

PARLIAMENT  
OF  
SOUTH AUSTRALIA

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# HOPE VALLEY RESERVOIR REHABILITATION PROJECT

## FINAL REPORT

*THE 132<sup>nd</sup> REPORT OF THE PUBLIC WORKS COMMITTEE  
August 2000*

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Third Session, Forty-Ninth Parliament

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## ***THE PUBLIC WORKS COMMITTEE***

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The Public Works Committee is established pursuant to sections 12A, B and C of the Parliamentary Committees Act, 1991, proclaimed February 1992.

The following members constitute the Fifteenth Public Works Committee as appointed on 2 December 1997:

**Mr Peter Lewis MP (Presiding Member)**

**Mr Joe Scalzi MP** (As from 28 October 1998)

**Ms Lea Stevens MP**

**Ms Gay Thompson MP**

**Mr Michael Williams MP**

Secretary to the Committee: **Ms Lyn Anderson**

Researcher: **Mr Keith Barrie**

## ***THE FUNCTIONS OF THE COMMITTEE***

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Section 12C of the Parliamentary Committees Act defines the functions of the Public Works Committee as:

- (a) to inquire into and report on any public work referred to it by or under this Act, including-
  - (i) the stated purpose of the work;
  - (ii) the necessity or advisability of constructing it;
  - (iii) where the work purports to be of a revenue-producing character, the revenue that it might reasonably be expected to produce;
  - (iv) the present and prospective public value of the work;
  - (v) the recurrent or whole-of-life costs associated with the work, including costs arising out of financial arrangements;
  - (vi) the estimated net effect on the Consolidated Account or the funds of a statutory authority of the construction and proposed use of the work;
  - (vii) the efficiency and progress of construction of the work and the reasons for any expenditure beyond the estimated costs of its construction;
- (b) to perform such other functions as are imposed on the Committee under this or any other Act or by resolution of both Houses.

## ***PART ONE : PREAMBLE AND PROJECT SUMMARY***

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### ***1.1 Term Of Reference***

#### ***Parliamentary Committees***

Parliamentary Committees are by definition a subset of Parliament, with the specific task to examine and report on individual initiatives, projects or policies of the government of the day, or issues of importance to society as a whole. Standing or permanent Committees are created by Act of Parliament and are charged with the ongoing examination of a series of subject categories such as Economic and Finance, Social Development, Environment Resources and Development, Statutory Authorities Review, Legislative Review, and, Public Works. In addition to standing Committees, select or non-permanent Committees are created from time to time by resolution of one or both houses of Parliament to examine specific issues. These Committees usually disband when their specific tasks are complete.

All Parliamentary Committees are made up of both government and opposition Members, with numbers of each calculated according to well established rules which reflect the numbers of seats each group holds in the Parliament. Much of the Committee process is, like Parliament, open to the public, and completed reports are public documents.

#### ***This Project***

The South Australian Water Corporation has referred to the Public Works Committee the Hope Valley Reservoir Rehabilitation project pursuant to the requirements of the Parliamentary Committees Act 1991. The Act requires the Committee to "...inquire into, consider and report..." to Parliament on such referred works. Under the terms of Parliamentary Committees Act, this level of public expenditure requires the project to be examined by the Committee.

Please refer to the "Functions of the Committee" on the previous page for a full description of the Committee's tasks.

## **1.2 Further Reporting To The Committee**

SA Water is required to notify the Committee in writing should there be substantial changes to the nature of the project or the evidence provided to the Committee **at any stage in the project**. If the basis on which the Committee has reported to Parliament alters in a manner which renders the report inaccurate or misleading, the proposing Agency is obliged to inform the Committee immediately. To enable appropriate monitoring of the project, the proposing agency must also advise the Committee of Cabinet approval, the day on which construction begins, and provide quarterly reports on progress of construction.

The Committee further requires that, prior to the completion of the proposed work, SA Water must forward a statement to the Committee pursuant to section 12C (vii) of the above Act which outlines the efficiency and progress of construction, and provides an explanation of any expenditure beyond the estimated costs quoted in this report. Evidence of any substantial changes to, or the withdrawal of, any approval, provisional or otherwise, must also be relayed to the Committee immediately with an appropriate explanation, and an assessment of the probability of a suitable resolution.

In addition, the Committee requires that it be notified of the proposed date for the commissioning of the works.

