The Committee will meet at 10.30 am in Committee Room 3.

1. **Forth Crossing Bill:** The Committee will take evidence on the Bill at Stage 1 from—

   Duncan McLaren, Chief Executive, Friends of the Earth Scotland;

   Aedán Smith, Head of Planning and Development, Royal Society for the Protection of Birds;

   Niall Corbet, Forth and Borders Operations Manager, and Erica Knott, Policy and Advice Manager (Casework Support), Scottish Natural Heritage;

   and then from—

   Colin Flint, Proprietor, CLOB;

   Dr Alastair Lyndon, Heriot-Watt University;

   and then from—

   John Howison OBE, Interim Project Director, Mike Glover OBE, Commission Project Manager, Frazer Henderson, Bill Manager, Shirley Henderson, Team Leader Environment, and Anne-Marie Martin, Policy and Communications Manager, Transport Scotland.

2. **Forth Crossing Bill (in private):** The Committee will consider evidence taken during the meeting.
The papers for this meeting are as follows—

**Agenda item 1**

Consideration of General Principles  
Extract from Policy Memorandum  
**Environmental Statement Non-Technical Summary**  
**RSPB Scotland objection 88**  
**Scottish Natural Heritage statement**  
**Colin Flint objection 6**  
Promoter supplementary written evidence
FORTH CROSSING BILL

CONSIDERATION OF GENERAL PRINCIPLES

Purpose

1. The purpose of this paper is to set out the arrangements for the Committee’s oral evidence meeting on the consideration of the general principles of the Bill.

Background

2. At Stage 1, the Committee has three functions—

- to consider and report on the general principles of the Bill;
- to consider and report on whether the Bill should proceed as a Hybrid Bill, that is to say:
  - whether the Bill adversely affects a particular interest of an individual or body in a manner different to the private interests of other individuals or bodies of the same category or class;
  - do the accompanying documents to the Bill satisfy the technical criteria that are set down in the Standing Orders and are they adequate to allow proper scrutiny of the Bill?
- to give preliminary consideration to all objections and reject any objection where the objector’s interests are, in the opinion of the Committee, not clearly adversely affected by the Hybrid Bill. The Committee will also give full consideration to those objections (or parts thereof) which relate to the whole Bill.

Approach

3. As part of its consideration of the general principles, the Committee agreed at its meeting on 3 February 2010 to seek written evidence from a range of organisations on the general principles of the Bill. The Committee also agreed at that meeting its approach to oral evidence meetings at Stage 1 and, in particular, a provisional timetable for such meetings¹.

Written material received

4. The written evidence and objections that are relevant to this meeting have been circulated to the Committee and posted on to the Committee’s page on the Parliament’s website. Specifically, the written evidence from the following will be of particular relevance to the meeting—

¹ http://www.scottish.parliament.uk/s3/committees/forthXbill/mop-10/fcbmop10-0203.htm
- Scottish Natural Heritage (mandatory consultee response)
- RSPB Scotland (is a member of Scottish Environment LINK, the forum for Scotland's voluntary environmental organisations)
- Mr Colin Flint (objection 6)

Witnesses

5. The Firth of Forth is important for nature conservation and a Site of Special Scientific Interest. The Firth of Forth Islands SPA (Special Protection Area) is host to over 90,000 breeding seabirds every year. There is a bird observatory on the Isle of May.

6. At the meeting, the Committee will hear oral evidence on the following topics—

- views on the impact that a construction project of this nature may have on the Firth of Forth and on the surrounding lands, during construction and also once a new crossing is in place and operational;
- view in relation to any perceived problems or concerns that arise and possible solutions: and
- 'best practise' in terms of the environmental issues and management.

from the following witnesses—

- Panel 1: Friends of the Earth Scotland; Scottish Environment LINK; and Scottish Natural Heritage;
- Panel 2: Mr Colin Flint;
- Panel 3: Promoter (Transport Scotland).

