

**Guidelines for
Implementing Total Management Planning**

Asset Management

OVERVIEW

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LIST OF ACRONYMS

COAG	Council of Australian Governments
CSS	Customer Service Standard
GIS	geographical information system
I/I	infiltration/inflow
NCP	National Competition Policy
SAMP	Strategic Asset Management Plan
TMP	Total Management Plan
WSP	Water Service Provider

1 INTRODUCTION

This Overview is intended to provide WSPs with an overall understanding of the Asset Management process, to enable them to develop formalised asset management practices appropriate to their own situation and the requirements of their customers. This Overview is supported by Implementation Guides on the various aspects of asset management:

- water demand management;
- water loss management;
- infrastructure planning;
- asset procurement;
- asset evaluation and renewal;
- operations management;
- maintenance management;
- sewer infiltration/inflow management;
- water source management;
- energy management; and
- drinking water quality management.

These documents provide guidance on the level of asset management plan development appropriate to various sizes of WSPs. The degree of sophistication of asset management implementation will depend on a number of factors, particularly the scale of its infrastructure, its relative strategic performance and its relative performance in service delivery. A basic plan is classified as Development Level 1 with more sophisticated plans classified at higher levels (up to Level 3). A basic plan (Level 1) would be appropriate to small local governments and rural water boards while a Level 3 plan would be appropriate for large, commercialised WSPs.

2 BACKGROUND

The Queensland water industry has developed an imposing portfolio of assets over the past 60–70 years. The current value of existing water-related infrastructure is estimated to be over \$20 billion. In the urban context \$10 000–\$15 000 worth of water and wastewater infrastructure exists for each household. Each year approximately \$200–\$400 million of infrastructure is added to this portfolio by the public or private sector.

The purpose of this infrastructure is to provide services such as:

- drinking water supply;
- crop irrigation;
- industrial water supply;
- stock watering; and
- collection, treatment, and reuse or disposal of wastewater.

The investment in this infrastructure generates dividends such as:

- improved living conditions;
- regional and local economic development and greater prosperity for the State's communities; and
- minimisation of environmental degradation.

The recent adoption of accrual accounting has highlighted the financial impacts of infrastructure on Water Service Providers (WSPs). Infrastructure-related costs account for 80–90% of a WSP's expenditure through operation and maintenance, depreciation and interest charges.

Water industry trends are:

- a continuing demand for water services;
- ageing infrastructure;
- increasing maintenance requirements;
- a rapidly increasing need to rehabilitate or replace infrastructure created before and immediately after World War II; and

- customers and investors in WSPs seeking greater value for money from infrastructure investments.

The water industry at all levels, while continuing to recognise the community benefits of water infrastructure, is taking a more ‘businesslike’ approach. This is being encouraged through the COAG/NCP water reform agenda, with a number of WSPs being commercialised and some corporatised. Elements of this ‘businesslike’ approach include:

- a more rigorous infrastructure investment decision-making process with non-asset solutions, full life cycle costs, risks and existing alternatives being considered before deciding to construct infrastructure;
- making the best use of existing infrastructure;
- ensuring that infrastructure can sustain agreed customer service standards; and
- a recognition that asset management is a core business function to support service delivery.

3 THE BASIS OF ASSET MANAGEMENT

3.1 Definition

The term Asset Management is used in these Guidelines to mean the comprehensive management of asset demand, planning, procurement, operation, maintenance, rehabilitation, disposal and replacement to maximise the return on investment at the required standard of service to current and future generations.

3.2 Key principles of asset management

Effective asset management is based on the following key principles:

- Assets exist only to support the delivery of services.
- Asset management is a key corporate activity and critical to the success of a water business.
- Non-asset solutions (e.g. demand management), full life cycle costs, risks and existing alternatives must be considered before any decision is made to construct new or replacement assets.
- Assets must be maintained to achieve the desired service levels.
- Asset owners and managers must ensure that they have appropriate supporting information systems.
- Asset owners and managers must use asset-related information to:
 - optimise their infrastructure investment program (new, rehabilitated or replaced assets);
 - implement effective and efficient operation and maintenance strategies; and
 - develop an optimum financial management strategy to support infrastructure investment, operation and maintenance, and non-asset solutions.

3.3 Benefits of asset management

WSPs can expect, over time, to reap the following benefits when they implement asset management.

For customers:

- value for money;
- maintenance of existing service levels or improvements if required; and
- no excessive cost increases due to inappropriate or unplanned infrastructure investment decisions (on new or replacement works).

For the organisation:

- the provision of competitive services that provide value for money in both the short term and long term;
- sustainable service levels;
- improved understanding of service level options and requirements;
- minimum life cycle costs for an agreed service standard;

- better understanding of infrastructure demand, capacity and utilisation;
- better management of asset failure risks;
- more cost-effective infrastructure investment;
- improved customer satisfaction; and
- a positive image.

For the owner/shareholder:

- maximised financial dividends from infrastructure investment, within commercial, regulatory and/or political constraints;
- maximised non-financial returns, including:
 - improved living conditions;
 - regional and local economic development; and
 - improvement in the environment; and
- sustained financial and non-financial returns in the long term.

3.4 The total management planning context

Figure 1 illustrates the structure of a typical Total Management Plan for a WSP. In this example Asset Management is considered as a key result area, and individual sub-plans are assigned to each of the aspects of asset management identified in Section 1 of this Overview, covering the full asset life cycle, from infrastructure planning through to asset renewal or disposal:

The relationship between asset management and other key result areas is illustrated in Figure 2.