The Committee has the authority under Section 16 (1)(c) of the Parliamentary Committees Act to reopen investigations into any project for the purpose of further examination and monitoring.

## **1.3 Scope Of This Report**

This Report examines the history of the proposal and the efficacy of the application of South Australian taxpayer funds to rehabilitate the Hope Valley Reservoir. The Report structure is guided by, and largely limited to, the terms of the Parliamentary Committees Act. It describes in summary the evidence presented to the Committee both in writing and during hearings, followed by the results of the Committee's investigation and examination of evidence, and concludes with a brief summary incorporating findings and recommendations.

Committee reports are not designed to be exhaustive. They are a summary of investigations only. Detailed evidence upon which the Committee's decision is based is held in Parliament and, in most cases, can be examined by making an application to the Committee Secretary.

## **1.4 Project Background**

SA Water owns, operates and maintains 17 dams throughout the state. They range in age from 22 to 128 years old. The oldest is the Hope Valley Dam that was completed in 1872 and is situated in a tributary of the River Torrens in the lower Adelaide foothills. It is constructed of earth and consists of a dam 21 meters high and 765 meters long and has a useable capacity of 3,630 ML. The reservoir provides a short-term balancing water storage capacity supplying the Hope Valley Water Treatment Plant which supplies the requirements of the northern inner city metropolitan area.

In 1996, as part of its due diligence process, SA Water commissioned a risk assessment of its 17 large dams. The report identified 25 separate risk reduction measures that would be required to bring all 17 dams into line with current accepted practice of dam safety. The report ranked the projects to ensure that the program of rehabilitation projects would achieve the most cost-effective rate of risk reduction. The Hope Valley Reservoir rehabilitation was rated as one of the highest priority projects because it represented the greatest opportunity improvement in risk reduction.

## PART TWO: EVIDENCE PRESENTED TO THE COMMITTEE

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### **2.1 The Current Proposal**

In order to improve the safety of the dam and the safety of people living below the dam, the following remedial works and operational practices are proposed.

#### *Reservoir Embankment Stabilisation*

The Committee is told that modern engineering best practice requires a minimal stabilising fill, or berm, across the central portion of the dam. When post-earthquake conditions and piping potential (see below) are taken into account, the required stabilising fill is substantially larger. The proposed berm is shown in schematic form on the drawings included in Attachment 1.

The existing clay berm is to be removed as part of the works. The proposed new berm will be constructed of quarry material covering a filter and drainage layer. The exact materials adopted will depend on availability and cost and will be finalised during the tendering process.

Construction of the berm can only be undertaken during the winter, as it will be necessary to take the reservoir out of service. The water level in the reservoir must be at a low level during construction for safety but will be raised again prior to peak demand in summer. This may require taking the reservoir and treatment plant out of service for several months.

#### *Piping*

Piping is the term used to describe a mode of embankment failure that involves the washing out of smaller soil particles from a section of the dam wall by water leaking through a weak point in its structure. The progressive removal of the fine soil particles increases the rate of flow of water and the rate of removal of the soil particles. As the rate of leakage accelerates further, larger soil particles can be transported and eventually localised collapse of the dam wall will occur (usually, 2–24 hours after the first concentrated leak is observed). In many cases, this results in a substantial dam failure with consequences of the same order of that of an earthquake failure.

The risk of a piping failure will be reduced by the placing a filter system over the downstream face of the embankment beneath a new berm. This will assist in limiting the movement of fine soil particles and subsequent localised collapse of the dam wall, or total dam failure.

#### *Flood Protection*

There is a risk that flooding resulting from a very large rainstorm may cause overtopping of the reservoir, leading to failure by erosion of the reservoir embankment. The Committee is told that three options were considered to protect the reservoir under these circumstances:

- construction of a spillway designed to allow floodwaters to safely overtop the reservoir without causing catastrophic failure;
- raising the reservoir wall by around 1.5 metres to provide the required storage capacity to catch all floodwaters within the reservoir;
- raising the reservoir wall by 0.5 metres and lowering the maximum reservoir operating level by 1.0 metre to provide the required storage capacity for floodwaters.

The third option has been chosen. The cost of a suitable spillway was too high and the relatively small upstream catchment meant that storing the floodwater is significantly cheaper. The existing dam foundations are not strong enough to raise the dam wall without lowering the maximum operating level of the reservoir.

