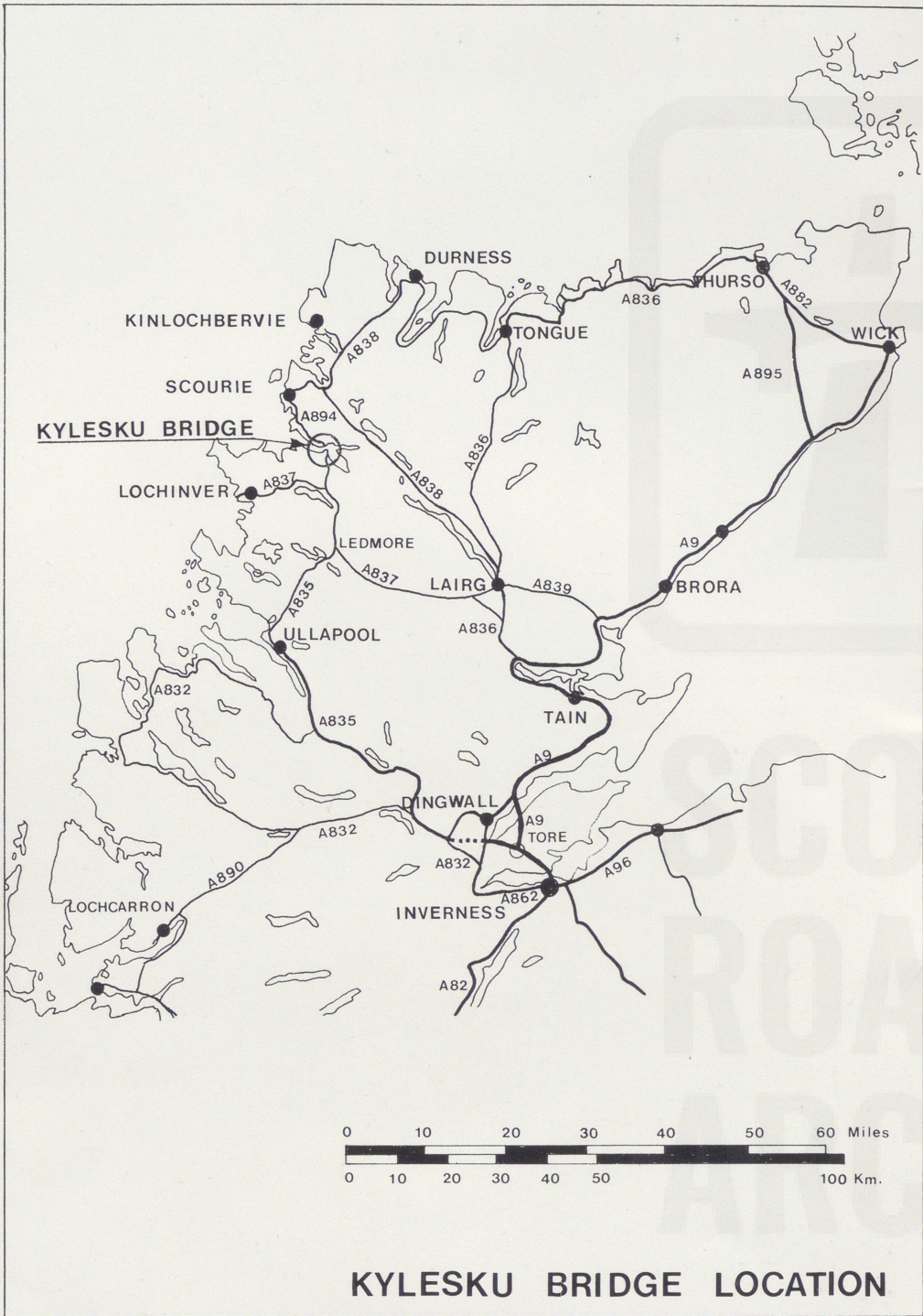


KYLESKU BRIDGE

Opening by
Her Majesty
the Queen
8th August 1984





OFFICIAL OPENING OF THE KYLESKU BRIDGE BY HER MAJESTY THE QUEEN

This booklet commemorates the opening of the Kylesku Bridge
By Her Majesty The Queen
on Wednesday, 8th August, 1984
and illustrates the former vehicular ferry and other projects proposed
in the Kylesku area following the construction of the new bridge.



Highland Regional Council

PROGRAMME

10.00 a.m.

Her Majesty, The Queen, will leave H.M.S. Britannia by barge.

10.05 a.m.

Her Majesty will arrive at South Jetty and be received by The Lord Lieutenant.

The Lord Lieutenant will present:

Mrs Gilmour

The Chief Constable

Her Majesty will proceed by car to the South end of the Kylesku Bridge.

10.10 a.m.

Her Majesty will arrive at the Bridge.

The Lord Lieutenant will present:

Sheriff S. E. Bell (Sheriff Principal)

I. S. Campbell, Esq., (Convener, Highland Regional Council) and Mrs. Campbell

J. C. Robertson, Esq., (Vice-Convener, Highland Regional Council) and Mrs. Robertson

R. H. Stevenson, Esq., (Chief Executive, Highland Regional Council)

J. M. Young, Esq., (Chairman, Regional Roads and Transport Committee)

F. R. M. Keith, Esq., (Member for North West Sutherland) and Mrs. Keith

G. K. M. Macfarlane, Esq., (Director of Roads and Transport) and Mrs. Macfarlane

H. T. Stears, Esq., (Director of Ove Arup, Consulting Engineers) and Mrs. Stears

A. F. Morrison, Esq., (Chairman and Managing Director of Morrison Construction) and Mrs. Morrison

10.15 a.m.

The Convener will invite Her Majesty to perform the opening ceremony.

10.20 a.m.

The Convenor will invite Her Majesty to drive across the Bridge to unveil the plaque at the North end accompanied by the Chairman of the Roads and Transport Committee

10.25 a.m.

