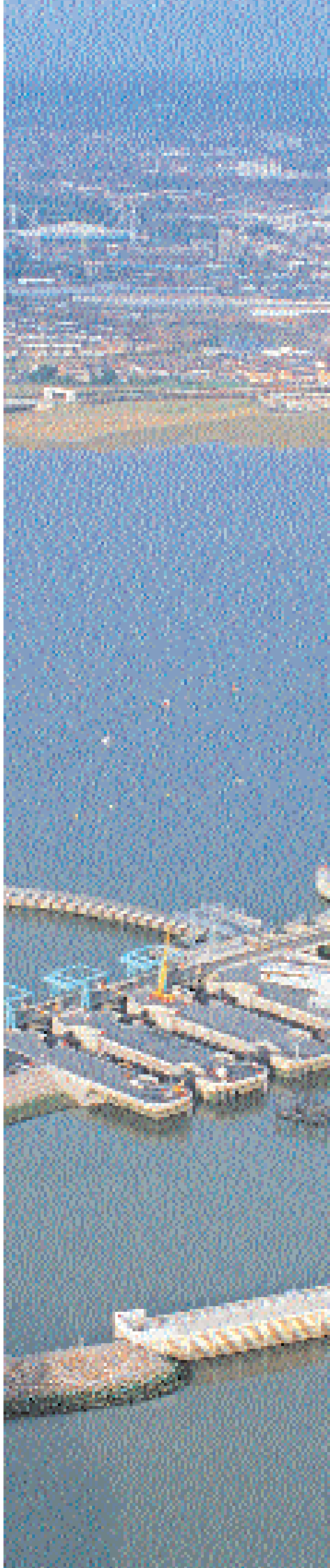


# THE CARDIFF BAY BARRAGE



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# **THE CARDIFF BAY BARRAGE**

Report by the Auditor General for Wales

Presented to the National Assembly on

5 July 2000

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**This report has been prepared for presentation to the National Assembly for Wales under the Government of Wales Act 1998.**

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# CONTENTS

<b>Executive Summary</b>	<b>1</b>
--------------------------	----------

<b>Part 1</b>	<b>5</b>
---------------	----------

<b>Background and History</b>	<b>5</b>
-------------------------------	----------

<b>Part 2</b>	<b>12</b>
---------------	-----------

<b>The cost of the project</b>	<b>12</b>
--------------------------------	-----------

<b>Part 3</b>	<b>19</b>
---------------	-----------

<b>Succession Arrangements and Future Issues</b>	<b>19</b>
--------------------------------------------------	-----------

# EXECUTIVE SUMMARY

## Introduction

1. In May 1994, the Cardiff Bay Development Corporation began work on a project to create a two hundred hectare (500 acres) freshwater lake in Cardiff Bay. The centrepiece of the project was the construction of a Barrage, 1.1 kilometres long, that runs from Penarth to Queen Alexandra Dock in Cardiff. By stemming the flow of the two main rivers in South Wales, the Taf and the Ely, and by excluding the sea from the Bay, the Barrage will allow the development of the freshwater lake.

2. The project also involved putting in place arrangements to meet the environmental obligations arising from the creation of the freshwater lake. These included

- ▶ ensuring the maintenance of minimum statutory standards of water quality in the Bay;
- ▶ monitoring groundwater levels, mitigating against the effects of rising groundwater levels and assessing whether any damage to properties in the Cardiff Bay area could be attributed to a change in groundwater level following the completion of the Barrage;
- ▶ working on sixteen separate sewage schemes in order to remove, relocate and improve public sewage outfalls adjacent to Cardiff Bay.

In addition, to compensate for the loss of the unique habitat, which Cardiff Bay provided for migratory wildfowl and other birds (and also as one of the measures which the government of the United Kingdom had to take to comply with the European Birds Directive and the Habitats Directive of the European Union), the Corporation had to provide, with the agreement of the European Commission, a new reserve at the Gwent Levels.

## Progress with the project

3. The target date for creating the freshwater lake was August 1998. In the event, the Barrage structure was substantially completed by the start of November 1999 and, on 4 November, enabled the impoundment of saltwater in the Bay under the terms of a temporary impoundment licence issued by the Environment Agency Wales. In order to complete the dredging of the Bay for water quality purposes and to meet the requirements of the Environment Agency Wales, the aim now is to achieve freshwater impoundment and create the freshwater lake by March 2001.

## The cost of constructing the Barrage and creating the freshwater lake

4. In the course of constructing the Barrage and working towards the creation of the freshwater lake, the estimated cost of the project has increased. In March 1995, the Secretary of State set a budget of £191 million for the project as a whole. This was less than the Corporation's forecast outturn for the project which at that time was £199 million. The Corporation had to cut £8 million from the Barrage programme to keep within the estimate set by the Secretary of State. In March 1999, the cap on the cost of the project was increased to £197 million. This figure excluded for commercial in confidence reasons an undisclosed provision of £6.5 million for contingencies for contract claims. On 28 March 2000, following the settlement of the final account for the Barrage contract with Balfour Beatty-Costain, the joint venture responsible for constructing the Barrage, the First Secretary announced a further increase in the cap figure to £213.4 million.

5. Within these estimates there were two areas where provision significantly increased. The main increase was linked to the Barrage structure where the overall estimated cost rose from £134 million in 1995 to £151.8 million by March 2000. An important factor influencing this increase was the unforeseen ground conditions which Balfour Beatty-Costain encountered in constructing the Barrage. More generally Balfour Beatty-Costain had to contend with difficult and uncertain physical conditions: as part of the Severn Estuary, Cardiff Bay has a tidal range of up to 14 metres, the second largest in the world.
6. The second area where there was a significant increase in estimated costs was in the provision for the measure to compensate for the loss of the Taf/Ely Estuary Site for Special Scientific Interest. The final cost of the Gwent Levels Wetland Reserve is now expected to be at least £10.4 million. This compares with an original provision of £5.7 million and reflects the effect of a different larger site, the need to hold a planning inquiry into establishing the Reserve and the subsequent cost of the compulsory purchase of land to create the Reserve.
7. Although much of the work associated with the project is substantially complete, it is not yet clear what the final cost of the project will be. This is because contractual claims that relate to the Gwent Levels Wetland Reserve and the drainage works and that amount to some £2.6 million have not yet been settled while continuing and planned work amounts in value to potentially £8 million. This expenditure will be offset by a payment due from Welsh Water in 2005. This is in respect of the drainage works associated with the project and although the amount is not yet known it is unlikely to exceed £4.3 million.
8. In addition, some elements of the project relating to water quality have been postponed to later years. They are not included in the revised cap of £213.4 million for the project and the best current estimate is that the capital investment needed to ensure that the water quality in the freshwater lake meets statutory requirements will be between £6 million and £7 million. When this amount is taken into account it suggests an overall cost for the Barrage project and the creation of the freshwater lake of some £220 million. This compares with the final outturn target of £191 million set by the Welsh Office in 1995 and represents an overall increase of 15 per cent. In a statement to the Assembly on 28 March 2000, the First Secretary said that there would be some disappointment at this cost overrun. He acknowledged that the containment of the rise in costs of a project of this complexity was a considerable achievement and he went on to say that the Corporation and its project manager, Bechtel Ltd, deserve credit for achieving it.
9. The progress made with the project by 31 March 2000 reflects a sound performance on the part of the Corporation, particularly in view of the size and complexity of the project, the physical difficulties associated with it and the need to deal with some cost increases that were due largely to factors outside the direct control of the Corporation, such as those associated with establishing the Gwent Levels Wetland Reserve. A number of factors contributed to this outcome. The imposition by the Welsh Office of, in effect, a cap on the overall cost of the project created a discipline from the outset for the Corporation to focus on cost control. The Corporation planned the project thoroughly and sought to develop an approach that did not focus simply on price but took a wider value for money view. The Corporation took account of the experience of other organisations in managing large capital projects and appointed from the outset a specialist project manager (Bechtel) for the construction of the Barrage. In this context, the development of a team approach involving the contractor (Balfour Beatty-Costain), the project manager (Bechtel) and the Corporation also helped secure this outcome.

**10.** One area of concern that emerged from the examination undertaken by the National Audit Office Wales was the handling of the provision for inflation and contingencies. The Corporation took a risk in reducing this provision at an early stage in the project in order to find some of the savings that it needed to keep within the overall estimate of £191 million originally set by the Welsh Office. As a consequence there was insufficient provision to meet, for example, later contractual claims. This serves to emphasise the need to ensure that for projects of this nature realistic provision is made to cover potential contingencies. In addition for those projects which it oversees but does not directly control, the Assembly should ensure that there is clear accountability for the management and use of this provision. Also the Assembly should explore the feasibility of developing some incentive for the organisation concerned to keep within this provision.

### **The implications for Cardiff Bay of the successor arrangements following the wind up of the Development Corporation**

**11.** In July 1997 it was confirmed that the Development Corporation would wind up its activities by the end of March 2000. In March 1999, the Secretary of State announced the detailed succession arrangements that were to be introduced with effect from 1 April 2000. On 20 October 1999, a further announcement confirmed that Cardiff County Council had agreed to assume responsibility for the operation, maintenance and management of the Barrage, the inland Bay and the outer harbour and associated responsibilities.

