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Susan E. Williams is the manager of benchmarking for the City of Monash in Melbourne, Australia. She is responsible for performance reporting, training teams in benchmarking, undertaking community needs and satisfaction surveys, and updating the city government's corporate plan. She has initiated and implemented the introduction of benchmarking in each division and established a benchmarking and quality group to oversee all benchmarking and quality projects.

Prior to this appointment, Williams worked as the project manager for the Australian national government's benchmarking project. Funding obtained for this project was a direct result of Williams' original research. During her tenure, she oversaw the development of the *Practical Guide* for implementation of benchmarking in local government in Australia and New Zealand, and managed the pilot study with 24 councils throughout Australia.

Williams spent several years working in the Victorian Public Service in the Department of the Premier and Cabinet, the Department of Labour, and Community Services Victoria. Before joining the public service, Williams undertook medical research developing and testing vaccines and was part of a team that analyzed the French nuclear atomospheric tests for the World Court.

Williams earned a bachelor of science degree from Melbourne University and a master of business administration from the Royal Melbourne Institute of Technology. In addition to *Benchmarking for Local Government*, Williams has written numerous articles for local governments and public sector journals, and has presented a number of papers on benchmarking at national conferences.

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CHAPTER 23

Syndicate Benchmarking: Water Supply and Sewerage

Roger Patrick, Chief Operating Officer and Director of Specialty Consulting, WRc inc., and Peter Mackenzie, Director, Urban Water Division, Department of Land and Water Conservation

Executive Summary

Working as a syndicate, seven municipal government organizations used benchmarking to identify cost and other improvements in sewage collection and transport. The syndicate approach shared costs, and allowed pooling of talent from small organizations, which would have been impossible acting individually.

The key results and findings of the project were as follows:

- Cost reductions of an average 18 percent were identified.
- Numerous service and environmental improvements were identified.
- Payback on the total investment (including all time and cash costs) was 100:1.
- Forty percent of the benefits were identified by comparisons between syndicate members.
- Many best practices were organization-specific.
- Even for commonly accepted best practices, benefits varied widely among individual organizations.

Study Purpose

Water supply, sewerage, and drainage services in nonmetropolitan New South Wales, Australia (NSW), are provided by 128 municipal councils. Pressure to reduce costs and justify price levels lead the industry bodies to consider benchmarking.

To avoid duplication of effort, the NSW Department of Land and Water Conservation (DLWC) together with the Local Government and Shires Associations (LGSA) decided to

initiate a pilot project involving a number of councils working together as a syndicate. The goals of this pilot project were to

- Assess the benefits of syndicate benchmarking for local government councils providing water supply, sewerage, and drainage services in NSW.
- Prepare guidelines for these councils on syndicate benchmarking.
- Make recommendations on how councils might undertake benchmarking of these water services.

Because of its high labor content and significant impact on costs, customer levels of service, and environmental performance, a steering committee selected *operation and maintenance of sewage collection and transport* as the pilot process for benchmarking. Sewage collection and transport involve the conveying of domestic and industrial sewage through pipe work and pumping stations, to waste treatment plants. Sewage treatment processes were not part of the pilot project.

Team Operation

The project syndicate comprised seven councils, which were selected from 24 respondents to an expression of interest sent to all councils in country NSW. The syndicate was assisted by a facilitator and a specialist consultant. The facilitator handled the logistical requirements of the team, and the consultant provided the methodology, training, and analytical tools. Without preempting the project outcomes, the consultant also provided some insights and guidance based on similar benchmarking studies.

The project was conducted over a six-month period from September 1995 to March 1996, and followed the methodology shown in Figure 23.1. It progressed through a series of syndicate workshops and individual efforts by syndicate members. Most analysis was done individually by members. The workshops were held every three weeks or so. They were mainly used for training, to review and analyze work done individually by syndicate members, to reach common decisions, and to prepare for the next phase of the project. The team members held each other mutually accountable for adhering to deadlines.