## **2.1 The Current Proposal (cont.)**

### *Post Earthquake Protection*

The percentage of risk of loss of life due to earthquake, as opposed to other dam failure possibilities, is very small and represents in the order of 1% of the risk. Nevertheless, the changes mooted to mitigate other risks will reduce this risk even further.

The combination of the full height embankment berm, a full height filter layer and an increase in freeboard (excess storage capacity gained by lowering the maximum reservoir operating level), will retain the stored water should the dam wall slump in height as a result of vibration caused by an earthquake.

As the risk of an extreme flood occurring at the same time as an earthquake is extremely remote, the conjunction of these two events has not been given specific consideration.

### *Outlet Modifications*

Upgrade works are proposed for the existing upper and lower level outlets. These outlets were decommissioned when the Hope Valley Water Treatment plant was constructed.

The upper level outlet will be designed to act as a rapid drawdown outlet for emergency release of water in the event of a problem occurring that threatens the safety of the dam. The lower level outlet will be used as a scour drain for removing stale water that can stratify and collect at the bottom of the reservoir, and will also enable lowering of the reservoir below the upper level outlet.

### *Expert Review Panel*

The Committee is told that SA Water has engaged a panel of experts including geologists, hydrogeologists, dam design experts and construction specialists. The panel will review the suitability of the rehabilitation works with particular emphasis on dam safety design and construction issues. The panel reports directly to SA Water on the suitability of the designs, and any recommendations are forwarded to the design consultants for inclusion in the project.

The expert review panel will be asked to review the final design documentation to confirm that the required level of risk reduction has been achieved.

### *Emergency Response Planning and Early Warning Systems*

The dam portfolio risk assessment conducted by RAC Engineers (Utah) and SA Water's expert review panel has identified that daily inspection of clay core dams is obligatory, considering the possible rapid failure modes. Daily inspection of all SA Water dams is now occurring. If a leak is found populations downstream of the reservoir may need to be warned quickly. Investigations into possible early warning systems for this dam include:

- traditional sirens as used by the Country Fire Services;
- a directed voicemail system whereby residents in downstream areas would be telephoned and played a recorded message that informs them of a potential problem with the reservoir and instructs them to leave the area.

As part of the public consultation process residents in the area will be briefed on these proposals and asked to comment. Once the rehabilitation is complete the risk of rapid failure will be substantially reduced but the warning system will be maintained. The warning system may be tied to the system proposed by the Bureau of Meteorology for the entire State.

## **2.2 Consultation**

The Committee is told that there have been informal discussions with the Tea Tree Gully City Council but residents have not yet been informed of the project due to the alarm that could be generated.

Consultation with the public will consist of:

- a project fact sheet issued to nearby residents, together with media releases to local papers;
- establishment of an info-line for the project;
- workshops with residents and the preferred construction contractor;
- workshops with downstream residents regarding the planned developments, the impact of construction activities and the introduction of emergency evacuation procedures;
- discussions with the Tea Tree Gully Council and Transport SA regarding haulage routes.

The South Australian government agencies consulted regarding elements of the project include:

- Crown Solicitors Office;
- Department of Treasury and Finance;
- Department of Premier and Cabinet;
- Department for Environment Heritage and Aboriginal Affairs;
- SAICORP.

The Committee is told that the Department of Premier and Cabinet, the Department of Treasury and Finance and the Crown Solicitor consider that this project has been developed in accordance with legal requirements and accepted procedures and guidelines. No outstanding issues have been identified.

The Committee accepts that the proposing agency has undertaken all appropriate agency and community consultation.

## **2.3 Aboriginal Heritage**

All proposed works are on SA Water owned land, which has been substantially disturbed by the construction and operation of the reservoir. All construction contracts will include a requirement to notify SA Water of the discovery of items that may be of Aboriginal heritage significance.

During August 1999 the Department of Environment, Heritage and Aboriginal Affairs were consulted in relation to Aboriginal heritage matters for the proposal and no issues were identified.

The Committee accepts that investigations undertaken by the proposing agency indicate that the proposed works will not impact any sites of Aboriginal significance.