**12.** Since 1 April 2000, a new Harbour Authority which is part of Cardiff County Council has been discharging these responsibilities. In addition Welsh Water has responsibility for the drainage and sewerage system around the Bay while the Countryside Council for Wales is responsible for operating and managing the Gwent Levels Wetland Reserve.

**13.** The Development Corporation had planned to contract out day to day arrangements for the management of the Bay through a facilities management contract. It began the selection process for this in August 1998 and Thames Water PLC emerged as the Corporation's preferred bidder. Before entering into a formal contract with Thames Water the Corporation sought the Assembly's approval in September 1999.

**14.** In assessing the Corporation's proposals for a contract with Thames Water, the First Secretary consulted Cardiff County Council as the body that from 1 April 2000 would take over responsibility for the management of the Bay. The First Secretary involved officials from the Corporation to give technical advice in further discussions with the County Council and the Environment Agency Wales. He also consulted representatives of the business community. The First Secretary concluded that the option not to proceed with Thames Water offered advantages in terms of cost and affordability, better control of risk and a more comprehensive solution in terms of maximising the business and leisure potential of Cardiff Bay and that the cost over the next three years of Cardiff County Council operating and maintaining the Barrage and the Bay without Thames Water would be the most effective option and save the Assembly £3 million. Against this background, on 27 March 2000 under section 165 of the Local Government Planning and Land Act 1980, the Corporation concluded an agreement on the Harbour Authority with Cardiff County Council.

**15.** For 2000-01, the Assembly made a net provision of £21.4 million for the cost to Cardiff County Council of meeting the responsibilities which it had inherited from the Development Corporation. This amount included a gross amount of £10.9 million for continuing to work on the Barrage project and £10.6 million for the responsibilities of the

Harbour Authority. The net funding to be provided by the Assembly is forecast to reduce and from 2002-03 overall provision for the Harbour Authority will be £9 million a year. The total net cost to the Assembly is forecast to fall to £5.8 million in 2004-05. This reflects the expected recovery in 2005 from Welsh Water of an amount up to £4.3 million in respect of the drainage works associated with the project.

**16.** The National Audit Office Wales noted that the arrangements put in place with effect from 1 April 2000 mean that Cardiff County Council will have permanent responsibility for the management and operation of the Barrage and the inland lake. Although this is expected to be cheaper over the next three years when compared with the other options considered, further competitive tension will have to be created after that period to help ensure continuing value for money. As part of the work to control future costs, the National Audit Office Wales recommends that the Assembly explores options that will provide some form of incentivisation for Cardiff County Council to secure financial savings where appropriate and to discharge its responsibilities as efficiently and economically as possible.

**17.** The environmental obligations stemming from the construction of the Barrage and the creation of the freshwater lake will bring with them significant responsibilities and some potential liabilities. This is particularly so in relation to maintaining the water quality regime in the Bay, preventing or repairing groundwater damage to properties around Cardiff Bay which will be the responsibility of Cardiff County Council and operating the Gwent Levels Wetland Reserve which will be the responsibility of the Countryside Council for Wales. Clearly it will be essential for the Assembly to ensure that all this is done in a way that minimises the risk of incurring liabilities and other unplanned costs that would have significant financial implications for the Assembly.

**18.** The Assembly will be developing policy, sponsor and funding arrangements with the new Harbour Authority, Cardiff County Council and the other organisations responsible for aspects of the day to day operation of the Barrage, the inland freshwater lake and the linked environmental projects. Given this, the National Audit Office Wales recommends that, in addition to exploring options to provide some form of incentivisation to help secure and encourage efficient and economic operations, the Assembly should also pay attention to

- ▶ ensuring that there are sensible arrangements in place for identifying potential risks, managing those risks and developing cost effective mitigation measures so as to keep to a minimum any unplanned or unforeseen demands on the public purse;
- ▶ ensuring that due regard is paid to recovering any money that would have fallen due to the Corporation;
- ▶ ensuring that there is scope for maximising the revenue which the new Bay environment will generate.



# PART I

## Background and History

**1.1** The Cardiff Bay Development Corporation was set up in April 1987. Its mission was to establish Cardiff as a superlative maritime city that would stand comparison with any other similar city in the world. This was seen as crucial to securing the long-term aim of enhancing the future prosperity not only of Cardiff but also of the rest of Wales.

**1.2** A year later, in April 1988, the Corporation published its first regeneration strategy for the economic transformation of the Cardiff Bay area. Central to this was the creation in the Bay of a two hundred hectare (500 acres) freshwater lake with nearly thirteen kilometres of permanent waterfront (Figure 1 overleaf). The proposal was to construct a Barrage 1.1 kilometres long that would run from Penarth to Queen Alexandra Dock in Cardiff. The Barrage would stem flow of the two main rivers in South Wales, the Taf and the Ely, and by excluding the sea allow the development of an inland freshwater lake and so give impetus to the regeneration of the area around Cardiff Bay.

**1.3** In 1993 the Cardiff Bay Barrage Act received royal assent. In May the following year, work began on the project to create the freshwater lake, of which the construction of the Barrage was largest single item. The Corporation's Board had overall responsibility for the project. To help it with this task, the Board established a special sub-committee, known as the Barrage committee, to supervise the day to day running of the project. The Corporation also appointed a senior manager to lead an interdisciplinary team to take forward the planning, management and implementation of the project.

**1.4** The contract to construct the Barrage structure was won in competition by a Balfour Beatty-Costain joint venture. The Corporation also appointed Bechtel Ltd through competition as project managers for the Barrage construction contract. The other aspects of the project were dealt with through Welsh Water or

managed in-house by the Corporation or through other specially appointed project managers.

**1.5** In March 1995, the Secretary of State set a budget of £191 million for the project as a whole. This amount was consistent with the figure which Parliament had been led to expect during the passage of the 1993 Act. It was, however, less than the Corporation's forecast outturn for the project at that time. This was £199 million and so the Corporation had to cut £8 million from the Barrage programme to keep within the estimate set by the Secretary of State.

**1.6** The original target date for creating the freshwater lake was August 1998. In the event, by the start of November 1999, the Barrage structure was substantially completed and, on 4 November 1999, enabled the impoundment of saltwater in the Bay under the terms of a temporary impoundment licence issued by the Environment Agency Wales. Work on other aspects of the project is continuing with the aim of achieving freshwater impoundment and creating the freshwater lake by March 2001. This is because, in particular, to preserve water quality and fisheries and to maximise the leisure use potential of the Bay, freshwater impoundment cannot start before completion of the dredging of the Bay. The Environment Agency Wales was not prepared to allow dredging to start before the Barrage structure had been fully tested and the Agency could issue a permanent impoundment licence. Figure 2 (page 7) sets out the chronology of the Barrage project.

**1.7** The estimated cost of the project subsequently changed. In March 1999 the cap on the capital cost was increased to £197 million, a figure which excluded for commercial in confidence reasons an undisclosed £6.5 million provision for contingencies for contract claims. On 1 July 1999 the National Assembly took over responsibility for the funding of the Corporation and for the oversight of its

## Figure 1 - The Cardiff Bay Barrage: Key Points

### Before the construction of the Barrage

- ▶ Cardiff Bay, as part of the Severn Estuary, experienced the second largest tidal regime in the world.
- ▶ Mud flats providing feeding grounds for water birds (wild fowl and waders) were important in the context of the wider Severn Estuary because they were exposed at both the earliest and latest phases of the tidal cycle, thereby extending the feeding opportunities for these birds
- ▶ Flooding of properties in the Bay area could occur when high river levels coincided with particularly high tides.
- ▶ Economic activity, mainly based on the docks, had fallen away over the century.

### The Barrage structure itself

- ▶ The Barrage structure runs some 1.1 km from Penarth to Queen Alexandra Dock in Cardiff.
- ▶ As well as coping with the extreme tidal regime, and in order to provide stability, excavations were required to around 13m in depth down to the gravel underlay beneath the soft mud.
- ▶ The Barrage is made up of a rock fill embankment with sand fill reclamation to form a landscaped area with an access road on top
- ▶ At the Penarth end are the control structure and hydro-mechanical features:
  - Five sluice gates to release waters from the Bay
  - Three locks and movable bridges to allow easy access for yachts and other vessels
  - an outer harbour providing shelter for vessels entering the Bay
  - a fish-pass to allow the safe passage of migrating salmon and trout
  - a control building to oversee Barrage operations

### After the construction of the Barrage

- ▶ The new Bay environment will create a new permanent waterfront of some 12.8km and a 200 hectare (500 acre) freshwater inland Bay.
- ▶ The Barrage may now be used to prevent or alleviate flooding by excluding surge tides from the Bay.
- ▶ Economic activity, attracted by Bay developments, is helping to regenerate the area.

