

**ArupTransport**

Tyne and Wear Passenger Transport Authority

**New Tyne Crossing**

Proof of Evidence on Environmental Matters

By Dr. Paul Johnson BSc, PhD, MI Biol, MRTPI, MI Env Sci

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**Ove Arup & Partners Ltd**

Central Square, Forth Street, Newcastle upon Tyne NE1 3PL  
Tel +44 (0) 191 261 6080 Fax +44 (0) 191 261 7879  
[www.arup.com](http://www.arup.com)

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## 1. QUALIFICATIONS AND EXPERIENCE

### **Paul Johnson will say:**

- 1.1 My name is Paul Johnson. I hold a Bachelor of Science degree in Botany from the University of Hull and a Doctorate of Philosophy in Applied Ecology from the University of Liverpool. I am a Chartered Biologist, a Chartered Town Planner and a Member of the Institution of Environmental Sciences.
- 1.2 I am a Director of Ove Arup & Partners Ltd (Arup) with particular responsibilities for environmental consultancy within the firm.
- 1.3 I have worked in both the private and public sectors and have over 25 years experience in directing and managing environmental assessments of major transport, utility and infrastructure projects. I have previously given evidence on environmental issues at Local Planning Inquiries.
- 1.4 Since 1996 I have been responsible for all environmental affairs on the Channel Tunnel Rail Link project, the UK's largest construction project, which comprises a wide range of civil, structural and environmental works including major tunnels under East London and under the River Thames and bridge crossings of the River Medway and numerous smaller watercourses. From 2000 I was asked by the New Tyne Crossing project team to act in an expert review capacity on the developing Environmental Impact assessment for the proposed new crossing. I am familiar with the area of the crossing having been born and raised in South Tyneside.

## 2. STRUCTURE OF EVIDENCE

2.1 This proof of evidence on environmental matters covers both generic and specific issues relevant to the environmental assessment of the proposed New Tyne Crossing.

2.2 My evidence first deals with the general processes followed by the project team in undertaking the Environmental Impact Assessment and preparing the Environmental Statement with its supporting technical documentation and Non-Technical Summary. This includes the preliminary scoping and consultation processes.

2.3 Specific environmental issues then dealt with in greater detail are :

- i) River Tyne – water quality;
- ii) River Tyne – marine ecology;
- iii) River Tyne – fish and fisheries;
- iv) Terrestrial ecology;
- v) Hydrology and Hydrogeology; and
- vi) Code of Construction Practice.

2.4 Other witnesses will deal with the following environmental issues :

- i) Noise and Vibration;
- ii) Air Quality;
- iii) Landscape;
- iv) Open Space;
- v) Listed Buildings;
- vi) Traffic and Transportation;
- vii) Alternatives considered; and
- viii) Spoil and Waste Management.

### 3. ENVIRONMENTAL IMPACT ASSESSMENT

#### Statutory Requirements

- 3.1 The requirement for Order applications to be accompanied by an Environmental Statement (ES) is set out in the Transport and Works (Applications and Objections Procedure)(England and Wales) Rules 2000 (the "Applications Rules"). An Environmental Statement must be supplied where a scheme is of a type specified by the European Council Directive 85/337/EEC as amended by Directive 97/11/EC. Production of an Environmental Statement is the culmination of the Environmental Impact Assessment process.

#### Objectives

- 3.2 The objectives of the Environmental Impact Assessment (EIA) were to describe the existing environmental conditions, identify the potential environmental effects associated with the construction and operation of the scheme, predicting their magnitude and duration, evaluating their significance and identifying appropriate measures to mitigate any significant adverse effects.
- 3.3 An outline reference design, prepared by Arup, formed the basis for the EIA. The reference design also included an assumed construction methodology, sequencing and programme to complete the new tunnel and associated works. The Concessionaire, when appointed, would progress the reference design to the detailed design stage and would then construct the New Tyne Crossing subject to the provisions of the Order and the appropriate legislative and contractual constraints.

#### Scoping

- 3.4 Prior consultation on the proposed scope and methodology for the EIA was undertaken with a variety of statutory consultees, public and voluntary sector bodies with a responsibility for, or interest in, the environmental issues arising from the proposals.
- 3.5 This formed part of a scoping study to determine the principal environmental issues and concerns relating to the site and proposed scheme at the start of the Environmental Impact Assessment. The results of the study were published by Arup in the Scoping Report in April 2000. The Scoping Report was re-issued in January 2001 to additional consultees.
- 3.6 The Scoping Report was sent to:
- Bede's World
  - Countryside Agency
  - Durham Wildlife Trust
  - East Howdon Community Centre
  - English Heritage
  - English Nature
  - Environment Agency
  - Health and Safety Executive
  - Highways Agency
  - Low Simonside Residents Association
  - Ministry of Agriculture, Fisheries and Food

- Newcastle City Council
- North Tyneside Metropolitan Borough Council
- Northumbrian Water Limited
- Northumberland Wildlife Trust
- One North East
- Port of Tyne Authority
- Railtrack PLC
- River Tyne Fishery District Riparian Owners and Occupiers Association
- River Tyne Fishery Improvement Association
- Royal Society for the Protection of Birds, North East England Regional Office
- St Pauls' Residents Association
- South Tyneside Metropolitan Borough Council
- Sustrans
- Transco
- Tyne and Wear Passenger Transport Authority
- Association of Waterways Cruising Club
- British Marine Industries Federation
- The Civic Trust
- Council for the Protection of Rural England
- Country Land and Business Association
- Joint Committee of the National Amenity Societies
- National Association of Boat Owners
- Open Spaces Society
- Rambler's Association
- Resident Boat Owners Association
- The Royal Town Planning Institute
- Town and Country Planning Association

3.7 On the basis of consultations during the scoping exercise and comments received on the Scoping Report, it was concluded that a number of environmental subject areas needed to be covered in the Environmental Statement. These were :

- Traffic and Access
- Noise and Vibration
- Air Quality
- Landscape, Townscape and Visual Impact

- Archaeology and Cultural Heritage
- Business and Commercial Issues
- Social and Community Issues
- Water Quality and River Impacts
- Marine Ecology
- Fish and Fisheries
- Nature Conservation
- Geology, Soils and Contaminated Land
- Hydrogeology
- Surface Water Hydrology, and
- Waste Arisings and Disposal
- Interactions of Effects / Cumulative Effects
- Code of Construction Practice

3.8 The scope and focus of each section was also revised as a result of the comments and information received. My proof of evidence relates to those matters concerning impacts on the River Tyne water quality, fish and fisheries, marine and terrestrial ecology, hydrology and hydrogeology, and the Code of Construction Practice

### **Environmental Impact Assessment Process**

3.9 The Environmental Impact Assessment (EIA) was undertaken by an experienced multi-disciplinary team of specialists. The team was led by Arup and drawn from Arup, Royal Posford Haskoning, Centre for Ecology and Hydrology, Reid Jubb Brown and Northern Archaeological Associates.

3.10 The assessment of the impact of the scheme on each aspect of the environment followed the procedure below:

- Baseline environmental conditions in the area were assessed and described. This included consultation with relevant organisations and desk based studies. Following consultation, where it was agreed that additional information was required to supplement existing data, field survey work and monitoring was undertaken. This comprised noise and air quality monitoring, investigation of soil, groundwater and sediment contamination, and terrestrial ecological and river ecological surveys.
- Significance criteria, against which any impacts are assessed, were identified. The purpose of the assessment criteria is to rank predicted environmental impacts according to their importance in a planning / environmental context. This ensures that the conclusions drawn from the assessment are objective and transparent. The criteria, which are considered to be robust, were derived from a variety of sources. These included relevant national standards or guidelines (where they exist), consultation, and the research and professional judgement of the relevant specialists.
- An assessment of the impacts of the proposals during both construction and operation was undertaken.
- Mitigation measures to reduce the impacts were proposed. These measures may form conditions on any planning permission accompanying the Order and if appropriate, would be incorporated into the Concessionaire's agreement and relevant construction contract documentation.

- Following the incorporation of agreed mitigation, the residual impacts of the project proposals were assessed and described.

### Alternatives Considered

- 3.11 The Environmental Statement prepared for the project included an outline of the main alternatives considered and the main reasons for the chosen option taking into account the environmental effects. The Statement provided the context within which the choices were made, outlining the reasons why a new crossing was needed and the relevant national, regional and local planning policy. The choice of the preferred scheme is a culmination of many studies taking into account environmental, economic, and engineering issues on the alternatives undertaken by various consultants on behalf of the local authorities, the Tyne and Wear Development Corporation and the Tyne and Wear Passenger Transport Authority.
- 3.12 Studies to examine alternative crossing locations commenced in June 1988. Both bridge and tunnel options were examined at three locations and the second phase of this work examined public transport improvement and private traffic restraint. The studies concluded with the Technical Steering Group finding that a case had been made for an additional crossing by 2001 downstream of the Tyne Bridge. A crossing at St. Bede's was favoured by North and South Tyneside, Newcastle and the Tyne and Wear Development Corporation.
- 3.13 In April 1995, new studies took place to consider the options for a crossing at St. Bede's. On the basis of the engineering, economic and environmental assessment, the preferred option of an immersed tube tunnel at St. Bede's was recommended by the consultants to the Tyne and Wear Authorities. The Authorities agreed that this would be taken forward by the TWPTA under a Transport and Works Act Order.
- 3.14 Arup were appointed in 1999 to advise the TWPTA on the development of the immersed tube tunnel. Studies on a series of immersed tube options were undertaken and the work was extended to examine bored tunnel options. Engineering, environmental, safety and capital cost comparisons were made. The environmental issues appraised for the bored tunnel covered visual impact, community impacts, river impacts, spoil disposal, river ecology, hydrology, dredging and property effects.
- 3.15 The assessment work undertaken by the Arup team concluded that the overall environmental impacts of the immersed tube tunnel during construction would be greater than a bored tunnel, but could be mitigated to a large extent, whilst the bored tunnel would have a marginally greater permanent adverse environmental effect due to the need to reconstruct at the A193 / A19 interchange.

### Public Consultation

- 3.16 Although not a formal requirement of the EIA process, public consultations were used to identify concerns of both statutory and non-statutory consultees. The consultees included individuals such as affected occupiers and landowners, residents groups, local interest groups, and local schools. Statutory consultees included the Highways Agency, the Environment Agency, One North East and DEFRA. The relevant statutory undertakers were also consulted. Their individual and collective responses helped to develop the approach to the proposal, methods of working and possible mitigation measures.
- 3.17 The consultation methods undertaken included: on-going consultations and meetings, newsletters, media briefings, public exhibition, and focus groups/workshops.
- 3.18 A large proportion of the on-going consultations were in the form of meetings with the consultees, TWPTA and Arup team members.
- 3.19 Five newsletters on the scheme and its development, entitled 'The New Tyne Crossing – Update', with the assistance of Arup were produced in Spring 2000 (Issue 1), Autumn 2000 (Issue 2), December 2000 (Issue 3), Summer 2001 (Issue 4), Autumn 2001.
- 3.20 These newsletters have a wide circulation list including the delivery of the newsletters by hand to all households within the vicinity of the scheme, both north and south of the river, in

addition to multiple copies being available at all libraries and public buildings within the community. The newsletters aim to ensure accuracy and relevance of information and maintaining impetus through the consultation phase up until the Public Inquiry.