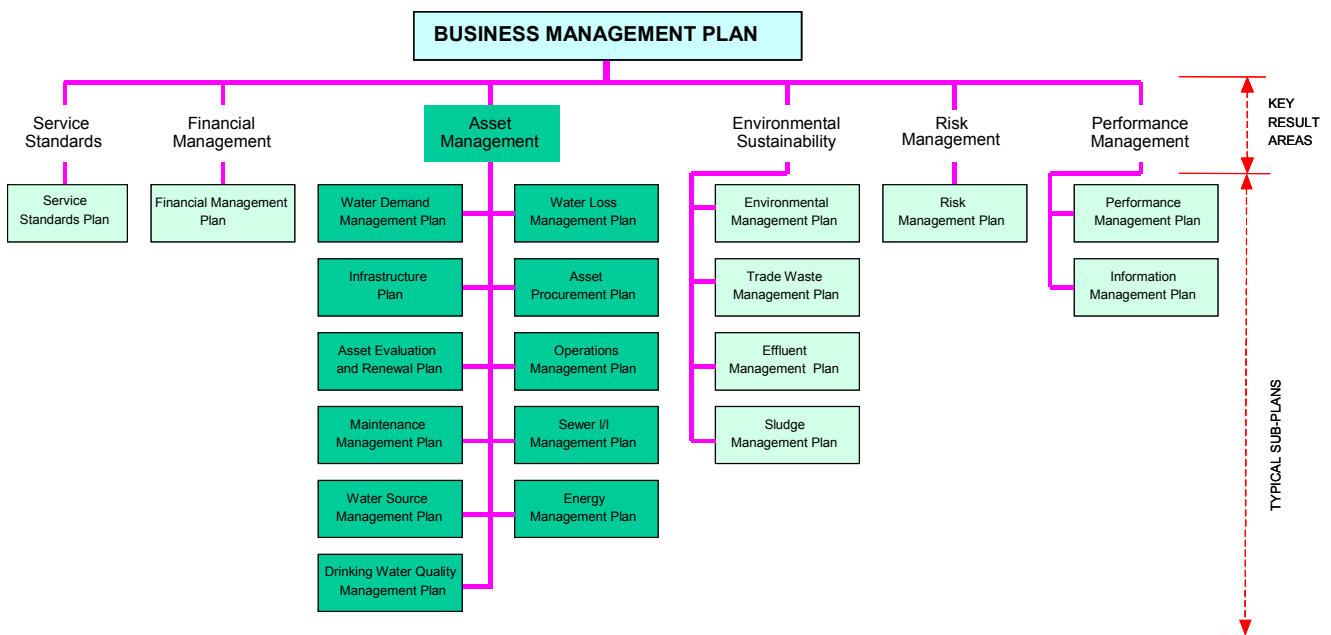


FIGURE 1: Asset Management in the TMP Context

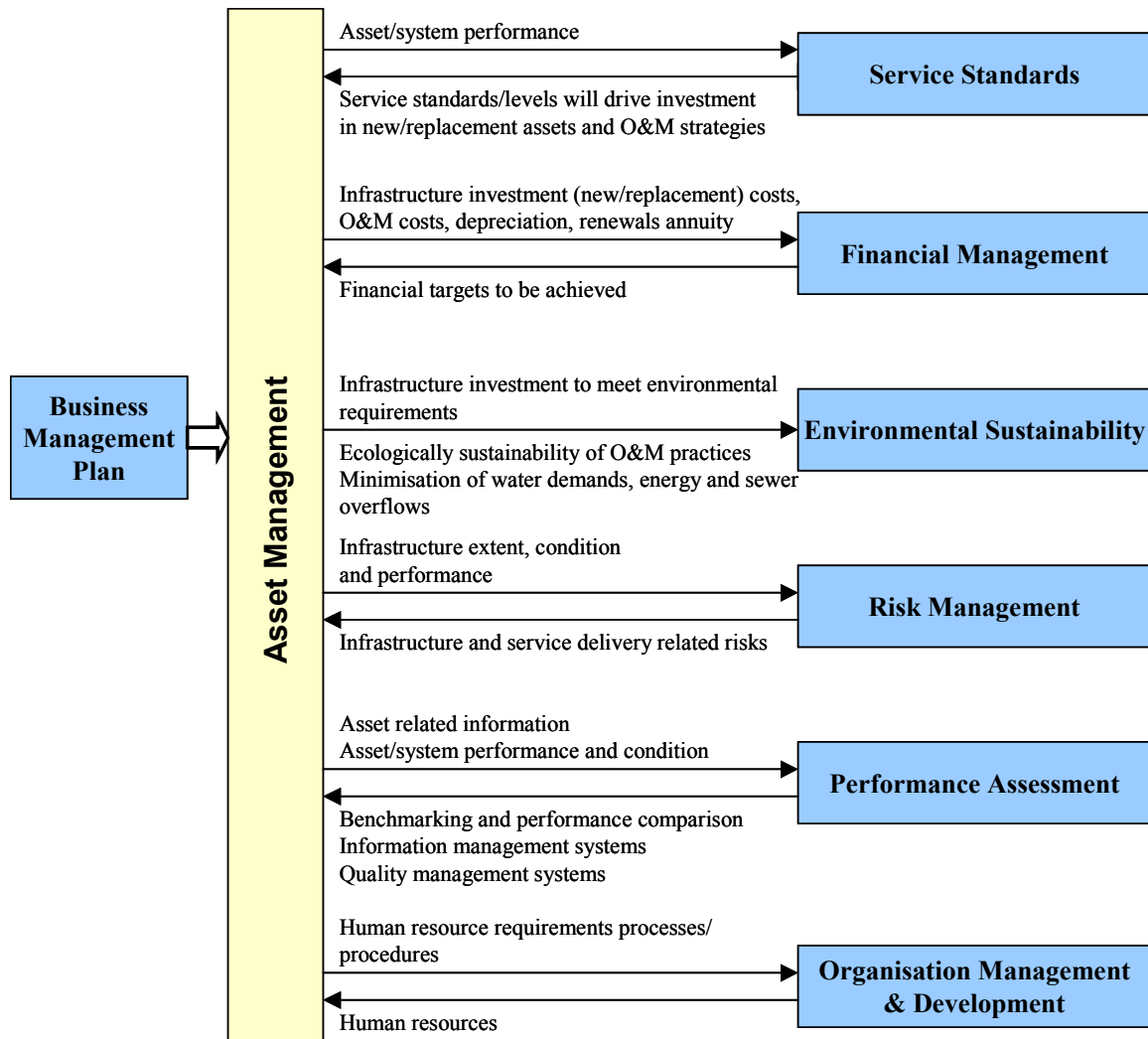


FIGURE 2: Relationship between Asset Management and other key result areas

3.5 Relationship to previous Departmental guidelines

The existing asset management guidelines for the urban water sector of the Queensland water industry were produced between 1989 and 1991 and incorporated into the original *Total Management Planning Manual* (Volume 2) in 1994.

The existing guidelines are comprehensive, and much of the information is still valid 10 years after their initial production. The original *Total Management Planning Manual* continues to be a useful reference source, and a number of sections are referenced in this document.

3.6 The asset management process

The asset management process is continuous through the life cycle of an asset. The process is illustrated in Figure 3 and the information further enhanced in the process flow chart in Figure 4. The process involves:

- setting or reviewing service levels;
- planning for asset or non-asset solutions;
- procuring assets;
- operating assets;
- maintaining assets; and
- renewing or disposing of assets.

Managing demand will occur right through the life cycle of an asset. Risk management and performance monitoring will be other key activities throughout the asset life cycle.

The process is dynamic. All WSPs will be involved in asset operation and maintenance. However, the level of asset planning, procurement and renewal will depend on such factors as growth rates, age and performance of the infrastructure.