## **2.4 Heritage Buildings**

A search of local government, State and Federal heritage registers has confirmed that there are no registered items of significant heritage value at the site. However, SA Water is aware of a study commissioned by Heritage SA that covers the Hope Valley Reservoir area and is considering items for future registration on the City of Tea Tree Gully's Local Heritage Register. The Committee is told that SA Water will monitor the outcomes of this report, and respond to any recommendations that the council may adopt that relate to the Hope Valley Reservoir site.

The Committee is satisfied that investigations undertaken by the proposing agency reveal that there are no heritage listed buildings on the site that will impact on the proposed works.



## **2.5    *Environmental Issues***

The Committee is told that environmental due diligence and consultation processes have been used in the development of the concept for the project. Most potential environment impacts comprising construction noise, dust and disruption to traffic are considered to be short term, and able to be mitigated by implementation of an environmental management plan. In particular, Environment Management plans shall comply with the requirements of ISO 14000 and the Stormwater Pollution Prevention – Code of Practice for the Building and Construction Industry. A key environmental issue will be the management of dust and sediment on site.

Contractors will also be required to submit a plan for the delivery of quarry materials to site. Truck routes and delivery times will need to be determined with due consideration to their impact on local residents and businesses.

## **2.6    *Site Inspection***

On 11 August 2000 a delegation of the Committee inspected the site of the proposed project. Members noted the layout and structure of the dam, outlets and treatment plant. They gained a full appreciation of the nature of the proposed rehabilitation works — particularly as they relate to the upgrade and security of the outlets.

Members also inspected areas that will be affected by any failure of the dam.

## ***PART THREE: FINDINGS OF THE COMMITTEE***

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### ***3.1 Project Justification***

The proposed works constitute part of SA Water's dam safety program to reduce the risks associated with its large water supply dams. The risks are being reduced to a level that is as low as reasonably practicable and in accordance with modern international benchmarks.

The Committee is told that many dams constructed decades ago do not meet current dam design practice and, in many cases, downstream development has increased the hazard associated with dam failure. The level of understanding of the seismic threat to dams has grown in recent decades and modern engineering practices also provide a more severe safety evaluation of the effects of floods and earthquakes.

The Committee is told that the following important reservoir safety outcomes are expected from this project and will reduce the risk of failure in any one year from one in 2,000 to one in 320,000:

- a significant reduction in the risk of breach due to internal failure of the dam wall (piping);
- a significant increase in the stability of the dam wall under normal operating conditions;
- a significant reduction in the risk of dam wall failure by ensuring the reservoir is capable of containing the flood resulting from the most severe rainfall that could be expected (termed the Probable Maximum Precipitation);
- a significant reduction in the risk of failure due to an earthquake;
- increased security of water supply system serviced by Hope Valley Reservoir.

After the implementation of the proposed project, SA Water intends to investigate the merits of the following additional upgrades to this reservoir, as part of a program for all SA Water dams:

- the development of a comprehensively documented Dam Safety Emergency Plan including an early warning system;
- a formal Dam Operating Manual outlining all day to day operating procedures for the Hope Valley Reservoir.

### ***3.2 Public Value Of The Proposed Project***

Approximately 450 people reside between the reservoir and the Torrens River in the area that would be rapidly inundated following dam failure. The consultants engaged by SA Water estimate the maximum consequences of failure of the Hope Valley dam to be:

- a possible loss of 208 lives;
- \$75 million in infrastructure costs;
- SA Water business costs.

This does not allow for any financial impacts resulting from injury, loss of life or the economic cost to the state associated with loss of water supply to 25% of Adelaide. Reconnection of water supply to all effected consumers could take several months.

The primary aim of the proposed project is to ensure that best practice dam engineering standards are applied to ensure that the probability of dam failure is as low as can be practically achieved.

### ***3.3 Revenue Earning Capacity Of Proposed Project***

This is a risk reduction project that is necessary to limit the risks associated with dam ownership and operation. While it is essential to ensure the ongoing viability of SA Water's business, the project is not being undertaken for the purpose of generating additional revenue.

### ***3.4 Whole Life Costs Of The Project***

### Capital Costs

The total amount applied for the construction of the project is estimated to be \$8.80 million. This cost is based on preliminary design drawings, is in year 2000 values and makes no allowance for the Goods and Services Tax (GST).

### Recurrent Costs

There will be no change in the operating cost of the reservoir as a result of this project. These costs are currently \$554,000 per annum.

