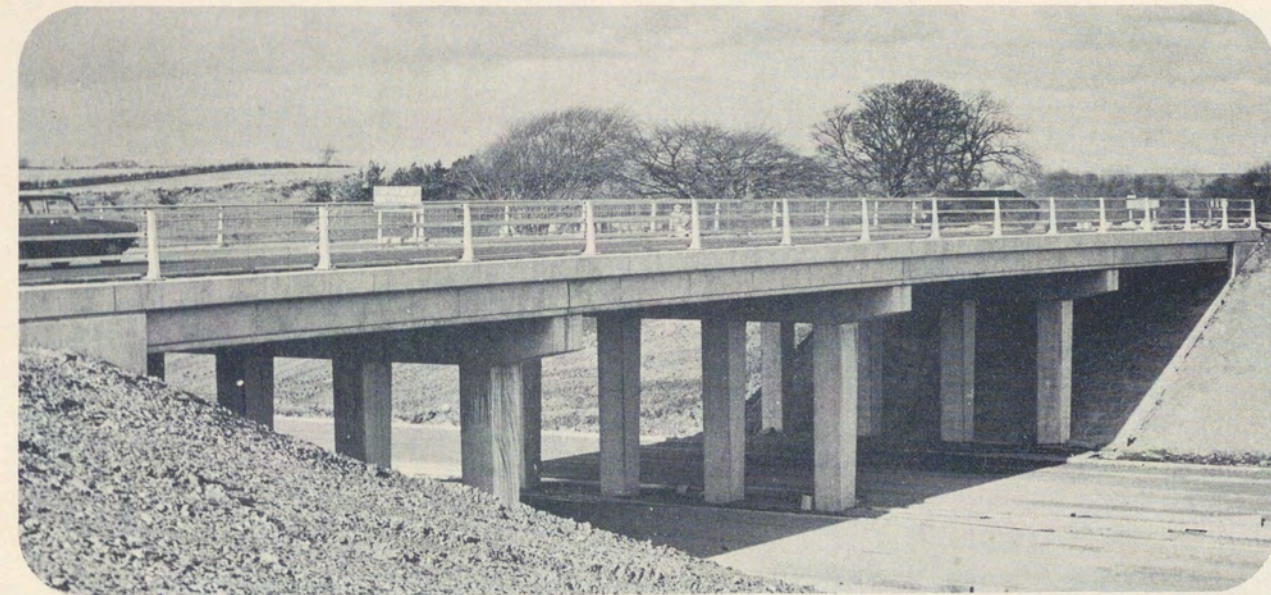
Guards
Farm
Underpass
North



SCOTTISH
ROADS
ARCHI

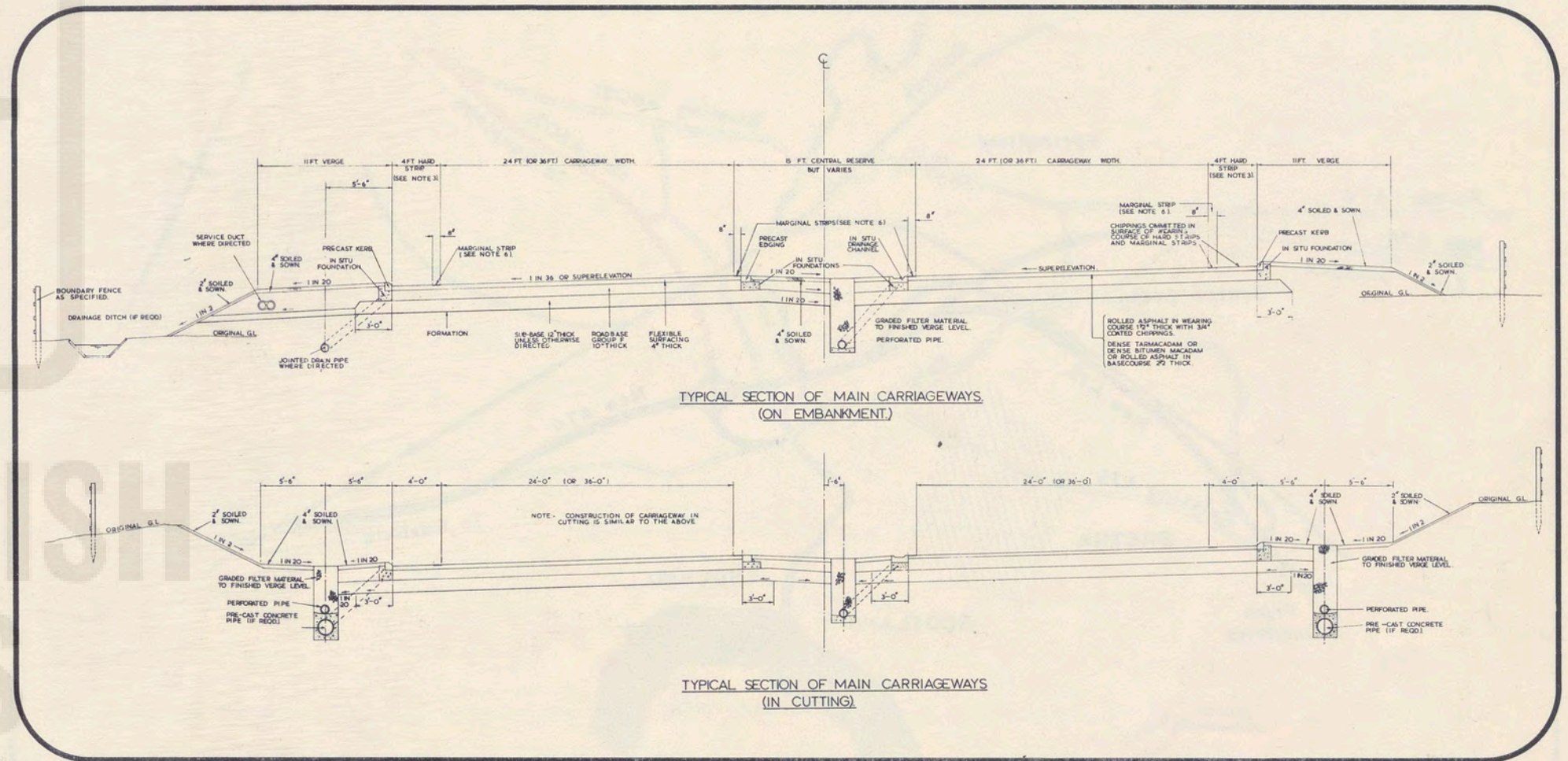


Gretna
Railway
Bridge

