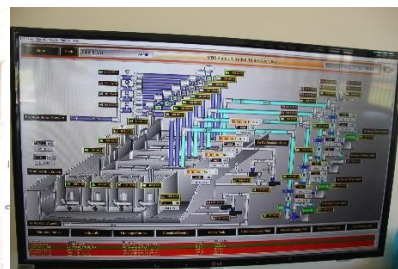


SWARTLAND MUNICIPALITY

WATER SERVICES DEVELOPMENT PLAN FOR 2022-2027

FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS



FINAL DOCUMENT

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WATER SERVICES DEVELOPMENT PLAN MASTER PLAN

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ABBREVIATIONS AND DEFINITIONS

AC	Asbestos Cement
AMP	Asset Management Plan
BPT	Bulk Pressure Tank
BRVAS	Berg River Voëlvelei Augmentation Scheme
BV	Book Value
CAFES	Conserving, Adequate, Fair, Enforceable and Simple
CCT	City of Cape Town
COD	Chemical Oxygen Demand
CRC	Current Replacement Cost
CRR	Cumulative Risk Ratio
DM	District Municipality
DO	Dissolved Oxygen
DSVI	Dissolved Sludge Volume Index
DWS	Department of Water and Sanitation
EC	Electrical Conductivity
EGL	Existing Ground Level
EHP	Environmental Health Practitioner
EPWP	Expanded Public Works Programme
FCV	Flow Control Valve
FDA	Future Development Area
GIS	Geographic Information Systems
HL	High Level
IAMP	Infrastructure Asset Management Plan
IBT	Inclining Block Tariff
ICT	Information and Communication Technology
IDP	Integrated Development Plan
ILI	Infrastructure Leakage Index
IMP	Incident Management Protocol
IMQS	Infrastructure Management Query System
IPP	Independent Power Producers
IRIS	Integrated Regulatory Information System
IT	Information Technology
IWA	International Water Association
Kl/day	Kilolitre per Day
KPI	Key Performance Indicator
l/c/d	Litre per Capita per Day
l/p/d	Litre per Person per Day
l/s	Litre per Second
LED	Local Economic Development
LL	Low Level
LM	Local Municipality
LOFLOS	Low Flow On-Site
m ³	Cubic Metre
m ³ /day	Cubic Metre per Day
MBA	Membrane Bioreactor
MFMA	Municipal Finance Management Act

ABBREVIATIONS AND DEFINITIONS

MIG	Municipal Infrastructure Grant
MI	Mega Litre
MI/a	Mega Litre per Annum
MI/d	Mega Litre per Day
MNF	Minimum Night Flow
MTEF	Medium-Term Expenditure Framework
ND	Nominal Diameter
NRW	Non-Revenue Water
NU	Non-Urban
NWA	National Water Act
NWRS	National Water Resource Strategy
O&M	Operation and Maintenance
OC	Opening Cost
PC	Process Controller
PDD	Peak Daily Demand
PPE	Personal Protective Equipment
PRP	Pipe Replacement Potential
PRV	Pressure Reducing Valve
PS	Pump Station
RDP	Reconstruction and Development Programme
RFP	Request for Proposal
RUL	Remaining Useful Life
SANS	South African National Standard
SCADA	Supervisory Control and Data Acquisition
SCM	Supply Chain Management
SDBIP	Service Delivery and Budget Implementation Plan
SDF	Spatial Development Framework
SFWS	Strategic Framework for Water Services
SMP	Sewer Master Plan
SOPs	Standard Operating Procedures
SST	Secondary Settling Tank
TCTA	Trans Caledon Tunnel Authority
TSS	Total Suspended Solids
TWL	Top Water Level
URV	Unit Reference Value
VIP	Ventilated Improved Pit
WARMS	Water use Authorisation and Registration Management System
WAS	Waste Activated Sludge
WC	Water Conservation
WC/WDM	Water Conservation / Water Demand Management
WCDM	West Coast District Municipality
WCWSS	Western Cape Water Supply System
WDM	Water Demand Management
WHO	World Health Organisation
WMA	Water Management Area
WMP	Water Master Plan

ABBREVIATIONS AND DEFINITIONS

WSA	Water Services Authority
WSDP	Water Services Development Plan
WTP	Water Treatment Plan
WTW	Water Treatment Works
WWTW	Waste Water Treatment Works

References

- 2001, 2011 and 2022 SA Census Data. 2016 Community Survey data of STATSSA.
- DWS's All Towns Reconciliation Strategy Documents for each of the towns in Swartland Municipality's Management Area, 2016.
- Final Draft 2022/2023 Annual Report, Swartland Municipality, January 2024.
- Integrated Development Plan, 2023/2024, Swartland Municipality, May 2023.
- 2022/2023 Medium Term Revenue Expenditure Framework (MTREF) Budget Report, Swartland Municipality.
- Operational and Capital Budgets and Tariffs of Swartland Municipality.
- 2022-23 Municipal Economic Review and Outlook, West Coast District, Western Cape Government.
- Socio-Economic Profile for Swartland Municipality, 2022, Western Cape Government.
- DWS's 2023 Blue Drop Report
- DWS's 2022 Green Drop Report.
- DWS's 2023 Green Drop PAT
- Swartland Municipality Spatial Development Framework, Draft 2023-2028, CK Rumboll & Partners.
- Growth Potential Study, 2014, Western Cape Government, Environmental Affairs and Development Planning.
- Municipal Services Strategic Assessment (MuSSA) for Swartland Municipality, 2023.
- Swartland Water Master Plan, 2020, GLS Consulting.
- Swartland Sewer Master Plan, 2020, GLS Consulting.
- Swartland Bulk Water Master Plan, 2021, GLS Consulting.
- WSDP Performance- and Water Services Audit Report for 2022/2023, iX engineers.
- West Coast District Municipality's Climate Change Plan, May 2019.
- Water Safety Plan for the Internal Water Supply Systems, Working Document, August 2022, iX engineers.
- Water Safety Plan for the Swartland Bulk Water Distribution System, Working Document, June 2022.
- Process Audit Reports for the Wastewater Treatment Plants for the period July 2018 to June 2020, May 2021, Chris Swartz Water Utilization Engineers.
- Wastewater Risk Abatement Plans (W₂RAPs) for the various WWTWs, Working Documents, January 2018, iX engineers.
- Swartland Municipality: Resource Augmentation Study – Desktop Study, May 2021, iX engineers.
- Assessment of Bulk Water Meters, Malmesbury and Riebeeck Kasteel, June 2023, Draft, Bigen.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 1: SETTLEMENT DEMOGRAPHICS AND PUBLIC AMENITIES

1. SETTLEMENT DEMOGRAPHICS AND PUBLIC AMENITIES

Table 1.1: Master Plan for Settlement Demographics and Public Amenities		
Section	Master Plan	Yes / No
Settlements Summary (Population, Households, Household size, Settlements)	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Settlement Group (Rural / Urban)	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Settlement Type	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Amenities Summary	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes

1.1 SETTLEMENT DEMOGRAPHICS

The purpose of the SDF is to guide growth and development in the municipal area or space in a sustainable manner. Hence, future growth, development and land use planning departs from a vision and principles that underscore the protection, creation (development) and support (change) of integrated, sustainable settlements and liveable environments to enable economic and social prosperity.

The spatial objectives and strategies of the SDF will be informed by the IDP's strategic objectives and the Swartland SDF Vision as indicated in the table below (2023/2024 IDP).

Table 1.1.1: SDF Spatial Objectives and Strategies	
Spatial Objective	Strategy
Objective 1: Grow economic prosperity [Economic Environment] IDP Strategic Goal 2 - Economic transformation	1. Protect Swartland's competitive trade advantage. 6. Grow (change) economic potential and trade advantage, strengthen mobility and economic links, stimulate diversification and product development. 11. Develop Swartland's competitive advantage, new markets and economic sectors (e.g. tourism).
Spatial Objective 2: Proximate convenient and equal access [Economic Environment] IDP Strategic Goal 3 – Quality and reliable services.	2. Protect economic vibrancy. 7. Provide (change) sustainable infrastructure and services (smart growth). 12. Provide land for residential and industrial development.
Objective 3: Sustain material, physical and social well-being [Social Environment] IDP Strategic Goal 1 - Community safety and wellbeing	3. Protect safety and security. 8. Provide (change) of social infrastructure and services (as per norm) to facilitate smart growth. 13. Manage risk and disaster (man-made and natural).
Objective 4: Protect and grow place identity and cultural integrity [Built Environment] IDP Strategic Goal 5 - A connected and innovative local government	4. Protect heritage resources. 9. Grow cultural potential. 11. Develop competitive advantage, new markets and economic sectors.
Objective 5: Protect ecological and agricultural integrity [Biophysical or Natural Environment] IDP Strategic Goal 4 - A healthy and sustainable environment	5. Protect food and water security and formalize conservation of Critical Biodiversity Areas. 10. Grow conservation potential and apply bioregional classification and coastal management. 11. Develop competitive advantage, new markets and economic sectors (e.g. tourism and utilities).

Swartland Municipality's 2023/2024 IDP list the following development proposals for the Swartland Region.

- Promotion of the N7 intensive rural corridor south and north of Malmesbury.
- Promotion of transport and tourism node development on N7 (R45 and Klein Dassenberg) and R27 (R415).
- Enhance the formalization of the Paardeberg as a world wine and conservation destination (cross border activity).
- Promote Darling and Yzerfontein as a world biodiversity and film destinations.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 1: SETTLEMENT DEMOGRAPHICS AND PUBLIC AMENITIES

- Promote the coastal conservation park as an extension of the West Coast Park.
- Promote the Diep River as a historic link between Swartland and Cape Town (cross border activity).
- Finalization of declaration of Critical Biodiversity Areas (including Renosterbos remnants around Malmesbury and in Swartland).
- Enter into further negotiations with the national Department of Agriculture to exempt land earmarked for urban development.
- Implement economic mobility proposals according to ward needs.
- Enhance partnership through the establishment of a development forum.

The Housing pipeline for the three financial years from July 2023 until June 2026 focuses on Malmesbury, Chatsworth, Darling and Moorreesburg and is subject to the availability of funding from the Provincial Department of Human Settlements. The table below provides an overview of Swartland Municipality's Housing Pipeline as included in the 2023/2024 IDP.

Table 1.1.2: Swartland Municipality's Housing Pipeline			
Town	2023/2024	2024/2025	2025/2026
Hoop Phase 2	506 sites	507 sites	500 sites
Phola Park	31 shared services	-	-
Darling Phase 1	-	187 sites	187 units
Darling Phase 2 (327)	-	Planning (PID)	-
Moorreesburg	-	645 sites	320 units
Chatsworth (130)	-	Planning (PID)	-

1.2 PUBLIC AMENITIES

All schools and medical facilities in the urban areas in Swartland Municipality are provided with a higher level of water and sanitation service (Water connection inside the erven and a waterborne sewer system) and no specific strategies with regard to the provision of water and sanitation services for the educational and medical facilities in the urban areas were therefore developed.

The existing service levels (Water and Sanitation) of the primary schools in the rural areas need to be verified. All schools in the rural areas without basic water and sanitation services need to be provided with at least basic services.

1.3 SOCIO ECONOMIC BACKGROUND

1.3.1 Population and Households

The table below gives a summary of the projected population for the various schemes in Swartland Municipality's Management Area.

Table 1.3.1.1: Projected future population							
Scheme	Projected Population 2022/2023	Future Estimated Growth (%/a)	Projected Population				
			2027	2032	2037	2042	2047
Darling	12 956	2.0%	14 304	15 793	17 437	19 252	21 256
Koringberg	1 869	4.0%	2 274	2 766	3 366	4 095	4 982
Malmesbury	58 256	4.5%	72 597	90 469	112 741	140 496	175 083
Abbotsdale	5 207	3.0%	6 037	6 998	8 113	9 405	10 903
Chatsworth & Riverlands	7 692	6.0%	10 294	13 775	18 434	24 669	33 013
Kalbaskraal	4 124	5.0%	5 263	6 717	8 573	10 941	13 964
Moorreesburg	19 824	4.0%	24 118	29 344	35 701	43 436	52 846
Riebeek Kasteel	10 021	7.0%	14 055	19 713	27 649	38 779	54 389
Ongegund (PPC)	420	3.0%	674	781	906	1 050	1 217

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 1: SETTLEMENT DEMOGRAPHICS AND PUBLIC AMENITIES

Table 1.3.1.1: Projected future population							
Scheme	Projected Population 2022/2023	Future Estimated Growth (%/a)	Projected Population				
			2027	2032	2037	2042	2047
Riebeek Wes	8 322	6.0%	11 698	15 655	20 950	28 036	37 518
Yzerfontein	1 755	4.0%	2 135	2 598	3 161	3 845	4 678
Farms	47 630	3.5%	56 570	67 187	79 797	94 774	112 561
TOTALS	178 075	4.1%	220 019	271 796	336 828	418 778	522 410

The population is likely to be influenced by economic opportunities and job creation. The table below gives an indication of the estimated future number of households per distribution system, as calculated from the projected future population figures.

Table 1.3.1.2: Estimated number of permanent future households							
Scheme	Projected Number of HH 2022/2023	Estimated Persons / Household	Estimated future number of permanent households				
			2027	2032	2037	2042	2047
Darling	3 481	3.7	3 844	4 244	4 686	5 173	5 712
Koringberg	488	3.8	594	722	879	1 069	1 301
Malmesbury	15 373	3.8	19 158	23 874	29 752	37 076	46 203
Abbotsdale	1 279	4.1	1 483	1 719	1 993	2 310	2 678
Chatsworth & Riverlands	2 100	3.7	2 810	3 760	5 032	6 733	9 011
Kalbaskraal	1 127	3.7	1 439	1 836	2 343	2 991	3 817
Moorreesburg	5 693	3.5	6 926	8 427	10 253	12 474	15 176
Riebeek Kasteel	2 831	3.5	3 971	5 569	7 811	10 955	15 365
Ongegund (PPC)	105	4.0	168	195	226	263	304
Riebeek Wes	2 066	4.0	2 904	3 886	5 200	6 959	9 312
Yzerfontein	754	2.3	918	1 117	1 359	1 653	2 011
Farms	10 759	4.4	12 778	15 176	18 024	21 407	25 425
TOTALS	46 056	3.9	56 993	70 525	87 558	109 063	136 315

1.3.2 Population Growth Rates

The historical population growth rates between 2001 and 2011 were used to estimate the future projected population growth rates for the various towns. The 2022 population Census data is not yet available per Community Profile. The 2022/2023 population was estimated by applying the annual growth rates as indicated in Table 1.3.1.1 to the 2011 Census data. The current population figures and the annual population growth percentages used in the WSDP Report are aligned with the figures used in DWS's GeoDatabase.

1.3.3 Age and Gender Profile

The table below indicates the population composition per age cohorts. These groupings are also expressed as a dependency ratio, which in turn indicates who are part of the workforce (Age 15 – 64) and those, who are depending on them (children and senior citizens). A higher dependency ratio implies greater pressure on social systems and the delivery of basic services.

Table 1.3.3.1: Age Cohorts, 2022 - 2026				
Year	Children 0 – 14 Years	Working Age 15-64 Years	Aged 65+	Dependency Ratio
2022	35 418	98 193	7 086	43.3
2024	36 662	102 902	7 306	42.7
2026	38 071	107 194	7 655	42.7
Growth	+1.8%	+2.2%	+1.9%	

Source: 2022 Socio-Economic Profile Swartland Municipality

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 1: SETTLEMENT DEMOGRAPHICS AND PUBLIC AMENITIES

Between 2022 and 2026, the highest projected population growth is recorded for the working age population (15-65 years), projected to grow at an annual average rate of 2.2 percent. The aged age cohort (65+ years) is predicted to also grow relatively fast, at an average annual rate of 1.9 percent over the same period. The child (0-14 years) cohort, is the slowest growing age cohort in the area, growing at a rate of 1.8 percent for the same period. These predicted growth rates will lead to a decline in the dependency ratio, from 43.3 in 2022 to 42.7 in 2026.

Considering a possible diminishing number of paying residents within the Swartland area due to the previous Covid19 pandemic and the current loadshedding, coupled with the influx of indigent people into the area, the dependency ratio is worth being noted and proactive mechanisms must be designed to address these issues in order to ensure that the municipality remains financially sustainable. The main concerns in an increased dependency ratio are decreased investment rates and slowdown in long-term economic growth. Failure to address this ratio could have a big impact on the social systems of Swartland Municipality.

1.3.4 Employment Profile

Unemployment leads to poverty which impacts negatively on the Municipality's income as it reduces the ability of people to pay for services and people become dependent on indigent grants which the Municipality has to finance through its equitable share as well as other grants provided by other government agents.

Swartland Municipality is conscious of the challenges of poverty in the area and strives to contribute towards the alleviation thereof by means of e.g. the Indigent Policy, Labour intensive projects, LED projects and the use of their Supply Chain Management Policy as an instrument to enforce the maximum use of local labour.

A critical aspect of infrastructure development is the obligation and commitment to create jobs. Direct job creation takes place through the development, operation and management of water infrastructure, which indirect job creation flows from the associated water supplies to economic activities such as mining, manufacturing, power generation and agriculture.

Investment in infrastructure development could create employment for local workers and provide skills development and work experience at a number of levels, from the highly technical jobs to manual labour, particularly where labour-intensive construction methods are used. The operation and management of water infrastructure also offers opportunities for job creation.

It is therefore important for Swartland Municipality to focus on labour intensive construction methods (EPWP projects) when implementing new projects. This process involves attacking poverty through job creation in the delivery of sustainable services. The Guidelines for the Implementation of Labour Intensive Infrastructure Projects under the Expanded Public Works Programme is available to assist Municipalities.

1.3.5 Household Income

Low household income in poverty areas is aggravated by poor quality of basic services, long walking distances to health and welfare facilities and long distances to the main employment opportunities. In recognition of the urgency to address poverty in the area Swartland Municipality adopted various measures of assistance to indigents such as incentives in respect of assessment rates and basic services and the provision of housing. Participation from other spheres of government and NGOs are also encouraged in order to meet with the demand.

The key element of the WSDP is the assessment of affordability of the service to consumers. In order to adequately understand affordability, typical monthly bills need to be assessed against what people are earning. This needs to be looked at in terms of how the Equitable Share will be allocated and the Indigent Policy of the municipality. It should be noted that the overall total municipal bill, which includes all municipal services and rates (i.e. not just water and sanitation) for low income earners, should not be greater than about ten (10) percent of income.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 1: SETTLEMENT DEMOGRAPHICS AND PUBLIC AMENITIES

Swartland Municipality needs to collaborate with the private sector and local non-profit organizations to provide needed skills at all levels, commission a skills audit and gap assessment and a skills development exercise focusing on specific priorities. The projects should focus on socio-economic upliftment, as part of Swartland Municipality's strategy to bring about poverty alleviation through job creation whilst enhancing the prospects of reducing outstanding municipal consumer debt. The main objectives of these projects should be as follows:

- Create employment
- Reduce poverty
- Reduce outstanding municipal debts
- Transfer / develop skills
- Create facilities, build infrastructure and improve service delivery
- Draw people into the economy (opening bank accounts)
- Build pride of ownership in the community
- Involve communities in developing their areas

Swartland Municipality's Indigent Policy caters for a proportion of the population not being able to afford water and sanitation services. The proportion of the population who cannot afford water and sanitation is also examined each year during the budgeting and tariff setting process and tariffs are adjusted accordingly. Households that cannot afford to pay can register as Indigent.

Certain initiatives from the Swartland Municipality aim to create job opportunities by means of:

- Labour intensive public work programmes;
- Procurement Policy in which preference is given to local contractors and contractors who employ local labour.

Labour Intensive methods must be used as far as possible for the following water services activities:

- Bulk and internal water reticulation networks
- Bulk and internal sewer drainage networks
- Provision of basic services on farms.

2. SERVICE LEVELS PROFILE

The Strategic Framework for Water Services (SFWS) places an appropriate focus on the imperative of ensuring universal access by households to at least a basic water supply and sanitation service. However, the provision of effective and efficient water services to meet the economic demand of all consumers (domestic and non-domestic) is equally important.

One of the visions of the Sector is that all people living in South Africa have access to adequate, safe, appropriate and affordable water and sanitation services, use water wisely and practise safe sanitation (SFWS).

One of the goals of the Sector is that water and sanitation services are provided (SFWS):

- Equitably (adequate services are provided fairly to all people);
- Affordably (no one is excluded from access to basic services because of their cost);
- Effectively (the job is done well);
- Efficiently (resources are not wasted);
- Sustainably (services are financially, environmentally, institutionally and socially sustainable; and
- Gender sensitively (taking into account the different needs and responsibilities of women and men with regard to water services and sanitation).

Basic services (the first step). As a priority it is the responsibility of Swartland Municipality to make sure that adequate and appropriate investments are made to ensure the progressive realisation of the right of all people in its area of jurisdiction to receive at least a basic level of water and sanitation services. The grants provided by national government in the form of the municipal infrastructure grant (MIG) will be adequate to ensure universal provision of at least a basic water supply facility and a basic sanitation facility within a reasonable period of time. This is called a universal service obligation and is the most important policy priority.

Whilst the provision of basic water services is the most important and immediate priority, WSAs are expected to provide intermediate and higher levels of services (for example, water on-site) wherever it is practical and provided it is financially viable and sustainable to do so.

PLANNING FOR BASIC LEVELS OF SERVICE

The primary constitutional obligation resting on WSAs is the provision of at least a basic level of services to all people living within their area of jurisdiction. The WSDP must show how the WSA plans to meet this universal service obligation.

PLANNING FOR HIGHER LEVELS OF SERVICE

Notwithstanding the primary constitutional obligation of basic services provision set out above (the first step), Swartland Municipality is expected to plan to move households up the water services ladder by providing higher levels of service wherever these are practical, financially viable and sustainable.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 2: SERVICE LEVELS PROFILE

Key issues to be taken into account when formulating a service level policy are as follows:

Socio-economic issues:

- The extent of cross-subsidization to support the provision of free or low cost services to poor and indigent members of the community is dependent on the make-up of the community in terms of the percentages of households that can afford to pay as well as the extent of commercial and industrial development.
- Population growth often tends to be greater in terms of the poorer members of society than the wealthier. Hence the future economic profile may tend towards a greater proportion of residents requiring subsidized services. This could be reversed in societies with high economic growth level.
- The health profile of communities is usually a result of a range of issues, including water supply, sanitation and health awareness. Experience has indicated that all three of these issues must be addressed in order to have a marked impact on the water and sanitation related health profile of a community.
- The implementation of water and sanitation projects can themselves make an impact on the employment and income profile of a community. The approach taken will govern the extent to which employment on the projects is facilitated, and whether the employment is short or long term.

Technical issues:

- The different options for water supply and sanitation systems have significantly different capital costs and operating costs. The local authority or WSP must ensure that these costs are affordable in terms of tariffs and subsidization possibilities.
- The different service level options usually have different water supply needs. Generally higher levels of service imply the need to supply more water per household and to a higher level of reticulation. It is critical to ensure that the water source is adequate and that the abstraction and reticulation systems are adequate and will not be subject to major leaks to ensure an ongoing reliable water supply.
- The risk of pollution of groundwater and surface water resources will be different for the different sanitation technology options. The risk of pollution from any particular system will also vary depending on the level operation and of the maintenance system. Hence a poorly operated and maintained waterborne sanitation system may have a significantly higher pollution risk than VIP sanitation systems, whereas a well operated and maintained waterborne sanitation system may result in a very low risk of pollution.
- The size and density of a settlement may be an important factor in the selection of technical options. The risks of pollution from dense settlements will usually be greater than from less dense settlements. It is also less costly to provide higher levels of services to more dense settlements than to disperse settlements.
- Different service levels have different operational demands, with off-site sanitation options placing more demands on the WSA and on-site options placing higher demands on households.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 2: SERVICE LEVELS PROFILE

- Experience with existing water and sanitation services may influence choices for new systems. It must be remembered that a negative experience associated with a particular system need not necessarily be as a result of a technological fault. Adequate human resource capacity and technical skills in operating these systems are also very relevant to their sustainable and affordable operation.

