

Essay on test



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1. PURPOSE The purpose of this document is to provide a framework for the adoption and implementation of asset management for Rand Water's physical asset portfolio.

2. SCOPE

This framework applies to physical assets associated with production infrastructure under the jurisdiction of Rand Water. Assets consist of buildings and property, pipelines, civil structures, mechanical equipment, electrical equipment water treatment process plants, and automation equipment. It excludes human assets, financial assets, information assets, intangible assets, and movable equipment.

Figure 21: Scope of Asset Management Framework (PAS55)

3. REFERENCES The following documents must be read in conjunction with this Framework.

Document Title| Document

No. Location| Quality Management System Requirements| ISO 9001: 2000 | RW Library| Environmental Management System Requirements| ISO14001: 2004| RW Library| Occupational Health and Safety Act and Regulations| OHS Act (85 of 1993)| RW Library| Occupational Health and Safety Assessment Series| OHSAS 18001: 2007| RW Library| International Infrastructure Management Manual – South Africa Edition 2006 | ISBN No: 0-473-10685-X| RW Library| Asset Management Part 1: Specification for the optimized management of Assets| BSI PAS 55-1: 2008| RW Library| Asset Management Part 2: Guidelines for the application of PAS 55-1| BSI PAS 55-2: 2008| RW Library| Rand Water – Strategic Asset Management Process Guides – Know Your Assets| RW SAM 60001 BPM SIS| RW Library| 4. TERMS, DEFINITIONS & ABBREVIATIONS These are terms used in the organization & are unique to the company terminology, business and culture. AM Asset Management

AMF Asset Management Framework AMP Asset Management Plan KPI Key Performance Indicators O&M Operations and Maintenance R&D Research and Development RW Rand Water SAM Strategic Asset Management 5. RESPONSIBILITY AND AUTHORITY The Chief Executive is accountable and Portfolio Heads are responsible for the implementation of Asset Management in RW. The General Manager: Strategic Asset Management is responsible for the implementation of Strategic Asset Management with regards to production infrastructure under the jurisdiction of Rand Water. 6. RECORD & DATA KEEPING Record Document| Form/Doc Number| Location | Retention Period| ||||| 7. DOCUMENT CHANGE HISTORY

The following table contains the history of this document with a description of each revision. Date| Previous revision number| New revision number|

Description of each revision| 23 Sep 2010| N/A| 0| First draft| 17 Nov 2010| 0| A| Second draft| 10 Dec 2010| a| B| Third draft| 17 Feb 2011| b| C| Fourth draft| 9 Mar 2011| c| D| Fifth draft|

8. ASSET MANAGEMENT DEFINITION The following definition for asset management is adopted, based on PAS 55: Asset Management is the systematic and coordinated activities and practices through which Rand Water optimally manages its assets, their associated performance, risks and expenditures over their lifecycle for the purpose of achieving its organizational strategic plan.

9. STAKEHOLDERS The following stakeholders are relevant to asset management: * Customers who purchase water from Rand Water; * Suppliers and service providers; * Government; * Standards authorities; and * Auditor General of South Africa.

10. STATUTORY REQUIREMENTS The following legislation and regulation are relevant: Annual Financial Statements are required to be prepared in compliance with the South African Statements of Generally Accepted Accounting Practice (SA GAAP), the Water Services Act No 108 of 1997, Companies Act No 61 of 1973, and the Public Finance Management Act No 1 of 1999 as amended. The Constitution (and its amendments) secures the right of every Citizen to sufficient water;

The Water Act ensures that everyone has access to water, water resources are conserved, protected and managed, proper water resource planning takes place, the costs of managing and developing the resource is addressed and that water resource institutions are established. The Water Services Act defines the rights to basic water supply, the setting of national standards and norms, water services planning, regulation of water services, establishment of water boards, the monitoring of water service provision and

the promotion of effective water resource management and conservation. The Water Services Act is supported by the Strategic Framework for Water Services which sets out an implementation framework for the Act and gives effect to the regulation of water services delivery.