- 3.21 Three main media briefings have been held, one on the 24<sup>th</sup> May 2001, which included details of the background to the scheme, the TWPTA decision on the alternative tunnelling options, and the nature of the subsequent public consultation exercise. The second was held on the 31<sup>st</sup> May 2001 and confirmed the decision made by the TWPTA, and outlined the programme for work over the period up to submission of the TWA application. The third was held on 25<sup>th</sup> February 2002 and again reaffirmed the decision by the TWPTA.
- 3.22 During July 2001 a major public exhibition was held on: 13th and 14th July at Wallsend Library, and on the 15th and 16th July 2001 at Jarrow Community Centre. Smaller exhibitions followed at East Howdon, Simonside and Jarrow on the 31st July, 1st August and 13th August respectively. A second series of Public Exhibitions was held in 2002.
- 3.23 The objective of these wider consultation events was to present the chosen immersed tube tunnel scheme in an accessible way to the local and wider communities and as many interested parties as possible. The consultation exercise invited attendees to comment on the proposals, allowed them to feed into certain design options, and to express their concerns. These concerns have helped inform the project as it evolved in the run-up to submission of the TWA application. Thus, one of the main purposes of this particular consultation exercise was to feedback comments from the exhibition to the project team and TWPTA. Approximately 450 people attended these exhibitions.
- 3.24 There was a range of design options available at the exhibitions for consultees to provide feedback, including questionnaires, discussions with a project team member (and subsequent completion of a pro-forma by that project team member to enable verbal questions and comments to be recorded in a consistent manner).
- 3.25 During the time of the exhibitions, five 'focus groups' were held to investigate in more detail the concerns and issues raised. These focus groups took the form of group discussions with a trained facilitator and were organised into categories of :-
- Road users
  - Residents and groups from North Tyneside,
  - Environmental,
  - Local businesses and river users
  - Residents and groups from South Tyneside
- 3.26 The report back from these groups was used to inform the project team's deliberations for example on the potential impact of construction noise and operational noise and air quality changes. The location of construction accesses and road junctions, movement of spoil, mobilisation of contaminants in the river during dredging, the ecological effects of the work, the need to improve local open spaces and ensure planning gain was directed locally were the main environmental issues high on the local agenda.

## 4. RIVER TYNE - WATER QUALITY ISSUES

### Introduction

4.1 This section covers water quality in the tidal reach of the River Tyne arising as a result of the construction works that would take place within the river. Posford Haskoning undertook the EIA and prepared the relevant section of the Environmental Statement. Various data, surveys, modelling studies and advice informed the EIA. These were undertaken internally by Posford Haskoning and externally by, for example, the University of Newcastle.

4.2 The issues considered for water quality were subject to consultation and agreement with the Environment Agency, DEFRA and representatives of riparian interest groups. In particular, detailed consultation was undertaken with various staff from the Environment Agency, including regular meetings and contact throughout the EIA process.

4.3 The following water quality parameters were investigated :

1. **Suspended solids** (i.e. matter in the water column comprising silt, clay, fine particles of inorganic and organic matter, soluble organic compounds, plankton and other microscopic organisms).
2. **Oxygen demand** (i.e. the demand on dissolved oxygen (DO) in the water column typically generated by biochemical degradation processes of micro-organisms that oxidise organic matter to an inorganic form).
3. **Chemical contaminants** (i.e. various naturally occurring and man-made substances that comprise a range of organic and inorganic substances including metals, organotins (e.g. tributyl tin (TBT) a toxic compound used widely in the past as a marine anti-fouling treatment on boat hulls), polychlorinated biphenyls (PCBs), pesticides, petroleum hydrocarbons, polycyclic aromatic hydrocarbons (PAHs) and nutrients).
4. **Sediment toxicity** (i.e. a characteristic of a chemical or mixture of chemicals in sediment that defines a toxic effect on an organism, influenced by bioavailability).
5. **Endocrine disrupters** (i.e. chemicals that can interfere with the endocrine (i.e. hormone) systems in organisms or their offspring, causing harmful effects in some cases including feminisation of male organisms and interference with female hormones (oestrogens)).

Because of the concern expressed by riparian interests over the potential mobilisation of toxic TBT in river sediments during dredging and other construction work, specific consideration is given in this evidence to the potential for TBT in sediment to affect water quality.

### Regulatory Framework

#### EC Dangerous Substances Directive

4.4 The EC Dangerous Substances Directive was adopted in 1976 to control pollution caused by certain dangerous substances on the aquatic environment. It is important to the regulatory framework affecting the New Tyne Crossing since it protects water quality in terms of chemical contaminants, which it considers to be dangerous substances. The Directive establishes two lists of substances:

- List I – substances regarded as particularly dangerous because of their toxicity, persistence and bioaccumulation; pollution by these substances must be eliminated. List I includes cadmium, mercury and many organochlorine compounds (mainly pesticides such as DDT, PCP and HCH).

- List II – substances regarded as less dangerous but which have a deleterious effect on the aquatic environment; pollution by these substances must be reduced. List II includes other metals such as arsenic, chromium, copper, lead, nickel and zinc, and TBT.
- 4.5 The EC Dangerous Substances Directive stipulates uniform emission standards (UESs; also known as limit values) and environmental quality standards (EQSs) as approaches for the control of List I substances. Member states were given discretion to select which approach to adopt, and the UK adopted EQSs. EQSs for List I substances have been established on a community level under a series of daughter Directives. The requirement to comply with EQSs in controlled waters (e.g. the River Tyne) influences the conditions on discharge consents containing List I substances. In England and Wales, discharge consents and EQSs are administered by the Environment Agency.
- 4.6 All member states are required to establish EQSs for List II substances on a national level. EQSs for List II substances have been implemented in the UK by the Surface Waters (Dangerous Substances) (Classification) Regulations 1997 and 1998.

### **Regulations for Other Water Quality Issues**

- 4.7 There are neither specific regulations nor EQSs for the other water quality issues covered by the Environmental Statement; namely suspended solids, oxygen demand, sediment toxicity and endocrine disrupters.

### **Method of Investigation**

#### **Data, Surveys, Modelling Studies and Advice**

- 4.8 Data, surveys, modelling studies and advice were commissioned and undertaken for the New Tyne Crossing. They were used to inform the EIA process and the findings reported in the ES for water quality:
- Water and sediment quality data for the tidal River Tyne for the years 1990-2000 from the public register administered by the Environment Agency.
  - Numerical modelling of river flows and sediment transport patterns of the tidal River Tyne undertaken by Posford Haskoning (formerly Posford Duvivier).
  - Sediment oxygen demand survey of the New Tyne Crossing site and modelling of the tidal River Tyne undertaken by the University of Newcastle with the co-operation of the Environment Agency.
  - Sediment contamination survey (deep sediment samples) of the New Tyne Crossing site undertaken by Allied Exploration and Geotechnics Ltd (AEG) with analyses by Severn Trent Laboratories and the Centre for Environment, Fisheries and Aquaculture Science (CEFAS).
  - Sediment contamination survey (inter-tidal and sub-tidal surface samples) of the New Tyne Crossing site and its environs, Jarrow Slake and the River Tyne entrance by the University of Newcastle and CEFAS.
  - Sediment leaching survey of the New Tyne Crossing site by WRc-NSF (WRc).
  - Sediment toxicity survey of the New Tyne Crossing site by WRc.
  - Endocrine disrupters survey of the New Tyne Crossing site by CEFAS.
  - Sediment release from dredging operations advice from Dredging Research Ltd (DRL).

### Significance Criteria

- 4.9 Significance criteria were established to inform the EIA process and (where possible) quantify the findings reported in the ES for water quality. The significance criteria used for water quality were based on statutory environmental quality standards (EQSs) for chemical contaminants. Where statutory EQSs did not exist for suspended solids, oxygen demand (as DO), sediment toxicity and endocrine disrupters, alternative significance criteria were identified through consultation with the Environment Agency and/or comparison with significance criteria used overseas, used for the Conwy immersed tube tunnel project or derived from research.
- 4.10 There is no statutory EQS set for **suspended solids** but during the EIA the Environment Agency proposed a temporary water quality standard for suspended solids of 200 mg.l<sup>-1</sup> as a 95%ile and 500 mg.l<sup>-1</sup> as an absolute maximum.
- 4.11 There is also no statutory EQS set for **Dissolved Oxygen (DO)** but during the EIA the Environment Agency proposed a temporary water quality standard of 3mg.l<sup>-1</sup> (95%ile) and 5mg.l<sup>-1</sup> (annual average) DO on the basis of protecting migratory salmonids in estuaries. For comparison, the EC Freshwater Fish Directive establishes a water quality standard in fresh water of 9mg.l<sup>-1</sup> (50%ile) and 6mg.l<sup>-1</sup> (100%ile). The same suspended solids and DO standards were implemented for monitoring the construction of the A55 Conwy estuary immersed tube tunnel (Allen and Heller (Eds.), date unknown).
- 4.12 The statutory EQSs under the EC Dangerous Substances Directive (see Tables 1 and 2) were used as the significance criteria for **chemical contaminants** in water and in leachate during the EIA. There are no quantified UK EQSs for sediment quality so baseline conditions were established by comparing survey data against the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME, 2001). The guidelines are based on research that demonstrates associations between chemicals and biological effects and establish cause-effect relationships. The guidelines include a list of chemical contaminant concentrations that represent threshold effect levels (TELs) and probable effect levels (PELs). However, for assessing potential environmental impacts (i.e on water quality), a different set of significance criteria were used in the EIA. The significance criteria were developed using the equilibrium partitioning approach, which draws upon partition coefficients for chemicals, water quality criteria (i.e. EQSs) and the organic carbon content of the sediment.
- 4.13 There is no statutory EQS set for **sediment toxicity** so the significance criteria used in the EIA for sediment toxicity was based on the research of the Sediment Bioassay Task Team, as reported in CEFAS (1997), and permitting concentrations for sea disposal of dredged material, as set by the US Environmental Protection Agency (USEPA) and the US Army Corps of Engineers (USACE) (USACE/USEPA, 1991).
- 4.14 There are no statutory standards for **endocrine disrupters** (e.g. hormones such as oestrogen) so significance was assessed during the EIA against published research results of endocrine disrupter measurements in the River Tyne.