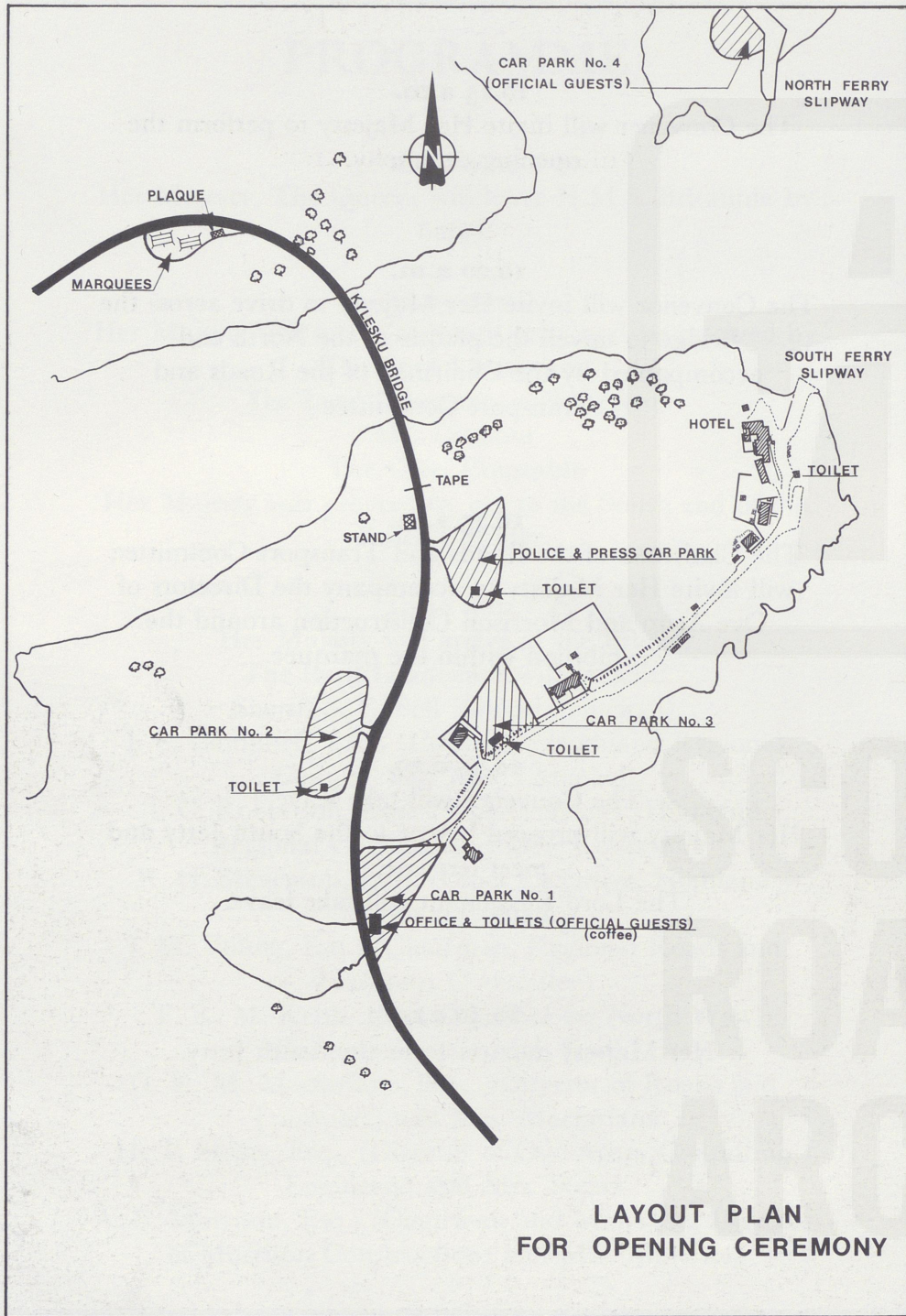
The Chairman of the Roads and Transport Committee will invite Her Majesty to accompany the Directors of Ove Arup and Morrison Construction around the exhibition within the marquee.

10.35 a.m.

The Convener will take leave.
Her Majesty will proceed by car to the South Jetty and meet ferrymen.
The Lord Lieutenant will take leave.

10.40 a.m.

Her Majesty departs from the South Jetty.

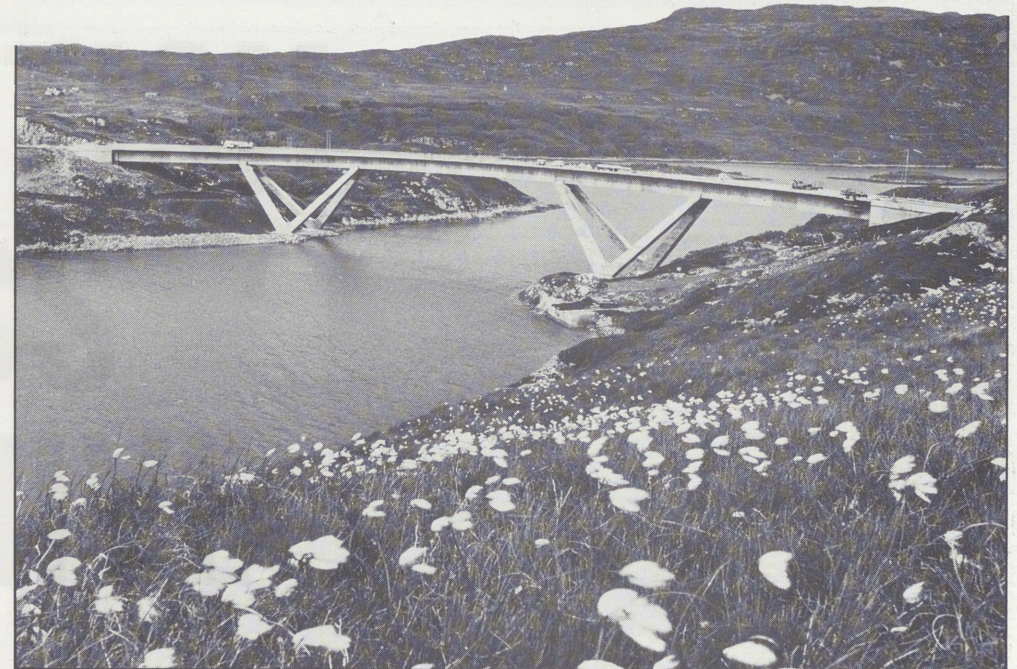


KYLESKU BRIDGE

Employer:
Highland Regional Council

Engineer:
Ove Arup & Partners, Scotland

Contractors:
Morrison Construction Ltd.

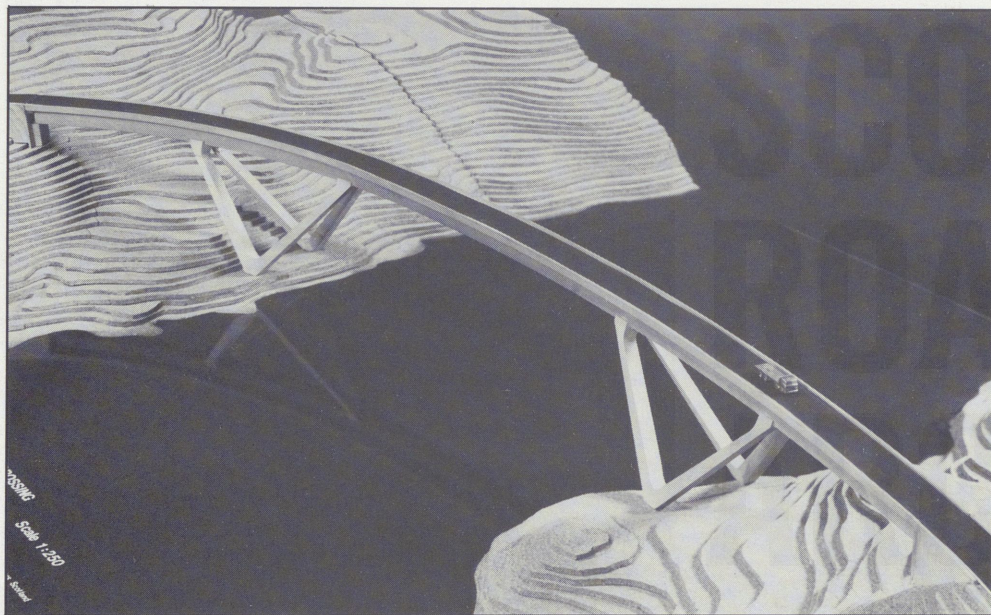


KYLESKU BRIDGE

Introduction

For many years access to the northwest part of Sutherland has been served on the west coast route by a vehicular ferry operating at Kylesku, about 40 miles north of the Trunk Road terminus at Ullapool. This ferry operated from dawn to dusk and, after dark social contact across the water could only be effected by travelling the 110 mile road detour. The former County Councils of Sutherland and Ross & Cromarty, and now the Highland Regional Council, have made significant improvements to the west coast route between Ullapool and Laxford Bridge by upgrading it from single track with passing places to a modern two lane highway.