## Figure 2 - The chronology of the Barrage project

April 1987	Establishment of Cardiff Bay Development Corporation
April 1988	The Corporation's first regeneration strategy for the economic transformation of the whole area, central to which is the creation of a lake through the construction of the Barrage
July 1988	Publication of first economic appraisal of the Barrage project, further updates produced in April 1989, January 1990 and October 1992
November 1993	Royal Assent for the Cardiff Bay Barrage Act 1993
May 1994	Main Barrage construction commences
March 1995	First drainage scheme starts
April 1995	Project budget fixed at £191 million against an estimate of £199 million so requiring savings to be achieved
March 1996	Property surveys commence
July 1997	Confirmation that the Development Corporation would wind up its activities by the end of March 2000 and Government review of Barrage project gives go ahead for completion
November 1997	Go ahead for new reserve, after completion of planning inquiry
May 1998	Property surveys substantially complete
October 1998	Drainage works substantially complete
March 1999	Project budget revised to £197 million
March 1999	Secretary of State announces detailed succession arrangements for the Development Corporation
May 1999	Final closure of the Bay commences and vessels use locks
August 1999	Groundwater dewatering works commence
September 1999	Gwent Levels Wetland Reserve substantially complete
October 1999	Announcement confirms that Cardiff County Council had agreed to assume responsibility for the operation, maintenance and management of the Barrage, the inland bay and the outer harbour and associated responsibilities
October 1999	Groundwater dewatering works complete
November 1999	Impoundment of the Bay completed and a saline lake created pending dredging works
March 2000	Project budget raised to £213.4 million
March 2000	Wind-up of the Corporation
April 2000	Harbour Authority created
March 2001	Target date for permanent closure and creation of freshwater lake

activities. On 28 March 2000, following the settlement of the final account for the construction contract with Balfour Beatty-Costain, the First Secretary announced a further increase in the cap figure to £213.4 million.

**1.8** Overall, the construction of the Barrage and the management of the project, including its cost, represent creditable achievements, given its size and complexity. In building the Barrage, for example, Balfour Beatty-Costain had to contend with difficult and uncertain physical conditions: as part of the Severn Estuary, Cardiff Bay has a tidal range of up to 14 metres, the second largest in the world.

**1.9** In addition, it is important not to lose sight of the economic benefits derived from the regeneration of Cardiff Bay. Shortly before it wound up, the Development Corporation estimated that by 31 March 2000 it had achieved private sector investment of £1,065 million and that this would rise to £1,815 million on completion of all developments. The Corporation also estimated that by 31 March 2000 it had achieved the creation of 13,270 jobs in new developments and that this should rise to 16,750 when the jobs that it had secured by the same date were taken into account. The Corporation forecast that a total of 31,000 jobs will be created on completion of all developments. The position on housing was similar with the Corporation forecasting that a total of 5,780 housing units will have been built when all developments are completed. In this context, in March 2000, the Corporation calculated that, as a minimum, £170 million a year was already being returned to the public purse in terms of business rates, income tax, council tax and value added tax directly attributable to the developments in Cardiff Bay.

**1.10** The creation of the lake has brought with it a series of environmental obligations under United Kingdom and European law.

- ▮ **Water Quality:** The Development Corporation had to plan arrangements that would ensure the maintenance of minimum statutory standards of water quality in the freshwater lake. This is to protect public health generally as well as fish and other aquatic life in the lake. In addition, water quality in the saltwater impoundment regime also has to be maintained.
- ▮ **Groundwater:** From the outset of the project, it was recognised that the completion of the Barrage and the creation of the freshwater lake could affect groundwater levels around Cardiff Bay. This in turn could result in damage to neighbouring properties through, for example, subsidence or the effects of damp. Under the requirements of the 1993 Cardiff Bay Barrage Act, to deal with this, the Corporation arranged for the survey of more than 21,000 properties around the Cardiff Bay area before completion of the Barrage. All these properties are due to be resurveyed in two to three years time to see whether there has been any change in their physical condition and, if so, to help determine whether this can be attributed to a change in groundwater levels following the completion of the Barrage. Any damage so caused will have to be rectified under the requirements of the Cardiff Bay Barrage Act, a responsibility that passed to Cardiff County Council (the Harbour Authority) from 1 April 2000. In addition, the Corporation identified six locations most at risk from rising groundwater levels and installed equipment at each of these locations for extracting groundwater and so help mitigate its effects.
- ▮ **Drainage and sewage:** To meet the requirements of the 1993 Act, the Corporation was obliged to remove, relocate and improve public sewage outfalls adjacent to

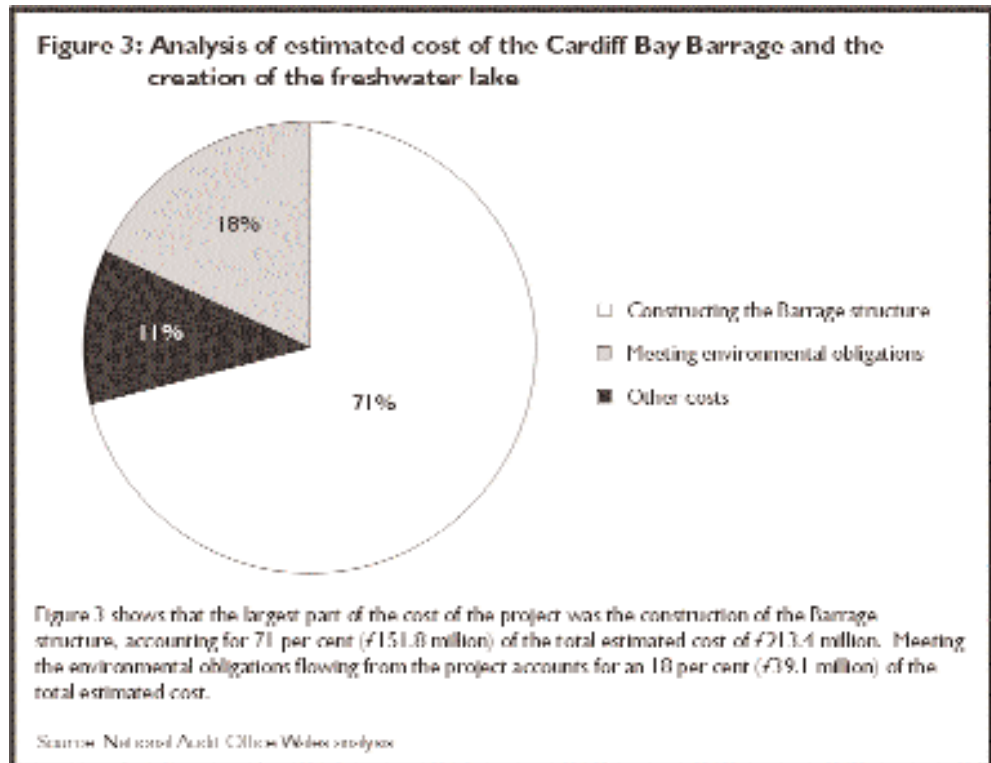
Cardiff Bay otherwise these would have been adversely affected on completion of the Barrage and the creation of the freshwater lake. To meet its obligations, the Corporation had to work on fifteen separate sewerage schemes with Welsh Water and on one with Cardiff County Council.

- The lost Bay habitat and the creation of the Gwent Levels Wetland Reserve:** The Taf/Ely Estuary was a Site for Special Scientific Interest and a critical component of the wider Severn Estuary Site for Special Scientific Interest and Special Protection Area. It provided unique habitat for migratory wildfowl and other birds. To compensate for the loss of this environment and as one of the measures which the United Kingdom government had to take to comply with the European Birds Directive and the Habitats Directive of the European Union, the Corporation had to provide an alternative site by overseeing the creation of a new reserve of some

410 hectares at the Gwent Levels. The works to create the reserve had to be substantially completed before impoundment of water in the inland bay. The Corporation appointed Mason Pittendrigh as project manager for engineering work needed for the creation of the Reserve.

- Protecting the rights of Bay users and neighbouring landowners:** During the passage of the 1993 Act the Corporation entered into 34 legal agreements with organisations and authorities who were concerned about protecting their interests with respect to the construction of the Barrage. These involved, for example, the relocation of moorings on the Bay and the relocation of yacht clubs that use the Bay.

1.11 Meeting these obligations has had a significant financial impact. As Figure 3 shows, they account for 18 per cent of the estimated cost of the entire project.



**I.12** The whole project was the subject of an urgent review following the general election in May 1997. The Secretary of State announced the outcome of the review in July 1997. He told the House of Commons that officials had reviewed the project and also obtained fresh legal advice on the European Birds Directive and on the Habitats Directive. They found that £140 million had already been committed to the project and that cancellation would cost a further £30 million. Private sector investment ventures totalling £200 million were likely to proceed in the expectation that the Barrage would be completed. These would bring major development and employment benefits to the Cardiff Bay area. Also officials confirmed that the European Commission had accepted that the planned environmental measures would be sufficient to meet European Union Directives. The Secretary of State concluded that on this basis the only proper course open to him was not to intervene and to allow the project to proceed.