Conclusion

6. The Committee is invited to note the above arrangements for the meeting.

Committee clerks
March 2010
Climate Change and Carbon/CO$_2$

104. The Scottish Government has a duty under the Climate Change (Scotland) Act 2009 to consider its proposals in relation to the output of carbon generated. Carbon considerations arise from the embodied carbon during construction and the change in carbon generated from the use of the road network.

105. The approach to scoping and development of the project has been influenced by the desire to minimise embodied carbon. This has led to the development of a proposed scheme which makes maximum use of existing infrastructure, reduces the scale of new construction and applies best practice during design and construction. As part of the sustainability appraisal, a carbon calculator has been used to assess the project’s carbon footprint. The embodied carbon assessment is not yet complete, but initial calculations indicate that it is likely to be in the order of 121,000 tCO$_2$. Final values are reported in the Sustainability Appraisal and Carbon Management Report.

106. In relation to the operation of the asset, maximum use will be made of new technology to increase the efficiency of the network and reduce emissions related to congestion. Carbon emission from scheme operation, based on the outcome of traffic and air quality models, is reported in the Environmental Statement. In keeping with the majority of the detailed assessments reported in the Environmental Statement, the baseline against which the scheme effects are assessed is that of the network operating as normal, i.e. the substantial repairs, including Main Cable Replacement likely to be required for the Forth Road Bridge, are not included in the baseline. The increase in calculated CO$_2$ emissions produced by the proposed scheme against this baseline in 2032 is 20,317 tonnes, which represents 0.16% of total transport sector emissions in Scotland in 2007 (12.4 million tonnes). These figures are derived from strategic modelled traffic data using established Department of Transport methodology.

Although small in an overall Scottish context, this increase does not contribute to the requirement in the Climate Change (Scotland) Act 2009 to reduce emissions by 42% in 2020 (interim target) and 80% by 2050. Therefore the increase in CO$_2$ as a result of the proposed scheme will require offsetting by greater reductions elsewhere in Scotland.

107. Further assessment was carried out to capture more fully the localised effect of stop start motoring conditions on the congested approaches to the Forth Road Bridge and the localised benefits to be derived from relieving these conditions. Findings from detailed local modelling using an alternative approach to emissions calculations indicate that during the congested morning peak...
period, increased CO\textsubscript{2} emissions from the additional distance travelled may be mitigated by reduced congestion that the proposed scheme will deliver relative to the baseline (Do-Minimum)

108. Consideration was also given to the environmental implications of Main Cable Replacement works (these are considered in Appendix 5.1 of the Environmental Statement). This includes an indicative assessment of the effect of these works on traffic emissions including CO\textsubscript{2}. This detailed local assessment indicates that avoiding the need for cable replacement and the lengthy period of congested conditions associated with that work, would mean that total CO\textsubscript{2} emissions during the congested peak periods for the proposed scheme are likely to be less than the baseline (including cable replacement) over the period 2012 to 2025.

**Information Box 3: How has operational carbon been assessed?**
The impact of scheme operation on carbon levels has been assessed by:

- Calculating global CO\textsubscript{2} emissions in accordance with DMRB guidance using strategic traffic model data from TMfS; and
- Calculating local CO\textsubscript{2} emissions using Paramics microsimulation model data.

The comparison of carbon released by traffic during operation of the Forth Replacement Crossing would ideally be made against the situation which would arise if the proposed scheme were not undertaken, and the existing bridge would undergo the major maintenance and repair works needed to reinstate its design integrity. However, the uncertainties regarding the extent and timing of these works are considered too great to facilitate a precise assessment. For this reason, a baseline of normal network operation was assumed for the majority of the detailed assessments reported in the Environmental Statement, with Appendix 5.1 addressing the indicative environmental implications of works on the FRB.