In June 1978 the Highland Regional Council appointed Ove Arup & Partners as consulting civil engineers to prepare a feasibility study on the design of a bridge and approach roads at Kylesku. This was completed in March 1979 and the Council made its commitment to make this vital link in the west coast route by building the Kylesku Bridge. The project was included in their five year programme for 79/84.



The Model

Design

The approaches to Kylesku follow the general contours in order to minimise the impact and cost of major rock excavations. The North approach which incorporates a rock causeway between the mainland and Garbh Eilean, curves round the South side of the island. The steep sides of Caolas Cumhann require the adoption of a high level crossing which gives a navigational clearance of 24 metres above high water.

The bridge following the concept of the road design requires to be curved in plan and is sited at the narrowest part of the ferry crossing. It is a large bridge, having a total length in excess of 275 metres, and the width of the water crossed is some 130 metres comparable with the Clyde at Kingston Bridge or the Thames at Westminster.

The wind speeds in the area, which have been recorded as in excess of 100 m.p.h. during construction, have to be taken into account and the high horizontal loadings are taken out by providing the widened base of the intermediate supports.



An aerial view of the site.

Advantage has been taken of the height of the bridge by sloping these intermediate supports to reduce the central span to 85 metres. Balancing the loads from these legs by mirroring with similar legs sloping towards the abutments has provided an integrated frame action which produces only direct loads on the foundations.

The location of such a large bridge in the north west of Scotland demanded that low maintenance be aimed at in the design. To this end prestressed and reinforced concrete was chosen with no joints in the main elements of the bridge. Movement joints and bearings are located at the abutments where inspection and replacement when necessary can be more easily undertaken.

The resultant design is a five span prestressed concrete box deck cast in situ and prestressed in five stages. The deck is supported on inclined pier legs, with each pier comprising a pair of V shaped legs, each inclined to the vertical.

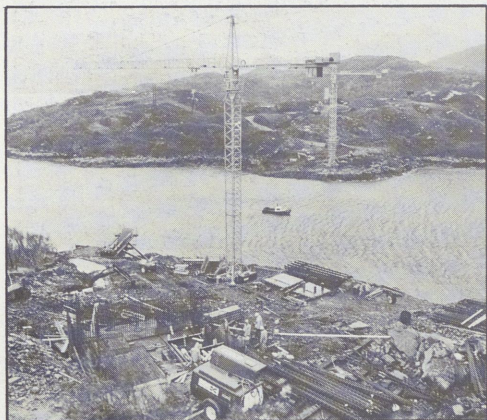
Statutory Procedures and Finance

The Kylesku Bridge project was subject to several statutory procedures including the Navigation Orders, which were confirmed in May 1980. The Royal Fine Arts Commission gave their wholehearted approval to the "aesthetically exciting and elegant design". Financial assistance to the North Approach was received from the Scottish Development Department under its Crofter Counties Schemes Programme and the Bridge and the South Approach received grant aid from the European Economic Community.

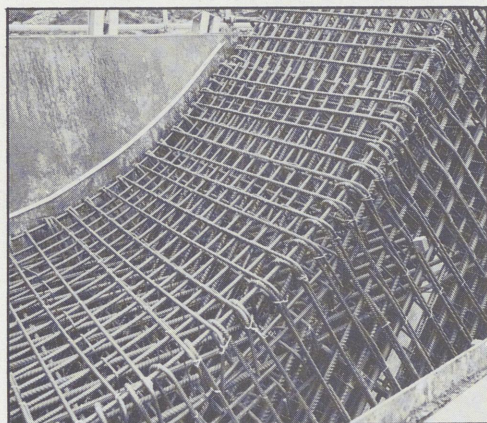
Having obtained all the necessary clearances and financial aid the Council commenced the approach road contract in 1981 and tenders for the Kylesku Bridge were invited from six contractors in 1982. Morrison Construction Ltd., part of the Shand Group of Companies, were awarded the contract on their tender of £2.75m and construction of the 2 year project started in August 1982.

Construction

The complex geometry and considerable height of the bridge necessitated extensive temporary works on a site exposed to very high winds. Construction commenced with the pier foundations, which extended down to 5m below high water and were protected behind concrete cofferdams. Pier leg construction started with the leg joint or "crutch" section which was cast inside a large steel framed shutter. The remaining part of the legs was of hollow box reinforced concrete, supported during construction on a framework of steel beams called ladder frames. For the landward leg construction these frames were supported on military trestling towers but for the seaward legs the ladder frames were supported on temporary horizontal ties, anchored back to the previously constructed landward legs.



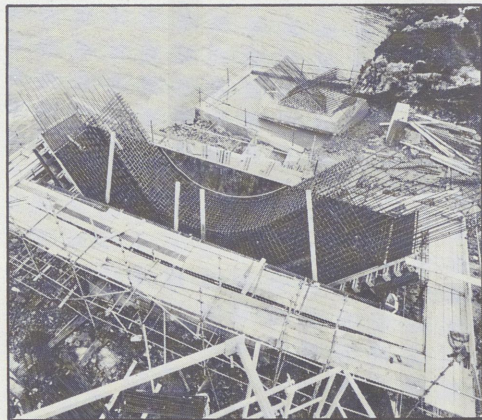
Early days on the site.



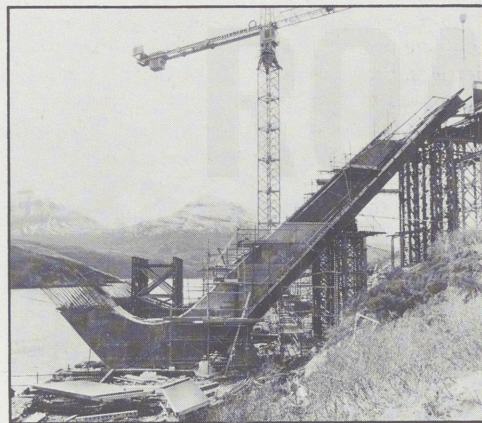
"Crutch" reinforcement.

While the legs were under construction, work was advancing on the abutments high above the Kyle. Work had also started on the deck approach spans which were supported on Bailey and Mabey Universal beams. To provide overall stability for the bridge during construction, a temporary support member, known as the tie/strut, was required under the landward pier heads. During early stages of construction this member was loaded in compression up to 900 tons and in later stages in tension up to 750 tons. The compression loading was taken down to the rock foundations through a 1 metre diameter steel tube and the tension loading by temporary prestressing tendons coupled to deep rock anchors.

