

Welcome to the exhibition

Welcome to the public information exhibition for the proposed
Forth Replacement Crossing.

This exhibition is presented by Transport Scotland on behalf of Scottish Ministers and is to allow members of the public to study the options for a new crossing across the Firth of Forth and provide their comments.

The exhibition will guide you through the work that has been done by Transport Scotland in assessing the requirement for a new crossing and the factors that have led to the short-listing of two main options – a bridge and a tunnel to the West of the existing Forth Road Bridge.

Please pick up an information pack and approach any member of the exhibition staff if you have any questions about the information on show here today.

Your pack contains a feedback form to provide any comments you wish to make about the options for the new Forth crossing.



Crossing the Firth of Forth

When the Forth Road Bridge opened in 1964 it was one of the world's most impressive feats of engineering and the longest suspension bridge anywhere outside the USA.

At that time, around 2 million vehicles used the crossing to travel north over the Firth of Forth every year. In 2006, this figure was closer to 12 million – growing more than five-fold in 40 years – far higher than the national average traffic growth.

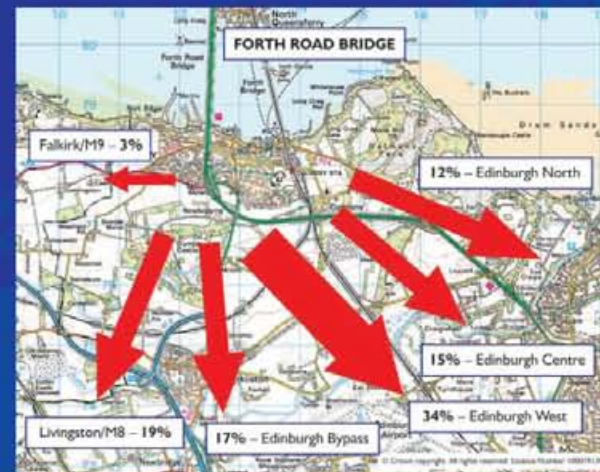
With 66,000 vehicles per day, the Forth Road Bridge carries 70% of the traffic across the three main crossings of the Forth.

Despite constant maintenance and investment throughout its lifetime the bridge is now showing signs of deterioration. This is mainly as a result of the increasing weight and numbers of vehicles using it but also the influence of weather and climate.

The Forth Road Bridge is the main route across the Forth for thousands of businesses and commuters. It is an economic lifeline for Fife, Edinburgh and the east coast of Scotland and vital to the wealth of Scotland as a whole. Alternatives to car travel – such as Park and Ride and increased rail services – are in place and more will be developed in the future to stem reliance on the car. But it is vital that crucial links connecting up the east coast economic corridor are maintained.



Forth Road Bridge travel origins



Forth Road Bridge travel destinations

THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



Repairing the Forth Road Bridge



FETA's traffic management team sets out a contraflow in preparation for resurfacing of the northbound carriageway.
Photo by Tony Marsh Photography, courtesy of Forth Estuary Transport Authority.

The Forth Road Bridge is managed and maintained by the Forth Estuary Transport Authority (FETA) which has undertaken considerable work to assess the condition and strength of the bridge.

FETA has announced that maintenance works will become more common in the future. In particular the bridge's main cables are corroding and although this process can potentially be slowed by using a de-humidification system the results of this will not be known for some time.

Replacing or adding to the cables is possible. Options include:

1. Completely replacing cables
2. Adding a new cable above the existing cable
3. Adding a new cable to the side of the existing cable.

Carrying out these works while the bridge remains open to traffic would take between 5½ and 7 years and could involve contraflows for 56 weeks and partial closures for 48 weeks over a four-year period. It could even mean the bridge would be closed completely for 50 weekends.



Strategic transport issues

The Forth Replacement Crossing Study forms part of the Strategic Transport Projects Review which will recommend a programme of measures for the period 2012 to 2022 along Scotland's key strategic transport corridors.

The Study identified the following transport planning objectives for the Forth estuary:

- Maintain cross-Forth transport links for all modes of transport to at least 2006 levels
- Connect to the strategic transport network
- Improve reliability of journey times for all modes of transport
- Increase travel choices and encourage the use of alternative types of transport for both goods and people
- Improve accessibility and social inclusion
- Minimise the impacts of maintenance
- Support sustainable development and economic growth
- Minimise the impact on people, the natural environment and the cultural heritage of the Forth

A range of options were considered as part of the study, but it was found that these objectives could only be met by building a replacement crossing of the Forth.



Forth Replacement Crossing Study Area.

THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



Constraints and considerations

There are a considerable number of very important physical and environmental constraints which influence options for crossing the Firth of Forth.

Some of the physical features are:

- Communities along the North and South shorelines such as Queensferry, Inverkeithing, Hopetoun, Rosyth and many others
- Industrial operations such as Grangemouth, Longannet Power Station, Rosyth Dockyards and MOD areas
- Oil, gas and electricity lines crossing the Firth
- Navigation channels, water depths, vessel anchorages and berthing areas for ships
- Firing range protected areas
- Outfall pipes
- BP oil pipeline to Grangemouth
- Geological features such as rockhead
- Mine workings



The Firth of Forth is a busy area in terms of industry, leisure and residential settlements.

THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



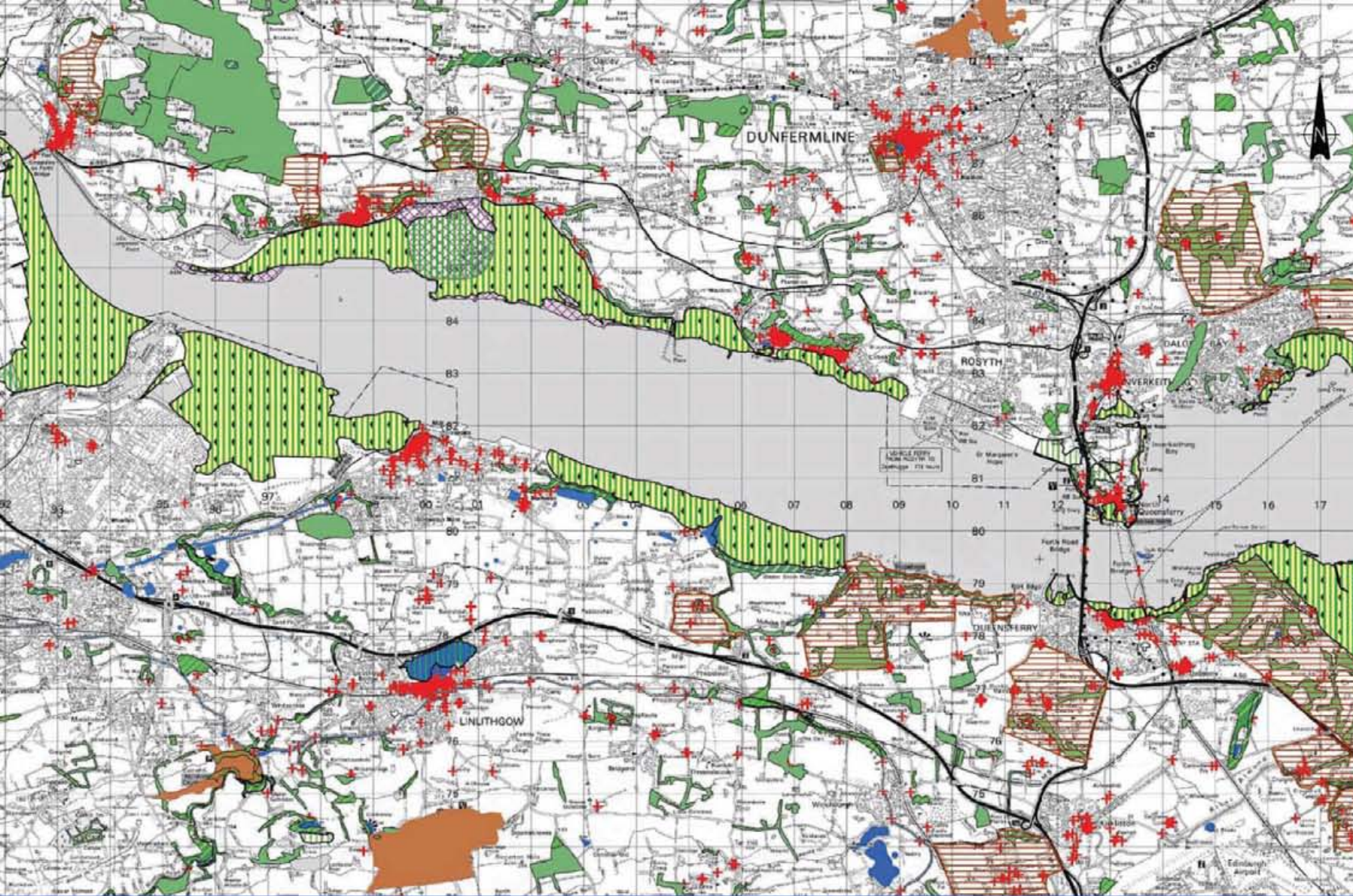
Environmental features

The need to protect the environment of the Firth of Forth has been an important part of the study and one of the objectives against which all options have been appraised: “Minimise the impact on people, the natural environment and the cultural heritage of the Forth area.”

The study area is rich in environmental features, many of which are protected under various pieces of legislation. The maps that follow show environmental features protected at a national and local level and include:

- **SPAs** – Special Protection Areas which are important habitats for rare and migratory birds
- **Ramsar sites** – Wetlands of international importance
- **SACs** – Special Areas of Conservation with listed species of flora and fauna
- **SSSIs** – Sites of Special Scientific Interest due to the presence of wildlife
- **SAM** – Scheduled Ancient Monuments
- **GDL** – Gardens and Designed Landscape
- Country parks, local nature reserves and significant historic features
- Listed buildings, archaeological sites and heritage conservation areas
- Various woodlands and specially protected trees
- **Areas of Landscape Value**
- **Greenbelt zones**
- **Rights of way and other public access**



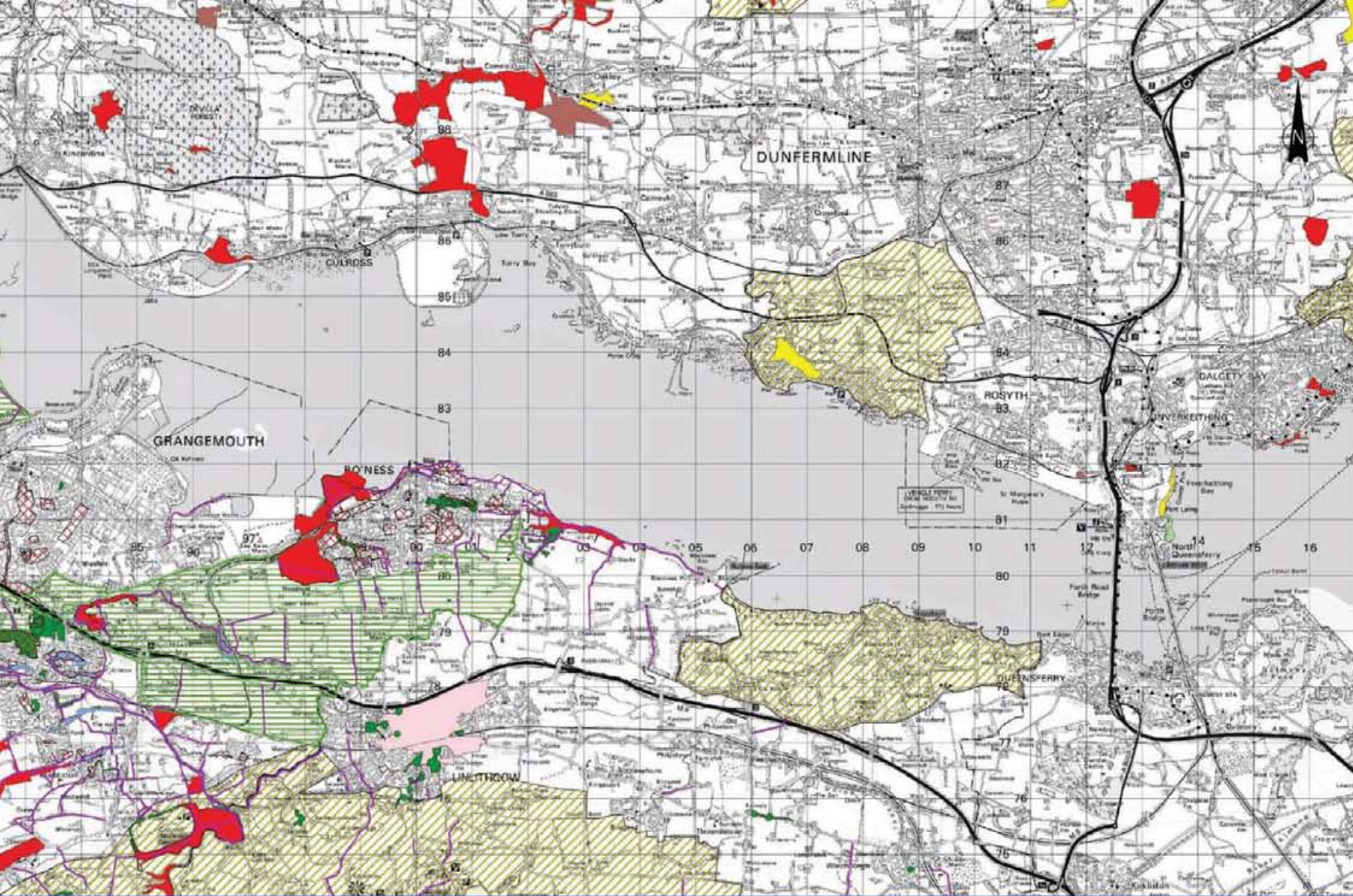


- Key**
-  SSSI
 -  RAMSAR
 -  SPA
 -  LISTED BUILDINGS
 -  SEMI-NATURAL WOODLAND INVENTORY SITES
 -  LOCAL NATURE RESERVES
 -  GARDENS & DESIGNED LANDSCAPE
 -  COUNTRY PARKS
 -  ANCIENT (OF SEMI-NATURAL ORIGIN) WOODLAND INVENTORY
 -  LONG ESTABLISHED (OF PLANTATION ORIGIN) WOODLAND INVENTORY
 -  OTHER PLANTATION
 -  SCHEDULED ANCIENT MONUMENTS



