
The Forth Bridge (United Kingdom) No 1485

Official name as proposed by the State Party

The Forth Bridge

Location

Estuary of the River Forth
Fife (north end) and Edinburgh City (south end)
Scotland

Brief description

The railway bridge over the River Forth estuary in Scotland is the world's longest multi-span cantilever bridge. It opened in 1890 and still operates today as an important passenger and freight rail bridge. More than 2.5 km long, this large-scale structure was designed and built using advanced civil engineering design principles and construction methods. Its distinctive industrial aesthetic is the result of a forthright, unadorned display of its structural elements. Innovative in its concept, design, materials, and scale, the Forth Bridge represents a milestone in the history of bridge construction.

Category of property

In terms of categories of cultural property set out in Article I of the 1972 World Heritage Convention, this is a *monument*.

1 Basic data

Included in the Tentative List

27 January 2012

International Assistance from the World Heritage Fund for preparing the Nomination

None

Date received by the World Heritage Centre

29 January 2014

Background

This is a new nomination.

Consultations

ICOMOS consulted several independent experts and the International Committee for the Conservation of the Industrial Heritage (TICCIH).

Technical Evaluation Mission

An ICOMOS technical evaluation mission visited the property from 1 to 3 October 2014.

Additional information requested and received from the State Party

A letter was sent by ICOMOS to the State Party on 17 September 2014 to request further information about the relationship of the setting to the nominated property, and the delineation of that setting; the decision not to create a buffer zone specifically for the nominated property; the nature of the Forth Bridge's new technologies, design principles and construction, its innovations in design and concept, and its influence on practice and construction; the changes to the bridge made over time; the interrelationships between the Forth Bridges Forum, Forth Bridge World Heritage Nomination Steering Group, and Forth Bridge Partnership Management Agreement Group; the nominated property's owner, Network Rail; and the current status of the draft Property Management Plan for the nominated property.

The State Party replied on 24 October 2014, sending additional documentation, and supplementary information was provided to the technical evaluation mission on 4 October 2014, all of which has been taken into account in this evaluation.

A second letter was sent to the State Party on 17 December 2014, requesting further information on the proposed *de facto* buffer zone; key viewsheds and views of the bridge; the composition and roles of the bodies managing and monitoring the property; the presumption against construction of wind turbines; and an interpretation and tourism plan. The State Party replied on 26 February 2015, sending additional documentation that has been taken into account in this evaluation.

Date of ICOMOS approval of this report

12 March 2015

2 The property

Description

The nominated property, which covers 7.5 ha, is a cantilever trussed bridge that spans the estuary (Firth) of the River Forth in eastern Scotland, linking Fife to Edinburgh by railway. The structure of the bridge, which is 2,529 m long from escarpment to escarpment, takes the form of three double-cantilever towers, with cantilever arms to each side. The towers rise 110 m above their granite pier foundations, and the cantilever arms each project 207 m from the towers, linked together by two suspended spans, each 107 m long. The two spans formed by the three towers are therefore each 521 m wide (for 28 years the greatest span in the world). The central cantilevered sections of the bridge are continued at each end by steel approach viaducts sitting on tall granite piers. The superstructure is distributed both above and below the deck, thereby reducing the steelwork's apparent bulk.

This large-scale engineering work is comprised of about 54,000 tons of mild steel used as main compression struts of rolled steel plate riveted into 4-m diameter tubes, and lighter spans used in tension. Mild steel was a relatively

new material in the 1880s. Its use on such a large-scale project was innovative, and helped to bolster mild steel's reputation. Because of its propensity to rust, the exposed steel is protected by paint (a distinctive red colour for the Forth Bridge) to prevent structural decay from corrosion.

History and development

John Fowler and Benjamin Baker started design of the Forth Bridge in 1880. A £1.6-million contract for its construction was awarded by the Forth Bridge Railway Company on 21 December 1882 to a partnership that became Tancred, Arrol & Co. The primary challenges in the bridge's design and construction were geographical (creating clear spans of unprecedented length), logistical (managing a volume of masonry and steel that exceeded any single bridge before or since), technical (exploiting a relatively new material, mild steel), and aesthetic (creating a functional and economical structure that was both truthful in expression and visually appealing).

There were two phases to the construction of the bridge. The first, from 1882 to 1885, focused on the substructure, including sinking the caissons and constructing the foundations and piers on which the upper structure of the bridge sits. The second, from 1886 to 1889, focused on the superstructure, including erecting the three cantilever towers and the approach viaducts. About 4,600 men were employed at the peak of construction; 73 died. The bridge was completed on 15 November 1889, successfully tested in January 1890, and officially opened on 4 March 1890.

Alterations undertaken since 1890 include strengthening the deck trough that carries trains in 1913, installing floodlighting in the 1990s, and adding a walkway around the Jubilee Tower in 2012. Painting the steelwork with a red oxide paint was a more-or-less continuous process until very recently. Modern cup-head bolts are now often used in repairs to mimic the original rivets.