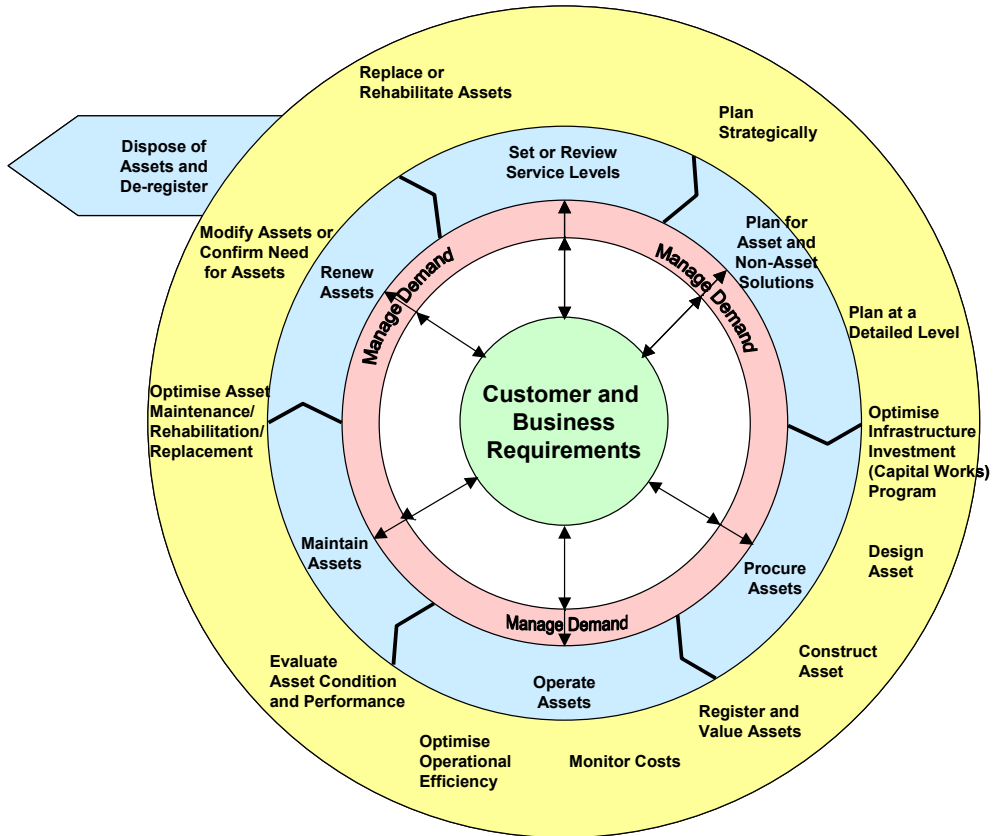


FIGURE 3: The asset management process

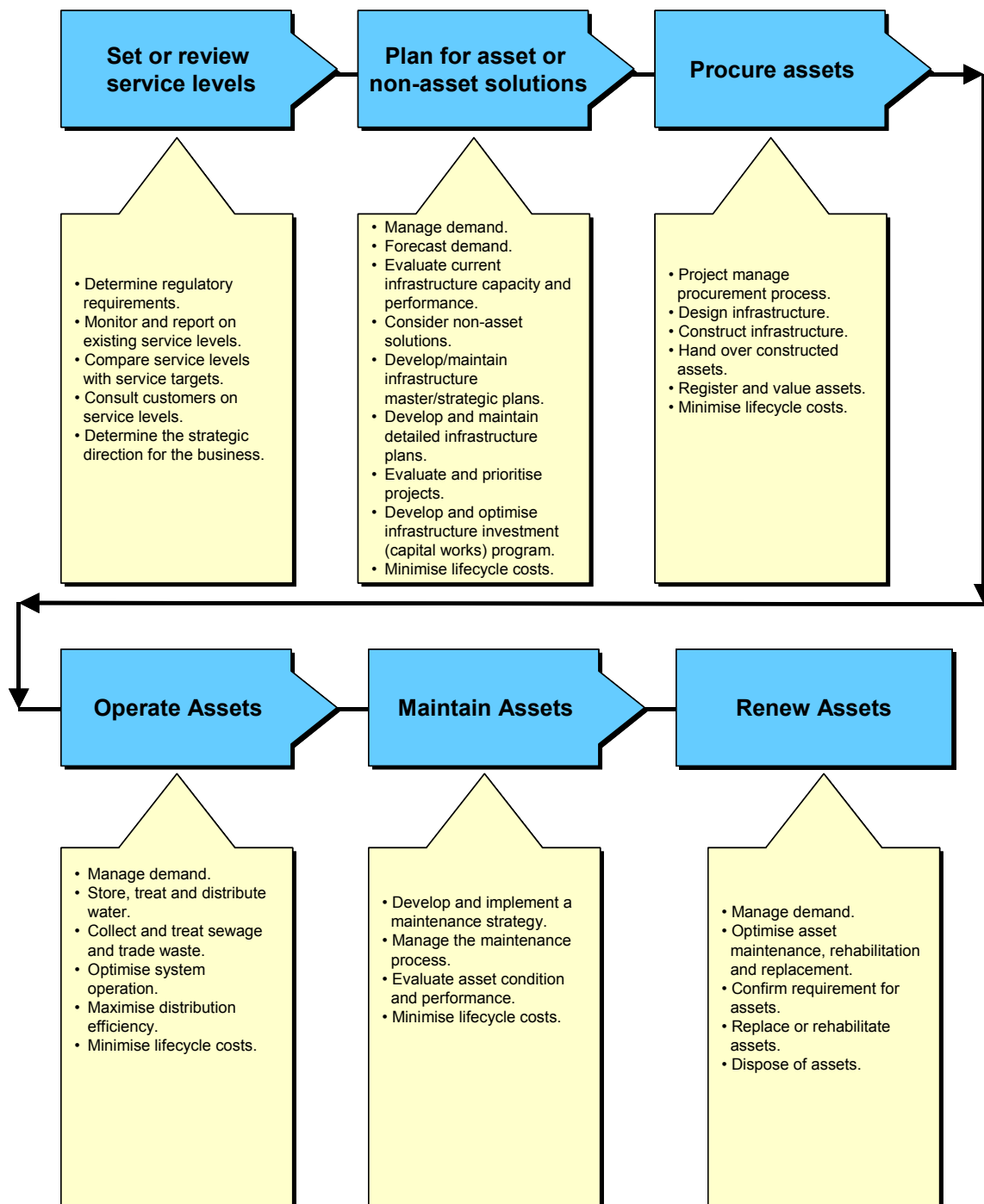


FIGURE 4: Asset management — process flow chart

4 KEY COMPONENTS OF ASSET MANAGEMENT

Components of the asset management process include:

- setting standards of service;
- water demand management;
- water loss management;
- infrastructure planning;
- asset procurement;
- asset evaluation and renewal;
- operations management;

- maintenance management;
- sewer infiltration/inflow management;
- water source management;
- energy management; and
- drinking water quality management.