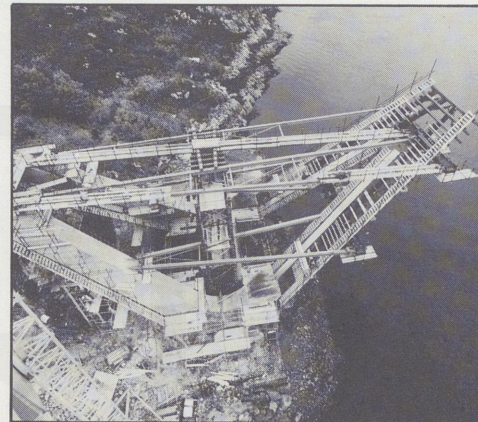
At the top of the piers the inclining legs meet at what is termed the saddle. This



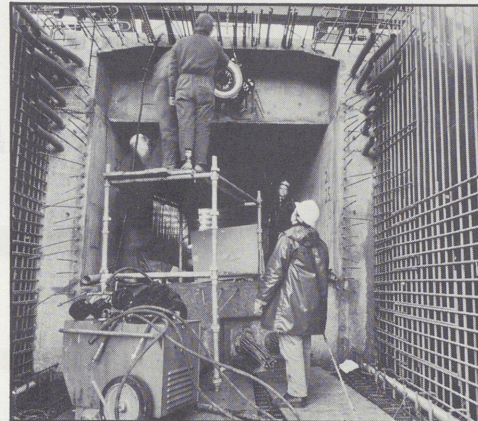
Pier foundations and "crutches".



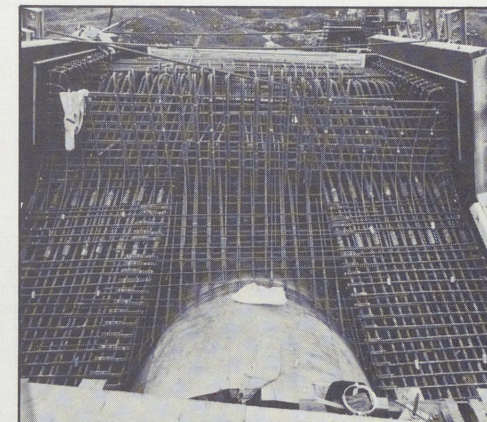
Landward leg construction.



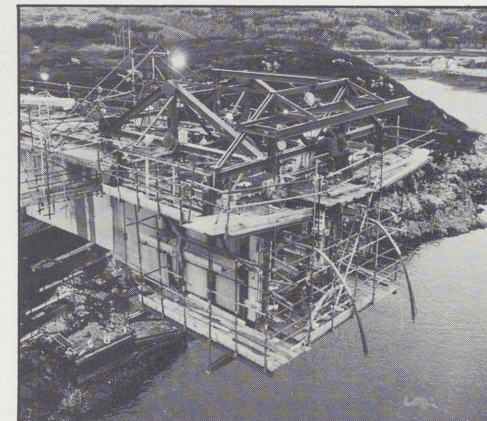
Ladder frames and horizontal ties.



Deck prestressing.



Saddle reinforcement.



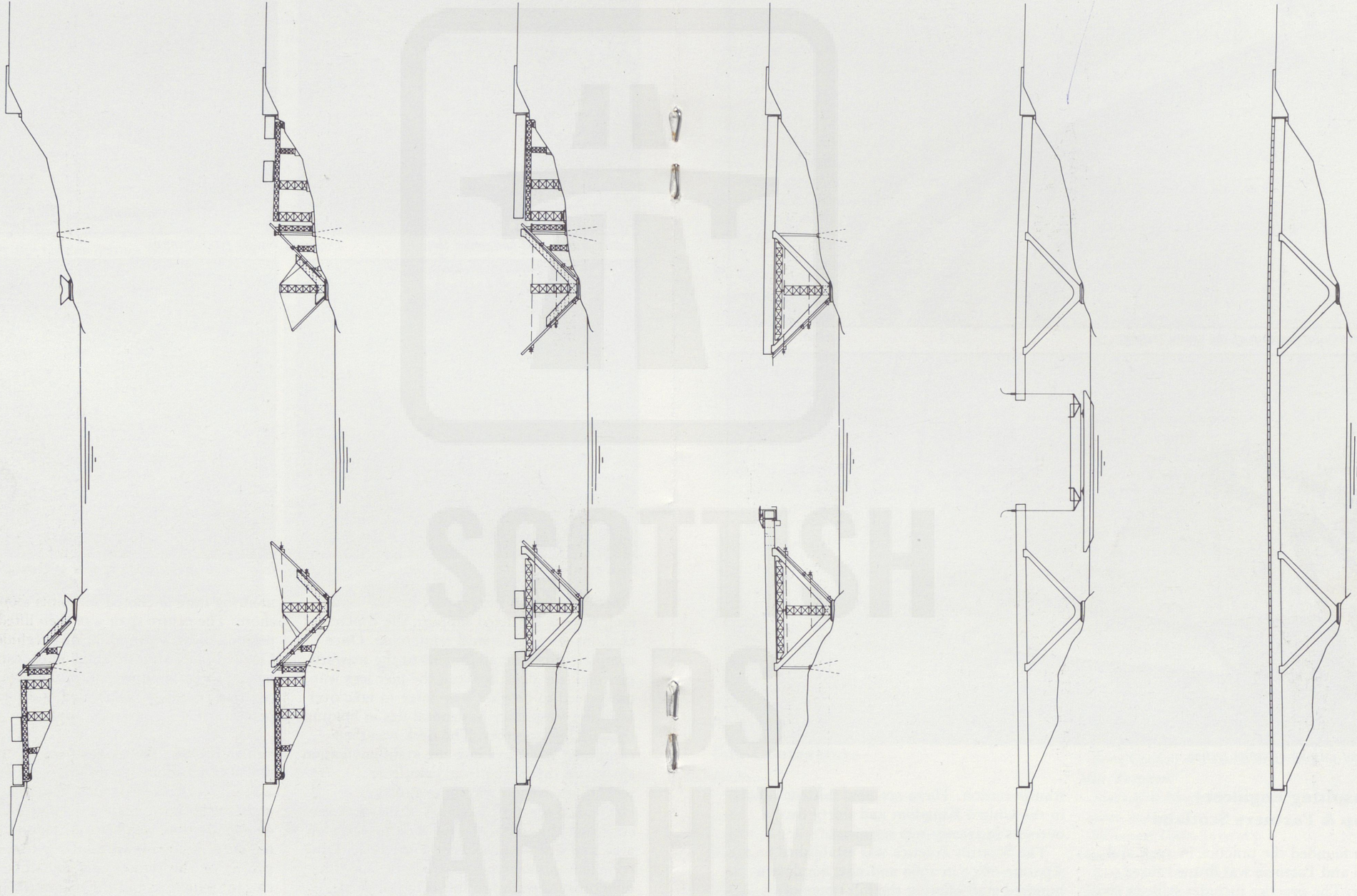
Incremental cantilevering of part of the main span.

junction provides the support for the deck and, since it is a fixed support, the concrete contains very dense steel reinforcing. Once complete from the abutments to the seaward pier legs, the deck between the pier legs was prestressed to provide a tie force to take over from the temporary horizontal ties in holding the pier legs together. The deck was then continued 20 metres into the main navigation span with the incremental cantilever techniques using a travelling gantry.

