SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

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SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

1. INTRODUCTION

1.1 General

1.1.1 In addition to the requirements of Schedule 7 Part 6, the Operating Company shall inspect, monitor, test, manage and maintain the Structures with particular requirements listed in Annex 7.7/A of this Part, in accordance with the manuals and associated schedules listed in Annex 7.7/B of this Part.

1.1.2 No later than 180 days after Commencement of Service Date 1, the Operating Company shall supply the Director with an Electronic Copy of all documents including manuals which have been transferred to it by FETA, the previous operating company or by the Director in relation to Network 1. No later than 50 Working Days after Commencement of Service Date 2, the Operating Company shall supply the Director with an Electronic Copy of all documents including manuals which have been transferred to it by the Director in relation to Network 2. The Operating Company shall advise the Director of any documents or parts thereof listed in Annex 7.7/B of this Part that were not transferred and of any further documents which it requires. The Director will forward to the Operating Company any such further documents which he holds. The Operating Company shall check the documents relating to Network 2 for any discrepancies or deficiencies. The Operating Company shall advise the Director of any deficiencies and discrepancies and shall submit proposals confirming how any discrepancies could be resolved.

1.1.3 In each Annual Period, the Operating Company shall review the documents listed in Annex 7.7/B of this Part for each of the Structures listed in Annex 7.7/A of this Part. Following the annual review of the documents and subject to the written consent of the Director, the Operating Company shall update the documents to meet the requirements of current Legislation and include amendments required to reflect work carried out.

1.1.4 Immediately following receipt of the Director's written consent, an Electronic Copy of each updated document shall be issued to the Director by the Operating Company.

1.1.5 The Operating Company shall issue an inspection report for each Structure in a General Inspection format to the Director by 31 January in the calendar year following the inspections of each Structure. The annual inspection report shall cover the matters identified in the documents referred to in Annex 7.7/B of this Part including any mechanical and electrical installations. Copies of periodic inspection and test Certificates shall be provided with the reports where applicable. Separate reports shall be provided for all Access Systems that remain certified for use.

1.1.6 The Operating Company shall provide Principal Inspection reports at intervals indicated in paragraphs 2.2.8 and 3.2.8 of this Part or Annex 7.7/A of this Part, that include detailed summaries of the inspection reports. Principal Inspection reports shall include priority ranking of Defects that have been identified. Principal Inspection reports shall be provided by 30 November in the year in which the Principal Inspection cycle becomes due.

1.1.7 The Operating Company shall enter all inspection reports and related data directly into the structures management function of the Integrated Roads Information System in a format consented to by the Director in writing within 10 Working Days of their production.

1.1.8 For the Structures listed in Annex 7.7/A of this Part, the Operating Company shall upload a summary Defect report into the structures management function of the Integrated Roads Information System in a format consented to by the Director in writing within 10 Working Days of its production.

1.1.9 Subject to an Order, Special Inspections shall be undertaken by the Operating Company.

1.1.10 The Operating Company shall carry out Programmed Special Inspections, as required by the *Forth Road Bridge Engineering Manual* and the *Register of Programmed Special Inspections for the Forth Road Bridge*.

This is Annex 7.7/A to Schedule 7 Part 7 referred to in the foregoing Agreement between Scottish Ministers and Amey LG Limited.

SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

ANNEX 7.7/A – Structures with Particular Requirements

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

ANNEX 7.7/A – Structures with Particular Requirements

1. Structures with Particular Requirements

1.1.1 The Structures listed within the tables below have particular requirements which the Operating Company shall carry out in addition to those duties set down in Schedule 7 Part 6. These requirements shall be read in conjunction with the documents listed in Annex 7.7/B of this Part.

Table 1.1.1.A – Structures on the Trunk Road

Structure Reference Number	Structure Name
A90 9	Forth Road Bridge
M90 0-1 68	Queensferry Crossing
M90 0-1 33	BP Oil Pipeline Protection Structure (ESQ06)
M90 0-1 37	BP Oil Pipeline Protection Structure (ESQ07)
M90 0-1 46	BP Oil Pipeline Protection Structure (ESQ05)
M90 0-1 35	New B800 Bridge (ESQ04)

Table 1.1.1.B – Structures which are the property of Scottish Canals

None.

Table 1.1.1.C – Structures not on the Trunk Road

None.

2. A90 9 Forth Road Bridge

2.1.1 Completed in 1964, this suspension bridge shown in Figure 2.1.1.A and whose location is denoted within Figure 2.1.1.B has a length of 2513 metres including the approach viaducts and carries four lanes of the A90 over the Firth of Forth. There is a separate footway and cycle track on either side.

The bridge, now a Category A listed Structure, has a central span of 1006m between its two main towers. The side spans, which carry the deck to the side towers, are each 408m long, and are flanked by approach viaducts.

The steel orthotropic deck is supported on steel stringer beams that span between large steel cross girders spaced at 9,144mm centres. These cross girders are supported by two longitudinal stiffening trusses which, in turn, hang from the 610mm diameter main cables. Linking the stiffening trusses to the main cables are 192 sets

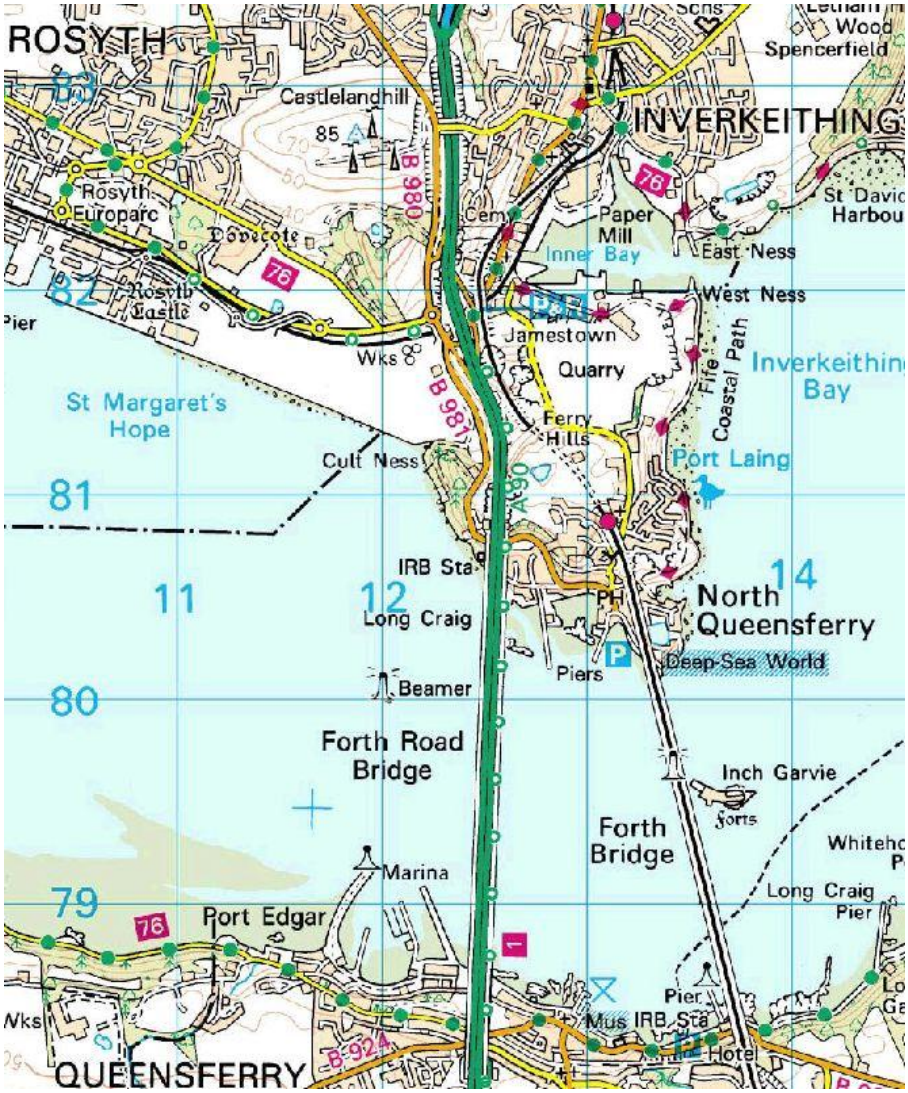
of wire rope hangers at 18.29 metre centres varying in length from 2.5m at mid span to 90m adjacent to the main towers.

The main towers extend 156m above mean high water level and the sag of the cables between the towers is approximately 91m; that is, the sag is 1 /11th of the span. The clearance to navigation at mid span is approximately 44 metres above mean high water springs without underdeck gantries.

At the side towers the supporting cables turn downwards towards the anchorages which are, essentially, wedges constructed by tunnelling into the rock.

Figure 2.1.1.A – Forth Road Bridge *(courtesy of FETA)*

Figure 2.1.1.B – Forth Road Bridge Location



signed for and on behalf of The Scottish Ministers

by ……...Roy Brannen…….

on …..…… December 2014……

at ……Glasgow……..……

……..……
Authorised Signatory

signed for and on behalf of AMEY LG Limited

by ……..……

on ……..… December 2014……

at ……Glasgow……..…..

