

Chapter 1

Introduction

1.1 Terms of reference for the audit

The *Sydney Water Catchment Management (SWCM) Act 1998* requires that a catchment audit of the state of the Sydney Drinking Water Catchment area be undertaken every two years. The Catchment covers over 16,000 square kilometres. It extends from the north of Lithgow south to the source of the Shoalhaven River near Cooma, and from the Woronora River in the east to the source of the Wollondilly River west of Goulburn. To facilitate the selection of management options to improve water quality and the health of the catchment the Sydney Drinking Water Catchment has been divided into 28 sub-catchments (see Figure 1.1).

The Act also requires that a report of the audit be submitted to the Minister for the Environment (being the Minister administering the Act). The primary purpose of the audit is to provide guidance for the management of the Sydney Drinking Water Catchment by reporting catchment health indicators and identifying trends (where data is available).

The Minister commissioned the Environment Protection Authority (EPA)* in July 2003 to undertake the 2003 audit and issued it with the following terms of reference with the requirement to submit the Audit Report by 30 November 2003:

1. Audit and report on the catchment consistent with current methods used for the purpose of New South Wales' state of the environment reporting, focusing on the priority sub-catchments.
2. As part of the audit, consult with stakeholders within and outside the catchment to seek information and data that may assist with the audit and to seek comments relating to the state of the catchment.

1.2 Application of pressure-state-response model to the audit

The Terms of Reference for the audit requires the use of a state of the environment 'pressure-state-response' (PSR) model for reporting its findings. The PSR model has been developed as an approach to understand the condition or health of large complex environmental systems where problems are either difficult to observe or ascribe to specific causes.

PSR is an appropriate model to use for a catchment audit especially for an area as large and diverse as the Sydney Drinking Water Catchment. Specifically it provides a framework for systematically reporting the state of the environment. This approach, which has been adopted by most State and Territory governments, not only attempts to describe the state or condition of the environment but also to identify the pressures that have caused, or are still causing problems, and the implications of these for the wider environment. This approach also broadly describes governmental and societal responses to deal with those problems and highlights significant gaps.

* The Department of Environment and Conservation (NSW) is a new State Government department which was created on 24 September 2003. It brings together the Environment Protection Authority (EPA), the National Parks and Wildlife Service (NPWS), Resource NSW and the Royal Botanic Gardens and Domain Trust, and also links with the work of the Sydney Catchment Authority (SCA).

Indicators

The primary challenge in using the PSR model is to develop an agreed set of indicators that describe key features of the system under investigation and where possible describe how important attributes are behaving through trend analysis. As the problems that are identified by a catchment audit have generally emerged over long time frames (often over many decades) and will take considerable time to fully resolve, using indicators that can be efficiently collected over long periods to provide robust trend analyses are particularly important. This will enable trends to be documented and changes identified against the baselines (once established).

A key focus of this audit has therefore been the development of a set of core indicators that will provide effective headline information to guide the management of the Catchment. In considering indicators for the audit the following were taken into account:

- the objectives of the SWCM Act
- indicators used and/or proposed by previous catchment audits by the CSIRO (1999, 2002)
- Review of the Catchment Audit Framework - Sustainable Investment Research Institute (SIRIS) (2003)
- Catchment Indicators for the Sydney Catchment Audit – CRC for Freshwater Ecology (1999)
- monitoring currently undertaken by Sydney Catchment Authority (SCA) for various reporting requirements
- indicators used/proposed and monitoring being undertaken for related natural resource management frameworks including National Monitoring and Evaluation Working Group and Catchment Blueprints
- draft NSW *State of Environment Report 2003* indicators.

In selecting a suite of indicators there is often a temptation to broaden the number of indicators used to gain a comprehensive understanding of the environmental systems that are being reported on. However the experience of previous and current audits is that there are significant limits and gaps in the data sources available to generate indicators. In proposing a methodology for future audits, the CSIRO in its 2001 audit reviewed the applicability of the biophysical indicators it had recommended in its 1999 audit for relevance (see CSIRO 2002, pp. 168–171). This review suggested combining several indicators and dropping others that had a primarily operational focus. The effect of these suggestions was to reduce the number of proposed indicators to 26.