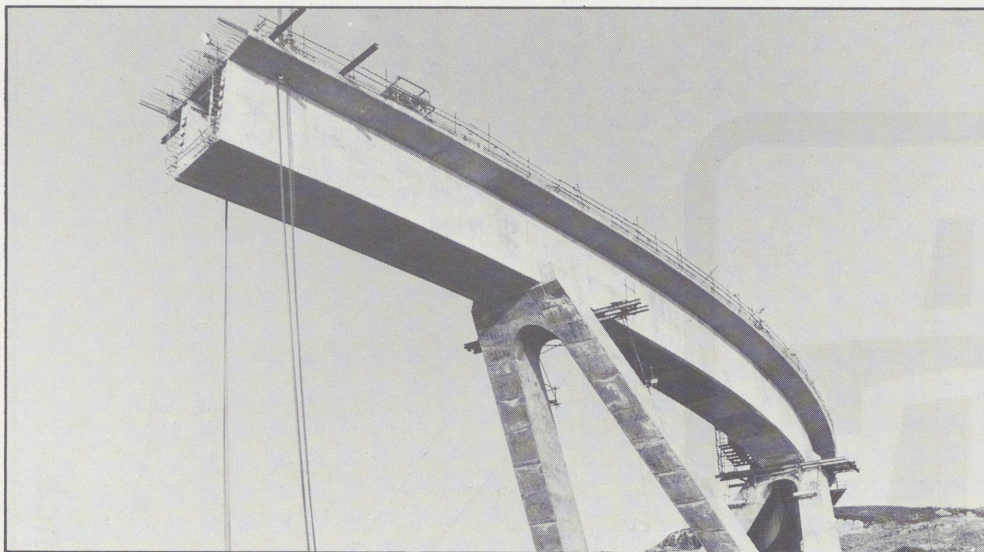
The 600 ton centre section of the deck was constructed in parallel with the cantilever on a casting bed on the shores of the Kyle. Once complete the section was strengthened with temporary prestress before being skidded along tracks onto a floating barge. The barge was then manoeuvred into position under the bridge and accurately held there using four

mooring lines anchored to points along the shore. The centre span was then lifted into position using a strand jacking technique. Once in place the two small gaps, each 1.5 metres wide, at either end of the precast centre section were concreted and the final permanent work prestress applied.

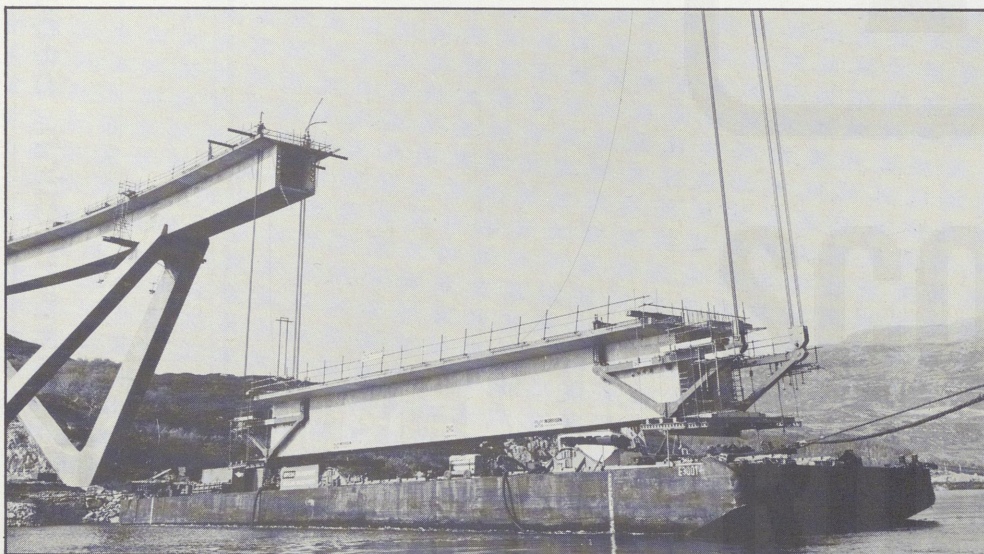
The Kylesku Bridge has been completed ahead of schedule. To do this the Contractor and his workforce, together with his sub-contractors, have made a massive effort in overcoming the weather and the many technical problems associated with a unique project on this remote site. The design of this elegant structure and the teamwork between the Contractor and the Consulting Engineer has created the Kylesku Bridge of which all those associated with it can be justly proud.



Construction Sequence



Cantilevers ready for jack-up of the centre section.



Float out and jack-up of centre section.

The Consulting Engineer Ove Arup & Partners Scotland

Ove Arup founded the practice in 1946 and Ove Arup and Partners was formed three years later. The practice includes skills in civil and structural design, project planning, building economics, building design, building service design, traffic engineering and

transportation. There are now thirteen offices in the United Kingdom and thirty-two overseas in twenty-two countries.

The Scottish Practice was established as a separate office in 1960 and now employs a hundred staff offering the full range of services. It is located in Glasgow, Dundee and Aberdeen in addition to the main office in South Queensferry.

The Contractor Morrison Construction Limited

Morrison Construction Limited is part of the Morrison Construction Group whose foundations can be traced to the building contracting business started by Alexander Morrison in Tain, Ross-shire in 1948. The Morrison Group is part of Alexander Shand (Holdings) Ltd., an international construction company. The Morrison Group is now active throughout Scotland in general building and civil engineering contracting, quarrying, private housing, property development and through the Cromarty Firth Engineering Co. Ltd., in providing services to the North Sea oil industry.

Permanent Works

Length of Bridge	275.8m
Clearance above H.W.M.	24m
Navigation Span	85m
Number of Spans	5
Volume of Concrete	4000m ³
Reinforcement Bars	700 Tonnes
Prestressing Tendons	82 Tonnes (5200 lin.m.)
Formwork	14,000m ²
Hired Falsework	450 Tonnes
Special Fabricated Structural Steel Falsework	400 Tonnes

Work Force

A maximum of 100 men, 95% of whom are resident in the Highland Region.

Contractors Plant

- 2 No. Liebherr EZA 500/750 Batching Plants
 - 2 No. Liebherr 256 HC Tower Cranes (48.5m Tower/65m Jib)
 - 2 No. Sidewinder 30 Concrete Pumps
- All electricity site generated.

Sub-Contractors

- Prestress*
Losinger Systems Ltd., Thame.
- Rebar*
J.D. (North) Construction Ltd., Inverness.
- Formwork*
W. MacLean, Kildary.
- Falsework Erection*
Weldex International (Offshore) Ltd., Inverness.
- Stage III Load out and Lift*
Breda Transport B.V., Holland.

Stage III Specialist Lift
P.S.C. Freyssinet, Iver.

- Rock Blasting*
Ritchies Equipment Ltd., Dunblane.
- Scaffolding*
Aberdeen Scaffolding Co. Ltd, Aberdeen.
- Safety Parapet*
Grundy Arnatt Ltd., Kingston-Upon-Thames.
- Bearings/Expansion Joints*
Maurer (U.K.) Ltd, Thame.
- Road Markings*
G.B. Markings, Kirkintilloch.
- Road Pavement*
Wimpey Asphalt, Muir of Ord.
- Setting Out*
Property & Land Services, Dingwall.
- Electrical*
Assynt Engineering, Drumbeg.
- Photography*
D.G.S. Films Ltd., Edderton.
- Concrete Mix Design*
Highland Testing Services, Inverness.