Approach and Conduct of the Study

Financial and customer analyses were undertaken individually by each syndicate member

- To understand how resources are expended within the key processes for their organizations
- To understand customer needs and expectations and link these to the key processes
- To identify priority areas within the key processes that have the greatest impact on financial performance and customer service

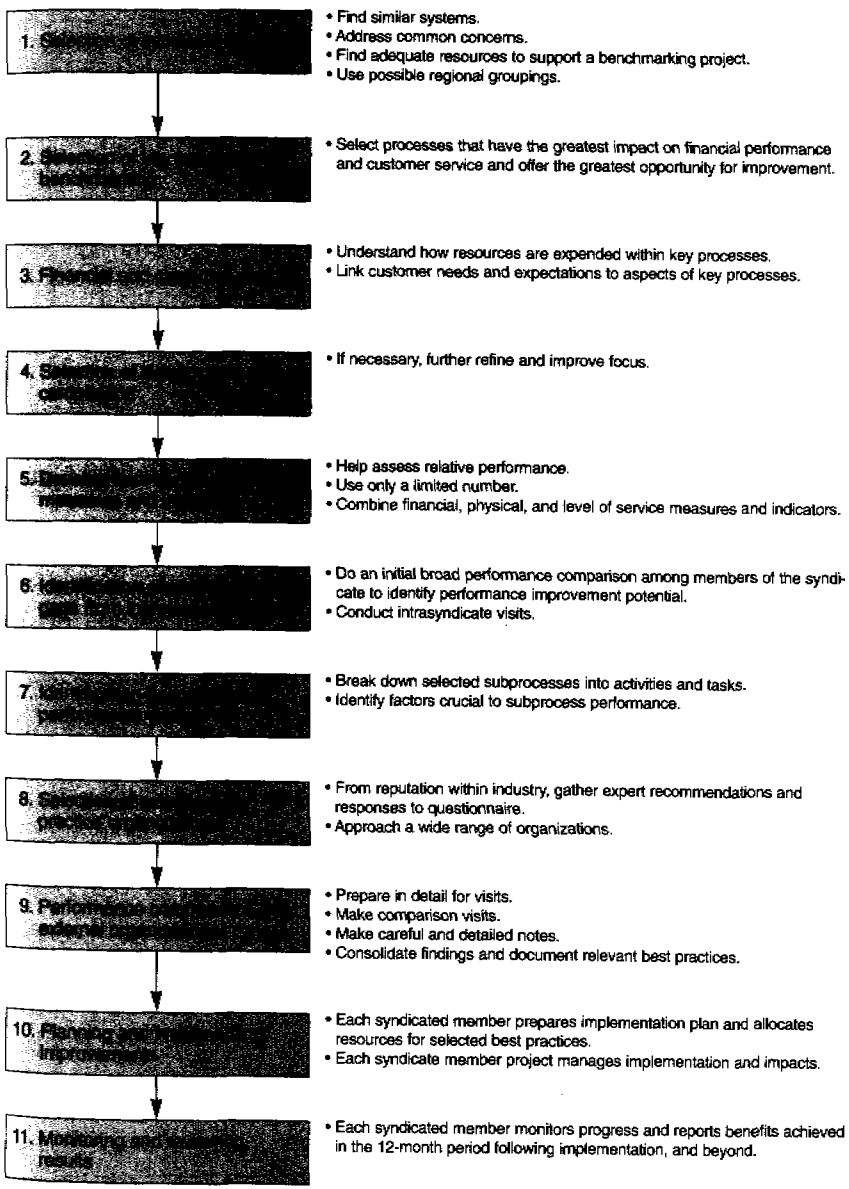

Figure 23.1. Syndicate benchmarking methodology.

Financial Analysis

A common framework for describing the main activities within the sewerage process was agreed, and each syndicate member allocated costs within this framework. It was similar to those used previously by the consultant for other water/wastewater industry clients. This allowed on-paper comparison to similar organizations outside the syndicate, as well as between syndicate members. Due to the absence of commonly accepted activity-based costing systems within the industry, and variations in overhead allocation methods, estimation was needed in many cases to allocate costs.

Customer Analysis

Customer needs were established by devising a questionnaire based on a range of eight probable needs, and each member conducting a telephone survey of several hundred customers. The results were analyzed for three customer types: (1) general community/domestic consumers, (2) commercial customers, and (3) industrial customers.

Once a ranked list of needs was developed, each member team linked delivery of needs against how well each main activity was performed. Strong links were rated 9, moderate links 3, weak links 1. The total scoring and prioritization for the general community/domestic customer group is shown in Figure 23.2.

In this example, the highest customer need was for a safe, healthy system. Therefore, this was rated an 8. The strong links were to the activities "operate SPS" (sewage pumping stations) and "inspect sewers." These links are shown as 9s. Examining Figure 23.2 reveals how the weighting system works to give a total score for each activity. The most important activity turned out to be operate SPS, with a score of 258. The lowest was eliminate WWF (wet weather overflows), with a score of 62.