The *Review of the Catchment Audit Framework* (SIRIS, 2003) cautioned against further expansion of the indicators for the audit including recommending against the adoption of social and economic indicators. It also recommended that the audit task be clearly focused on the state of the land constituting the Catchment.

The auditors support this view and consequently have sought to identify a minimum set of indicators that would provide a coherent understanding of the condition of the Catchment across two key objectives:

- protection of water quality
- protection of ecosystem health.

The approach taken was to identify themes that address the key elements of these objectives (four themes were chosen) and then relevant pressure and state indicators were selected from the sources referred to above, to optimise the alignment between the audit's indicators and those used for other purposes. Similar to the approach taken by the CSIRO in its 2002 report, the audit team sought to minimise duplication and further consolidate indicators. Through this process 17 indicators were identified for potential use.

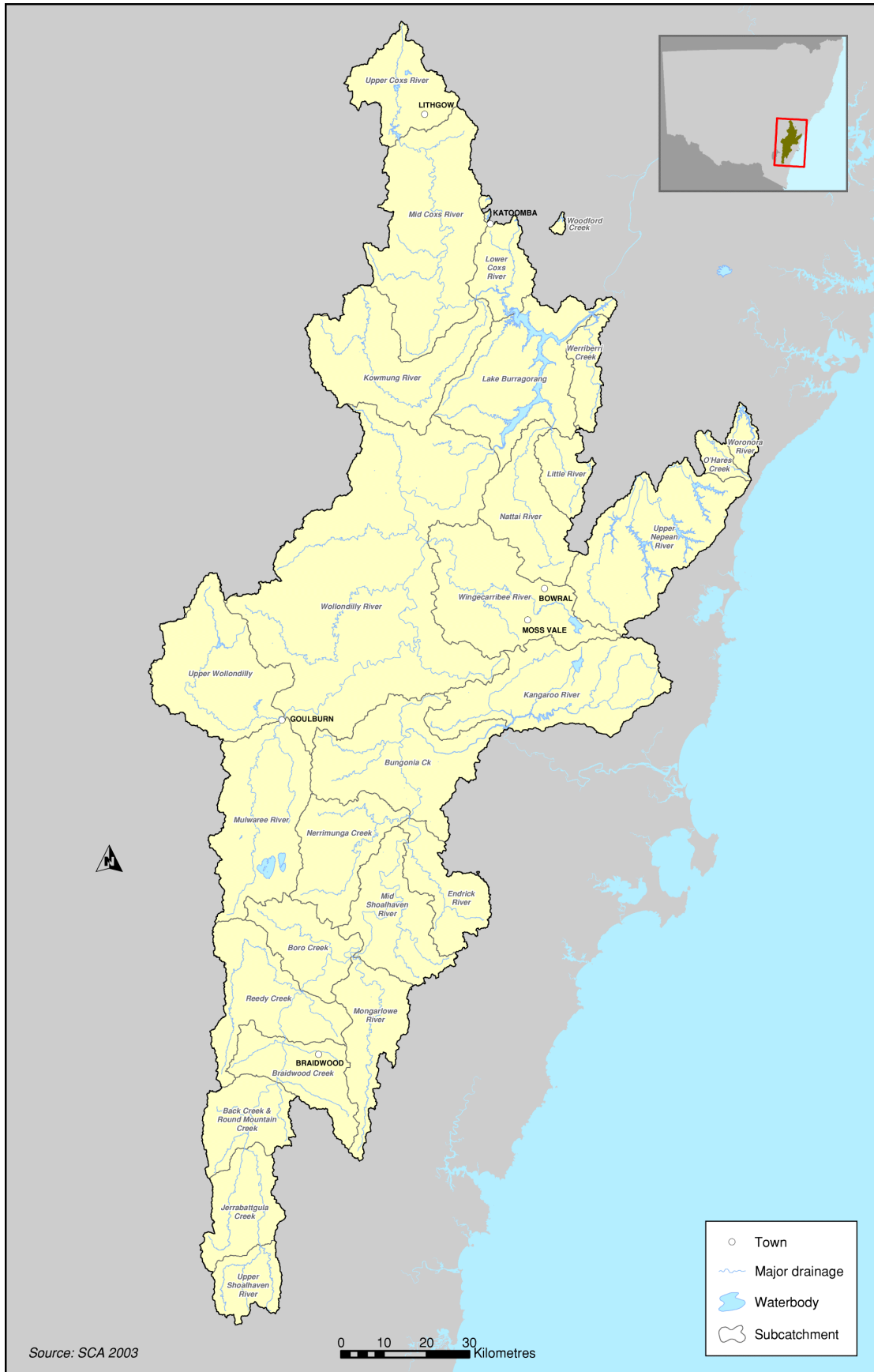


Figure 1.1 – Map of the Sydney Drinking Water Catchment

A draft outline of the report themes and proposed indicators was made available to stakeholders. Comments received were considered in the finalisation of the themes and the 16 indicators used for the audit. Table 1.1 outlines the themes and indicators used by the audit, and shows whether the indicator is used by the 2001 Audit Report, the SCA's Annual Report or the draft NSW State of the Environment Report 2003. Details regarding the themes and the indicators are provided in the relevant chapters of this report.

1.3 Audit methodology

Scope

The audit has focused on developing and reporting on indicators related to the state of the Sydney Drinking Water Catchment to guide responses by all relevant stakeholders. The audit has not attempted to set response indicators nor to do an operational assessment or evaluation of programs referred to in the audit.

There are other processes more appropriately set-up for the assessment of programs. Similarly the audit has primarily focused on issues within the Catchment area and has not sought to address issues such as water demand management external to the Catchment (see section 1.6).

Review of documentation

The SCA provided the audit with a large range of background material to support its task, including the reports of the 1999 and 2001 Catchment Audits conducted by the CSIRO. This material was used extensively by the audit team and provided a strong foundation for developing the Audit Plan and preparing this Report. A full list of material provided to the Audit by the SCA is provided at Appendix B.