Because of the complexity of the assessment and the need to assess carefully the effect of congested traffic, Transport Scotland has used two distinct modelling approaches, the Transport Model for Scotland, and the Paramics microsimulation suite. The former, which is a variable demand matrix transportation model, has provided an overview assessment across a wide geographical area of the impacts of traffic reassignment, trip distribution, trip suppression and modal shift in both normal operating circumstances and during periods of construction and repair. The local area Paramics model is a fixed demand matrix model and has assessed the detailed characteristics of traffic flow along the A90/M90 and M9 routes and adjacent network of roads, identifying the carbon output from a representative fleet of vehicles, using detailed operational outputs for each vehicle. This approach provides the most advanced modelling assessment and
closest representation of circumstances on the networks reviewed that is currently possible.

56 The calculation of total emissions has been undertaken in accordance with the methodology detailed in the ‘Design Manual for Roads and Bridges Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 HA207/07 Air Quality’. Calculations were based on emission factors derived using the dataset incorporated in the DMRB worksheets (version 1.03c, July 2007). The underlying dataset is provided in the National Atmospheric Emissions Inventory (http://www.naei.org.uk/emissions/index.php).
57 Do-Minimum – The base situation where there are no modifications to the existing road network and the new bridge does not exist and also includes the minimum modifications.
59 Paramics simulates the progression of every vehicle as it travels through a modelled network in real-time, and can present its output as a real-time visual display. The software models the interactions between individual vehicles as they travel through the road network, and the interaction between vehicles and the physical characteristics of the modelled road network including for example horizontal curves and gradient impacts.
60 The Local Area Paramics Model provides a detailed model of the forecast traffic levels travelling along the M90/A90 corridor, and better reflects the local traffic movements travelling adjacent to and across the M90/A90 than the strategic national model TMfS.

1. ADDITIONAL INFORMATION: CLIMATE CHANGE (SCOTLAND) ACT 2009

The Act can be found at:

TARGETS

The 2050 Target
Part 1 of the Act formally creates the long-term statutory framework for greenhouse gas emission reduction in Scotland. Section 1(1) of the legislation introduces the statutory target for Scottish Ministers to ensure Scotland’s net emissions reduce by at least 80% by 2050 lower than the 1990 baseline. The term ‘emissions’ covers the basket of six greenhouse gases recognised by the United Nations Framework Convention on Climate Change (carbon dioxide; methane; nitrous oxide; hydrofluorocarbons; perfluorocarbons and sulphur hexafluoride) and includes Scotland’s share of emissions from international aviation and shipping.
**The Interim Target**

In addition to the 2050 target, section 2(1) of the legislation states “The Scottish Ministers must ensure that the net Scottish emissions account for the year 2020 is at least 42% lower than the baseline”. This is to be known as the 'Interim Target'.

This interim target of at least 42% emissions reduction by 2020 is higher than the UK government stated aim of curbing greenhouse gas emissions by 34% by 2020 although the Act also contains provisions for the Scottish Ministers to vary targets following expert advice from such a body as the UK Committee on Climate Change, which will be ‘the relevant body’ in the absence of any formally established Scottish equivalent.

Under section 2(4), the Scottish Ministers must, as soon as reasonably practicable, request advice from the relevant body as to whether the percentage figure is the highest achievable interim target; and if not, what the highest achievable interim target is. This advice must be published by the Scottish Ministers no later than 31 December 2009 or, if the advice is not published by that date, as soon as reasonably practicable afterwards.

**Annual Targets**

Under section 3 of the legislation progress towards the 2050 and interim targets will be driven by a framework of annual targets consistent with a reduction of net Scottish emissions to allow the interim and 2050 targets to be met. Ministers must set the first batch of annual targets by order, covering 2010-2022, by June 1 2010 and annual targets to cover 2023-2027 must be set by October 31 2011 with further batches set every five years by 31 October thereafter. Again in setting such targets Scottish Ministers must take advice from the relevant body as mentioned above.