**I.13** In July 1997 it was confirmed that the Development Corporation would wind up its activities by the end of March 2000 and in March 1999 the Secretary of State announced the detailed succession arrangements that were to be introduced with effect from 1 April 2000. These included the creation of a new dedicated body which would assume the responsibility for the operation, maintenance and management of the Barrage, the inland Bay and the outer harbour. The responsibilities of this body would include exploitation of the impounded lake for the public benefit, groundwater monitoring and control of water quality in the Bay. On 20 October 1999, a further announcement confirmed that Cardiff County Council had agreed to assume responsibility for the operation, maintenance and management of the Barrage, the inland Bay and the outer harbour and associated responsibilities.

**I.14** With effect from 1 April 2000 responsibility for the Barrage, the freshwater lake and the linked environmental projects were divided as follows:

- ▶ A new Harbour Authority is responsible for

  - the operation, maintenance and management of the Barrage itself;
  - dealing with any outstanding contractual issues in relation to the construction of the Barrage;
  - completing the work necessary for the creation of the freshwater lake;
  - ensuring that the water quality in the Bay meets statutory requirements;
  - monitoring groundwater levels, administering dewatering schemes and carrying out the second survey of properties in the Cardiff Bay area;
  - taking on the obligations flowing from the legal agreements made by the Development Corporation with the Bay users and neighbouring land owners.
- ▶ The Harbour Authority is part of Cardiff County Council. This arrangement is intended to be permanent though it will be subject to review after five years.
- ▶ Welsh Water retains responsibility for the drainage and sewerage system around the Bay.
- ▶ The Countryside Council for Wales is responsible for operating and managing the Gwent Levels Wetland Reserve and for dealing with contractual issues that were unresolved when the Corporation wound up.

**I.15** The National Assembly will continue to fund any necessary, reasonable and proper expenditure related to the Corporation's residual activities in accordance with agreements signed with

the approval of the Assembly between the Corporation and each successor body. The current estimate of net funding required for the Harbour Authority and completion of the Barrage project and other projects is as follows:

- 2000-01:** £21.4 million (this includes £10.6m for the Harbour Authority and just under £11 million for completing the Barrage project);
- 2001-02:** £17 million;
- 2002-03:** £15 million;
- 2003-04:** £13.8 million;
- 2004-05:** £5.8 million (this figure reflects the payment in 2005 of up to £4.3 million by Welsh Water in respect of the drainage works associated with the project).

**1.16** The remainder of this Report considers the costs of constructing the Barrage and putting in place the linked environmental schemes (Part 2). It then goes on to look in more detail at the arrangements put in place for the management and operation of the Barrage, the inland lake and the linked environmental projects following the wind up of the Development Corporation on 31 March 2000. It also considers the financial implications of succession arrangements and other issues for the Assembly (Part 3).

## PART 2

### The cost of the project

**2.1** By 31 March 2000, the Development Corporation had incurred expenditure of some £204 million in constructing the Barrage and in developing and implementing the other schemes linked to the project to create the inland freshwater lake. This part of the Report describes how the cost of the project has changed. It then goes on to discuss the future costs that the Assembly may have to meet in completing the project.

### The approved cost of the project now stands at £213.4 million

**2.2** In October 1992, during the passage of the Cardiff Bay Barrage Bill, the estimated capital cost of the project was put at £168 million. This included a commitment to provide a fixed sum of £5.7 million for a bird reserve. During 1993 and into 1994 the Corporation continued to develop its plans and costings for the whole project. But it had not reached a firm, final estimate for the total cost of the project when, in May 1994, it placed a contract with Balfour Beatty-Costain for the construction of the Barrage, the single largest and most expensive element of the project. Work on constructing the Barrage began immediately the contract had been signed.

**2.3** In late 1994, the Corporation finalised its firm overall estimate of the cost of the project. Because its forecast of £199 million was greater than the estimate given during the passage of the 1993 Act, the Welsh Office asked the Corporation to review and reduce the estimated cost of the project. Following this review, in April 1995, Ministers told the House of Commons that the forecast cost of the whole project to create a freshwater inland lake in Cardiff Bay was £191 million; a sum which, allowing for inflation and contingency provision over the expected lifetime of the project, was now in line with the estimate made during the passage of the 1993 Act.

**2.4** By this point, the Corporation had already commissioned, and put in place the outcome of, a value reengineering review by Bechtel. Consequently, the scope for further savings was limited. Nevertheless, to keep within the estimate, the Corporation took a number of measures to reduce its forecast cost of £199 million by some £8.5 million to bring it within the estimate of £191 million approved by the Secretary of State. The two most significant measures that were implemented were as follows:

- ▶ The Corporation reviewed the design of the Barrage structure and implemented measures intended to save £3.7 million by downgrading, postponing or cancelling features that it considered cosmetic or non-essential.
- ▶ The Corporation also reduced its contingency provision for the project by £2.3 million. This in turn helped to reduce the cost savings that it was seeking from £8.5 million to £6.2 million.

**2.5** In the event the savings, which the Corporation sought to achieve by redesigning elements of the Barrage structure, were offset by costs which the Corporation subsequently incurred as a result of the contractors implementing the changes.

- ▶ The Corporation had to pay additional fees amounting to almost £1 million because of consequent changes to the design of the Barrage and to manage and implement the changes.
- ▶ The Barrage, as originally designed, incorporated three locks for vessels passing through the Barrage. The Corporation sought to achieve a saving of £500,000 by delaying the provision of gates to the third lock. It reinstated this feature as part of the Barrage structure in 1997. The original plans for the Barrage envisaged that the third lock like the other two locks would be installed



behind stop logs in a dry environment. The delay in commencing work on the third lock meant that this was not possible and it had to be built in a tidal environment. Consequently, the cost of constructing the third lock amounted to £1.2 million, that is £700,000 more than the amount the Corporation initially sought to save by delaying this aspect of the construction of the Barrage structure.

**2.6** The reduction in the contingency provision to keep within the estimate had longer term implications for the project as a whole. In response to Welsh Office concerns, the National Audit Office looked at this specific aspect when it reviewed the project in 1995. It noted then that, in addition to the reduction of £2.3 million, the Corporation had also decided to use a further £2.7 million of the contingency provision to cover escalation or inflation costs that were not provided for within the budget of £191 million for the project. In commenting on this to the Welsh Office and the Corporation, the National Audit Office pointed out that this change in the contingency provision for the project could result in an inadequate allowance being made for additional costs that might arise later through, for example, the potential costs flowing from any delays to the project.

**2.7** In the event, the concerns of the National Audit Office and the Welsh Office were borne out by subsequent developments. By mid 1997, the need to pay contract variations and other unplanned but relevant costs meant that the potential contingencies which had not been paid for at that point exceeded the contingency reserve for the project by some £5 million. This in turn was a strong indication that, even if all the remaining elements of the project were completed to plan and on budget, the overall estimate for the project would be exceeded.

**2.8** In July 1997 the Secretary of State announced the results of the review he had commissioned of the Barrage project and

the fresh legal advice that he had been given on the European Birds Directive and on the Habitats Directive (paragraph 1.12). This had included an assessment of the economic case for the Barrage project and a comparison of the cost of dismantling what had been built by that stage with completing the project as planned. No change was made as a result of this review to the overall estimate of £191 million as the cost for the project as a whole.

**2.9** However by 1998 the Corporation's forecasts were confirming that it would be difficult to contain the project's costs within the overall estimate of £191 million. The Corporation carried out a further detailed review of the costs of the project and on 31 March 1999 the Secretary of State announced an increase of £6 million in the overall financial cap for the project, raising it to £197 million. This amount excluded an additional provision of £6.5 million for contingencies which was not announced publicly because it was commercial in confidence information. The increase reflected the need to make provision to meet new statutory requirements in relation to Landfill Tax and the Construction Design Management regulations in relation to Health and Safety. The increase was also intended to meet additional costs incurred in establishing the Gwent Levels Wetland Reserve (paragraph 2.12).

**2.10** Table 1 overleaf sets out the estimated cost of the different elements of the project and how these changed between 1995 and 2000. It also includes the latest revised estimate which shows that at 1 April 2000 the total cost of the project was expected to be £213.4 million.

**2.11** The most significant element within the revised estimate is the final settlement of the contract for the construction of the Barrage. Shortly before the Corporation was wound up, it negotiated with Balfour Beatty-Costain a full and final settlement of the construction contract valued at £120.24 million. This compared with the provision made for this aspect of the project, some £114 million.

In considering this proposal, the Assembly commissioned independent professional advice from George Corderoy & Co., a firm of chartered quantity surveyors and construction cost consultants. Corderoy assessed the Corporation's proposal and confirmed that it achieved a full and final settlement. Corderoy also examined all the unresolved contractual claims and against this background concluded that the proposal represented value for money. Corderoy's advice was endorsed by officials and the First Secretary subsequently approved the proposed settlement.