MAP SHOWING NATIONAL PROTECTED SITES

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info



- Key**
- TREE PRESERVATION ORDER
 - RIGHTS OF WAY
 - GREENBELT
 - PUBLIC PARKS
 - SCOTTISH WILDLIFE TRUST RESERVE
 - WILDLIFE SITE
 - FAILED WILDLIFE SITE
 - PROVISIONAL WILDLIFE SITE
 - SITE OF IMPORTANCE FOR NATURE CONSERVATION (SINC)
 - HERITAGE CONSERVATION
 - AREA OF GREAT LANDSCAPE VALUE



MAP SHOWING LOCAL PROTECTED SITES

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info

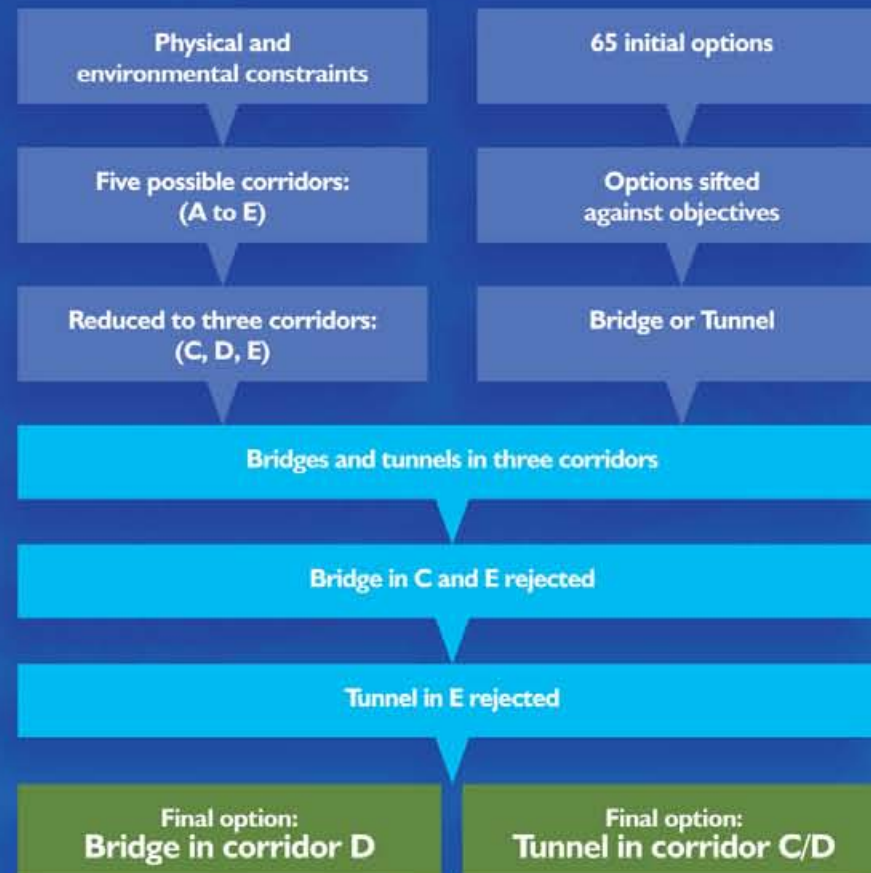


The selection process

During 2006 and 2007 Transport Scotland and a group of leading transport consultants from Jacobs and Faber Maunsell Aecom have been exploring options for a new Forth crossing.

This process has worked down from an original list of 65 options to the final short-list of two options presented here today.

Over time the options have been sifted as follows:



THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



Initial options



A very wide range of possible solutions were developed at the start of the selection process. These included:

Types of crossings:

Physical crossings such as bridges and tunnels to carry increased bus or train services or new services like trams, ferries and hovercrafts.

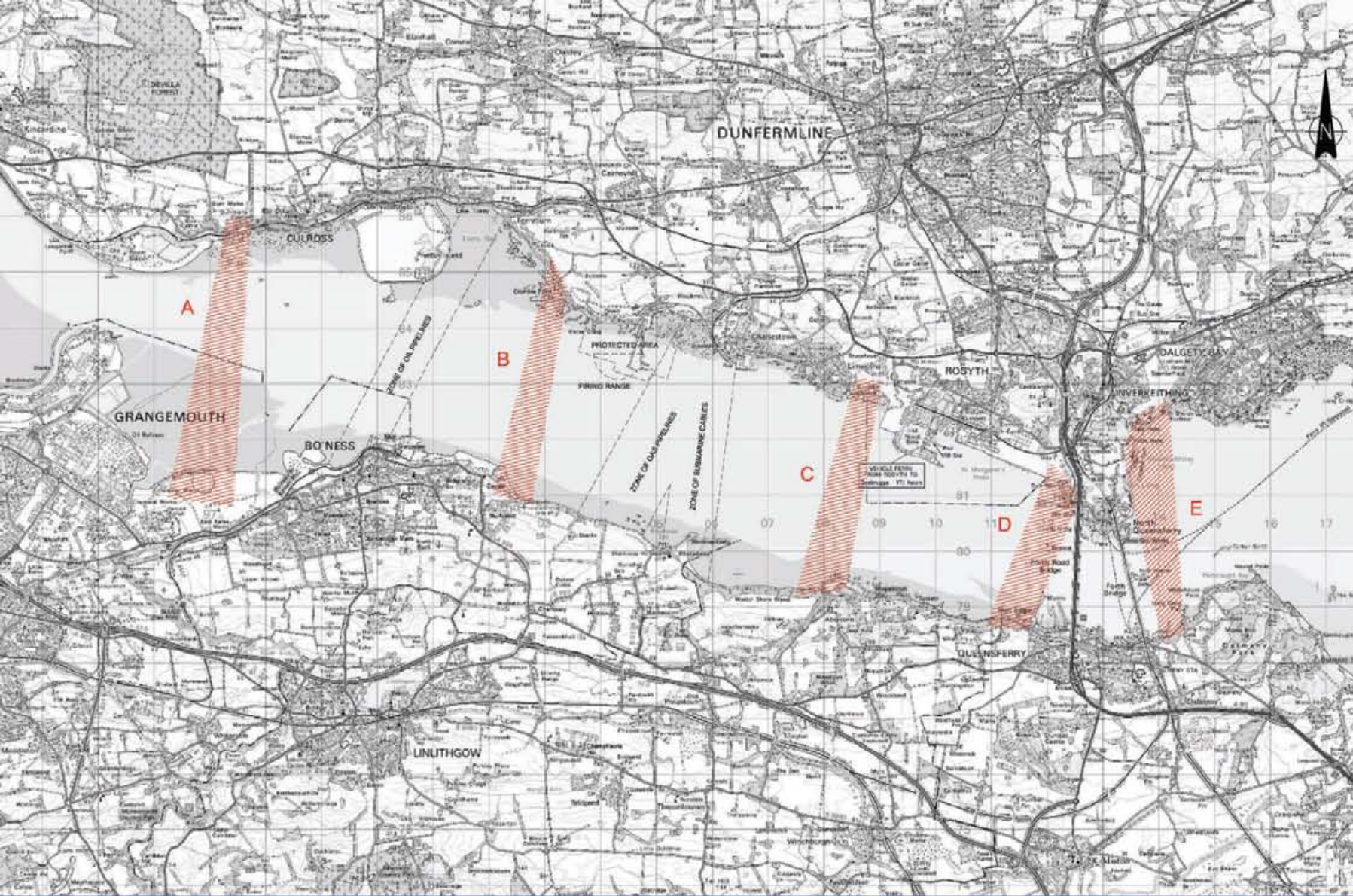
Conclusion: Public transport options on their own would not be sufficient.