### Existing Conditions

#### The Tidal River Tyne

- 4.15 The tidal river extends from its mouth, known as the River Tyne Entrance, to the weir at Wylam, which is some 40 kilometres upstream. In addition to upstream river flows that include releases from Kielder Reservoir, the estuary receives waters from the River Derwent, River Team, Ouse Burn, River Don and the North Sea. The site of the New Tyne Crossing is approximately 5 kilometres upstream of the River Tyne Entrance. Various industrial premises including port terminals, ship repair facilities and fabrication yards, aggregate suppliers, etc border the river in this location. In addition, Howdon sewage treatment works discharges into this area of the river.

### **General Water Quality Conditions**

- 4.16 According to the Environment Agency (1997), the River Tyne's tidal water quality has been steadily improved over the past 20 years with new sewage collection and treatment schemes, controls over sewage and industrial discharges, and a general decline in industrial activity. The improvement in water quality has been accompanied by increasing numbers of migratory salmonid fish, although fish deaths occur in the upper estuary for reasons believed to be associated with low dissolved oxygen levels during the summer.

### **Suspended Solids**

- 4.17 The baseline condition of suspended solids was assessed from water quality data provided by the Environment Agency for the period 1990 –1998. In virtually all recorded cases (693 records), the data obtained was well within the Agency's own proposed temporary suspended solids significance criterion of 200mg/l (95% quartile) and all cases were within the 500mg/l (absolute maximum) criterion.

### **Oxygen Demand**

- 4.18 Like all natural waters, The River Tyne contains dissolved oxygen which is essential for the support of aquatic life. The concentration of dissolved oxygen is a function of a number of factors but can be adversely affected by Biochemical Oxygen Demand (BOD). This BOD may arise from bacteria in the water utilising organic material in sediments, suspended particulate matter and dissolved organic material, or polluting organic discharges. Dredging for the New Tyne Crossing will result in suspension of sediment into the river water. Core samples of sediments were taken and tested for BOD. The values obtained were combined with estimates of sediment release from dredging to obtain an estimate of the impact of dredging on BOD.

### **Chemical Contaminants**

- 4.19 A review of Environment Agency data revealed that contamination of water by toxic metals (cadmium, mercury and nickel) rarely exceeded their respective EQS's. Copper and zinc data exceeded their EQS's more frequently, probably as a result of inputs from sewage discharges. Concentrations of a range of pesticides (such as aldrin, dieldrin and ppDDT) were below their respective EQS's. River sediments are also contaminated by the metals arsenic, cadmium, chromium, copper, lead, mercury and zinc as a result of past industrial processes and sewage discharges. Sampling at the new Tyne Crossing site revealed that levels were highest in the upper alluvial clays and silts. Arsenic, cadmium, copper and mercury levels were generally below the Canadian PEL guidelines although nearly 50% of the lead and zinc levels exceeded the PEL guidelines. The majority of pesticide data fell below the PEL guideline.

### **TBT in Water**

- 4.20 TBT is a biocide agent used principally in anti-fouling paint formulations. Sources of TBT in the River Tyne include ship repair and fabrication yards, releases of TBT from vessel hulls coated with TBT-based anti-fouling paints, industrial effluents, and TBT-contaminated sediment. The Environment Agency has reported that TBT concentrations in the River Tyne have 'fallen significantly since the mid-1980s due to pollution control measures and the decline in ship building activities' (Environment Agency, 1997). However, in terms of the EC Dangerous Substances Directive, the Environment Agency is concerned about concentrations of TBT in the tidal river. As reported in the ES, the Environment Agency's monitoring data (1992 to 2000) show that concentrations regularly exceed the EQS (set at 0.002µg.l<sup>-1</sup>). It is understood that the Environment Agency is considering derogation of the tidal river for TBT as continuing inputs of TBT from anti-fouling paints on vessels hulls, means that the Agency's EQS is unlikely to be achieved in the medium term.

### **TBT in Sediment**

- 4.21 TBT was one of the chemical contaminants considered during the EIA. The Environment Agency's monitoring data for sediment at Hebburn and Lloyds Hailing Station (which are

located upstream and downstream of the New Tyne Crossing) recorded from 1997 to 2000, were 0.005 to 0.115mg.kg<sup>-1</sup> at Hebburn and 0.72 to 0.86mg.kg<sup>-1</sup> at Lloyds Hailing Station. The Environment Agency's data for sediment monitoring sites situated at the river bank near International Paints, which is upstream of Hebburn, were higher at 1.2 to 2.7mg.kg<sup>-1</sup>.

- 4.22 The two surveys undertaken for the New Tyne Crossing EIA included analyses of sediment samples for TBT concentrations. In the first survey, 51 sediment samples were collected from the site of the New Tyne Crossing. Following analysis, 19 of the 51 TBT data were recorded at 0mg.kg<sup>-1</sup> or below the detection limit of the analytical equipment (0.001mg.kg<sup>-1</sup>), and the maximum, mean and median concentrations were 0.9, 0.15 and 0.005mg.kg<sup>-1</sup> respectively. TBT distribution appeared to be linked with the river bed strata because TBT concentrations were lower in alluvial sand and gravel compared to the underlying alluvial clay and silt. The second survey yielded TBT data for river sediment taken from upstream, downstream and along the alignment of the New Tyne Crossing. The 11 TBT data ranged from 0.07 to 0.42mg.kg<sup>-1</sup>.
- 4.23 There are no EQSs against which the TBT data can be compared, but the data suggest that there are elevated concentrations of TBT in the surface sediments at and adjacent to the New Tyne Crossing. The TBT concentrations at the New Tyne Crossing are not uncharacteristic of the neighbouring upstream and downstream reaches of the River Tyne, as indicated by the Environment Agency's data for Hebburn and Lloyds Hailing Station.

#### **Sediment Toxicity**

- 4.24 Contamination in the River Tyne sediments has some potential to adversely affect aquatic life if it is disturbed and enters the water column. Assessments of sediment toxicity were undertaken using bioassay techniques on samples taken from the New Tyne crossing site in accordance with agreed Environment Agency procedure so that they could be compared with the Agency's own data for the River Tyne sediments. Data from the sediment samples indicated that baseline conditions on the route of the crossing are not significantly toxic. The measured levels were consistent with the Agency's results recorded for surface sediment both at, and downstream of Howden.

#### **Endocrine Disrupters**

- 4.25 Presence of the hormone oestrogen in river water can cause sexual changes in fish such as flounder. Samples taken from sediment at the New Tyne Crossing site gave results for the presence of oestrogen which were below that obtained in earlier 1991 surveys by others. This is indicative of a downward trend in oestrogenic activity in river sediments.

#### **Findings**

- 4.26 The EIA identified that construction works in the river could potentially effect water quality in a number of ways. The significance of these effects is given below.
- 4.27 **Sediment suspension during dredging** was raised as a concern by the Environment Agency, English Nature and fisheries interests because of the potential effect on biological systems and especially fish migration. The effect of dredging was assessed using two numerical models. The first was a 2D hydrodynamic model (C-DIVAST) which was used to simulate tidal flow patterns in the river. The water velocities and water levels derived from this model were used to drive a 3D sediment transport model (STM) to simulate movement and deposition of mobilised sediments. The modelling showed that during flood and ebb tides, a suspended sediment plume could be transported upstream and downstream respectively of the dredger before dispersing. Generally the modelling predicted that the suspended sediment concentrations (taking background concentrations into account) would, under average conditions, be well within the Environment Agency's proposed limit values. Under slack water (low flow) conditions, average concentrations could exceed the Agency's 200mg/l (95%ile) but should not exceed the 500mg/l absolute maximum value. Such concentrations would in any case be found in a limited area around the dredger (30m by 10m) and would also

- only arise for a limited time period (approx. 15 mins). They would also be affected by choice of dredger (backhoe), type of sediment (fine silt) and hydrodynamic conditions (slack water).
- 4.28 Overall the effects of sediment suspension were judged to be of minor adverse significance. However, sediment suspension could, depending on a combination of factors including natural conditions, cause short-term increases of suspended solids in concentrations that exceed the significance criteria, which could cause a moderate adverse impact on water quality although it would be very localised and short-lived. A moderate adverse impact was defined as being important at a district level, but would not represent a key factor in the decision-making process
- 4.29 The effects of **sediment suspension during bedding and backfilling**, were also assessed using the 2D and 3D computer models mentioned previously. A worst case sediment release rate was assumed as the models used the release parameters defined for dredging the trench. In the case of bedding and backfilling, the sediments used are coarser (i.e. have a lower mobile silt fraction) and the trench more protected from the river regime than the hydrodynamically exposed dredging process. The predicted concentration of suspended solids (taking into account the background levels) should not exceed the Environment Agency significance criteria of 200mg/l (95%ile) and 500mg/l (absolute maximum). Overall, sediment suspension was assessed to be of minor adverse significance, which was defined as relevant in the local context, yet can generally be reduced, removed or even reversed by appropriate mitigation.
- 4.30 **Oxygen demand during dredging and construction works** has been assessed using data produced by Newcastle University to run the Environment Agency's River Tyne water quality model. The Agency was concerned that mobilisation of organic material in the river sediment into the River's water column could have an adverse impact on water quality by reducing dissolved oxygen concentrations. The model was run for a range of river conditions, dredging periods and seasonal conditions. The model predicts that a dredging induced oxygen deficit of 1% on baseline concentrations could occur but that this indicates that dissolved oxygen concentrations would not be reduced below either of the significance criteria set by the Agency (5mg/l DO as a 95%ile and 3mg/l as an absolute minimum). This is assessed as a minor adverse impact on water quality.
- 4.31 The oxygen demand due to sediment dispersion and deposition was also assessed using the 2D hydrodynamic and 3D sediment transport models referred to earlier. The mean sediment deposition depth is predicted to be very small, and only exceed 0.1mm within the model boundaries (800m upstream and downstream). The total amount of sediment transported upstream (approx 540 tonnes), would be redistributed over the upper estuary causing an increase in average sediment depth of about 0.7mm. The conclusion was that these very small changes in sediment dispersion and sedimentation would have only a minor adverse effect on water quality.
- 4.32 **Chemical contaminant mobilisation** (from sediments into the water column) during dredging and construction works was raised as a potential issue by the Environment Agency. The assessment undertaken concluded that there was only limited potential for the works to mobilise contaminants in concentrations that could be considered significant to water quality. Taking into account background levels of contaminants, there is however potential for dredging works to increase some contaminants e.g. copper, zinc, TBT, where baseline conditions already exceed water quality requirements due to inputs from other sources. Taking into account these factors it was predicted that dredging and construction works would have a minor to moderate impact on water quality. It was noted in the ES though that the impact would be a short-term event and the moderate significance is only applicable for a few contaminants in some areas of the sediment at the New Tyne Crossing. Also, the dilution effect of the volume of water in the River Tyne would have the effect of substantially reducing the concentrations of any mobilised contaminants in the water column.