The Forth Bridge has been in continuous use since 1890, and remains an important part of the United Kingdom and Scottish railway networks. Care and maintenance of the bridge declined significantly during the final years of state ownership (1947-1993). Its present owner, Network Rail, completed a 10-year, £130-million restoration of the bridge in 2011, including stripping all the steelwork down to bare metal and repainting it with a longer-lasting glass-flake epoxy system developed for the offshore oil and gas industry. In addition, a few smaller angle sections that had suffered significant corrosion were replaced in-kind during the restoration programme. The bridge is estimated to retain about 99.5 percent of its original steelwork.

3 Justification for inscription, integrity and authenticity

Comparative analysis

The State Party presents a comparative analysis of bridges within a geo-cultural area it defines as global, in respect of the international nature of large-scale engineering works in the late 19th century. Comparisons

are made to large bridges on the basis of their construction material (with a focus on mild steel), form, and span. The State Party makes particular reference to the thematic study *Context for World Heritage Bridges*, prepared by Eric DeLony in 1996 for the International Committee for the Conservation of the Industrial Heritage (TICCIH) and ICOMOS. This study concludes that only three cantilever bridges might have the potential to demonstrate Outstanding Universal Value: the Forth Bridge; the Poughkeepsie Bridge (1886-1899) in New York State, United States of America; and the Quebec Bridge (1903-1919) in Quebec, Canada. The study notes that the steel Forth Bridge, "*perhaps the world's greatest cantilever,*" was "*the crowning achievement of the material during the 19th century.*"

Comparisons are also made to the four properties already on the World Heritage List where a bridge is the principal focus for inscription: Mehmed Paša Sokolović Bridge in Višegrad (Bosnia and Herzegovina, 2007, (ii), (iv)); Old Bridge Area of the Old City of Mostar (Bosnia and Herzegovina, 2005, (vi)); Ironbridge Gorge (United Kingdom, 1986, (i), (ii), (iv), (vi)); and Vizcaya Bridge (Spain, 2006, (i), (ii)). With the possible exception of the latter, none are comparable in a meaningful way.

Comparisons are likewise made to bridges that are components of larger properties already on the World Heritage List, the most relevant of which is the Luiz I Bridge in Oporto, Portugal (1885) (Historic Centre of Oporto (Portugal, 1996, (iv)). While it is the largest wrought-iron span in the world, the Luiz I Bridge does not figure in the justification for inscription on the World Heritage List, which focuses on Oporto's urban fabric and its many historic buildings. And, finally, comparisons are made to the three large bridges that are on the Tentative Lists: the Puente de Occidente wire-cable suspension bridge in Medellin, Colombia; the lattice-truss Malleco Viaduct in Chile; and the now-demolished bowstring-arch Yenisei River Railway Bridge in Krasnoyarsk, Russian Federation.

ICOMOS considers that the State Party has adequately demonstrated that long-span bridges represent a class of monument that is not currently well represented on the World Heritage List. The State Party's analysis shows that there is room on the List for the nominated property, and that there are few similar properties that could be nominated.

ICOMOS considers that the comparative analysis justifies consideration of this property for the World Heritage List.

Justification of Outstanding Universal Value

The nominated property is considered by the State Party to be of Outstanding Universal Value as a cultural property for the following reasons:

- The Forth Bridge's steel-built cantilever design, devoid of decoration, is an aesthetic achievement of tremendous grace.
- Its design represents a unique level of creative genius in conquering a scale and depth of natural barrier that had never before been overcome.
- In civil engineering, it was a crucible for the application of new design principles and new construction methods.
- It exerted great influence on civil engineering practice the world over, and is an icon to engineers world-wide.
- It is a potent symbol of the railway age, part of the revolution in transport and communications that represents a significant stage in human history.
- It is a unique milestone in the evolution of bridge and other steel construction, innovative in its design, concept, materials, and enormous scale.
- It marks a landmark event in the application of science to architecture that profoundly influenced humankind in ways not limited to bridge building.

ICOMOS considers that this justification is generally appropriate: the Forth Bridge, an extraordinary and impressive milestone in the history of bridge construction, is innovative in its concept, design, materials, and enormous scale; it was designed and built using advanced civil engineering design principles and construction methods; and it possesses a distinctive industrial aesthetic that is the result of a forthright, unadorned display of its structural elements. ICOMOS considers, however, that its direct influence has not been demonstrated; rather than being the prototype for subsequent structures, it was the culmination of a typology, a single outstanding example scarcely repeated but widely admired as an engineering wonder of the world.