It was not considered necessary to flowchart the process, since the work carried out was comprised mainly of a set of activities to maintain system operations, rather than a sequentially linked series of steps to produce a product.

On the basis of these analyses, syndicate members divided the sewerage process into two subprocesses for detailed investigation and analysis.

1. Operation and maintenance of sewage pumping stations
2. Operation and maintenance of sewer reticulation mains

Key Performance Measures

Performance measures were developed for the key processes and the selected subprocesses. These were used to identify performance gaps within the syndicate via internal performance comparison among the syndicate members, and to compare against existing external benchmarks.

The performance measures and results for each syndicate member, and the best known results, are shown in Figure 23.3. The syndicate members and the consultant used their

Customer needs	Rank	Main activities: Operate SPS	Inspect sewer	Clean sewer	Preventive maintenance	Reactive maintenance	Improve system performance	Eliminate WWF	Customer service
Safe healthy system	8	9 72	9 72	3 24	9 72	3 24	3 24	1 8	1 8
Environmentally responsible system	7	9 63	1 7	1 7	9 63	1 7	1 7	1 7	1 7
Reliable system	6	9 54	3 18	3 18	9 54	9 54	3 18	3 18	3 18
No odors	5	9 45	3 15	9 45	3 15	3 15	3 15	3 15	1 5
Efficient customer service	2	1 2	3 6	1 2	1 2	3 6	1 2	3 6	9 18
Appropriate pricing	3	3 9	1 3	1 3	3 9	1 3	1 3	1 3	1 3
Timely understandable bill	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	9 9
Rapid response to problems	4	3 12	1 4	1 4	3 12	3 12	1 4	1 4	3 12
Weighted total		258	126	104	228	122	74	62	80
Weighted rank		1	3	5	2	4	7	8	6

Figure 23.2. Domestic consumer/community segment priority needs ranking against activity performance.

Performance measures	U.S. Australia	Council 1	Council 2	Council 3	Council 4	Council 5	Council 6	Council 7	Best known practice
Total cost/kilometers pipe/year		$ 1136 $A1398	$ 2423 $A2980	$ 2272 $A2795	$ 2065 $A2540	$ 1704 $A2096	$ 1214 $A1493	$ 2894 $A3560	$ 967 $A1190
Nontrades hours/SPS/year		90	220	88	233	180	47	142	N/A
Mechanical and electrical maintenance hours/SPS/year		19	52	66	54	34	71	85	30
Dry weather overflows/year		177	Negligible	Very low	Very low	2.00	6	10	Negligible
Pipe blockages/100 kilometers/year		173	380	60	183	37	59	49	13

Figure 23.3. Performance measures: Sewer operations and maintenance.

combined experience to identify the major performance drivers; that is, the key factors that influenced performance under the following domains.

- Planning and scheduling
- Technology
- Organization
- People
- Other

For the high-priority activities, a range of performance drivers was identified by the syndicate. Examples of performance drivers for cleaning down walls in pumping stations (a preventative maintenance activity) included the following:

- How often the work was done (planning and scheduling)
- Type of equipment used (technology)
- Whether the work was done in-house or contracted out (organization)
- Experience and skill of work team (people)
- Physical structure and design of pumping station (other)

These performance drivers were then reviewed against the current work practices and experiences of individual syndicate members, and best practices among the syndicate members were identified. A list of practices and issues considered to have the greatest impact on costs and customer needs was prepared. Then the syndicate decided what data would be required to compare performance with other organizations, and how these data would be collected prior to the benchmarking visit. Syndicate members also estimated potential benefits should it be possible to bridge on-paper performance gaps.

On this basis, the syndicate developed guidelines and a questionnaire to aid in the selection of external benchmarking partners. This questionnaire was forwarded to 31 councils along the east coast of Australia and in New Zealand. The councils were chosen on the basis of the following:

- Having a good reputation in the industry
- Serving a similar size population to the syndicate members
- Operating sewage collection and transport systems of a similar type to those operated by the syndicate members
- Demonstrating an interest in the project

The syndicate selected eight councils as external benchmarking partners on the basis of the quality of their responses to the questionnaire and follow-up inquiries, relevance of their activities to the syndicate members, and their high level of performance. Three of the selected councils were from southeast Queensland, one was from NSW, and four were from New Zealand.