Types of structures:

Bridges, tunnels, viaducts, causeways and barrages.

Conclusion: The sensitive environmental sites around the Forth would be severely affected by changes in water levels and flow caused by an obstruction such as a causeway or barrage. The replacement crossing should be a bridge or tunnel.

This first stage selection led to five broad crossing areas suitable for tunnels or bridges.



- Five broad corridors (A – E) were identified as having potential for a new crossing.
- A and B were the first to be eliminated as they were too far away to serve the transport demand.



MAP SHOWING THE FIVE CROSSING CORRIDORS

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info



Next stage analysis

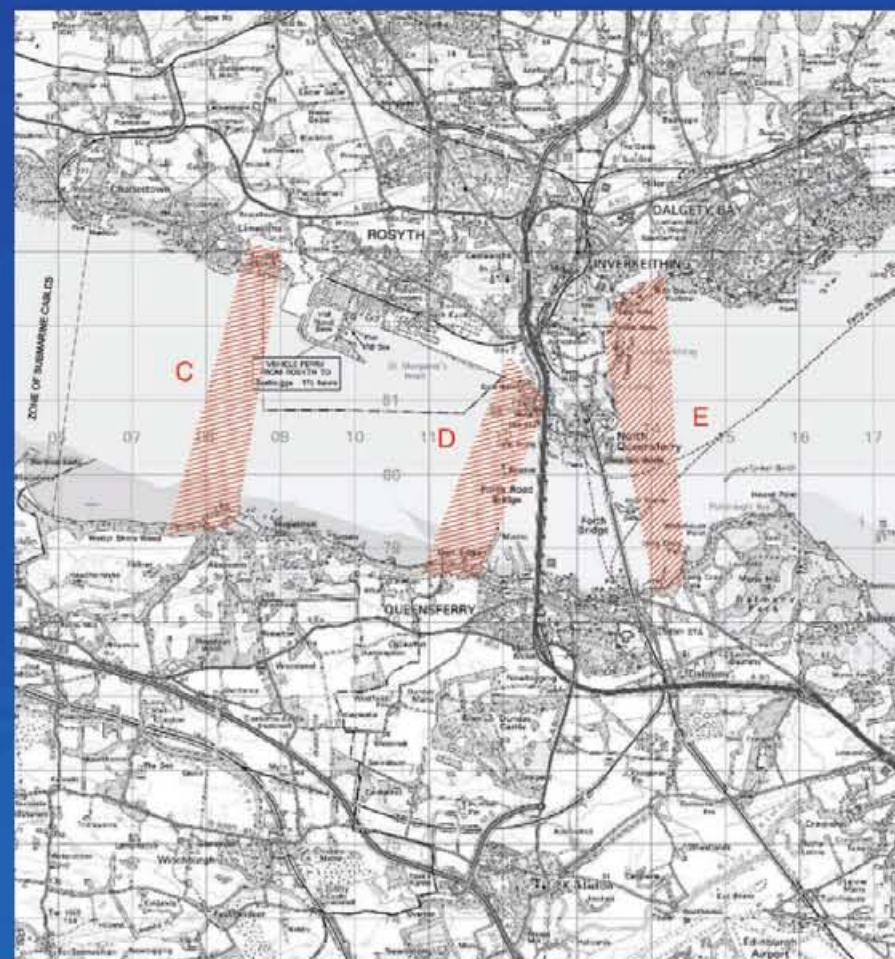
Following the elimination of corridors A and B, attention turned to the remaining corridors and their suitability for bridges or tunnels:

Corridor C	Corridor D	Corridor E
Bridge (suspension)	Bridge (suspension or cable stayed)	Bridge (suspension)
Tunnel	Tunnel	Tunnel

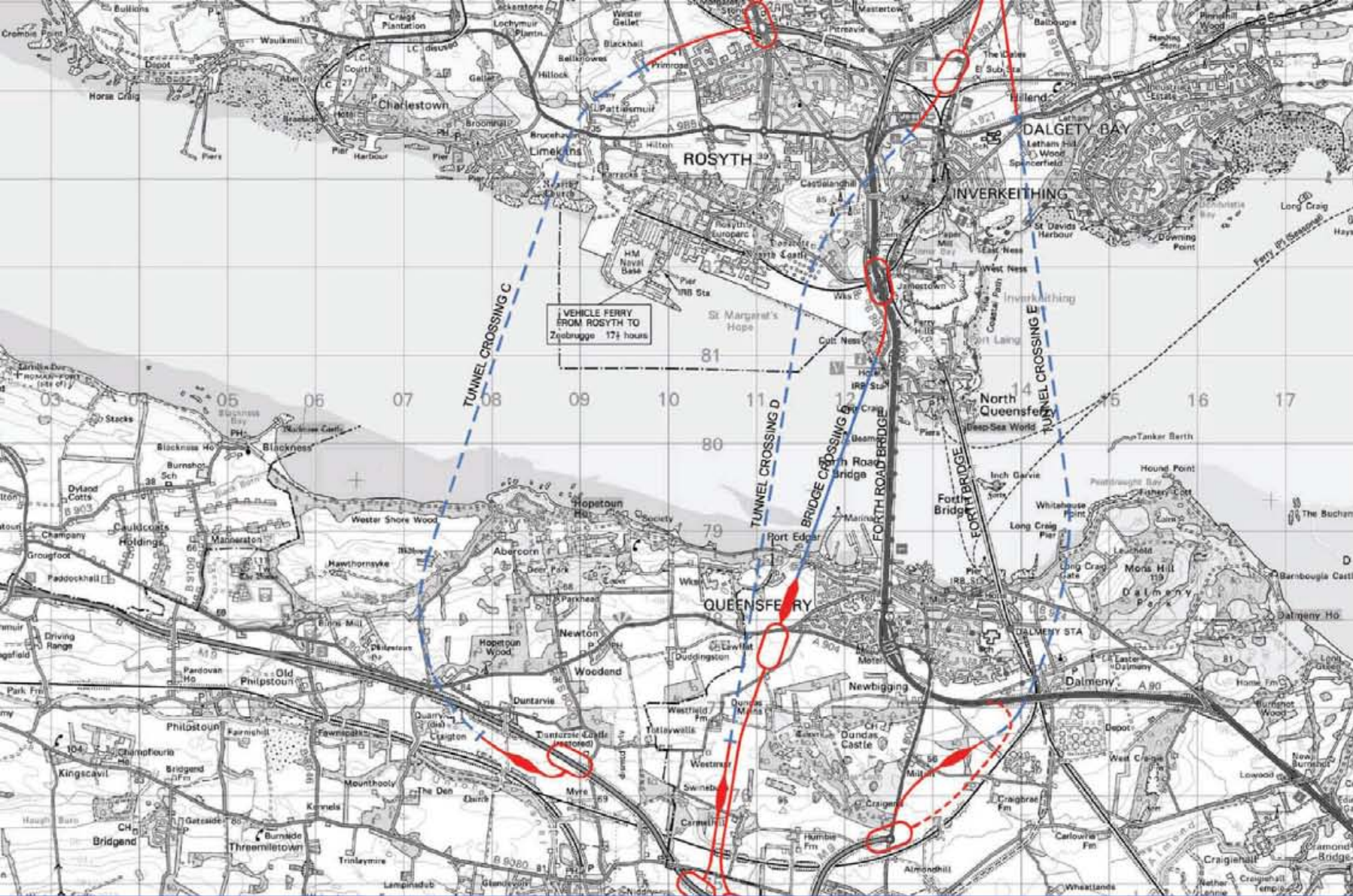
Cable stayed bridges were not considered in corridors C and E as the span would be too long for this type of bridge.