The principle objectives of the PFMA are to secure transparency, accountability, and sound management of the revenue, expenditure, assets and liabilities of the institutions to which this Act applies. In terms of this Act, from an asset management perspective Rand Water is: * responsible for the effective, efficient, economical and transparent use of the resources of the department, trading entity or constitutional institution; * responsible for the management, including the safe-guarding and the maintenance of the assets, and for the management of the liabilities; The Occupational Health and Safety Act (OHSA) (85 of 1993, Construction Regulations) state that: the owner of any “ structure” (incl. nrastructure such as waterworks, buildings, drainage works and roads) to maintain such structure in a manner that the structure remains safe for continued use and such maintenance records shall be kept and made available to an inspector for continued use. 11. ASSET MANAGEMENT QUALITY FRAMEWORK The development of an ISO Standard for Asset Management is currently in progress. The ISO Standard development is being led by the British Standards Institute (BSI) as secretariat and there are 22 countries participating and 14 countries observing. South Africa is participating with representation from the SABS. The ISO standard is expected to be launched in late 2011. The final ISO standard is expected to be substantially aligned with the current PAS55

specification for asset management, which has widespread adoption around the world by both public and private enterprises.

Rand Water will adopt the PAS55 specification as an interim framework for the implementation of asset management until the launch of the ISO Quality Standard for Asset Management. Once the ISO Quality Standard has been launched, Rand Water can evaluate the formal adoption of the Quality Standard within the organization.

12. ASSET MANAGEMENT STRUCTURE

ROLES AND RESPONSIBILITIES

The strategic assets of Rand Water work together as one large system, for which custodianship is assigned to the Senior Manager Assets. However, the Rand Water assets can currently be split into 4 main supply systems and 2 main purification systems, on the basis of geography and function.

The systems are the following: * Eikenhof Supply System * Zwartkopjies Supply System * Palmiet Supply System * Mapleton Supply System * Vereeniging Purification System * Zuikerbosch Purification System These systems are shown in the figure below. Figure 121: Rand Water Supply and Purification Systems The management objectives of the Supply Systems are somewhat different from the management objectives of the Purification Systems. The management objectives of the Supply Systems are focused on satisfying commercial customer service levels, managing current and future user demand, and managing water delivery including water conveyance, pumping, storing, and end user delivery control.

The Purification System management objectives revolve around managing the purification of raw water to agreed quantity and quality service levels. Given the vast magnitude of the assets under Rand Water control and the

different management objectives, it is prudent to split the asset management planning responsibility according to the different supply systems and then roll these plans up into a consolidated Asset Management Plan (AMP) for the entire organization. This is shown schematically below.

Eikenhof Supply System AMP Zwartkopjies Supply System AMP Palmiet Supply System AMP Mapleton Supply System AMP Vereeniging Purification System AMP Zuikerbosch Purification System AMP Rand Water Consolidated AMP

Figure 122: Asset Management Plans

Although the management objectives and the planning are logically split according to the functional areas above, the technical expertise is asset type specific and cuts across the different functional areas. Seven areas of technical expertise have been identified below and a detailed breakdown of assets is provided in Annexure A. : 1. Buildings and Property; 2. Civil Structures; 3. Pipelines; 4. Electrical Equipment; 5. Mechanical Equipment; 6. Process Plant; and 7. Automation Equipment. In order to effectively manage the asset portfolio, planning should be done by functional area, with each functional area being assigned to one Asset Management Planner.

The technical expertise of managing the assets is best arranged by asset group and should be headed by an Asset Manager. The Asset Management Planner should have expertise in planning and the primary management responsibility of developing and implementing Asset Management Plans for each Supply System. This includes defining service levels, forecasting demand, integration, optimised decision making, and developing long term financial plans. The Asset Manager should have a strong technical background in design, rehabilitation, and maintenance of the asset group

and the primary management responsibility of optimally managing the lifecycle of the asset group, bearing in mind the priorities and constraints of each Supply System.