Prior to visiting these external benchmarking partners, syndicate members undertook dry run, or practice, site visits to two councils within the syndicate to gain experience and confidence in the process as well as to fine-tune the approach and conduct of external visits. Following these site visits syndicate members

- Reconfirmed performance drivers
- Estimated additional benefits to the operations and maintenance of their sewage collection and transport through implementation of best practices identified during the dry run visits
- Refined the approach for selecting and visiting external benchmarking partners
- Finalized the guidelines for conducting site visits to benchmarking partners and prepared a detailed questionnaire covering specific issues and aspects to be discussed during these visits

After each trip, the visit team held debriefing meetings to discuss and select those best practices that offered the greatest potential for improvements to syndicate members. Each member then estimated the costs and benefits to his or her individual organization from adapting the observed practices considered to offer the best returns and presented the analysis and results at a syndicate workshop.

Best Practices Discovered and Results

The seven councils in the syndicate estimated that they could collectively achieve net annual savings of about $1.1 million ($A1.4 million) through the introduction of identified best practices requiring either no or minimal initial outlays. This represents about 18 percent of the total annual cost of $6.5 million ($A8 million) for operation and maintenance of the sewage collection and transport systems for the seven councils. The annual savings of $1.1 million ($A1.4 million) have a present worth in excess of $18.7 million ($A23 million) using a 6 percent discount rate. A summary of these savings is shown in Figure 23.4.

The level of estimated cost savings increased as the project progressed. Of the total estimated annual cost saving of $1.1 million ($A1.4 million),

- Initial comparisons between syndicate members yielded estimated annual cost savings of $211,0000 ($A260,000) or 18 percent of $1.1 million ($A1.4 million).
- Dry run visits by the syndicate to two of its members yielded additional potential annual cost savings of $236,000 ($A290,000) or 21 percent of $1.1 million ($A1.4 million).
- Visits by syndicate members to the eight external benchmarking partners yielded further potential annual cost savings of $700,000 ($A860,000) or 61 percent of $1.1 million ($A1.4 million).

		Sewer reticulation mains ($'000)			Sewage pumping stations, nontrades ($'000)			Sewage pumping stations, trades ($'000)			Other ($'000)	Total ($'000)
		Initial comparison	Internal visits	External visits	Initial comparison	Internal visits	External visits	Initial comparison	Internal visits	External visits		
Council 1	U.S.		$57			$8					$57	$122
	Australia		$A70			$A10					$A70	$A150
Council 2	U.S.	$32		$41	$8		$32	$8				$122
	Australia	$A40		$A50	$A10		$A40	$A10				$A150
Council 3	U.S.		$65	$16			$65			$114		$260
	Australia		$A80	$A20			$A80			$A140		$A320
Council 4	U.S.					$41					$16	$57
	Australia					$A50					$A20	$A70
Council 5	U.S.				$81		$163					$244
	Australia				$A100		$A200					$A300
Council 6	U.S.	$81					$57			$8		$146
	Australia	$A100					$A70			$A10		$A180
Council 7	U.S.						$16		$65	$49	$65	$195
	Australia						$A20		$A80	$A60	$A80	$A240
Subtotal	U.S.	$114	$122	$57	$89	$49	$333	$8	$65	$171	$138	$1146
	Australia	$A140	$A150	$A70	$A110	$A60	$A410	$A10	$A80	$A210	$A170	$A1410
Total net annual savings ($'000)	U.S.	$1146										
	Australia	$A1410										
Annual process costs ($'000)	U.S.	$6504										
	Australia	$A8000										
% potential savings		17.6%										
% identification of savings		Initial comparisons: 18%			Interval visits: 21%			External visits: 61%				

Figure 23.4. Estimates of net annual savings during course of project.

The source of savings is interesting, in that approximately 40 percent of the ultimate value was identified *within the syndicate.* This shows that for organizations such as multinational conglomerates, substantial benefits can be expected through internal benchmarking alone. Therefore, if time or budget is short, organizations may consider this route.