Integrity and authenticity

Integrity

ICOMOS considers that the nominated property contains all the elements necessary to express the property's Outstanding Universal Value, that it is of adequate size to ensure the complete representation of the features and processes that convey the property's significance, and that it does not suffer from adverse effects of development or neglect. ICOMOS also considers that a logical and scientific basis has been presented for the selection of the area being nominated – though being limited to the bridge itself, it is the smallest conceivable, and justifiable, area for this engineering work. ICOMOS concurs with the State Party that the Forth Bridge is in an excellent state of conservation after completion of its 10-year restoration in 2011, and that the risk from decay or neglect is small for the foreseeable future.

Authenticity

ICOMOS considers that the links between the potential Outstanding Universal Value of the nominated property and its attributes are truthfully expressed, and that the

attributes fully convey the value of the nominated property. In particular, the nominated property is fully authentic in its form and design, which are virtually unaltered; in its materials and substance, which have undergone only minimal changes; and in its use and function, which have continued as originally intended. The use of traditional hot rivets is a subject worth investigating for selected and highly visible repairs of the Forth Bridge in the future.

In conclusion, ICOMOS considers that the conditions of integrity and authenticity have been met.

Criteria under which inscription is proposed

The property is nominated on the basis of cultural criteria (i), (ii), and (iv).

Criterion (i): *represent a masterpiece of human creative genius;*

This criterion is justified by the State Party on the grounds that the Forth Bridge is an aesthetic triumph in its avoidance of decoration and yet an achievement of tremendous grace for something so solid. Its steel-built cantilever design represents a unique level of new human creative genius in conquering a scale and depth of natural barrier that had never before been overcome by man.

ICOMOS considers that the Forth Bridge is a creative masterpiece because of its distinctive industrial aesthetic, which is the result of a forthright, unadorned display of its massive functional structural elements. ICOMOS considers, however, that the point concerning the creative genius required to conquer a natural barrier could be applied to most large-scale bridges that are the first at their respective locations.

ICOMOS considers that this criterion has been justified.

Criterion (ii): *exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design;*

This criterion is justified by the State Party on the grounds that the Forth Bridge was a crucible for the application to civil engineering of new design principles and new construction methods. It was at that time the most-visited and best-documented construction project in the world. It therefore exerted great influence on civil engineering practice the world-over and is an icon to engineers world-wide.

ICOMOS considers that the Forth Bridge is notable for the design principles and construction methods employed during its erection, including innovative approaches related to wind loading, thermal changes, hydraulic machinery, and the organization of the construction effort, but that an important interchange of human values over a span of time or within a cultural area of the world has not yet been demonstrated.

ICOMOS considers that this criterion has not been justified.

Criterion (iv): *be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;*

This criterion is justified by the State Party on the grounds that the Forth Bridge represents a significant stage in human history, namely the revolution in transport and communications. The railway age, of which it is a potent symbol, was made possible by, and influenced the speed and connectivity of, the industrial revolution. The bridge forms a unique milestone in the evolution of bridge and other steel construction, is innovative in its design, its concept, its materials and in its enormous scale. It marks a landmark event in the application of science to architecture that went on to profoundly influence mankind in ways not limited to bridge-building.

ICOMOS considers that the Forth Bridge is an outstanding and unique milestone in the evolution of bridge design and construction during the period when railways came to dominate long-distance land travel, innovative in its concept, in its use of mild steel, and in its enormous scale. ICOMOS considers, however, that the bridge's global importance as a symbol of the railway age, and/or its influence on humanity beyond bridge-building, have not been adequately demonstrated.

ICOMOS considers that this criterion has been justified.

In conclusion, ICOMOS considers that the nominated property meets criteria (i) and (iv) and the conditions of authenticity and integrity.

Description of the attributes

The Outstanding Universal Value of The Forth Bridge is expressed in its massive, unadorned structure comprised of granite piers supporting a superstructure of mild steel rolled plate riveted into tubes used in compression and lighter spans used in tension, all painted a distinctive red colour, and in its clear spans of unprecedented length. The bridge's visual impact on the setting, and its continuing use, are also contributing attributes.

4 Factors affecting the property

There is little development pressure possible within this very tightly delimited property. Potential threats to the proposed Outstanding Universal Value of the nominated property identified by the State Party include the creation of visitor access structures and the possible future electrification of the railway. One option for visitor access envisions a visitor centre with a glass ceiling underneath the bridge, and lifts to carry passengers up the eastern face of the Fife Tower to a viewing platform at the top.

Such visitor access is currently at the pre-application stage. Detailed designs of proposed buildings, lifts, walkways, and associated infrastructure for "the Forth Bridge Experience" have yet to be prepared by Network Rail, and no formal proposals have been submitted.