Water resources:

- South Africa is a water-scarce country with limited water resources. Opting for higher levels of service that require significantly more water at each household may not be compatible with the available resources. In the Western Cape in particular, rainfall occurs during periods of lowest demand for water (winter) and considerations such as storage (surface and aquifer) become important in order to store surplus winter water for the summer.
- Other water resources options that may be considered include demand management, aquifer recharge and water re-use at a local level and desalination of sea-water or of treated effluent. Groundwater sources must be carefully managed to ensure that abstraction does not exceed recharge potential and that the impact of abstraction on the surface water flow is monitored.
- The option of groundwater mining (i.e. pumping more than the annual recharge) should be avoided at all costs.
- Options of dual reticulation could be considered where fresh water supplies are limited. The second reticulation system may carry re-used water or saline groundwater and used for toilet flushing, gardens and laundry.

Water conservation / water demand management

From an urban water demand management perspective, there are many options which can be considered for implementation. Private initiatives include:

- Rainwater tanks. In the Western Cape, this option is not well suited for garden watering purposes as the available storage is limited.
- Private well-points and boreholes. This is only suited to those users able to afford the high installation costs, and where groundwater is accessible.
- Grey-water systems. These are also private initiatives and are relatively expensive. There may be associated health concerns, particularly if systems are not properly maintained.
- Retro-fitting of existing plumbing fittings with water efficient alternatives. Also dependent on the willingness of the users to pay for this privately.

Options for consideration by WSAs include:

- Pressure reduction interventions in conveyance networks to reduce leaks during periods of high pressure (common at night when demand is low).
- Dual reticulation systems where the second reticulation system carries treated effluent or saline groundwater for use in toilet flushing, gardens and laundry. May only be affordable to install in new developments.
- Irrigation exchange. This involves the exchange of treated effluent with equal volumes of fresh raw water used for irrigation. There may social, religious and market related objections to this.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 2: SERVICE LEVELS PROFILE

- Retro-fitting of plumbing fittings in existing municipal owned premises and promulgation of by-laws to enforce use of water efficient fittings only in new private developments. These include waterless urinals, removal of automatic flush urinals, use of dual flush toilets and low consumption shower heads.
- Adequately stepped tariff structures, particularly in the high consumption range, where water remains cheap to those who are able to afford it.
- Public awareness and education programmes.

The proposed WC/WDM strategy of the WSA should be assessed and the relevant sections that may influence the choice of water and sanitation systems should be taken into account.

Water service infrastructure

- The availability of water supplies with sufficient capacity within close proximity may significantly reduce the costs of providing a higher level of water and sanitation services to communities. The development of local infrastructure such as boreholes remain options well suited to the more remote areas.
- The availability of sewers and sewage treatment works within close proximity will significantly reduce the capital costs of providing a higher level of sanitation service, and reduce the incremental operational costs associated with the scheme. The availability of adequate resources to operate and maintain such systems is important.
- The existing services provided to one section of a community may often govern the choice of service levels to be provided to other sections of the community. However the sustainability, cost effectiveness and level of subsidization of the existing system should also be taken into consideration.

Water services institutional profile:

- Any new sanitation scheme requires ongoing care, maintenance and management. These services must usually be undertaken by the Water Services Provider (WSP). The requirements for these services depend on the type of sanitation system installed. The capacity of the WSP to be able to undertake these tasks, and the additional training requirements, must be considered when formulating a service delivery policy for sanitation services.

Customer service profile:

- Aspirations, concerns and past complaints of residents should be considered when formulating a sanitation service delivery policy.
- The associated awareness of health and hygiene education programmes should be based on the current level of knowledge of residents, and be formulated in consultation with community representatives.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 2: SERVICE LEVELS PROFILE

Financial profile:

- Financial considerations are one of the most important aspects that should be taken into account when considering a services delivery policy. Considerations include aspects of affordability, providing services to the poor, and the need to create jobs.
- Previous income and sales information may be relevant in the formulation of a way forward. It should be recognized that it takes considerable time to change from a low payment rate to an intermediate or high level of payment of tariffs.

Water Service Level Policy

A separate water service level policy is not in place, but the water service levels to be provided by the Municipality to the consumers in their Management Area are however included in the Water Supply, Sanitation Services and Industrial Effluent By-law. All water services provided by Swartland Municipality to consumers within the Municipal Management Area are linked to the Municipality's Tariff Policy (May 2023) and poor households are incorporated through Swartland Municipality's Indigent Policy (May 2023).

Sanitation Service Level Policy

A separate sanitation service level policy is not in place, but the sanitation service levels to be provided by the Municipality to the consumers in their Management Area are however included in the Water Supply, Sanitation Services and Industrial Effluent By-law. All sanitation services provided by Swartland Municipality to consumers within the Municipal Management Area are linked to the Municipality's Tariff Policy (May 2023) and poor households are incorporated through Swartland Municipality's Indigent Policy (May 2023).

Swartland Municipality works towards providing all households in the towns with a water connection inside the erven and connecting all households to a waterborne sanitation system. It is however important to consider the Municipality's capacity (financial and institutional) to operate and maintain complex sewage systems if opting for higher service levels and in particular waterborne sanitation.

Table 2.1: Master Plan for Service Levels		
Section	Master Plan	Yes / No
Direct Backlog Water	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Direct Backlog Sanitation	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Residential Water Services Infrastructure Supply Level Profile	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Residential Water Reliability Profile	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Residential Sanitation Services Infrastructure Supply Level Profile	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Residential Sanitation Reliability Profile	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Water Services Education	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Water Services Health	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Sanitation Services Education	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Sanitation Services Health	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 2: SERVICE LEVELS PROFILE

Table 2.1: Master Plan for Service Levels

Section	Master Plan	Yes / No
Health and Education Facilities	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes

The National Norms and Standards for Domestic Water and Sanitation Services, as published in the Government Gazette No.41100 of 8 September 2017, make provision for the following norms and standards for levels of water supply and sanitation services:

Table 2.2: Norms and standards for levels of water supply services

Full level of service: People access and pay for more than 90 l/c/d at high pressure.	Interim Full	Full provision: People access a minimum of 50 l/c/d of SANS241 quality water on demand at the boundary of the yard, metered and tarified.
Middle level of service: People access and pay for 51-90 l/c/d at medium pressure.	Interim Upper	Upper provision: People access a maximum of 90 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tarified.
	Interim Intermediate	Intermediate provision: People access more than 50 l/c/d but less than 90 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tarified.
Minimum level of service: People access 25-50 l/c/d at low to medium pressure, use of more than 25 l/c/d is paid for.	Interim Basic Plus	Basic Plus provision: People access more than 25 l/c/d but less than 50 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tarified.
	Interim Basic	Basic provision: People access a minimum of 25 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered and tarified.
	Interim Free Basic	Free basic provision: People access a minimum of 25 l/c/d of SANS241 quality water from an improved source at the boundary of the yard, metered.
	Intermittent	Intermittent provision: People access a minimum of 1500 l/household/week of acceptable quality water on a weekly basis within 100m, which is metered.
Bulk service: Source of potable water to be provided to people, which is metered in all circumstances.		
No service / provision = backlog: People access water from insecure or unimproved sources, or sources that are too distant, too time consuming or are of poor quality.		



Interim provision: People access a minimum of 25 l/c/d of acceptable quality water within 24 hours of disruption, normal service to be restored within 7 days.

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TOPIC 2: SERVICE LEVELS PROFILE

Table 2.3: Norms and standards for levels of sanitation services		
Hygiene promotion; Prevention of pollution; Re-use / recycle; Operation and Maintenance; Metering and tariffing; Solid Waste Management; Asset Management		
Full level: Full concern for human health, environment and sustainability of interconnected systems.	Full services	In-house facility: Storm water, wastewater/excreta, greywater, solid waste are collected and managed to achieve maximum benefits from treatment and re-use of water and nutrients.
		In-house facility: Access to a pleasant, safe, reliable and properly maintained facility for 24 hours a day, with control of nutrients in human excreta, wastewater and greywater.
Basic level: Remove excreta from the environment through treatment, pathogen reduction, resource recovery and nutrient reuse.	Free basic services	Toilet with functional hand washing facility in the yard: Access to a pleasant, safe and reliable facility for 24 hours a day, including privacy, personal safety and shelter through a subsidy for free. Maintenance of the facility is for free and is the responsibility of services provider.
	Basic services	Toilet with functional hand washing facility in the yard. Access to a pleasant, safe and reliable facility for 24 hours a day, including privacy, personal safety and shelter through a capital subsidy. Maintenance of the facilities is not for free and is the responsibility of the household / owner.
Interim level: Blocking the spread of faecal-oral diseases through proper excreta containment at a fixed point.	Excreta containment	Household, shared or communal toilets with functional hand washing facilities: Access to safe, reliable and properly maintained toilet and hand washing facility, free of charge, within 200m of the dwelling, which at a minimum safely contains human excreta. Maintenance is the responsibility of the services provider. To be phased out by 2030.
No service / provision = backlog: People practice open defecation or access an unimproved sanitation facility, such as pit toilets and bucket toilets. To be completely eliminated by 2030.		

Proper disposal, clean platform, vector and rodent control, resource use and health protection.

Emergency level: People access pleasant, safe, reliable and properly maintained improved toilets and hand washing facility on the premises in close proximity to the temporary dwelling within 24 hours and for duration of event.

The National Norms and Standards for Domestic Water and Sanitation Services also include the following interim water and sanitation services (Communal services for informal areas):

Table 2.4: Interim water and sanitation services (National Norms and Standards for Domestic Water and Sanitation Services)
Intermittent provision of water at a minimum level of water supply services
- A minimum volume of 1 500 litres of potable water shall be made available to a household per week. - The water provided shall comply with the SANS241 quality standards. - The access/delivery point shall be at a minimum a communal standpipe, or a storage facility in the yard (water container, yard tank, roof tank) of at least a volume of 1 500 litres. - In the case of a communal standpipe, it shall be within a reasonable walking distance of no more than 100m from the farthest household. - In the case of a storage facility in the yard (water container, yard tank, roof tank), it shall be refilled by a water tanker with potable water at least once a week. - The water shall be made available for 52 weeks per year. - All water use and/or supply shall be metered, but not tariffed. - Maintenance of the infrastructure for this level of service is the responsibility of the WSA. - Point-of-use water treatment systems and methods shall be advocated. - Efforts shall be made to ensure user acceptance and understanding for this level of service. - Users shall be educated in effective water use and hygiene. - This level of service shall be phased out by 2030 to comply with the National Development Plan's requirement of providing a basic service of at least a yard connection for water.
Interim sanitation services (Communal and shared facilities)
- Users shall be consulted on the siting and design, and the responsible cleaning and maintenance of shared toilets. Clean toilets are more likely to be frequently used. - Plumbing in and for communal and shared facilities needs to be more robust than that installed on private premises, and shall comply with the general principles of the National Building Regulations. Precautions need to be taken in the design against vandalism, theft and misuse. - Efforts shall be made to provide people living with chronic illnesses, such as HIV and AIDS, with easy access to a toilet as they

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Table 2.4: Interim water and sanitation services (National Norms and Standards for Domestic Water and Sanitation Services)

Intermittent provision of water at a minimum level of water supply services

frequently suffer from chronic diarrhoea and reduced mobility.

- Where possible, communal and shared toilets must be provided with lighting, or users provided with torches. The input of the users must be sought with regard to ways of enhancing the safety of users.
- Efforts to build a sense of communal ownership and pride of possession shall be made so that cooperation is voluntarily given or assured by peer pressure.
- Sufficient sanitation facilities shall be provided for the number of users
 - Communal toilet: Toilet seats – 1 seat per 50 users; Urinal units – 1 unit per 100 users; Hand washing – 1 basin per 10 toilet seats.
 - Shared toilet mostly used all the time: Toilet seats – 1 seat per 20 users; Urinal units – 1 unit per 50 users; Hand washing – 1 basin per 4 toilet seats.
- Shared and communal facilities shall have separate toilet blocks for men and women with separate entries; waste bins with lids in toilet block for women – emptied once a week and disposed of appropriately; urinal facilities for men; seats for children in the section for women; waiting / circulating area; separate washing cubicles for men and women; facility to store large volumes of water (water-borne sanitation); appropriate wastewater disposal system; and store room for keeping the cleaning material / equipment.

2.1 RESIDENTIAL WATER PROFILE

All the formal households in the urban areas of Swartland Municipality's Management Area are provided with water connections inside the erven. Standpipes are provided in the informal areas as a temporary emergency service. The current water service levels are included under Section 2.1 of the Administration, Information and Comprehensive Overview Report.

Communal standpipes represent probably the weakest part of a network's water supply services. Standpipes must be constructed in ways that can withstand excessive use and should not be neglected in terms of operation and maintenance. Malfunctioning standpipes may adversely affect the health of its already vulnerable and poor users. Communal standpipes are also used by poor households who normally do not pay for water. Poor people are the ones that suffer the most from water-related diseases due to:

- Poor quality and maintenance of standpipes and their surroundings. Standpipes are often leaking and poor drainage around standpipes results in standing pools of water and muddy soil.
- Standpipes are not protected and animals lick the taps.
- When people have to walk long distances to fetch water, it is used sparingly and not enough water is used for hygiene.
- Even if water is clean when it leaves the standpipe tap, it is often contaminated by dirty containers used for carrying and storage.

Swartland Municipality is committed to support the private landowners as far as possible with regard to addressing the basic water services backlog that might still exist on the farms in the rural areas once clear and practical policy guidelines are available from the DWS and funding is made available. Water Service Levels in the WSDP for the farms are based on the 2011 Census data, because the 2022 Census Community Profiles are not yet available.

The West Coast District Municipality takes various water quality samples on the farms in the rural areas of Swartland Municipality's Management Area and the water quality information needs to be shared with the private landowners, also the risks associated with storage of water in open reservoirs or tanks and where no filtration or disinfection takes place.

2.2 RESIDENTIAL SANITATION PROFILE

All the formal households in the urban areas of Swartland Municipality's Management Area are provided with waterborne sanitation connection points inside the erven. Communal ablution facilities are provided in the informal areas as a temporary emergency service. The current sanitation service levels are included under Section 2.2 of the Administration, Information and Comprehensive Overview Report.

Swartland Municipality is faced with various challenges with regard to the provision of services on private owned land in a financial sustainable manner (enabling the on-going operation of services and adequate maintenance and rehabilitation of the assets), which include the following:

Free basic water policy:

- The provision of the infrastructure (facilities) necessary to provide access to water to all households in a sustainable and economically viable manner.
- The development of subsidy mechanisms which benefit those who need it most.

Free basic sanitation policy:

- Provision of the most appropriate sanitation facility to the poor household.
- Health and hygiene promotion must be provided in a co-ordinated manner and must be properly managed and adequately funded if free basic sanitation is to become a reality. This requires close collaboration between the EHPs of the West District Municipality responsible for environmental health and Swartland Municipality.
- Subsidising the operating and maintenance costs. If the basic service is to be provided free to the poor then Swartland Municipality must ensure that the costs of providing the service are covered by the local government equitable share and / or through cross-subsidies within Swartland Municipality's Management Area.

The ownership of water services assets may be in the hands of the person owning the land where an "on-site" water or sanitation facility is provided to a household. There is no legal impediment to the use of government grants to fund infrastructure for a poor household on private land not owned by that household, provided that the intermediary (the private land owner) makes a financial contribution (this is because the intermediary becomes the owner of the infrastructure once it is installed). Government is looking at specific policies with regard to the appropriate level of contribution.

Swartland Municipality will investigate the following types of sanitation technology options when they provide sanitation services to communities.

- VIP latrines and approved Eco-San dry, on-site sanitation systems.
- Low flow on site (LOFLOS) systems
- Septic tanks
- LOFLOS or septic tanks with solids-free sewers also referred to as septic tank effluent drainage (STED) systems.
- Full water-borne sanitation

2.3 PUBLIC AMENITIES

2.3.1 Water Services

All public institutions within the towns receive uncontrolled water supply from Swartland Municipality. The Municipality is committed to keep on providing good quality of water to these public institutions and industries.

All the clinics and hospitals in Swartland Municipality's Management Area have adequate and safe water supply and sanitation services. All the tertiary education facilities and schools in the urban areas of Swartland Municipality's Management Area have adequate and safe water supply and sanitation services. **The water service levels of the schools in the rural areas need to be verified.**

It is important for the schools to focus on Water Demand Management activities and for Swartland Municipality to support the schools with WDM initiatives. This will not only aid in Swartland Municipality's demand management initiative directly by reducing the water consumption, but the education of learners at a young age regarding wise water use is a key component for sustainable supply in the long term.

It is not anticipated that the percentage distribution of residential, industrial and commercial consumers for the various distribution systems will change drastically in the nearby future. The water usage per sector is also presented graphically per distribution system in Annexure C of the Administration, Information and Comprehensive Overview Report.

Education Plan

All education facilities in the urban areas of Swartland Municipality's Management Area are provided with adequate water services and no specific strategies, with regard to the provision of water services to these facilities, were therefore identified. Swartland Municipality is however committed to work with the Education Department to address any possible shortcomings with regard to the provision of water services that might still exist at any of the schools in the rural areas.

Health Plan

Swartland Municipality will strive to continue to ensure that the minimum required SANS241:2015 water quality standards are met through the systematic upgrading of their WTWs. The monitoring of provision of basic minimum services to farm dwellers remains a challenge, in view of the limited funding and human resources.

The establishment and functioning of effective health systems and health care services is critical for not only the upliftment of communities but more so for the sustainability of communities. Health services are rendered throughout the area by a network of clinics. The environmental health function is currently with the West Coast District Municipality. Typical functions of the West Coast District Municipality, with regard to health services, include the following:

- Households to meet the minimal health safety requirements
- Monitoring water quality
- Waste management
- Food control
- Schools to meet health requirements
- Contagious disease control

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- Community development: Making communities aware of environmental health issues and communicates with farm workers regarding sanitation services.

The Municipal Health Services of the West Coast District Municipality also report monthly to the Department of Health on water quality. The quality of life of the people within a Municipality is influenced by the available health care. Various factors influence the health conditions of people in any region, for example access to clean water, good sanitation, proper nutrition and adequate housing.

It is important that a co-operative relationship exist between the West Coast District Municipality and Swartland Municipality with regard to environmental health issues and that a good communication protocol is followed between the District Municipality and Swartland Municipality to report on health issues.

The most vulnerable groups within Swartland Municipality's Management Area are the persons living in informal areas with shared services. It is therefore of outmost importance that the communal standpipes are properly maintained, to promote better health and hygiene among users. It is necessary to:

- keep the standpipe area clean and free from stagnant water;
- avoid water spillage by keeping the tap closed when not in use;
- report and rectify leakages immediately;
- keep straying animals away from standpipe area; and
- keep the tap outlet, standpipe slab and soak away clean.

Promote health and hygiene awareness amongst standpipe users by focusing on the following:

- users must use the standpipe only for the filling of containers;
- no body or clothes washing is allowed at standpipes;
- no house pipes or other objects may be attached to the standpipes;
- use clean containers and close containers with a suitable lid when transporting water;
- disinfect containers when necessary; and
- immediately report any irregularities, contamination, tampering or vandalism at standpipes.

Damp and sometimes unsanitary conditions present in informal settlements provide an ideal breeding environment for bacteria. Some of the challenges WSAs phase in the informal settlements include the following:

- It is difficult to supply toilets to the dense informal settlements.
- Grey water pollution.
- Grey water run-off from standpipes.

2.3.2 Sanitation Services

The clinics and hospitals in Swartland's Management Area have adequate and safe sanitation services. All the tertiary facilities and the schools in the urban areas of Swartland's Management Area have adequate and safe sanitation services. **The sanitation service levels of the schools in the rural areas however need to be verified.**

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TOPIC 2: SERVICE LEVELS PROFILE

Education Plan

All education facilities in the urban areas in Swartland Municipality's Management Area are provided with adequate sanitation services and no specific strategies, with regard to the provision of sanitation services to these facilities, were therefore identified. Swartland Municipality is however committed to work with the Education Department to address any possible shortcomings, with regard to the provision of sanitation services that might exist at any of the schools in the rural areas.

Health Plan

Swartland Municipality's long term goal is to connect all households to a waterborne sanitation system in order to prevent any future grey water problems that might occur and to reduce the possible risk of groundwater pollution from soak-aways. Swartland Municipality primarily focus over the next few years will be on addressing the existing housing backlogs.

The supply of basic sanitation services on the farms needs to be linked to the provision of health and hygiene education. Improved health requires behaviour change, which cannot be achieved with a single health education talk given by an outside expert. Behaviour change requires sustained monitoring and promotion within the community. This is the key function of the community health workers employed on sanitation projects.

Swartland Municipality needs to continue to actively engage with service providers and NGO's in the fight against illnesses such as HIV/Aids and TB. A solution to the sustainability of the community health worker's position and employment within the community has been to link their position and function to the activities of the Department of Health. In addition support can be provided to the Community Health Workers through local clinics and through the programmes of the EHPs. Education on the HIV/Aids pandemic would play a key role in stemming the spread of the disease.

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

3. WATER SERVICES ASSET MANAGEMENT

Table 3.1: Master Plan for Water Services Asset Management

Section	Master Plan	Yes / No
General Information	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Operation	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Functionality Observation	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Asset Assessment Spectrum	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Water and Sanitation Schemes	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes

The development of land is dependent on availability of bulk infrastructure and services and contributes to the economy and future development in Swartland settlements. The need for water and sewerage infrastructure is very high in Chatsworth and Riverlands. Overall there is a need for upgraded water infrastructure in all settlements except Malmesbury. Improved sewerage capacity is required in Koringberg, Moorreesburg, Kalbaskraal, Darling and Yzerfontein (2023/2024 IDP).

The major backlogs with regard to water and sewerage infrastructure, as included in the 2023/2024 IDP, are indicated in the table below.

Table 3.2: Water and Sewerage Infrastructure Backlogs (2023/2024 IDP)

Water	Sewerage
Koringberg	
- Poorly developed network, small diameter pipes, low pressure and flow condition and open ring mains. - Sections of the water reticulation network are obsolete and must be upgraded. - Secondary chlorination at reservoirs must be implemented.	- Sewerage reticulation network poorly developed and must be expended. - WWTW is overloaded and must be upgraded.
Moorreesburg	
- Obsolete infrastructure, pipe breakages, leaking valves and leaking hydrants. - Poorly developed network, shortage in shut-off valves. - Secondary chlorination at reservoirs must be implemented.	- Illegal discharge of storm water in the sewer collection system results in overloading and failure during storm events. - Localised frequent blockages in the sewer collection system.
Riebeeck Wes / Riebeeck Kasteel	
- Poorly developed network, small diameter pipes, low pressure and flow condition and open ring mains. - Sections of the water reticulation network are obsolete and must be upgraded. - Secondary chlorination at reservoirs must be implemented. - Poor condition of Ongegund reservoir and pump station must be upgraded.	- Illegal discharge of storm water in the sewer collection system results in overloading and failure during storm events. - Sewer reticulation network poorly developed in Riebeeck West and must be extended.
Chatsworth and Riverlands	
- Secondary chlorination at reservoirs must be implemented. - Bulk supply system cannot supply in the demand during peak months. - Water supply is under pressure due to illegal connections and wastage of water.	- Sewerage system must be extended. - WWTW must be upgraded.
Kalbaskraal and Abbotsdale	
- Reservoir capacity must be increased for new developments. - Bulk supply system cannot supply in the demand during peak months. - Secondary chlorination at reservoirs.	Sewerage system in Kalbaskraal is limited and should be expanded.