- 4.33 **Toxic Sediment mobilisation and dispersion** was also assessed during dredging and construction. The analyses undertaken of sediment toxicity indicated that the River Tyne sediments were not significantly toxic. The results also indicate that the chemicals in the sediment are not sufficiently bio-available in concentrations that would pose a significant toxic risk when mobilised sediment is suspended and dispersed in the river. At worst the effects were considered to be a minor adverse impact on the receiving sediment within 800m of the works and not significant, further upstream and downstream. The effects associated with **potential mobilisation and dispersion of endocrine disrupting substances** in the Tyne sediments were also assessed to be not significant.
- 4.34 **The enabling and completion works at Howdon Basin** and extension to Howdon Quay involve a significant amount of dredging, piling, soil excavation and rock placement. There would be some potential for sediment disturbance which would cause small scale short term changes in sediment suspension, oxygen demand, sediment toxicity and endocrine disruption activity. Overall this was assessed to be not significant or of minor adverse significance (subject to confirmation by a soil investigation of potentially contaminated made ground to be excavated from the western side of the basin).
- 4.35 After mitigation measures the residual impacts on water quality were all judged to be either not significant or of minor adverse significance.

#### **Mitigation**

- 4.36 During the EIA, mitigation measures were identified to minimise impacts on water quality arising from the construction works in the river. The measures were recommended on a precautionary basis to reinforce the minimisation of potential impacts on water quality.
- 4.37 Since the factors that could affect water quality (i.e. suspended solids, dissolved oxygen, chemical contaminants, sediment toxicity and endocrine disrupters) are all associated the removal or placement of sediment and/or soil materials in the river, the proposed mitigation measures focus on controlling the suspension and distribution of these materials during construction. The principal mitigation measures were divided into the categories of dredging method, control structures and environmental windows.

#### **Dredging Method**

- 4.38 There are two factors for mitigating suspended sediment through the use of dredging methods.
- 4.39 The first measure is based on which dredging equipment is used. DRL were appointed to advise on the dredging methods suitable for the construction of the New Tyne Crossing and recommended that an enclosed grab dredger be used to minimise sediment suspension during the dredging of alluvial clay and silt in the river channel. The enclosed grab prevents fine-grained clay and silt material being washed out of the grab when it is being raised and lowered through the water column. The grab is enclosed by rubber flaps or by steel plates and can reduce sediment losses by up to 50% (CIRIA, 2000).
- 4.40 The second measure is based on how the dredging equipment is used. Sediment suspension is influenced by the actions of the person(s) operating the dredging equipment. For example, the operator positions the grab on the riverbed and is therefore best placed to minimise the impact of the grab on the bed and the resulting sediment suspension. It was recommended that the dredging contractor be made aware of the environmental implications of sediment suspension and the suspended solids significance criteria recommended by the Environment Agency.
- 4.41 Sediment suspension will also be reduced by the backfilling method.
- 4.42 Backfilling will take place using a fall pipe to maximise accurate control during placement of fill material in preference to dropping the fill material from the surface and through the water column. Backfilling using a fall pipe will reduce the potential for sediment suspension compared to dropping the fill material from the surface.

- 4.43 Sand and gravel will be used for backfilling and assurance will be given that this material is clean with respect to its fines content, since this measure would reduce the risk of sediment suspension.

#### **Control Structures**

- 4.44 On the north bank there will be a cofferdam and on the south bank will be training walls, structures in the river to direct the flow of water and allow works to take place behind them.. The structures will reduce the potential impact of sediment suspension in two ways.
- 4.45 Firstly, the structures reduce the quantity of dredging required. This is an added benefit of the cofferdam on the north bank and the primary benefit of the training walls on the south bank.
- 4.46 Secondly, the structures can be used to prevent suspended sediment entering the river and having an impact on water quality. For example, the cofferdam will be completely sealed so that it is watertight and therefore no sediment will enter the river due to the initial dredging inside the cofferdam.
- 4.47 Some dredging will take place within the control structures at a time when suspended sediment could escape into the river. It is anticipated that there are three potential methods for reducing sediment suspension from this source; namely silt curtains, bubble curtains and complete isolation of the dredging zone by temporary works. The final choice of any control method considered to be necessary, will be made following further assessments of practicability by the chosen contractor.

#### **Environmental Windows**

- 4.48 Environmental windows is the term given to time zones that provide mitigation by restricting dredging through defining and agreeing specific time periods to which a dredging project should be confined. The recommended environmental window for the New Tyne Crossing will restrict dredging to the period between November and March, thus avoiding an indirect water quality impact on fish migration over the summer months.

#### **Management Plan**

- 4.49 As a result of the mitigation measures, it was recommended in the ES that the appointed dredging contractor prepares and implements a management plan concerning the methods and operations that will be employed to reduce suspended sediment affecting water quality in the river. The management plan will cover measures such as the dredging and backfilling methods, the use of control structures, environmental windows, the quality of the fill material and, if necessary, minimising soil entering the water during works at Howdon Basin. Monitoring

#### **Continuous Water Quality Monitoring**

- 4.50 Consultation with the Environment Agency revealed the requirement to continuously monitor (i.e. at 15 minutes intervals) the existing water quality in the river local to the New Tyne Crossing site for a period of three years prior to the dredging works. The monitoring is to cover DO and suspended solids (as turbidity) and be supported by measurements of salinity, temperature and current speed. The monitoring is to take place at four sites in the river, two sites upstream and two sites downstream of the New Tyne Crossing, located on buoys at fixed positions in and either side of the river. The final positions of the buoys would be subject to agreement with the Port of Tyne Authority for reasons of navigation.

#### **Construction Works Monitoring**

- 4.51 Following consultation with the Environment Agency it is proposed that water quality would be monitored at 15 minutes intervals during the dredging. As for continuous water quality monitoring, the works monitoring would include for DO, turbidity, salinity, temperature and current speed. Turbidity and dissolved oxygen will be monitored against criteria set by the Environment Agency. The monitors would transmit data by telemetry on a continuous basis

during dredging. Alarms would be set at the monitoring criteria. It was suggested that the monitoring data should be transmitted from the monitors (by telemetry) directly to the Environment Agency so that 24-hour coverage will be maintained. The receiving computer would store the data such that it checks the criteria and operates the alarms if necessary. If the alarms are triggered, construction works would cease and only restart when the relevant parameters were within the criteria set.

## 5. RIVER TYNE - MARINE ECOLOGY

### Introduction

- 5.1 This section of the Proof of Evidence covers the potential effects of the construction of the New Tyne Crossing on the marine ecology (i.e. aspects below the high water mark but excluding fisheries which are dealt with in a subsequent section of this evidence) of the River Tyne and adjacent coast. The marine ecology section of the Environmental Statement was prepared by Posford Haskoning in Autumn 2001.

### Regulatory Framework

- 5.2 The site of the proposed crossing is situated some 5km upstream from the nearest point of the Northumbria Coast Special Protection Area (SPA) and Ramsar site located at the River Tyne entrance (Figure PEJ 1).
- 5.3 The Conservation (Natural Habitats etc.) Regulations 1994 (referred to hereafter as the Habitats Regulations) implement EC Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). Under the Habitats Regulations, the granting of planning permission for developments is restricted if they are likely to have a significant adverse effect on a SPA or (Special Area of Conservation (SAC). In determining whether permission can be granted, the competent authority must decide whether the development is likely to have a significant effect on the SPA or SAC. If the development is likely to have a significant effect, then an appropriate assessment must be made of its implications for the site in view of the site's conservation objectives.

### Method

- 5.4 In the EIA, the potential effects on marine ecology were investigated through the following processes:
- Consultation with English Nature and Environment Agency to determine concerns about the scheme, potential impacts and agree methodology for surveys.
  - Collection of existing data about the site, such as existing survey data and information on nature conservation designations.
  - Undertaking a marine biological survey
  - Assessment of impacts.
  - Identification of possible mitigation measures.
- 5.5 In order to inform the EIA, a marine biological survey was carried out to determine the nature of the benthic communities in the vicinity of the works. The survey was undertaken by University of Newcastle with sample analysis carried out by Identichaete. The survey consisted of taking grab samples from ten subtidal sites and core samples from ten intertidal sites within the River Tyne. The samples were sieved and species within them identified and enumerated.

### Significance Criteria

- 5.6 In assessing significance of impacts arising from the New Tyne Crossing, each impact was assessed on an individual basis and then in the context of the River Tyne as a whole. The general parameters examined were :
1. The importance of the features which would be affected (e.g. a designated nature conservation area, or a nationally rare or scarce species)..
  2. The degree of impact on the species / habitat (e.g. reduced growth rate or viability, or loss of habitat or whole populations).

3. The scale of the impact (e.g. the area of habitat or number of species affected).
  4. Whether the effects were reversible or if not, what are the recovery rates of the affected species / habitats.
- 5.7 The significance of impacts was assessed in the ES against the following criteria :
1. Major Adverse - A large scale impact, giving rise to great concern. Considered unacceptable. (e.g. permanent loss of habitat within a SSSI or SPA or loss of a nationally rare or scarce species)
  2. Moderate Adverse – An impact giving rise to some concern but is tolerable in the short term, in some cases requiring further investigation. (e.g. features of a SSSI or SPA are temporarily affected or a small area of subtidal habitat is permanently lost)
  3. Minor Adverse – An impact of small scale and of little concern, undesirable but acceptable. (e.g. the viability of a species or habitat temporarily affected say by reduction in growth rate or a small area of sub tidal habitat is lost but would recover in one year).
  4. Not Significant – No effects – beneath the levels of perception
  5. Beneficial – The effect provides positive gain for the environment (e.g. an area of intertidal or subtidal habitat is created or in improvement in water quality occurs).

### Existing Conditions

- 5.8 The site of the proposed new crossing is situated approximately 5km upstream from the mouth of the River Tyne. At the River Tyne entrance are located the Northumberland Shore Site of Special Scientific Interest (SSSI), and Northumbria Coast Ramsar and Northumbria Coast Special Protection Area (SPA). On the coast to the north of the Tyne entrance is the Tynemouth to Seaton Sluice SSSI, while to the south is the Durham Coast SSSI and Durham Coast Special Area of Conservation (SAC).
- 5.9 The majority of these sites are designated for their importance to passage and overwintering waders and wildfowl, except for the Durham Coast SAC which is designated for vegetated sea cliffs and the Tynemouth to Seaton Sluice SSSI which is also designated for geological interests.
- 5.10 The riverbed of the Tyne estuary consists predominantly of a mixture of mud, muddy sand and gravel. Approximately 92% of the area of the estuary is subtidal. Surveys have found that the lower estuary is composed of sublittoral muddy sand with oligochaetes. The mid-estuary is recorded as sublittoral estuarine mud with sparse infauna.
- 5.11 The riverbed in the area of the proposed tunnel is sandy mud. The animals of the seabed comprise mainly annelid worms with a small molluscan and crustacean component. The seabed community was found to be numerically dominated by polychaete worms and oligochaetes typical of disturbed environments.
- 5.12 The extent of intertidal area in the River Tyne is limited. The majority of the shore is made of hard quay walls with few areas of mudflat. Within the vicinity of the works, mudflats are found at Northumberland Dock and Jarrow Slake. These areas of mudflat (both designated as Sites of Nature Conservation Interest – a county level designation) can support significant numbers of birds.