……..…..
Director/Company Secretary/
Authorised Signatory*

2.2 Particular Requirements for The Forth Road Bridge

2.2.1 The Forth Road Bridge Engineering Manual

The *Forth Road Bridge Engineering Manual* contains the requirements for the inspection and maintenance of the Forth Road Bridge. Written originally as a standalone document, any directions within it that appear to conflict with the requirements of the Contract shall be raised with the Director in writing for determination within two weeks of discovery. The *Forth Road Bridge Engineering Manual* also provides design and historical maintenance information on the Forth Road Bridge. The Operating Company shall review and update this information until the Service End Date in accordance with the procedure described in Schedule 7 Part 6.

2.2.2 Forth Road Bridge Maintenance Procedures

During Mobilisation Period 1, the Operating Company shall develop procedures in the Management System for the inspection, operation and maintenance of the Forth Road Bridge. Historical procedures associated with Forth Road Bridge inspection, operation and maintenance shall be reviewed and assessed in the course of producing the new procedures. The Operating Company shall submit these to the Director for written consent no later than 60 Days prior to Commencement of Service Date 1.

The Operating Company shall undertake the inspection, operation and maintenance of the Forth Road Bridge in accordance with the procedures consented to in writing by the Director.

The *Forth Road Bridge Engineering Manual* includes operational and health and safety statements, sometimes expressed as requirements. In developing its own procedures, the Operating Company shall assess the suitability of each statement in light of its own responsibilities under health and safety Legislation. The manual shall be reviewed and updated by the Operating Company as described in Schedule 7 Part 6.

2.2.3 In addition to the requirements of Schedule 7 Part 6, the Operating Company shall undertake the inspection, survey and maintenance of the structural elements of the Forth Road Bridge from Commencement of Service Date 1 until the Service End Date including as a minimum:

(i) Main Cable, clamps and handstrand equipment,

(ii) Towers,

(iii) Suspended truss,

(iv) Main span orthotropic deck panels,

(v) Side span composite concrete deck,

(vi) Truss-to-tower pendel link bearings,

(vii) Cable anchorages,

(viii) Hangers and assemblies,

(ix) Deck half joints on the truss,

(x) Deck end trimmers,

(xi) Tower Expansion joints (Demag),

(xii) Approach viaduct box girders and concrete decks,

(xiii) Viaduct piers, bearings and movement joints,

(xiv) North Viaduct comb-type expansion joint,

(xv) South Viaduct comb-type expansion joint,

(xvi) Barriers/ parapets,

(xvii) Ship impact cofferdams protecting main piers,

(xviii) Access Systems (gantries), and

(xix) Access walkways.

2.2.4 The Operating Company shall undertake the inspection, survey and maintenance of the non-structural elements on the Forth Road Bridge from Commencement of Service Date 1 until the Service End Date including as a minimum:

(i) Deck drainage steelwork,

(ii) Steel balustrades and fences,

(iii) De-humidification system inside towers,

(iv) De-humidification system inside anchorages,

(v) Main cable de-humidification system including neoprene wrapping,

(vi) Main cable acoustic monitoring equipment,

(vii) Lifts inside towers,

(viii) CCTV cameras,

(ix) Security systems,

(x) Aviation/ navigation warning lights, and

(xi) All other mechanical and electrical systems.

2.2.5 **Structural Assessment**

The Forth Road Bridge is subject to a 2-yearly Bridge Specific Assessment Live Load pursuant to *BD50/92*. The Operating Company shall submit a schedule for the proposed continued execution of these assessments to the Director for written consent a minimum of 30 days prior to Commencement of Service Date 1. Subject to an Order, the Operating Company shall undertake a Bridge Specific Assessment Live Load determination. Where a Bridge Specific Assessment Live Load is needed, contemporary data from the calibrated weigh-in-motion system shall be required.

2.2.6 **Inspection Frequencies**

The detailed inspection regime contained within the *Forth Road Bridge Engineering Manual* requires inspections of specific elements to be undertaken at different frequencies from the intervals stated in Schedule 7 Part 6. Where described in the *Forth Road Bridge Engineering Manual*, the minimum frequency of inspections shall be determined using a criticality and vulnerability assessment in accordance with the *Forth Road Bridge Engineering Manual* and paragraph 2.2.8 of this Part. In addition the minimum frequency of Programmed Special Inspections is as described in the

Register of Programmed Special Inspections for the Forth Road Bridge. The Operating Company shall continuously review these assessments and the elements forming part of the Programmed Special Inspections as a part of its inspection planning activity and any changes to the planned inspection programmes and frequencies shall be submitted to the Director for his written consent as a part of the annual inspection reporting process.

2.2.7 Elements not specifically identified in the Forth Road Bridge Engineering Manual or criticality and vulnerability assessment shall be subject to inspection requirements in accordance with the requirements of *Transport Scotland Interim Amendment No 33*, BD63 and the *Transport Scotland Inspection Manual – Principal Inspection of Trunk Road Structures and Location System*.

2.2.8 **Inspections on Forth Road Bridge**

(i) The maximum intervals for element inspections are determined by a criticality and vulnerability ratings procedure using the method described in the *Forth Road Bridge Engineering Manual*,

(ii) Owing to the difficulty of access to many areas of the Forth Road Bridge and large viewing distances involved, inspections that would ordinarily be categorised as General Inspections in *BD63* and so requiring only Visual Inspection shall be executed to a Close Visual Inspection standard in accordance with the requirements for Principal Inspections to save repeated visits,

(iii) At least one full Principal Inspection of all elements shall be completed within four years and nine months of Commencement of Service Date 1. Where the period from Commencement of Service Date 1 to Service End Date extends beyond six years, the subsequent Principal Inspections shall be undertaken in accordance with the inspection programme as defined in Schedule 7 Part 6 and within the maximum time periods between scheduled inspections. The schedule of Principal Inspections shall be subject to the written consent of the Director,

(iv) During Mobilisation Period 1, the Operating Company shall review FETA's inspection schedules and prioritise the elements selected for inspection to ensure that maximum required inspection intervals are not exceeded,

(v) For the Forth Road Bridge, Principal Inspection reports shall be submitted in each Annual Period a minimum of 30 days prior to the review of the structures maintenance schedule as defined in Schedule 7 Part 6 for the sets of structural parts inspected in the preceding period. The first such submission shall take place no earlier than five months after and no later than 11 months after Commencement of Service Date 1,

(vi) Historic times and intervals of the inspection of structural elements have been recorded in the Forth Road Bridge Maintenance Database, and

(vii) The Operating Company shall carry out Programmed Special Inspections as required by the *Forth Road Bridge Engineering Manual* and the *Register of Programmed Special Inspections for the Forth Road Bridge*.

2.2.9 **Positional Surveys**

The Operating Company shall produce a Principal Inspection survey procedure for the Forth Road Bridge and submit it to the Director for written consent no later than Commencement of Service Date 1. Surveys shall be scheduled with Principal Inspections using conventional optical survey methods. These may be combined with relevant, verified and datum-referenced records provided checks are made by the Operating Company. The surveys shall measure and record:

(i) Horizontal alignment and levels of the viaduct spans at pier and midspan locations,

(ii) Pier and tower foundation and abutment levels and transverse tilts,

(iii) Navigational clearances at the bridge midspan and corners of the navigational envelope,

(iv) Longitudinal and transverse verticality of the towers,

(v) Longitudinal verticality of the piers,

(vi) Gaps at the tower, side tower and viaduct expansion joints, and

(vii) Mean effective temperatures of each deck girder or deck box for the survey period.

Verticality values shall be absolute and gravity-referenced.

2.2.10 The Operating Company shall ensure that all structural baseline measurements and positions are established for long-term monitoring and be repeatably referable to permanent datum benchmarks for horizontal position and level by taking at least two independent sets of measurements to an accuracy of 2mm.

The first positional survey shall be completed to establish the reference data set no later than 12 months after Commencement of Service Date 1 and repeated thereafter to coincide with the completion of each Principal Inspection cycle.

2.2.11 **The Forth Road Bridge Main Cable**

Prior to Operations Commencement Date 1, the main cable has been subject to a series of intrusive inspections carried out by independent specialists in order to assess its internal condition in accordance with the United States guidance document *National Cooperative Highway Research Program Report 543*. The Operating Company shall review the findings of such previous inspections including as a minimum the recommended time periods for further inspections.

The Operating Company shall review the monthly reports produced for the acoustic monitoring system. No more than 180 days after Commencement of Service Date 1 the Operating Company shall propose dates for further intrusive inspections to the Director for his written consent. Subject to an Order, the Operating Company shall facilitate the execution of further main cable inspections.