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Table 3.2: Water and Sewerage Infrastructure Backlogs (2023/2024 IDP)

Water	Sewerage
Darling	
- Poorly developed network, small diameter pipes, low pressure and flow conditions and open ring mains. - Sections of the water reticulation network are obsolete and must be upgraded. - Reservoir capacity must be increased for further developments. - Water supply to the industrial area must be increased to supply future demand.	- Regular blockages in Darling North. - WWTW is at capacity and must be upgraded to supply future demand. - Waterborne sewerage system must be extended to the industrial area.
Yzerfontein	
Secondary chlorination at reservoirs must be implemented.	Yzerfontein has no formal WWTW as well as no waterborne sewer system.
Malmesbury	
- Portions of the water network are outdated and needs to be upgraded. - Reservoir capacity should be increased for future development. - Secondary chlorination at reservoirs must be implemented.	- Illegal discharge of storm water in the sewer collection system results in overloading and failure during storm events. - Localised frequent blockages in the sewer collection system. - Obsolete infrastructure causing regular blockages. - Upgrading of the drainage network is needed. - Upgrading of main connectors in Voortrekker Street from swimming pool to Bokomo Road to accommodate future demand.

3.1 GENERAL INFORMATION

3.1.1 Asset Management Plan

It is essential for any service delivery organisation to compile an Asset Management Plan (AMP) to ensure efficient, effective and optimal management, operation and maintenance of all assets, which includes treatment plants, reservoirs, structures, buildings, pipelines, sites, etc. The purpose of the AMP is to:

- Ensure the operation and maintenance functions are well planned.
- Demonstrate responsible management.
- Justify and communicate funding requirements.
- Service provisioning complies with regulatory requirements.

An AMP normally includes the following:

- documents the nature, extent, age, utilisation, condition, performance and value of the infrastructure work;
- identifies existing and target levels of service, as well as expected changes in demand;
- identifies the life-cycle management needs of the infrastructure (development, renewal, operations and maintenance);
- assesses capital and operational budget needs; and
- identifies infrastructure asset management improvement needs.

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Swartland Municipality needs to differentiate between budget allocated towards the operation and maintenance of the water and sewerage infrastructure and the budget allocated towards the replacement of the water and sewerage infrastructure. A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of the existing water and sewerage infrastructure (Best Practice). In the case of operations and maintenance of the system, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the system remains in good condition (Best Practice).

A proxy for asset consumption can be considered the level of depreciation each asset incurs on an annual basis. Preserving the investment in existing infrastructure needs to be considered a significant strategy in ensuring the future sustainability of infrastructure and the Municipality's revenue base. Swartland Municipality considered the need for asset renewal as a priority, within this framework, and hence the capital programme was determined based on renewal of current assets versus new asset construction.

Further, continued improvements in technology generally allows many assets to be renewed at a lesser "real" cost than the original construction cost. Therefore, it is considered prudent to allow for a slightly lesser continual level of annual renewal than the average annual depreciation. The Asset Management Policy is therefore considered a strategic guide in ensuring a sustainable approach to asset renewal, repairs and maintenance and is utilised as a guide to the selection and prioritisation of individual capital projects. In addition the policy prescribes the accounting and administrative policies and procedures relating to property, plant and equipment (fixed assets).

It is important for Swartland Municipality to develop an AMP from their Asset Register. The objective of an AMP is to support the achievement of the strategic goals of the Municipality and facilitate prudent technical and financial decision-making. It is also a vehicle for improved internal communication and to demonstrate to external stakeholders the Municipality's ability to effectively maintain its existing infrastructure as well as the new infrastructure to be developed over the next 20 years.

Priority should be given to rehabilitating existing infrastructure as this generally makes best use of financial resources and can achieve an increase in (operational) services level coverage most rapidly. The preparation of maintenance plans and the allocation of sufficient funding for maintenance are required to prevent the development of a large condition backlog. The potential renewal projects for water and sewerage infrastructure need to be identified from the Asset Register. All assets with a condition grading of "poor" and "very poor" need to be prioritised.

It is essential for Swartland Municipality to protect their assets by ensuring that an appropriate maintenance and rehabilitation plan (AMP) is developed and implemented. This plan must be based on the principle of preventative maintenance in order to ensure that, as far as this is practical, damage to assets is prevented before it occurs. Swartland Municipality must ensure that the maintenance and rehabilitation plan is part of the WSDP and that the plan is implemented. Assets must be rehabilitated and / or replaced before the end of their economic life and the necessary capital funds must be allocated for this purpose.

One of the key challenges of Swartland Municipality is to identify adequate funds for the rehabilitation and maintenance of their existing infrastructure, which is critical to ensure the sustainability of the services that are provided by the Municipality. It is important for the Municipality to secure adequate funding for major refurbishment and maintenance work, the provision of bulk infrastructure and the upgrading of the Swartland WTW and some of the WWTWs in order to keep up with the high demand for services.

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

3.1.2 Disaster Management Plan

Disaster Management is continued to be shared with the West Coast District Municipality. The responsibility for reducing disaster risk, preparing for disasters and responding to disasters is shared among:

- all disciplines and employees of the Swartland Municipality;
- all disciplines and employees of the West Coast District Municipality;
- neighbouring local municipalities within the West Coast District Municipality;
- all provincial and national organs of state operating within the municipality;
- all sectors of society within the municipality; and
- all the residents of the municipality.

The 2023/2024 IDP includes the following Risks and Mitigation Actions for Swartland Municipality.

Table 3.1.2.1: Potential Risks and Mitigation Actions of Swartland Municipality	
Risk	Mitigation Actions
Fires	• Awareness campaigns in high risk areas. • Alien vegetation clearing. • Creating and maintaining fire breaks. • Fire hydrant maintenance plan.
Floods	• Clearing /cleaning rivers and riverbanks (debris, alien invasive plants, excessive reeds, etc.). • Maintenance of culverts. • Storm water systems maintenance. • Determining and updating of flood lines (important for development planning). • River and catchment management. • Engineering parameters.
Drought / Water Scarcity	• Bulk water capacity and resources to always be considered in development planning. • Awareness campaigns for demand reduction/conservation. • General usage of water-saving devices. • Effective management strategies and equipment /infrastructure in place for water resource management.
Covid-19	• Slowing the spread. • Testing and treatment. • Quarantine and Isolation. • Civil compliance. • Humanitarian relief and food security. • Economic recovery. • Communication.
Loadshedding	• Procure emergency standby power supplies (Generators) for Critical Customer interfacing offices. • Negotiated exclusion (12 months) of Swartland Water Treatment works from the load shedding schedule. • Procuring additional generators to provide standby power to water and sewage pump stations. • Revised budget for emergency fuel for generators and fleet vehicles. • Visible law enforcement during load shedding to prevent theft. • Awareness campaign/hotline to prevent theft of infrastructure. • Allowing customers that meet the requirements to connect Small Scale Embedded Generators (SSEG) to the municipal Network and to export energy into the network. • Approach Eskom to consider participation in the Load Curtailment Programme (where possible and within the rules). • Issue an RFP for the connection of renewable IPP to the municipal grid to provide and additional source of energy to reduce the cost of electricity and to support the grid when the Eskom supply is available.

3.1.3 Untreated Effluent Management Plan

There are no known untreated effluent discharged to the environment. The W₂RAPs for the WWTWs and sewer drainage networks include Management Procedures and Incident Response and Emergency Protocols to respond to incidents.

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

3.2 FUTURE WATER AND SEWERAGE INFRASTRUCTURE REQUIREMENTS

3.2.1 Groundwater Infrastructure (Boreholes)

Swartland Municipality will continue with the implementation of their Groundwater Monitoring Programme for their three Riverlands boreholes. The groundwater monitoring data is currently processed, analysed and reported on by an experienced hydrogeologists on an ad-hoc basis in order to ascertain whether the resources are being sustainably utilised and to ensure compliance with the approved Groundwater Monitoring Programme and water use license. Managing groundwater for water supply purposes should have the following three main functions:

- Ensure that the aquifer is used optimally: The aquifer should not be over-pumped as that would negatively impact on its long-term sustainable yield or on the environment. It also means that if the aquifer is being under-utilised, this will become known.
- Ensure that the water quality in the aquifer is not negatively affected: This may be as a result of high abstraction from the aquifer, or from poor groundwater protection (from latrines, animal enclosures, etc.).
- Optimise borehole pumping rates so that the pumping equipment operates efficiently: Pumping rates are frequently set too high and this cause unnecessarily high pumping heads, a waste of energy, and at times, pump failure.

An additional function, which is usually captured in the first two points, is to ensure that environmental integrity is maintained. A botanical and streamflow monitoring programme is therefore also required. It is important for Swartland Municipality to continue to focus on aquifer protection, groundwater monitoring and wellfield management, in order to meet the town's future water requirements.

The table below gives an overview of the key groundwater management functions.

Table 3.2.1.1: Key groundwater management functions				
Activity	Responsible Person	Skills and qualifications required	Resources, tools and equipment	Remarks
Measuring and recording of water levels.	Pump operator	Literacy, numeracy, trained in taking water levels	Dip meter, ruler, log book, pen.	Done as part of operators' regular O&M activities.
Measuring and recording abstraction	Pump operator	Literacy, numeracy, trained in reading water meters.	Log book, pen	Done as part of operators' regular O&M activities.
Providing data to the authority that is responsible for water supply on a regular basis.	Pump operator and pump operator supervisor	Literacy, numeracy, keeping records.	Postal service or public transport.	Including as part of the reporting requirements of the pump operator.
Taking water samples	The authority that is responsible for water supply.	Trained in taking water samples, driving license.	Transport, sample bottles, cooler box.	Sampling routine defined by sampling plan.
Sending water samples for testing.	The authority that is responsible for water supply.	Keeping records.	Transport to laboratory	Sent to nearest accredited laboratory.
Defining the monitoring requirements of an individual borehole.	Technical manager of operations or hydrogeologist.	Hydrogeological degree or diploma, experience of hydrogeological conditions.	Reports and records on borehole, monitoring data.	
Ensuring that boreholes are equipped with piezometer tubes for measuring water levels and water meters for measuring abstraction.	The authority that is responsible for water supply.	Project management	In house technical staff, suppliers, contractors, specifications.	
Ensuring that operators	The authority that is	Project management	Trainers, suppliers,	

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Table 3.2.1.1: Key groundwater management functions

Activity	Responsible Person	Skills and qualifications required	Resources, tools and equipment	Remarks
have the equipment and skills to do monitoring.	responsible for water supply.		specifications.	
Monitoring the pump operator's competence to collect and record data.	Pump operator supervisor	Staff supervision, knowledge of pump operators' tasks.	Transport	Done as part of the supervision of O&M activities.
Processing data collected at the local level	Data clerk	Data capture, record keeping, filing, trained in operating software.	Computer, spreadsheet or groundwater management software, files.	Maintains an electronic and physical record of data.
Studying water level, water quality and abstraction data on a regular basis.	Technical manager of operations.	Technical training, operations experience.	Project files, monitoring data	Done as part of the management of O&M
Revising pumping recommendations and adjusting the monitoring requirements. Ensuring the recommendations are carried out and monitoring the implementation of the recommendations.	Technical manager with hydrogeologist as required.	Technical training, operations experience.	Reports and records on borehole, monitoring data, operational information.	Ongoing management of operations and groundwater resources.
Reporting to council and pump operator, providing summary data to the CMA.	Data clerk with supervision from technical manager.	Training in operating software.	Computer, spreadsheet or groundwater management software, printer.	Summary data defined by license (frequency, what data, form of data)

Detail information regarding the groundwater sources is available under Sections 3 of the Administration, Information and Comprehensive Overview Module.

3.2.2 Surface Water Infrastructure (Abstraction Points)

Section 6.1 of Topic 6 gives an overview of the years in which the annual water requirement is likely to exceed the licence volumes.

The preventative maintenance activities, as included under Section 4.1.2, are to be implemented by Swartland Municipality for their surface water infrastructure.

The Paardenberg Dam is the only other surface water source of Swartland Municipality. The dam is still in a good condition, in spite of its advanced age (93 years). The fourth dam safety inspection of the dam, as carried out on the 7th of May 2019, reported the following:

The wall appears to be structurally sound and stable and the buttresses are well founded on strong and hard foundation rock. There are a number of structural cracks, but these do not threaten the safety of the dam.

The dam does not meet the minimum freeboard; however, the dam has reportedly never been overtopped. In the case of overtopping the possible damage is not expected to jeopardise the safety of the dam. Despite this, the dam does not show any signs of distress.

In the event of failure, there would be some risk to lives and property. The released volume of water would likely inundate and possibly damage a number of farms and dams downstream. The following abbreviated recommendations were made following the evaluation of the dam's safety:

- Keep the current strip along the toe cleared of vegetation cut short (shorter than 0.3m);
- Routine inspections should be carried out quarterly and reports completed in accordance with the O&M Manual;

- Flow readings should then be taken during quarterly inspections;
- Monitor erosion at the end of the concrete dam wall on the right flank and the spillway discharge channels and repair the erosion as and when necessary;
- The outlet valves should receive some maintenance and operated through their full range at least quarterly.
- Keep crest walkway drains clear of debris;
- If ever any floods overtop the non-overspill crest, the rock surface below the dam must be examined, and any potentially dangerous erosion repaired without delay; and
- Public warning signs should be displayed at strategic positions to create an awareness of potential dangers at the dam.

3.2.3 Bulk Water Pipeline Infrastructure

The Bulk Water Master Plan for Swartland Municipality (December 2021) has indicated that based on the most likely land-use development scenario, it will be necessary to upgrade the following bulk water infrastructure (Components of the future system with the highest priorities).

- Malmesbury: Upgrade supply from Panorama reservoir to West Bank draw-off Phase 1 (450 mm dia.). Estimated cost of R10 397 000.
- Riebeeks: Upgrade 100 mm dia. feeder main to Riebeek Kasteel reservoirs (200 mm dia.). Estimated cost of R748 000.
- Upgrade bulk supply to Panorama reservoir (Part of Swartland Municipality's Reticulation Water Master Plan).
- New bulk supply from Atlantis to Chatsworth (Part of Swartland Municipality's Reticulation Water Master Plan).
- Yzerfontein: Additional balancing capacity at Wildschutsvlei balancing tank. Estimated cost of R2 683 000.
- Malmesbury: Upgrade supply from Panorama reservoir to West Bank draw-off Phase 2 (550 mm dia.). Estimated cost of R7 013 000.
- Upgrade bulk supply pipe from WC DM meter 11/4 to Wesbank reservoirs (Part of Swartland Municipality's Reticulation Master Plan).
- Riebeeks: Upgrade 100 mm dia. feeder main from Kasteelberg reservoirs to Ongegund PS (160 mm dia.) (Part of Swartland Municipality's Reticulation Water Master Plan).
- Moorreesburg: Upgrade 100 mm dia. feeder main (F-line) to Moorreesburg reservoirs (200 mm dia.) Estimated cost of R4 248 000
- Riebeeks: Upgrade supply from Kasteelberg reservoirs to Riebeek Kasteel (315, 250 and 200 mm dia.). Estimated cost of R22 197 000
- Swartland: Swartland WTP to Kasteelberg reservoir rising main upgrade (600 mm dia.). Estimated cost of R40 960 000
- Withoogte: Upgrade capacity of Withoogte WTP from 72.0 Ml/d by 16.5 Ml/d to 88.5 Ml/d (Part of Saldanha Bay Municipality's Bulk Water Master Plan).
- Withoogte: Additional raw water storage capacity at Withoogte WTP (Part of Saldanha Bay Municipality's Bulk Water Master Plan).

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Table 3.2.3.1: Future bulk water infrastructure for the Swartland bulk water system as included in Bulk Water Master Plan for Swartland Municipality

Bulk Master Plan Item	Year	Distance (m)	Diameter (mm)	Estimated cost 20/21 (R million)
CCT Voëlvlei WTW to Swartland WTW, Swartland WTW to Kasteelberg & Gouda (A, B & C lines)				
Swartland WTW to Kasteelberg pipeline - Phase 2	2025	3 469	600	R27.448
Swartland WTW to Kasteelberg pipeline - Phase 3	2025	1 821	600	R13.512
Decommission existing Swartland WTW infrastructure after system is supplied 100% from CCT Voëlvlei WTW) – 29 100 m³/d @ 0 m EGL Water Treatment Facility to be abandoned	2030	-	-	-
New 750 L/s @ 280 m Pump Station required to supply Swartland system from CCT Voëlvlei WTW	2030	-	-	R20.360
New bulk supply pipeline required to supply Swartland system from CCT Voëlvlei WTW	2030	5 440	900	R71.394
New bulk supply pipeline required to supply Gouda & Kamp systems from CCT Voëlvlei WTW	2035	18	200	R0.072
New PRV to reduced pressures to Gouda reservoir from CCT Voëlvlei WTW PS	2035	1 x PRV	150	R0.241
New PRV to reduced pressures to Kamp reservoir from CCT Voëlvlei WTW PS	2035	1 x PRV	100	R0.212
12000 m³ @ 286 m TWL Reservoir. Additional storage capacity at Kasteelberg reservoir site	2035	-	-	R30.450
Required when existing bulk supply to Gouda reaches capacity	2040	6 817	200	R12.419
Sub-total				R176.108
Kasteelberg to Riebeek Valley (D & E lines)				
Install pipeline to improve supply to Riebeek Kasteel reservoir	2022	388	200	R0.748
Install pipeline to improve bulk supply capacity (Swartland Municipality reticulation water master plan item).	2025	103	160	Part of Swartland Municipality reticulation water master plan
Install pipeline to improve supply to Riebeek Kasteel	2030	3 323	315	R11.056
Install pipeline to improve supply to Riebeek Kasteel	2030	4 086	250	R9.966
Install pipeline to improve supply to Riebeek Kasteel	2030	623	200	R1.175
Sub-total				R22.945
Kasteelberg to Glen Lily and Moorreesburg (F & H lines)				
Upgrade existing 100 mm to improve supply to Moorreesburg reservoirs from Swartland system	2025	2 537	200	R4.248
Upgrade existing 50 mm to improve network conveyance when pressure problems are experienced	2035	7 647	75	R6.169
Replace existing 300 Ø pipeline with 600 Ø to augment bulk supply to Malmesbury	2035	10 746	600	R75.219
Replace existing 300 Ø pipeline with 600 Ø to augment bulk supply to Malmesbury	2040	2 435	600	R17.754
Upgrade PS (600 L/s @ 47m) when existing PS reaches capacity	2040	-	-	R3.450
Upgrade PS (600 L/s @ 47m) when existing PS reaches capacity	2040	-	-	R3.450
Sub-total				R110.290
Glen Lily to Darling and Yzerfontein (I & J lines)				
Required to augment bulk supply to Wesbank, Darling and Yzerfontein, replace existing 200 mm Ø pipe with a new 450 mm Ø pipe	2022	673	450	R4.014
Required to augment bulk supply to Wesbank, Darling and Yzerfontein, replace existing 200 mm Ø pipe with a new 450 mm Ø pipe	2022	746	450	R4.434

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Table 3.2.3.1: Future bulk water infrastructure for the Swartland bulk water system as included in Bulk Water Master Plan for Swartland Municipality

Bulk Master Plan Item	Year	Distance (m)	Diameter (mm)	Estimated cost 20/21 (R million)
Required to augment bulk supply to Wesbank, Darling and Yzerfontein Replace existing 300 mm Ø pipe with a new 450 mm Ø pipe	2022	316	450	R1.949
Required to improve bulk supply to Panorama reservoir (when future area MM_05 develops)	2022	132	200	Part of Swartland Municipality reticulation water master plan
Install 350 m³ @ 189.7 m TWL reservoir to ensure additional balancing capacity at Wildschutsvlei balancing tank site	2025	-	-	R2.683
Required to augment bulk supply to Wesbank, Darling and Yzerfontein, replace existing pipe under N7.	2025	71	650	R7.013
To improve supply to Darling and Yzerfontein. Replace existing 200 mm Ø pipe	2030	16 182	400	R75.631
To improve supply to Darling and Yzerfontein. Replace existing 200 mm Ø pipe	2035	14 307	400	R66.880
Install 25000 m³ @ 263.525 m TWL Reservoir. Additional storage capacity at Glen Lily reservoir site (can be phased).	2035	-	-	R54.013
Required to augment bulk supply to Wesbank, Darling and Yzerfontein, new parallel reinforcement 450 mm Ø pipe	2040	330	550	R3.230
Required to augment bulk supply to Wesbank, Darling and Yzerfontein. Replace existing 450 mm Ø pipe with a new 650 mm Ø pipe	2045	142	650	R2.309
Required to augment bulk supply to Wesbank, Darling and Yzerfontein. New 550 mm Ø parallel reinforcement pipe	2050	783	550	R6.400
New 315 mm Ø bulk supply from WC DM bulk pipeline to the new Wesbank Upper reservoir	2050	653	315	Part of Swartland Municipality reticulation water master plan
53 l/s FCV to sustain pressure in upstream bulk system	2050	1 x FCV	150	
New 5.0 ML Wesbank Upper reservoir (required when AADD supplied from Wesbank reservoirs exceeds 6.5 ML/d, or when future areas MM_02 or MM_09 develop)	2050	-	-	
Required to augment bulk supply to Wesbank, Darling and Yzerfontein, replace existing 300 mm Ø pipe with new 550 mm Ø pipe	2055	663	550	R5.559
Required to augment bulk supply to Wesbank, Darling and Yzerfontein, replace existing 300 mm Ø pipe with 400 mm Ø pipe	2055	753	550	R6.191
Required to augment bulk supply to Wesbank, Darling and Yzerfontein Replace existing two 300 mm Ø pipes with a new 600 mm Ø pipe (retain 350 Ø pipe)	2060	1 268	600	R10.617
Sub-total				R250.923
Rural Water Schemes (Weltevrede, Langgewens, Goudapad 1 and WBK line)				
PRV Required to reduce high static pressures within the Weltevrede rural water scheme	2025	PRV	100	-
Required to monitor water losses within the Weltevrede rural water scheme	2025	1 x Meter	100	R0.119
Emergency connection pipeline between Weltevrede and Goudapad 2 rural schemes (for redundancy)	2025	2 247	75	R1.832
Zone valve between Weltevrede and Goudapad 2 rural schemes (for redundancy)	2025	1 x Valve	75	R0.102
Valve required to move part of the WBK scheme from Swartland system to the Withoogte system to ensure adequate supply and pressures	2025	1 x Valve	200	R0.121
Open Valve. Required to move part of the WBK scheme from Swartland system to the Withoogte system to ensure adequate supply and pressures	2025	-	200	-
Required to monitor water losses within the Langgewens rural water scheme	2027	1 x Meter	180	R0.146
Replace existing 75 mm to improve network conveyance	2030	1 165	160	R1.544

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Table 3.2.3.1: Future bulk water infrastructure for the Swartland bulk water system as included in Bulk Water Master Plan for Swartland Municipality

Bulk Master Plan Item	Year	Distance (m)	Diameter (mm)	Estimated cost 20/21 (R million)
Required to reduce high static pressures within the Langgewens rural water scheme	2030	1 x PRV	75	R0.182
Required to reduce high static pressures within the Langgewens rural water scheme	2030	1 x PRV	50	R0.160
Emergency connection pipeline between Langgewens rural scheme and F-line (for redundancy)	2030	2 732	75	R2.221
Zone valve between Langgewens rural scheme and F-line (for redundancy)	2030	1 x Valve	110	R0.114
Replace existing 50 mm pipelines to improve network conveyance (when pressure problems occur)	2030	3 851	110	R3.681
PRV required to reduce high static pressures within the Goudapad 1 rural water scheme	2035	1 x PRV	75	R0.182
Emergency connection pipeline between Goudapad 1 and Goudapad 2 rural schemes (for redundancy)	2035	1 216	75	R1.003
Zone valve between Goudapad 1 and Goudapad 2 rural schemes (for redundancy)	2035	1 x Valve	100	R0.108
Replace existing 75 mm pipeline to improve network conveyance (when pressure problems are experienced)	2055	3 272	110	R3.133
Replace existing 50 mm pipeline to improve network conveyance	2055	1 422	100	R1.372
Sub-total				R16.020
Total				R576.286

Table 3.2.3.2: Future bulk water infrastructure for the Withoogte bulk water system as included in Bulk Water Master Plan for Swartland Municipality

Bulk Master Plan Item	Year	Distance (m)	Diameter (mm)	Estimated cost 20/21 (R million)
Withoogte to Moorreesburg & Koringberg (MB, WB & G lines)				
New 1.500ML reservoir at 243.8m TWL, when existing storage nears capacity	2030	-	-	R6.888
Sub-total				R6.888
Rural Water Schemes (Goudapad 2, Koringberg Rural and Nootgedaght)				
Valve to insert and close. Verify if existing zone valve is closed	2022	1 x Valve	110	R0.114
Meter required to monitor water losses within the Koringberg rural water scheme	2022	1 x Meter	100	R0.137
Valve to insert and close. Verify if existing zone valve is closed	2022	1 x Valve	63	R0.102
Valve to insert and close. Verify if existing zone valve is closed	2022	1 x Valve	100	R0.108
Meter required to monitor water losses within the Koringberg rural water scheme	2025	1 x Meter	110	R0.129
Meter required to monitor water losses within the Nootgedaght rural water scheme	2025	1 x Meter	100	R0.118
Meter required to monitor water losses within the Koringberg rural water scheme	2025	1 x Meter	150	R0.135
Replace existing 75 & 63 mm pipeline to improve network conveyance	2030	6 708	160	R8.681
Replace existing 50 mm pipeline to improve network conveyance	2030	5 973	110	R5.690
PRV required to reduce high static pressures within the Goudapad 2 rural water scheme	2030	1 x PRV	150	R0.241
Water meter required to monitor water losses within the Goudapad 2 rural water scheme	2030	1 x Meter	160	R0.144

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Table 3.2.3.2: Future bulk water infrastructure for the Withoogte bulk water system as included in Bulk Water Master Plan for Swartland Municipality

Bulk Master Plan Item	Year	Distance (m)	Diameter (mm)	Estimated cost 20/21 (R million)
PRV required to reduce high static pressures within the Nootgedaght rural water scheme	2030	1 x PRV	75	R0.182
Replace existing 50 mm pipelines to improve network conveyance	2035	2 439	160	R3.184
Replace existing 63 mm and 100 mm pipelines to improve network conveyance	2035	4 535	160	R5.883
Replace existing 100 mm pipelines to improve network conveyance	2045	6 019	160	R7.794
Replace existing 100 mm pipeline to improve network conveyance (when pressure problems are experienced)	2045	11 397	160	R14.718
Replace existing 75 and 63 mm pipeline to improve network conveyance (if supply problems to Koringberg BPT are experienced)	2055	4 388	110	R4.284
Emergency connection pipeline Koringberg rural scheme to improve network conveyance and redundancy	2055	1 433	50	R0.927
Replace existing 50 mm pipeline to improve network conveyance (if supply problems to Koringberg BPT are experienced)	2065	4 339	110	R4.143
Sub-total				R56.714
Total				R63.602

The Water Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, it will be necessary to upgrade the following bulk internal water supply systems of the various towns (Feeder mains).