This includes managing condition data collection, assessing asset risk, setting standards, and the development of maintenance and rehabilitation strategies. These two groups will interact in a matrix structure as shown below. Figure 123: Asset Management Planning and Management Structure It should be noted that the Asset Managers help the Asset Management Planners develop the best asset management strategies to achieve the specific objectives of the Supply System. For example, the strategy to manage pumps in a Supply System may be different from the strategy to manage pumps in a Purification System as the pumps pose different risks to the achievement of the management outcomes.

Even between two different Supply Systems, similar pumps may have different strategies as they may pose different risks to each particular Supply System. The organogram under the Senior Manager Assets is shown below. Figure 124: Organogram There is substantial integration required between all the units under the Senior Manager: Assets to implement effective asset management practices. These interfaces will mature with the implementation of a structured asset management improvement process.

13. 14. ASSET MANAGEMENT IMPROVEMENT PROCESS Rand Water is at the initiation stage of the implementation of asset management as a holistic practice across its structure.

A new structure has been formed under a strategic asset manager and the mandate has been given for the structure to implement asset management

best practice. The strategic asset manager now needs to proceed with the implementation process. The process for the adoption of asset management within Rand Water follows the approach advocated by PAS55 with additional guidance from the IIMM. The process starts with the development of an asset management policy that is aligned with the strategic objectives of the organization. The policy then guides the development of an asset management strategy, which is a set of actions, to enable asset management within the organization.

The strategy needs to be implemented in a manner that develops internal capacity in the organization to execute the asset management practices as a part of everyday business. A process of improvement management then needs to be adopted to ensure that the asset management capabilities are further developed and refined with time. The asset management strategy implementation will require substantial change management to raise the capability from awareness through to integration. The process is shown in the table below.

| Asset Management Policy | Asset Management Strategy | Strategy Implementation | Improvement Management | What is it? |
|--|---|---|--|-------------|
| Broadly outlines how and why AM will be undertaken across the organisation as a whole. | Specifies actions to be undertaken to improve AM capability to achieve specific objectives. | Implementation of the identified actions . | Continuous refinement of the strategy and implementation of revised actions. | Objective |
| Provides the organisational foundation and mandate to undertake AM in a structured and coordinated manner. | Develops a structured set of actions aimed at enabling AM within the organisation. | Develops internal capability to implement and sustain AM practices. | Refines | |

AM capabilities through continuous structured improvement management. | Description| * Organizational context, importance of AM * Organizational vision and goals and AM vision and goals * AM policies underpinning AM goals * Key performance measures for policies incl. imeframes * AM responsibilities and relationships * AM integration with business processes| * Description of current practices * Description of required practices to achieve AM vision and goals * Identification of the gap between current practices and future vision * Identification and description of strategies to close the gaps in a structured manner| * Raising of awareness across the organization * Developing of technical understanding * Embedding of AM practices through application * Integration of AM practices to achieve multi-disciplinary AM benefits| * Optimisation of AM practices through refinement and enhancement * Innovation of new and best practices that deliver step changes rather than incremental change| 15. ASSET MANAGEMENT STRATEGY DEVELOPMENT The asset management strategy specifies the actions that need to be undertaken to develop, improve and embed asset management capacity within the organization in order to achieve the corporate objectives.

The process of strategy development is to assess the organization's asset management system by means of an asset management practices audit, which compares the organization's current asset management practices against the requirements of PAS 55 and international best practice. The audit is made against the asset management system components that comprise asset management within the organization. The identified best practice “gaps” are prioritized and programmed in an asset management strategy to drive improvement. Furthermore, the audit provides a benchmark to

measure organizational improvement and maturity annually. 16. ASSET MANAGEMENT SYSTEM COMPONENTS The asset management system is a whole of life asset management framework that reflects the management and control level in the organization as well as the different stages of the asset lifecycle i. e. he system addresses the strategic, tactical and operational management of the organization as well as the planning, implementation and asset care phases of the asset lifecycle. Note that the disposal stage is included under the asset care phase. The asset management system components illustrated below provide a high level structure for the strategy development. Each component should be reviewed in detail to determine the level of maturity of current practices, the best appropriate maturity level, and to define the actions required to achieve best practice. The components are shown in the figure below and described in greater detail in the text that follows.