Standards and service levels

A key element of the water service regulatory framework under the *Water Supply (Safety and Reliability) Act 2008* is the requirement that WSPs supply water-related services at the required standard of service they adopt. WSPs are also required to report on their performance (service levels) against the service standards.

Service standards in relation to quality, quantity, reliability, responsiveness, environmental impact of service and customer satisfaction provide explicit parameters by which to measure performance, either directly or through the use of service indicators.

Service indicators are usually categorised according to the service characteristic being assessed. Some commonly used service characteristics and associated service indicators are listed in Appendix B. The Appendix also lists the service indicators and performance measures that are required to be addressed in a Strategic Asset Management Plan (SAMP) and a Customer Service Standard (CSS) required under the *Water Supply (Safety and Reliability) Act 2008*.

The ongoing monitoring and analysis of service levels will be a critical input into a WSP's decision-making processes in relation to all aspects of the asset life cycle.

Demand management and water loss management

The outcomes from implementing effective demand management and water loss management strategies include:

- reduced water usage — both average and peak demands;
- reduced water leakage or loss;
- reduced wastewater flows;
- improved financial performance through:
- deferment of infrastructure investments, and
- reduced operational costs;
- improved knowledge of the water distribution system, and its condition and performance;
- greater awareness by consumers of the financial and environmental value of water;
- increased agricultural production through the increased water availability arising from greater water use efficiency;
- improved viability of Queensland's rural industries; and
- reduced run-off of pesticides and nutrients into rivers and streams.

Infrastructure planning

Infrastructure planning is a dynamic process involving the following activities:

- developing, adopting and refining policies in relation to infrastructure;
- collecting and analysing supporting information;
- ensuring linkages with other planning activities;
- project management;
- ensuring that planning is at an appropriate level;
- documenting outputs of planning studies; and
- developing and prioritising the infrastructure investment (capital works) program.

Outcomes from effective infrastructure planning include:

- a cost-effective infrastructure investment program;
- minimisation of life cycle costs;
- integration into regional infrastructure planning studies;
- lower costs to the customer;

- continued achievement of service standards;
- protection of the natural environment; and
- minimisation of risk.

Asset procurement

The asset procurement process involves the following activities:

- developing and refining policies;
- determining the infrastructure delivery method;
- acquiring assets provided by others;
- project management;
- commissioning and handover of assets; and
- evaluating the project (post completion review).

Outcomes from effective asset procurement include:

- delivery of infrastructure at the lowest life cycle cost; and
- ‘just-in-time’ delivery within quality and budgetary specifications to meet WSP and customer requirements.

Asset evaluation and renewal

The asset evaluation process includes the following activities:

- capturing asset attribute data;
- developing and maintaining asset registers;
- undertaking asset valuation;
- evaluating asset condition and performance; and
- developing an asset renewal strategy.

Effective asset evaluation and renewal will allow a WSP to have an intimate knowledge of:

- assets it has under its control;
- the location of these assets;
- the value of these assets;
- the condition and performance of these assets;
- the approximate residual life of these assets; and
- prioritised projections of asset replacement or rehabilitation costs.

In many instances, identifying future asset renewal costs and addressing the prioritisation and funding of these liabilities are among the greatest challenges facing WSPs, particularly where a large part of the infrastructure is nearing the end of its useful life. Questions that arise include the following:

- Are residual life estimates correct?
- Are the replacement costs reasonable?
- How will we fund this expenditure?
- What will be the impacts (particularly on our customers) if we defer asset replacement or rehabilitation?
- What would happen if we spent more on planned or predictive maintenance practices?

It is therefore essential that each WSP has an asset renewal strategy, to:

- optimise expenditure on asset rehabilitation and maintenance;
- plan ahead, particularly for funding asset replacement or rehabilitation; and
- review the existing stock of infrastructure to determine whether, as it approaches the end of its useful life, it should be:
 - replaced with a similar asset;
 - replaced with larger-capacity infrastructure as part of an augmentation program;
 - replaced with smaller-capacity infrastructure if customer demands have reduced; or
 - disposed of.

Operations management

Effective operations management will ensure:

- achievement of operational (including environmental) objectives at least cost;
- cost-effective provision of services that are regularly reviewed to achieve appropriate best practice;
- shared knowledge within the WSP of its operating philosophy and procedures; and
- compliance with statutory requirements.

Maintenance management

Effective maintenance management will ensure that:

- life cycle costs are minimised;
- resources are used efficiently;
- environmental compliance is not compromised through asset failure; and
- service levels are maintained or improved.

Sewer infiltration/inflow management

The process of sewer infiltration and inflow (I/I) management involves:

- evaluation of the wastewater collection system;
- flow measurement and analysis;
- source detection and analysis;
- rehabilitation; and
- post-rehabilitation evaluation.

Outcomes from implementing an effective sewer infiltration/inflow strategy include:

- minimised environmental impacts;
- reduced customer complaints;
- reduced hydraulic loading on the collection system and treatment plant;
- deferment of asset augmentation;
- improved knowledge of the wastewater collection system, and its condition and performance; and
- reduced energy costs.

Water source management

Water source management consists of four interrelated elements within a regulatory framework:

- management of water source reliability;
- management of water quality;
- management of infrastructure assets; and
- optimisation of business opportunities.

The outcomes from effective water source management are that:

- the quantity, quality and reliability of a WSP's water sources will meet current and future requirements; and
- regulatory compliance is achieved.

Energy management

The energy management process includes:

- monitoring energy consumption and costs;
- identifying opportunities for energy minimisation; and
- implementing cost-effective strategies.

The outcomes from implementing an effective energy management strategy include:

- minimisation of energy costs; and
- minimisation of greenhouse gas emissions.

Drinking water quality management

The drinking water quality management process includes:

- establishing/reviewing appropriate water quality monitoring programs;
- developing systematic operational and management plans for critical procedures; establishing standing audit protocols; and
- maintaining contingency plans.

The outcomes from implementing an effective drinking water quality management strategy include:

- the protection of public health by assuring a safer water supply;
- improved consumer confidence in water quality and trust of the water service provider;
- improved communication with consumers and employees;
- demonstrated commitment by the WSP to a quality management system, to demonstrate due diligence; and
- clearly defined levels of service and performance indicators.