Malmesbury Feeder Mains:

- Upgrading of the existing bulk pipelines between the Glen Lily reservoirs and the draw-off points to the existing Wesbank Lower reservoirs and proposed Wesbank Upper reservoir is proposed in the Swartland bulk water master plan (items S3.2, S3.3, S3.4 and S3.5) in order to augment the capacity of the existing bulk system to supply water to Wesbank (Lower reservoir and proposed Upper reservoir), Darling and Yzerfontein.
- It is proposed in the water master plan that Abbotsdale, Kalbaskraal, Riverlands and Chatsworth is supplied with bulk water from the Wesbank reservoirs (through the implementation of projects SMW-001) as opposed to the current operation where these areas are supplied from the Kleindam reservoir. The implementation of project SMW-001 will improve the supply capacity from Malmesbury to Abbotsdale, Kalbaskraal, Riverlands and Kalbaskraal from the current capacity of 1.5 Ml/d (capacity when supplied under gravity from the Kleindam reservoirs) to a capacity of 3.4 Ml/d (capacity when supplied under gravity from the Wesbank reservoirs).
- A new 315mm dia. supply pipeline is proposed from the I-line (between Malmesbury and Darling) to the proposed Wesbank Upper reservoir (item SMW.B1). It is proposed that flow into the reservoir is regulated through a flow-control valve for even withdrawal from the Swartland bulk system (item SMW.B2).
- Upgrading is proposed of the existing supply pipeline from meter I1/4 to the Wesbank reservoirs (new 500mm dia. parallel reinforcement pipe, item SMW.B6).
- Upgrading of the existing 150mm dia. feeder main to the Panorama reservoir with a new 200mm dia. pipe is proposed (item SMW.B5)
- Upgrading of the existing 100mm dia. feeder main to the Wesbank tower is proposed (item SMW.B10)
- A new 500mm dia. bulk pipeline is proposed from the existing Wesbank reservoirs in the Malmesbury system to the proposed draw-off point to the future De Hoop reservoirs in the Abbotsdale system (item SMW.B7).

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- A new 400mm dia. bulk pipeline is proposed between the draw-off point to the De Hoop reservoir and the proposed draw-off point to the future Oranjefontein reservoir (item SMW.B8). It is proposed that item SMW.B8 connects to the existing 200mm dia. bulk pipeline between Malmesbury and Abbotsdale. Items SMW.B7 and SMW.B8 should then be the main supply of bulk water from the Wesbank reservoirs to Abbotsdale and Kalbaskraal and the existing 200mm dia. bulk pipeline from Malmesbury can be transferred to the existing Malmesbury reticulation network.

Abbotsdale Feeder Mains:

- It is proposed that the existing bulk pipeline between Malmesbury and the draw-off point to Abbotsdale is upgraded in order to augment supply to Abbotsdale and Kalbaskraal (items SAW.B9 and SAW.B10). Item SAW.B9 is the replacement of the existing 200mm dia. AC pipe from the proposed connection point to the new 500/400mm dia. bulk pipeline from the Wesbank reservoir up to the point where the diameter of the existing 200mm dia. AC pipe enlarged to a 250mm dia. ductile iron pipe. Item SAW.B10 is a 250mm dia. parallel reinforcement of the existing 250mm dia. ductile iron pipe up to the Abbotsdale draw-off point.
- A new 160mm dia. supply pipe is proposed from the De Hoop Lower reservoir to the De Hoop Upper reservoir (item SAW.B5).
- A new 200mm dia. bulk pipeline is proposed from the 500/400mm dia. bulk pipeline from the Wesbank reservoirs (future bulk supply pipe to Oranjefontein, Abbotsdale and Kalbaskraal reservoirs) to the proposed Oranjefontein reservoir (item SAW.B11). It is proposed that flow into the reservoir is regulated through a flow-control valve for even withdrawal from the upstream bulk system (item SAW.B12).

Kalbaskraal Feeder Mains:

- A new 200mm dia. bulk supply pipeline is proposed between the Kalbaskraal Lower and the proposed Kalbaskraal Upper reservoir (item SKW.B2).

Chatsworth and Riverlands Feeder Mains:

- It is proposed that the existing 160mm and 200mm dia. portions of the bulk pipeline between the Kalbaskraal Lower reservoir and the Riverlands break pressure tank are upgraded to improve bulk water supply to the Chatsworth reservoirs (items SCW.B2 and B3). Item SCW.B2 is a proposed 250mm dia. parallel reinforcement of the existing 3km 200mm dia. portion of the bulk pipeline. Item SCW.B3 is the replacement of the existing 160mm dia. portion of the bulk pipeline (3.1km) with a new 315mm dia. pipeline.
- It is proposed that the existing 160mm dia. bulk pipeline (4.7km) between the Riverlands break pressure tank and the Chatsworth reservoirs is upgraded to a 250mm dia. to improve bulk water supply to the Chatsworth reservoirs (items SCW.B5).
- Through the implementation of master plan items SCW.B2, SCW.B3 and SCW.B5 the capacity of the existing system to supply bulk water from Kalbaskraal to the Chatsworth reservoirs will improve from the current capacity of 1.3 Ml/d to a future capacity of 3.5 Ml/d. This will however not be sufficient to supply the potential peak day demand of 6.1 Ml/d that is calculated for Chatsworth and Riverlands.
- In order to supply a peak demand of more than 3.5 Ml/d to Chatsworth the existing 250mm dia. pipeline between Malmesbury and Kalbaskraal should be upgraded and the sizes of the master plan items from the Glen Lily reservoir to the Wesbank reservoir, from the Wesbank reservoir to the Abbotsdale draw-off point and from Kalbaskraal to Chatsworth should be enlarged. Alternatively a second supply pipeline should be constructed between the CCT Pella reservoirs and the Swartland Local Municipality Chatsworth reservoirs.
- It is therefore proposed that a new 355mm dia. bulk pipeline is constructed between the CCT Pella reservoirs and the SLM Chatsworth reservoirs (item SCW.B7) in order to augment bulk water supply to Chatsworth. This pipeline will alleviate pressure that currently exists on the bulk system between Malmesbury and Kalbaskraal, Chatsworth and Riverlands.

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Darling Feeder Mains:

- Upgrading of the existing bulk pipeline between Malmesbury and Darling is proposed in the Swartland bulk water master plan (items S4.3 and S4.4) in order to augment the capacity of the existing bulk system to supply water to Darling and Yzerfontein.

Koringberg Feeder Mains:

- The only feeder main required in future is the feeder main to the proposed internal booster PS.

Moorreesburg Feeder Mains:

- Upgrading of the so-called “F-line” between the Kasteelberg reservoirs and Moorreesburg is proposed in the Swartland bulk water master plan (item S2.9) in order to improve the redundancy of the bulk supply system to Moorreesburg.

Riebeek Kasteel Feeder Mains:

- A new 250mm dia. feeder main is proposed from the so-called “D-line” (bulk pipeline from the Kasteelberg reservoirs) to the proposed Riebeek Kasteel Lower reservoir (item SRkW.B1). It is proposed that flow into the reservoir is regulated through a flow-control valve for even withdrawal from the upstream bulk system (item SRkW.B2).
- It is proposed in the Swartland bulk water master plan that the existing 100mm dia. feeder main from the D-line to the existing Riebeek Kasteel reservoirs is upgraded to a 200mm dia. pipe (item S2.4).
- Upgrading of the 150mm dia. portion of the D-line between Riebeek West and Riebeek Kasteel is proposed in the Swartland bulk water master plan (items S2.2 and S2.3).

Riebeek Wes Feeder Mains:

- It is proposed that the existing 100mm dia. feeder main from the so-called “D-line” (bulk pipeline from the Kasteelberg reservoirs) to the existing Riebeek West Lower reservoir is upgraded to a 200mm dia. pipe (item SRwW.B1).
- It is proposed that the existing 100mm dia. feeder main from the Riebeek West Lower reservoir to the Riebeek West Upper reservoir is upgraded to a 160mm dia. pipe (item SRwW.B3).
- Upgrading of the 200mm dia. portion of the D-line between the Kasteelberg reservoirs and Riebeek West is proposed in the Swartland bulk water master plan (items S2.1 and S2.2).

Ongegend Feeder Mains:

- Upgrading of the existing 100mm dia. feeder main to the Ongegend PS is proposed (item SOW.B1).
- A new 160mm dia. dedicated bulk supply line from the Ongegend PS to the Ongegend Lower reservoir is proposed (item SOW.B3).
- A new 110mm dia. feeder main from the Ongegend Lower reservoir to the Ongegend Upper reservoir is proposed (SOW.B5).

Yzerfontein Feeder Mains:

- No upgrades are required to the bulk system between Darling and Yzerfontein in order to accommodate the future water demand.

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The Water Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, it will be necessary for the following future bulk water pipelines.

Table 3.2.3.3: Future bulk water infrastructure as included in Water Master Plans					
Town	New feeder mains that are proposed or existing feeder mains that require upgrading in the future	Year	Distance (m)	Diameter (mm)	Estimated cost 19/20 (R million)
Malmesbury	New 315 mm Ø bulk supply from Wesbank to Kalbaskraal bulk pipeline (item SMW1.1)	2021	882	315	R3.554
	New 315 mm Ø bulk supply from Wesbank to Kalbaskraal bulk pipeline (including N7 National Road crossing) (item SMW1.3)	2021	806	315	R4.121
	New 250 mm Ø bulk supply from Wesbank to Kalbaskraal bulk pipeline (including 2x railway-crossings & 1x stream crossing) (item SMW1.4)	2021	712	250	R3.718
	1 x 200 mm Ø Valve required to isolate Kleindam and Wesbank bulk supply towards Kalbaskraal. Kleindam supply can be utilised as part of the reticulation network. (item SMW1.5)	2021	-	200	R0.117
	New 200 mm Ø Pipe required to improve bulk supply to Panorama reservoir (when future area MM_05 develops) (item SMW.B5)	2023	130	200	R0.270
	New 200 mm Ø Pipe to increase flow velocity in existing 100 Ø pipe > 2.5 m/s (item SMW.B10)	2030	28	200	R0.091
	New 500 mm Ø bulk supply from Wesbank to de Hoop & Oranjefonten reservoir and Kalbaskraal bulk pipeline (including railway crossing) (item SMW.B7)	2035	1 639	500	R9.857
	New 500 mm Ø Pipe to install to improve supply to West Bank reservoirs (item SMW.B6)	2040	2 199	500	R12.507
	New 400 mm Ø bulk supply from Wesbank to Oranjefonten reservoir & Kalbaskraal bulk pipeline (including N7 & stream crossings) (item SMW.B8)	2040	1 748	400	R9.475
	New 315 mm Ø bulk supply from WC DM bulk pipeline to the new Wesbank Upper reservoir (item SMW.B1)	2050	662	315	R1.974
	50 L/s 150 mm Ø Flow Control Valve required to sustain pressure in upstream bulk system (item SMW.B2)	2050	-	150	R0.233
Abbotsdale	New 315mm Ø bulk supply pipeline to De Hoop Lower reservoir (including stream-crossing) (item SAW.B1)	2035	1 543	315	R5.031
	65 L/s 200 mm Ø Flow Control Valve required to sustain pressure in upstream bulk system (item SAW.B2)	2035	-	200	R0.269
	23 L/s 150 mm Ø Flow Control Valve required to sustain pressure in upstream bulk system (required when bulk system is supplied from the Wesbank reservoirs) (item SAW.B8)	2040	-	150	R0.233
	Replace existing 200 Ø AC pipeline with a new 300 Ø pipeline (required to increase supply capacity to Abbotsdale and Kalbaskraal) (item SAW.B9)	2040	1 029	300	R3.060
	250 mm Ø Pipe required to increase supply capacity to Abbotsdale and Kalbaskraal (item SAW.B10)	2045	1 245	250	R3.668
	New supply pipeline to the De Hoop Upper reservoir (item SAW.B5)	2050	640	160	R0.830
	New 200 mm bulk supply pipeline to the new Oranjefontein reservoir (item SAW.B11)	2055	1 568	200	R2.790
	21 L/s 200 mm Ø Flow Control Valve to sustain pressure in upstream bulk system (item SAW.B12)	2055	-	200	R0.269
Kalbaskraal	New feeder main from old reservoir to new reservoir (item SKW.B2)	2023	1 287	200	R2.101
Chatsworth and Riverlands	Alternative supply to Chatsworth from CCT system. Required when future area CW_04 develops. (item SCW.B7)	2022	5 260	355	R15.320
	Parallel reinforcement of existing 200 mm Ø pipeline to improve bulk supply to Chatsworth (item SCW.B2)	2040	3 012	250	R7.108
	Upgrade existing 160 mm Ø pipeline to improve bulk	2040	6 147	315	R19.667

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Table 3.2.3.3: Future bulk water infrastructure as included in Water Master Plans

Town	New feeder mains that are proposed or existing feeder mains that require upgrading in the future	Year	Distance (m)	Diameter (mm)	Estimated cost 19/20 (R million)
	supply to Chatsworth (item SCW.B3)				
	Upgrade existing 160 Ø pipeline to improve bulk supply to Chatsworth (item SCW.B5)	2045	4 682	250	R11.020
Riebeeck Kasteel	New 250 mm Ø bulk supply pipeline to the new Riebeeck Kasteel Lower reservoir (item SRkW.B1)	2025	118	250	R0.330
	42 L/s 150 mm Ø Flow Control Valve to sustain pressure in upstream bulk system (item SRkW.B2)	2025	-	150	R0.233
Riebeeck Wes	Upgrade existing pipe when AADD for Riebeeck West exceeds 650 Kl/d (item SRwW.B1)	2023	607	200	R1.106
	Replace existing 110 Ø feeder main to the reservoirs (required when PS is upgraded) (item SRwW.B3)	2030	343	160	R0.446
Ongegund	Replace existing 100 Ø feeder main to PS (item SOW.B1)	2025	74	160	R0.134
	New 160 mm Ø Pipe required for dedicated bulk supply to existing Ongegund reservoir (item SOW.B3)	2025	300	160	R0.440
	New 110 mm Ø bulk supply pipeline to Ongegund Upper reservoir (item SOW.B5)	2055	318	110	R0.317
Total					R120.289

3.2.4 Water Treatment Works Infrastructure

An automatic backwash rapid gravity sand filter is used to treat the surface water supplied from the Paardenberg dam. The filtration capacity is currently adequate to treat the authorised surface water supplied from the dam and no upgrades of the filtration capacity are planned for the nearby future.

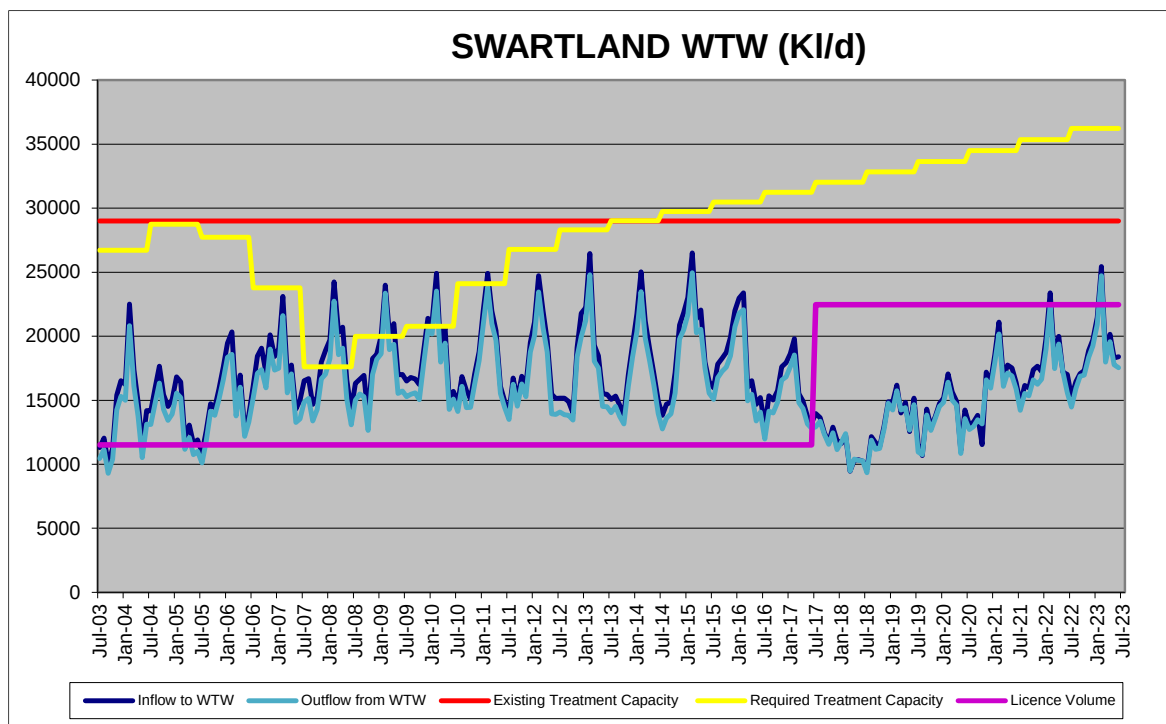
The table below gives an overview of the design capacity, current flows and required treatment capacity of the Swartland WTW.

Table 3.2.4.1: Design capacity, current flows and required treatment capacity of Swartland WTW

Year	Design Capacity	Maximum Month Average Daily Flow		Average Annual Daily Flow		Required Treatment Capacity
	(Ml/d)	Flow (Ml/d)	Operational Capacity (%)	Flow (Ml/d)	Operational Capacity (%)	1.5 x AADD _{10yr} (Ml/d)
2013/2014	29.000	25.032 (Febr)	86.32%	17.801	61.38%	29.011
2014/2015	29.000	26.496 (Febr)	91.37%	19.161	66.07%	29.736
2015/2016	29.000	24.226 (Febr)	83.54%	18.492	63.77%	30.479
2016/2017	29.000	19.816 (Febr)	68.33%	15.847	54.64%	31.241
2017/2018	29.000	13.958 (Jul)	48.13%	11.734	40.46%	32.022
2018/2019	29.000	16.171 (Febr)	55.76%	13.332	45.97%	32.823
2019/2020	29.000	17.054 (Febr)	58.81%	13.853	47.77%	33.643
2020/2021	29.000	21.089 (Febr)	72.72%	16.072	55.42%	34.484
2021/2022	29.000	23.392 (Feb)	80.66%	17.850	61.55%	35.347
2022/2023	29.000	25.441 (Feb)	87.73%	18.869	65.07%	36.230

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The following four options were investigated, as part of the Bulk Water Master Plan for Swartland Municipality, to augment the treatment capacity of the Swartland system in order to supply the future water demand.

- **Option 1:** Augment treatment capacity of the Swartland WTW from the current capacity of 29 MI/d with 36.4 MI/d to the future required capacity of 65.4 MI/d. Supply total Swartland system with water from the Swartland WTW (as proposed in the June 2013 Water Master Plan for the WC DM). For this scenario the Swartland WTW is operated by the WC DM.
- **Option 2:** Capacity of Swartland WTW remain at 29 MI/d. CCT to supply additional demand to the system from the existing CCT's Voëlvlei WTW. Treated water is pumped from the CCT's Voëlvlei WTW (up to 36.4 MI/d for the future demand) to the Swartland WTW to augment peak weekly demand if it exceeds the existing capacity of the plant of 29 MI/d. The total peak demand for the future system of 65.4 MI/d is then pumped from the Swartland PS (located at the Swartland WTW) to the system. For this scenario the Swartland WTW is operated by the WC DM and the system from the CCT's Voëlvlei WTW up to the Swartland WTW is operated by the CCT. Alternatively CCT can take over the operation of the Swartland WTW from the WC DM and operate the total system up to the Swartland PS.
- **Option 3a:** The existing Swartland WTW is decommissioned and the future peak weekly demand for the system of 65.4 MI/d is supplied from the CCT's Voëlvlei WTW. For this scenario the existing pumps at the Swartland WTW is retained and water is pumped from the CCT's Voëlvlei WTW to the decommissioned Swartland WTW, and then from the Swartland WTW site to the Swartland system via the Swartland PS (pump station should be upgraded to supply the future demand of 65.4 MI/d). For this scenario the total system is operated by CCT up to the Swartland PS.
- **Option 3b:** This is the same as for scenario 3a, except that the Swartland PS (located at the Swartland WTW) is also decommissioned and the demand of the total system is supplied from the CCT's Voëlvlei WTW. For this scenario water is pumped from the CCT's Voëlvlei WTW to the Kasteelberg reservoirs, the Kamp reservoirs and the Gouda reservoirs (bulk pipeline from the CCT's Voëlvlei WTW is connected at the Swartland WTW site to the existing bulk pipelines to the Kasteelberg reservoirs, the Kamp reservoirs and the Gouda reservoirs). For this scenario the total system is operated by CCT up to the connections to the old bulk pipelines.

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3.2.5 Water Pump Stations

The water pump stations, as inspected during the WSDP site visits in May 2023, are all operational and well maintained. Duty and Standby pumps are available for all the pump stations. No leaks were observed at any of the water pump stations. The pump stations are also fenced and locked and some are supplied with alarms to prevent any possible vandalism. Some of the issues to be addressed at the water pump stations, as identified through the WSDP inspection process, are as follows.