Conduct of the audit

A work plan was prepared outlining key steps for the audit process including:

- scoping the project
- selecting core indicators (see section 1.2)
- identifying information needs and gathering data to prepare indicators
- consultation with stakeholders including requesting specific information and data for the audit analysis (see section 1.4)
- inspection of the Catchment area
- collecting, processing and analysing the available data to prepare the indicators and actions and response sections
- reviewing quality assurance and quality control processes for main data provided to the audit (see Appendix C)
- identify data, knowledge and response gaps
- develop options for addressing these and draft findings and recommendations for the report.

Assessment of data used in the audit

The audit did not directly collect primary data for this report. Rather, it deliberately set out to use existing datasets so that wherever possible it could report on the condition of the Catchment over the audit period. This generally involved the audit requesting agencies (primarily SCA) to prepare specific

analyses of databases to provide input to the indicators. A number of different processes were used to test the reliability and integrity of such data and analysis. These include:

- reviewing datasets used for analyses and seeking explanations of anomalies or gaps
- comparing data/analysis to relevant independent sources
- reviewing internal audit reports for specific datasets.

Stakeholders that provided information and data to the audit were provided with a draft of the relevant part of the report to provide an opportunity to comment on the accuracy of use of that information. A list of these stakeholders is provided at Appendix D.

1.4 Consultation

A key component of the audit was consultation with stakeholders. The audit used a variety of mechanisms to seek input from stakeholders ranging from a broad invitation to submit relevant information and comments, to direct contact and meetings with key stakeholders to help gather information and data to assist the conduct of the audit.

Submissions were invited from interested parties through a notice in the press (in *The Sydney Morning Herald* and 20 regional papers) and letters to key stakeholders including state and local government agencies, industry and non-government organisations and members of SCA's consultative forums. Twenty-three submissions were received: 12 from State Government agencies (including the Hawkesbury–Nepean Catchment Management Board), four from local government, three from non-government groups, two from industry and two individual responses. A full list of organisations who made submissions to the Audit is provided at Appendix E.