Information management to support asset management

WSPs face an array of regulatory, reporting and cost pressures and related operational challenges, all demanding ready access to information. Information is required by WSPs to facilitate management decisions on customers, human resources, finance, asset management and corporate management.

The complexity of these information needs makes effective and efficient information management essential for WSPs. Many WSPs have already found that appropriate investment in information systems has produced significant gains in efficiency.

4.1 Asset life cycle costs

Figure 5 (next page) illustrates that the opportunities for life cycle cost reduction are typically greatest in the planning stage. Diminishing opportunities exist for life cycle cost reduction in the procurement (design and construction) phase. Once an asset moves into the operation and maintenance stage the opportunities for life cycle cost reduction become more limited. However, opportunities continue to exist through more effective and efficient operation and maintenance practices.

The asset renewal or disposal phase provides an opportunity to revisit past infrastructure investment decisions and reduce asset life cycle costs.

The cost of planning is very small compared to the asset life cycle costs. The two graphs in Figure 5 indicate that optimal investment in the infrastructure planning phase will pay significant dividends in terms of reduced life cycle costs. ‘Cutting corners’ on infrastructure planning results in inappropriate infrastructure decisions that result in increased costs to the customer.

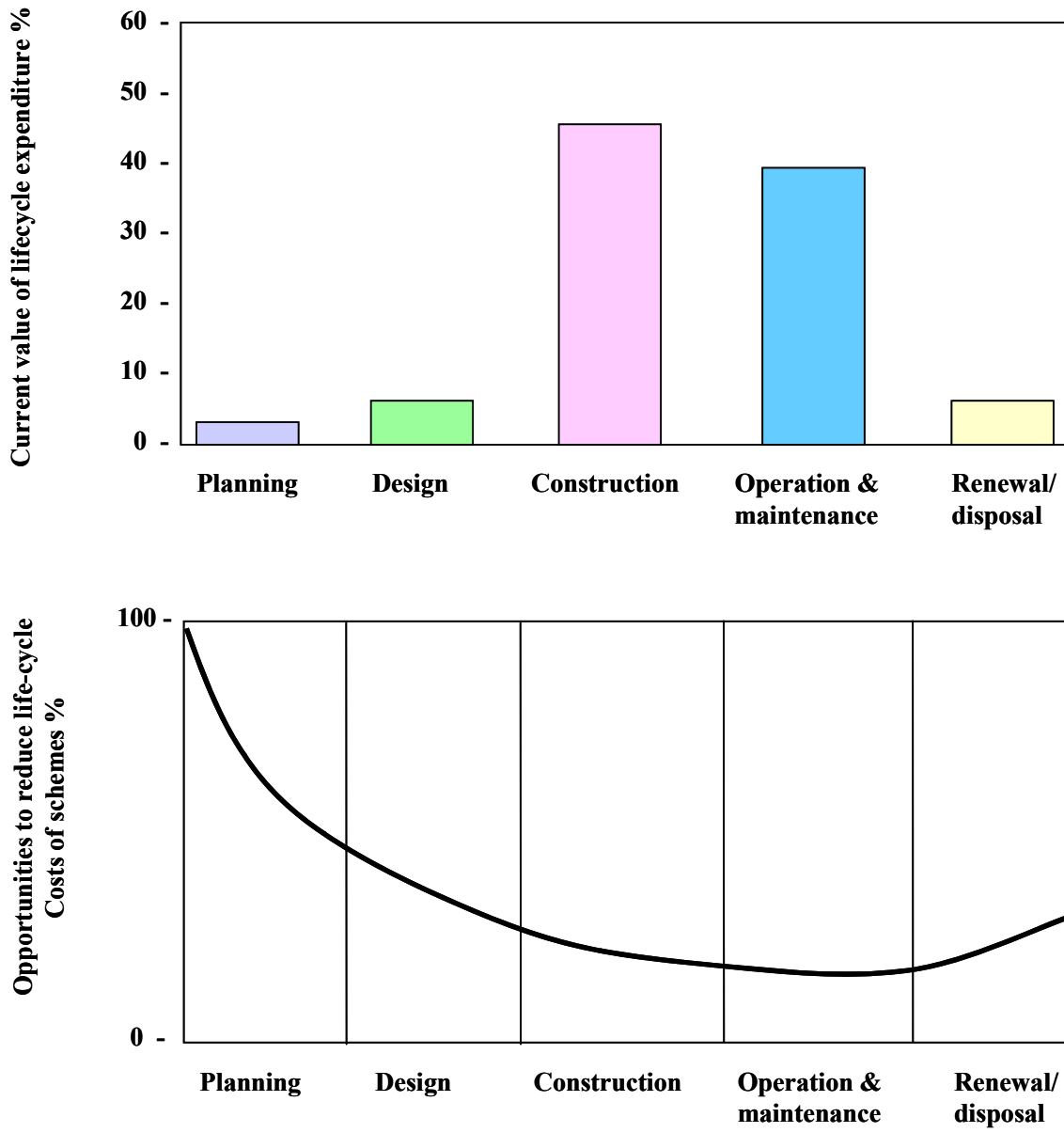


FIGURE 5: Life cycle costs, and opportunities to reduce these costs

5 DEVELOPMENT AND IMPLEMENTATION

The development process for an Asset Management Plan broadly follows the TMP development process described in the TMP Development Guide. The specific process for the development of an Asset Management Plan is shown in Figure 6.