2.12 Against this background the National Audit Office Wales noted the following key points:

- ▶ The main factor influencing the change in the cost of constructing the Barrage was the unforeseen ground conditions which Balfour Beatty-Costain encountered. When the Corporation had been planning the design and construction of the Barrage, it had commissioned ground condition surveys of the area where the Barrage was to be built. Subsequently when Bechtel,
- ▶ the project managers appointed by the Development Corporation to oversee the construction of the Barrage, had carried out its initial risk analyses to assess the potential impact of factors that could affect or delay the construction of the Barrage, it had not identified unforeseen ground conditions as a significant risk to the project. Bechtel told the National Audit Office Wales that in preparing these risk analyses it had relied on the accuracy of the earlier ground conditions surveys. In the event these turned out to be inaccurate in particular with regard to the precise level at which the sands and gravels were considered suitable to support the Barrage structure.
- ▶ An important factor in containing the cost of the contract to construct the Barrage was the inclusion of an incentive clause. Under this the contractors, Balfour Beatty-Costain, were able to share the benefits flowing from any cost savings which they identified. This proved very successful and produced savings for the

**Table I - How the budget for the project changed between 1995 and 2000**

	Estimated Cost 1995 (£ million)	Revised Estimate 2000 (£ million)
Barrage structure	134.0	151.8
Water Quality(1)	6.7	6.2
Groundwater	11.0	11.2
Drainage	10.6	11.3
Bird Reserve	5.7	10.4
Legal Agreements	7.5	6.4
Design, planning and development	15.4	16.1
<b>Total</b>	<b>190.9</b>	<b>213.4</b>

Table I sets out how the estimated cost of the different elements of the project have changed between 1995 and 2000.

**Notes**

1. The estimate for 1995 contains some provision for the capital cost of oxygenation equipment. No provision is included in the estimate for 2000. Currently the best estimate of the capital investment needed to meet statutory water quality requirements is between £6 million and £7 million (paragraph 2.16).

Source: Cardiff Bay Development Corporation and the National Assembly for Wales

Corporation that amounted to £720,000.

- ▶ The approved plans for the Gwent Levels Wetland Reserve envisaged creating a site of some 377 hectares. The initial provision for the Reserve was £5.7 million. This was the estimated cost of the original reserve at Wentlooge that Parliament subsequently rejected. The estimate was transferred as a budget to fund a different scheme at a different location. The proposal for the Gwent Levels Wetland Reserve was to establish three different habitats and assumed that much of the wet grassland that would be needed for the Reserve would still be used for grazing for most of the year and that the owners of the land would be paid a fee for the use of their land. However, after the plan had been approved not all the relevant landowners wanted to enter into an agreement with the Development Corporation. Consequently, the Corporation had to ask the Land Authority for Wales to assist through compulsory purchase to obtain the land it needed for the Reserve. This meant that there then had to be a full public inquiry into creating the Reserve. So it was not until November 1997, after the Welsh Office Planning Inspector had made his recommendations, that the Secretary of State was able to give the go ahead for the scheme to create the Reserve. The effect of selecting a different scheme at a different location, the planning inquiry and the acquisition of all the land which was not originally envisaged was to increase the estimated cost of this part of the project from £5.7 million to £10.4 million. In addition, the Corporation also spent £200,000 on measures for birdlife in Cardiff Bay itself.

**2.13** As well as affecting the total cost of the project, the problems encountered with ground conditions in constructing the Barrage also influenced the timing of the completion of the project. Under the Corporation's original plans the target date for the creation of the freshwater lake was August 1998. In the event, impoundment of the Bay did not take place until November 1999. Subsequently, following the decision to give Cardiff County Council responsibility for the new Harbour Authority, the First Secretary announced in December 1999 that the target date for completing the project would now be the end of March 2001 because of the need to resolve issues relating to water quality in the Bay.

### **It is not yet clear what the final cost of the project will be**

**2.14** The main Barrage structure has now been substantially completed though it is not yet fully operational. In addition, some of the other elements needed to bring the inland freshwater lake into operation are not in place. Consequently, it is not yet possible to say what the final cost of the project will be. Several factors will influence the final figure. They include:

- ▶ contractual claims amounting to some £2.6 million that have not yet been settled;
- ▶ the postponement to later years of some elements of the project relating to water quality that may cost between £6 million and £7 million; and
- ▶ continuing and planned work amounting in value to potentially £8 million.

In addition, this expenditure will be offset by money due to be paid in 2005 by Welsh Water in respect of the drainage works associated with the project. The amount involved is not yet known though it is unlikely to exceed £4.3 million and may be less than this (paragraph 3.35).

## Contractual claims

**2.15** When the Corporation wound up it had not resolved some contractual claims in relation to the drainage construction work and the creation of the Gwent Levels Wetland Reserve. At 31 March 2000, claims in respect of drainage works stood at £1.8 million and those in respect of the Gwent Levels Wetland Reserve amounted to more than £800,000. At the time of completing this report, the Assembly was awaiting detailed proposals on settling these claims.

## The postponement of some elements of the project

**2.16** Currently, the best estimate of the capital investment needed to ensure that the water in the freshwater lake meets statutory requirements is between £6 million and £7 million. The new Harbour Authority, as part of Cardiff County Council, will now be responsible for making this investment and the Assembly will meet the cost. Originally, the Corporation had intended to have in place arrangements for water quality as part of its plans for completing the project and included provision for this in its estimates for the overall cost of the project. As part of this process, in 1998, the Corporation invited organisations in the private sector to compete for the contract to operate and manage the Barrage and the freshwater lake. The implications of this change are considered in more detail in Part 3 of this Report (paragraphs 3.2 to 3.4 and 3.10 to 3.19).

## Continuing work on the project that has not yet been completed

**2.17** As work to complete the inland freshwater lake continues, there are three important areas provided for in the original estimate for the project that have not yet been completed. These relate to dredging the Bay, the landscaping of the Barrage structure and the re-surveying of

properties around the Bay two to three years after the completion of the Barrage structure.

- ▶ **Dredging:** The Corporation's plans recognised from the outset of the project that, in order to meet minimum statutory requirements for water quality, it would be necessary to dredge the Bay before creating the inland freshwater lake. Originally the Corporation had planned to complete the dredging of the Bay by October 1996. However, because of the high cost of dredging in a tidal environment like Cardiff Bay, the Corporation decided to defer dredging until after the substantial completion of the Barrage. Accordingly, at the end of September 1999, the Corporation sought the approval of the Assembly for placing contracts for dredging the Bay to begin immediately after seawater impoundment, which took place on 4 November 1999, with the aim of finishing this work by spring 2000. The Corporation estimated that the cost of dredging to meet minimum water quality standards would be £4.3 million. The Corporation also estimated that it would cost an additional £2 million for deeper dredging in parts of the Bay in order to increase the range of water sports that could be undertaken. In line with the decision to delay freshwater impoundment to March 2001, the First Secretary asked the new Harbour Authority, once it was established, to consider in consultation with the Environment Agency Wales the scope and cost of the required dredging work.
- ▶ **Landscaping:** There is the need to landscape the Barrage to a minimum standard for example by creating gardens and building timber walkways. The Corporation had earmarked £900,000 for this purpose. Completion of the landscaping of the Barrage became the responsibility of Cardiff County

Council with effect from 1 April 2000.

- ▶ **House Surveys:** The Corporation has put in place arrangements to re-survey all properties in the Bay area. This is to help determine whether measures to prevent damage to properties have been successful. The re-surveys will cost £2 million and are due to be carried out two to three years after the closure of the Bay in November 1999. This programme is provided under the Cardiff Bay Barrage Act.

## Conclusions and main lessons for the future

**2.18** The Corporation faced a unique challenge in constructing the Barrage in one of the most extreme tidal marine environments in the world and in handling a project of considerable complexity. The commencement of the works and the promise of the new Bay environment were, however, viewed as key to attracting economic investment into the area and it is to the Corporation's credit that the structure of the Barrage was substantially complete and operational by November 1999 and that it had ensured as far as possible other tasks connected with the creation and operation of the freshwater lake were either largely finished or progressing well by the time the Corporation wound up on 31 March 2000. As matters currently stand the Barrage and freshwater lake will not be fully operational until March 2001 when the major remaining tasks, in particular dredging, remedial works on the fish pass and the testing of the Barrage systems operation are due to be completed.

**2.19** The approved cost of the project now stands at £213.4 million. This rises to £220 million when additional capital expenditure of £7 million for maintaining water quality in the Bay is included. This figure of £220 million compares with the

final outturn target of £191 million set by the Welsh Office in 1995 and represents an overall increase of 15 per cent.

**2.20** Against this background, these are some useful lessons for the future:

- ▶ Significant effort went into the design of the Barrage and the Corporation sought to develop an approach that did not focus just on price but took a wider value for money view.
- ▶ Because of the lengthy Parliamentary process associated with the 1993 Act, the Corporation was able to spend more time than originally planned in discussing and analysing the successful tender submitted by Balfour Beatty-Costain. The result was that when contracts were signed there were no unresolved issues between the Corporation and the contractor.
- ▶ The Corporation took account of the experience of other organisations in managing large capital projects. Instead of employing specialist project managers to "firefight" problems after they had occurred, the Corporation appointed Bechtel as project managers in advance of work commencing on the project and so, in a sense, adopted a "fire prevention" policy.
- ▶ The Welsh Office, in effect, imposed a cap on the overall cost of the project. This in turn created a discipline from the outset of work on the project for the Corporation to focus on cost control.
- ▶ The development of a team approach to the project, involving the contractor (Balfour Beatty-Costain), the project manager (Bechtel) and the Corporation together with the quality of the individuals who worked on the project also contributed to its successful outcome.