Table 1.1 Themes and indicators for the audit report

Minimising contamination of raw water supply		2001 CA	SCA AR	2003 SoE	Managing water resources		2001 CA	SCA AR	2003 SoE	Protecting and improving land condition		2001 CA	SCA AR	2003 SoE	Maintaining and enhancing ecosystem health		2001 CA	SCA AR	2003 SoE
2.1 Nutrient loads Loads from point and diffuse sources by land use	P	✓	✓	✓ 5.4	3.1 Surface water extraction	P	✓		✓ 5.2	4.1 Changes in land use Extent and type of land use in the catchment area and any changes	P	✓	✓	✓ 4.1	5.1 Ecosystem water quality objectives Exceedence of ANZECC guidelines	S		✓	✓ 5.5
2.2 Raw water quality criteria Operating requirements for water filtration plants	S		✓		3.2 Ground water extraction	P	✓		✓ 5.8	4.2 Sites of potential contamination Progress of risk assessment and management process	P				5.2 Macro invertebrates AusRivAS health rating	S	✓	✓	✓ 5.1
2.3 Algal blooms Incidence of toxic and non toxic algal blooms	S	✓	✓	✓ 5.7	3.3 Environmental flow objectives	S	✓	✓	✓ 5.3	4.3 Soil erosion Erosion hazard map	S	✓	✓	✓ 4.2	5.3 Fish Fish populations in streams and storages	S	✓		
2.4 Pathogens Occurrence of <i>Cryptosporidium</i> and <i>Giardia</i>	S	✓	✓							4.4 Salinity Salinity hazard map	S	✓	✓	✓ 4.3	5.4 Riparian Extent and condition of riparian vegetation	S	✓	✓	
															5.5 Native vegetation Extent and condition of native vegetation	S	✓	✓	✓ 6.1

P – Pressure Indicator S – State Indicator

2001 CA – Catchment Audit 2001 (CSIRO)

SCA AR – SCA Annual Environment Report 2001–02

2003 SoE – draft *NSW State of the Environment Report 2003* – indicator numbers refer to draft NSW SoE 2003 Indicators (May 2003)

1.5 Report on recommendations of 2001 audit

The 2001 Audit made 31 recommendations covering a very broad range of issues. This audit has taken careful account of these recommendations and where appropriate has made reference to specific recommendations within relevant sections of the report. A summary of the recommendations, the key issues they raise and the level of response since the 2001 audit are outlined below. The recommendations from the 2001 audit have been divided into the following categories so that wherever possible they are grouped within the themes presented in this report. Therefore categories 2 to 5 correspond to the themes presented in Chapters 2 to 5 respectively. The 2001 audit recommendations, as numbered in the report, have been categorised as follows:

Category name	2001 Audit recommendation
1. Integrated catchment management – institutional arrangements	1, 6, 25
2. Minimising contamination of raw water supply	13, 14, 15, 16, 17, 22
3. Managing water resources	10, 11, 12, 24, 28
4. Protecting and improving land condition	4, 5,
5. Protecting and enhancing ecosystem health	8, 9, 18, 19, 20, 21, 23
6. Audit structure and synthesis of information	2, 3, 7, 31
7. Other issues	26, 27, 29, 30

Progress against the 2001 recommendations

Integrated catchment management – institutional arrangements

Integrated Catchment Management was covered by three recommendations in the 2001 audit which made specific recommendations regarding institutional arrangements for managing the Catchment. Institutional arrangements clearly influence the ease in which appropriate responses to the catchment issues are developed and implemented. However there are a multiple of options of institutional arrangements to address the issues confronting the Catchment with a variety of strengths and weaknesses. Given that new institutional arrangements relating to catchment management have only recently been announced this Audit has not addressed the responses to these recommendations. It should also be recognised that good catchment outcomes will only be achieved by the cooperation of all stakeholders regardless of institutional arrangements.

Minimising contamination of raw water supply

Minimising contamination of raw water supply was featured by six recommendations in the 2001 audit. These recommendations covered two broad contamination issues. The first on microbial pathogens which required further research into detection, risk, behaviour and impact on water supplies, while the second highlighted the need for improved management of sewage treatment plants (STPs).

Progress on these recommendations have generally been positive with a number of research projects having been initiated in response to the audit recommendations. Disease surveillance studies undertaken during and after the 1998 outbreak of *Cryptosporidium* found no evidence of increases in gastroenteritis cases. Hence the recommendation for an epidemiological study into reported gastroenteritis cases in relation to wet weather

events was not actioned because it was unlikely to provide any conclusive results. Increased emphasis was placed on the priority and monitoring of STP compliance and the management of the consequences of compliance failure.