The Operating Company shall continuously monitor the results from the Forth Road Bridge main cable acoustic monitoring system from Commencement of Service Date 1 until the Service End Date. The Operating Company shall review the monthly reports produced by the contractor responsible for the acoustic monitoring system from Commencement of Service Date 1 until the end of the contractor's monitoring and reporting service period. Thereafter the Operating Company shall produce monthly

reports in the same format and within the same timescales as those produced by the contractor responsible for the acoustic monitoring system. The Operating Company shall produce an interpretative report in a format to be agreed with the Director every six months from Commencement of Service Date 1 summarising the findings of the monitoring and reporting and shall submit the report to the Director. Any anomaly that might give cause for concern regarding the apparent behaviour of the main cable or the acoustic monitoring system shall be reported to the Director in writing within 30 days of the emergence of said anomaly.

Prior to the end of the contractor's monitoring and reporting service period for the acoustic monitoring system the Operating Company shall obtain all archived and backup data stored by the contractor and thereafter shall store this data together with all additional data generated by the system on suitable durable storage media until Service End Date. At Service End Date, all data and all rights therein shall be assigned by the Operating Company unconditionally to the Director.

The Operating Company shall be responsible for the on-site maintenance of the acoustic monitoring system in accordance with the requirements of the performance specification from Commencement of Service Date 1 until the Service End Date.

2.2.12 **Mechanical, Electrical & Plumbing Installations (Forth Road Bridge)**

The Operating Company shall be responsible for the inspection, operation, maintenance and certification of all mechanical, electrical and plumbing installations in accordance with the requirements of the Forth Road Bridge Engineering Manual from Commencement of Service Date 1 until the Service End Date. If inspection and maintenance requirements are not adequately covered in the Forth Road Bridge Engineering Manual, manufacturer's recommendations and Legislation shall be adhered to.

The sub-systems forming part of the mechanical, electrical and plumbing systems shall include as a minimum:

(i) Power systems and electrical installations including navigation, aircraft obstruction and display lights and internal lighting to the towers and viaducts,

(ii) Access Systems,

(iii) Anemometers and weather stations,

(iv) CCTV cameras, variable message signs and traffic signalling equipment,

(v) Dehumidification systems for the main cables, tower top and saddles,

(vi) Dehumidification systems for the anchorages,

(vii) Weigh in motion system – maintenance and calibration,

(viii) Roadway Icelerts,

(ix) Roadside emergency (crisis) telephone system,

(x) Plumbing systems, and

(xi) Any other systems set out in the *Forth Road Bridge Engineering Manual*.

Details of the above systems are set out in the *Forth Road Bridge Engineering Manual*. During Mobilisation Period 1, the Operating Company shall develop procedures and schedules for the operation, maintenance and inspection of all mechanical, electrical

and plumbing equipment and shall submit these to the Director for written consent a minimum of 30 Days prior to Commencement of Service Date 1. The procedures shall include details of any proposed specialists and subcontractors required.

Inspection and maintenance intervals and summary duties shall be carried out as stated in the *Forth Road Bridge Engineering Manual* and shall follow manufacturer's recommendations and Legislation.

2.2.13 **Access Systems (Forth Road Bridge)**

In addition to the requirements of Schedule 7 Part 6, the Operating Company shall be responsible for the inspection, operation, maintenance, storage and servicing (including mechanical and electrical installations) of all Access Systems on the Forth Road Bridge from Commencement of Service Date 1 until the Service End Date and with the exception of the systems listed in Annex 7.7/C of this Part, these Access Systems shall remain certified for use at all times regardless of whether they are used or not. Access Systems not required to be kept certified shall be kept in secure, sheltered, and enclosed storage facilities. Subject to an Order the Operating Company shall dispose of any Access Systems which will not be required, the value being credited to Scottish Ministers.

During Mobilisation Period 1, the Operating Company shall develop procedures for the inspection, operation and maintenance of all Access Systems and shall submit these to the Director for his consent a minimum of 30 Days prior to Commencement of Service Date 1. Inspection, operation and maintenance requirements shall comply with the recommendations set out in the *Forth Road Bridge Engineering Manual.*

The Operating Company shall provide secure sheltered and enclosed storage facilities within the Unit for all Access System equipment not in use on the Forth Road Bridge.

The following types of Access System equipment together with any further Access Systems commissioned prior to the Service End Date shall be maintained and kept in working order at all times:

(i) Underdeck access gantries – Suspension Bridge,

There are two underdeck gantries serving the main bridge suspended structure, one for the sidespans and one for the main span.

(ii) Underdeck access gantries – Approach Viaducts,

There are two underdeck access gantries, one for each Approach Viaduct; each comprises three sections – two 'wing' gantries that are suspended below the outer cantilevers and a central suspended section that hangs from each and bridges between them.

(iii) Tower platforms and cradles,

There are two access systems from the towers, one is a full wrap-around 'Beeche' system that was developed for complete overpainting of the towers; this was operated in conjunction with a dropped object canopy. The second system is an 'Alta' self-winched system comprised of several modular components configurable to suit different inspection and light maintenance activities with only one or two separate cradles usable at a time.

All are suspended from lifting beams at the tower top portal level.

(iv) Main Cable Gantries,

There are three types – two for Forth Road Bridge main cable intrusive inspection, two for cable band bolt replacement and one for hanger replacement. Gantries shall be maintained such that access and functionality for all of these activities shall be retained at all times.

(v) Hanger access cradles,

There are two man-riding type self-winching 'Tirak' cradles used for hanger painting and inspection.

(vi) Suspended span underdeck access system – Suspension Bridge,

This system has to be maintained and tested and components certified as fit for use.

(vii) Tower Lifts,

(viii) There are a total of two internal tower lifts, operating in the south east and north west legs.

2.2.14 **Access Walkways, Ladders, Stairs and Platforms**

All access walkways, ladders, stairs and platforms shall be inspected, maintained and kept safe and continuously operable by the Operating Company from Commencement of Service Date 1 until the Service End Date in accordance with the requirements of the *Forth Road Bridge Engineering Manual* and Legislation.

2.2.15 **Spare Parts Stocks and Spare Parts Inventory**

A required spare parts inventory is referred to in the *Forth Road Bridge Engineering Manual*. These required spare parts shall be separately identified within the list of equipment, materials, plant and spares owned by FETA to be transferred to Scottish Ministers and made available for use under this Contract which is required by Part 7 of Schedule 5 to be provided to the Director no later than 30 days prior to Commencement of Service Date 1. The Operating Company shall continuously maintain and update the spare parts inventory for the Forth Road Bridge in accordance with the requirements of Schedule 5 Part 7.

2.2.16 **FETA Inspection Records and Defects Management Database**

During Mobilisation Period 1, the Operating Company shall review the historical Forth Road Bridge Maintenance Database. The Operating Company shall either maintain the historical Forth Road Bridge Maintenance Database or develop a new SQL based inspection, Defects and repair management database for the Forth Road Bridge with equivalent functionality to the historical database. The Operating Company shall submit proposals including, as appropriate, the proposed database to the Director for his written consent no later than 60 days after Operations Commencement Date 1. The Operating Company shall continually use, update and licence the database and other associated software until the Service End Date. The Operating Company shall use the database as the main tool for recording and tracking the results of inspections and Defect identification, monitoring, management and repair. The system shall be accessible to the Director, the Performance Audit Group and any other parties appointed by the Scottish Ministers and the Operating Company shall grant a licence

on an irrevocable and unconditional basis to the Scottish Ministers for use of the database and software from Commencement of Service Date 1. At Service End Date, the database including all software and all rights therein shall be assigned by the Operating Company unconditionally to the Director and the software shall be provided with a perpetual licence. The database shall be retained by the Director for use by successor operating companies.

2.2.17 **Structural Condition Indices**

A scoring system shall be developed by the Operating Company to produce composite monitoring indicators for tracking the long-term condition of all structural elements on the Forth Road Bridge. The scoring system shall be submitted to the Director for his written consent no later than six months after Commencement of Service Date 1. The Operating Company shall update all composite indicators in the scoring system consented to by the Director at the end of the first Annual Period and thereafter in each Annual Period and in each Annual Period shall submit a report to the Director. The report shall as a minimum provide a summary of the results, changes in the composite indicators over the Period, the reasons for these changes and recommendations for addressing any deterioration in condition.

2.2.18 **Forth Road Bridge Structural Analysis Models**

During Mobilisation Period 1, the Operating Company shall procure the software required to run the structural analysis models developed by others for the assessment of the Forth Road Bridge. Subject to an Order, the Operating Company shall update the structural analysis models to reflect any changes to the Structure or undertake any analysis required. The Operating Company shall maintain the software licences from Commencement of Service Date 1 until the Service End Date and the Operating Company shall grant a licence on an irrevocable and unconditional basis to the Scottish Ministers for use of the analysis models from Commencement of Service Date 1. At Service End Date, the analysis models and all rights therein shall be assigned by the Operating Company unconditionally to the Director.