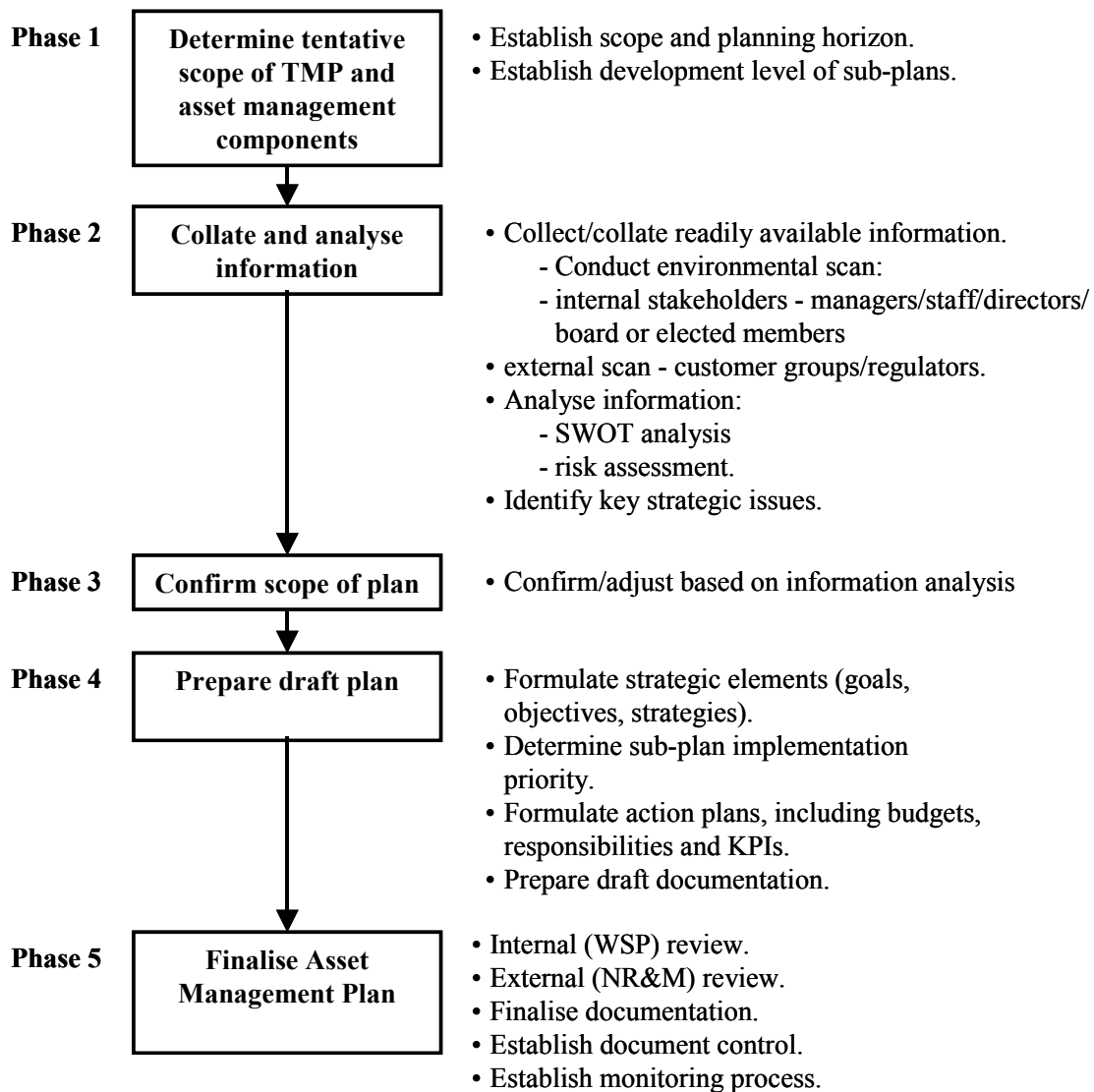


FIGURE 6: The development process for an Asset Management Plan

5.1 Coordinating the asset management process

The TMP Development Guide recommends that a TMP coordinator be allocated. During implementation of the TMP the coordinator's role is to:

- keep the TMP up-to-date;
- disseminate to staff information generated through implementing the TMP; and
- coordinate the review and updating of action plans.

Some WSPs may wish to allocate the responsibility of coordinating the asset management component of the TMP to a specific asset management coordinator, who would report to the TMP coordinator.

There are a number of options available, and the approach would be determined by individual WSPs. However, the person responsible for the asset management component of the TMP should:

- have a keen interest in all facets of the infrastructure life cycle;
- have strategic as well as operational asset management skills;
- have the enthusiasm and project management skills to achieve the asset management objectives and action plan targets; and
- be able to promote asset management to all levels of the organisation.

5.2 Implementing asset management

It is desirable that asset management is implemented within the TMP context, as discussed in the TMP Development Guide. Implementation involves:

- monitoring implementation performance;
- ensuring the allocation of programmed resources and budgets; and
- participation in benchmarking surveys.

5.3 Maintaining the Asset Management Plan

Guidance on maintaining an Asset Management Plan (which is a key component of the TMP) is discussed in the TMP Development Guide. It involves reviewing and updating:

- action plans (6- to 12-monthly);
- sub-plans (1- to 3-yearly);
- policies (1- to 5-yearly); and
- Business Management Plan (1- to 3-yearly).

6 FORMAT OF ASSET MANAGEMENT

The documentation model illustrated in Figure 1 suggests the following sub-plans under the Asset Management key result area:

- Water Demand Management Plan;
- Water Loss Management Plan;
- Infrastructure Plan;
- Asset Procurement Plan;
- Asset Evaluation and Renewal Plan;
- Operations Management Plan;
- Maintenance Management Plan;
- Sewer I/I Management Plan;
- Water Source Management Plan;
- Energy Management Plan; and
- Drinking Water Quality Management Plan.

A separate Implementation Guide has been prepared for each of these sub-plans. Combined, these sub-plans constitute a full Asset Management Plan. However, an Asset Management Plan can exist in a range of formats, not necessarily the one suggested. Guidance on alternative plan formats is provided in other asset management guidelines (refer References and Further Reading).

Whatever the format of the Asset Management Plan, it should:

- address the full life cycle, from planning to asset renewal or disposal;
- adequately address demand management and non-asset solutions;
- address the status of existing asset management initiatives;
- include strategies (including actions and cost estimates) to ensure continuous improvement in asset management; and
- have strategies that are consistent with the WSP's objectives and customer service targets.

Issues such as water source management and energy management could be addressed under a separate key result area; and issues related to information management (included in these Guidelines under Performance Management) could also be included within the Asset Management Plan. These decisions would be based on the WSP's operating context and requirements.

7 DEVELOPMENT LEVEL FOR ASSET MANAGEMENT

The degree of sophistication of asset management implementation will depend on a number of factors, particularly the scale of a WSP's infrastructure and its relative performance in service delivery. The TMP Development Guide outlines an approach for developing an appropriate sub-plan development level. Basic plans and processes are classified as development Level 1, with more sophisticated plans/processes classified at higher levels (up to Level 3). A basic plan (Level 1) would be appropriate to small local governments and rural water boards, while a Level 3 plan would be appropriate for large, commercialised WSPs. The development levels are translated into management mechanisms for each of the sub-plans in the individual Implementation Guides.

REFERENCES AND FURTHER READING

A number of excellent references exist on asset management. These can be classified into:

- guidelines on the overall asset management process; and
- detailed guidelines on specific asset management issues.