The actions and responses to minimising contamination of raw water supply from various diffuse and point sources including pathogens and STPs are also outlined in Chapter 2 – Actions and Responses.

Managing water resources

Managing water resources was covered by five recommendations in the 2001 audit which covered improvements to water resource data collection, assessment of environmental impact and improving the efficient use of water resources.

There has been little action on improving the collection of data on water flows or extractions from surface water or groundwater. Although the 2001 audit attributed this task to the SCA, this is more appropriately a responsibility of the Department of Infrastructure, Planning and Natural Resources (DIPNR). This audit has made similar recommendations regarding the need to address these issues. There has been some progress on the issue of undertaking baseline surveys in waterways potentially affected by longwall coalmining. (See also a broader discussion of mining related issues in Chapter 4).

Protecting and improving land condition

Protecting and improving land condition was referred to by two recommendations within the 2001 audit. The issue of progressing the risk assessment and management process for potentially polluted sites in a more systematic manner is also the subject of a recommendation from this audit (see Chapter 4).

Protecting and enhancing ecosystem health

Protecting and enhancing ecosystem health was featured by seven recommendations in the 2001 audit. These recommendations covered improved monitoring and assessment of native vegetation, habitats and water quality across the entire Catchment and development of management plans to restore and protect the ecological value of Special Areas and riparian zones.

While there has been progress on the water quality monitoring, gaps still exist (see Chapter 5). Monitoring and assessment of native vegetation and habitats has undergone a scoping study assessment but as yet no decision has been made towards on-ground actions. There has also been development and implementation of management plans for Special Areas. A comprehensive riparian strategy has been developed by the SCA however it is still in its assessment stage.

Audit structure and synthesis of information

Audit structure and synthesis of information was featured by four specific recommendations in the 2001 audit. These recommendations cover the frequency and structure of the audit, integration, analysis and interpretation of existing data and the inclusion of social and economic indicators into the terms of reference of future audits.

There is a strong argument that once core water quality and catchment health indicators have been committed to, and baseline data established for trend analysis, the frequency of the state of the catchment audit should be reduced because of the small changes in ecosystem conditions that could be expected to be shown in under a five-year period. There has however only been limited progress in developing core water quality and catchment health indicators, and related trend analyses. This audit has therefore particularly focused on developing a core set of indicators for measuring catchment health for use in the future audits.

It is important to consolidate the information collection that would result in the relevant information being available for indicator analysis. Responsibility for the collection of specific data most appropriately lies with the agency charged with managing that issue (e.g. surface water quality data should be collected by SCA

while surface and ground water extraction data should be collected by DIPNR). As discussed in section 1.2, the *Review of the Catchment Audit Framework* (SIRIS, 2003) recommended against the adoption of social and economic indicators.

As noted above under 'Integrated catchment management', the Government has recently announced new institutional arrangements for catchment management. At the time of the audit enabling legislation for these reforms (i.e. Native Vegetation Bill 2003, Catchment Management Authorities Bill 2003 and the Natural Resources Commission Bill 2003) were before Parliament. It is anticipated that among other functions these reforms will create catchment audit processes which could potentially duplicate the requirements under the SWCM Act.

Recommendation 1: That the review of the SWCM Act consider extending the frequency of the Catchment Audit to five years. Consideration should also be given as to the potential for rationalising catchment audit processes within the Catchment as natural resource management frameworks evolve.

Other issues

The final group of recommendations primarily related to the management of cultural and heritage sites and the SCA's internal management practices. As outlined above the audit has not considered these issues.