These options were tested against the Government's criteria for appraised transport schemes – environment, safety, economy, integration and accessibility and social inclusion.

Bridges in Corridors C and E were eliminated at this stage, owing to their environmental impact. This left four crossing options.



THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



• The four crossing options were Tunnel E, Bridge D, Tunnel D and Tunnel C.



MAP SHOWING THE FINAL FOUR CROSSING OPTIONS

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info



Alternative modes of travel

Heavy Rail

Since the Forth Rail Bridge and its approaches can be improved to carry more trains, the assessment of alternative modes of transport for the new crossing has concentrated on either light rail or bus services.

Light Rail / Trams

The existing Forth Road Bridge cannot accommodate rail-based systems such as trams unless a totally new deck forms part of the refurbishment programme.

To provide sufficient width for light rail or trams on a new bridge would mean strengthening the deck, increasing costs by around 20%. Light rail infrastructure connecting the new crossing to existing or planned systems would also be required.

Tunnels would require an additional tunnel for rail increasing tunnel costs by around 50%.

Bus

Bus and high occupancy vehicle lanes successfully improve journey times for public transport. Transport Scotland, Fife Council and SEStran are investigating high occupancy vehicle lanes north of the existing bridge.

To provide an additional bus or high occupancy vehicle lane increases crossing costs:

- by 6% to widen a bridge to carry two bus lanes
- by 15% to widen an immersed tube tunnel
- by 50% to build an additional bore in a bored tunnel (this is already a large diameter and could not be easily enlarged)

Providing car sharing opportunities and Park and Ride facilities would increase the use of bus and high occupancy vehicle lanes.

These and other alternative transport measures will be explored as part of the design and development of the crossing.





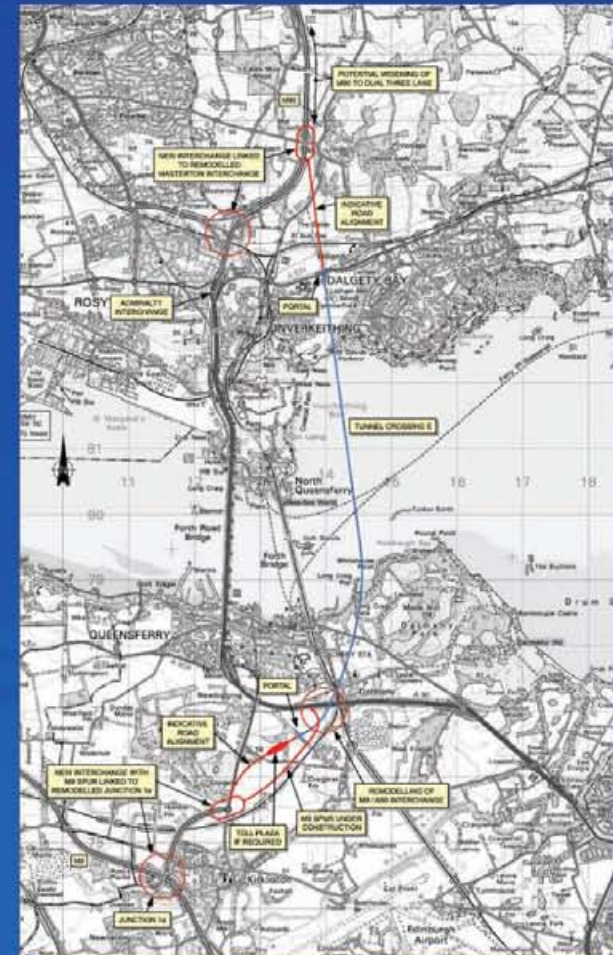
Tunnel in Corridor E

All four of the final options were found to meet the majority of the criteria required. Cost and environmental impact were the main distinguishing factors.

Unlike the other tunnels proposed which use a combination of two tunnelling techniques, this one would require a combination of three. The central section would have been an Immersed Tube Tunnel – this is where the section of tunnel is prefabricated, floated out and dropped into position.

This section of tunnel would then be joined to the northern and southern sections of tunnel which would be built using bored and sprayed concrete lining techniques. This combination is necessary to reduce the gradient on the tunnel approach and comply with current tunnel design standards.

Tunnel E was the last option to be eliminated from the study. It would have run to the East of the Forth Road Bridge, connecting with the M90 in the North near Dunfermline's Duloch area and with the new M9 spur road near Kirkliston in the south.





Analysis of Tunnel in Corridor E

The table below summarises the advantages and disadvantages of the Tunnel in corridor E:

Advantages	Disadvantages
<ul style="list-style-type: none">• 1.2km shorter than the Tunnel in Corridor C• Highest economic benefits of all the tunnel options (because it is closest to Edinburgh)• Immersed Tube Tunnel section could be fabricated off-site	<ul style="list-style-type: none">• Most expensive of all the options• Dredging bed for Immersed Tube Tunnel has significant environmental impacts• Drill and blasting techniques probably required to cut through dolerite rock in the Forth• Joining the immersed tube section to other tunnel sections technically challenging• Safety risk which could increase cost• Mine workings on the southern approach to the tunnel• Tunnel approach would impact on a designated landscape area at Dundas Castle



Cable Stayed Bridge in Corridor D



Cable Stayed Bridge option:

- 2.2 km long
- Southern access linking with M9 approximately 1km west of M9 Junction 1a
- Northern access linking with A90/M90 in the vicinity of Ferrytoll Junction
- Includes wind shielding and de-humidification system
- 5½ years to construct
- Cost estimate £1.5 billion at 2006 prices
- Benefit to cost ratio 4.31



THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



Suspension Bridge in Corridor D

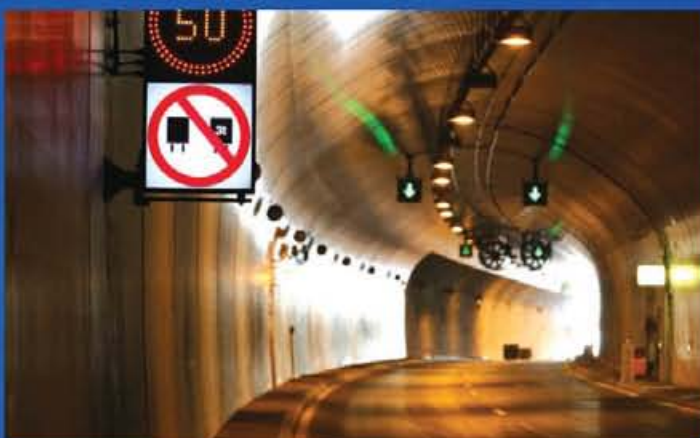
Suspension Bridge option:

- 2.2 km long
- Southern access linking with M9 approximately 1km west of M9 Junction 1a
- Northern access linking with A90/M90 in the vicinity of Ferrytoll Junction
- Includes wind shielding and de-humidification system
- 6 years to construct
- Cost estimate £1.7 billion at 2006 prices
- Benefit to cost ratio 3.83



THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE

Twin Bore Tunnel



Corridor C Tunnel:

- Twin bore tunnel (one tunnel in each direction)
- 8.5 km long
- Northern entrance linking with M90 at Junction 2
- Southern entrance linking to M9 near Craigton Quarry
- 7½ years to construct
- Cost estimate £2.3 billion at 2006 prices
- Benefit to cost ratio 2.23

Corridor D Tunnel:

- Twin bore tunnel (one tunnel in each direction)
- 7.3 km long
- Northern entrance linking with Admiralty Road
- Southern entrance linking with M9 North of Humbie Reservoir
- 7½ years to construct
- Cost estimate £2.2 billion at 2006 prices
- Benefit to cost ratio 2.68



Immersed Tube Tunnel

Immersed Tube Tunnel

- Twin carriageway tunnel
- 6.15km long of which 2.2 - 2.3km is immersed tube
- Northern entrance links with M90 at Junction 2 via A823(M)
- Southern entrance linking with M9 near Craigton quarry
- 5½ years to construct
- Cost estimate £2.1 billion at 2006 prices
- Benefit to cost ratio of 2.44

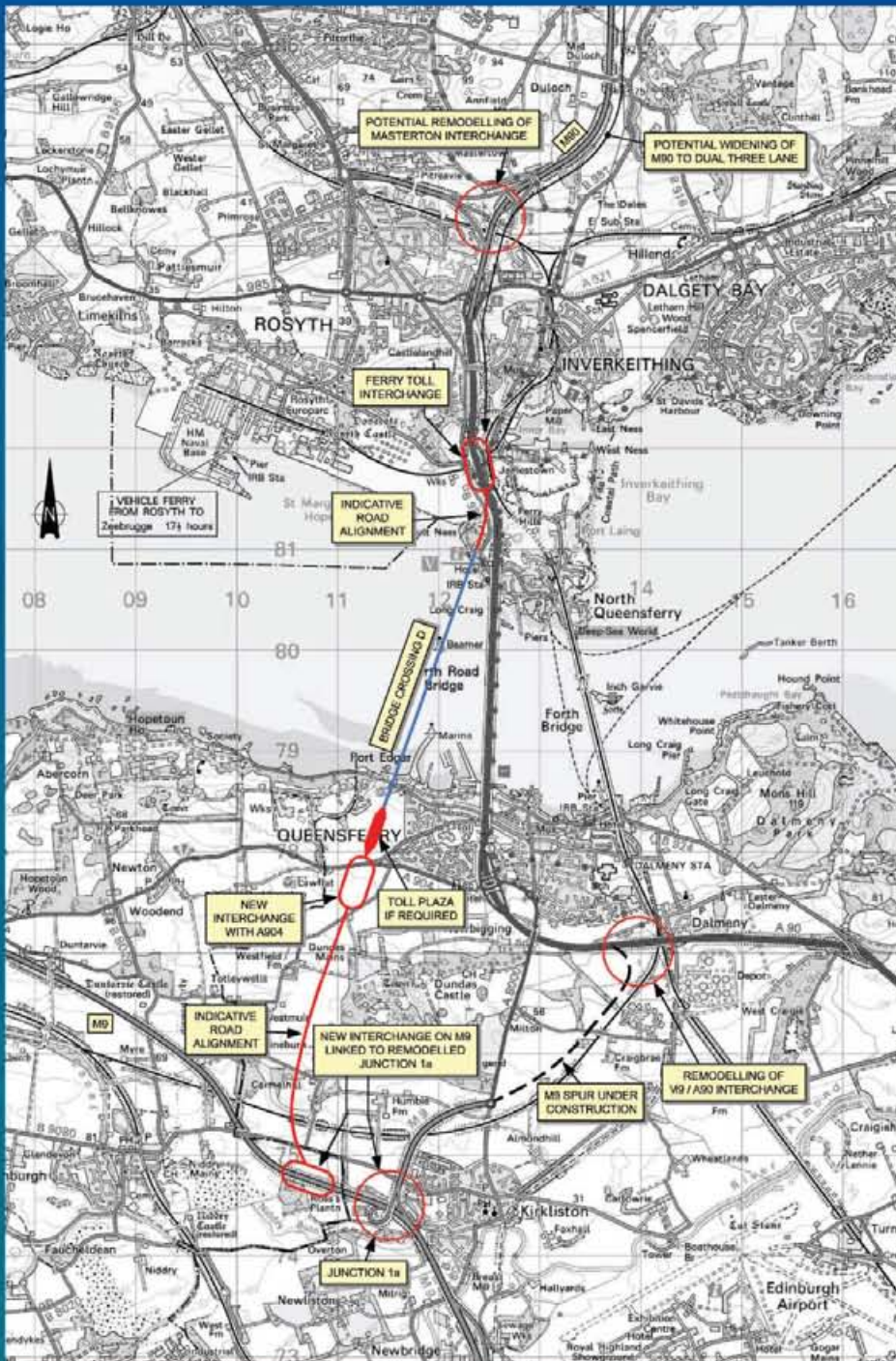


THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



Final option I: Bridge in Corridor D

Two final options have emerged from the study. The first option is a Bridge in Corridor D.