Development pressures outside the nominated property but in its vicinity could include a significant increase in the number of visitors to both Queensferry and North Queensferry; heightened pressure on existing services and infrastructure, including roads and public transport; potentially detrimental alterations or additions to properties immediately adjacent to the bridge; destruction of valuable features and views around the bridge in response to pressure from development; influence on the value of property in the neighbourhoods close to the bridge; increased demand for development in the setting of the bridge; and wind turbines.

The new Queensferry Crossing cable-stayed road bridge that is currently under construction approximately 1 km to the west of the nominated property is due to open in 2016. Between this bridge and the nominated Forth Bridge is the Forth Road Bridge, a suspension bridge built in 1964 and a Category 'A' listed building. It will become a dedicated public transportation corridor for buses, cyclists, and pedestrians after the new road bridge is opened. These two very large bridges are close to the nominated property, but not so close as to have a negative impact on its proposed Outstanding Universal Value.

No severe environmental pressures are mentioned. Disaster risk management will be addressed through the Property Management Plan. The State Party notes a concern in the bridgehead communities that any increases in visitor numbers will need to be managed appropriately.

ICOMOS considers that there are no immediate threats to the property itself, but that there are potential threats outside the property related to possible increases in the number of visitors and developments in the setting. ICOMOS recommends developing, as part of the Property Management Plan and in full consultation with residents, an interpretation and tourism plan associated with the value of the nominated property. It should consider strategies that avoid overwhelming North Queensferry and Queensferry, such as remote parking, shuttle systems, and alternatives to automobile travel. If a visitor centre is formally proposed, it should be submitted at the earliest possibility to the World Heritage Centre for review, in accordance with paragraph 172 of the *Operational Guidelines*. ICOMOS further considers that a clearer presumption against the construction of wind turbines within the key viewsheds of the bridge should be made in the appropriate planning instruments and Property Management Plan.

5 Protection, conservation and management

Boundaries of the nominated property and buffer zone

The boundaries of the nominated property are defined by the single contract that was let in 1882 for the construction of the masonry and steel elements of the Forth Bridge, as represented in the original contract drawings. In physical terms, the nominated property is limited to the stone and steel-built elements of the 2,529-m-long bridge itself, from escarpment to escarpment. It includes the cantilever piers it stands on, and the caissons set into the water to support the central pier, but not the submerged rock of Inchgarvie Island or the rock in North Queensferry on which the two other piers stand. The embankments and cuttings connecting the bridge to the rest of the rail network are not included within the proposed boundaries, nor are the islands or the marine portions of the Firth of Forth itself.

No “buffer zone” for the purpose of protecting the nominated property from wider threats has been specifically created for this nomination. The State Party contends that the nominated property is adequately protected through the local planning system and, in particular, through the suite of existing designation systems (both cultural and natural). These are supported by detailed analyses of views and viewsheds undertaken in support of this nomination. These analyses (which have no status in relation to planning controls) allow planning authorities to take into consideration in their decision-making the protection of views identified as being of value.

The State Party proposed in October 2014 that the Conservation Areas at each end of the bridge designated under the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997, combined with the suite of other existing cultural and natural heritage designations, collectively comprise a *de facto* buffer zone (“Bridgehead Zone”). The State Party further advised on 26 February 2015 that this aggregation of planning designations will also include the marine area of the estuary (which in the nomination dossier had been omitted), and that marine protection will also be included in an updated version of actions contained within the Property Management Plan and coordinated with the key viewsheds. These revisions have been initiated and will be completed by the end of 2015. The estimated total area of the proposed polygonal Bridgehead Zone, including the relevant marine area, is 1,233 ha, about 40 percent of which is on land.

ICOMOS considers that the boundaries of the nominated property are adequate, and that boundaries of the *de facto* buffer zone, as revised in February 2015 to include the relevant marine area of the estuary, are also adequate. A limited number of key viewsheds and views of the bridge should also be selected and included in the appropriate planning instruments and management plan, with the objective of ensuring their protection.

Ownership

The nominated property is owned and managed by Network Rail Limited, a public sector arm’s-length body of the Department for Transport.

Protection

The Forth Bridge is listed at Category ‘A’ as a “building of special architectural or historic interest” under City of Edinburgh Council, Edinburgh Burgh HBNUM: 40370 Item No: 30 QF; and Fife Council, Inverkeithing Parish HBNUM 9977 Item No: 6. This listing, given effect in 1973, gives the nominated property the highest level of statutory protection for a structure that is in use.

Any changes that affect the special interest of the bridge require the consent of both City of Edinburgh and Fife councils, with advice in certain circumstances from Historic Scotland on behalf of Scottish Ministers. Directions for planning authorities with regard to listed buildings are set out in the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997, as amended.

ICOMOS notes that the setting of a World Heritage property in Scotland is protected under the 2014 Scottish Planning Policy, wherein the planning authority must protect and preserve the Outstanding Universal Value.

ICOMOS considers that the legal protection in place, with the inclusion of the relevant marine area of the estuary in the *de facto* buffer zone and the safeguarding of key viewsheds and views of the bridge, is adequate.