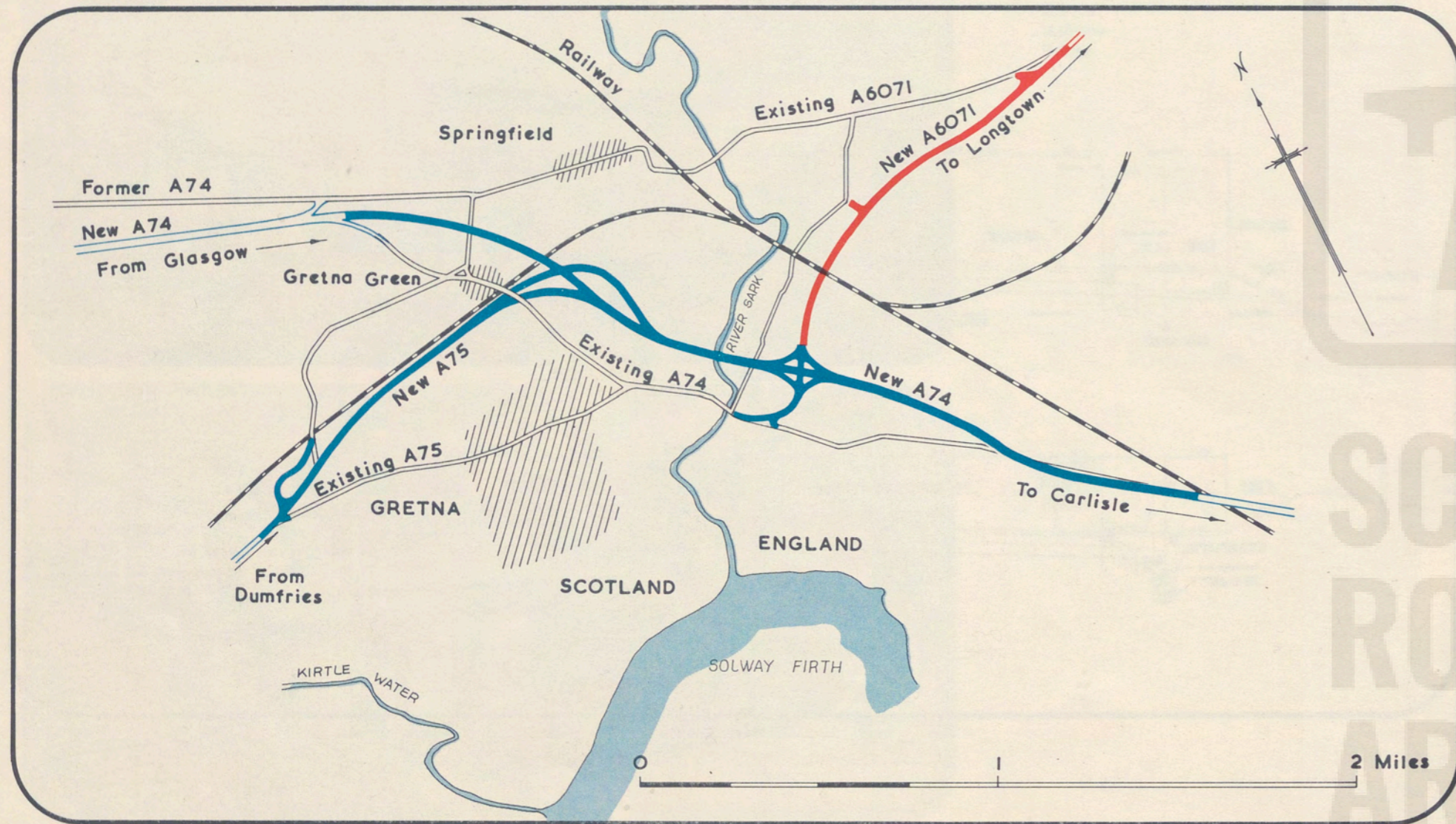


Guards
Mill
Bridge

TYPICAL SECTION OF CARRIAGEWAY



PLAN OF GRETNA DIVERSIONS



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