2.2.19 **Forth Road Bridge Security**

The Operating Company shall be responsible for ensuring the security of the Forth Road Bridge from Commencement of Service Date 1 to the Service End Date. During Mobilisation period 1 the Operating Company shall review any historic FETA policies and procedures and shall develop a Security Patrol Plan. The Security Patrol Plan shall be submitted to the Director for his written consent a minimum of 30 days prior to Commencement of Service Date 1. The Security Patrol Plan shall, as a minimum, include procedures for:

(i) Continuously monitoring all closed circuit television cameras,

(ii) Monitoring all alarms and intruder detection systems,

(iii) Undertaking security patrols including routine patrols and patrols in response to an incident, and

(iv) Operating a permit system for the control of access to all non public areas of the bridge including the internal areas of the towers and anchorages.

The Operating Company's responsibilities shall, as a minimum, include for guarding against acts of terrorism, malicious damage and structural damage and preventing unauthorised access to the Forth Road Bridge at all times.

The Operating Company shall undertake all monitoring and security patrols on a continuous basis 24 hours per day, seven days per week during each Annual Period.

2.2.20 **Cathodic Protection**

The Operating Company shall be responsible for the operation, monitoring and maintenance of the cathodic protection systems in operation on the approach viaduct piers and the ship protection to the main piers of the Forth Road Bridge in accordance with the operation and maintenance manuals from Commencement of Service Date 1 until Service End Date. The Operating Company shall undertake monthly functional checks of the systems to ensure that the system is functioning correctly and quarterly performance assessments to ensure that the performance criteria as set out in the operation and maintenance manuals are being met. These checks and assessments shall be undertaken by remote monitoring and the performance assessments shall include the recommendation and implementation of any changes required to the systems. Inspections of the systems including ground based cabinets, remote monitoring and control enclosures and the cathodic protection system including anodes and the concrete being protected shall be undertaken annually.

The Operating Company shall produce annual inspection reports and reports summarising the performance of each cathodic protection system in the period and shall submit these reports to the Director. The Operating Company shall administer the suppliers' warranties and raise the matter of continuation of warranties with the Director in writing no later than 90 days before the expiry of each.

3. M90 0-1 68 Queensferry Crossing

3.1.1 The Queensferry Crossing is shown in Figures 3.1.1.A and 3.1.1.B and the location is denoted within Figure 3.1.1.C. The completion and handover date is scheduled for 2016. The Queensferry Crossing has an overall length of 2638m metres including the approach viaducts and carry four lanes and two running hard shoulders of the M90 over the Firth of Forth. Traffic is sheltered from high winds by the windshields present on each edge of the crossing.

Refer to Figure 3.1.1.B; the cable-stayed bridge comprises two main central spans of 650m each between the three towers. The single boxes of the sidespans have lengths of 366m (S) and 354.4m (N), each with an additional pier tying down the span at approximately its one-third point. The southern approach viaduct comprises seven spans. The northern approach viaduct comprises a single span.

The bridge deck on the cable supported spans comprises a trapezoidal steel box girder with a composite reinforced concrete slab which is post-tensioned transversely. The southern approach viaduct consists of twin continuous steel box girders with composite reinforced concrete slab and with bearing supports on the piers.

In the zone between the southern approach viaduct and the cable-stayed bridge a transition section is employed such that the twin steel box girders of the approach spans are merged into the single steel box girder.

The mono-towers each comprise a reinforced concrete box. Each tower incorporates steel cable anchorages cast into the upper sections. The twin planes of cables emanating from each tower are anchored along the central corridor of the bridge deck between the two carriageways.

The viaducts are supported on a family of V-shaped piers. Each pier leg consists of a hollow rectangular concrete section.

Each of the towers is supported on a reinforced concrete foundation with each foundation either bearing directly on rock or mass concrete upfill bearing on rock.

The central tower foundation is buried underneath a covering of re-constituted material. All other foundations within the tidal zone are submerged.

The deck will be continuous from abutment to abutment with no intermediate movement joints. A movement joint will be provided at each abutment and the only point of longitudinal fixity of the deck is at the central tower.

Figure 3.1.1.A – Queensferry Crossing – Architectural Impression

Figure 3.1.1.B – Queensferry Crossing Elevation

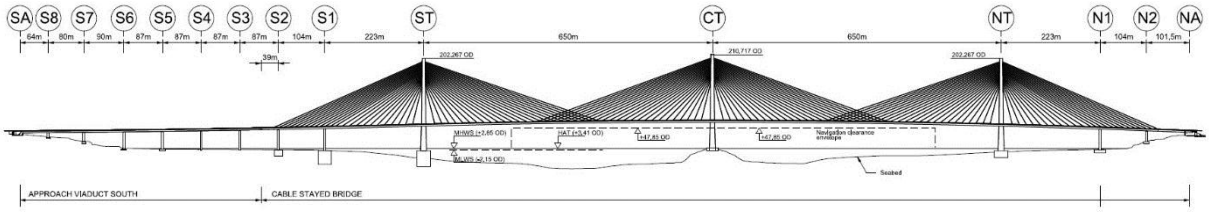


Figure 3.1.1.C – Queensferry Crossing Location

signed for and on behalf of The Scottish Ministers

……
Authorised Signatory

by ……Roy Brannen……

on ……. December 2014……

at ……Glasgow……

signed for and on behalf of AMEY LG Limited

……
Director/Company Secretary/
Authorised Signatory*

by
……

on ……. December 2014……

at ……Glasgow……

3.2 Particular Requirements for M90 0-1 68 Queensferry Crossing

3.2.1 The Queensferry Crossing Inspection and Maintenance Manual

The *Queensferry Crossing Inspection and Maintenance Manual* contains the requirements for inspection, operation and maintenance of the Queensferry Crossing; it has been written as a standalone document; any directions within it that appear to conflict with the requirements of this Contract, shall be raised with the Director in writing for determination within two weeks of discovery.

3.2.2 Maintenance Procedures

During Mobilisation Period 2, the Operating Company shall develop procedures in the Management System for the inspection, operation and maintenance of the Queensferry Crossing and shall submit these to the Director for his written consent a minimum of 30 Days prior to Commencement of Service Date 2. The Operating Company shall undertake the inspection, operation and maintenance of the Queensferry Crossing in accordance with the procedures consented to by the Director.

The *Queensferry Crossing Inspection & Maintenance Manua*l also includes operational and health and safety statements, sometimes expressed as requirements; when developing its own procedures, the Operating Company shall assess the suitability of each statement in light of its own responsibilities under health and safety Legislation. The manual shall be reviewed and updated by the Operating Company as described in Schedule 7 Part 6.

3.2.3 Structural Elements

In addition to the requirements of Schedule 7 Part 6, The Operating Company shall undertake the inspection, survey and maintenance of all structural elements of the Queensferry Crossing from Commencement of Service Date 2 until the Service End Date including as a minimum:

(i) Towers,

(ii) Decks,

(iii) Abutments,

(iv) Substations,

(v) Piers and associated pad foundations, cofferdams and caissons,

(vi) Stay Cables, tie-downs and assemblies,

(vii) Deck stay anchorages,

(viii) Tower stay anchorages,

(ix) Tower lateral bearings,

(x) Abutment movement joints,

(xi) Viaduct and abutment bearings,

(xii) Sign gantries,

(xiii) Parapets/ barriers,

(xiv) Wind shields, and

(xv) Noise barriers.

3.2.4 **Non-Structural Elements**

The Operating Company shall be responsible for the inspection, operation and maintenance of all non-structural elements from Commencement of Service Date 2 until the Service End Date including as a minimum:

(i) Deck drainage system,

(ii) Steel balustrades and fences,

(iii) Scour protection,

(iv) De-humidification system inside the deck boxes and towers,

(v) Supervisory control and data acquisition system,

(vi) Structural health monitoring system,

(vii) CCTV cameras,

(viii) Aviation and navigation warning lights,

(ix) Architectural lighting,

(x) Other mechanical and electrical equipment,

(xi) Fixtures and fittings within the abutment and substations.

3.2.5 **Not used**

3.2.6 **Inspection Frequencies**

The Operating Company shall note that a detailed inspection regime as outlined within the *Queensferry Crossing Inspection and Maintenance Manual* for the Queensferry Crossing shall require General Inspections of specific elements to be undertaken at different frequencies from the maximum two yearly interval stated in paragraph 3.3.1 of Schedule 7 Part 6. Where described in the manual, the frequency of inspection shall be determined using a criticality and vulnerability assessment in accordance with the *Queensferry Crossing Inspection and Maintenance Manual* and paragraph 3.2.8 of this Part. The Operating Company shall continuously review these assessments as a part of its inspection planning activity and any changes to the planned inspection programmes and frequencies shall be submitted to the Director for his written consent as a part of the annual inspection reporting process.

3.2.7 Elements not covered by the Queensferry Crossing Inspection and Maintenance Manual or criticality and vulnerability assessment shall be subject to inspections in accordance with the requirements of *Transport Scotland Interim Amendment No 33*, *BD63* and the *Transport Scotland Inspection Manual – Principal Inspection of Trunk Road Structures and Location System*.