Conservation

The nominated property has been documented and will be digitally mapped and scanned in 2015. Its present state of conservation is good, and active conservation measures include regular inspections: effectively, one-sixth of the bridge is inspected visually by Network Rail each year. There is no discernible threat to its continued use. The draft Management Plan identifies actions to further protect and enhance the condition of the historic fabric. The conservation measures are appropriate to conserve the nominated property’s value, authenticity, and integrity. Funding for maintenance and conservation work has been identified by the State Party, and the work is carried out by persons with the appropriate level of skill and expertise. There are no urgent issues following the recent 10-year restoration project.

ICOMOS considers that the state of conservation of the property is good, and that the conservation measures adopted are effective.

Management

Management structures and processes, including traditional management processes

Management of the nominated property is currently the responsibility of its owner, Network Rail. In the event the Forth Bridge is inscribed on the World Heritage List, a Partnership Management Agreement will be implemented

as one of the first actions of the draft Property Management Plan. It involves the members of the Forth Bridge World Heritage Nomination Steering Group (a subgroup of the Forth Bridges Forum) that have statutory planning functions, including Network Rail, Historic Scotland, Fife Council, and City of Edinburgh Council. The role of the Forth Bridge Partnership Management Agreement Group will be to protect the property's Outstanding Universal Value while helping it continue as an operating structure.

Policy framework: management plans and arrangements, including visitor management and presentation

A draft Property Management Plan for the nominated property is included with the nomination dossier. Now operational, its prioritized six-year action plan began in 2014. In addition to benchmark information, the Plan includes the Statement of Outstanding Universal Value; statutory duties of main bodies and other existing management arrangements; operation of heritage protection measures and land use planning; a summary of pressures and threats and opportunities for change or improvements; means of implementing the Plan, and measures by which it will be monitored.

The Town and Country Planning (Scotland) Act 1997 and The Planning etc. (Scotland) Act 2006 (which modifies and amends many of the 1997 provisions) provide the legal framework for local planning policy. They act as the primary legislation guiding planning and development in Scotland. Edinburgh and Fife Local Development Plans – the local interpretations of regional and national planning policy – are both expected to be completed in 2015; the Fife version is intended to include policy specifically directed at protecting the context of the Forth Bridge. Both Local Development Plans will be linked to the two relevant Conservation Area designations.

Concerning visitor management, there is currently no public pedestrian access to the bridge, and no means of counting individual visitors. The number of people who experience and interact with the bridge in their daily lives, however, is very large, as up to 200 passenger trains cross the rail bridge every day. The State Party has outlined some possible initiatives to manage visitors, including creating new visitor facilities and presentation experiences. Current resources, including staffing levels, expertise, and training, appear to be adequate. Network Rail is currently committed to approximately £1 million per year over the next five years for ongoing care and maintenance of the bridge structure. Risk management will be addressed through the Property Management Plan.

Involvement of the local communities

Local communities have been involved in the development of the nomination and the Property Management Plan, and the Fife and Edinburgh city councils have formally agreed to support the nomination.

ICOMOS considers that the management system for the property is adequate. ICOMOS recommends that various improvements initiated by the State Party, as outlined in February 2015, be completed, including clarifying the institutionalization of the current Steering Group; formally incorporating World Heritage into the remit of the Forth Bridge Partnership Management Agreement Group; and developing an interpretation and tourism plan as part of the Property Management Plan.

6 Monitoring

Monitoring the condition of the nominated property is part of Network Rail's mandated maintenance programme, and the results are recorded in its Civil Asset Register and electronic Reporting System, which is tailored to the maintenance and monitoring needs of the bridge. Network Rail also has an asset management plan. The nomination dossier includes four key indicators: two make reference to the Buildings at Risk Register; one to the enhancement of, or harm to, key views by foliage or new development; and one to train tickets sold to North Queensferry and Dalmeny. ICOMOS considers these key indicators, as well as their periodicity, to be vague. The key indicators should relate more directly to the attributes that convey potential Outstanding Universal Value (that is, to more than just the physical condition of the bridge), to ensure that these attributes are protected, conserved, and managed in order to sustain that value. The key indicators do not express a benchmark that indicates a desired state of conservation.

ICOMOS considers that the proposed key indicators should be more specific and relate more directly to the attributes that convey potential Outstanding Universal Value.

7 Conclusions

ICOMOS considers that the Outstanding Universal Value of the nominated property has been demonstrated. The Forth Bridge represents an extraordinary milestone in the history of bridge construction, notable for its enormous scale, its innovative use of materials, its advanced design principles and construction methods, and its distinctive industrial aesthetic. The relevant attributes conveying the Outstanding Universal Value of the nominated property are included within its boundaries. The nominated property is in a good state of conservation, and has the highest level of protection at the national level. Its *de facto* buffer zone, as proposed in October 2014 and revised in February 2015 to include the relevant marine area, is adequate. Key viewsheds and views of the bridge should be safeguarded, including from wind turbine construction. The management system for the property, while adequate, will benefit from the organizational clarifications that have been initiated, and the Property Management Plan should include an interpretation and tourism plan.