FIGURE PROVIDED SEPARATELY Figure 151: Asset Management System Components Strategic Management Components Asset Management Policy and Strategy An Asset Management Policy is a description of an organisation's approach to Asset Management. It provides both the link between the overall organisational strategic plan and an effective Asset Management Plan, and also provides the start of the rationale that ultimately justifies every Asset Management activity the organisation undertakes. An Asset Management Strategy documents the organisation's overall approach to managing physical assets. It describes how the Asset Management Policy is to be implemented.

As such it needs to be closely aligned with that policy as well as linking to other associated higher level strategies (e. g. operational strategic plans etc.) Risk Management Policy A Risk Management Policy is a description of an organisation's approach to Risk Management. It addresses the management of risk between the strategic, tactical and operational level of management and the linkages between these levels. It is closely aligned to the Asset Management Policy. Statutory Compliance Organisations must be fully aware of the duties imposed under legal instruments for all of their activities and must ensure its systems and procedures fully comply with the requirements.

The organisation should have a system for identifying the laws and regulations applying to all activities involved with physical assets and to ensure its systems and procedures comply with the requirements. Organisational Alignment and Commitment Organizational alignment and commitment across the organization is essential for the successful implementation of asset management. The Asset Management Policy, Strategy, and Plans should be aligned with corporate objectives. The asset management strategy implementation should be overseen by a steering committee with representation by departments including finance, corporate, planning, maintenance, operations, and project management. Asset management information and plans should be widely available and used across the organization to inform strategic and tactical plans across the organization.

A strong commitment to an asset management improvement process by senior executive management, backed by the availing of adequate resources to implement the process, has proved to be a significant determinant of

asset management success and lead to the realisation of asset management benefits. Asset Management Structure and Responsibilities The definition of roles and responsibilities for the implementation of the Asset Management Strategy is necessary to ensure clarity of purpose and to manage interfaces between line functions. Asset management KPIs should strengthen the accountability towards the implementation of the strategy. Customer Service Level Management

The setting and management of Customer Service Levels have substantial influence on the Asset Management Plans, which have the objective of providing the desired level of service in the most cost-effective manner (IIMM). The setting of Customer Service Levels should be undertaken in a consultative basis with customers and should reflect customer expectations. Improvement Actions and Management of Change Improvement actions and management of change are the combined processes, systems and procedures in place in an organisation to specifically deal with corrective actions, preventive actions and continuous improvement actions. Financing Strategy

The financing strategy should quantify the total cost of asset ownership and the funding needs for additional capacity, level of service changes, asset renewal, and maintenance and operations over a long term planning period (20 years). The impact on funding sources and tariff setting should be determined to manage the surplus/deficit and to maintain financial sustainability over the long term. Investment decision making should incorporate organizational risk and triple-bottom-line consequences in the analysis framework. Skills Enhancement and Management Skills

Enhancement and Management refers to the processes utilised to manage personnel training and development, along with staff retention systems.

Tactical Management Components Subgroup: Planning Demand Forecasting

Demand forecasting is the estimation of the change in demand based on population and land use change within a long term planning horizon (20 years). Demand forecasts incorporate several demand influences including service level changes, pricing, customer types, and consumption trends. Several demand forecast scenarios are developed and associated risks are quantified.

Failure Prediction (capacity) Capacity failure prediction is the evaluation of capacity against forecast demand to predict failure time and the associated risks thereof.

Failure Prediction (condition) Condition failure prediction is the prediction of asset decay and the associated risks of asset deterioration over time along with the identification of appropriate asset strategies to manage the risks.

Strategic Maintenance Planning The Strategic Maintenance Plan documents the continuing suitability, adequacy, effectiveness and efficiency of the Asset Care function by addressing formal compliance audits results, performance against KPIs, incident results, progress against previous management reviews, and plans for improvement.

Reliability Engineering ; RAM analysis Reliability, Availability, Maintainability (RAM) Analysis provides organisational risk based assessments to highlight which assets are providing optimised return on investment and are being administered effectively at lowest cost.