### Economic Analysis

The Committee is told that consultants engaged to undertake a comparative Net Present Value (NPV) assessment of costs and risk analysis of various options in the financial assessment concluded that the proposed project is the least cost solution (Attachment 2). Each option achieves a 100-fold reduction in risk of failure compared to the do-nothing option. However, the chosen solution also improves the probability of being able to warn residents in the event of any problem occurring.

Although the study indicates that the cost of dam failure would be very high, the resultant benefit cost ratio in the economic evaluation is low as the probability of dam failure in any one year is very low. Therefore, the project cannot be justified on a pure economic basis.

The practice of assigning economic value to potential lives saved is not considered to be appropriate in an economic evaluation.

## **3.5 Estimated Net Effect Of The Work, And Its Use, On Public Funds**

Allowance for the proposed project has been incorporated into SA Water's Financial Plan that determines the contributions SA Water will pay to the consolidated account. Therefore the impact on the Consolidated Account has already been factored into the Government's financial plans.

## **3.6 Project Delivery**

The target date for project completion is September 2001. The construction will be split into two stages with stage 1 completed as soon as possible to reduce the risk associated with the operation of the reservoir. The construction of the berm in stage 2 requires the lowering of the reservoir from the end of summer 2000/2001. A more detailed program is shown in Attachment 3.

A panel of SA Water staff and design consultant's representatives will evaluate expressions of interest and tenders for all contracts in accordance with SA Water contract procedures. Contractors will be asked to demonstrate compliance with the Civil Contractors' Federation Integrated Management System, or equivalent. This requires a documented and auditable system for managing quality, occupational health and safety issues and environmental issues associated with civil construction projects. They will be required to meet the following additional requirements:

- experienced key personnel;
- experience on related construction projects;
- a sound financial position;
- a track record in effective management of occupational health and safety and environmental aspects of similar construction activities;
- a track record for effective contractual dispute resolution

All SA Water contracts will be formulated in accordance with government legislation and procurement practices, while utilising SA Water's contract documentation including Australian Standard AS2124.1992.

## **3.6 Project Delivery (cont.)**

The SA Water project management system is based on the Corporation's version of the 'PRINCE2' project management system and has been developed in line with the principles of ISO9001, continuous improvement and customer satisfaction. The Committee is told that the project team

includes representatives from the water operations, contract management, and corporate finance sections of SA Water together with designers from PPK, SMEC and BC Tonkin & Associates.

SA Water has appointed a single project manager for this project and that officer is responsible for project formation, contract execution and system delivery.

### ***3.7 The Efficiency And Progress Of The Project And Justification Of Any Expenditure Beyond Estimated Costs***

The Committee will monitor the progress of the project as required by the Parliamentary Committees Act through the regular reports the proposing agency is required to provide prior to the completion of construction (refer to "Further Reporting to the Committee" page 3). The Committee will provide a further statement to Parliament in the event that subsequent information provided renders this Report inaccurate or misleading.

## **PART FOUR : CONCLUSION & RECOMMENDATION**

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After an inspection of the site, examination of written and oral evidence including the proposing agency's assurance that acquittals have been received from the Departments of Treasury and Finance, Premier and Cabinet and Attorney-General that works and procedures are lawful) the Public Works Committee finds the proposal to rehabilitate the Hope Valley Reservoir to be soundly based. The Committee is satisfied that the proposal has been subject to the appropriate agency and community consultation and meets the criteria for examination of projects as set out in the Parliamentary Committees Act 1991.

In 1996, as part of its due diligence process, SA Water commissioned a risk assessment of its 17 large dams. The report ranked the projects to ensure that the program of rehabilitation projects would achieve the most cost-effective rate of risk reduction. The Hope Valley Reservoir rehabilitation was rated as one of the highest priority projects because it represented the greatest opportunity improvement in risk reduction.

Approximately 450 people reside between the reservoir and the Torrens River in the area that would be rapidly inundated following dam failure. The consultants engaged by SA Water estimate the maximum consequences of failure of the Hope Valley dam to be:

- a possible loss of 208 lives;
- \$75 million in infrastructure costs;
- SA Water business costs.

This does not allow for any financial impacts resulting from injury, loss of life or the economic cost to the state associated with loss of water supply to 25% of Adelaide. Reconnection of water supply to all effected consumers could take several months.