Suppliers

- Falsework*
Mabey Bridge Engineering Co. Ltd.,
Ravensthorpe.
- Travelling Gantry*
Newton Formwork Design, Wigan.
- Stage III Lifting Equipment*
Lemand Engineering, Matlock.
- Rebar*
Rom River Reinforcement Co. Ltd., Hamilton.
- Cement*
J. & W. Henderson (Blue Circle Cement),
Grangemouth.
- Aggregates*
Morrison Quarries Ltd., Kildary.
- Deck Waterproofing*
Servicised Ltd., Glasgow.
- Misc. Falsework*
W.H. Mackay, Fearn.
- Misc. Falsework*
Bone Connell & Baxter, Inverness.
- Misc. Falsework*
Mackay & Macleod, Evanton.
- General Supplies*
Inverness Tools, Inverness.
- General Supplies*
Ross-shire Nut & Bolt, Dingwall.
- General Supplies*
Dividag Systems Ltd., Southam.
- Fuel*
B.P. Oils (Robertson), Lairg.

KYLESKU FERRY

As with so many Highland ferries, the origins of the service at Kylesku are lost in the mists of time.

Until the early 1800s the area had no road system suitable for wheeled transport and travel was by horse and foot over rough tracks pounded out by drovers bringing black cattle from north-west Sutherland to the trysts at Muir of Ord and Falkirk.

The ferry at this stage consisted of a rowing boat; cattle and horses had to swim.

With the advent of wheeled traffic and more regular use of overland transport in the latter part of the 19th century, the service was operated using a six oared cobble on which horses and carts could be transported by the rudimentary and hazardous process of creating a platform of turf in the centre section of the boat.

From the turn of the century to the start of the First World War the ferry was operated by the Duke of Sutherland using a cable operated steel barge with a hand winch which took four men to operate. Crossings took one hour – on a calm day – and were restricted to one or two per day.

The service reverted to a rowing boat for the War years and it was not until after the War that a vessel capable of carrying motor vehicles was used on a regular basis.

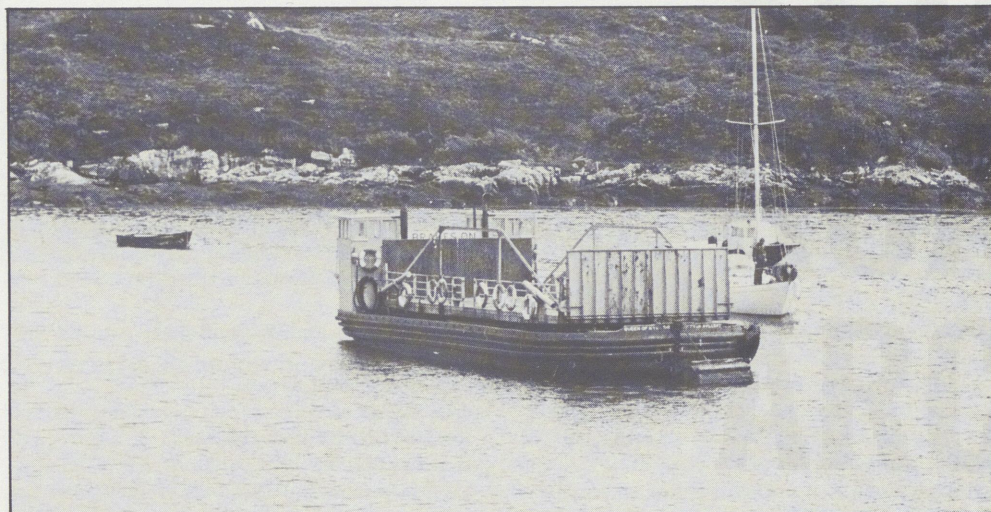
Operators in this period included the Automobile Association who ran a small motor ferry which could carry one car and later Mr. Filmer-Sankey who operated a 2-car turntable boat which ran until commandeered by the Navy in the early part of the Second World War.

The ferry once again reverted under the pressure of national need to a rowing boat.

In the post War years the ferry, now run by Mr. Vestey, operated as a vehicle ferry in summer with a passenger launch only in the winter, and this arrangement continued until the ferry was taken over by Sutherland County Council in 1948. The Council ran the service with a variety of turntable boats and most significantly for both locals and tourists the service was free to all users.

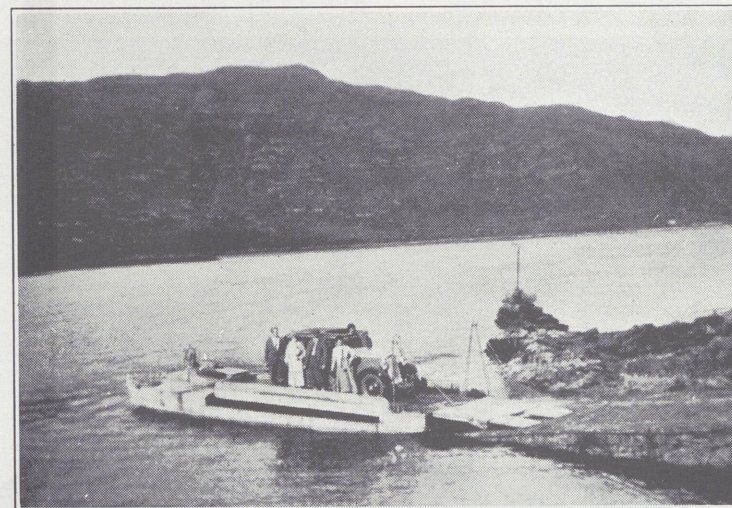
Shortly before reorganisation of Local Government in 1975, Sutherland County Council ordered a new roll-on roll-off ferry "The Maid of Glencoul" capable of carrying both cars and full sized commercial vehicles, and this vessel continued to provide a greatly improved but regrettably no longer free service as the principal vessel on the crossing.

With the opening of the Kylesku Bridge, another of the established ferries of the Highlands will disappear and with it some of



A turntable ferry.

No. 14. KYLESKU (Sutherland)



Telegraphic Address : Ferry, Kylestrome, Scourie, Sutherland.

Motor Ferry Boat. Service operates (Sundays included) from 1st May to mid-October between 8 a.m. and 8 p.m. except during October, when boat runs from 9 a.m. to dusk ;—delay at low tides.

	Single		† Return	
	s.	d.	s.	d.
Motor-car, up to 10 h.p.	6	0	9	0
Over 10 h.p., but not exceeding 20 h.p.	8	0	12	0
Exceeding 20 h.p.	10	0	15	0
Motor-cycle	2	6		
Motor-cycle and Side-car	3	6		
Luggage Trailers*	3	6		
Trailer Caravans	6	0		

† Return tickets are available only on day of issue.

*NOTE.—This rate only applies if the luggage trailer can be taken at the same time as the car.

the romance of West Highland travel. Many regular travellers in the area will miss the interlude in a long journey which the ferry could bring and the cheerful contact with the ferrymen who have over the years become as much of a local institution as the ferry itself. Few, however, will regret the disappearance of the delays and frustrations inevitable from

time to time on the best regulated ferries or deny the benefits to the area of a transport link being available for the first time at any hour of day or night.

Not least, all travellers will have restored to them the privilege which they enjoyed in the past of a free crossing of the Kylesku narrows.