- Secure perimeter fence needs to be installed for the Rustfontein booster pump stations (Remote area).
- Abbotsdale Bulk Water PS and Booster PS at reservoir site: Existing 1.8m high diamond-mesh razor wire fences need to be replaced with perimeter fences.
- Darling and Yzerfontein Bulk Water PSs: Pump Station located in urban area, but current fencing is not adequate. Install secure perimeter fence.
- Moorreesburg Booster PS: Existing fence is inadequate and a new perimeter fence needs to be installed.
- Ongegund PS and Sump: Existing fence is inadequate and a new perimeter fence needs to be installed.
- Riebeeck Kasteel Booster PS: Pump Station is not fenced and a new perimeter fence needs to be installed.

The Water Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, it will be necessary for the following water pump stations.

Table 3.2.5.1: Future water pump stations required for Swartland Municipality's distribution systems				
Pumps	Future Capacity (l/s)	Head (m)	When	Estimated Cost 19/20 (R million)
Malmesbury				
Upgrading of the Wesbank booster pumping station is proposed (item SMW.B4).	50	25	2021	R0.319
Upgrading of the Wesbank tower pumps is proposed (item SMW.B9).	45	20	2025	R0.290
New pump station when FDA MM_05 develops (item SMW7.2)	10	50	2025	R1.748
Upgrading of the pumps of the existing Mount Royal pumping station is proposed (item SMW9.3).	10	20	2035	R0.306
Abbotsdale				
Upgrading of the Abbotsdale bulk pumping station is proposed (item SAW.B7) in order to augment bulk supply to Abbotsdale for the current operational scenario where bulk water to Abbotsdale and Kalbaskraal is supplied from the Kleindam reservoir in Malmesbury. When the master plan items are implemented in order to supply Abbotsdale and Kalbaskraal with water from the Wesbank reservoirs, the operational pressure in the existing system will improve and the existing bulk PS will become redundant.	30	35	2021	R0.404
A new De Hoop PS is proposed to supply water to the De Hoop Upper reservoir (item SAW.B4).	20	60	2050	R1.959
It is proposed that the existing Abbotsdale booster PS is decommissioned when the De Hoop Lower reservoir zone is implemented (item SAW2.13).	5	20	2045	R0.216
A new Abbotsdale booster PS is proposed in order to accommodate the higher lying erven of future area AD_05 (item SAW4.1).	10	40	2050	R1.736
Kalbaskraal				
A new pump station is proposed to supply water from the Kalbaskraal Lower reservoir to the proposed Kalbaskraal Upper reservoir (item SKW.B1).	40	40	2023	R2.266
It is proposed that the existing Kalbaskraal booster pumping station is decommissioned when the Kalbaskraal Upper reservoir zone is implemented (item SKW.B4).	12	20	2023	R0.216

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Table 3.2.5.1: Future water pump stations required for Swartland Municipality's distribution systems

Pumps	Future Capacity (l/s)	Head (m)	When	Estimated Cost 19/20 (R million)
A new bulk PS is proposed on the existing 250 mm Ø bulk pipeline between Abbotsdale and Kalbaskraal in order to augment the capacity of the existing bulk system from 40 L/s to 70 L/s (item SKW.B5).	70	40	2045	R2.789
A new Kalbaskraal Upper booster PS is proposed in order to accommodate the higher lying erven of future area KK_04 (item SKW2.1).	20	30	2060	R1.889
Chatsworth & Riverlands				
Upgrading of the Kalbaskraal to Riverlands PS is proposed (item SCW.B1) when the existing bulk pipeline between Kalbaskraal and the Riverlands BPT is upgraded. These items can be postponed through the implementation of a new bulk supply pipeline between the CCT Pella reservoirs and the SLM Chatsworth reservoir.	40	30	2040	R0.315
Upgrading of the Riverlands to Chatsworth PS is proposed (item SCW.B4) when the existing bulk pipeline between the Riverlands BPT and the Chatsworth reservoirs is upgraded. These items can be postponed through the implementation of a new bulk supply pipeline between the CCT Pella reservoirs and the SLM Chatsworth reservoir.	45	125	2040	R0.693
Darling				
New Pump Station required when future area DL_02 develops, cost to the developer (item SDW3.1)	3	20	2040	-
Upgrading of the pumps at the Darling PS that is pumping to the Darling reservoirs is proposed (item SDW.B2).	70	50	2045	R0.512
Koringberg				
Internal PS is required for the higher lying erven in development areas KB_02 & KB_06 (item SKoW1.5).	4	15	2045	-
Moorreesburg				
Upgrading of the pumps at the Moorreesburg booster PS is proposed (item SMoW.B1).	60	50	2040	R0.470
Riebeeck Wes				
New Pump Station required when future area RW_05 develops, cost to the developer (item SRwW4.1)	2	25	2040	-
Upgrading of the pumps at the Riebeeck West PS is proposed (item SRwW.B2).	15	45	2030	R0.269
Ongegund				
Upgrading of the pumps at the Ongegund Lower PS is proposed (item SOW.B2).	20	35	2025	R0.271
A new pumping station is proposed to supply water to the future Ongegund Upper reservoir (SOW.B4).	8	55	2035	R1.705
Total				R18.373

The future bulk water pump stations required for the Swartland and Withoogte bulk water distribution systems are included in Tables 2.3.2.1 and 2.3.2.2.

3.2.6 Reservoir Infrastructure

The condition of most of the reservoirs in Swartland Municipality's Management Area is good and the reservoirs are well maintained. The levels of the bulk and internal reservoirs are monitored through telemetry systems. No leaks were noticed at any of the reservoirs during the WSDP site visits in May 2023. Not all the reservoirs are fenced and locked. Some of the issues to be addressed at the water reservoirs, as identified through the WSDP inspection process, are as follows.

- Abbotsdale reservoirs: Existing 1.8m high diamond-mesh razor wire fence needs to be replaced with perimeter fence.
- Darling reservoirs: Reservoirs and chlorine facility is not fenced and a secure fence needs to be installed.

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- Panorama reservoir and chlorine facility: A new Shopping Mall is constructed next to the existing Panorama reservoir facility site. The site is not fenced and a new fence needs to be installed.
- Moorreesburg reservoirs: The existing reservoirs and disinfection facility is located on private property, but the site is not fenced. A new fence needs to be installed.
- Ongegund reservoir: The reservoir is located on private property, but the reservoir is not adequately fenced. A new fence needs to be installed.
- Riebeek Kasteel reservoirs: The two reservoirs are not fenced and a new fence needs to be installed.
- Chatsworth reservoirs: Existing 1.8m high diamond-mesh razor wire fence was vandalised at a number of places and needs to be replaced with perimeter fence.
- The asbestos roofs of the one Koringberg reservoir and the one Riebeek Kasteel reservoir failed and needs to be repaired or replaced.
- The covers of the Koringberg, Moorreesburg, Riebeek Wes LL, Wesbank No.2 and one of the Glen Lilly reservoirs needs to be locked. It was not locked during the WSDP site visits.
- The access ladders of the Kasteelberg and Glen Lilly reservoirs needs to be locked. It was not locked during the West Coast Water Safety Plan site visits. One of the Kasteelberg reservoir valve chambers is without a cover.
- Lockable cover needs to be installed for the Wildschutvlei balancing tank.

The 2022/2023 storage factors of the total reservoir storage capacity for the various towns, based on 1 x PDD (24 hours storage capacity), are 1.49 for Koringberg, 2.38 for Moorreesburg, 1.34 for Darling, 2.59 for Yzerfontein, 17.68 for Ongegund, 3.45 for Riebeek Wes, 0.94 for Riebeek Kasteel and 2.67 for Malmesbury. Even though the overall storage capacity might be adequate for all of the towns there can be distribution zones within some of the towns with inadequate storage capacity, which require additional reservoirs.

The Water Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, it will be necessary for the following future reservoirs.

Table 3.2.6.1: Estimated cost of future reservoir storage capacities required				
Town	Recommendations included in the Water Master Plan	Capacity (MI)	When	Estimated Cost 19/20 (R million)
Malmesbury	New 5.0 MI Wesbank Upper reservoir (item SMW.B3)	5.000	2050	R15.190
Abbotsdale	New 5.5 MI de Hoop Lower reservoir (item SAW.B3)	5.500	2035	R16.324
	New 1.2 MI De Hoop Upper reservoir (item SAW.B6)	1.200	2050	R5.757
	New 2.5 MI Oranjefontein reservoir (item SAW.B13)	2.500	2055	R9.415
Kalbaskraal	New 3.6 MI Kalbaskraal Upper reservoir (item SKW.B3).	3.600	2023	R12.172
Chatsworth and Riverlands	New 5.0 MI reservoir (item SCW.B6).	5.000	2030	R15.190
Darling	New 3.5 MI reservoir (item SDW.B1)	3.500	2035	R11.920
Koringberg	New 1.0 MI reservoir (item SKoW.B1).	1.000	2035	R5.040
Riebeek Kasteel	New 4.5 MI reservoir (item SRkW.B3).	4.500	2025	R14.223
Riebeek Wes	New 1.0 MI reservoir (item SRwW.B4).	1.000	2030	R5.040
Ongegund	New 500 KI Ongegund Upper reservoir (item SOW.B6)	0.500	2055	R3.206
Total				R113.477

The future bulk reservoirs required for the Swartland and Withoogte bulk water distribution systems are included in Tables 3.2.3.1 and 3.2.3.2.

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3.2.7 Water Reticulation Infrastructure

The Water Master Plan (2020) has indicated that based on the most likely land-use development scenario, the following future water reticulation infrastructure components will be necessary.

Table 3.2.7.1: Future water reticulation infrastructure required			
Scheme	Year	Project	Estimated Cost 19/20 (R Million)
Malmesbury	2021	New bulk water infrastructure: Wesbank to Kalbaskraal supply (PRJ-SMW-001)	R0.108
		Development related infrastructure: Proposed Winelands Pork abattoir (PRJ-SMW-002)	R0.548
		Wesbank booster PS zone upgrades (PRJ-SMW-003)	R3.347
		Development related infrastructure: De Hoop housing (PRJ-SMW-005)	R1.114
	2022	De Hoop main supply infrastructure (De Hoop housing) (PRJ-SMW-004)	R5.280
		Network reinforcements: Wesbank reservoir zone (PRJ-SMW-007)	R1.110
	2023	Incorporate old bulk system to Abbotsdale as part of the Kleindam reservoir network (PRJ-SMW-016)	R0.127
		Upgrade main pipeline to and from Panorama reservoir (PRJ-SMW-017)	R0.343
	2025	Development related infrastructure: Panorama reservoir zone (PRJ-SMW-011)	R0.261
		Development related infrastructure: Wesbank PRV 2 zone (PRJ-SMW-021)	R0.524
	2030	Development related infrastructure: De Hoop housing (PRJ-SMW-005)	R2.439
		Development related infrastructure: Wesbank PRV 1 zone (PRJ-SMW-006)	R1.610
	2035	Development related infrastructure: Mount Royal (PRJ-SMW-022)	R1.150
	2040	Development related infrastructure: De Hoop housing (PRJ-SMW-005)	R1.015
	2045	Development related infrastructure: Old Golf Course reservoir (PRJ-SMW-014)	R2.992
	2050	New bulk water infrastructure: Wesbank Upper reservoir (PRJ-SMW-008)	R8.316
		Development related infrastructure: Wesbank Upper reservoir zone (PRJ-SMW-009)	R0.475
		Development related infrastructure: Kleindam reservoir (PRJ-SMW-015)	R0.437
	2020 - 2050	Water Demand Management Items for Malmesbury	R9.529
	Sub-total		R40.725
Abbotsdale	2022	Network reinforcements: Abbotsdale (PRJ-SAW-007)	R0.693
	2025	De Hoop mixed use main supply infrastructure (connection to Wesbank reservoir zone) (PRJ-SAW-001)	R2.362
	2030	De Hoop mixed use main supply infrastructure (connection to Wesbank reservoir zone) (PRJ-SAW-001)	R1.457
	2035	Development related infrastructure: De Hoop mixed use (PRJ-SAW-002)	R2.311
		Implement De Hoop Lower reservoir (PRJ-SAW-003)	R3.853
		Inter-connection pipeline between De Hoop Lower and Abbotsdale systems (PRJ-SAW-004)	R3.260
	2040	Development related infrastructure: De Hoop mixed use (PRJ-SAW-002)	R1.521
		Development related infrastructure: Wesbank PRV2 zone (PRJ-SAW-005)	R1.866
		Development related infrastructure: Abbotsdale (PRJ-SAW-008)	R0.267
		Connection pipe between Abbotsdale, De Hoop & future Oranjerfontein networks (PRJ-SAW-012)	R2.109
		Network reinforcements: Oranjerfontein reservoir zone (PRJ-SAW-013)	R0.955
	2050	Implement De Hoop Upper reservoir (PRJ-SAW-006)	R0.866
	2055	Oranjerfontein reservoir and supporting infrastructure (PRJ-SAW-014)	R4.025
	-	Water Demand Management Items for Abbotsdale	R0.305
	Sub-total		R25.850
Kalbaskraal	2023	Construct new Kalbaskraal reservoir & supporting infrastructure (PRJ-SKW-001)	R3.291
	2030	Network reinforcements: Kalbaskraal (PRJ-SKW-002)	R1.793
	2050	Development related infrastructure: Kalbaskraal (PRJ-SKW-003)	R0.976
	-	Water Demand Management Items for Kalbaskraal	R0.100

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Table 3.2.7.1: Future water reticulation infrastructure required

Scheme	Year	Project	Estimated Cost 19/20 (R Million)
	Sub-total		R6.160
Chatsworth & Riverlands	2025	Network reinforcements: Chatsworth (PRJ-SCW-003)	R13.704
	-	Water Demand Management Items for Chatsworth & Riverlands	R0.100
	Sub-total		R13.804
Darling	2025	Darling network reinforcements: Phase 1 (PRJ-SDW-002)	R3.821
		Development related infrastructure: Darling PRV zone (PRJ-SDW-006)	R0.922
	2030	Darling network reinforcements: Phase 2 (PRJ-SDW-003)	R1.243
		Development related infrastructure: Darling PRV zone (PRJ-SDW-006)	R0.477
	2035	Development related infrastructure: Darling PRV zone (PRJ-SDW-006)	R0.404
	2040	Development related infrastructure: Darling reservoir zone (PRJ-SDW-005)	R1.186
	2045	Darling network reinforcements: Phase 3 (PRJ-SDW-004)	R2.380
	-	Water Demand Management Items for Darling	R0.100
	Sub-total		R10.533
Koringberg	2025	Koringberg network reinforcements (PRJ-SKoW-002)	R0.848
	2030	Development related infrastructure: Koringberg (PRJ-SKoW-003)	R0.588
	2045	Development related infrastructure: Koringberg (PRJ-SKoW-003)	R0.233
	-	Water Demand Management Items for Koringberg	R0.070
	Sub-total		R1.739
Moorreesburg	2030	Moorreesburg network reinforcements: Phase 1 (PRJ-SMoW-002)	R0.500
		Development related infrastructure: Moorreesburg PRV zone (PRJ-SMoW-006)	R1.334
	2035	Moorreesburg network reinforcements: Phase 2 (PRJ-SMoW-003)	R8.556
		Development related infrastructure: Moorreesburg PRV zone (PRJ-SMoW-006)	R0.365
		Development related infrastructure: Moorreesburg reservoir zone (PRJ-SMoW-007)	R0.803
	2040	Moorreesburg network reinforcements: Phase 3 (PRJ-SMoW-004)	R1.576
	2045	Moorreesburg network reinforcements: Phase 4 (PRJ-SMoW-005)	R1.638
		Development related infrastructure: Moorreesburg reservoir zone (PRJ-SMoW-007)	R0.913
	2055	Development related infrastructure: Moorreesburg PRV zone (PRJ-SMoW-006)	R1.485
	-	Water Demand Management Items for Moorreesburg	R0.150
	Sub-total		R17.320
Riebeek Kasteel	2021	Network reinforcements: Riebeek Kasteel Upper reservoir zone (PRJ-SRkW-002)	R0.505
	2025	Riebeek Kasteel Lower reservoir & supporting infrastructure (PRJ-SRkW-001)	R1.951
		Network reinforcements: Riebeek Kasteel PRV 1 zone (PRJ-SRkW-003)	R0.317
		Network reinforcements: Riebeek Kasteel Lower PRV 5 zone (PRJ-SRkW-005)	R0.725
	2030	Development related infrastructure: Riebeek Kasteel (PRJ-SRkW-006)	R0.241
	2035	Riebeek Kasteel network reinforcements: Kloof Street pipeline (PRJ-SRkW-004)	R3.840
	2040	Development related infrastructure: Riebeek Kasteel (PRJ-SRkW-006)	R0.434
	-	Water Demand Management Items for Riebeek Kasteel	R0.070
	Sub-total		R8.083
Riebeek Wes	2021	Riebeek West network reinforcements: Phase 1 (PRJ-SRwW-001)	R0.726
	2025	Riebeek West network reinforcements: Phase 2 (PRJ-SRwW-003)	R0.448
		Development related infrastructure: Riebeek West (PRJ-SRwW-006)	R0.220
	2030	Additional reservoir storage capacity for Riebeek West (PRJ-SRwW-008)	R0.471
	2035	Riebeek West network reinforcements: Phase 3 (PRJ-SRwW-004)	R1.547
		Development related infrastructure: Riebeek West (PRJ-SRwW-006)	R0.147
	2040	Riebeek West network reinforcements: Phase 4 (PRJ-SRwW-005)	R1.079
		Development related infrastructure: Riebeek West (PRJ-SRwW-006)	R0.269
	2045	Development related infrastructure: Riebeek West (PRJ-SRwW-006)	R0.344
	2050	Development related infrastructure: Riebeek West (PRJ-SRwW-006)	R0.354

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Table 3.2.7.1: Future water reticulation infrastructure required

Scheme	Year	Project	Estimated Cost 19/20 (R Million)
	2021	Water Demand Management Items for Riebeeck Wes	R1.582
	Sub-total		R7.187
Ongegund	2035	Network reinforcements: Ongegund (PRJ-SOW-003)	R0.243
	2055	New Ongegund Upper reservoir & supporting infrastructure (PRJ-SOW-002)	R0.288
	2055	Water Demand Management Items for Ongegund	R0.100
	Sub-total		R0.631
Yzerfontein	2030	Development related infrastructure: Yzerfontein (PRJ-SYW-002)	R3.551
	2035	Development related infrastructure: Yzerfontein (PRJ-SYW-002)	R1.776
	-	Water Demand Management Items for Yzerfontein	R0.437
	Sub-total		R5.764
Total			R137.796

3.2.8 Bulk Sewer Pipeline and Sewer Drainage Network Infrastructure

The Sewer Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, the following future sewer reticulation infrastructure components will be necessary.

Table 3.2.8.1: Future bulk sewer pipeline and sewer drainage network infrastructure required

Scheme	Year	Project	Estimated Cost 19/20 (R Million)
Malmesbury (Includes Abbotsdale)	2021	Provide sewer infrastructure for Winelands Pork Abattoir (PRJ-SMS-004)	R5.898
	2025	Sanitation system for unserved erven in Malmesbury (PRJ-SMS-002)	R2.507
		Network reinforcements in Malmesbury (PRJ-SMS-003)	R0.993
		Implement future Malmesbury PS 2 drainage area (PRJ-SMS-005)	R1.201
		Development related infrastructure: De Hoop housing development (PRJ-SMS-006)	R4.151
	2030	Network reinforcements in Malmesbury (PRJ-SMS-003)	R1.723
		Implement future Malmesbury PS 5 drainage area (PRJ-SMS-009)	R1.382
		Development related infrastructure: De Hoop housing development (PRJ-SMS-006)	R0.896
		Development related infrastructure: Malmesbury future PS 2 drainage area (PRJ-SMS-007)	R1.003
	2035	Implement future Malmesbury PS 5 drainage area (PRJ-SMS-009)	R2.331
		Network reinforcements in Malmesbury (PRJ-SMS-003)	R5.463
		Development related infrastructure: De Hoop housing development (PRJ-SMS-006)	R1.600
	2040	Network reinforcements in Abbotsdale (PRJ-SAS-002)	R27.471
		Implement future Abbotsdale PS 3 drainage area (PRJ-SAS-003)	R0.407
		Development related infrastructure: De Hoop Junction (PRJ-SAS-009)	R3.489
		Development related infrastructure: De Hoop housing development (PRJ-SMS-006)	R2.348
		Implement future Malmesbury PS 3 drainage area (PRJ-SMS-008)	R0.509
	2045	Sanitation system for unserved erven in Abbotsdale - Phase 1 (Abbotsdale PS 1 drainage area) (PRJ-SAS-004)	R5.341
		Development related infrastructure: De Hoop Junction (PRJ-SAS-009)	R1.172
	2050	Sanitation system for unserved erven in Abbotsdale - Phase 2 (Abbotsdale future PS 3 drainage area) (PRJ-SAS-005)	R2.304
		Sanitation system for unserved erven in Abbotsdale - Phase 2 (Abbotsdale future PS 1 drainage area) (PRJ-SAS-007)	R2.184
	2055	Implement future Abbotsdale PS 1 drainage area (PRJ-SAS-006)	R1.859
	Sub-total		R76.232

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Table 3.2.8.1: Future bulk sewer pipeline and sewer drainage network infrastructure required

Table 5.2.6.1: Future Bulk Sewer Pipeline and Sewer Drainage Network Infrastructure Required			
Scheme	Year	Project	Estimated Cost 19/20 (R Million)
Chatsworth & Riverlands	2021	Development related infrastructure in Chatsworth (PRJ-SCS-001)	R3.017
	2025	Sanitation system for unserved erven in Chatsworth (PRJ-SCS-002)	R2.024
		Implement Chatsworth future PS 1 drainage area (PRJ-SCS-003)	R0.930
	2030	Sanitation system for unserved erven in Chatsworth (PRJ-SCS-002)	R20.172
	2035	Sanitation system for unserved erven in Chatsworth (PRJ-SCS-002)	R19.218
	2045	Sanitation system for unserved erven in Chatsworth (PRJ-SCS-002)	R0.274
	Sub-total		
Kalbaskraal	2025	Network reinforcements in Kalbaskraal (PRJ-SKS-001)	R2.161
	2045	Sanitation system for unserved erven in Kalbaskraal - Phase 1 (Kalbaskraal future PS 1 drainage area) (PRJ-SKS-002)	R3.567
	2050	Sanitation system for unserved erven in Kalbaskraal - Phase 2 (Kalbaskraal future PS 2 drainage area) (PRJ-SKS-003)	R4.548
		Implement future Kalbaskraal PS 3 drainage area (PRJ-SKS-004)	R1.511
	2055	Sanitation system for unserved erven in Kalbaskraal - Phase 3 (Kalbaskraal future PS 3 drainage area) (PRJ-SKS-005)	R1.893
	Sub-total		
Darling	2021	Network reinforcements in Darling (PRJ-SDS-001)	R0.221
		Relocate Darling PS and construct new outfall to WWTW (PRJ-SDS-002)	R4.056
	2030	New bulk sewer for future development area (PRJ-SDS-003)	R1.891
	Sub-total		
Koringberg	2030	Sanitation system for unserved erven in Koringberg (PRJ-SKoS-001)	R6.796
	2035	Sanitation system for unserved erven in Koringberg (PRJ-SKoS-001)	R8.901
	Sub-total		
Moorreesburg	2040	Network reinforcement in Moorreesburg (PRJ-SMoS-001)	R0.815
	2045	Sanitation system for unserved erven in Moorreesburg (West of Railway) (PRJ-SMoS-003)	R4.042
	2050	Sanitation system for unserved erven in Moorreesburg (West of Railway) (PRJ-SMoS-003)	R11.010
	2055	Sanitation system for unserved erven in Moorreesburg (East of Railway) (PRJ-SMoS-004)	R9.380
	Sub-total		
Riebeek Valley	2021	Network reinforcements in Riebeek Kasteel (PRJ-SRKS-002)	R2.363
	2025	Development related infrastructure in Riebeek West (PRJ-SRwS-001)	R2.057
		Sanitation system for unserved erven in Riebeek West (PRJ- SRwS-002)	R18.273
	2040	Development related infrastructure in Riebeek West (PRJ-SRwS-001)	R0.582
	2045	Development related infrastructure in Riebeek West (PRJ-SRwS-001)	R2.765
Sub-total			R26.040
Yzerfontein	2030	Provide waterborne sanitation system for Yzerfontein developments (PRJ-SYS-001)	R6.038
	2035	Provide waterborne sanitation system for Yzerfontein developments (PRJ-SYS-001)	R1.296
	2045	Provide waterborne sanitation system for Yzerfontein developments (PRJ-SYS-001)	R1.468
	Sub-total		
Total			R217.501

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3.2.9 Sewer Pump Stations

Most of the sewer pump stations are fenced and locked, with duty and standby pumps. Key issues to be addressed at the sewer pump stations, as identified through the WSDP inspection process in May 2023, are as follows.