The primary aim of the proposed project is to ensure that best practice dam engineering standards are applied to ensure that the probability of dam failure is as low as can be practically achieved.

The project involves the following remedial works and operational practices:

- a minimal stabilising fill, or berm, across the central portion of the dam. Construction of the berm can only be undertaken during the winter, as it will be necessary to take the reservoir out of service for several months;
- placing a filter system over the downstream face of the embankment beneath the new berm. This will assist in limiting the movement of fine soil particles and subsequent localised collapse of the dam wall, or total dam failure;
- raising the reservoir wall by 0.5 metres and lowering the maximum reservoir operating level by 1.0 metre to provide the required storage capacity for floodwaters;
- upgrading the existing upper and lower level outlets. The upper level outlet will be designed to act as a rapid drawdown outlet for emergency release of water in the event of a problem occurring that threatens the safety of the dam. The lower level outlet will be used as a scour drain for removing stale water that can stratify and collect at the bottom of the reservoir, and will also enable lowering of the reservoir below the upper level outlet.

The estimated capital cost of the project is estimated to be \$8.80 million. There will be no change in the operating cost of the reservoir as a result of this project.

The Committee is told that consultants engaged to undertake a comparative Net Present Value (NPV) assessment of costs and risk analysis of various options in the financial assessment concluded that the proposed project is the least cost solution. Each option achieves a 100-fold reduction in risk of failure compared to the do-nothing option. However, the chosen solution also improves the probability of being able to warn residents in the event of any problem occurring.

#### **4. Conclusion and Recommendation (cont.)**

Although the study indicates that the cost of dam failure would be very high, the resultant benefit cost ratio in the economic evaluation is low as the probability of dam failure in any one year is very low. Therefore, the project cannot be justified on a pure economic basis.

The target date for project completion is September 2001 and the construction will be split into two stages. Stage 1 will be completed as soon as possible to reduce the risk associated with the operation of the reservoir. The construction of the berm in stage 2 requires the lowering of the reservoir from the end of summer 2000/2001.

The proposed works will reduce the risks associated with the Hope Valley Reservoir to a level that is as low as reasonably practicable and in accordance with modern international benchmarks.

The Committee understands that SA Water has engaged a panel of experts that will review the suitability of the rehabilitation works with particular emphasis on dam safety design and construction issues. The expert review panel will be asked to review the final design documentation to confirm that the required level of risk reduction has been achieved.

The Committee also understands that the expert review panel has identified that daily inspection of clay core dams is obligatory because of the possible rapid failure modes. Daily inspection of all SA Water dams is now occurring. Investigations are also occurring into possible early warning systems for this dam.

Contractors will be required to submit a plan for the delivery of quarry materials to site so that truck routes and delivery times can be determined with due consideration to their impact on local residents and businesses.

The Committee is told that the following important reservoir safety outcomes are expected from this project and will reduce the risk of failure in any one year from one in 2,000 to one in 320,000:

- a significant reduction in the risk of breach due to internal failure of the dam wall (piping);
- a significant increase in the stability of the dam wall under normal operating conditions;
- a significant reduction in the risk of dam wall failure by ensuring the reservoir is capable of containing the flood resulting from the most severe rainfall that could be expected (termed the Probable Maximum Precipitation);
- a significant reduction in the risk of failure due to an earthquake;
- increased security of water supply system serviced by Hope Valley Reservoir.

Given the above and pursuant to Section 12C of the Parliamentary Committees Act, 1991, the Public Works Committee reports to Parliament that it recommends the proposed public work.

**Peter Lewis MP**  
**PRESIDING MEMBER**  
**Public Works Committee**

**August 2000**

## ***PART FIVE : ATTACHMENTS***

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### ***5.1 List Of Witnesses And Submissions***

#### ***Witnesses***

The following persons appeared before the Committee on Wednesday 26th July, 2000 at Old Parliament House, North Terrace, Adelaide:

Mr Roger Perry, General Manager, Bulk Water, SA Water Corporation;  
Mr Van Kennewell, Project Director, Dam Safety Program, SA Water Corporation.

#### ***Submissions***

Hope Valley Reservoir Rehabilitation Project, Report to the Public Works Committee, July 2000, South Australian Water Corporation.

***ATTACHMENT: 1***



# ***ATTACHMENT: 2***



# ***ATTACHMENT: 3***