► One area of concern that did emerge from the examination undertaken by the National Audit Office Wales was the handling of the provision for inflation and contingencies. The Corporation took a risk in reducing this provision at an early stage in the project in order to find some of the savings needed to keep within the overall estimate set by the Welsh Office. This was because, at that stage, much of the construction of the Barrage had still to take place and also the likely cost of the linked environmental works was not finally known. Consequently, there was insufficient provision available to meet, among other things,

contractual claims arising at a later stage in the project. This serves to emphasise the need to ensure that for projects of this nature realistic provision is made to cover potential contingencies. In addition, for those projects which it oversees but does not directly control, the Assembly should ensure that there is clear accountability for the management and use of this provision. Also the Assembly should explore the feasibility of developing some incentive for the organisation concerned to keep within this provision.

## PART 3

### Succession Arrangements and Future Issues

**3.1** This part of the Report deals with the key issues for the future operation of the Barrage and the freshwater lake in terms of accountability, cost, operations and environmental obligations. The Corporation was wound up on 31 March 2000 and has provided the Assembly with its estimates of the future funding implications, including funding required by the Harbour Authority for operation and maintenance of the Barrage and the Bay and associated activities. Also, as set out in part 2 of the Report, there are certain aspects of the project that have not yet been completed as well as the issue of some unresolved contractual claims. In addition, there may also be potential liabilities for the Assembly should the Bay's new environment not behave as predicted.

#### **The successor bodies and their accountability to the National Assembly for Wales**

**3.2** In March 1999, when the Secretary of State for Wales confirmed the detailed arrangements for the wind up of the Corporation, he announced that responsibility for the operation of the Barrage and the freshwater inland lake would pass to a new Harbour Authority. He also announced that responsibility for the operation and management of the Gwent Levels Wetland Reserve would pass to the Countryside Council for Wales while the drainage schemes linked to the project would remain the responsibility of Welsh Water.

**3.3** On 1 July 1999, the Assembly took over responsibility for the Development Corporation and has been actively involved in overseeing and managing the wind up of the Corporation. After considering the options and on receiving an expression of interest from Cardiff County Council, the First Secretary announced that he had decided to transfer the Harbour Authority powers to operate and control the Barrage and activities in the Bay to a dedicated body within the Council and on

18 October 1999 he signed a Memorandum of Understanding with Cardiff County Council concerning the Barrage and the operation of the freshwater lake. Under the Memorandum of Understanding, the Council will put in place such arrangements to discharge the functions and duties of the Harbour Authority, as it determines, with the agreement of the Assembly. The Council will also be responsible for accounting to the Assembly for the Harbour Authority's expenditure. Cardiff County Council's responsibility for the Harbour Authority is intended to be a permanent arrangement. Though it will be subject to a review after five years when either party may choose to end the arrangement or to review the terms of the arrangement. On the wind up of the Corporation, ownership of relevant assets and responsibility for liabilities (including those associated with the Harbour Authority) were transferred to Cardiff County Council under section 165 of the Local Government Planning and Land Act 1980.

**3.4** Because funding for the Barrage and other responsibilities inherited from the Development Corporation will come almost entirely from the Assembly, the Harbour Authority's activities are to be ring fenced within Cardiff County Council. This new arrangement also raised the question of how the County Council would account to the Assembly and whether the Auditor General for Wales would have access rights to the Authority's books and records. The Assembly has ensured that appropriate arrangements are in place and that these will give the Auditor General for Wales the access that he requires in order to discharge his responsibilities to the Assembly.

#### **Bringing the Barrage into service**

**3.5** By April 1999, Balfour Beatty-Costain had completed the Barrage's first lock gate and the other mechanical and electrical works apart from the fish pass.

#### Figure 4 - The responsibilities of the new Cardiff Bay Harbour Authority

The new Cardiff Bay Harbour Authority will be responsible for

- ▶ maintaining and repairing the Barrage and other Bay structures
- ▶ operating the Barrage
- ▶ maintaining the water level and quality within prescribed limits
- ▶ implementing the groundwater protection and compensation measures
- ▶ issuing licences and collecting fees from Bay users
- ▶ fulfilling the statutory role of a harbour authority as set out in United Kingdom legislation including the banning or removing of dangerous vessels, making and enforcing bye-laws, maintaining lights, buoys and other equipment as required by Trinity House
- ▶ promoting use of the Bay in consultation with all interested bodies
- ▶ providing, or ensuring that others provide the necessary infrastructure of car parking, slipways, information points
- ▶ developing and conserving flora and fauna in consultation with the Countryside Council for Wales.

Source: National Assembly for Wales

Work to close the remaining gap in the Barrage embankment commenced at the end of May 1999 and since then all vessels have passed through the lock gates. By November 1999, all the contractual work on the Barrage was substantially complete though Bechtel, the project manager, identified a number of operational issues affecting, for example, the Barrage's control system that still had to be addressed.

**3.6** In addition to ensuring that all contractual conditions had been met, the Corporation also needed a licence to impound Cardiff Bay from the Environment Agency Wales before any form of non-tidal regime was introduced in the Bay. The Agency was particularly concerned to see

- ▶ satisfactory demonstration tests of the Barrage operations; and

- ▶ an approved Operations Policy and Procedures Manual in place.

**3.7** The Corporation asked for a licence to impound in November 1999 when work to close the Barrage was completed. At this point the Environment Agency Wales was not in a position to finally 'sign off' the Barrage's equipment as operational because neither of the Agency's key concerns had been satisfactorily resolved. However, in consideration of the level of risk involved, the public purse and the pressing timetable for completion, the Agency gave an interim two week approval subject to the satisfactory completion of commissioning tests, and appropriate staffing and reporting arrangements being in place. This arrangement was subsequently extended for a further two weeks to 1 December 1999.



**3.8** At the end of this extended approval period, the Agency remained concerned that ongoing technical problems, in particular in relation to the sensors controlling the Barrage's sluice gates, could cause a problem in the event of a potential flood. The Agency directed the Corporation, under Section 8 (1) of the 1993 Act, to disimpound the Bay back to a tidal regime. The Corporation, in accordance with the options available to it under the Act and as an alternative to complying, appealed to the Assembly about the reasonableness of the direction. In the event the Assembly did not have to take action because, after urgent discussions between the Corporation and the Agency, the Corporation established manual procedures that were acceptable to the Agency and that allowed the Agency to issue a further temporary impoundment licence which was subsequently extended to 31 March 2000. A further temporary three months licence has now been granted from 1 April to Cardiff County Council to undertake remedial works to the fish pass and complete the testing of the Barrage operating systems.

**3.9** From November 1999, Crest Nicholson Marinas Ltd was responsible under contract to the Corporation for operating the Barrage. This contract terminated on 31 March 2000 when the Corporation wound up. Cardiff County Council put in place its arrangements for the operation of the Barrage on 1 April. These involved the use of Crest Nicholson's services for a further limited period.

### **Future day to day management of the Bay and its related activities**

**3.10** On 1 April 2000 the new Harbour Authority will take on the responsibility for operating the Barrage and managing the inland Bay and the outer harbour. The Harbour Authority will also be responsible for ongoing activities with regard to completing all outstanding project activities, for dealing with unresolved contractual issues, for groundwater

control, for monitoring arrangements for birds and fish and for complying with legal obligations inherited from the Corporation.

**3.11** The Corporation had planned to put day to day Bay management arrangements out to contract by way of a facilities management contract and in August 1998 invited tenders for this contract. The Corporation received tenders from three organisations and, in assessing them, focussed on cost and technical and management competency. The Corporation also sought to develop competitive tension further by stipulating that the contract could be for a fixed period of either three or five years when it would be competed for again.

**3.12** As a result of this exercise, the Corporation selected Thames Water PLC as its preferred bidder in April 1999. Before entering into a formal contract with Thames Water, the Corporation sought the Assembly's approval in September 1999 following the conclusion of the final negotiated terms.

**3.13** The First Secretary, before making his final decision on whether to approve the Corporation's Thames Water contact proposals, consulted Cardiff County Council, the body that would take over from 1 April 2000 the responsibility for the Harbour Authority, including the operation and maintenance of the Barrage and the Bay. The First Secretary involved officials from the Corporation to give technical advice in further discussions with the County Council and the Environment Agency Wales. He also consulted representatives of the business community. The First Secretary concluded that the option not to proceed with the Thames Water offered advantages in terms of cost and affordability, better control of risk and a more comprehensive solution in terms of maximising the business and leisure potential of Cardiff Bay and that the cost over the next three years of the County operating and maintaining the Barrage and the Bay without Thames Water would be the most cost effective option and save the Assembly £3 million. Against this background, on 27 March 2000, the

Corporation concluded the Harbour Authority Section 165 Agreement with Cardiff County Council.