### Findings

- 5.13 The EIA found that the new crossing could potentially have the following impacts:

#### Alteration of riverbed habitat type

- 5.14 The construction of the crossing will cause a change in the nature of the habitat on a small area of the seabed of the River Tyne. An area of seabed will require dredging to create a trench for the immersed tube tunnel. When the tunnel elements have been put in place the

trench will be backfilled with sand and a layer of rock armour will be placed on top. The rock armour is required to protect against accidental damage to the tunnel from ship's anchors. The placement of the rock will alter the habitat of roughly 3.42ha of seabed from sandy mud to rock. This could affect the type of marine organisms that live on the seabed.

- 5.15 This impact was assessed as being of both minor adverse and minor beneficial significance, because the naturalness of the seabed will be reduced, but the introduction of rock will increase the diversity of habitats present on the river.

#### **Loss of species in area of dredging**

- 5.16 The construction of the new crossing will require dredging of approximately 3.42ha of river bed. Marine organisms currently living within this area will be lost upon dredging. The type of marine species present within the dredge area was investigated during the marine biological survey. The majority of species affected are common and widespread in occurrence. The few species which were not commonly found were molluscs which are nevertheless widely distributed around northern European shores and found in all the major estuaries along the north east coast of England. Overall, therefore, the significance of this impact was assessed as being minor adverse.

#### **Increase in suspended sediment**

- 5.17 An impact on the marine ecology of the River Tyne could arise if the works were to significantly increase levels of suspended sediment in the river. The potential effect of the works on the ecology of the River Tyne are presented in Section 4 of this proof. The water quality investigations found that outside the immediate area of the dredging, suspended solids are predicted to be generally less than 20mg/l. This is predicted to have no effect on the ecology of the River Tyne and therefore this impact was assessed as being not significant.

#### **Increase in sedimentation**

- 5.18 As with all dredging works there is a risk that an indirect impact on marine ecology could occur through an increase in the rate of sedimentation on the riverbed. An increase in sedimentation can sometimes have an impact on marine ecology through causing smothering. The levels of sedimentation caused by the dredging on the Tyne have been predicted during a numerical modelling study by Posford Haskoning (Appendix 12 of the Environmental Statement). The study determined that outside the immediate area of the dredger, the level of sedimentation will be generally around 0.1mm within approximately 800m upstream and 800m downstream of the dredger. Within the SSSI's and Northumbria Coast SPA at the mouth of the Tyne, mean sedimentation will be roughly 0.001mm.
- 5.19 These levels of suspended sediment are predicted to have no impact on the marine ecology of the Tyne.

#### **Reduction in dissolved oxygen**

- 5.20 The potential impact of the dredging works on levels of dissolved oxygen has been assessed by numerical modelling by the University of Newcastle. The study found that the dredging would have minimal impact on dissolved oxygen levels in the Tyne and therefore it is predicted that there will be no impact through this route on the marine ecology of the River Tyne.

#### **Remobilisation of contaminants**

- 5.21 A potential impact of the dredging works could be an adverse impact on SSSIs and SPA at the mouth of the River Tyne through deposition of contaminated sediments. Investigations in the EIA found that the sediments to be dredged are considered to be not significantly toxic. Due to the lack of toxicity and the minimal levels of sediment that will be deposited in the area no impact on marine ecology is predicted to occur.

**Construction of training walls**

- 5.22 It is possible that a minor adverse impact could arise during construction of the training walls through loss of the marine species immediately underneath the walls. This impact would be restricted to a very small area because although the walls are quite long, they would be very thin due to the sheet pile construction. This impact was therefore assessed as being of minor adverse significance.

**Change in hydrodynamics**

- 5.23 It is possible that the presence of the training walls could have an indirect impact on the marine ecology of the Tyne through temporarily altering the hydrodynamics of the river. The impact of the training walls on the hydrodynamics is described in Appendix 12.2 of the Environmental Statement. The modelling study determined that the temporary structures would have a limited impact on the tidal flow and sediment transport regime, therefore it was assessed that there would be no significant impact on the marine ecology of the river.

**Disturbance to birds**

- 5.24 It is possible that the works could have an impact on birds through causing disturbance. The river is already subject to shipping and movements of vessels. It is therefore likely that waterfowl on the river are already accustomed to disturbance from vessels on the river. The presence of an extra vessel dredging is therefore unlikely to significantly increase the existing levels of disturbance to birds and hence birds are unlikely to be affected.

**Temporary loss of subtidal habitat within Howdon Dock**

- 5.25 The proposed alterations to Howdon Dock involve reclaiming an area of seabed then demolishing part of the existing quay. Overall a minimal amount of seabed would be lost because the area of seabed to be reclaimed would roughly equal that which would be created. The temporary loss of a very small area of seabed is judged as being of minor adverse significance.

**Loss of vertical Intertidal Habitat**

- 5.26 It is possible that a very small amount of intertidal habitat could be lost as a result of the works in order to join the immersed tube tunnel in the river to the tunnel on the landward side. The works will result in loss of a very small area of intertidal quay wall habitat. This impact is judged as being of minor adverse significance because this habitat is very common on the Tyne.

**Mitigation**

- 5.27 For most of impacts described above, no mitigation is required. For the remainder, which relate to potential changes in sedimentation or dissolved oxygen or contaminant mobility, it is recommended that the mitigation measures proposed earlier to control dredging methods should be utilised.

**Appropriate Assessment**

- 5.28 Under Regulation 48(1) of the Conservation (Natural Habitats etc) Regulations 1994, should a project be considered to have a significant effect on a European site such as a SPA or SAC, an appropriate assessment is required by a competent authority (in this case, the Office of the Deputy Prime Minister) to determine whether the project would have an adverse effect on the integrity of the site.
- 5.29 The proposed New Tyne Crossing is located approximately 5km from the Northumbria Coast SPA and at present it is unclear whether an appropriate assessment is necessary. However, should it be determined that such an assessment is required, information is being gathered to inform this process. A report is being prepared for the First Secretary which will present information and conclusions on the implications of the construction and operation of the New Tyne Crossing on the conservation interests and integrity of the Northumbria Coast SPA. The

report will also provide information on potential in-combination effects arising from other plans or projects, in so far as that information is available. It is for the competent authority to undertake any appropriate assessment in due course.

### **Conclusions**

- 5.30 The construction of the new crossing could have an effect on the marine ecology of the river Tyne, directly through loss of the species during dredging and alteration of the seabed and indirectly through effects on water quality or change in coastal processes.
- 5.31 The EIA found that the majority of the impacts on the marine ecology of the River Tyne will be negligible or of minor significance. The biggest impact relates to the change in nature of the seabed from muddy sand to rock on 3.42ha of the seabed. No significant effects on the Tynemouth to Seaton Sluice SSSI, Northumberland Shore SSSI, Durham Coast SSSI, or Northumbria Coast SPA / Ramsar are predicted to occur.

## 6. RIVER TYNE – FISH AND FISHERIES

### Introduction

- 6.1 This section of my proof deals with fish and fisheries in the Tyne river and estuary. The issues were assessed for the Environmental Statement by fisheries management specialists at the Centre for Ecology and Hydrology, Windermere Laboratory.

### Regulatory Framework

- 6.2 In the present context, the principal regulatory body is the Environment Agency which has statutory duties for the aquatic environment through the Environment Act 1995, and specifically for the maintenance, improvement and development of fisheries for salmon, trout, freshwater fish and eel through the Salmon and Freshwater Fisheries Act 1975. From a nature conservation perspective, there are no local records of any of the nine species of fish protected under the Wildlife and Countryside Act 1981, but the River Tyne does hold populations of salmon, sea lamprey and river lamprey which are listed in Annex II of the European Community Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

### Existing Conditions

- 6.3 The main River Tyne is formed from the confluence of the North Tyne and the South Tyne at Watersmeet, 3 km west of Hexham. It then runs eastwards for approximately 24 km to its tidal limit at Wylam, where it joins its 35 km long estuary. The main River Tyne is itself joined by the Devils Water east of Hexham, and by the River Derwent, the River Team, the Ouse Burn and the River Don in its estuary. Appreciation of this extensive geography is important because a number of fish species migrate extensively along it during the course of their life cycles.
- 6.4 Although much of the River Tyne's *c.* 2,900 km<sup>2</sup> catchment lies in unspoilt countryside, its fish populations have been affected by Kielder Reservoir in its upper reaches and the Tyneside conurbation in its lower reaches. Construction of the former resulted in the loss of significant areas of spawning habitat for salmonids, while the latter resulted in the near loss of salmonid (or game) rod fisheries through direct mortalities, including the effects of low levels of dissolved oxygen during some summer months. However, great environmental improvements have been attained in recent years. These have been reflected in significant increases in rod catches of both salmon and sea trout (conspecific with brown trout) as shown respectively in Figure 14.1 and Figure 14.2 of the Environmental Statement. As a result, the River Tyne is now one of the most important game fisheries in England and Wales.
- 6.5 In addition to the two game species considered above, a considerable number of other fish species has been recorded in the River Tyne and comprise resident and non-resident species of varying ecological, conservation and fisheries importance. Such species include eel, lampreys, *c.* 10 coarse species (i.e. non-salmonid freshwater fish of several genera), and *c.* 25 estuarine species (such as flounder and whiting) which use the estuary as a nursery or temporary habitat. Although recreational coarse fisheries are present in several areas of the River Tyne, there are no quantitative data available to allow the assessment of their historical trends.
- 6.6 Salmon, sea trout, eel and lampreys pass between fresh water and the sea during two key phases of their life cycles and so use the estuarine River Tyne as a migration route. Almost nothing is known about the local ecology of eel in the River Tyne, but it can be assumed that this species shows its typical migration pattern of an upstream migration of young from April to June, inclusive, followed by a return migration of adults during October and November. Local movements of lampreys are also unknown, but again can be assumed to be similar to those recorded elsewhere in Europe where young run downstream to the sea and adults run upstream to spawning grounds between April and June, inclusive.