8 Recommendations

Recommendations with respect to inscription

ICOMOS recommends that The Forth Bridge, United Kingdom, be inscribed on the World Heritage List on the basis of **criteria (i) and (iv)**.

Recommended Statement of Outstanding Universal Value

Brief synthesis

The Forth Bridge, which spans the estuary (Firth) of the River Forth in eastern Scotland to link Fife to Edinburgh by railway, is at 2,529 m long the world's longest multi-span cantilever bridge. It opened in 1890 and continues to operate as an important passenger and freight rail bridge. This enormous structure, with its distinctive industrial aesthetic and striking red colour, was conceived and built using advanced civil engineering design principles and construction methods. Innovative in design, materials, and scale, the Forth Bridge is an extraordinary and impressive milestone in bridge design and construction during the period when railways came to dominate long-distance land travel.

This large-scale engineering work's appearance is the result of a forthright, unadorned display of its structural elements. It is comprised of about 54,000 tons of mild steel plate rolled and riveted into 4-m diameter tubes used in compression, and lighter steel spans used in tension. The use of mild steel, a relatively new material in the 1880s, on such a large-scale project was innovative, and helped to bolster its reputation. The superstructure of the bridge takes the form of three double-cantilever towers rising 110 m above their granite pier foundations, with cantilever arms to each side. The cantilever arms each project 207 m from the towers and are linked together by two suspended spans, each 107 m long. The resulting 521-m spans formed by the three towers were individually the longest in the world for 28 years, and remain collectively the longest in a multi-span cantilever bridge. The Forth Bridge is the culmination of its typology, scarcely repeated but widely admired as an engineering wonder of the world.

Criterion (i): The Forth Bridge is a masterpiece of creative genius because of its distinctive industrial aesthetic, which is the result of a forthright, unadorned display of its massive, functional structural elements.

Criterion (iv): The Forth Bridge is an extraordinary and impressive milestone in the evolution of bridge design and construction during the period when railways came to dominate long-distance land travel, innovative in its concept, its use of mild steel, and its enormous scale.

Integrity

The property contains all the elements necessary to express the Outstanding Universal Value of The Forth Bridge, including granite piers and steel superstructure. The 7.5-ha property is of adequate size to ensure the

complete representation of the features and processes that convey the property's significance, and it does not suffer from adverse effects of development or neglect.

Authenticity

The Forth Bridge is fully authentic in form and design, which are virtually unaltered; materials and substance, which have undergone only minimal changes; and use and function, which have continued as originally intended. The links between the Outstanding Universal Value of the bridge and its attributes are therefore truthfully expressed, and the attributes fully convey the value of the property.