It involves understanding the concept of the three critical factors and how each affects the other. RAM can be applied at any point in the project lifecycle from concept to operation. However, it is most cost-effective at the

early detailed design stage when the required operating parameters are known, equipment designs/vendors have been selected and engineering feedback from the RAM study can still be effectively and efficiently incorporated into the overall design. Asset Lifecycle Analysis Life cycle analysis involves the analysis of all costs associated with owning an asset. It is the sum of all recurring and non-recurring costs over the full life p of an asset or system.

It includes the purchase price, installation cost, operating costs, maintenance and upgrade costs and the salvage value at the end of ownership or its useful life. Optimised Decision Making Optimised Decision Making is the process of identifying and prioritising projects/interventions required to manage risks at optimal timing, along with multi-criteria prioritisation based on lifecycle cost and triple-bottom-line based consequence analysis. The decision making is integrated across service disciplines and functional areas to derive the optimal project/intervention program that results in the best investment for the organization. Investment Analysis

Investment Analysis refers to the evaluation framework and financial analysis used to evaluate the viability of the investments and to inform investment decision making. Investment analysis includes financial modelling and the quantification of net present value, benefit-cost ratios, risk reduction benefits, societal benefits, etc. Asset Management Plan The Asset Management Plan informs the organization of how the assets will be managed over the long term (20 years) along with a short term implementation plan (5 years). The Asset Management Plan highlights the

changes in demand, service levels, and asset condition along with the risks that these pose to the organization.

It quantifies the long term funding needs and constraints and explains how the funding will be prioritised between the competing needs. It provides a prioritised short term (5 year) project/intervention program for implementation. It also incorporates the asset management improvement plan, which guides the organization on the practices to improve over the short term. Subgroup: Implementation Lifecycle Design Optimisation Lifecycle Design Optimisation is the process of incorporating lifecycle analysis, maintenance strategy, and maintenance constraints into the design phase to ensure that infrastructure is designed in a manner that minimises the long term lifecycle cost of asset ownership. Operational Readiness and Commissioning

Operational Readiness is a structured systemic process that is used to prepare for the project operational phase. It is used to ensure that new or modified assets or systems are able to commence operation in the desired and expected manner. It is an integrated, proactive, considered approach to projects that ensures that people are operationally ready, systems are operationally ready, and assets are operationally ready. Commissioning is an integral part of the Operational Readiness process that refers to the execution of the testing, dynamic verification and acceptance plans for the assets to ensure the asset has been delivered to the required quality and performance criteria. Equipment Standardisation

Equipment Standardisation describes the continual improvement method of reducing the cost of inventory and maintenance, by reducing instances of

machinery, materials or spare parts that are one-off or stand-alone compared to others in use at a site. When equipment is standardised, one suite of spare parts can be used, and training for personnel is reduced, which in turn reduces overall maintenance cost. Subgroup: Asset Care Maintenance Performance Management (KPIs) Performance metrics (KPIs) are measures of an organisation's activities and performance and enable maintenance performance to be monitored against specific targets. Asset Strategies

Asset Strategy Development is the process to ensure that appropriate maintenance activities are performed with optimum effectiveness and efficiency to allow an organisation to achieve its business objectives at the lowest asset lifecycle cost. Failure Analysis and Root Cause Mitigation Failure Analysis and Root Cause Mitigation is the identification of potential costly failures and mitigation of all possible root causes of such failures. "Apollo Root Cause Analysis" is an event-based problem solving technique widely used as a leading practice to identify failure modes and effects on the process. Failure Modes and Effects Analysis (FMEA) and Failure Modes, Effects and Criticality Analysis (FMECA) are reliability based techniques and products that can be used to solve a wide range of reliability problems.