Key benefits:

- Does not directly affect the special protected environmental sites
- Is the cheapest of all the options
- Can be built quicker – around two years less than bored tunnel options
- Has the highest benefit to cost ratio
- Can include more lanes than a tunnel and therefore feature bus lanes / high occupancy vehicle lanes etc
- Can be used by cyclists and pedestrians
- Fewer risks during construction

Drawbacks:

- Could have some indirect impact on the special protected environmental sites
- Construction is likely to fit round breeding and wintering bird seasons
- Northern part of bridge passes through a site of special scientific interest
- Would incur some loss of woodland
- Greater visual impact on the landscape than tunnels

THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE

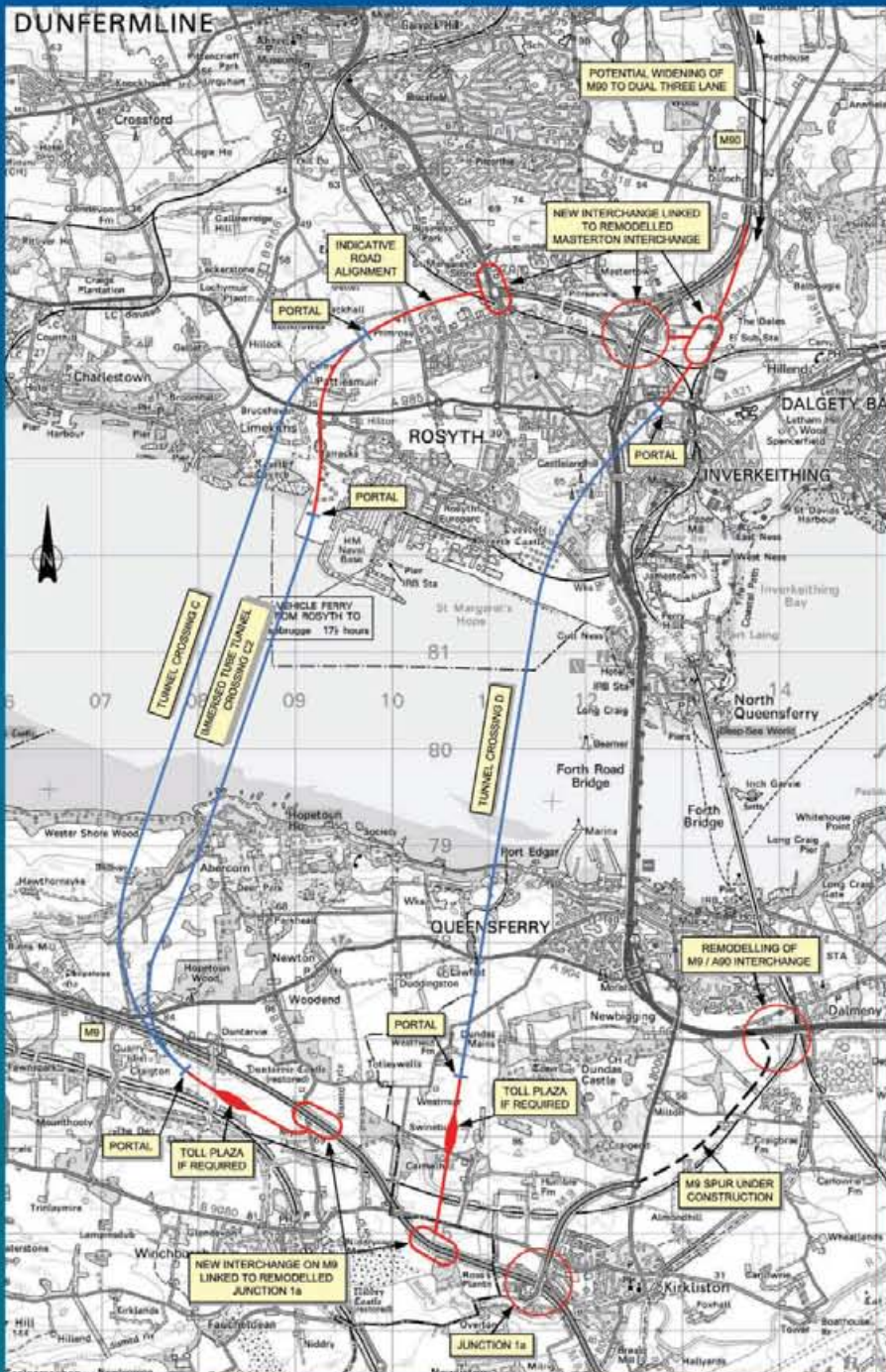


FINAL OPTION I: BRIDGE IN CORRIDOR D

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info

Final option 2: Tunnel in Corridor C/D

The second option is a Tunnel in Corridor C or D. Both corridors are still under consideration while further survey work is undertaken to assess the ground conditions in the area. These findings will impact on the final line and cost of the tunnel.



Key benefits:

- Minimises visual impact on the landscape except for portals, ventilation shafts and road connections
- Avoids impact on special protected areas because the entrance / exits are further inland (Twin Bore Tunnel only)
- Tunnel sections can be constructed in dry dock. Allows fabrication in a controlled environment (Immersed Tube Tunnel only)
- Immersed Tube Tunnel allows more flexible use of carriageway space and greater potential for light rapid transit

Drawbacks:

- Tunnel costs around 50% (£800 million) more than the bridge option
- Immersed Tube Tunnel would take a similar time to construct as a bridge - bored tunnel would take around 2 years more
- More significant risks during construction
- Requires extensive trench excavation in river bed resulting in significant environmental impacts on protected areas (Immersed Tube only)
- Impact on Special Protection Area during construction (Immersed Tube only)
- Environmental impacts may result in annual limits on construction and breaks in trench excavation (Immersed Tube only)
- Direct impact on southern shore due to cut and cover section (Immersed Tube only)
- Dolerite rock likely to be present necessitating blasting
- Difficult ground conditions could add to length of tunnel, cost and timescale
- Only two lanes in each direction therefore unable to accommodate bus lane / cyclists / pedestrians (Twin Bore only)
- Requires special management plan for hazardous loads such as petrol

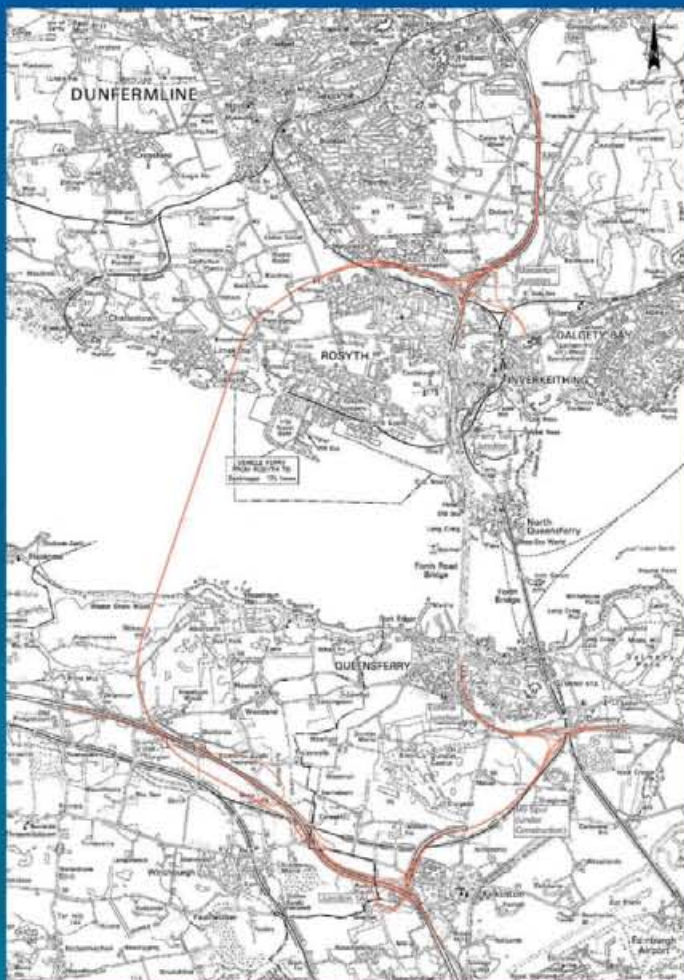
THE FORTH CROSSING IS CHANGING. SHAPING ITS FUTURE.