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**2. Extract from SPICe briefing, 15 January 2009**

http://www.scottish.parliament.uk/business/research/briefings-09/SB09-03.pdf

**KEY POINTS**

- Evidence on climate change is now regarded by the world experts as “unequivocal”.
- The concentration of CO$_2$ in the atmosphere is higher now than at any time over the past 650,000 years, and “the recent rate of change is dramatic and unprecedented”
- Emissions reductions of 50-85% are necessary to limit temperature rises to 2.0-2.4 $^\circ$C
• The SNP 2007 Manifesto included a commitment to legislation containing “carbon reduction targets of 3% per annum”. The Scottish Government has a commitment to reducing emissions by 2011.
• The average decrease in emissions in Scotland since 1990 has been 1.23% though the latest figures showed a 5.4% increase between 2005 and 2006.
• The Scottish Government consulted on emissions reduction targets, advice reporting mechanisms and duties on public bodies in January 2008 – 21,000 responses received.
• Other consultations relevant to the Bill were carried out later – some were not complete at time of the Bill introduction, others remain uncompleted at publication of this briefing.
• The Scottish Climate Change Bill was introduced on 4 December 2008.
• The Bill sits within the context of the UK Climate Change Act 2008.
• The Bill covers five main policy areas: Emissions reduction targets for greenhouse gases; Advisory functions; Reporting duties; Duties of public bodies relating to climate change; Measures to adapt to climate change and achieve targets.
• The Bill sets emissions reduction targets of at least 80% reductions (on a baseline) by 2050, and an interim target of 50% by 2030 – the targets are for the 6 greenhouse gases included in existing international agreements.
• The Bill requires annual targets to be set from 2010. These are to be more stringent year on year but with no prescribed limit until 2019, after which they should result in emissions cuts of at least 3% year on year – annual targets will be set in batches of years.
• Targets are based on emissions from Scotland, rather than emissions from goods and services consumed in Scotland. Targets are “point in time” rather than relating to all emissions which Scotland could release on an equitable basis to 2050.
• The Government is required to take advice before setting annual targets – initially this will come from the UK Committee on Climate Change, but the Bill allows for another body to take on this role, or for a Scottish Committee on Climate Change to be established.
• The Bill allows for international credits to count towards the Scottish targets and prescribes no limit on this (the UK Act does require a limit to be set for the UK target).
• The Bill will include international aviation and shipping in Scottish targets, though this will be by order – the Scottish Government is committed to this.
• The Bill requires that reporting on the annual, interim and 2050 targets are made to the Scottish Parliament, together with a report on how any excess emissions can be compensated in subsequent years.
• The Bill gives Scottish Ministers powers to place climate change duties on public bodies.
• Provisions are included to: require Scottish Ministers to publish a programme to address climate change risks; vary permitted times for
muirburn; modify functions of Forestry Commissioners to participate in joint ventures for renewable energy, and to release capital from the National Forest Estate; require Scottish Ministers to publish an energy efficiency action plan; extend the role of Energy Performance Certificates in non domestic buildings; promote use of heat from renewable sources; give Scottish Ministers powers to make waste regulations (the latter is outlined in another SPICe Briefing (Wright 2009).
FORTH CROSSING BILL COMMITTEE
SUPPLEMENTARY EVIDENCE FROM PROMOTER

This submission provides commentary on a number of issues raised by John Carson in his evidence to the committee on 24 February, and which leave to clarify was sought by John Howison at the conclusion of the evidence session.

The several issues raised by Transport Scotland as capable of benefiting from clarification are referenced by way of the column identifier within the Official Report and the quotation from the relevant text, in italics, with the response from Transport Scotland following in normal text:

Col 48: “To stem the growth in traffic flow on the bridge we would have to build a new Ferrytoll Facility in Fife every year”

Response: It should be borne in mind that the crossing is not congested for the whole of each day, but only during the peak flow periods. Therefore a park and ride strategy, to address the concerns of congestion does not have to compensate for the increase in all day traffic, but rather to reduce flows during peak periods. This is explained in Information Box 2 of the policy memorandum.