- 6.7 Much more is known about the migration patterns of salmon and sea trout. For both species, the downstream migrations of young smolts in the U.K. are confined to the period between April and June in general terms. No smolt migration data are available for the River Tyne itself. The timings of returning adult salmon and sea trout are very complex and considered at length in the Environmental Statement, including results from a fish counter operating on the River Tyne at Riding Mill 11 km upstream of the tidal limit, but such fish typically return from spring to autumn. Migration of both smolts and adults is predominantly nocturnal. Note that this deficit of information on the timing of salmon and sea trout migrations in the River Tyne itself would be addressed by the monitoring described below. It is a key feature of salmon and sea trout biology that through such migratory behaviour, local populations show remarkable homing to their native rivers which itself facilitates considerable genetic differentiation between local stocks.
- 6.8 It is also relevant to note that the local population dynamics of salmon in the River Tyne and its tributaries are complicated through extensive stockings of young fish to compensate for spawning grounds lost as a result of the construction of Kielder Reservoir, and for poor estuarine water quality conditions. For example, in the four years from 1996 to 1999 a total of almost 2 million juvenile salmon was stocked.
- 6.9 Little is known about the coarse fish of the River Tyne other than that they include significant populations of dace, roach and chub in the main river and the lower reaches of the North Tyne and South Tyne. Pike and perch have also been recorded in the lower South Tyne, while three-spined stickleback, stone loach, minnow and bullhead are also found in numerous areas.

#### **Method**

- 6.10 The assessment of potential impacts was based primarily on documents, local information, data (particularly on the relative abundances and migratory timings of salmon and sea trout) and guidance provided by the Newcastle Office and the National Salmon and Trout Fisheries Centre of the Environment Agency. In addition, presentations were made to the River Tyne Fisheries Improvement Association and discussions held with the Tyne Fishery District Riparian Owners & Occupiers Association and with fisheries consultants retained by the latter body. This dialogue has involved numerous meetings, site visits, and the analysis of fish and fisheries data made available by the Environment Agency. A wider perspective has been assured by the consideration of experience of similar projects elsewhere and by several searches of the scientific literature. The fish and fisheries assessment method has also included extensive and close contact with the assessment of water quality issues.

#### **Significance Criteria**

- 6.11 Significance criteria are difficult to define quantitatively for fish because of sampling difficulties, lack of baseline data and the naturally high variability of fish population dynamics. Nevertheless the following qualitative significance criteria were adopted within the ES.
1. Severe Adverse – Total loss of a nationally rare, scarce, statutorily protected or important fisheries species or component of that species (e.g. salmon and sea trout).
  2. Major Adverse – Reduction in population size that threatens the viability of a nationally rare, scarce, statutorily protected or important fishery species or component of that species, or, reduction in population size to a level that has a significant adverse effect on the performance of local fisheries (for salmon, brown or sea trout or commercially exploited marine species such as flounder and whiting).
  3. Moderate Adverse – Temporary reduction in population size of a nationally rare, scarce, statutorily protected or important fisheries species or components of that species, or total loss of a fish species not in the above categories, or, reduction in population size to a level that has a significant adverse impact on the performance of local fisheries species not falling into the above categories.

4. Minor Adverse – Temporary reduction of population size of a fish species not falling into the above categories
5. Not Significant – Not resulting in any of the above adverse or beneficial effects
6. Beneficial – Improvement in the status of any fish species, the performance of any fishery or their management.

### Findings

- 6.12 Potential effects on fish, and indirectly on fisheries, arise exclusively from the construction works with no effects foreseen from the subsequent operational phase. Broad classes of potential impacts include those on suspended solids, dissolved oxygen, chemical contaminants, sediment toxicity, endocrine disruptors, construction noise and construction lighting. Such effects can potentially be manifested at :
- **lethal level** (which kills individuals, causes population reductions, or damages the capacity of the ecosystem to produce fish. This category also includes reductions in population size that are believed to be caused by sub-lethal or behavioural effects),
  - **sub-lethal level** (which injures the tissues or physiology of the fish, but are not severe enough to cause death) and
  - **behavioural level** (which changes activity patterns or alters the kinds of activity usually associated with a fish in an unperturbed environment) levels. The latter category of effects can be particularly important in the case of migrating fish if their behaviour is disrupted by a stimulus which causes abortion of the current passage.
- 6.13 Although approximately 40 fish species could be influenced by such effects, they are likely to be most pronounced on the salmon and sea trout populations as these species are widely acknowledged as the most sensitive to poor environmental conditions. Salmon and sea trout have therefore been taken as the key species for the EIA on the basis that adequate environmental conditions for them would also be adequate for the other, more tolerant, fish species.
- i) Suspended solids**
- 6.14 Elevated levels of suspended solids, even if they are effectively inert, may impact a fish by impairing its sensory systems, primarily vision, and ultimately damaging its gills. The latter effect could produce sub-lethal or even lethal results, depending on its severity, while the former could produce behavioural effects. Limits previously adopted during construction of the Conwy Tunnel in North Wales of 200 mg l<sup>-1</sup> as a 95%-ile and 500 mg l<sup>-1</sup> as an absolute maximum were proposed for the present project and have been accepted by the Environment Agency. Modelling of suspended solids reported earlier indicated that with appropriate mitigation measures in place no significant amounts of disturbed sediments would be transported downstream to the estuary mouth, and disturbed sediments would also not be carried into the freshwater section of the river upstream of Wylam. Effects of this factor on fish would thus be restricted to impacts on young and adult individuals near the construction site within the estuary itself. However, the modelling also showed that with appropriate mitigation measures in place sediment suspension during dredging, construction, enabling and completion works would have only a minor adverse impact on water quality and so would have an insignificant impact on fish and fisheries.
- ii) Dissolved Oxygen**
- 6.15 Depending on their magnitude, reduced levels of dissolved oxygen caused by the disturbance of sediments during dredging could also produce lethal, sub-lethal or behavioural effects. As warmer water holds less dissolved oxygen than colder water, the physical potential for such adverse effects increases greatly during the summer. This is also the period of the year when biological oxygen demand reaches peak values, resulting in an increased potential for the

development of marked oxygen sags. Such effects have been implicated in significant mortalities of adult salmon returning to the River Tyne during recent summers, and have been the subject of many studies elsewhere. Lower limits of 5 mg l<sup>-1</sup> for upstream migration of salmon and 3 mg l<sup>-1</sup> for survival during exposures of 1 day or greater are typical, although there is considerable variation. For the specific case of the River Tyne and bearing in mind its recent history of dissolved oxygen problems, a level of 3 mg l<sup>-1</sup> has previously been adopted as a target minimum for environmental conditions by the Tyne Estuary Group and has been agreed with the Environment Agency in the present context as a 95%-ile with 5 mg l<sup>-1</sup> as an annual average. However, with appropriate mitigation measures in place increased oxygen demand during dredging, construction, enabling and completion works was predicted to have only a minor adverse impact on water quality which would not reduce levels below the above values, and thus would have an insignificant impact on fish and fisheries.

### iii) Chemical Contaminants and Sediment Toxicity

- 6.16 Appropriate criteria were given earlier for chemical contaminants and sediment toxicity, which have the potential to produce lethal, sub-lethal or behavioural effects given sufficient periods of exposure to fish. However, with appropriate mitigation measures in place the mobilisation and dispersion of chemical contaminants and toxic sediments during dredging, construction, enabling and completion works were concluded to have only a minor and localised moderate adverse impact on water quality, and so would have an insignificant impact on fish and fisheries.

### iv) Endocrine Disruptors

- 6.17 Endocrine disruptors are currently receiving extensive research attention in Europe and elsewhere, but no statutory or guideline standards have yet been adopted. Consequently, specific significance criteria for the fish populations of the River Tyne could not be established. The significance of endocrine disruption for fish population dynamics remains largely unknown, although it is likely that most effects will operate at the sub-lethal level, with a potential to cause a population decline by reducing or stopping reproduction. Even after allowing for this degree of uncertainty, with appropriate mitigation measures in place the change in endocrine disruption activity due to suspension and redistribution of sediments during dredging, construction, enabling and completion works was concluded earlier to have a minor adverse impact on water quality and thus would have an insignificant impact on fish and fisheries.

### v) Noise

- 6.18 Construction noise has the potential to produce lethal, sub-lethal or behavioural effects on fish populations, although detailed studies are limited. Lethal effects are likely to be restricted to extreme and sudden noise events, such as those likely to be experienced in close proximity to pile driving, while sub-lethal effects would probably be restricted to areas of extreme noise in which fish were exposed for considerable periods of time. However, if such a stimulus were to form an acoustic barrier to migrating adult fish, then it could have ultimately significant effects at the population level through the indirect mortality of fish forced to return to sea and the subsequent loss of their young from the next generation. Given the lack of appropriate scientific understanding of the generic effects of construction noise on fish populations, and thus fisheries, it is difficult to arrive at a robust conclusion with respect to the present assessment. Although considered extremely unlikely on the basis of best available information, construction noise is currently judged, on a worst case basis, to have the potential for a moderate impact on fish and fisheries. A reassessment of this potential impact will be undertaken when more detailed information becomes available on the noise characteristics and levels likely to be generated during construction. The opportunity will be taken when the construction contractors are appointed to review the most appropriate methods and equipment available to minimise construction noise impacts.

### vi) Lighting

- 6.19 The impact of construction lighting, in terms of extensive floodlighting during the night, is likely to be restricted to behavioural effects in all situations. As for construction noise, if such a stimulus formed a barrier to migrating adult fish then it could have ultimately significant effects at the population level. With respect to the present assessment, however, it is considered that such a barrier effect would not occur due to a combination of river width, natural turbidity levels, and low levels of proposed construction lighting. Given the lack of appropriate scientific understanding of the generic effects of construction lighting on fish populations, and thus fisheries, it is difficult to arrive at a robust conclusion with respect to the present assessment. However, on the basis of best available information, construction lighting is judged to have an insignificant impact on fish and fisheries.

### **Mitigation**

- 6.20 The effects on the fish populations of the River Tyne is largely determined by the impacts on water quality, which have already been covered in detail earlier. Consequently, mitigation is repeated only briefly here, but additional mitigation specific to fish populations of construction noise and lighting is described for the first time. Finally, additional precautionary mitigation specific to some of the fish populations is also presented.
- 6.21 The major mitigation method which would be adopted is the seasonal constraint of dredging activities to within the period from 1 November to 31 March, on the basis of prevailing environmental conditions and the principal migration periods of salmon, sea trout, eel and lampreys. It should also be noted that modelling of the suspended sediment plume indicated that it would be extremely localised to the vicinity of the dredger under all conditions, and so would not produce an impact across the complete river width. This spatial restriction would further reduce any impact on the passage of migratory fish.
- 6.22 Although dredging is not predicted to cause significant increases in suspended solids, its effects on this aspect of the environment would be mitigated by the use of a sealed grab, the preparation and implementation of management plans for dredging and backfilling, and the enclosure of cofferdam open ends and training wall structures. Such measures would also mitigate effects on dissolved oxygen, chemical contaminants and sediment toxicity on water quality such that they would be only minor adverse impacts. They would also reduce the impact of endocrine disruptors, which would have no significant impact.
- 6.23 Construction noise, including pile driving, and potential effects of construction lighting would be mitigated, where practicable, by restricting relevant activities to daylight hours when fish migration is likely to be at its daily minimum.
- 6.24 In addition to the above direct mitigation, and in appreciation of the great importance of the local fish populations and the long timescales on which their population dynamics are based, a substantial programme of precautionary mitigation would also be undertaken to improve the resilience of the fish populations to any future adverse impact. Following extensive discussions with the Environment Agency and fisheries interests, such precautionary mitigation would be directly primarily towards salmon and sea trout as these are both the ecologically most sensitive species and the most important species in fisheries terms. Precise details are still under discussion, but these activities would probably include improved fish passage, instream habitat improvements, and increased stocking of salmon before, during and after the major period of construction activities.