3.2.8 **Inspections on Queensferry Crossing**

(i) The intervals for element General Inspections are determined by a criticality and vulnerability ratings procedure using the method described in the *Queensferry Crossing Inspection and Maintenance Manual,*

(ii) At least one full Principal Inspection of the Queensferry Crossing shall be completed 90 days prior to the expiry of the Queensferry Crossing defects

notification period or 90 days prior to the Initial Service End Date, whichever occurs first. Where the Commencement of Service Date 2 to Service End Date duration extends beyond six years, the subsequent Principal Inspections shall be undertaken in accordance with the inspection programme as defined in Schedule 7 Part 6 and within the maximum time periods between scheduled inspections. The schedule of Principal Inspections shall be subject to the written consent of the Director,

(iii) Subject to an Order, the Operating Company shall undertake an inspection of the Queensferry Crossing following Commencement of Service Date 2. The inspection shall take the form of a General Inspection and shall include but not be limited to structural elements, carriageway, drainage, movement joints, mechanical, electrical, hydraulic and plumbing systems and all access equipment and facilities. The inspection Records shall be uploaded to the inspection, Defects and repair management database for the Queensferry Crossing and the structures management function of the Integrated Roads Information System in accordance with the requirements of this Part and Schedule 7: Part 6, and

(iv) For the Queensferry Crossing, Principal and General Inspection reports shall be submitted in each Annual Period a minimum of 30 days prior to the review of the structures maintenance schedule as defined in Schedule 7 Part 6 for the sets of structural parts inspected in the preceding period. The first such submission shall take place no earlier than five months after and no later than 11 months after the Commencement of Service Date 2.

3.2.9 **Positional Surveys**

The Operating Company shall produce a Principal Inspection survey procedure for the Queensferry Crossing and submit it to the Director for written consent no later than Commencement of Service Date 2. Surveys shall be scheduled with Principal Inspections using conventional optical survey methods. These may be combined with relevant, verified and datum-referenced information from the Structural Health Monitoring System and the Queensferry Crossing construction records provided that checks are undertaken by the Operating Company, the surveys shall measure and record:

(i) Horizontal alignment and levels of the bridge and viaduct spans at pier and midspan locations,

(ii) Pier and tower foundation and abutment levels and transverse tilts,

(iii) Navigational clearances at the bridge midspans and corners of the navigational envelopes,

(iv) Longitudinal and transverse verticality of the towers,

(v) Longitudinal verticality of the piers,

(vi) Gaps at the abutment expansion joints, and

(vii) Mean effective temperatures of the deck box throughout the survey period.

(viii) Verticality values shall be absolute and gravity-referenced.

The Operating Company shall ensure that all structural baseline measurements and positions are established for long-term monitoring and be repeatably referable to permanent datum benchmarks for horizontal position and level by taking at least two independent sets of measurements to an accuracy of 2mm.

The first positional survey shall be completed to establish the reference data set no later than 12 months after Commencement of Service Date 2 and repeated thereafter to coincide with the completion of each Principal Inspection cycle.

3.2.10 **Mechanical & Electrical and Plumbing Installations (Queensferry Crossing)**

The Operating Company shall be responsible for the inspection, operation, maintenance and certification of all mechanical, electrical and plumbing installations in accordance with the requirements of the *Queensferry Crossing Inspection and Maintenance Manual* from Commencement of Service Date 2 until the Service End Date. If inspection and maintenance requirements are not adequately covered in the *Queensferry Crossing Inspection and Maintenance Manual,* manufacturer's recommendations and Legislation shall be adhered to.

The sub-systems forming part of the mechanical, electrical and plumbing systems include those listed in Table 3.2.1 and shall include as a minimum:

(i) Power systems generally including substations, standby generators and backup supplies (uninterruptable and essential power) at each abutment,

(ii) Electrical installations include marine navigation, aircraft obstruction and architectural display lights and internal lighting to the entire crossing,

(iii) Security systems, CCTV cameras, communications and the fire protection system,

(iv) Dehumidification systems for the deck boxes, and tower voids,

(v) Weigh in Motion (WIM) system – including calibration,

(vi) Structural Health Monitoring System,

(vii) SCADA System and associated subsystems, and

(viii) Intelligent transport system gantries, which are a part of the Traffic Scotland Equipment.

Having reviewed the *Queensferry Crossing Inspection and Maintenance Manual*, the Operating Company shall develop procedures and schedules for the maintenance, inspection, operation and monitoring of all mechanical, electrical and plumbing equipment all pursuant to manufacturers' recommendations and submit them to the Director for written consent not later than 60 days prior to Commencement of Service Date 2.

The Operating Company shall send representatives to attend the testing and the commissioning of the mechanical, electrical and plumbing, and control systems both on and off site sufficient to enable staff to operate and maintain the systems safely and effectively.

3.2.11 **Access Systems (Queensferry Crossing)**

The Operating Company shall be responsible for the inspection, operation, maintenance, storage and servicing (including mechanical and electrical installations)

of all Access Systems on the Queensferry Crossing from Commencement of Service Date 2 until Service End Date and shall ensure that all Access Systems including any Access System held in storage shall remain certified for use at all times. During Mobilisation Period 2, the Operating Company shall develop procedures for the inspection, operation and maintenance of the Access Systems and shall submit these to the Director for his written consent a minimum of 30 days prior to Commencement of Service Date 2. Inspection and maintenance requirements shall comply with the recommendations set out in the manuals for each system called up in the *Queensferry Crossing Inspection and Maintenance Manual.*

The following types of Access Systems shall be maintained and kept in certification at all times:

(i) Underdeck access gantries,

There are two pairs of underdeck gantries serving the main bridge suspended Structure and a total of two gantries capable of serving the north and south approach spans.

(ii) Tower cradles,

There are four tower cradles, two to access the tower corners and two to access the arc-faces.

(iii) Stay Cable Gantries,

There are two stay cable access gantries.

(iv) Deck Shuttles,

There are two deck shuttles running on overhead rails that run inside the deck boxes for the full length of the Crossing. One is housed next to each abutment.

(v) Tower Lifts,

There are a total of three internal tower lifts, one operating in each tower. Type: rack and pinion.

(vi) Piers,

All rope access anchor points.

All Access Systems shall be maintained by the Operating Company in accordance with the inspection and maintenance manuals relevant to each Access System such that access and full functionality for their intended use shall be retained at all times.

The Operating Company shall provide secure, sheltered and enclosed storage facilities for all Access Systems not in use on the Queensferry Crossing.

The Operating Company shall send representatives to witness the testing and the commissioning of the Access Systems both on and off site sufficient to enable staff to operate and maintain the systems safely and effectively.

3.2.12 **Access Walkways, Ladders, Stairs and Platforms**

All access walkways, ladders, stairs and platforms shall be inspected, maintained and kept safe and continuously operable by the Operating Company from Commencement of Service Date 2 until the Service End Date in accordance with the *Queensferry Crossing Inspection and Maintenance Manual* and Legislation.

3.2.13 **Spare Parts Inventory**

A required spare parts inventory is referred to in the *Queensferry Crossing Inspection and Maintenance Manual*. These required spare parts shall be separately identified within the list of equipment, materials, plant and spares made available for use under this Contract which is required by Part 7 of Schedule 5 to be provided to the Director no later than 30 days after Commencement of Service Date 2. The Operating Company shall continuously store all the spare parts and shall maintain and update the spare parts inventory for the Queensferry Crossing in accordance with the requirements of Schedule 5 Part 7.

3.2.14 **Detailed Inspection Records and the Defects and Repair Management Database**

During Mobilisation Period 2, the Operating Company shall develop an electronic Structured Query Language (SQL) inspection, Defects and repair management database for the management of all inspection and Defect management information for the Queensferry Crossing. The Operating Company shall submit a proposed design for the database to the Director for his written consent no later than 60 days after Operations Commencement Date 1. The Operating Company shall complete the commissioning of the database no later than 30 days prior to Commencement of Service Date 2. The database shall be used by the Operating Company for the issue and management of work packages for repair actions and monitoring until the Service End Date. The system shall be accessible to the Director, the Performance Audit Group and any other parties appointed by the Director and the Operating Company shall grant a licence on an irrevocable and unconditional basis to the Scottish Ministers for use of the database and software from Commencement of Service Date 2. At Service End Date, the database including all software and all rights therein shall be assigned by the Operating Company unconditionally to the Director and the software shall be provided with a perpetual licence. The database shall be retained by the Director for use by successor operating companies.

The database server application and any necessary client applications shall be supplied by the Operating Company along with hardware as necessary and shall be based on the same Structured Query Language SQL server database application used for the Queensferry Crossing Structural Health Monitoring System. Thereafter, Principal Inspection, General Inspection and Special Inspections data, Defect monitoring and repair activity for the Queensferry Crossing shall be logged in the system. The system shall also be configured to serve a processed set of queries required to generate data reports for the structures management function of the Integrated Roads Information System. As a minimum, the system shall have equivalent functionality to the historical Forth Road Bridge Defect and Repair Management Database and shall include the storage of photographs.