General asset management guidelines

1. *Asset Management Guidelines for Water Supply and Sewerage Schemes*, NSW Public Works Department, 1992.
2. *International Infrastructure Management Manual*, Institute of Public Works Engineering Australia and the National Asset Management Steering Group New Zealand, 2000.
3. *Strategic Asset Management Guidelines*, Department of Public Works, Queensland, 1996.
4. *Physical Asset Strategic Planning Guidelines*, Queensland Treasury, Brisbane, October 1995.
5. *Total Management Planning, Urban Water-Related Services, Volume 2 — Management Issues*, Queensland Department of Primary Industries (Water Resources), Brisbane, 1994.
6. *Total Asset Management Manual*, New South Wales Government, 2001.
7. *Australian Drinking Water Guidelines*, National Health and Medical Research Council; Agricultural and Resource Management Council of Australia and New Zealand, Canberra, 1996.
8. *Australian Water Quality Guidelines for Fresh and Marine Waters*, Australian and New Zealand Environment and Conservation Council, Canberra, November 1992.

Each of these guidelines addresses asset management with a slightly different perspective and emphasis. However, in each case the general thrust is consistent with the concepts outlined in this Overview.

Detailed guidelines on specific asset management issues

The 'References and further reading' section of each implementation guide provides more detailed information on specific issues.

APPENDIX A: Suggested asset management question prompt sheet

The following is a suggested list of question prompts that may be used in evaluating a WSP's asset management practices. These prompts should be enhanced or modified to suit individual WSPs.

Sub-plan or strategic issue	Question
Levels of service	<ul style="list-style-type: none"> ▪ What are the current and proposed standards of service? ▪ What are current and past service levels? ▪ How are service levels monitored, analysed and reported? ▪ Does the WSP undertake any inter-agency performance comparison? What are the results? ▪ What are current and potential problems?
Water demand management	<ul style="list-style-type: none"> ▪ What is the WSP's policy on water demand management? ▪ What are unit demands for different customer groups? ▪ What have been the historical trends? ▪ What are projected trends? ▪ Has a water balance study been undertaken? ▪ What is the reliability of the meters? ▪ What irrigation methods are used? ▪ Are any water restrictions in place? ▪ What is the pricing policy? ▪ Is any irrigation tailwater or effluent reuse undertaken? ▪ Is any customer/community education process in place? ▪ Have any specific water demand management studies been undertaken? ▪ Any other water demand management strategies implemented?
Water loss management	<ul style="list-style-type: none"> ▪ What is the level of: <ul style="list-style-type: none"> - real water loss (by categories)? - apparent water loss (by categories)? ▪ What water loss performance indicators are used? ▪ How do these compare to other WSPs? ▪ What are existing and proposed practices in reducing water loss from bursts and leakages? ▪ What are existing and proposed practices in relation to inaccurate metering, authorised and unauthorised water use? ▪ What are current/potential problems? ▪ What are proposed initiatives?
Infrastructure plan	<ul style="list-style-type: none"> ▪ What is the WSP's policy on infrastructure planning? ▪ What infrastructure planning studies have been undertaken, and are these current? Do they comprehensively cover the scheme? ▪ How are planning reports registered and stored? ▪ What is the quality of raw information? ▪ What network models are used? Are these calibrated? ▪ How is infrastructure planning planned, programmed and implemented? ▪ Have any value management studies been undertaken? ▪ Has a 10–20 year infrastructure investment (capital works) been developed? ▪ How are projects prioritised? ▪ What are current/potential problems? ▪ What are proposed initiatives?
Asset procurement	<ul style="list-style-type: none"> ▪ What is the WSP's policy on asset procurement? ▪ How is infrastructure delivered? ▪ Does the WSP have any infrastructure standards document? ▪ How are projects managed, from development of the capital works program to asset handover? ▪ Are any post-completion reviews undertaken? ▪ What are current/potential problems? ▪ What are proposed initiatives?

Sub-plan or strategic issue	Question
Asset evaluation and renewal	<ul style="list-style-type: none"> ▪ Do any policies exist on asset evaluation and renewal? ▪ Do schematic layouts of systems exist? ▪ Does an appropriate hierarchy of assets exist (asset classification)? ▪ How was asset attribute data captured and what is level of accuracy? ▪ Do asset registers exist? ▪ Where are databases located? ▪ What is the level of linkage/integration with other databases? ▪ What is the level of detail? ▪ What is the level of accuracy/data confidence? ▪ Who is responsible for updating the reports? ▪ Are there any formal procedures for register updating? ▪ Is location of assets known? <ul style="list-style-type: none"> - Are assets located on GIS? - What is the level of accuracy? - Are there problems with Digital Cadastral Data Base? ▪ Have assets been valued? <ul style="list-style-type: none"> - What method was used? - Does a valuation policy exist? - Who undertook the valuation? - Are summary statistics available? - Does a valuation report exist? - Has an external audit been undertaken? - Are further requirements proposed? ▪ What methods of asset condition and performance assessment are applied to different asset types? ▪ Are there formal procedures for asset condition/performance evaluation? ▪ How is condition evaluation prioritised? ▪ Where is data stored and how is it analysed? ▪ How is data used to refine asset life? ▪ Do any models exist for refining asset residual life? ▪ Does an asset replacement cost profile exist? <ul style="list-style-type: none"> - How realistic is it? - How is it refined? - How is this information related into the financial model? ▪ What are current/potential problems? ▪ What are proposed initiatives?
Operations management	<ul style="list-style-type: none"> ▪ Do any policies on operations management exist? ▪ Do system schematics exist? ▪ How are operational services delivered? ▪ What is the number of operational staff? ▪ Is there a full understanding (documented) on how the system operates? ▪ Do system network models exist? Are these used to optimise system performance? ▪ What is the level of automation of system control and monitoring? How is the system used to optimise system performance? ▪ What proportions of procedures are documented? ▪ What operational performance indicators are used? ▪ Is any performance comparison and benchmarking undertaken? ▪ What are current/potential problems? ▪ What are proposed initiatives?