### **Monitoring**

- 6.25 Whilst the data obtained for the ES allows an adequate assessment of the effects of the proposed construction of the new crossing on fish and fisheries, an extensive fish monitoring programme is being agreed with the Environment Agency. The monitoring of fish populations in a large river such as the River Tyne is an extremely difficult task. Consequently, the following extensive monitoring programme, which would span over 7 years and include a substantial pre-construction component, has been developed in close association with and received the approval of the Environment Agency at both local and national levels. The

approach taken would be to obtain an understanding of the River Tyne fish populations and fisheries that would enable informed judgements to be made about potential construction effects, in addition to direct measurement of any changes. It is widely accepted that attributing any such observed change to a single factor is impossible, but the monitoring programme will record any changes and contribute to their best informed interpretation.

- 6.26 The programme would comprise nine components, of which five would be enhanced versions of current Environment Agency activities. Specific details of the methodology, duration, resulting data and timetable of each component are given in Table 14.2 and Table 14.3 of the Environmental Statement. Given the uncertainties inherent in terms of ease of implementation and the limited nature or absence of baseline data for a number of the components, the plan would be flexible with the condition that any changes would be approved by the Environment Agency.
- 6.27 Mortalities of salmon and sea trout in the estuary, which have been considerable for adult salmon in recent years, would be monitored by weekly visual patrols covering the tunnel vicinity and upstream areas. Salmon and sea trout smolt numbers, biology and movements would be monitored by a combination of the counting and examination of individuals captured in two new screw traps, together with acoustic tracking of a sub-sample of such individuals down to the river mouth. Corresponding aspects of the ecology of adults would be examined by the counting and examination of individuals captured in an upgraded adult trap at Riding Mill, the upgrading of an existing counter at the same location by the installation of an underwater video camera system, and the acoustic tracking of individuals captured by nets at the river mouth and followed up into the freshwater section of the river.
- 6.28 Finally, the salmon and sea trout fisheries of the River Tyne would be monitored by a combination of conventional licence returns for rods and nets, and the introduction of a voluntary logbook survey of targeted anglers. The latter activities would also contribute to the monitoring of adult salmon and sea trout biology.

### **Further Work**

- 6.29 Since publication of the Environmental Statement, work has been further progressed by developing aspects of the precautionary mitigation and the monitoring programme described above. In particular, progress has been made on the planning of the numbers of juvenile salmon to be stocked, upgrading the Environment Agency's trapping and counting facilities at Riding Mill, and developing the agreed specifications for the tracking studies of smolt and adult salmon and sea trout.

### **Conclusions**

- 6.30 The fish populations have historically been affected by loss of spawning habitats and poor water quality, but salmon and sea trout populations have recently recovered to the extent that the River Tyne is now one of the most important game fisheries in England and Wales. Long-term trends in other fish species, including eel, lampreys, coarse and estuarine species, are poorly known.
- 6.31 Salmon, sea trout, eel and lampreys use the estuary of the River Tyne as a migration route between fresh water and the sea, and so pass the proposed construction site at least twice during their life cycles. Such movements are generally nocturnal and concentrated within the period from spring to autumn.
- 6.32 Broad classes of potential impacts include those on suspended solids, dissolved oxygen, chemical contaminants, sediment toxicity, endocrine disruptors, construction noise and construction lighting. Effects on fish and fisheries were concluded to be insignificant for all classes, with the exception of construction noise which is difficult to assess robustly due to a lack of scientific understanding of its impacts on fish. Although considered extremely unlikely on the basis of best available information, this factor was judged to have the potential

for a moderate impact and will be reassessed when more information becomes available on construction noise characteristics and levels.

- 6.33 Mitigation of potential effects on fish and fisheries would be achieved primarily by mitigating effects on water quality, which would itself be achieved by a seasonal constraint of dredging to within the period from 1 November to 31 March, the use of a sealed grab, the use of management plans for dredging and backfilling, the enclosure of cofferdam open ends and training wall structures, and precautionary mitigation.
- 6.34 Precautionary mitigation would be undertaken to improve the resilience of fish populations to any future adverse impact. These activities would be directed at salmon and sea trout and probably include improved fish passage, instream habitat improvements and increased stocking.
- 6.35 An extensive monitoring programme for salmon and sea trout would be undertaken for a period of over 7 years, including a substantial pre-construction component. Activities would include the monitoring of mortalities in the estuary, the numbers, biology and movements of smolts and adults, and fisheries performances.

## **7. TERRESTRIAL ECOLOGY**

### **Regulatory Framework**

- 7.1 In this context, the principal body responsible for nature conservation is English Nature which has statutory duties through the Wildlife and Countryside Act 1981 to ensure the protection of certain species as well as areas of national importance such as Sites of Special Scientific Interest. It is also concerned to ensure protection of Special Areas of Conservation and Special Protection Areas for birds under EU legislation.

### **Existing Conditions**

#### **Designated Sites**

- 7.2 A number of designated sites were identified as a result of consultation with the appropriate bodies during the production of the Environmental Statement.
- 7.3 The national, European and international designations present along the coastline are marine sites and dealt with in detail under Marine Ecology.
- 7.4 On the north side of the river there are three non-statutory Sites of Nature Conservation Importance (SNCI). These are the River Tyne Entrance, Willington Gut and Northumberland Dock. Northumberland Dock was reported in the Environmental Statement as a Site of Local Conservation Interest (SLCI) but was upgraded by North Tyneside Borough Council to a SNCI in its latest Unitary Development Plan (UDP). These sites are primarily, brackish, inter-tidal or saltmarsh habitats which are locally rare.
- 7.5 There are a further two non-statutory sites on the south side of the river in close proximity of the tunnel approach roads. These are Jarrow Slake SNCI and the River Don Saltmarsh SNCI. In addition, South Tyneside Borough Council has identified two other sites during a survey of potential SNCIs. These sites are located at Straker Street and Cemetery Road, and have been treated as if fully designated SNCIs.
- 7.6 The River Tyne itself is noted as a Strategic Wildlife Corridor and the River Don is considered a corridor for the movement of wildlife through the wider countryside.

#### **Method**

- 7.7 Desk Study work and discussions with relevant authorities identified designated sites. Four separate surveys were also carried out. The first survey was a Phase One Habitat survey conducted according to English Nature's extended Phase One methodology. This survey was carried out by an experienced ecologist and involved a walkover survey of all land areas that may be affected by the proposals.
- 7.8 A second survey was made of the River Don Corridor using guidelines from the National Rivers Authority (now Environment Agency) in order to produce a botanical species list and annotated sketch maps. Thirdly, a Water Vole survey of the River Don and its tributaries was carried out as part of a Durham Biodiversity Project. This survey was conducted during June and July 2000. Finally, a Bat Survey was carried out at Jarrow Cemetery to identify any potential roost sites.

#### **Existing Habitat**

- 7.9 The lower stretches of the River Don and the River Tyne contain locally rare and potentially fragile habitats. These areas are consequently of high local and regional nature conservation interest. They easily damaged by changing water levels, pollution and/or excessive disturbance of the substrate.
- 7.10 Landscaping has used a variety of both native and exotic tree and shrubs species throughout most of the survey site. This has now matured and is considered a valuable resource for local people and wildlife. Three faunal species of high importance were observed within the survey

site. These are: the Water Vole, protected under the Wildlife and Countryside Act 1981; the Skylark and the Song Thrush, both listed as priority species in the UK Biodiversity Action Plan.

- 7.11 The two ponds at Church Bank and Straker Street add to the habitat diversity in the study area. Ponds are considered a priority habitat in the Durham Biodiversity Action Plan. Tadpoles and a common frog were seen at these ponds. Although not a protected species, they are considered to be of local conservation importance.

#### **Significance Criteria**

- 7.12 The significance criteria below were used to assess the potential direct or indirect effects of construction and operational activities on ecological features.
1. Severe Adverse – Loss of, land take from or permanent loss of value from a site of national importance such as a SSSI or areas designated under Special areas of Conservation or Special Protection Areas.
  2. Major Adverse – Loss of, land take from, or permanent loss of value from Sites of Nature Conservation Importance or loss of nationally rare habitat or species. Loss or disturbance to protected species where no mitigation measures can be implemented effectively. Temporary adverse effects causing measurable loss of ecological value from SSSI's.
  3. Moderate Adverse – Loss, land take from, or permanent loss of value from sites of district ecological importance or of priority in relevant Biodiversity Action Plans. Adverse effects on protected species where mitigation measures can be successfully applied. Temporary adverse effects which cause measurable loss of ecological value to significant ecological resources within other designated sites.
  4. Minor Adverse – Loss of, land take from, or permanent loss of value from sites of local ecological importance, severance or disruption to linear habitat features or loss of urban green space of some ecological value. Temporary adverse effects which cannot be fully mitigated which cause measurable loss of ecological value to sites of regional or local importance.
  5. Not Significant – No significant change in the nature conservation of the area.
  6. Beneficial – Habitat creation and enhancement where this can achieve an overall benefit to ecological resources.

#### **Findings**

##### **Construction Impacts**

- 7.13 The River Tyne Entrance SNCI and Willington Gut SNCI are sufficiently far from the site that they would not be affected directly or indirectly (e.g. by the movement of resuspended silt) by the proposals. Similarly, Jarrow Slake SNCI and the River Don Saltmarsh SNCI would not be directly affected. The potential SNCIs at Straker Street and Cemetery Road would also not be affected by the approach roads to the Tunnel.
- 7.14 Although no work is planned within the River Don wildlife corridor, works are proposed adjacent to it which may cause some temporary disturbance to the passage of wildlife. Similarly, there may be some temporary disturbance to the passage of wildlife along the River Tyne corridor. Overall, the impact on these river corridors is considered to be minor adverse.
- 7.15 The two ponds at Church Street and Straker Street would not be directly affected by the proposals. However, there is a slight potential for surface runoff and accidental spillages to pollute Straker Street Pond if they are not correctly controlled.
- 7.16 The removal of landscape areas identified in the habitat survey would have an impact on the ecological value of the study area. Matured planted areas may serve as nesting sites or

foraging areas for the Song Thrush. Without appropriate mitigation this impact is considered to be minor adverse.