Details on best practices are shown in Figure 23.5; however, some of the most significant ones identified as having potential for cost savings and improved customer service include the following:

- Increased use of telemetry not only as a control system for pumping stations but also for monitoring condition and performance

Domain	Area	Best practice
1. Planning and scheduling	• Integrated management systems	Greater use of integrated databases and other computer systems (for example, asset registers, complaints registers, maintenance management, renewals, and capital works program) to identify resource priorities, control work and expenditure, monitor performance, and achieve objectives.
	• Maintenance scheduling	Maintenance programs and activities based on impact of failure (for example, reliability-centered maintenance approach).
2. Technology	• Closed circuit television (CCTV)	Use of CCTV for inspection of new pipe work prior to commissioning, for identification of blockages, and for checking cleared blockages.
	• Root foaming, etc.	Injection of chemicals into sewer mains to reduce blockages from tree roots.
	• Telemetry	Wider use of remote systems such as telemetry for monitoring condition and performance as well as control. Can lead to greater use of reactive servicing/maintenance of sewage pumping stations, reduced operator involvement, and rationalization of available resources. Alarms should alert and identify equipment failures and resulting impact.
	• Raw sewage pumps	Use of grinder pumps and recirculation to reduce buildup of fats, etc. in wet wells. Use of mechanical seals for improved performance.
	• Standardization	Standardization of equipment and procedures (for example, pumps, operating procedures).
	• Pump controls	Use variable range of set points in wet wells to reduce buildup of fats, etc.
	• Wet well linings	Coating of wet wells with, for example, epoxy, pine oil, etc. to reduce adherence of fats and to protect structure.
3. Organization	• Contracting out noncore business activities	Directing internal resources only at core business and contracting out noncore activities such as grounds maintenance, mechanical and electrical repairs, etc. Responsibility for scheduling can also be contracted out.
	• Contract administration	Issuing longer-term maintenance contracts to take advantage of contractor's accrued knowledge of organization's specific systems and equipment.
4. People	• Reduced demarcation	Removal/reduction in work and skills barriers. Identified accountability of work groups for output.
	• Skills	Introduction of higher skill levels and multiskilling.
	• Training	Appropriate and effective programs for training and skill development as identified by business units.
5. Other	• National standardized system	Introduction of uniform performance indicators, training, accreditation, asset management programs and systems, accounting and activity-based costing.
	• Community consultation	Extensive and ongoing consultation with the community to determine needs and willingness to pay.

Figure 23.5. Selection of identified best practices in sewage collection and transport.

- Introduction of energy management practices such as power shedding and time-of-use tariffs
- Use of contractors for noncore business activities
- Greater reliance on reactive maintenance for sewage pumping stations (supported by telemetry)
- Greater reliance on proactive maintenance for the reticulation system
- Use of closed-circuit television (CCTV) inspection for reactive and proactive maintenance of the reticulation system
- Lining of wet wells
- Training and multiskilling for operation and maintenance personnel
- Greater workforce accountability and ownership of assets, systems, and levels of service
- Greater use of computerized management systems

Implementation and Actions Taken

The individual syndicate members are now planning and implementing the best practices that are most cost effective for their organizations. Note that the savings estimate of 18 percent was based on changes that could be implemented within 12–18 months, and that required little if any investment. Further benefits from the adoption of more of the best practices identified during the pilot project would be possible in a longer time frame. Examples of specific implementation projects and their costs and benefits are shown in Figure 23.6.

The councils have agreed to monitor and report on their impact in order to verify the benefits estimated during the pilot project. Feedback from syndicate members is that some have already achieved a substantial portion of the benefits identified.

The Department of Land and Water Conservation is also circulating a report and encouraging all 128 councils in the state of New South Wales to adopt syndicate benchmarking as a practical means of performance improvement.

Conclusions and Lessons Learned

The pilot project has demonstrated the value of syndicate benchmarking. For the total one-off cost of around $162,600 ($A200,000), the pilot project identified net annual cost savings of $1.1 million ($A1.4 million) or about 18 percent of the total annual cost of $6.5 million ($A8 million) for operation and maintenance of the sewage collection and transport across the syndicate. Since the present worth of these savings is in excess of $18.7 million ($A23 million) at a 6 percent discount rate, the readily achievable benefits are about 100 times the project cost.