Management and protection requirements

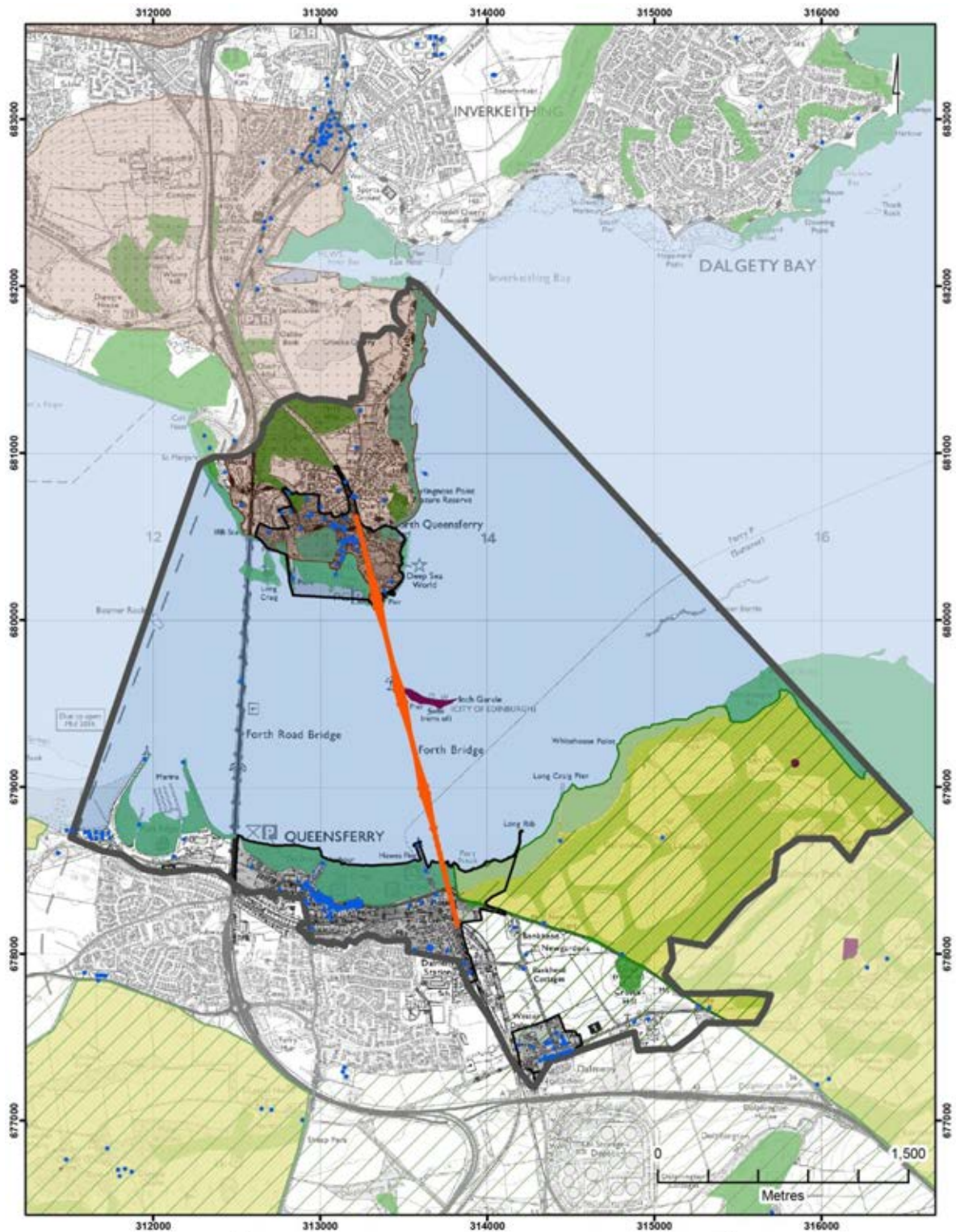
The Forth Bridge is listed at Category 'A' as a building of special architectural or historic interest, giving the property the highest level of statutory protection. Its immediate surroundings are also protected by means of a suite of cultural and natural heritage designations. Owned by Network Rail Limited, the property will be managed in accordance with a Property Management Plan by the bodies that have a statutory planning function. The Forth Bridges Forum partnership has been established to ensure that local stakeholders' interests remain at the core of the management of the Forth bridges.

Specific long-term expectations related to key issues include maintenance of strong community support, broadening understanding in the context of world bridges, attention to developments within key views, risk management, and inspiring others.

Additional recommendations

ICOMOS recommends that the State Party give consideration to the following:

- Creating key indicators that are more specific and relate more directly to the attributes that convey potential Outstanding Universal Value;
- Extending the Property Management Plan to include an interpretation and tourism plan;
- Submitting to the World Heritage Centre, by 1 December 2016, a report on the selection of key viewsheds and views of the bridge for inclusion in the appropriate planning instruments and management plan, along with an analysis of their effectiveness in ensuring the protection of these key viewsheds and views, for examination by the World Heritage Committee at its 41st session in 2017;
- Submitting plans for any proposed visitor centre at the earliest possibility to the World Heritage Centre for review, in accordance with paragraph 172 of the *Operational Guidelines for the Implementation of the World Heritage Convention*.