It shall include as a minimum the following features:

(i) Integration with the Queensferry Crossing as-built drawing database and the project archive referencing system,

(ii) Compatibility with the component referencing system, inspection rating system and defect classification and rating system and bridge referencing system (as defined in the *Queensferry Crossing Inspection and Maintenance Manual*),

(iii) Structural element level data retrieval,

(iv) Search by location code, and

(v) Defect and repair tracking with linking to repair Records and safe working procedures, method statements and weld procedures and preparation of Operations.

Typical element resolution will be to the level of individual bracings or stiffeners but not welds or bolts unless particularly substantial. Fabrications or composite entities shall be subdivided to pre-assembly elements or facets according to how they may be adequately represented on inspection pro formas.

The Operating Company shall continually use, update and licence the database and other associated software until the Service End Date.

3.2.15 **Structural Condition Indices**

A scoring system shall be developed by the Operating Company to produce composite monitoring indicators for tracking the long-term condition of structural elements on the Queensferry Crossing. The scoring system shall be submitted to the Director for his written consent no later than six months after Commencement of Service Date 2. The Operating Company shall update all composite indicators in the scoring system consented to by the Director at the end of the first Annual Period following Commencement of Service Date 2 and thereafter in each Annual Period. In each Annual Period the Operating Company shall submit a report to the Director. The report shall as a minimum provide a summary of the results, changes in the composite indicators over the Period, the reasons for these changes and recommendations for addressing any deterioration in condition.

3.2.16 **Operation of the Queensferry Crossing Structural Health Monitoring System**

The Operating Company shall be responsible for the monitoring, inspection, operation and maintenance of the Structural Health Monitoring System in accordance with the details of the *Employer's Delivery Team Memorandum - Operation and Maintenance of the Queensferry Crossing Structural Health Monitoring System* and the Operation and Maintenance Manual for the Structural Health Monitoring System. The Operating Company shall develop procedures for the monitoring, inspection, operation and maintenance of the structural health monitoring system and shall submit these to the Director for his written consent 30 Days prior to Commencement of Service Date 2. The procedures shall be developed with the objective of ensuring that the system has the capability to capture critical or rare events at all times. The Operating Company shall record the occurrence of faults and problems with the Structural Health Monitoring System during the Queensferry Crossing defects notification period.

3.2.17 **Structural Health Monitoring System Routine Tasks**

The Structural Health Monitoring System routine tasks shall include as a minimum development of procedures for and execution of the following:

(i) Structural Health Monitoring System inspection and maintenance,

(ii) Operational monitoring,

(iii) Logging and keeping records of Structural Health Monitoring System maintenance,

(iv) Assessment of system performance,

(v) Data management – archiving and warehousing,

(vi) Annual checks on data retrieval of randomly selected warehoused data,

(vii) Trigger level refinement and acquisition adjustment, and

(viii) Optimising stored data volumes.

3.2.18 **Operational Monitoring**

The Operating Company shall use the Structural Health Monitoring System for certain operational aspects. These shall include as a minimum:

(i) Windspeed monitoring,

(ii) Overweight vehicle detection and assessment,

(iii) Navigational clearance monitoring,

(iv) Winter Service and extreme weather monitoring, and

(v) Meteorological monitoring.

3.2.19 **Refinement of Structural Health Monitoring System Configuration**

Following the first Winter Service Period after Commencement of Service Date 2, the Operating Company shall review the triggering criteria for the Structural Health Monitoring System. The Operating Company shall submit a report detailing the findings of this review to the Director no more than 30 days after the first Winter Service Period following Commencement of Service Date 2. This report may include proposals for the development and refinement of the triggering criteria.

Subject to an Order, the Operating Company shall modify the triggering criteria for the Structural Health Monitoring System.

3.2.20 **Alert Procedures**

During Mobilisation Period 2, the Operating Company shall develop procedures for reacting to all structural alerts generated by the Structural Health Monitoring System and for providing reports on structural status and shall submit these procedures to the Director for his written consent no later than 60 Days after Commencement of Service Date 2. These procedures shall cover aspects including as a minimum change in geometry combined with the results of close visual inspections of parts identified for inspection in advance with relevance to the type and location of the source of the alert.

These procedures shall cover the method and scope of physical inspection required in response to an alert, the required response times and the reporting requirements and report distribution for each event type.

3.2.21 **Field Measurements Associated with Principal Inspection**

Equipment for field measurement of response will be supplied by the Director as a part of the Structural Health Monitoring System following system commissioning

The Operating Company shall be responsible for undertaking field measurements as a part of every Principal Inspection of the Queensferry Crossing in accordance with the *Employer's Delivery Team Memorandum Operation and Maintenance of the Queensferry Crossing Structural Health Monitoring System Operation* and the Operation and Maintenance Manual for the Structural Health Monitoring System. The

field measurements shall record and their associated reports shall present analyses of:

(i) Changes to substructure and stay natural frequencies,

(ii) Changes to static and quasi-static geometry measured through the permanent system and conventional survey methods, and

(iii) The possible or established causes of each of the above.

The field measurement reports shall be included in the Principal Inspection submission at the completion of the full Principal Inspection cycle.

3.2.22 **Structural Health Monitoring System Reporting Requirements**

The system will produce report sets at different intervals designed to meet different aims. The format, number and distribution list for these reports shall be agreed with the Director at least 30 days prior to Commencement of Service Date 2. The Operating Company shall distribute this information to the lists of recipients as consented to by the Director in writing. These reports comprise:

(i) Annual Interpretative Reports,

The Operating Company shall produce annual interpretative reports and submit these to the Director no later than 60 days after the end of each Annual Period.

The interpretive reports shall summarise the data gathered for each sensor type over the period, the interpretation of the data including any trends or results which are not as expected together with any recommendations for extended data analysis required to support any maintenance recommendations along with recommendations for monitoring in the forthcoming year.

(ii) Routine Structural Health Monitoring System Reports,

The Operating Company shall produce routine quarterly reports of system data that summarise the main processed data sets and any monitoring issues identified on subjects for monitoring. These reports shall be submitted to the Director for his review a maximum of 30 days after the end of each quarter in the Annual Period.

These quarterly reports shall include results in standardised forms reporting on:

(a) Statistical data of all channels (such as means and standard deviations),

(b) Resampled low resolution time histories,

(c) Structure geometrical and positional information,

(d) Natural Frequencies of identified components,

(e) Event summaries and timelines,

(f) System status reports, including storage status, and

(g) Activity summary (such as which inspections or measurement campaigns have been carried out in the reporting period).

These reports shall also contain information on data availability in accordance with the Structural Health Monitoring System Performance Indicators and system repair response times.

(iii) Special Reports,

The Operating Company shall produce a report on each extreme event including weather and loading events, where trigger levels are exceeded or other incidents that arise from Structural Health Monitoring System monitoring. These reports shall include a description of the event, a summary of the results from the Structural Health Monitoring System, any Special Inspections or structural checks undertaken and the conclusions from the findings of the investigation and review. The Operating Company shall submit the report to the Director for his review within 10 days of each event occurring.

(iv) Sensor Classification for Performance Measurement,

Class A components shall include the main acquisition backbone and primary acquisition storage; the live and backed up data sets; response and tilt measurement subsystem; primary wind and selected strain measurement subsystems; embedded strain sensor cabling and signal conditioning system: live traffic measurement systems and data set and any system part that affects data captured of rare events.

Class B: are those subsystems not in Class A.

A channel classification schedule shall be submitted to the Director for consent no later than 30 days prior to Commencement of Service Date 2.

The Operating Company shall report the failure of an embedded or unreachable component to the Director. Subject to an Order, the Operating Company shall replace any embedded component.

(v) Structural Health Monitoring System Faults and Faulty Component Replacement,

The Operating Company shall monitor and report on any faults to any sensor, associated cabling or signalling system to the Director within 3 days of their detection. Subject to an Order, the Operating Company shall repair faults or replace components within the time periods stated in the Order.

(vi) Spares for the Structural Health Monitoring System,

During Mobilisation Period 2, the Operating Company shall compile an inventory of spare parts that have been supplied as part of the Structural Health Monitoring System and not more than 30 Days following Commencement of Service Date 2 the Operating Company shall submit this inventory to the Director. The Operating Company shall be responsible for cataloguing, maintaining and updating the spares listed in the Structural Health Monitoring System Operations and Maintenance Manual from Commencement of Service Date 2 until the Service End Date. The Operating Company shall only use spare parts from the inventory in the operation and maintenance of the Queensferry Crossing Structural Health Monitoring System. A full complement of spare parts as listed in the inventory shall be handed over to the incoming operating company at the Service End Date.