**3.14** As this Report was being finalised, Thames Water told the National Audit Office Wales that it had concerns about the procurement process in this case and about the savings stemming from the arrangements established with Cardiff County Council which the First Secretary said would be £3 million over three years, a figure which Thames Water questions. Thames Water had earlier raised these concerns with the Assembly and, on 6 April 2000, the First Secretary responded to them in writing. In his letter, the First Secretary said that the conclusion in November 1999, based on information provided by the Corporation, with the agreement of Cardiff County Council and the Environment Agency, was that proper procurement procedures were followed and that Cardiff County Council proceeding without Thames Water was better value for money. He went on to say that in the light of Thames Water's concerns about value for money, Assembly officials had conducted a thorough review of the proposals on a like for like basis and this had confirmed that the cost comparisons which formed the basis of the Development Corporation's advice to the First Secretary in November 1999, and the decisions taken, were robust and show a £3 million saving on the County Council proposal against alternatives. He also said that the relevant Section 165 Agreement between the Corporation and the County Council binds the County Council to providing the works, services and supplies, which could have been required pursuant to a contract awarded on the basis of the invitation to tender (paragraph 3.11) at a net equivalent cost not exceeding £19,313,191.

**3.15** In this context the Corporation emphasised to the National Audit Office Wales that its role had been one of providing technical advice (paragraph 3.13). The Assembly will wish to note that the National Audit Office Wales is currently undertaking an examination of the arrangements put in place for the wind

up of the Cardiff Bay Development Corporation. As part of this, the National Audit Office Wales will examine in detail all the Section 165 Agreements that were concluded between the Corporation and the successor organisations.

**3.16** The National Audit Office Wales noted that the arrangements devised between the Assembly and Cardiff County Council mean that the Council will take on overall responsibility permanently for the management and operation of the Barrage and the inland lake. Although this is expected to be cheaper over the next three years compared with other options considered, further competitive tension will have to be created after that period to help ensure continuing value for money. As part of the work to control future costs, the National Audit Office Wales recommends that the Assembly explores options that will provide some form of incentivisation for the County Council to secure financial savings where appropriate and to discharge its responsibilities as efficiently and economically as possible.

**3.17** As noted in Part 2 of this report, this type of approach provided useful benefits for all parties involved in the construction of the Barrage. In addition, a recent National Audit Office report (Modernising Procurement, HC 808 1998-99) noted that, amongst other things, an incentivised relationship can enable partners to secure mutual benefits as projects develop. If carefully thought out and targeted at areas where, for example, firm costs have been agreed, some form of incentivisation would benefit both the Assembly and the Council.

**3.18** The decision to award the facilities contract work to Cardiff County Council had some immediate consequences. In particular, the First Secretary confirmed that freshwater impoundment of the Bay would be delayed until early 2001 and no later than 31 March 2001. This will be about one year later than planned by the Corporation under the Thames Water PLC option. In addition, because the Barrage was not designed for saltwater entering the Bay in

either an open tidal environment or a more restricted saltwater impoundment environment, it will be necessary to take steps to protect the Barrage structure. The cost of this is estimated at some £1.1 million.

**3.19** As these arrangements were being finalised, the Corporation also raised with the Assembly its concerns about the safety issues associated with any reversion to a tidal regime. The Assembly shared these concerns and said in response that it was the intention of Cardiff County Council to follow the prolonged saline impoundment regime adopted by the Corporation. The Assembly commented that it was expected that there may have to be short periods during the summer months when the Environment Agency Wales might request more frequent emptying of the Bay to protect water quality and fisheries and that the County Council had undertaken to provide any additional safety measures should this be necessary. The Assembly confirmed that subject to this the County Council planned to continue with salt water impoundment with the agreement of the Environment Agency Wales until such time as the County Council can meet its objective of completing the dredging of the Bay and achieving freshwater impoundment by 31 March 2001.

## **How Bay funding costs have changed**

**3.20** The costs of operating the Bay will be significant. During the passage of the 1993 Act, the Corporation's consultants estimated that the net cost of operating the Barrage would be some £1.4 million a year. This was based on assumed operating expenses of £1.9 million offset by estimated operating income of £500,000. By 1997, when the review ordered by the Secretary of State was carried out, the annual estimated running costs had increased to £5 million.

**3.21** For 2000-01 the Assembly made a net provision of £21.4 million for the cost to Cardiff County Council of meeting the

responsibilities which it had inherited from the Development Corporation. This amount included a gross amount of £10.9 million for continuing work on the Barrage project and £10.6 million for the responsibilities of the Harbour Authority. The estimated overall net provision for 2001-02 is expected to reduce to £17 million. This figure includes a gross amount of £2.2 million for the Barrage project and £13.6 million for the Harbour Authority. From 2002-03 overall provision for the Harbour Authority will be £9 million a year though the overall net cost to the Assembly of funding the successor arrangements is forecast to fall to £5.8 million in 2004-05. This reflects the recovery in 2005 of the amount due from Welsh Water in respect of the drainage works associated with the project. The precise amount due is not yet known but is unlikely to exceed £4.3 million and may be less than this (paragraph 3.35).

**3.22** One way of limiting the net costs of operating the Bay is to optimise income potential. In 1992 it was estimated that some £500,000 a year could be earned, mainly from boat users. The estimate has not materially changed since then. Concessions made during the passage of the 1993 Act, for example to local yacht clubs, will limit the amount of revenue that can be generated from that source. In addition, the use of the freshwater lake for other purposes, such as wind surfing, which could also generate revenue, will be contingent on securing clearance from the relevant local authority Environmental Health Departments.

## **The environmental obligations bring with them significant responsibilities and some potential liabilities**

**3.23** As illustrated in Part I, the environmental works linked to this project are many and varied and have posed considerable challenges to the Corporation which has had to devote considerable

resources to them. Most of these resources have been targeted at meeting four aims:

- ▶ researching the water quality measures required and then getting the agreement of the Environment Agency Wales to them;
- ▶ assessing the danger of damage to properties in the Bay area and, where deemed beneficial and cost effective, putting in place dewatering schemes to prevent damage;
- ▶ diverting sewers that flow into Cardiff Bay (referred to as the drainage schemes); and
- ▶ the creation of the Gwent Levels Wetland Reserve to compensate for the habitat lost in Cardiff Bay as a result of the creation of the inland freshwater lake.

## The water quality regime in the Bay

**3.24** The 1993 Act defines the water quality standard required within the Bay as not less than five milligrams dissolved oxygen per litre at all times. Therefore, the Corporation put considerable effort into predicting the behaviour of the Bay after impoundment and agreeing with the Environment Agency Wales the most cost-effective measures for maintaining water quality and dealing with potential problems and so in this way protecting fish and other aquatic life as well as public health generally. There remains, however, the need to monitor, and maintain the level of water quality and to take other steps, for example providing fresh stocks of salmon and trout, and, if need be, further resources should measures of this kind not work as predicted.

**3.25** The new Harbour Authority now has the responsibility for implementing the key measures identified as necessary to monitor and maintain statutory standards

of water quality. However, the Assembly retains liability should the measures fail. The key measures are as follows.

- ▶ **To oxygenate the Bay:** At certain times of the year, mainly in summer, there is a risk that the level of oxygen in the water will fall below the level needed to meet the water quality standard specified in the 1993 Act and so put at risk fish and other aquatic life. In the view of the Development Corporation, the use of machines known as ‘bubblers’ to inject oxygen into the water was the best measure for dealing with this problem. However, with the decisions to delay freshwater impoundment and give overall responsibility for managing the Bay to Cardiff County Council, the precise means and cost of dealing with this issue is subject to review by the new Harbour Authority in consultation with the Environment Agency Wales.
- ▶ **To prevent algal problems:** A certain amount of algae will inevitably thrive in the Bay environment and discolour the water, particularly because the Taf and Ely rivers flowing into the Bay are rich in nutrients. The main problem is seen as the risk of blue-green algae growing because this could be a danger to health. Measures are therefore planned to remove algal scum and so prevent the build up of hazardous algae. However, the issue of the disposal route, for example to the sea, has not been resolved and will require the approval of the Environment Agency Wales and possibly also of the Department of the Environment Transport and the Regions. This awaits actual experience on the nature and extent of algal collections. At present there is no provision in budgets beyond transfer to local treatment works, and costs could increase if, for example, the quantities of algae are greater than expected.