The Maid of Glencoul.

THE KYLESKU ACTION PLAN

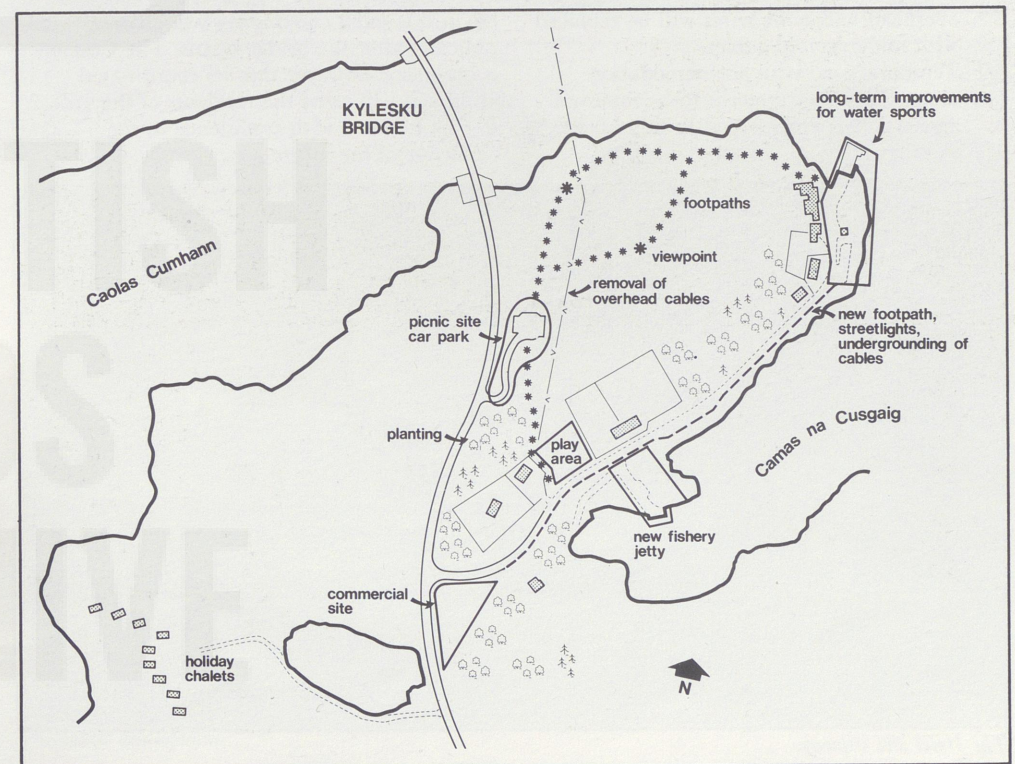
The long-awaited confirmation of the Regional Council's decision to construct a new bridge over the narrow waters of Kylesku was greeted with mixed feelings by the villagers living in the community. Everyone appreciated the great benefits that the new road communications would bring to their neighbours in North West Sutherland. The obvious fact remained however, that the completion of the bridge would bring to an end the employment of the ferrymen and would divert the tourist traffic which passed the doors of a shop, the post office and the hotel. In this regard, the economic stability of the small isolated community of Kylesku was threatened.

With the support of the local Councillor and residents, the Regional Council examined a number of ways in which alternative sources of employment could be created and existing jobs maintained. A programme of action involving a number of the Council's

Departments, and with assistance from outside agencies, was drawn up.

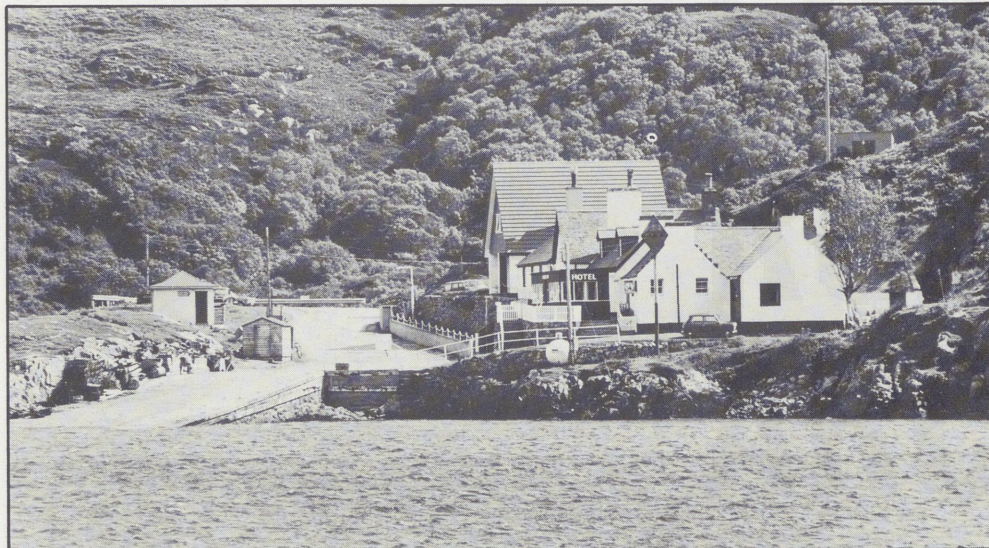
The major priority of the action programme was to establish a wider employment base in the locality. The Council agreed to construct a fishery jetty from which local fishing boats could operate and expand their activities. This part of the project is now under construction and is sponsored by the Council's Roads and Transport Department. Also, following a feasibility study of a number of sites, the Development Committee agreed to acquire a site at the entrance to the village, adjacent to the main road, suitable for small workshops, a restaurant or tourist craft shop facilities.

The tourist industry is already a significant employer in the area with the well-established hotel, offering facilities to visitors. Recently, development of an attractive chalet complex has begun on a site above the village overlooking Loch a' Chairn Bhain. A number of projects are proposed by the Council which



are designed to improve the environment of the village and the surrounding area, and promote and expand the tourist facilities.

- (a) Overhead electricity power lines which formerly crossed the Kylesku Narrows have been removed and replaced by cables within the structure of the new bridge.
- (b) A scheme for planting trees in and around the village is currently being designed and will be implemented in the autumn.
- (c) A new picnic site and car park is to be constructed between the new bridge and the village which will offer the opportunity for travellers to stop and enjoy the spectacular scenery.
- (d) The car park will be linked to the village and to viewpoints by a system of footpaths.
- (e) The village street leading from the new road to the ferry slipway is being improved and a footpath constructed along the shore-side.
- (f) New street lights will be installed and overhead telephone wires will be replaced with underground cables.
- (g) Temporary caravan accommodation along the village street is to be removed and residents encouraged to tidy up the frontage.



The Hotel and slipway.