- Riebeek Kasteel Madeliefie sewer PS: Fence was vandalised, to be repaired or replaced.
- Riebeek Kasteel Esterhof main sewer PS: One of the three pumps was removed for required repairs.
- Darling Industrial sewer PS: One of the two pumps was removed for required repairs.
- Darling Asla (RD) sewer PS: One of the two pumps was removed for required repairs.

The Sewer Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, it will be necessary for the following future sewer pump stations.

Table 3.2.9.1: Future sewer pump stations required

Drainage System	Recommendations included in the Sewer Master Plan	Capacity (l/s)	When	Estimated Cost 19/20 (R million)
Abbotsdale	Upgrade existing Pump Station, investigate first (item SAS1.5)	26	2040	R0.573
	Upgrade existing Pump Station, investigate first (item SAS2.1)		2040	R0.024
	Upgrade existing Pump Station, investigate first (item SAS3.1)	42	2040	R0.694
	New Pump Station (item SAS5.1)	4	2040	-
	New Pump Station (item SAS7.1)	10	2040	R1.658
	New Pump Station (item SAS4.1)	8	2055	R1.598
Malmesbury	New Pump Station (item SMS3.1)	60	2021	R3.118
	New Pump Station (item SMS5.1)	62	2025	R2.564
	New Pump Station (item SMS6.1)	7	2040	R1.568
	New Pump Station (item SMS7.1)	15	2040	R1.807
	New Pump Station (item SMS4.1)	7	2045	R1.568
	New Pump Station (item SMS8.1)	4	2050	-
Chatsworth and Riverlands	Upgrade existing Pump Station, investigate first (item SRIS1.1)		2022	R0.024
	New Pump Station (item SCS2.1)	20	2025	R1.955
	New Pump Station (item SRIS2.1)	4	2045	R1.206
Kalbaskraal	Upgrade existing Pump Station, investigate first (item SKS2.1)		2022	R0.024
	Upgrade existing Pump Station (item SKS1.3)	30	2025	R0.580
	New Pump Station (item SKS3.1)	4	2045	R1.206
	New Pump Station (item SKS4.1)	4	2050	R1.206
	New Pump Station (item SKS5.2)	16	2050	R1.837
Darling	Abandon existing Pump Station (item SDS2.3)		2021	R0.216
	New Pump Station (item SDS3.2)	21	2021	R1.985
Riebeek Valley	Upgrade existing Pump Station, investigate first (item SOS1.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS1.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS2.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS3.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS4.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS5.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS6.1)		2022	R0.024
	Upgrade existing Pump Station, investigate first (item SRkS7.1)		2022	R0.024
	New Pump Station (item SOS2.1)	4	2050	-

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Table 3.2.9.1: Future sewer pump stations required

Drainage System	Recommendations included in the Sewer Master Plan	Capacity (l/s)	When	Estimated Cost 19/20 (R million)
Yzerfontein	New Pump Station (item SYS1.1)	24	2030	R2.074
Total				R27.677

3.2.10 Waste Water Treatment Works

The table below gives a summary of the existing hydraulic design capacities and current flows at each of the WWTWs, as well as the final effluent quality compliance percentages for the 2022/2023 financial year (Ml/d).

Table 3.2.10.1: Existing hydraulic design capacities and flows at each of the WWTWs (Ml/d)

WWTW	Existing Hydraulic Capacity	Peak Month Average Daily Flow	Average Daily Flow (2022/2023)	Average Wet Weather Flow (Jul'22, Aug'22, May'23, Jun'23)	Average Daily Flow as a % of Design Capacity	Final Effluent Compliance for 2022/2023
Malmesbury	10.000	7.022 (Jun)	5.807	6.093	58.07%	Microbiological: 100.0% Chemical: 79.2% Physical: 86.1%
Kalbaskraal	0.157	Unknown	0.084	Unknown	53.50%	Microbiological: 100.0% Chemical: 58.3% Physical: 100.0%
Riverlands/Chatsworth	0.270	Unknown	0.341	Unknown	126.30%	Microbiological: 8.3% Chemical: 31.1% Physical: 63.9%
Moorreesburg	2.000	1.570 (Jun)	1.234	1.322	61.70%	Microbiological: 8.3% Chemical: 45.8% Physical: 60.0%
Riebeek Valley	1.900	1.011 (Aug)	0.800	0.852	42.11%	Microbiological: 83.3% Chemical: 89.6% Physical: 100.0%
Koringberg	0.030	Unknown	0.090	Unknown	300.00%	Microbiological: 0.0% Chemical: 27.1% Physical: 36.1%
Darling	1.500	1.450 (Jul)	1.307	1.369	87.13%	Microbiological: 100.0% Chemical: 83.3% Physical: 83.3%

The organic design capacities of the WWTWs and the current loadings at the WWTWs are indicated in the table below.

Table 3.2.10.2: Existing organic design capacities and current loadings at the WWTWs

WWTW	Organic Design Capacity (kg COD/d)	22/23		21/22		20/21	
		Average Load (kg COD/d)	% of Design Capacity	Average Load (kg COD/d)	% of Design Capacity	Average Load (kg COD/d)	% of Design Capacity
Malmesbury	10 000	7 690	76.9%	7 213	72.1%	8 105	81.1%
Moorreesburg	2 000	1 067	53.4%	-	-	1 165	116.5%
Riebeek Valley	1 500	748	49.9%	929	61.9%	882	58.8%
Darling	1 500	1 828	121.9%	1 725	115.0%	1 675	111.7%

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The projected future WWTW flows are included in the future water requirement projection models. The table below gives an overview of the average daily future projected WWTW flows.

Table 3.2.10.3: Average daily and peak month future projected WWTW flows (Ml/d)											
WWTW	Existing Hydraulic Capacity	Average Daily Future Projected WWTW Flows					Peak Month Average Daily Future Projected WWTW Flows				
		2027	2032	2037	2042	2047	2027	2032	2037	2042	2047
Malmesbury	10.000	7.310	9.273	11.069	13.261	15.944	8.991	11.406	13.615	16.311	19.611
Moorreesburg	2.000	1.462	1.775	2.152	2.455	2.809	2.061	2.503	3.034	3.462	3.961
Darling	1.500	1.485	1.669	1.881	2.125	2.407	1.960	2.203	2.483	2.805	3.177
Riebeek Valley	1.900	0.884	1.241	1.738	2.190	2.784	1.432	2.010	2.816	3.548	4.510
Koringberg	0.030	0.103	0.143	0.193	0.230	0.274	0.155	0.215	0.290	0.345	0.411

Note: The peak month factors used in the above table is 1.23 for Malmesbury, 1.41 for Moorreesburg, 1.32 for Darling, 1.62 for Riebeek Valley and 1.50 for Koringberg (Maximum peak month factor over last five years).

Detail Process Audits were completed during 20/21 for all the WWTWs in Swartland Municipality's Management Area and the recommendations from these Process Audits are summarised under each of the WWTWs below.

Malmesbury WWTW: The WWTW is a hybrid Membrane Bioreactor nutrient removal system. The system was designed to accommodate seasonal flow variation and provide operational flexibility and energy saving. The upgrade increased the plant hydraulic capacity to a peak wet weather flow of 30 Ml/d and peak dry weather flow of 20 Ml/d, while achieving the most restrictive effluent requirements. The new Malmesbury WWTW has been operating successfully for already ten years and has consistently met stringent effluent quality standard requirements, with excellent removal of COD, Nitrogen, TP, TSS and faecal coliforms.

The existing treatment works was incorporated and a new MBR was constructed, which resulted in all flow up to the peak dry weather flow passing through the membranes and only the peak wet weather flow flowing through the existing clarifiers. Flow is split and recycled between the old and new units to create one integrated system, in which the MBR has hydraulic capacity for the design peak dry weather diurnal flow of 20 Ml/d. To accommodate the significant peak wet weather flows, the clarifiers are put into operation automatically along with the disinfection system. To accommodate this and ensure the clarifiers do not fail in flux overloading, the recycles are carefully designed to achieve conventional lower mixed-liquor concentrations in the Pasveer Ditch, whilst the MBR unit runs at 8 to 15 kg/m³.

The new WWTW was put into operation during 2013 and the capacity of the plant is adequate to meet the future treatment requirements.

Table 3.2.10.4: Recommendations from Malmesbury WWTW Process Audit (July 2018 to June 2020)	
Component	Recommendation
Conclusion	Plant is functioning as intended and in excellent condition. The plant is currently operating at 45% of its hydraulic design capacity and 68% of its organic loading capacity. The mechanical and electrical equipment and process units are in good conditions. The processes are operated and maintained at their design specifications and the final effluent complies with the standards as set out in the Water Use Licence. Overall, it can be concluded that the Malmesbury WWTW is in an excellent condition, due to the efforts of the operational staff and management working together and striving to the same goal.
Recommendation: Design aspects	<u>Inlet pipeline</u>: Solutions to alter and/or adjust the upward bend at the inlet works, should be investigated, e.g. using grit channels that precede the inlet works.
Recommendation: Operational aspects	<u>Plant operation</u>: The proposed Control Sheets, as included in the January 2018 W₂RAP, need to be implemented. <u>Monitoring</u>: The proposed Operational Monitoring Program needs to be implemented. <u>Incidents</u>: The Incident Management Protocols, as included in the January 2018 W₂RAP, need to be implemented.

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Moorreesburg WWTW: The Moorreesburg WWTW was upgraded over the last two financial years and the new WWTW was put into operation on the 13th of March 2023. The hydraulic design capacity of the new WWTW is 2.000 Ml/d and the organic design capacity 2 000 kg COD/day. **The capacity of the plant is adequate to meet the future treatment requirements and to ensure compliance with the required final effluent discharge limits.**

The previous Moorreesburg WWTW Process Audit was done for the old WWTW and is therefore not applicable anymore.

Darling WWTW: The WWTW was upgraded in 2008 from an oxidation pond system to an activated sludge treatment system with denitrification, using the Modified Ludzak-Ettinger (MLE) process configuration, consisting of an inlet works, anaerobic ponds, bioreactor (with two surface aerators), secondary settling tank, chlorination, maturation ponds and a belt-press sludge dewatering system, which was recently constructed. The works has a hydraulic design capacity of 1.5 Ml/d. **The current capacity is inadequate to meet the future treatment requirements.** The Municipality allocated budget for 2023/2024 for the installation of new mechanical screens at the inlet works.

Table 3.2.10.5: Recommendations from Darling WWTW Process Audit (July 2018 to June 2020)

Conclusion	The Darling WWTW is in a reasonable condition. The mechanical and electrical equipment are in good operating condition and the process controllers are performing their duties well as can be expected. The final effluent complies to the General Standard, except for ammonia and free chlorine. The plant is currently operating at 72% and 100% of the plant's hydraulic and organic capacity, respectively. Therefore, the plant is organically overloaded, leading to numerous operational issues.
Recommendation: Design aspects	<u>Inlet works screening:</u> As the screen is too small to handle peak flows, resulting in floods, a new mechanical screen and a manual hand-raked by-pass screen is recommended. <u>Inlet works design:</u> A new inlet works should be constructed, that is above ground level, with a higher Peak Wet Weather Flow design capacity.
Recommendation: Operational aspects	<u>Poor nitrification in bioreactor:</u> Modifications to the recycle streams and aeration should be made, to improve the oxidation process efficiency. <u>Poor TSS removal in SSTs:</u> The secondary sedimentation process should be investigated, to avoid the high amounts of TSS in the final effluent. <u>Plant operation:</u> The proposed Control Sheets, as included in the January 2018 W₂RAP, need to be implemented. <u>Monitoring:</u> The proposed Operational Monitoring Program needs to be implemented. <u>Incidents:</u> The Incident Management Protocols, as included in the January 2018 W₂RAP, need to be implemented.

Riebeek Valley WWTW: The 1.9 Ml/d Riebeek Valley WWTW is an activated sludge system with biological nutrient removal that provide an effluent quality that meet the required final effluent discharge limits. **The WWTW was put into operation in 2016 and the capacity of the plant is adequate to meet the future treatment requirements for Riebeek Kasteel, Riebeek Wes and Ongegund.**

Table 3.2.10.6: Recommendations from Riebeek Valley WWTW Process Audit (July 2018 to June 2020)

Conclusion	The Riebeek Valley WWTW is performing well, operating at 40% of its hydraulic design capacity and 41% of its organic loading capacity. The mechanical and electrical equipment and process units are in good operating condition. The plant is in an excellent condition, due to the efforts of the operational staff and management working together and striving to the same goal.
Recommendation: Design aspects	<u>Inlet pipeline:</u> Solutions to alter and/or adjust the upward bend at the inlet works, should be investigated.
Recommendation: Operational aspects	<u>Plant operation:</u> The proposed Control Sheets, as included in the January 2018 W₂RAP, need to be implemented. <u>Monitoring:</u> The proposed Operational Monitoring Program needs to be implemented. <u>Incidents:</u> The Incident Management Protocols, as included in the January 2018 W₂RAP, need to be implemented.

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Koringberg WWTW: The WWTW is an oxidation pond system with unlined ponds, with an estimated treatment capacity of 0.030 Ml/d. The WWTW includes two primary oxidation ponds and three secondary ponds. There is no re-use of treated effluent. Treated effluent is returned into a local stream (Brak River).

The Municipality plans to upgrade the oxidation dams so that it complies with the required final effluent discharge limits. The quantity of treated effluent expected from the Koringberg WWTW is so little that it does not justify constructing an activated sludge works. It was recommended that the wastewater be treated in a pond system and the effluent be irrigated. The estimated area required for irrigation is 0.77 ha. **The capacity of the WWTW is inadequate to meet the current and future treatment requirements.**

Table 3.2.10.7: Recommendations from Koringberg WWTW Process Audit (July 2018 to June 2020)

Conclusion	The Koringberg ponds system is in very poor condition. Based on the estimated flow to the ponds, the system is currently hydraulically overloaded, operating at 114% of the current design capacity of the pond system. It is recommended that the capacity of the system be upgraded to accommodate the flow to the plant, in order to ensure final effluent compliance. Regular maintenance tasks should be carried out to ensure that the pond embankments are kept in an immaculate condition and that no further nuisances can develop.
Recommendation: Design aspects	<u>WWTW capacity</u>: The organic loading capacity of the ponds system should be investigated to determine if the WWTW has enough hydraulic capacity. A package plant could be a good solution.
Recommendation: Operational aspects	<u>Ponds condition</u>: The ponds should be cleaned, by removing all vegetation, sludge, scum and pollution. <u>Embankments condition</u>: The embankments should be cleared of vegetation. They should also be reinforced to avoid further damage. <u>Plant operation</u>: The proposed Control Sheets, as included in the January 2018 W₂RAP, need to be implemented. <u>Incidents</u>: The Incident Management Protocols, as included in the January 2018 W₂RAP, need to be implemented.

Kalbaskraal WWTW: The WWTW is an oxidation pond system with unlined ponds, with an estimated treatment capacity of 0.157 Ml/d. The WWTW includes two primary oxidation ponds, three secondary ponds and one tertiary pond. **The current capacity is still adequate and no upgrading is planned at present.**

Table 3.2.10.8: Recommendations from Kalbaskraal WWTW Process Audit (July 2018 to June 2020)

Conclusion	The Kalbaskraal ponds system is in a poor condition. The plant is hydraulically still under capacity, operating at 40% of the plant's design capacity. It is recommended that regular maintenance tasks should be continued to ensure that the pond embankments are kept in an immaculate condition and that no nuisances can develop.
Recommendation: Design aspects	<u>WWTW capacity</u>: The organic loading capacity of the ponds system should be investigated to determine if the WWTW has enough capacity to handle the incoming COD loads. <u>Discharge point</u>: A platform should be built where the trucks position themselves to discharge their waste to the first pond, to avoid damage to the embankments.
Recommendation: Operational aspects	<u>Ponds condition</u>: The ponds should be cleaned, by removing all vegetation, sludge, scum and pollution. <u>Embankments condition</u>: The embankments should be cleared of vegetation. They should also be reinforced to avoid further damage. <u>Plant operation</u>: The proposed Control Sheets, as included in the January 2018 W₂RAP, need to be implemented. <u>Incidents</u>: The Incident Management Protocols, as included in the January 2018 W₂RAP, need to be implemented.

Chatsworth / Riverlands WWTW: The WWTW is an oxidation pond system, which was upgraded during 2016/2017. The hydraulic design capacity of the WWTW was increased from 0.118 Ml/d to 0.270 Ml/d. The WWTW includes an anaerobic pond, facultative pond, one primary oxidation pond, five secondary ponds and a tertiary pond.

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Dekker Envirotech completed a short report, during December 2011, on the proposed upgrading of the Chatsworth WWTW. They recommended upgrading of the works in two phases of 270 m³/day each. The problems that were identified were as follows:

- Sludge build-up in the primary ponds results in a reduction of effective treatment capacity due to hydraulic short circuiting. The primary ponds were erroneously designed being too shallow to promote sustained methanogenic activity.
- Nitrification is not achieved in the secondary oxidation ponds – these ponds were originally designed to achieve both COD removal and biological Nitrification. However, due to the failure of the primary ponds the higher organic load will prevent the development of nitrifying organisms as these require a constant free dissolved oxygen level above 1.5 mg DO/L.

The report recommended upgrading of the existing ponding system to receive 270 m³/day of raw sewage (Phase 1) and involves the following (Was implemented by Municipality during 2016/2017):

- New fermentation pit and new facultative pond needs to be constructed upstream of the existing primary ponds. The fermentation pit will be submerged within the new facultative pond to provide a total water depth of 5m inside the fermentation pit. The fermentation pit will be a rectangular concrete structure with volume approximately 1 700 m³. The facultative pond will surround the fermentation pit and provide an effective water volume of 16 000 m³ and average water depth of 3 m.
- A Rock Filter will be constructed in the final existing secondary pond – this unit will have to be drained and then filled with stone of size >80mm. The rock filter will provide additional surface area for biofilm growth to enhance nitrification and suspended solids (primarily algae) removal. This will be a submerged filter and not a trickling filter. The inlet and outlet structures to this unit will be altered to achieve a uniform distribution.
- The existing primary ponds will require in-situ sludge digestion utilising injection of specific microbial formulations to rapidly ferment the organic sludge.
- Continual weekly addition of a microbial blend to augment the system will ensure that the nitrifying population is properly maintained and mercaptan-odours are prevented. This will be part of the commissioning period for 12 months.

Phase 1: Makes provision for abovementioned, also note that the construction of the fermentation pit and facultative pond would be sufficient to accommodate Phase-2 (Was implemented).

Phase 2: Treatment of an additional 270 m³/day (therefore system total of 540 m³/day) requires duplication of ponding system (except for fermentation pit and facultative pond already constructed during Phase 1).

The pond system is in a very poor condition. The capacity of the WWTW is inadequate to meet the current and future treatment requirements and Phase 2 of the proposed upgrade needs to be implemented. The Municipality allocated budget in 2023/2024 for the fencing of the WWTW.

Table 3.2.10.9: Recommendations from Chatsworth / Riverlands WWTW Process Audit (July 2018 to June 2020)

Conclusion	The Chatsworth ponds system is in very poor condition. Based on the estimated flow to the ponds, the system is currently operating at 63% of its design capacity and is therefore still hydraulically under capacity. It is recommended that the system be investigated to plan for future upgrades to the system, as is currently happening. Regular maintenance tasks should be continued to ensure that the pond embankments are kept in an immaculate condition and that no nuisances can develop.
Recommendation: Design aspects	• The final effluent quality is complying with the Irrigation Standards. It is still well below the limits and therefore the ponds system is still sufficient. The Municipality is busy with upgrades. The upgrade consists of two phases. The first phase has already taken place in July 2017, which consisted of increasing the capacity to 270 kl/day. Phase 2 will consist of an additional 270m³/day, increasing the total capacity of the ponds system to 540 kl/day. This requires the duplication of the ponds system, after the Phase 1 upgrades, but excludes the fermentation pit and facultative pond.

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Table 3.2.10.9: Recommendations from Chatsworth / Riverlands WWTW Process Audit (July 2018 to June 2020)

Recommendation: Operational aspects	• <u>Ponds condition</u>: The ponds should be cleaned, by removing all vegetation, sludge, scum and pollution. • <u>Embankments condition</u>: The embankments should be cleared of vegetation. • <u>Plant operation</u>: The proposed Control Sheets, as included in the January 2018 W₂RAP, need to be implemented. • <u>Incidents</u>: The Incident Management Protocols, as included in the January 2018 W₂RAP, need to be implemented.
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Swartland Municipality evaluates the capacity and suitability of their WWTWs to meet the final effluent quality limits on an annual basis. When the water quality requirements for the final effluent becomes stricter and / or when the inflow to the WWTW has increased to such an extent that the capacity of the plant needs to be increase, the Municipality appoints reputed consulting engineering firms to undertake feasibility studies to perform technical and economical evaluation of the different options available for upgrading or extending the capacity of the treatment works.

The Sewer Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, it will be necessary for the following bulk sewerage infrastructure.

Table 3.2.10.10: Future bulk sewerage infrastructure as included in Sewer Master Plans

Town	Item	Short description	Scheduled date	Estimated cost 19/20 (R Million)
Chatsworth / Riverlands	SCS.B1	New WW Treatment Plant	2022	R53.285
Koringberg	SKoS.B1	Upgrade existing WW Treatment Plant	2025	R6.400
Kalbaskraal	SKS.B1	New WW Treatment Plant	2030	R25.947
Moorreesburg	SMoS.B1	Upgrade existing WW Treatment Plant	2030	R35.373
Yzerfontein	SYS.B1	New WW Treatment Plant	2030	R22.829
Darling	SDS.B1	Upgrade existing WW Treatment Plant	2035	R20.598
Riebeek Valley	SRKS.B1	Upgrade existing WW Treatment Plant	2035	R25.060
Malmesbury	SMS2.5 SMS2.11	480 m x 675 mm Ø Upgrade existing Gravity Sewer Upgrade existing Pump Station	2055	R3.644 R1.833
Total				R194.969

3.3 WATER AND SANITATION SCHEMS

3.3.1 Water Schemes

The Water Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, the following future water reticulation infrastructure components will be necessary.

Table 3.3.1.1: Future water reticulation infrastructure required

Malmesbury
Proposed distribution zones • It is proposed that the boundaries of the existing zones are increased to accommodate future development areas. • The zone boundary between the Panorama reservoir zone and the Panorama PRV zone is slightly adjusted in order to lower high static pressures within the network. • A new Glen Lily local reservoir zone is proposed to accommodate future development areas MM_5 and MM_30 to the north east of Malmesbury and to replace the existing Panorama and Glen Lily booster zones in the higher lying areas of the Panorama reservoir zone. A new PRV is proposed for this zone to manage high static pressures at the lower lying even. • A new Wesbank Upper reservoir zone is proposed to accommodate future development areas MM_2, MM_7, MM_8.4 - MM_8.13, MM_9 & MM_24 to the north west of Malmesbury and to replace the existing Wesbank booster zone in the higher lying areas to the north of Wesbank. • It is however proposed that future development areas MM_8.4 - MM_8.13 & MM_24 is in the interim (before the new Wesbank Upper reservoir is constructed) accommodated within the existing Wesbank booster zone. • Alteration between the zone boundaries of the Wesbank booster and Wesbank tower zones are proposed in order to accommodate a portion of the existing tower zone within the existing Wesbank booster zone. • Four new PRV zones are proposed to accommodate the lower lying future development areas in the Wesbank reservoir supply area. Proposed future system and required works

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Table 3.3.1.1: Future water reticulation infrastructure required

- The existing Malmesbury water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Malmesbury distribution network and new distribution pipelines are proposed to supply future development areas with water when they develop.
- Project SMW-001 (New bulk water infrastructure: Wesbank to Kalbaskraal supply) will improve network conveyance and redundancy within the existing Wesbank reservoir distribution zone, enable the existing system to accommodate future development areas MM_21, MM_22 & MM_26 (proposed Winelands Pork abattoir) and improve bulk water supply to Abbotsdale and Kalbaskraal.
- Project SMW-003 (Wesbank booster PS zone upgrades) will be required to accommodate the higher lying areas of the De Hoop housing area. It is also proposed as part of this project that a portion of the existing Wesbank tower zone is accommodated within the existing Wesbank booster distribution zone. This will create additional spare capacity within the existing tower zone.
- Project SMW-004 (De Hoop main supply infrastructure (De Hoop housing)) will be required to accommodate the lower lying areas of the De Hoop housing area. This infrastructure will also be required to supply water in the interim (before the proposed De Hoop Lower reservoir is constructed in the Abbotsdale system) to the De Hoop mixed use area between Malmesbury and Abbotsdale (future areas AD_7.1, & AD_7.6 - AD_7.15).