Col 48: “Barry Colford talked about suffering two and a half years delays in the middle of seven years for recabling the bridge. Believe it or not, we will suffer delays of that sort just by building the northern gyratory on the north side of the new crossing”

Response: The restrictions referred to for recabling the Forth Road Bridge would involve the closure of one carriageway, leaving just one carriageway of two lanes available for traffic. Although the roadworks planned around the Ferrytoll gyratory system will be some of the most complex works of the project and could last up to 3 ½ years to complete, two lanes of traffic will be maintained on the A90/ M90 in each direction during day time periods. An analysis has been undertaken of how these works might be constructed in phases to minimise the disruption to traffic, and whilst the final arrangement for the works will be the responsibility of the selected contractor, this will need to recognise the regime for lane rental being introduced into the contract for the works.

Col 49: “All the major private finance initiative projects I have worked on have involved RPIX or RPIX minus mortgage interest payments”

Response: The purpose of providing indexation for contract payments is to match and neutralise the precise risks faced by the contractor over which he has no control or the ability to withstand. For that reason the indexation for the construction of the Forth Replacement Crossing has been based on the constituent elements of the construction process which might increase (or decrease) in price during the construction process, that is labour, plant and materials.

Although PFI projects last a considerable period, the period over which the contractor is exposed to the risk of new construction price increase is usually relatively low and of a duration that the contractor could hedge or withstand the risk. At the end of construction, the contractor is exposed to other risks such as operating wages, maintenance works, or inflation reducing the value of the returns which he will periodically receive. Other indices will be more appropriate to these risks, and particularly where the maintenance construction element
is low, either the RPI or CPI would provide a better match than the DTI derived construction indices.

**Col 49:** “People could have bought something in one month and delayed claiming for it for another six months. With inflation running at 22%, 11% would be picked up on material costs just by delaying claiming for them”

Response: Whilst this is true, the value of the money paid would, in the high inflation climate of the 1970’s also have reduced in value by 11%. An advantage would only materialise if indexation for supplies and materials continued to accrue once payment (for instance by way of an advance payment scheme or payment for materials on site but not yet incorporated into the works) had already been made. The framework on which the Forth Replacement Crossing contract is based is designed to preclude inflation being credited to supplies and work after payment has first been made.

**Col 61:** “it does not have an appropriate, experienced project director”

Response: John Howison, OBE, BSc, MSc, C.Eng. MICE, MICArb, FRSA., was appointed as Interim Project Director in June 2008. As former Chief Roads Engineer to the Scottish Executive, Director in charge of Transport Scotland Trunk Roads Infrastructure and Professional Services Directorate, and Director of Purchasing for the Agency, the experience he has been able to bring to the pre-construction development phases of the project has been both appropriate and extensive. The recruitment process for a substantive project director who can bring direct construction and implementation experience to the next stages of the project is now well in hand.

I have attached a copy of correspondence from Matt Sykes, Project Manager delivering the tunnel design for the Fehmarnbelt project, Denmark, in respect of the paper on that project tabled by John Carson. I draw your attention to Mr Sykes’ willingness, if required, to give evidence to the Committee on comparisons between the Fehmarnbelt project and the Forth Replacement Crossing.

Finally, in relation to Mr Carson’s substantive submission of formal objection we stand by the Reports on the Forth Replacement Crossing Study which informed the Scottish Ministers prior to the announcement of the selection of the Cable Stayed Bridge Option on 19 December 2007. In relation to international comparisons, we commend the advice published in the SPIce report “Financial Scrutiny Unit Briefing - The Forth Replacement Crossing Analysis of Costs” and in relation to the estimated price for the project, we stand by the prices quoted in the Financial Memorandum to the Forth Crossing Bill.

Should you have any queries in relation to this letter or require any further information, please do not hesitate to contact me.
Mr Henderson,

Fehmarnbelt Tunnels

I am the Arup Project Manager for the Ramboll-Arup-TEC Joint Venture delivering the tunnel design for the Fehmarnbelt project, and led an overview review for the Jacobs Arup Joint Venture of the Tunnel options prepared by Faber Maunsel for the Forth Crossing Study. Prior to that I was employed by Maunsel in relation to the study of the Forth, but joined Arup before the completion of the study reports.

I offer the observations below and advise that, within the constraints posed by the remits of the studies and any differences in the conventions for reporting costs, I am aware of no inconsistencies in the approach to costings of the Forth Replacement Crossing tunnel options which would have created a bias.