- 3.26 To control nuisance plants, animals and insects:** There is a need to control both the spread of nuisance plants and also the potential proliferation of certain animals and insects, such as rats and midges, and so provision has been made to control and eliminate them as necessary.
- 3.26 To prevent seawater entering the lake:** Saline intrusion is a threat to the freshwater nature of the lake, in particular around the lock gates. One of the aims of the dredging contract (paragraph 2.17) was to build a sump at the Bay side of the lock gates so that any seawater intrusions can be collected and flushed back out to sea.
- 3.26 To collect litter:** Inevitably considerable amounts of litter (for example branches, drums, containers and other flotsam and jetsam) will either flow into the Bay from its feeder rivers or be discarded by Bay users. The Corporation had developed plans for collecting and disposing of this material which the new Harbour Authority will take on responsibility for.
- 3.26 To deal with one-off incidents of pollution or other emergencies:** Provision has been made to drain down the Bay in the event of a serious incident.

**3.26** In addition, in exceptional circumstances, there may also be the need to prevent or alleviate flooding. The 1993 Act expects the maintenance of a water level in the Bay of between four and four and a half metres above mean sea level unless a higher level is caused by, for example, high river flows. The view of the Environment Agency Wales is that the Barrage will match current levels of flood defence and is likely to create a worthwhile improvement in flood defences in the event of a surge tide coinciding with an extremely high river flow.

**3.27** Finally, there is also the possibility that the new Harbour Authority may have to meet further requirements to improve water quality as the result of changing regulations. For example, Cardiff Bay may be classified as a 'Sensitive Water' under the European Union's Urban Waste Water Treatment Directive. If this happens the Harbour Authority may need to take measures to reduce nutrient flows into the Bay from sewage discharges upstream in the Taf and Ely. The current estimate of the Environment Agency Wales for the cost of dealing with this is £4.5 million, a figure agreed with the Corporation and Cardiff County Council in November 1999.

### Preventing or repairing groundwater damage to properties

**3.28** The 1993 Act recognised that there was a risk of damage to local buildings resulting from any alteration to groundwater levels caused by the Barrage, in particular buildings in what is defined as the protected property area. The Corporation put in place arrangements for ascertaining the condition of buildings in the protected property area, through pre and post impoundment property surveys, so that owners could have redress should damage occur. The Corporation also faced the challenge of determining which parts of the protected property area were most at risk to rising groundwater levels and whether preventing changes in groundwater levels and consequent damage to properties was better than repairing after the event.

**3.29** Prior to impoundment and in accordance with a Code of Practice issued under the Act, the Corporation successfully arranged the survey of some 21,000 buildings representing virtually all the properties in the Bay area. The exceptions were a handful of properties whose owners never permitted access to their property despite repeated requests and who thus forfeited protection under the scheme. For those surveyed there should be certainty as to the effects of the

Barrage and the owners can be compensated should there be resulting damage to their property. Damage includes:

- ▶ settlement or subsidence to any part of the building;
- ▶ damage to drains or sewers or any other service to the property;
- ▶ dampness or free water in cellars, basements or voids; and
- ▶ dampness affecting walls, floors, timber, components, electrical fittings, heating appliances, pipework or any other part of the property.

**3.30** Assuming no immediate problems are apparent, the Corporation put in place arrangements for a second tranche of surveys between two and three years after impoundment in November 1999 to ascertain whether any changes are detectable. In addition, the Corporation and its successor body retain a liability for twenty years after impoundment, provided a claimant requests a further survey that shows the need for remedial work within the twenty year period. There is also provision under the Code of Practice for any claimant to claim compensation in lieu of remedial works and for proving damage to gardens, which are excluded from the surveys. In case of complaints concerning the scheme, the Corporation funded the costs of an Independent Groundwater Complaints Administrator. This will continue after the wind up of the Corporation.

**3.31** As a separate measure, the Corporation tried to identify those areas most at risk to rising groundwater levels and to assess whether protection by extracting groundwater through installing dewatering equipment would be cheaper than remedial works to repair any damage that may be done. After public consultation and a cost comparison exercise to justify that investment is cheaper than a 'do nothing option', the Economic

Development Secretary for the Assembly approved the groundwater control scheme in July 1999.

**3.32** The Corporation had identified 561 properties at risk at 5 separate locations in the Bay area. It also agreed the need for a scheme to install preventative de-watering equipment for the new Millennium Stadium. The resulting 6 dewatering scheme works were successfully completed at a cost of £2.9 million by November 1999. The maintenance costs, which the Harbour Authority will inherit are estimated at £336,000 a year. The Harbour Authority will also have responsibility for monitoring groundwater levels and for the extraction contracts. Any failure of the measures taken which causes damage to properties will result in the Assembly having to fund the remedial works.

## **Drainage schemes to severely restrict sewage inflows to the Bay**

**3.33** Drainage schemes were necessary in order to remove, relocate and improve public sewage outfalls adjacent to the Bay. Under the 1993 Act the Corporation was obliged to pay Welsh Water all relevant costs, including the cost of acquiring acquisition sites for new or improved pumping stations. As a result, other than in extreme storm conditions when water from surface drains cannot be stored for disposal elsewhere and so is allowed to flow into Cardiff Bay, all sewage is now diverted for treatment.

**3.34** In all 14 separate schemes were substantially completed before the impoundment of the Bay and a further two, not affecting impoundment, completed later. Managing the cost of these schemes presented a considerable challenge and was achieved mainly through a value engineering exercise which saved over £4 million on a scheme with gross expenditure at £15.6 million (and net expenditure of £11.3 million net when recoveries from Welsh Water are taken into account). However, as noted at

paragraph 2.15, there are contractual claims amounting to £1.8 million that have not yet been decided.

**3.35** Under the European Union's Urban Waste Water Treatment Directive, Welsh Water would have had to carry out some of these works by 2005. At the outset of the project, Welsh Water and the Corporation agreed that the Corporation should be compensated for these works, but not until 2005. The recovery of these monies is the subject of ongoing discussions on the precise scale of works that would have needed to be carried out under the Directive. It is assumed, at present, that the recovery is unlikely to exceed £4.3 million and may be less than this. The recovery will also be subject to some form of adjustment for inflation.

## Providing compensation for the lost Bay habitat

**3.36** To compensate for the loss of the Taf/Ely Estuary Site for Special Scientific Interest, the Corporation ensured that the Gwent Levels Wetland Reserve was substantially completed before impoundment of the Bay in November 1999. The two principal species lost from the Taf/Ely Estuary Site for Special Scientific Interest were Redshank and Dunlin. As a compensation measure, the Gwent Levels Wetland Reserve will support a significant number of these species and has been designed to attract and accommodate many other species. Two of these, Wigeon and Shoveler, are required to meet levels of national importance and, in line with the commitment made by the Secretary of State in June 1996, the Reserve as a whole is to be developed so that within five years it will qualify for Special Protection Area status alongside the Severn Estuary.

**3.37** Engineering work was required to convert the land purchased by the Corporation into a reserve capable of providing a varied habitat made up of saline pools, reedbeds and managed wet grassland. Much of the work involved earthwork movements, including the

removal of pulverised fuel ash left over from a closed coal fired power station, and the laying of pipes to move water around the reserve. Some further minor works continue and are due to be completed by spring 2000. The final cost of the Reserve is likely to be in excess of £10.4 million (almost £5 million more than originally expected).

**3.38** With the substantial completion of the works and prior to formally taking over the Reserve in April 2000, the Countryside Council for Wales managed the reserve for the Corporation under an interim arrangement. This initial phase of works after 31 March 2000 will be to ensure that the Reserve is managed so as to reach the national bird targets for Wigeon and Shoveler and to meet the Secretary of State's commitment for it to achieve Special Protection Area status within five years. Within due course, the Reserve will have facilities for the visiting public. The Countryside Council for Wales told the National Audit Office Wales that it was pleased with the standard of the Reserve and was confident that it should ultimately achieve the targets set. The estimated annual running cost of the Gwent Levels Wetland Reserve is £317,000 for 2000-01.

## Conclusions and Key Issues for the Future

**3.39** The Assembly has the obligation to fund in perpetuity the future running costs of the Barrage and the inland freshwater lake. It will look to the new Harbour Authority and Cardiff County Council to manage and control these costs as efficiently and effectively as possible. There remain though significant project issues to be resolved and meeting the various requirements on the environmental aspects of the project pose their own challenge. It will be essential for the Assembly to ensure that these are managed in a way that minimises the risk of incurring liabilities and other unplanned costs that would have significant financial implications for the Assembly.

**3.40** Against this background the Assembly will be developing policy, sponsor and funding arrangements with the new Harbour Authority, Cardiff County Council and the other organisations responsible for aspects of the day to day operation of the Barrage, the inland freshwater lake and the linked environmental projects. In this context, the National Audit Office Wales recommends that the Assembly pays particular attention to

- ▶ ensuring there is an adequate substitute for competitive tension in the contractual arrangements being put in place through, for example, the use of incentivisation to help secure and encourage efficient and economic operations;
- ▶ ensuring that there are sensible arrangements in place for identifying potential risks, managing those risks and developing cost effective mitigation measures so as to keep to a minimum any unplanned or unforeseen demands on the public purse;
- ▶ ensuring that due regard is paid to recovering any money that would have fallen due to the Corporation (for example in relation to work in connection with the European Union's Urban Waste Water Treatment Directive);
- ▶ ensuring that there is scope for maximising the revenue which the new Bay environment will generate.