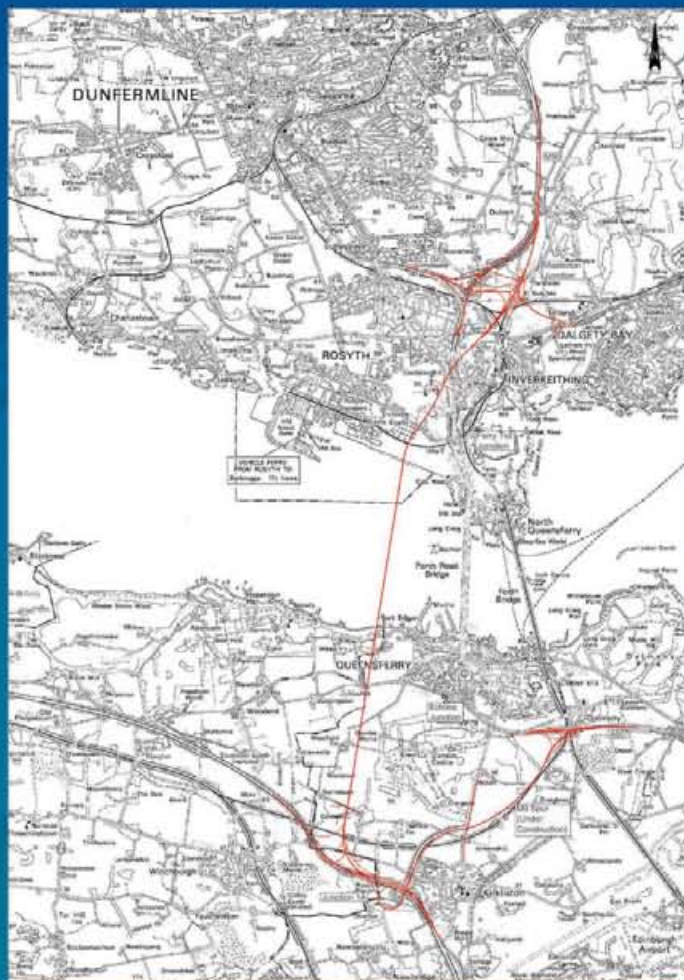
Final option 2: Tunnel in Corridor C/D

The maps below are an approximate illustration of how a Tunnel in Corridor C/D would connect to the road network:

Tunnel in Corridor C network access



Tunnel in Corridor D network access



THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



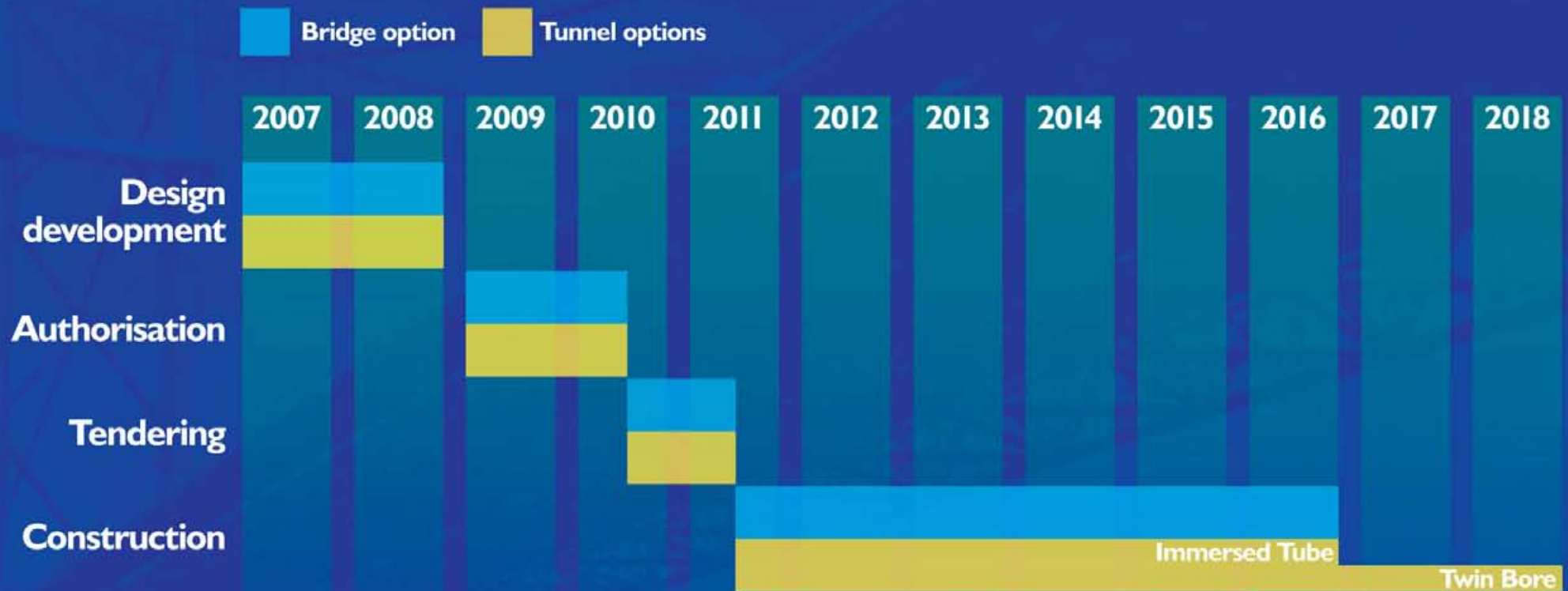
FINAL OPTION 2: TUNNEL IN CORRIDOR C/D ROAD NETWORK

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info



Timescale for a new crossing

The diagram below shows the approximate minimum timescales for building a Forth Replacement Crossing:



THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE



Next steps

1. Choosing a crossing:

- **Scottish Ministers intend to make a decision on the choice of crossing later this year**

2. Delivering the project:

- **Design development:** Work has already begun to select a world-class consultant to design and develop the chosen crossing
- **Legislation and procurement:** A decision on legislation and funding options will be made once the crossing type and cost have been determined
- **Formal consultation:** This will be part of the future legislative process

3. Planning ahead:

- **Scenario planning:** Work has already begun on scenarios should the Forth Road Bridge be repaired and come back into operation
- **New public transport:** Work has already begun on complementary transport measures that can be introduced prior to the new crossing opening which would relieve pressure on, and congestion around, the existing bridge

THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE

THE FORTH CROSSING IS CHANGING – SHAPING ITS FUTURE

Feedback

Thank you for taking the time to visit the exhibition. If you have any further questions please feel free to approach a member of exhibition staff.

Please take the opportunity to feedback your views by using the form contained within the exhibition packs. You can post this in the boxes at the exhibition or send it to:

Forth Replacement Crossing
6th Floor
Buchanan House
58 Port Dundas Road
Glasgow
G4 0HF.

Feedback can also be provided via the project website –
www.forthreplacementcrossing.info

Please return your comments to the address shown by Friday 7th September.

Thank you.

FORTHREPLACEMENTCROSSING
www.forthreplacementcrossing.info