Council	Examples of best practice initiatives	Potential annual cost saving ($)		Cost of initiative ($)	
		U.S.	Australia	U.S.	Australia
Council 1	• Proactive maintenance of sewers to reduce blockage rate	$65,040	$A80,000	—	—
Council 2	• Reduction in cleaning visits to pump stations through use of mechanical flush valves, reprogramming of pump starts and stops to minimize buildup of scum, and use of automatic well washers	$8130	$A10,000	$97,561	$A120,000 (one off)
	• Reduction in condition visits to pumping stations through use of amp meters on all pump motors and telemetry	$6504	$A8000	$81,301	$A100,000 (one off)
	• Remote switchover of pumps to reduce changeover visits to pumping stations	$6504	$A8000	$40,650	$A50,000 (one off)
	• Use of CCTV for sewer inspections	$48,780	$A60,000	$28,455	$A35,000 annually
	• Requirement for a CCTV report for all new pipes prior to commissioning	$32,520	$A40,000	—	—
	• Scheduled inflow and infiltration program	$20,325	$A25,000	$81,301	$A100,000 (one off)
Council 3	• Use of variable speed pumps in major pumping stations	$16,260	$A20,000	$48,780	$A60,000 (one off)
	• Sewer crew on preventative maintenance	$73,170	$A90,000	—	—
	• Energy management, "power shedding" and "time-of-use" tariffs	$94,309	$A116,000	—	—
	• Epoxy lining/pine oil lining of wet wells	$65,040	$A80,000	$16,260	$A20,000 annually
Council 4	• Refine sewage pumping station operating procedures	$40,650	$A50,000	—	—
	• Review and renegotiate electricity tariffs	$16,260	$A20,000	—	—
Council 5	• Pump choke clearing by nontrades people; review of the amount of grass mowing and landscaping around pumping stations; cleaning of pump wells from surface rather than entry into the confined space	$97,561	$A120,000	—	—
	• Energy audit of pumping station operations	$52,846	$A65,000	$8130	$A10,000 (one off)
Council 6	• Proactive maintenance of sewers to reduce blockage rate	$162,602	$A200,000	$81,301	$A100,000 annually
	• Reducing scheduled cleaning visits to pumping stations	$48,780	$A60,000	—	—
Council 7	• Energy management, "power shedding" and "time-of-use" tariffs	$81,301	$A100,000	—	—

Figure 23.6. Potential savings estimated by individual syndicate member.

Syndicate members felt that additional savings and benefits were possible with further experience in the benchmarking process and if

- The search for best practice partners extended into a wider geographical area and a wider range of industries, including the private sector.
- The pilot project was not limited to maintaining or improving the current levels of service but also considered reductions in the levels of service where overservicing had been identified.

Although the likely savings will be smaller for smaller councils, these results indicate that it would still be highly cost effective for all NSW councils to carry out syndicate benchmarking of their water supply and sewerage services. Also, smaller councils may choose not to proceed to searching and visiting external best practice organizations because, as the pilot project demonstrated, significant cost savings can be identified from internal performance comparisons within the syndicate.

It is estimated that the total annual operation and maintenance expenditure by local government councils throughout NSW on water supply and sewerage services is about $130 million ($A160 million). Taking into account fixed costs for items such as materials and chemicals, and the probability that not all councils will have the opportunity to achieve the same level of savings, it is estimated that statewide annual savings in the order of $12.2 million to $16.3 million ($A15 million to $A20 million) can be achieved in operation and maintenance expenditure through the application of syndicate benchmarking techniques. The present worth of these savings would be from $203 million to $ 268 million ($A250 million to $A330 million) using a 6 percent discount rate.

At the conclusion of the pilot project, members considered that the syndicate approach to benchmarking had great potential for local government and offered significant advantages over single council benchmarking. Benefits included the following:

- Costs, such as for a facilitator, specialist, and/or consultant, can be shared and thereby reduced.
- The syndicate benefits from the synergy created by a range of people with different specializations and background.
- The syndicate can be split up to visit a larger number of external best practice organizations in a given period of time than would be possible for a single council.
- The workload can be shared among syndicate members and thereby reduced.

About the Authors

Roger Patrick has a background in chemical engineering, process industry management, and management consulting to a wide range of industrial and government clients. In recent years he has specialized in performance improvement consulting to water and wastewater utilities, including Sydney Water, Melbourne Water, the Water Corporation of Western Australia, Brisbane City Council, and the NSW Department of Land and Water Conservation.

Patrick's assignments have included best practices and benchmarking; industry and utility restructuring to emulate private sector performance; process reengineering; outsourcing; business planning; and project management of improvements. His work in the area of best practices and benchmarking has been recognized internationally, through publications, speaking engagements, and workshops.

Patrick was the benchmarking specialist consultant for this project. Currently, he is chief operating officer and director of specialty consulting at WRc inc., a leading water and wastewater management consulting, specialist engineering, research, and information company.

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