(vii) Witnessing of Load Tests,

The Operating Company shall witness the load testing carried out on the Queensferry Crossing during commissioning of the bridge and witness the associated Structural Health Monitoring System report production.

and,

(viii) As-Built Geometry of the Queensferry Crossing,

Within 30 days of its receipt from the Director, the Operating Company shall review the as-built geometrical information produced from the construction of the Queensferry Crossing in order to be familiar with the information and how it relates to the baseline values in the Structural Health Monitoring System database for ongoing monitoring and the production of quarterly and annual reports to the Director. This includes the navigational clearance and data on stay relaxation.

3.2.23 **Operation of the Queensferry Crossing Supervisory Control and Data Acquisition Systems**

The Supervisory Control and Data Acquisition system monitors and controls mechanical, electrical and plumbing systems on the Queensferry Crossing. The Operating Company shall monitor, operate and maintain the Supervisory Control and Data Acquisition system in accordance with the requirements of the Operation and Maintenance Manuals for the Supervisory Control and Data Acquisition System from Commencement of Service Date 2 until the Service End Date.

The Operating Company shall develop procedures for the monitoring, operation and maintenance of the Supervisory Control and Data Acquisition system and shall submit these to the Director for his written consent 30 Days prior to Commencement of Service Date 2. These procedures shall be developed with the objective of ensuring that the system is operational and effective at all times and shall include proposals for monitoring the system 24 hours per day, seven days per week during the Annual Period and the maximum time periods for reacting to warnings, alarms or alerts identified by the system and the identification and replacement of faulty parts.

Table 3.2.1 – Mechanical, Electrical and Plumbing Systems Summary

MEP SCADA Subsystems
Dehumidification systems
Water cleansing system
Security systems (CCTV/Access/Intrusion)
All lighting systems
Fire detection system
Lifts, including Tower Lifts
ITS Power Monitoring
Structural Health Monitoring System
Power Supply systems
Electrical Distribution System
Electrical Distribution System (LV)
UPS and EPS Distribution Systems
Building Management System
CCTV Systems
Server rack

3.2.24 **Supervisory Control and Data Acquisition System Routine Tasks**

The procedures for the monitoring, operation and maintenance of the Supervisory Control and Data Acquisition system shall include the following as a minimum:

(i) Supervisory Control and Data Acquisition system,

(ii) Inspection and maintenance,

(iii) Inspection and maintenance of mechanical, electrical and plumbing systems whether associated with the Supervisory Control And Data Acquisition system or not,

(iv) Continuous operational monitoring,

(v) Responding to warnings and indicators including response time for responding to and dealing with faults,

(vi) Logging and keeping records of Supervisory Control and Data Acquisition system maintenance,

(vii) Assessment of Supervisory Control and Data Acquisition system performance,

(viii) Data management – archiving and warehousing, and

(ix) Maintenance and cataloguing of spares listed in the Supervisory Control and Data Acquisition System Operations and Maintenance Manual throughout the Contract Period.

3.2.25 **Fixing of Supervisory Control And Data Acquisition Faults and Faulty Component Replacement**

The Operating Company shall monitor and report on any faults to any part of the Supervisory Control and Data Acquisition system to the Director within three days of their detection. Subject to an Order, the Operating Company shall repair faults or replace components within the time periods stated in the Order save where such need for repair arises from the Operating Company not complying with its obligations in this Part in which case the cost of such repair and or replacement shall be borne by the Operating Company.

3.2.26 **Structural Health Monitoring System and Supervisory Control and Data Acquisition Training**

During Mobilisation Period 2 and in the period following Commencement of Service Date 2 the Operating Company shall ensure that all the required suitably qualified staff attend the training provided by the Director in connection with the Structural Health Monitoring system and Supervisory Control and Data Acquisition system.

3.2.27 **Software for Structural Analysis Models**

Prior to the end of mobilisation Period 2, the Operating Company shall procure the software required to create structural analysis models of the Queensferry Crossing and undertake any analysis required. Subject to an Order, the Operating Company shall produce structural analysis models of the Queensferry Crossing and carry out structural analysis of the bridge. The Operating Company shall, subject to an Order, update the models to reflect any changes to the structure. The Operating Company shall maintain the software licences from Commencement of Service Date 2 until Contract End Date and the Operating Company shall grant a licence on an irrevocable and unconditional basis to the Scottish Ministers for use of the analysis models from Commencement of Service Date 2. At Service End Date, the analysis models and all rights therein shall be assigned by the Operating Company unconditionally to the Director.

3.2.28 **Queensferry Crossing Security**

The Operating Company shall be responsible for ensuring the security of the Queensferry Crossing from Commencement of Service Date 2 to the Service End Date.

During Mobilisation period 2 the Operating Company shall update the Security Patrol Plan to take account of Network 2 and shall submit the Security Patrol Plan to the Director for his written consent a minimum of 30 days prior to Commencement of Service Date 2. The updated Security Patrol Plan shall, as a minimum, include procedures with respect To Network 2 for:

(i) Continuously monitoring all closed circuit television cameras,

(ii) Monitoring all alarms and intruder detection systems,

(iii) Undertaking security patrols including routine patrols and patrols in response to an incident, and

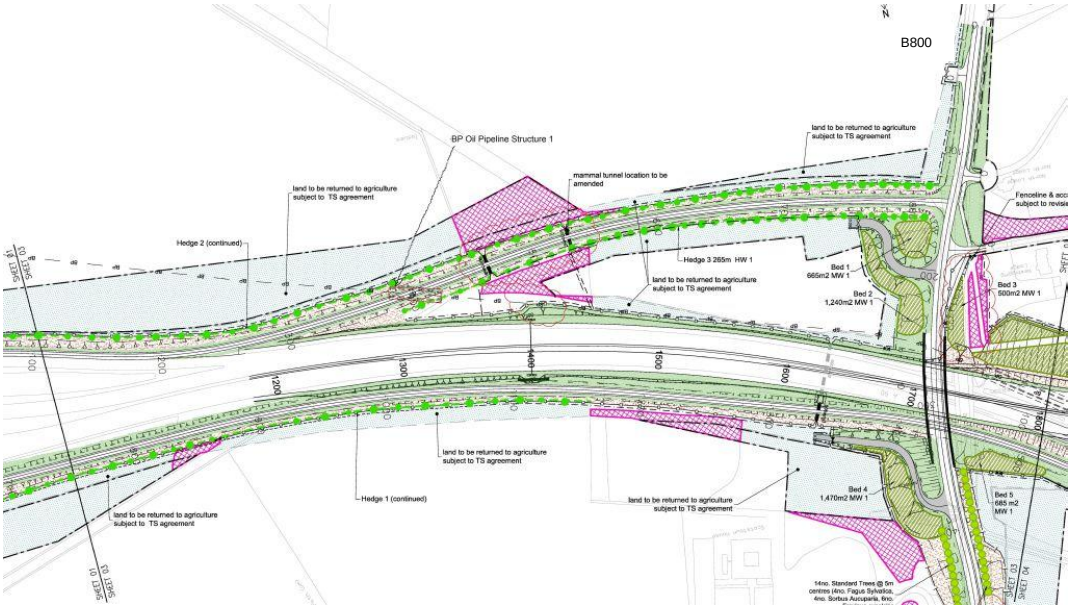
(iv) Operating a permit system for the control of access to all non public areas of the bridge including the internal areas of the towers and deck boxes.

The Operating Companies responsibilities shall, as a minimum, include guarding against acts of terrorism, malicious damage and structural damage and preventing unauthorised access to the Queensferry Crossing at all times.

The Operating Company shall undertake all monitoring and security patrols on a continuous basis 24 hours per day, seven days per week during the Annual Period.

4. BP Oil Pipeline Protection Structures

Figure 4.1.1.A – Location of the M90 0-1 33 BP Oil Pipeline Protection Structure (ESQ06)



signed for and on behalf of The Scottish Ministers

by ……...Roy Brannen…….

on …..…… December 2014……

at ……Glasgow……...……

……
Authorised Signatory

signed for and on behalf of AMEY LG Limited

by ……..……

on ……..… December 2014……

at ……Glasgow……..…

……..…
Director/Company Secretary/
Authorised Signatory*

Figure 4.1.2.A – Location of the M90 0-1 37 BP Oil Pipeline Protection Structure (ESQ07)