Reliability Centred Maintenance

Reliability Centred Maintenance (RCM) is a process that is used to determine what sort of maintenance needs to be carried out on any physical asset with a focus on preserving its system functions, rather than preserving the equipment. RCM is a logical, structured framework for determining the optimum mix of applicable and effective maintenance activities needed to sustain the desired level of operational reliability of systems and equipment

while ensuring their safe and economical operation and support. External benchmarking Benchmarking is a continuous improvement tool that is used to achieve improved performance by measuring the organisation against other organisations that are identified as exhibiting leading practice worldwide. Sustainability

Sustainability is the evaluation of the environmental, economic and social impact of the assets and the extent to which the triple-bottom-line elements are incorporated in the organisation's practices. Loss Mapping and Analysis

All organisations are working to get competitive returns from their investments in assets. The complexity in plants and equipment through process automation and technology has substantially increased the number of problems that can cause production problems. To identify the source of the problems which contribute to major losses is a very important criterion to prioritise the process improvement projects. Maintenance/Operations Integration Maintenance/Operations Integration is a management principle with derivative actions, and is designed to combine the organisational functions of the

Operations and Maintenance groups in order to become more effective and efficient. Integration ensures that the human resources of both departments have a clear, common and collective purpose to improve the equipment performance, and subsequently the benefits to the business. Operational Risk Analysis (compliance, contingency plan, risk management) The Operational Risk Management (ORM) process is undertaken to identify and quantify risk exposure and then develop suitable strategies, plans and procedures to maximise its upside and minimise its downside exposures.

Operational Management Components Subgroup: Planning Planning Data Collection (condition, usage, risk)

Planning data collection refers to the collection of information for planning purposes, which usually includes condition, usage, and risk data amongst other data. This information typically covers the entire asset group and is used to identify projects/interventions that need to be implemented over the planning horizon. Planning Information Management (condition, usage, risk, GIS) Planning Information Management refers to application of systems to manage planning information. Due to the different nature of planning and maintenance data, planning data typically does not reside in a CMMS, but rather resides within a GIS and planning database. Linkages between systems are important to allow the transfer of data for planning and analysis.

Subgroup: Implementation

Material and Contract Management (vendor reliability, material management) Vendor Reliability refers to the capacity and capability of a vendor (or group of vendors) to consistently supply goods and services to the client in a timely manner as per defined specifications and standards. Materials Management is the complete set of processes and procedures that are used to ensure that resources other than personnel, tools and equipment are readily available to support all maintenance activities. Subgroup: Asset Care Maintenance Information Mgmt (CMMS) Maintenance Information Management entails acquiring, organising, maintaining and retrieving maintenance information.

A Computerised Maintenance Management System (CMMS) is a system to assist with the effective and efficient management of maintenance activities

through the application of computer technology. It generally includes elements such as a Work Order system, as well as facilities for scheduling Routine Maintenance Tasks, and recording and storing Standard Jobs, Bills of Materials and Applications Parts Lists, and other associated features. Maintenance Identification and Prioritisation Maintenance Identification is the process of defining what needs to be done to an existing asset to either ensure it remains in a state whereby it can perform its stated function, or can be efficiently returned to such a state.

Maintenance Prioritisation is the process of determining a ranking or rating for a defined amount of work, based on an objective assessment of the importance of the work, in terms of the impact failure of the asset would have. Asset Criticality can be incorporated during this prioritisation process. Preventative Maintenance (inspections, work management) Preventive Maintenance is the systematic care, servicing and inspection of equipment for the purpose of maintaining it in serviceable condition and detecting and eliminating failure modes. The ultimate goal of doing preventive maintenance is to keep the equipment running to its required function and operational standard. Work management covers all procedures that are followed to ensure that maintenance work is carried out in an efficient and effective manner.

Work execution procedures are usually enacted by maintenance supervisors or coordinators and apply to work being done under the authority of properly planned and scheduled work orders. Planning and Scheduling (budgeting, short and medium-term planning, scheduling) Maintenance planning and scheduling includes the budgeting, planning and scheduling of equipment

maintenance strategies to ensure that activities are performed with optimum effectiveness and efficiency. Health, Safety and Environment Health Safety and Environmental (HSE) management encompasses the systems and procedures that are adopted to reduce the risk of causing harm to people and the environment that may be associated with the way in which maintenance activities are carried out. Condition Based Maintenance

Condition Based Maintenance is an equipment maintenance strategy based on measuring the condition of equipment in order to assess whether it will fail during some future period, and then taking appropriate action to avoid the consequences of that failure. The condition of equipment could be monitored using Condition Monitoring, Statistical Process Control techniques, by monitoring equipment performance, or through the use of the Human Senses. The terms Condition Based Maintenance, On-Condition Maintenance and Predictive Maintenance can be used interchangeably. Autonomous Maintenance Autonomous Maintenance refers to the management routine and minor maintenance of equipment without the need or requirement for intervention from a dedicated maintenance team. It is the running repairs and adjustments that can be performed by the operators, before, after and during the use of the machinery.