Should you wish further re-assurance, I would be prepared to give evidence to the Committee.

Comparisons between major projects, particularly tunnelling projects are useful for only very basic information. They are commonly used for benchmarking cost and programmes. Trying to draw comparisons on the decision to adopt either a bridge or tunnel solution is simplistic and often misleading. The selection of a construction approach is based on the particular constraints and opportunities of an individual area.

When making a selection for a crossing, engineering challenges must sit alongside environmental, economic and financial factors. These are drawn together in a rigorous appraisal system; such as detailed in the STAG process followed for this project. Selection of particular technical issues to promote one solution ignores this process and the wider impact of a solution.

Comparisons with the Fehmarn project have been made in support of an Immerse Tube Tunnel (ITT) option on Forth Crossing Alignment C.

These are based on a feasibility study carried out in 1999 and various financial updates released on the project website. The Fehmarn project is current at planning stage, with the tunnel option in competition with a bridge option. When drawing comparisons with this project it must be remembered that:

* It is not a constructed project, costs and technical comparisons are not real or contemporary and therefore may be misleading, they are also subject to change as the design progresses and remain far from finalised
* Using comparisons drawn from data based on a very basic feasibility study carried out 11 years ago in a different country, for a different method of procurement and for a different approvals process does not seem appropriate given the rigour of the STAG process followed for this project
* The Fehmarn tunnel is designed for a peak traffic flow of about 1,200 vehicles per hour and 9,600 per day when opened. This tunnel also has a very low predicted traffic growth rate. Projected vehicle numbers for the Forth Crossing on opening are peak around 8,000 vehicles per hour and 92,000 per day - almost an order of magnitude greater. Traffic flow in tunnels significantly affects how a tunnel is designed, ventilated and operated. Although some very limited comparisons can be made for cost and programme, this further reduces the validity of comparisons between the Fehmarn and Forth projects.
* In particular the purpose of the Fehmarn costing was for an input into the financial model for a Build-Own-Transfer scheme, not as a stand alone estimate of the construction costs. Therefore many of the add-ons for a stand-alone cost estimate would have been used for the financial model and not necessarily in the cost estimate
The crossing of such a wide shipping channel for the Fehmarnbelt bridge option requires a significantly higher proportion of ship protection than would be required for the Forth Crossing this is likely to affect the comparative costs of the two options.

There are always exceptions; however Immersed Tube Tunnels (ITTs) are typically used where there are flat approach topographies making the immersed tube the principal element of the tunnel crossing. ITTs therefore tend to be used in low-lying estuarine and river crossing tunnels.

The channel depth and flow can have a significant impact on the cost and feasibility for ITT. The crossing for Alignment C involves crossing the shipping channel to the west of Rosyth. At this point the alignment will be at about 30 to 35m below high water in the Forth. This is relatively deep for an ITT but not without precedent, the Busan - Geoje ITT is currently being constructed in 50m of water. The main impact of the depth is that is makes the approach structures long and deep within the valley sides, leading to deep incised cut and cover and mined construction.

An ITT in the Forth area would require significant approach structures, mined and cut and cover construction which should not, and have not been, underestimated in terms of cost, programme and impact. Alignment C is a series of tunnelling challenges and impacts totalling some 6km, only part of which is associated with the immersed tube tunnel. The steep valley topography of the Forth is markedly different for a tunnel option than the estuarine landscape of the Fehmarn and many other ITTs.

It should also be noted that the 6 km immersed tunnel option on Alignment C is significantly longer than the bridge. The bridge also has limited requirements for new network connections due to its proximity to the existing network. In the case of Fehmarn, the overall length of the tunnel and bridge options are very similar.

The valley, particularly on the southern side runs through protected areas, including ancient woodland. The topography and restricted site access will make the layout and operation of the southern work site difficult and there remain risks with the ground, including methane gas (which has been studied for commercial extraction) and mine workings.

Matt Sykes
4 March 2010.