1.6 Relationship of the audit to other government processes

In addition to the Sydney Drinking Water Catchment audit there are a number of audit and review processes that examine various aspects of the Catchment's management and health, and the supply of drinking water to Sydney and Illawarra areas. These include:

- **Audit of SCA's Operating Licence** – This process which is undertaken by the Independent Pricing and Regulatory Tribunal (IPART) includes an annual audit, a mid-term review (May 2003), and an end-term review (June 2005). These audits establish the SCA's operational compliance in regard to: memoranda of understanding with key agencies, customer supply, bulk water quality, catchment management and protection, management of catchment infrastructure and its environment plan.
- **Audit of SCA's Water Management Licence** – This process, undertaken by DIPNR, includes an annual audit of the SCA's Water Management Licence issued under Part 9 of the *Water Act 1912*. The major objective in licensing the SCA is to manage its access to water resources within its area of operations.
- **Statement of Intent (SOI) Audits undertaken by the Healthy Rivers Commission (HRC) for the Hawkesbury–Nepean, Georges River/Botany Bay, and Shoalhaven River catchments** – This process involves an audit two years after the release of the SOI to report on the progress of the general and specific principles and strategies endorsed by the government on river specific issues.
- **Hawkesbury–Nepean River Management Forum (HNRMF) and Independent Expert Panel** – As part of the Government's response to the Hawkesbury–Nepean River Inquiry by the HRC, the HNRMF was established. The purpose of the HNRMF is to examine and recommend environmental flow release strategies downstream of the Sydney Catchment Authority's dams to enhance the environmental quality of the river for their inclusion in the SCA's Water Management Licence. The HNRMF is supported by the Independent Expert Panel which was appointed by the Government. It's anticipated that the HNRMF's report will address the sustainability of Sydney's water supply, demand management, inter catchment transfers, water efficiency targets, effluent re-use and environmental flows.

The audit has sought not to duplicate the core work of these processes and has focused reporting on the health of the Sydney Drinking Water Catchment, consistent with its terms of reference.

1.7 Stakeholders roles and responsibilities for the health of the Catchment

The SWCM Act established the SCA with specific powers and responsibilities with respect to the management of the Catchment. However there are a diverse range of organisations and communities who also have significant roles and responsibilities that impact upon the state of the Catchment. A list of these and their roles and responsibilities is provided in Appendix F.

In addition to other State agencies including the recently announced Catchment Management Authorities, councils have an important role as environmental managers. Local businesses, landowners and residents generally can also have a significant impact through their day-to-day decisions.

It is important to acknowledge that in many instances the overall environmental outcomes for the Catchment are a culmination of smaller decisions by multiple stakeholders.

1.8 Independence of the audit

In July 2003, the Minister for the Environment asked the EPA to undertake an audit of the state of the land within the Sydney Drinking Water Catchment area. *The Sydney Water Catchment Management Act 1998* requires an audit to be conducted every two years by a person nominated by the Minister for the Environment. The two previous audits were undertaken by the CSIRO in 1999 and 2001. On 24 September 2003 the Minister and the Premier established the Department of Environment and Conservation (NSW), incorporating the staff of the EPA. While the SCA continues as a separate statutory authority, a new close linkage between the new department and SCA was established.

The EPA initially instituted the following structural arrangements to preserve the independence and transparency of the audit:

- Tony Wright, as Deputy Chairperson of the EPA Board and Chairman of the State of the Environment Advisory Council, was invited to review the Audit Report and to confirm the independence and integrity of the audit process. In particular, he was invited to confirm that the audit had appropriately reviewed the EPA's own roles and responsibilities as a regulator operating within the Catchment.
- A project manager was appointed to the then Policy, Economics and Environmental Reporting Branch to undertake the audit to ensure that the audit was independent of any regulatory role of the EPA for activities within the Catchment area. A project team was established drawing significantly from the Environmental Science Branch as well as on the expertise of other areas of the EPA as required. The project team operated at 'arms-length' from the relevant regulatory staff.
- An internal Steering Committee was established to oversight the preparation of the audit comprising senior staff from relevant areas of the Department to ensure all aspects of the audit were undertaken transparently.

Following the establishment of the Department of Environment and Conservation (NSW) the Steering Committee for the audit reconsidered the Audit Report review and approval process and confirmed that the previously established process of review by Tony Wright continued to provide appropriate review of the independence of the Audit Report. The Report was jointly endorsed by Mr Tony Wright and Mr Simon A Y Smith (Chair of the Steering Committee) and forwarded to the Minister for the Environment.

1.9 Audit Team

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1.10 Audit Steering Committee

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