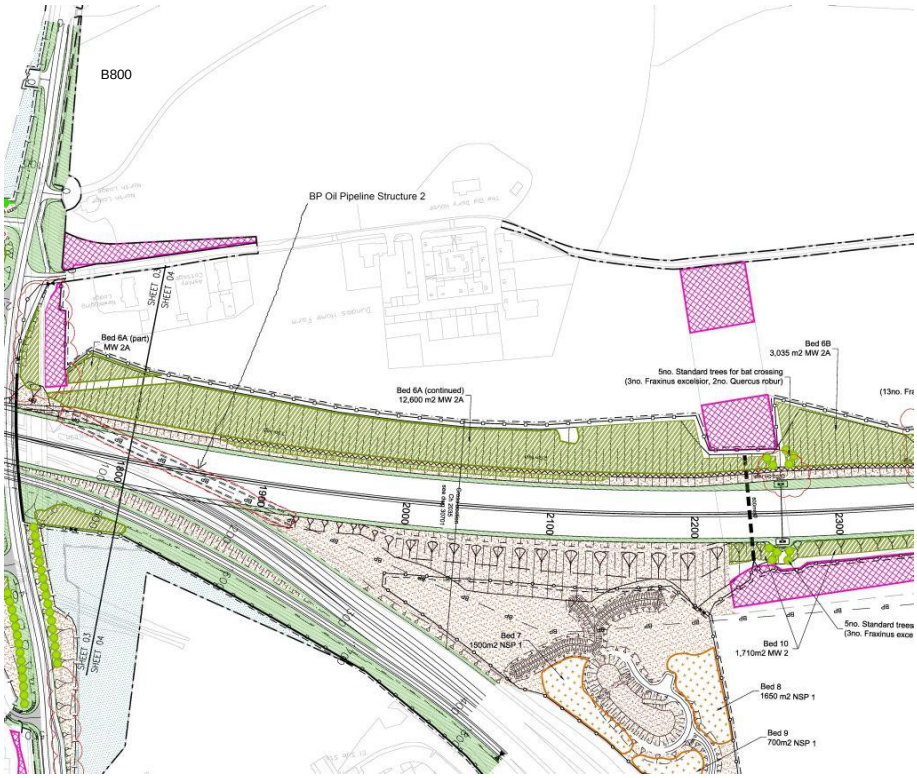
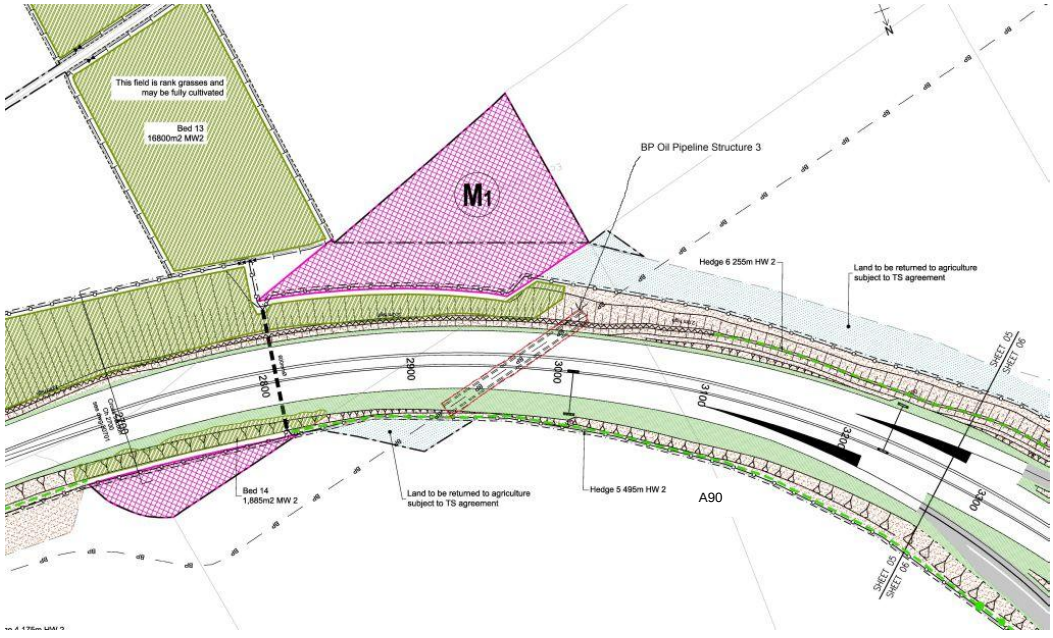


Figure 4.1.3.A – Location of the M90 0-1 46 BP Oil Pipeline Protection Structure (ESQ05)



signed for and on behalf of The Scottish Ministers

by .....Roy Brannen.....

on ..... December 2014

at .....Glasgow.....

.....
Authorised Signatory

signed for and on behalf of AMEY LG Limited

by .....

on ..... December 2014

at .....Glasgow.....

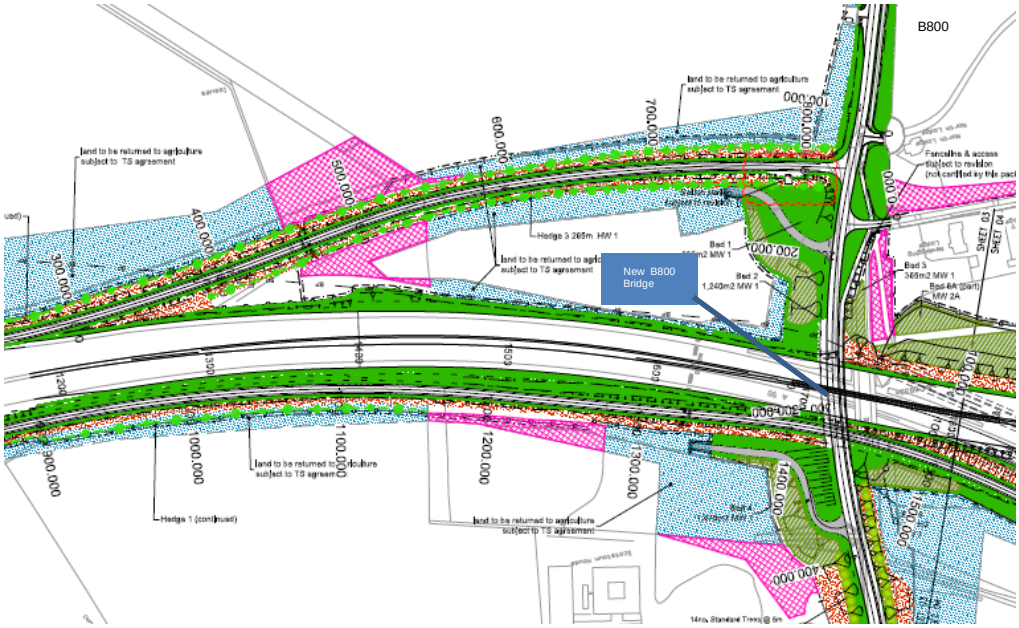
.....
Director/Company Secretary/
Authorised Signatory*

4.1 Particular Requirements for the BP Oil Pipeline Protection Structures

The Operating Company shall, as a minimum, undertake annual checks for stray currents in each structure arising from the cathodic protection system installed on the BP oil pipeline. The results shall be submitted to the Director a minimum of 30 days prior to the end of each Annual Period.

5. New B800 Bridge (ESQ04)

Figure 5.1.1.A – Location of the M90 0-1 35 New B800 Bridge (ESQ04)



5.1 Particular Requirements for the New B800 Bridge

The Operating Company shall, as a minimum, undertake annual checks for stray currents in the New B800 Bridge arising from the cathodic protection system installed on the BP oil pipeline. The results shall be submitted to the Director a minimum of 30 days prior to the end of each Annual Period.

signed for and on behalf of The Scottish Ministers

by .....Roy Brannen.....

on ..... December 2014

at .....Glasgow.....

.....
Authorised Signatory

signed for and on behalf of AMEY LG Limited

by .....

on ..... December 2014

at .....Glasgow.....

.....
Director/Company Secretary/
Authorised Signatory*

This is Annex 7.7/B to Schedule 7 Part 7 referred to in the foregoing Agreement between Scottish Ministers and Amey LG Limited.

SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

ANNEX 7.7/B – Documents for Structures with Particular Requirements

SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

ANNEX 7.7/B – Documents for Structures with Particular Requirements

These documents are reference documents.

Forth Road Bridge
Forth Road Bridge Engineering Manual
FETA historical Forth Road Bridge inspection schedules and maintenance routines.
• General Operatives Work Detail
• Electrical 10 Year Plan
• Maintenance Plan
• Electrical Integrated Plan
• Schedule of Routines
• Electrical Maintenance Schedule
• Engineering Maintenance Schedule
• Schedule of Inspections
• Joiners Maintenance Schedule
• Grade IV Maintenance Schedule
• Mechanic Maintenance Schedule
• Painters Maintenance Schedule
• Riggers Maintenance Schedule
• Appendix 1 – Vulnerability and Criticality Assessment
• Criticality Vulnerability Inspection Programme
Register of Programmed Special Inspections for the Forth Road Bridge
Queensferry Crossing
Queensferry Crossing Inspection and Maintenance Manual.

This is Annex 7.7/C to Schedule 7 Part 7 referred to in the foregoing Agreement between Scottish Ministers and Amey LG Limited.

SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

ANNEX 7.7/C – Forth Road Bridge– List of Access Systems Exempt from Full-Time Certification.

SCOTTISH MINISTERS' REQUIREMENTS

SCHEDULE 7 PART 7

STRUCTURES WITH PARTICULAR REQUIREMENTS

ANNEX 7.7/C – Forth Road Bridge– List of Access Systems Exempt from Full-Time Certification

Forth Road Bridge
"Beeche" Tower Painting Cradle System
Hanger Replacement Gantry from 1990 Strengthening Works
Main Cable Inspection Gantries