Sub-plan or strategic issue	Question
Maintenance management	<ul style="list-style-type: none"> ▪ Do any policies on maintenance management exist? ▪ For each asset group: <ul style="list-style-type: none"> - How are maintenance services delivered? - What is the status of procedures documentation? - How are maintenance strategies determined (preventive, predictive and reactive)? - How is maintenance planned and prioritised? - How is maintenance controlled, recorded, analysed and reported? - How is maintenance optimised? - Does a maintenance management system exist? - What is the management and workforce attitude/culture in relation to maintenance? ▪ What are current/potential problems? ▪ What are proposed initiatives?
Sewer infiltration/inflow (I/I) management	<ul style="list-style-type: none"> ▪ What is the extent of wet weather I/I? ▪ What is the number of wet weather overflow events? ▪ How has I/I investigation and analysis been planned and prioritised? ▪ Has any flow measurement and analysis been undertaken? ▪ Have the sources of problems been identified and remedied? ▪ What is the extent of smoke testing; illegal inflow reduction? ▪ Is I/I reduction part of a planned maintenance program? ▪ Has any community education been undertaken to reduce the discharge of stormwater into the sewer system? ▪ What are current/potential problems? ▪ What are proposed initiatives?
Water source management	<ul style="list-style-type: none"> ▪ What is current allocation and what are proposed future allocations? ▪ Does the WSP have transferable water entitlements? ▪ What are existing sources, yield, usage and mode of operation? ▪ What is the status of agreements with existing bulk water suppliers? ▪ Does a strategic water source study exist? ▪ Do formalised operating rules exist for the water sources? ▪ How is raw water quality monitored? ▪ Does a dam safety program exist? Does this comply with regulatory requirements? ▪ What are current/potential problems? ▪ What are proposed initiatives?
Energy management	<ul style="list-style-type: none"> ▪ Do any policies on energy management exist? ▪ What information exists on energy consumption, cost, trends? ▪ How do energy costs compare to overall O&M costs? ▪ What energy tariffs are used? ▪ Who is the supplier and what are contractual arrangements? ▪ Have any energy studies/audits been undertaken? ▪ What are current/potential problems? ▪ What are proposed initiatives?

Sub-plan or strategic issue	Question
Drinking water quality management	<ul style="list-style-type: none"> ▪ What is the current and proposed quality of water provided to consumers? ▪ What criteria is quality assessed against? ▪ Have all of the factors (hazards) likely to affect water quality for each component of the system (catchment to tap) been identified and prioritised? ▪ What measures are in place / need to be in place to eliminate/reduce the impact of these factors? ▪ Are there documented management plans for each component of the system? ▪ What are the existing and proposed monitoring programs for operational, verification and performance assessment purposes? ▪ How is operational and monitoring data recorded and analysed? ▪ What are the current/proposed reporting procedures? ▪ Is there a community awareness and consultation process in place? ▪ Is there a contingency plan for extreme and emergency incidents? ▪ What are the proposed initiatives to address significant water quality issues?
Information management	<ul style="list-style-type: none"> ▪ Where is the following data stored and how is it analysed and reported: <ul style="list-style-type: none"> - customer service data; - planning related data; - capital works data; - contract data; - financial data; - asset maintenance data; - asset condition and performance data; and - operational data? ▪ How are databases linked/integrated?

APPENDIX B: Service characteristics and typical service indicators

Note: Typical service indicators shown shaded are those standards that must be included in a SAMP and CSS required under the *Water Supply (Safety and Reliability) Act 2008*¹

Type of service	Service characteristic	Typical service indicators
All services	Responsiveness	<ul style="list-style-type: none"> ▪ % telephone calls answered within 20 seconds ▪ % billing inquiries resolved within one day ▪ % written complaints responded to within 5 days
Potable water supply	Quality of supply	<ul style="list-style-type: none"> ▪ Degree of compliance with microbiological quality guidelines in Australian Drinking Water Guidelines (Ref. 5) or other nominated industry guideline ▪ Degree of compliance with physical/chemical characteristic guidelines in Australian Drinking Water Guidelines (Ref.5) or other nominated industry guideline
	Supply pressure and or flow	<ul style="list-style-type: none"> ▪ Minimum static pressure (metres head) and/or flow (litres/min) at connection
	Reliability of service	<ul style="list-style-type: none"> ▪ Number of days restrictions applied per year ▪ % service interruptions restored within 5 hours ▪ % of connections with deficient flow/pressure ▪ Number of connections experiencing an unplanned interruption ▪ Events/incidents causing an unplanned interruption to customers (number per 100 km main) ▪ % connections experiencing more than (1,2,3,4,5 or more) interruptions ▪ Relative incidence of planned and unplanned interruptions ▪ Overall average duration of service interruption (hrs) ▪ Interruption frequency per 1000 properties ▪ Number of main breaks per 100 km of mains ▪ System water loss (litres/connection/day) ▪ Response/reaction time in hrs.
	Customer satisfaction	<ul style="list-style-type: none"> ▪ Quality complaints per 1000 properties ▪ Number of drinking water quality incidents ▪ Confirmed pressure complaints (outside range 220–800 kPa) per 1000 properties. ▪ % positive survey returns.
Sewerage	Reliability of service	<ul style="list-style-type: none"> ▪ Sewage overflows affecting customer properties per 1000 properties ▪ Number of Sewage overflows per 100 km ▪ % service interruptions restored to within 5 hours. ▪ Overall average duration of service interruption (hours). ▪ Interruption frequency per 1000 properties. ▪ Sewer main chokes and breaks per 100 km of mains. ▪ Sewer inflow and infiltration (ratio) ▪ Response/reaction time in hrs
	Customer satisfaction	<ul style="list-style-type: none"> ▪ Odour complaints per 1000 properties. ▪ % positive survey returns.
	Environmental impact	<ul style="list-style-type: none"> ▪ Overall sewage overflows per 100 km of sewer and rising mains. ▪ Unlicensed sewage overflows per 100 km of sewer and rising mains. ▪ Degree of compliance of treatment plant effluent with DERM licence conditions.
Irrigation water supply	Quality of supply	<ul style="list-style-type: none"> ▪ Degree of compliance with appropriate total dissolved solids guideline for irrigation water in Australian Water Quality Guidelines (Ref. 11).
	Reliability of service	<ul style="list-style-type: none"> ▪ Order to delivery delay (days) ▪ % of entitlement actually delivered ▪ % of diversions delivered.

Type of service	Service characteristic	Typical service indicators
	Customer satisfaction	<ul style="list-style-type: none"> ▪ Quality complaints per 100 customers. ▪ % positive survey returns.
Rural water supply	Quality of supply	<ul style="list-style-type: none"> ▪ Degree of compliance with appropriate total dissolved solids guideline for irrigation water in Australian Water Quality Guidelines (Ref 11).
	Supply pressure	<ul style="list-style-type: none"> ▪ Minimum static pressure at first property tap.
	Reliability of service	<ul style="list-style-type: none"> ▪ Number of days restrictions applied per year. ▪ % service interruptions responded to within 5 hours. ▪ Overall average duration of service interruption (hrs). ▪ Interruption frequency per 100 properties. ▪ Number of main breaks per 100 km of mains.
	Customer Satisfaction	<ul style="list-style-type: none"> ▪ Quality complaints per 100 properties ▪ Confirmed pressure complaints (outside specified range) per 100 properties. ▪ % positive survey returns.

¹Note: Customer Service Standards may be reported in a qualitative fashion as long as the quantitative data is available for inspection by customers.