7.17 Other species noted of significance in the habitat surveys would not be directly affected by the proposals. The scheme would not extend into areas used by the water vole or remove habitat important to the Skylark.

7.18 The effects of construction noise are expected to be temporary and of short duration. Any disturbance to wildlife is considered to be a minor adverse impact.

#### **Operational Impacts**

7.19 Provided appropriate measures to prevent pollution are incorporated within the completed scheme, the impact of the tunnel on ecological resources would be not significant.

#### **Further work**

##### **Mitigation**

7.20 It is recommended that Church Street and Straker Street Ponds are fenced to prevent accidental disturbance by construction workers and vehicles. There should also be appropriate protection measures provided to prevent pollution occurring from runoff and accidental spillages in Straker Street Pond and the River Don.

7.21 Where previously planted landscape measures exist they should be maintained where possible. If this is not possible, and they have an ecological, visual or amenity value, they would be replaced with new measures following construction of the scheme. New landscape measures would be implemented using ecological design guidance to fully mitigate any losses and create new areas of value to nature conservation where this is practicable. This would reduce the minor adverse impact from planted landscape removal to a not significant or possibly beneficial impact.

7.22 There would be appropriate measures put in place at Straker Street SNCI and Cemetery Road SNCI to prevent pollution from runoff and spillages affecting water voles. Where works are proposed in close proximity to these sites, the sites would be temporarily fenced to ensure encroachment does not take place.

7.23 English Nature have been consulted and will also be consulted on the final mitigation measures. This will generally be designed as part of ecologically beneficial landscape proposals.

#### **Conclusions**

7.24 Following implementation of the proposed mitigation measures, there will be, at worst, minor adverse effects on terrestrial ecological resources of the River Tyne and River Don corridors. These minor effects will reduce still further with the passage of time following the completion of construction works.

## 8. HYDROGEOLOGY

### Introduction

- 8.1 This section deals with the likely impacts of construction on groundwater resources. A desk study and phased site investigation were undertaken to assess the nature of the groundwater in the area.

### Baseline Conditions

- 8.2 The hydrogeological regime in the area is influenced by the geology which comprises made ground and drift deposits over Carboniferous Middle Coal Measures. The Middle Coal Measures comprise a sequence of sandstones, siltstones, mudstones and coals. The overlying drift deposits comprise glacial tills, clays and gravels with sand and pebble beds. The sandstones, gravels and sands are generally more permeable than the siltstones and clays. The made ground at the surface comprises mainly clay and gravel fill with ash.
- 8.3 Groundwater tables in the area are expected to be generally rising following the cessation of pumping for mining reasons. There is close connectivity to the River Tyne and a tidal response can be seen in boreholes close to the river. There are no abstraction licences within 3km of the site and the area is not in a source protection zone.
- 8.4 Groundwater quality shows evidence of saline intrusion and contamination with ammoniacal nitrogen, sulphate, and slight contamination by List I and List II substances such as cadmium, mercury, iron and manganese.

### Construction Impacts and Mitigation

- 8.5 Dewatering of the cut and cover phases of tunnel construction would lower groundwater levels around the site in an area extending to about 100- 200 metres away from the excavation. Any risk of settlement can however be mitigated by the design and operation of the dewatering system in conjunction with appropriate cut-off walls. Monitoring of ground levels and critical structures would be required to assess whether settlement was occurring.
- 8.6 The groundwater is slightly contaminated and appropriate discharge consents would need to be agreed with the Environment Agency if discharge was to be to the River Tyne. Saline intrusion into the Coal measures may also occur as dewatering proceeds and again Environment Agency agreement would be needed in advance of any abstraction. Monitoring of groundwater quality would be needed to determine whether contaminant transport was taking place.
- 8.7 The risk of contamination of groundwater resources during excavation work can be mitigated by adoption of good working practices and effective site management through the Code of Construction Practice.
- 8.8 Conclusion
- 8.9 Implementation of appropriate mitigation measures would result in minor or negligible residual impacts of construction or operation of the project on ground water resources

## 9. SURFACE WATER HYDROLOGY

### Introduction

- 9.1 This section deals with the surface water hydrological features in the project area. The assessment presented in the ES was undertaken qualitatively as a desk study but with consultation with the Environment Agency and Northumbrian Water.

### Baseline conditions

- 9.2 Given the urban and industrialised nature of the local area, the hydrology of the site has been extensively modified over many years. The area is dominated by the Rivers Tyne and Don, but apart from near shore areas, flooding is not an issue. Surface water drainage is carried by combined sewer systems and water north of the Tyne is carried to the Howden Treatment works or directly to the Tyne,. South of the Tyne water is carried by the combined sewer system to discharge points on the Don and the Tyne.

### Construction Impacts and Mitigation

- 9.3 The main conflict with surface water hydrology is the effect of construction on the network of drainage pipes and water mains which pass through the area. As the waste water system and existing water mains in Howden and Jarrow serve a significant area, there is the potential for a moderate adverse impact. Close working with water supply and sewerage undertakers will be necessary to prevent disruption.
- 9.4 A potential for a small increase in surface runoff to occur also exists. In themselves the quantities are not great but they may have a moderate adverse effect because of the effect on existing piped drainage systems which become periodically tide locked – increasing the risk of local flooding. The design of traditional or sustainable urban drainage systems should adequately mitigate this issue.
- 9.5 Runoff from the development site also carries the risk of discharging silt laden water from construction activity to the River Tyne. There is also the potential risk of pollution incidents to occur affecting surface water quality. This can be mitigated by the adoption of good site management practices to ensure that drainage water is allowed to settle before discharge and that pollution incidents are prevented from occurring.

### Conclusion

- 9.6 Implementation of appropriate mitigation measures should ensure that conflicts with existing drainage systems, and water mains, increases in surface runoff, the effects on receiving watercourses and works around the existing local watercourses should be non significant or at worse have a minor adverse residual effect. The key issues to be controlled during construction would be the risk of pollution by spillages or by silt runoff. The requirements of the Code of Construction Practice should ensure that such risks are minimised.

## 10. CODE OF CONSTRUCTION PRACTICE

### Purpose of the Code of Construction Practice

- 10.1 The construction of the new Tyne Crossing will involve significant engineering works within relatively small urban areas of South and North Tyneside. Whilst a range of environmental legislation exists to protect the public and the environment, a Code of Construction Practice has been prepared to provide a framework for sound environmental management which the Concessionaire and any appointed contractors will be obliged to adopt and implement.
- 10.2 The Code sets out a series of general environmental standards, objectives and measures which to be applied to the construction works throughout the construction period. Its purpose is to maintain satisfactory levels of environmental protection and minimise disturbance and inconvenience to local residents, businesses and the general public from the proposed construction activities, so far as is reasonably practicable.
- 10.3 The TWPTA's obligation to adopt and implement the Code will be imposed by virtue of a condition of the First Secretary of State's 'Planning Direction' under Section 90(2A) of the Town and Country Planning Act 1990. The adoption of the Code is designed to provide confidence to local authorities, statutory agencies and the public that sound environmental control and management will be achieved on the project. The Code does not duplicate other statutory provisions.
- 10.4 Codes of Construction Practice are being increasingly used in the UK on major infrastructure projects, such as the current Channel Tunnel Rail Link, to demonstrate commitment and transparency in the delivery of environmental commitments made during design and the consenting process to the construction works. The delivery of the Code is normally ensured by enshrining its provisions in contract documentation to which the concessionaire /construction contractors must comply. Policing of the Code is undertaken by the client organisation, the relevant local authorities and any statutory agencies which have an interest in its provisions (for example the Environment Agency).

### Scope of the Code of Construction Practice

- 10.5 The Code covers both general management principles to be applied and the context for specific mitigation measures. It also requires a series of specific Environmental Management Plans to be prepared and implemented and makes provision for continued liaison with local communities. A copy of the draft Code is attached as an Appendix to this Proof of Evidence.

### General Management Issues

- 10.6 Key provisions of the Code and the Environmental Management Plans are the requirement for :
- An Environmental Management System – identifying management responsibilities and procedures to deliver satisfactory levels of environmental protection. This will include the need for a full time Environmental Manager, staff training, target setting, surveillance and audit, incident response, communication and reporting processes;
  - Liaison arrangements with local authorities, statutory agencies and the public;
  - General site operations and management;
  - Working hours;
  - Construction site boundaries , layout and appearance;
  - Lighting; and
  - Safety and security measures;

**Specific Management Issues**

10.7 A series of specific management plans will be required from the contractor to ensure effective delivery of environmental control. These are likely to comprise:

- General Environmental Management Plan;
- Public Access and Traffic Management Plan;
- Noise and Vibration Management Plan (including noise insulation criteria);
- Dust and Air Pollution Management Plan;
- Contaminated Land Management Plan;
- Surface and Groundwater Management Plan;
- River Tyne Management Plan;
- Spoil and Waste Management Plan; and
- Landscape and Ecology Management Plan.

10.8 The Management Plans will develop the general principles described in the Code into more specific control measures which can be applied at the local level. The Plans, which will be formulated by the appointed contractor, will be discussed with the local planning authorities and relevant statutory bodies such as the Environment Agency. They will be updated at appropriate intervals as the construction work and mitigation activity proceeds.

**Community Relations**

10.9 The Code also provides for mechanisms to ensure that relevant occupiers of premises are given advance notification of the commencement of works in their vicinity. Contact names of community relations representatives and a telephone help line will be provided. A project web site with educational resources will be established. The Environmental Management System will provide a mechanism for the timely processing of enquiries and complaints to a satisfactory conclusion.

## **11. CONCLUDING REMARKS**

### **Objectors representations**

- 11.1 Where objectors have made specific representations about issues considered in this proof of evidence, individual responses have been prepared. The responses are attached as an Appendix.

### **Statement of Matters**

- 11.2 The Office of the Deputy Prime Minister has raised a number of matter about which the Secretary of State wishes to be informed. Those of relevance to this proof of evidence relate to: (9) The probable impact on ecology and on the environment of constructing and operating the proposed works; (10) the proposals for mitigating any adverse environmental effects; and (11) the adequacy of the environmental statement and whether statutory procedural requirements have been met.
- 11.3 With respect to the matters considered in this proof of evidence, it is my conclusion that the effects of the works on water quality and the marine environment, on the ecology and fisheries of the River Tyne and on the conservation status and integrity of the Northumbria Coast SPA have been adequately assessed, proposals for comprehensive mitigation and monitoring have been made and only limited residual effects of minor significance would remain. I further conclude that the Environmental Statement submitted with the application for the order, adhered to statutory procedural requirements and is adequate for use in the decision making process.