Abbotsdale

Proposed distribution zones

- A new De Hoop Lower reservoir zone is proposed to accommodate future development areas between the existing Abbotsdale and Malmesbury systems.
- A new De Hoop Lower PRV zone is proposed to accommodate future development areas AD_02 & AD_08.
- It is proposed that the existing Abbotsdale booster PS is abandoned and the existing booster zone accommodated within the proposed De Hoop Lower reservoir zone.
- A new Oranjefontein reservoir zone is proposed to accommodate future development areas to the east of Abbotsdale.
- A new Abbotsdale booster zone is proposed to accommodate the higher lying erven of future development area AD_05.
- The boundary of the existing Abbotsdale reservoir zone is enlarged to accommodate future development area AD_04 and the lower lying erven of area AD_05.
- The boundary of the existing Abbotsdale reservoir zone is adjusted so that portions of the existing distribution zone are accommodated within the future De Hoop Lower reservoir, De Hoop Lower PRV and Oranjefontein reservoir distribution zones.
- A new De Hoop Upper reservoir zone is proposed to accommodate the higher lying future development area AD_7.16.

Proposed future system and required works

- The existing Abbotsdale water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Abbotsdale distribution network and new distribution pipelines are proposed to supply future development areas with water when they develop.
- Project SAW-001 (De Hoop mixed use main supply infrastructure (connection to Wesbank reservoir zone)) will be required to supply the proposed future development areas between Abbotsdale and Malmesbury in the interim (before the proposed De Hoop reservoir and supporting infrastructure are constructed) with water from the Malmesbury system.
- Project SAW-004 (Inter-connection pipeline between De Hoop Lower and Abbotsdale systems) will be required to connect the Abbotsdale system to the Malmesbury system. This will enable SLM to supply future development areas AD_02, AD_08 & AD_10 in the interim (before the proposed De Hoop Lower reservoir is constructed) with water from the Malmesbury system.

Kalbaskraal

Proposed distribution zones

- A new Kalbaskraal Upper reservoir zone is proposed to accommodate future development areas KK_01, KK_03 and the lower lying erven of area KK_04. It is proposed that the existing Kalbaskraal booster zone is accommodated within the Kalbaskraal Upper reservoir zone when the new Kalbaskraal Upper reservoir is constructed.
- A new Kalbaskraal Upper booster zone is proposed in order to accommodate the higher lying erven of future development area KK_04.

Proposed future system and required works

- The existing Kalbaskraal water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Kalbaskraal distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop and to supply the existing Kalbaskraal network with water from the proposed Kalbaskraal Upper reservoir when it is constructed.

Chatsworth and Riverlands

Proposed distribution zones

- The only changes to the existing distribution zones are that the boundaries of the existing distribution zones are increased to accommodate future development areas.

Proposed future system and required works

- The existing Chatsworth & Riverlands water distribution systems have insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- New distribution pipelines are required to reinforce water supply within the existing Chatsworth distribution network in order to

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Table 3.3.1.1: Future water reticulation infrastructure required

accommodate future development areas when they develop.

Darling

Proposed distribution zones

- Alterations to the zone boundaries between the tower and booster distribution zones are proposed in order to operate the existing system more effectively.

Proposed future system and required works

- The existing Darling water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Darling distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop.

Koringberg

Proposed distribution zones

- A new Koringberg booster zone is proposed in order to accommodate the higher lying erven of future development areas KB_02 & KB_06.
- It is proposed that the boundaries of the existing distribution zones are increased to accommodate future development areas.

Proposed future system and required works

- The existing Koringberg water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Koringberg distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop.

Moorreesburg

Proposed distribution zones

- It is proposed that the boundaries of the existing distribution zones are increased to accommodate future development areas.

Proposed future system and required works

- The existing Moorreesburg water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Moorreesburg distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop.

Riebeek Kasteel

Proposed distribution zones

- A new Riebeek Kasteel Lower reservoir zone is proposed. It is proposed that the existing Riebeek Kasteel PRV 1 zone (which is currently supplied from the existing Riebeek Kasteel reservoirs through the Riebeek Kasteel no. 1 PRV) is supplied directly from this reservoir.
- It is proposed that the existing distribution zones are increased to accommodate future development areas.

Proposed future system and required works

- The existing Riebeek Kasteel water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Riebeek Kasteel distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop.

Riebeek Wes

Proposed distribution zones

- A new Riebeek West Lower PRV zone is proposed to reduce high static pressures on the eastern side of Voortrekker Road.
- A new Riebeek West Upper booster zone is proposed to accommodate the higher lying erven of future development area RW_05.
- It is proposed that the boundaries of the existing distribution zones are increased to accommodate future development areas.

Proposed future system and required works

- The existing Riebeek West water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Riebeek West distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop.

Ongegund

Proposed distribution zones

- A new Ongegund Upper reservoir zone is proposed to accommodate the higher lying future development area OG_02.
- The boundary of the existing Ongegund Lower PRV distribution zone is increased to accommodate future development areas.

Proposed future system and required works

- The existing Ongegund water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas.
- A few distribution pipelines are required to reinforce water supply within the Ongegund distribution network.
- New distribution pipelines are proposed to supply future development areas with water when they develop.

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TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Table 3.3.1.1: Future water reticulation infrastructure required

Yzerfontein
Proposed distribution zones • A new Yzerfontein PRV zone is proposed to regulate high static pressure at the lower lying erven in Yzerfontein. • The boundary of the existing supply area is increased to accommodate future development areas. Proposed future system and required works • The existing Yzerfontein water distribution system has insufficient capacity to supply the future water demands for the fully occupied scenario and the additional future development areas. • A few distribution pipelines are required to reinforce water supply within the Yzerfontein distribution network and to supply water to future development areas when they develop. • A new PRV zone is proposed in the Yzerfontein reservoir zone to reduce water pressure in the network (project SYW-001).

The water master plan items and tables are included in Annexure A.

3.3.2 Sanitation Schemes

The Sewer Master Plan (June 2020) has indicated that based on the most likely land-use development scenario, the following further sewer reticulation infrastructure components will be necessary.

Table 3.3.2.1: Future sewer reticulation infrastructure required

Malmesbury and Abbotsdale
• The boundaries of the existing drainage areas in Malmesbury and Abbotsdale are increased to accommodate proposed future development areas that fall within these drainage areas. • Verification projects are proposed to investigate if waterborne sewer infrastructure is available at existing occupied stands where no sewer network information was available. Pending verification, new sewers are proposed to service the existing erven in Malmesbury and Abbotsdale if they are currently not serviced with a full waterborne sanitation system. • The existing pumping station duty flows and rising main capacities of Abbotsdale need to be verified and upgraded to accommodate full occupation and future development. • The new Malmesbury Future PS 1 drainage area is proposed to accommodate future development areas MM_02, MM_09 & MM_8.16 that cannot gravitate towards the existing De Hoop bulk sewer. • The new Malmesbury Future PS 2 drainage area, with pumped and gravity sub-drainage areas (Malmesbury Future PS 3, Malmesbury Future PS 6, Abbotsdale Future PS 3 & De Hoop Junction gravity), is proposed to accommodate future development areas located to the west of Malmesbury that cannot gravitate towards the existing De Hoop bulk sewer as well as the future development areas between Malmesbury and Abbotsdale north of the N7 National Road. • The new Malmesbury Future PS 4 & 5 drainage areas are proposed to accommodate future development areas MM_13, MM_14, MM_18, MM_19, MM_21 & MM_26, located to the south of Malmesbury. • The new Abbotsdale Future PS 1 drainage area is proposed to accommodate existing erven in the south west of Abbotsdale, without a formal waterborne sanitation system as well as a portion of future development area AD_01. • The new Abbotsdale Future PS 2 drainage area is proposed to accommodate future development area AD_02. • A number of existing outfall sewers require upgrading by replacement with larger sized future sewers and a number of new outfall sewers are proposed to accommodate future development areas that fall within the gravity drainage area of the Malmesbury WWTW, as well as for the Abbotsdale PS 1 drainage area.
Chatsworth, Kalbaskraal & Riverlands
• The boundaries of the existing drainage areas in Kalbaskraal & Riverlands are increased to accommodate proposed future development areas that fall within these drainage areas. • New formal waterborne sewer infrastructure is required in Chatsworth to accommodate all existing occupied and vacant erven as well as the proposed future development areas CW_01, CW_02, CW_03 & CW_04. The future Chatsworth drainage area can gravitate to the Chatsworth WWTW, except for the lower lying areas of future development area CW_04. A new Chatsworth Future PS 1 drainage area is proposed to service this area. A new pump station and rising main should be constructed for this drainage area that discharges at the Chatsworth WWTW. • A new Riverlands Future PS 1 drainage area is proposed to accommodate future development area RL_01 to the east of Riverlands. A new pump station and rising main should be constructed for this drainage area that discharges into the existing Riverlands PS 1 drainage area. • The new Kalbaskraal Future PS 1 and PS 2 drainage areas and new outfall sewers are proposed to accommodate existing erven in the south of Kalbaskraal without a formal waterborne sanitation system. • The new Kalbaskraal Future PS 3 drainage area is proposed to accommodate existing erven in the north of Kalbaskraal without a formal waterborne sanitation system, as well as proposed future development areas KK_03 & KK_04. • A number of existing outfall sewers require upgrading by replacement with larger sized future sewers and a number of new outfall sewers are proposed to accommodate future development areas that fall within the drainage areas of the Kalbaskraal WWTW.
Darling
• The boundaries of the existing drainage areas in Darling are increased to accommodate proposed future development areas that fall within these drainage areas.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 3: WATER SERVICES ASSET MANAGEMENT

Table 3.3.2.1: Future sewer reticulation infrastructure required

- Verification projects are proposed to investigate if waterborne sewer infrastructure is available at existing occupied stands where no sewer network information was available.
- It is proposed that the existing Darling pump station is decommissioned and replaced with the new Darling Future PS 1 located just north of the existing pump station. New sewers will be required to divert sewage to the proposed future Darling Future PS 1. The new drainage area is proposed to accommodate future development areas DL_01, DL_03, DL_04, DL_05, DL_06 & DL_09. The new pump station and rising main, replacing the existing pump station drainage area, should be constructed and should discharge into a new outfall sewer that drains to the Darling WWTW.
- The new outfall sewer is required to prevent the upgrade or replacement of existing outfall sewer due to increased flow from the new pumping station and future developments in the gravity drainage area.

Koringberg

- The boundary of the existing Koringberg gravity drainage area is increased to accommodate existing occupied and vacant erven as well as future development areas that fall within the drainage area.
- New formal waterborne sewer infrastructure is required in Koringberg to accommodate all existing occupied and vacant erven as well as the proposed future development areas KB_01, KB_02, KB_03, KB_05 & KB_06.

Moorreesburg

- The boundary of the existing Moorreesburg gravity drainage area is increased to accommodate existing occupied and vacant erven as well as future development areas that fall within the drainage area.
- Verification projects are proposed to investigate if waterborne sewer infrastructure is available at existing occupied stands in the south east where no sewer network information was available.
- It is proposed that the outfall sewer, crossing the railway at the sports field, is upgraded if an investigation finds that the slope is inefficient.
- New formal waterborne sewer infrastructure is required in the northern, lower density area of Moorreesburg to accommodate all existing occupied and vacant erven for the densification area MR_05.

Riebeeck Kasteel, Riebeeck West & Ongegund

- The boundaries of the existing drainage areas in Riebeeck Kasteel, Riebeeck West & Ongegund are increased to accommodate proposed future development areas that fall within these drainage areas.
- Verification projects are proposed to investigate the duty flows of the minor pumping stations, and if waterborne sewer infrastructure is available at existing occupied stands within Riebeeck Kasteel.
- The existing outfall sewer in Riebeeck Kasteel, which conveys sewage from west to east and connects to the new Riebeeck Valley outfall, requires upgrading by replacement with larger sized sewers due to insufficient slope.
- New formal waterborne sewer infrastructure is required in Riebeeck West to accommodate all existing occupied and vacant erven as well as the proposed future development areas RW_01, RW_04, RW_05, RW07, RW_08 & RW_09 to the west of the main road.
- A new Ongegund Future PS 1 drainage area is proposed to accommodate the low lying norther part of future development area OG_03 in the north of Ongegund. A new pump station and rising main should be constructed for this drainage area that discharges into the existing Ongegund Transfer PS drainage area.
- A number of development related future sewers are proposed to accommodate future development areas that fall within the drainage areas of the Riebeeck Valley WWTW.

Yzerfontein

- Yzerfontein has no formal waterborne sanitation system and therefore new formal waterborne sewer infrastructure is proposed to accommodate the future development areas YF_02, YF_03, YF_05, YF_06, YF_07 & YF_08, that fall outside of the boundary of existing occupied or vacant erven.
- A new Yzerfontein Future PS 1 drainage area, draining to the north east of the urban edge development boundary, is proposed to accommodate these developments. The new pump station should discharge into a newly constructed Yzerfontein WWTW to the north of the town, at an environmentally appropriate location.
- The proposed future development areas YF_01, YF_09 & YF_10, fall within the boundary of existing erven and it is proposed that these developments should be serviced by septic tanks as the rest of the existing town, until such time that a decision is reached to provide formal waterborne sanitation to the entire town of Yzerfontein.

The sewer master plan items and tables are included in Annexure A.

4 WATER SERVICES OPERATION AND MAINTENANCE

It is important for Councils to understand the value of maintenance and provide the necessary funding to properly operate and maintain infrastructure. There is a conflict of interest in Councils, due to backlogs of basic necessities such as housing and water, sanitation and electricity services, which many poor people urgently need, and expect councillors to provide. They are inclined to prioritise the needs for extending services before maintaining existing services.

It is the responsibility of the municipal and technical managers to educate and inform Councils on this and help councillors explain these issues to their communities. **Successful municipalities depend to a large extent on a single principle – effective and efficient management!**

Much of the routine work of technical departments involves managing and undertaking the O&M of services that is done in-house by municipal staff. A second major aspect of work is managing O&M undertaken by external service providers. The third major area is new or capital projects, also usually undertaken by external service providers.

Each service area in Swartland Municipality needs an O&M system that monitors and assesses infrastructure condition and plans the required preventative maintenance, and when necessary, rehabilitation, upgrading or replacement of infrastructure. This is a major part of an overall Asset Management System, which

- records, describes all infrastructure assets;
- monitors and assesses their condition;
- plans and monitors maintenance;
- plans upgrading, rehabilitation and replacement; and
- values assets and the costs of maintenance, upgrading, rehabilitation and replacement.

There is a wide range of **desirable objectives** that should be achieved with the help of maintenance.

- Retain an asset in a serviceable condition during its designed life span.
- Optimize the reliability of equipment and infrastructure.
- Ensure that the equipment and infrastructure are kept in a good condition.
- Ensure prompt emergency repair of equipment and infrastructure to sustain service delivery.
- Take action before repair costs become too high.
- Ensure operation by eliminating breakdown risks or limiting them as much as possible.
- Improve delivery by upgrading infrastructure.
- Enable repairs under the best possible conditions.
- Improve operational safety and remove causes of accidents.
- Reduce the overall management burden through better work preparation and reduced unforeseen production stoppages.
- Protect the environment.

To achieve these objectives, it is necessary to train personnel in specific maintenance skills and to influence their attitudes, as better operational results depend on motivated staff who are committed to proper maintenance procedures and standards.

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TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

Setting up a preventative maintenance programme is one of the most effective ways of reducing breakdowns and keeping equipment and infrastructure in good condition. It is important to implement such a programme as soon as new equipment or infrastructure is put into service.

Implementing a preventative maintenance programme requires a **maintenance plan**, with particular emphasis placed on the following:

- Periodic inspection of equipment according to a pre-established programme so that working conditions may be checked.
- Systematic servicing – the first step in devising this programme is to forecast the life of parts and components subject to wear, i.e. the study of reliability, failure modes and effects and fault analysis.
- Overhauls, which often require considerable work, should be planned during low production periods.

4.1 OPERATION AND MAINTENANCE PLAN

Table 4.1.1: Master Plan for Water Services Operation and Maintenance		
Section	Master Plan	Yes / No
Operation and Maintenance Plan	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Partly
Resources	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Partly
Information	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Partly
Activity Control and Management	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Partly

The complexity of maintenance activities should be analysed to set up an efficient maintenance plan and to take management decisions, e.g. regarding use of own resources and unskilled or skilled resources. **Five levels of maintenance** can be distinguished, depending on the complexity of the work and the urgency of action.

- Simple adjustments are generally applicable to accessible components and require no dismantling or opening of the equipment. These adjustments involve the completely safe replacement of accessible consumable components such as signal lights or some types of fuses. Servicing of this type may be performed by the operator on site, without tools, following the instructions for use. The stock of consumable parts required is very small.
- Troubleshooting entails minor preventative maintenance operations such as greasing or checking for proper functioning. Servicing of this type may be performed on site by an authorised technician. An authorised technician has received training that enables him/her to perform such maintenance work safely and is well aware of potential problems.
- Breakdowns require identification, diagnosis and repairs by replacing components or working parts. Servicing of this type must be carried out by trained persons, on site or in the maintenance shop, using the documentation (manuals, spare part lists, etc.) necessary for maintenance of equipment.
- Major maintenance work covers all major corrective or preventative work except modernization and rebuilding. Servicing of this type must be carried out by a team that comprises highly skilled technical specialists, using the relevant documentation.

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- Modernising and rebuilding equipment or executing major repairs is usually done by the manufacturer or builder. Resources are specified and usually very similar to those used in the original manufacturing or construction.

In order to ensure **good quality O&M**, technical managers firstly need to ensure that staff responsible for in-house O&M

- understand equipment and infrastructure;
- understand and implement the proper O&M requirements and procedures;
- understand the required service and operating standards;
- have and develop the necessary O&M skills;
- assess equipment and infrastructure conditions;
- understand and identify typical defects and problems;
- solve problems and make necessary repairs, or engage experts to do so; and
- record all activities to provide data for planning and analysis of O&M.

Secondly technical managers must ensure that they contact competent external service providers.

The bulk of O&M activities should be of a preventative nature. That is regular checking all the water and sewerage infrastructure and ensuring that everything is in good operational condition. The sections 4.1.1 to 4.1.10 below include recommended O&M tasks for the various water and sewerage infrastructure components that should be implemented by Swartland Municipality.

4.1.1 Groundwater infrastructure



Riverlands BH No.1, fenced and locked



Riverlands BH No.2, fenced and locked



Riverlands BH No.3, fenced and locked

Groundwater is supplied from three boreholes in Riverlands, which is pumped to the Chatsworth reservoirs (after disinfection with chlorine gas) where it is blended with the other potable water, before it is distributed to the Riverlands and Chatsworth consumers.

Monitoring and control systems are in place to ensure the adequate operation of the three boreholes. The boreholes are fenced and locked and the control panels were recently refurbished. Abstraction rates of all three boreholes are monitored and recorded. The groundwater data is monitored by a Geohydrologist on an ad-hoc basis in order to ensure compliance with licence requirements.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

O&M of boreholes has often been neglected by some Municipalities, and when performance declines beyond a prescribed level, they are abandoned and new boreholes are drilled. This waste of and disrespect for scarce water resources has been allowed to continue for years in many municipalities. There are many causes of decreased borehole yields and failure including:

- mechanical failure related to breakdown of the pumping equipment;
- inefficient hydraulic flows in borehole feeding pipes due to incorrect pipe sizes, poorly matched pumps and inefficient use of valves;
- geohydraulic failure as a consequence of over-pumping, which can cause inelastic compression of fractures, pumping of silts, sealing or encrustation of aquifer pores and screen openings by fine particles, or chemical/biological precipitation caused by iron bacteria on the slotted casing; and
- geohydraulic failure can also be caused by poor borehole design, which leads to borehole collapse, or the entry of unacceptably high volumes of sediment.

Maintenance is needed to prevent specific problems, and rehabilitation can restore the optimum efficiency of a borehole. Boreholes often need to be rehabilitated every 15 years, and sometimes as often as every six or nine years. In some cases, major reconstruction may be necessary, such as replacing the screen or a portion of the casing. Three aspects need to be taken into account when considering the implementation of a borehole maintenance or rehabilitation programme.

- Human Factors: It is often difficult to obtain support for a comprehensive maintenance and rehabilitation programme. Such programmes often lack status and excitement, compared to the implementation of new projects. Poor management, pride and reluctance to admit project failure by implementing agents, and an ignorance concerning the importance of regular maintenance are other factors. There is often a belief that as long as a borehole is operating there are no problems and no need to monitor borehole performance. When this perception is prevalent, it is often difficult to identify those problems that could be remedied by rehabilitation at an early and 'curable' stage.
- Economic Factors: It is often cheaper to maintain or rehabilitate a borehole than to replace it, once its performance has deteriorated significantly. Even when rehabilitation is more economical, as is often the case, money for rehabilitation is often more difficult to obtain than money for new projects. New projects are mostly grant funded, while O&M and rehabilitation are funded by municipal income. Since the water services income is not ring-fenced to cover necessary O&M costs related to delivering services, but used for other municipal expenses, this leads to less and less resources being allocated to O&M. It is understandable that desperate technical managers sometimes try to secure O&M resources via new projects, by disguising replacement costs as new infrastructure projects.
- Technical Factors: Technical factors relate to understanding the processes which cause declining borehole performance, and the means by which they can be avoided or rectified. If potential causes of declining performance can be diagnosed, maintenance methods to prevent their occurrence can be planned and included in the O&M budget. But effective preventative maintenance and rehabilitation require that accurate borehole construction records be kept, showing geological conditions and hydraulic performance profiles. Experience has shown that once a borehole's performance drops by about 25 %, expressed as a decline in specific yield, it is time to rehabilitate the borehole.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

It is important for Swartland Municipality to implement the following recommended daily, weekly, monthly and six monthly O&M activities for their three boreholes.