To enable these tasks to be completed effectively, operators need to be trained in the types of adjustments and repairs they are expected to perform, and given a degree of ownership of the equipment. Autonomous maintenance relies heavily on training and education to be able to identify the difference between normal and abnormal operation of the equipment they are operating. Organizational Support Components Information Architecture

and Business Process Information Architecture is the flow of information and defines where and whom will be updating various data fields to ensure accurate information and accountability as it flows through various systems (GIS, CMMS, etc.) Information flow mapping and allocating responsibility for data management increases the quality of the information.

Business Process mapping identifies the process of tasks and responsibilities for the implementation of key processes in the business. 17. CONCLUSION This document provides a framework for the adoption of a structured approach to implement asset management best practice within Rand Water. The document clarifies the scope of asset management, identifies a quality framework to adopt, describes the high level structure and responsibilities, defines an improvement process, and defines the asset management system components that should be developed in the improvement process to implement a whole of life asset management approach within the organisation.

The implementation process required to adopt and embed asset management practices in a structured manner is described in this document and is the recommended way forward for Rand Water. Annexure A: ASSET PORTFOLIOS The following table lists a comprehensive collection of Rand Water's Strategic Assets. The Assets of Rand Water can broadly be grouped into the following portfolios (in alphabetical order): Buildings and Property| Civil Structures| Pipelines and Servitudes| Electrical Equipment| Mechanical Equipment| Process Plants| Automation Equipment| Access control Air conditioning CarportsCCTVElectricsEngine Rooms Estates Farms Fencing Fire protection Furniture GardensHostels Houses Interior decorationIntruder

detectionLandOffices Passive SecurityPavingPlant uildings
SewageStoresWorkshops Encroachment | Balancing TanksBarrage
structureBridgesCarbonation baysConditioning baysControl WorksCanal
Engine RoomsFiltersForebayFlocculators OverflowsPlant structuresRailway
sidingsReservoirsRoadsSediment tanksSumps| Air valvesBreak pressure
tanksConnectionsCulvertsDeviationsElectrolysisFlow controlIn-line
filtersInner liningsIsolation valvesJunctionsMeter chambersNon-return
valvesOuter coatingsPipe manufacture plantPipelinesPipeline
protectionPressure controlProtectionScour chambersScour
valvesServitudesSurveyTunnelsValve chambersWater hammer
systemsWater lossesEncroachment| BatteriesBattery chargersCablingControl
desksControl panelsDistribution boardsEarthingElectricity supplyEmergency
generatorsEnergy meteringEnergy managementHarmonic filtersHydro power
LightingLightning protectionLV switchgearMimicsMinisubsMotor control
centresMotorsMV switchgearPower factor
correctionProtectionReticulationRing main
unitsSubstationsTransformersUPS'sVSD's / soft starters|
ActuatorsBlowersCompressorsConveyorsCranesCrushersDesludge
bridgesDust extractionGatesPipeworkPressure vesselsPumpsValvesNon
return valvesSteelworkThickenersSump pumpsVehiclesEarth moving|
AmmoniaCarbonationChlorineFerric ChlorideGAC filtrationLime burningLime
slakingMembraneMilk of lime dosingOzonePoly ElectrolyteRWW
treatmentSand filtrationSodium hypochloriteUltra violet lightChemical
supplyChemical quality| OrchestraCommunicationControl CentresControl
schemesFlood controlFlow meteringHuman Machine
InterfacesInstrumentation PLCScadaInsql data historiansIndustrial networks

Industrial serversIndustrial
controlTelemetryIntelligent control|

softwareSW

configuration