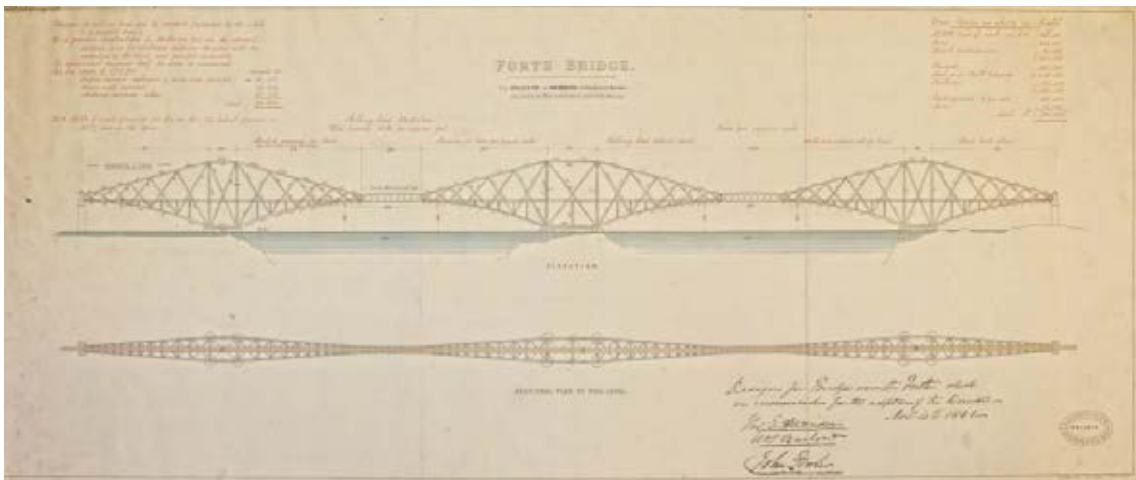


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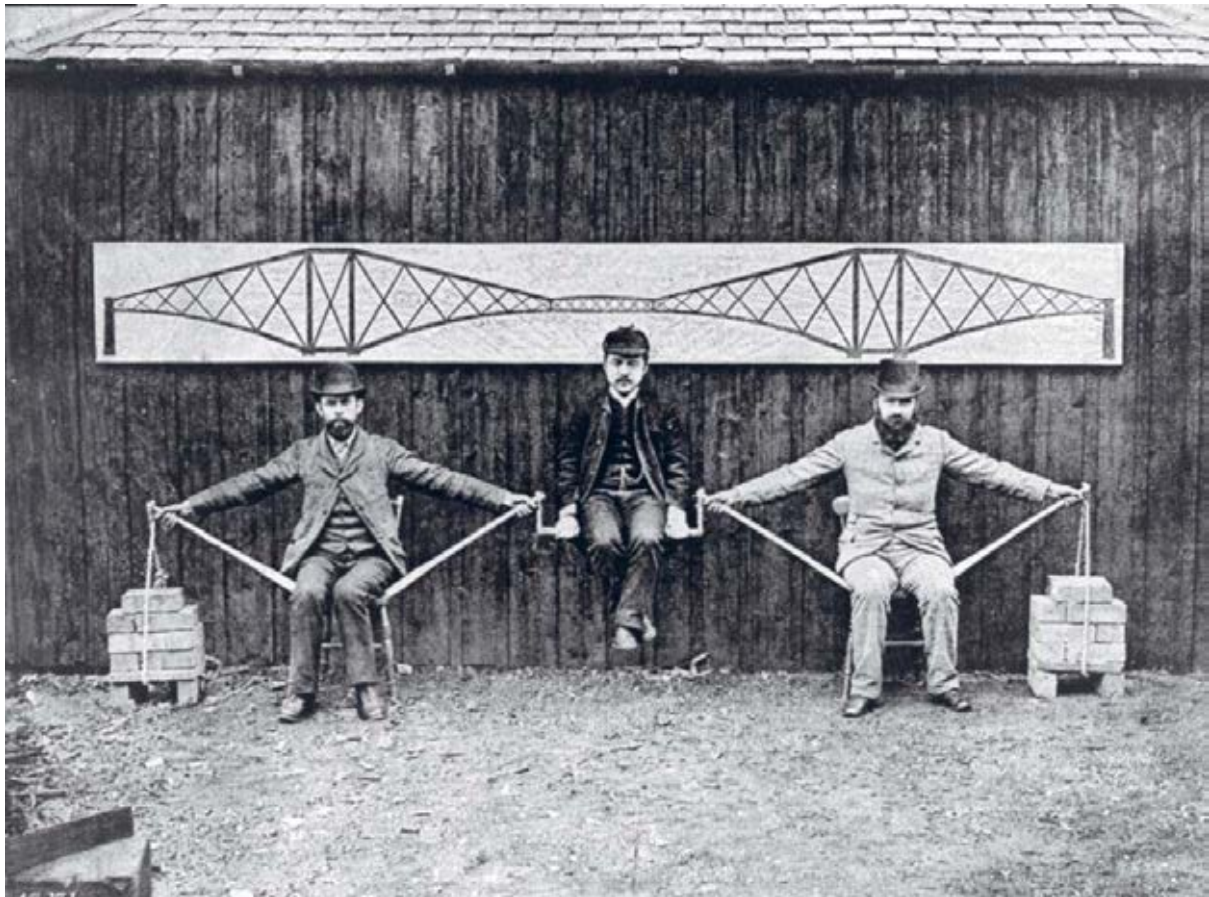
Title:		Key	
The Forth Bridge: Bridgehead Zone		Nominated Property	Listed Building
Bridgehead Zone Boundary		Scheduled Monument	Natural Heritage Protected Sites
Scale: 1 : 30,000 @ A4		Inventory Battlefield	Marine Planning Area
Projection: British National Grid		Conservation Area	Green Belt
		Gardens and Designed Landscape	



Map showing the boundaries of the nominated property



Drawing of the Forth Bridge signed by Mr. Barlow, Sir Fowler, and Mr. Harrison (1881)



The human cantilever



Photograph showing progress of the Queensferry main tower



Forth Bridge from South Queensferry



View of the Forth Bridge from South Queensferry