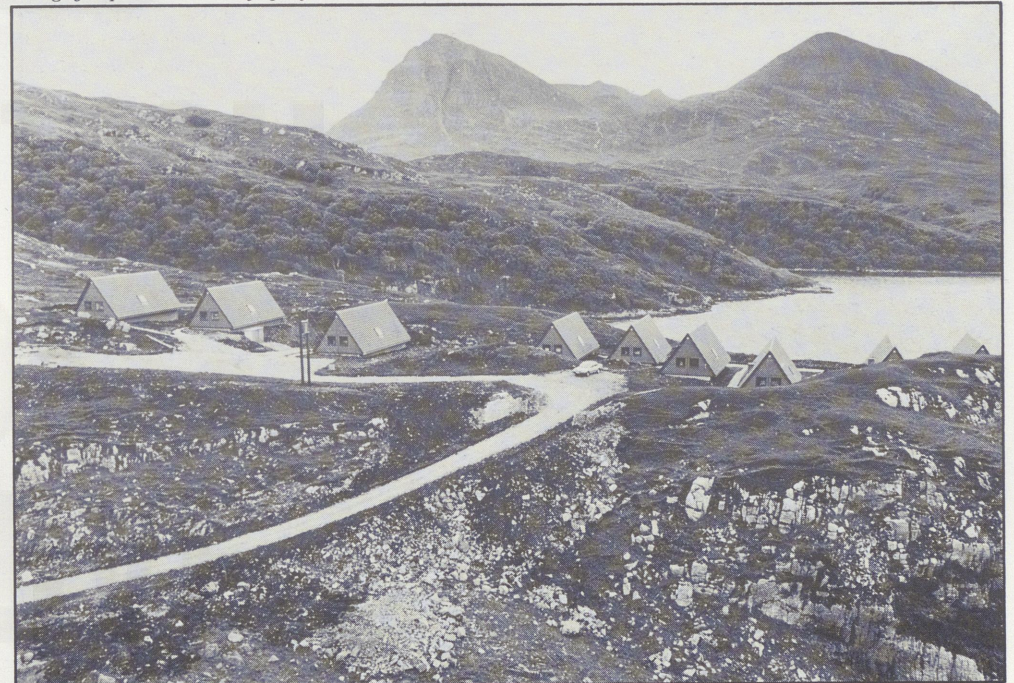
- (h) Attractive road signs will be erected on the new road, north and south of the village access, drawing the visitors' attention to the various facilities and services offered in the community.

The existing ferry slipway and its immediate vicinity have been examined with a view to improving the facilities for water based recreation, particularly for launching of small craft to allow sailing enthusiasts to enjoy the potential for exploring the picturesque west coast waters. This could form the basis for a longer term recreation development proposal.

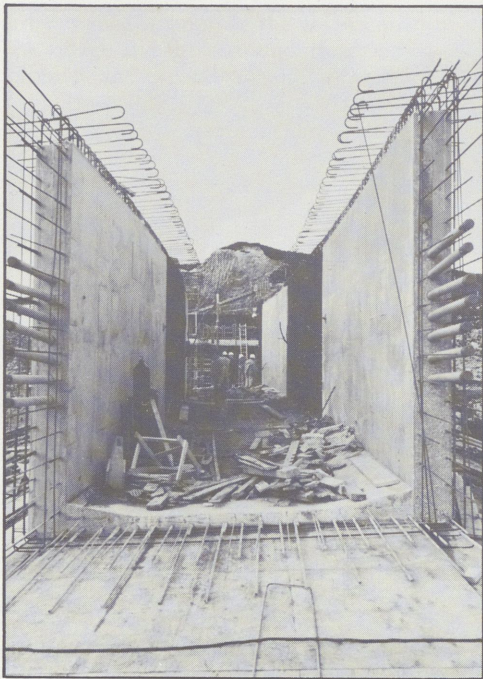
Kylesku and its new bridge lies on the northern periphery of one of the finest National Scenic Areas in Scotland. The proposals for environmental improvements, designed to enhance the scenic quality of the area and improve visitor facilities, have attracted grants from the Countryside Commission. The combination of proposals which resulted from the "Kylesku Project" is a recognition by the Regional Council that life in this small community will change radically after the bridge opens. The Council is optimistic however that its coordinated approach will assist the residents of the village to look forward with confidence to the challenge of the future.



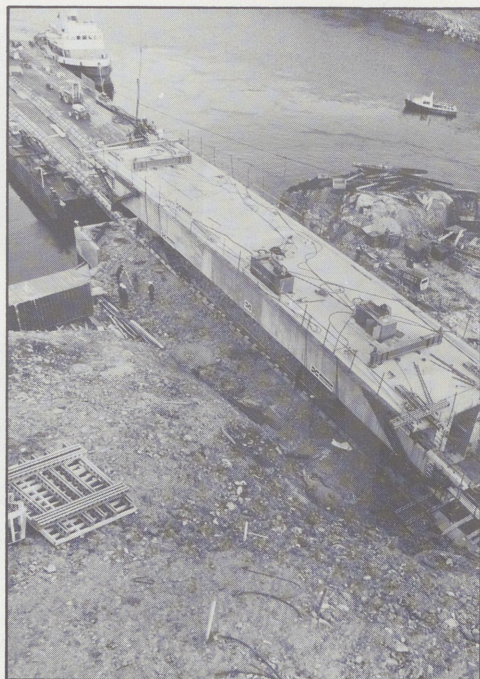
Village footpath and Fishery Jetty under construction.



The chalet development.



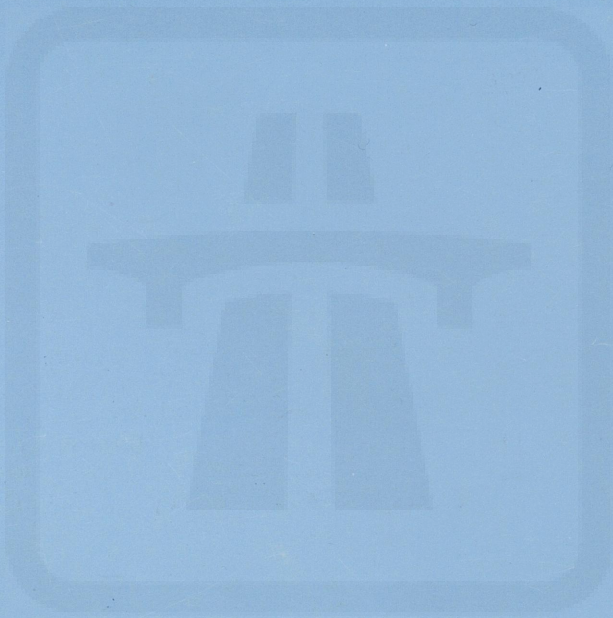
The prestressed box section deck.



Loading of precast centre span onto barge.



Completed Bridge.



SCOTTISH
ROADS
ARCHIVE

HIGHLAND
REGIONAL COUNCIL

Registration Number HST 239Y

Make FORD ESCORT

Valid until 31/3/85

Endorsement of

Issuing

Officer

J.M.R.

EXEMPTION CERTIFICATE
KYLESKU FERRY

No. 428

LAST SAILING



HIGHLAND REGIONAL COUNCIL

KYLESKU FERRY

LAST DAY OF SAILING

Wednesday 8th August, 1984

COMMEMORATIVE TRIP

ABOARD M.V. "MAID OF GLENCOUL"

Ticket entitles bearer to a ferry crossing and return journey by
ferry or coach via Kylesku Bridge to original point of departure.



On the Occasion of the Official Opening

of

KYLESKU BRIDGE

by

HER MAJESTY THE QUEEN

The Convener and Members of Highland Regional Council

Invite the Presence of

Mr. & Mrs D. Fraser

.....
on Wednesday 8th August, 1984 at 9.40 a.m.