Table 4.1.1.1: Recommended daily, weekly, monthly and six monthly O&M activities for the boreholes	
O&M Activity	Frequency
Borehole underground condition and equipment	
For a borehole with a rotary pump; pull out the rising main and pump element: - Clean and check the pump element (screen, rotor and stator). - Clean and check all sections of the rising main (columns). - Check the rubber stabilizers and replace any badly worn. Assess if the borehole needs cleaning and/or rehabilitation. Decide when this must be done.	Every three years, depending on the geological formations. In some areas it might be necessary to do it more often.
For a borehole equipped with a submersible pump: start the pump and monitor the full load current to ensure correct operation.	At least once a week.
Remove the submersible pump from the borehole and remove trapped particles and deposits from the inlet screen with a jet of clean water.	Every six months
Change the oil on the submersible pump if the oil can be replaced, some pumps are sealed units.	Every six months
Record water levels: static water level and drawdown during operation or just after operation.	If the borehole is connected to a telemetry system, this is done automatically and daily. Otherwise the operator must take and record the measurements.
Pump house and pump installation above ground	
Check and attend to the condition of the pump house foundation (plug any gaps or holes), walls and roof, door and lock, ventilation bolts and paint condition. Patch up where necessary. Apply a drop of oil on the lock.	Monthly
Start the pump and monitor the full load current and check operating pressure on the delivery pressure gauge. Also check for abnormal vibration, abnormal temperature and strange noise. Check oil level.	Weekly
Check condition of gland packing and adjust to provide a steady drip.	Weekly
Check and tighten base plate mounting bolts.	Weekly
Check the alignment of the drive pulley and pump pulley. Correct if necessary. Listen for any bearing noise. Check that the safety cage is Ok and securely mounted.	Weekly
Check the tension and condition of the v-belt and replace if frayed or worn.	Weekly
Check the operation of the motor cooling fan.	Weekly
Petrol/diesel driven pump: check for any oil or fuel leakage and spill. Check the gaskets and replace if leaking. Check the oil and fuel spill collection sump and take out any spill and it to the workshop. Under no circumstances is it allowed to be dumped in the veld.	Weekly
Other equipment	
Check the operation of the non-return valve. Failure of this valve can result in a sheared pump shaft or a snapped v-belt.	Daily
Check for and attend to leaks from gaskets, joints, and corroded piping, and for ingress of rainfall.	Daily
Take the reading of the flow meter if not automated. Keep the meter clean and check that it is in good order. If automatic reading, check connection to telemetry.	Daily
Check flow switch and pressure switch.	Daily
Check pressure gauge with ball valve on tee.	Daily
Check the scour valve.	Daily
Daily check that the air/pressure release valves are in good order.	Daily
Replace the air valve with a back-up while maintaining the valve in workshop every six months.	Every six months
Borehole yard	
Check that rainfall runoff is directed away from the yard and that there are no puddles in the yard. Check also that there are no other pollution risks in or near the yard.	As necessary after heavy rains, otherwise this is a monthly check point.
Clean the yard of any scrap and discarded containers etc. Never allow any waste to be dumped within the yard and the inner protection zone.	Monthly

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Table 4.1.1.1: Recommended daily, weekly, monthly and six monthly O&M activities for the boreholes	
O&M Activity	Frequency
Keep the grass and weeds short. Remove any 'emerging' bushes and trees.	Monthly
Check condition of fence, gate, lock, sign board (is the information on the sign still readable, telephone number correct etc.?). Apply a drop of oil on lock. Repair as necessary, immediately. Never allow the borehole yard to be un-protected.	The operator would do these checks every day, but a more thorough inspection to be done monthly.
If the borehole is equipped with a rain gauge, check it as a matter of routine every day and record any rainfall.	Daily
Electrical installations (Note that most of the required activities can only be performed by an electrician)	
Clean the cabinet and the contactors.	Weekly
Check functioning of all starters, contactors and trip mechanisms.	Weekly
Check over/under voltage relay.	Weekly
Start the pumps and other electrical equipment manually and check the operation of all instruments such as am-meters and volt meters for correct functioning.	Weekly
Check that all panel lamps and site lights are working. Replace bulbs where necessary.	Weekly
Check the operation of the control system which may be an ultrasonic sensor, float switches, pressure transducer or a liquid level sensor.	Weekly
Check the operation of the telemetry system (if installed).	Weekly
Listen to all motor bearings for excessive wear.	Weekly
Inspect the entire installation and ensure all equipment is to required specification. Repair or replace all damaged parts of the equipment.	At least every three months
Clean all cabinets and enclosures thoroughly by washing down with a damp cloth on the outside and blowing out all dust, spider webs and insects on the inside using an electrical industrial blower.	At least every three months
Remove and clean all contactors with a solvent approved for electrical components.	At least every three months
Tighten all cable glands and ensure all cables are secured on cable racks and in conduits.	At least every three months
Check all terminations for integrity and signs of corrosion.	At least every three months
Clean level sensors and check the settings.	At least every three months
Inspect all wiring for evidence of heat build-up and tighten motor terminals to avoid hot connections.	At least every three months
Grease all motor bearings.	At least every three months
Inspect frame and tighten mounting bolts.	At least every three months
Measure supply voltage.	At least every three months
Check all earthing systems and lightning arrestors for correct functioning, and replace if faulty.	At least every three months
Ensure all labelling and name plates are in place and readable.	At least every three months
Paint cabinet if required to protect it from corrosion.	At least every three months
Check canopy; tighten mounting bolts and patch up the corrosion protection.	At least every three months
Telemetry System	
Clean the battery terminals.	Monthly
Test the charger and test batteries for 12 volt.	Weekly
Check that the antenna is fixed in the right direction.	Monthly
Check the cabinet frame, canopy, and mounting bolts. Clean cabinet with a blower and a soft cloth. Check for corrosion, and patch up with paint where necessary.	Monthly
Quality control, log books and reports	
Fill in the logbook daily as required.	Daily
Adjust, if necessary, the inspection and maintenance schedules.	Monthly
Measure and record the (turbidity), electric conductivity and pH levels.	Monthly
Take water sample for bacteriological testing.	Monthly or as agreed with DWS
Draft and submit prescribed reports.	Monthly
Up-date records of all production and monitoring boreholes. Most importantly: volumes abstracted during the year, water levels and physical parameters (electrical conductivity, pH, (turbidity) beginning and end of year, and summarise lab reports on bacteriological testing.	Monthly and annually

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Table 4.1.1.1: Recommended daily, weekly, monthly and six monthly O&M activities for the boreholes

O&M Activity	Frequency
Once a year have a water sample tested for chemical parameters. Compare records with DWS authorization/license and with Management Recommendation, e.g. level of pump intake. Highlight trends and draw conclusions and include in an annual report.	

Note: As can be seen in the table, most activities are part of the daily O&M performed by the operator. Many monitoring activities can also be automated in a telemetry system. If the borehole is connected to a telemetry system, then a maintenance operator or the technical supervisor must visit the borehole at least twice a month and do the checks and associated maintenance. It is important to validate automated records with regular on-site observations and measurements.

4.1.2 Surface water infrastructure

Bulk raw water supply to the Withoogte WTW is from the Misverstand Weir (Berg River) and the supply to the Swartland WTW is from the Voëlvei dam, which both form part of the WCWSS. These surface water infrastructure is monitored and maintained by the West Coast District Municipality.



Voëlvei Dam: West Coast DM Inlet



Off-take to Swartland WTW from the canal



Misverstand Weir: Supply to Withoogte WTW

The bulk potable water supplied to the Malmesbury water distribution system from the Swartland bulk water distribution system is supplemented with water from the Paardenberg Dam, which is treated by an automatic backwash rapid gravity sand filter, before it is distributed to Abbotsdale, Kalbaskraal, Riverlands and Chatsworth.

Some of the O&M activities implemented by Swartland Municipality for their surface water abstraction points include the following:

- Routine inspections of all abstraction points;
- Recording of abstraction volumes and rainfall readings (Only Citrusdal); and
- Cleaning of inlets when required.

The following preventative maintenance procedures are necessary to ensure satisfactory operation of the abstraction facilities for the surface water sources.

- Operate the intake gates through one cycle at least once a month.
- Clean debris from the intake area as the need arises or at least six times per year.
- Monitor debris build-up on screens continuously.
- Check level of abstraction point, (i.e. not at bottom or too near to top).
- Lubricate the bearings of screens as Scheduled.
- Check cleaning systems of screens periodically.
- Remove screenings daily and dispose in an approved landfill.

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- Calibrate raw water meters so that an accurate indication can be obtained of the volume of water that is abstracted and treated. A trained technician must do calibration.
- Clean raw water pump stations and attend to any abnormal noise, smell, excessive heating etc.

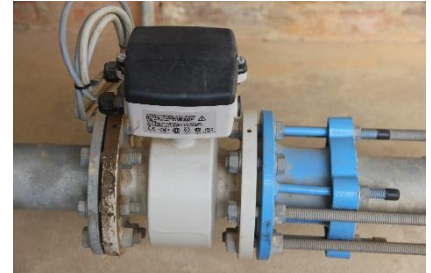
4.1.3 Bulk and water network reticulation and fittings



Chatsworth Reservoirs bulk water meters adequately protected in cage.



Moorreesburg Booster PS 200mm dia. Endress and Hauser bulk water meter



Riebeeck Wes 80mm dia. bulk water meter for supply to HL reservoirs



Abbotsdale Booster PS bulk water meter



Kalbaskraal Booster PS bulk water meter



Tafelsig Booster PS bulk water meter

The water reticulation networks and pipe fittings are well operated and maintained. Most of the bulk water meters and valves are operational and no major leaks were noticed during the WSDP site visits. The water infrastructure is also protected against possible theft and vandalism. Most of the chambers are supplied with lockable covers.

Some of the O&M activities implemented by Swartland Municipality for their bulk and water reticulation networks and fittings include the following:

- Replacement of faulty meters, valves and fittings on an ad-hoc basis;
- Immediately repairing any leaks on the networks or at valves, hydrants or other fittings;
- Scada system that monitors the flows for some of the systems;
- Standby teams over weekends and during holiday periods to attend to any required O&M tasks; and
- Customer complaints logbook system to respond immediately to any possible water complaints.

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The table below gives some of the Maintenance actions that can be implemented by Swartland Municipality on their water reticulation networks and fittings.

Table 4.1.3.1: Maintenance activities for the water reticulation networks and fittings						
No.	Maintenance Action	Daily	Weekly	Monthly	Annually	Other
1	Pipelines					
1.1	Check for leakages in system (block by block)			X		
1.2	Check and clean chambers. Check chamber lock.			X		
1.3	Stock taking of spares (materials for pipe repairs)			X		
1.4	Flush entire system					X
1.5	Check marker posts and beacons				X	
1.6	Refurbish marker posts and beacons					X
2	Standpipes (Communal and Public Buildings)					
2.1	Check for leakages	X				
2.2	Clean standpipe slab and surroundings		X			
2.3	Clean soak away		X			
2.4	Maintain standpipe equipment / accessories		X			
2.5	Read meters and clean meter chambers			X		
2.6	Replace biptap				X	
3	Bulk Meters					
3.1	Reading of bulk meters			X		
3.2	Cleaning of chambers			X		
3.3	Check for leakages			X		
3.4	Calibration of meters				X	
3.5	Replacement of registering unit					X
3.6	Replacement of entire meter					X
3.7	Check and empty all strainers protecting the bulk meters			X		
4	Consumer Meters					
4.1	Reading of meters			X		
4.2	Cleaning of meter chamber			X		
4.3	Check for leakages			X		
4.4	Check for tampering			X		
4.5	Check meter accuracy					X
4.6	Replacement of entire meter					X
5	Valves					
5.1	Open and close isolating valves			X		
5.2	Check functionality of scour valves			X		
5.3	Check functionality of air valves			X		
5.4	Check functionality of pressure reducing valves			X		
5.5	Service pressure management valves (Pressure Controllers) every 2 yrs					X
5.6	Maintain valve equipment / accessories				X	
5.7	Replacement of valves					X
5.8	Clean valve chambers. Check the cover lock			X		
6	Fire Hydrants					
6.1	Check for leakages			X		
6.2	Check and if required refurbish beacon / marker				X	
6.3	Check functionality of hydrants			X	X	
6.4	Test flow rate of hydrants				X	
6.5	Maintain hydrant equipment / accessories				X	

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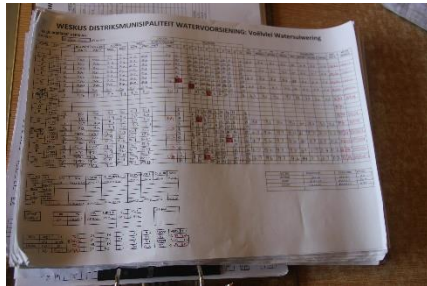
TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

Table 4.1.3.1: Maintenance activities for the water reticulation networks and fittings

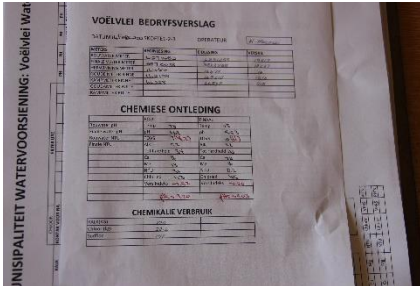
No.	Maintenance Action	Daily	Weekly	Monthly	Annually	Other
6.6	Replacement of fire hydrants					X
7	Record Keeping and Reporting	X	X	X	X	

Swartland Municipality needs to evaluate their existing O&M activities and schedules for their water reticulation networks and fittings against the above recommended daily, weekly, monthly and annual maintenance checklists and needs to ensure that all the required activities are adequately monitored and recorded.

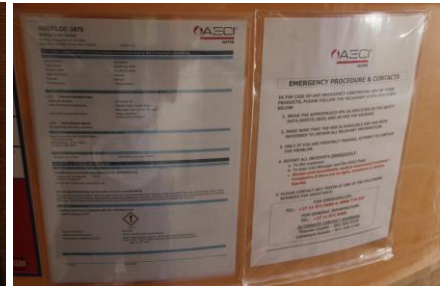
4.1.4 Water Treatment Works



Swartland WTW: Daily report



Swartland WTW: Operational report



Swartland WTW: Sudfloc Safety Signage

The Swartland WTW is well maintained and operated with adequate control and monitoring systems in place to ensure proper process control. The identified O&M problems to be addressed at the WTW are summarised under Section 3.2.4 of the WSDP Master Plan Report (Recommendations from WSDP site visits). A detail WTW Process Audit is available for the Swartland WTW.

Larger plants generally employ maintenance staff to carry out maintenance tasks, and even outsource more technical tasks to external contractors. At smaller works, some maintenance tasks can be carried out by the operators. The amount and level of maintenance that operating staff can carry out depends on their skills. The complexity of tasks relative to the skill of the operators should be decided by the technical manager or supervisor.

Coagulation and Flocculation: Effective coagulation and flocculation are critical for the successful operation of subsequent treatment processes. Problems associated with coagulation-flocculation processes will result in high turbidity water in the overflow of the sedimentation tank and/or the filtered water.

- Perform jar tests on raw water samples when significant raw water quality changes occur (such as after heavy rainfall), in order to determine new coagulant dosages and mixer speeds.
- Clean accumulated precipitate and sludge from rapid-mix and flocculation basins when the need arises, or at least every six months.
- Ensure that chemical feeders are calibrated every month (by the supplier).
- Check that the chemicals supplied comply with the specifications and adjust feed rates as indicated by the analysis and jar tests.

Sedimentation: Sedimentation can typically remove 80% to 95% of suspended solids and will result in better filter performance and longer filter runs. However, the performance of sedimentation tanks is dependent on effective coagulation-flocculation. Operational problems associated with sedimentation tanks typically relate to ineffective sludge removal or short-circuiting. Ineffective sludge removal is commonly associated with equipment problems or inadequate sludge removal practices. Short-circuiting is typically the result of poor inlet or outlet design. This occurs when the water is able to find a short route between the inlet and outlet,

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reducing retention time and resulting in poor sedimentation and poor quality water. Short-circuiting can also be the result of wave action, density currents, hydraulic overloading or temperature currents. The aim is to have a settled turbidity of < 5 NTU.

Preventative maintenance at the sedimentation tanks include the following:

- Clean launder and overflow weir daily. Launder is the channel in the sedimentation tank in which the water overflows.
- Remove floating solids daily
- Clean the tanks annually to remove any accumulated sludge and algae growth
- Maintain sludge collection equipment as recommended by the manufacturer
- Test turbidity of effluent daily and whenever the raw water quality or flow rate changes.

Filtration: The operation and maintenance of the filters at the works is aimed at ensuring that clear water is produced. The aim is to have a filtered turbidity of less than 1 NTU. When the water leaving the filters is not acceptable, the following questions should be asked (in this order)

- Can the measurements be trusted?
- Is the pre-treatment sufficient for the water currently being treated?
- Is the operation correct and suitable for the water currently being treated?
- Is the maintenance up to date?

The four checks below provides an indication of the seriousness of the implications in terms of the cost and time required to rectify a problem. Each of the four questions forms the focus of a series of investigations that are listed below. The maintenance of the filter components should be done on a routine, preventative basis. The success of filtration depends not only on whether equipment is working, but on equipment working effectively and accurately. For this reason, frequent calibration, lubrication and overhaul according to the manufacturer's specifications should form the basis of the maintenance programme.

- Check No.1: Measurement (Ensure you can trust what your instrument tells you)
 - Check whether the turbidimeters are calibrated correctly
 - Check the measuring cylinders for cleanliness and scratches
 - Check whether the sample is representative and well mixed
 - Check whether the sampling procedure is sound
 - Check expiry date of calibration standards.
- Check No.2 Pre-treatment (Pre-treatment issues that may cause filter turbidity problems)
 - Check if anything is blocking the chemical dosing points
 - Check for proper chemical mixing
 - Check that the coagulant dose is set at the correct rate
 - Verify the dosing rates required with jar tests and visually inspect that this is applicable in practice
 - Check for poor floc retention in the tanks
 - Check that chemical feeder tanks are not empty
 - Check that dilution/carrier water supplies are functioning acceptably
 - Check that turbidity of water is less than 5 NTU.
- Check No.3 Operation (Operating issues that may cause filter turbidity problems)

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- Check current position of the filter in the filtration cycle. Has the filter run extended into breakthrough or is the filter still within a ripening stage?
- Check the backwash operation and take the filter out of operation if the previous backwash was not performed properly
- Check that the flow rate is acceptable and that the filter is not operating outside of acceptable limits
- Check that the filter is not being operated at excessive pressure
- Carry out a backwash to end the filter run
- Consider implementing techniques for managing filter ripening (becoming dirty)
- Check that turbidity is less than 1 NTU.
- Check No.4 Maintenance (Maintenance issues that may cause filter turbidity problems)
 - Check that the filter contains the correct depth of filter media
 - Check the filter media condition. Look for an even flat surface, watch out for mud balls and cracks
 - Watch filter backwash. Check for even distribution of air scour and backwash water
 - Check backwash bed expansion
 - Check backwash rates.

Disinfection:

Routine and preventative maintenance of chlorine systems and ancillaries include the following:

- Visually inspect and report on complete system (Daily);
- Clean complete installation thoroughly so that leaks would be obvious when they occur (Weekly);
- Check, service, repair and clean dosing apparatus from blockages (Monthly);
- Corrosion protect all equipment and ancillaries (Whenever necessary);
- Check for and repair all leaks. Report leaks. (Monthly);
- Check dosing rate and reset regulators if necessary (Monthly); and
- Measure residual chlorine in the drinking water system (At least daily).

SABS 0298 must also be adhered to in the routine preventative maintenance of vacuum systems for gas chlorination.

The following two daily and monthly O&M tasks are provided as a guide of actions that should be carried out to ensure the proper functioning of a WTW. Some of these actions are already included in the existing O&M schedules of the Swartland WTW.

Table 4.1.4.1: Recommended daily O&M tasks for the WTW			
Item	Component	Monitor	Remarks
Screens / Grids	Screens / Grids	Clean screens/grids and check for debris or distortion/breakage. Remove all debris, leaves, etc.	Replace screens/grids if damaged
Raw water pumps	Motor / Gearbox	Check oil level	Refill if necessary
		Check for vibrations and / or bearing noise	Stop and inspect if necessary. Replace bearing if vibrating or noisy
		Inspect for leakages	Repair
	Coupling	Inspect coupling between motor and	Repair if damaged

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Table 4.1.4.1: Recommended daily O&M tasks for the WTW			
Item	Component	Monitor	Remarks
		pump	If cover has been removed, replace
	Pump	Record pressure reading at output/delivery	If pressure is low, pump is damaged or suction pipe is blocked
	Pressure gauge	Record pressure gauge reading before and after pumps	Compare with previous day's reading. If suction pipe pressure builds up, suction pipes are blocked. If delivery side builds up, delivery pipes are blocked.
Chemicals	Quantity	Inspect bulk supply container	If level is lower than half, order new supply
		Inspect mixing tanks	Fill up daily and monitor regularly
Chlorine dosing	Chlorine dosing	Inspect venture	Repair
		Check sufficient chlorine in cylinders / tanks	Switch tank / re-order
		Test for gas leaks	Repair
		Inspect switch on chlorine regulator	Repair if necessary
Dosing pumps	Pump and motor	Check for vibration and noise	Repair if necessary
		Check oil	Refill
	Dosing rate	Set dosing rate	Set rate based on quality of inflow and jar tests that have been carried out
Settling tanks	Valves	Inspect valves for leakages	Replace or repair
	Desludging	Desludge settling tank at least three times a day	Inspect desludged water and stop if water runs clear
	Overflow / top water	Do visual inspection of quality of overflow water and sludge blanket	If quality reduces, change dosing or desludge on a more regular basis
	Bridge	Check rotating bridges for free operation.	Free obstructions. Repair if damaged.
		Check desludging mechanism and ensure free operation.	Free obstructions. Repair if damaged.
	Distribution box	Inspect the distribution box	Remove all settled solids. Clean the weirs, gates and walls as necessary.
	Effluent box	Inspect the effluent box. Measure the head over the weir routinely	Clean the weir and walls if necessary. Record.
	General	Check for floating solids	Remove
		Inspect inside exposed vertical walls and channels	Clean if necessary
Filter pumps	Motor / gearbox	Check oil	Refill if necessary
		Check for vibrations and/or bearing noise	Stop and inspect, if necessary. Replace bearings if vibration or noise increases.
		Check for leaks	Repair
	Coupling	Inspect coupling between motor and pump.	Repair if damaged.
	Pump	Record pressure reading at output/delivery side.	If cover has been removed, replace.
	Pressure gauge	Record pressure before and after pumps.	If pressure reduces, pump is damaged or suction pipe is blocked
			Compare with previous day's reading. If suction pipe pressure builds up, suction pipes are blocked. If delivery side builds up, delivery pipes are blocked.
Filters	Valves	Inspect valves for leaks.	Repair or replace
	Pressure gauges	Inspect pressure gauge readings before and after filters.	If pressure increases over filters, backwash. If pressure remains unchanged, check meters are

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Table 4.1.4.1: Recommended daily O&M tasks for the WTW

Item	Component	Monitor	Remarks
			operating.
	Back wash	Inspect pattern of backwash water and air.	If patterns are uneven, there are damaged nozzles.
		Check sand level.	If the sand level is falling, check if nozzles are damaged or sand is being washed out with backwash water. Fill up with sand. Monitor and replace nozzles if necessary.
Switchboard	Switch	Check switchboard for any alarms.	Reset and inspect fault
Water samples	Take water samples	Take water samples at identified sampling points.	Keep record of all readings and take corrective action if quality decreases.
Control equipment	Level-control	Inspect level-control equipment at the clear water reservoir.	If levels given are faulty, repair.
Record keeping / Diary	Recording	A record should be kept of all daily activities and inspections.	If record is not kept properly, implement immediately.

Table 4.1.4.2: Recommended monthly O&M tasks for the WTW

Item	Component	Monitor	Remarks
Screens / Grids	Screens / Grids	Inspect working of screens/grids	Replace any component if necessary. Clean and tidy
Raw water pumps	General	Clean motor and pump	Paint and clean if necessary
Pipelines	Pipes and valves	Inspect pipelines for blockages	Flush and clean pipes if necessary
Settling tanks	Structure	Check for leaks	Repair

The O&M schedules need to be signed by the Process Controller and the Supervisor for each specific plant. The Supervisor for each plant should also carry out the following **weekly** tasks:

- Check work of operators and discuss performance.
- Check logbooks and action where necessary.
- Check gauge readings and calibrate if necessary.
- Check samples of final outflow and send for analysis. This can also be done on a monthly basis.
- Check that pumps and mechanical equipment are being maintained.
- Check the working of the chlorine dosing unit where applicable.
- Check for any other issues that may need attention.

According to the Water Act, an independent person must visit a WTW **quarterly** and do the following:

- Take and test a sample of the inflow and final outflow.
- Check the mechanical equipment.
- Check that the recommendations of the previous visit have been implemented.
- Write and submit a report to the Supervisor and the DWS.

Swartland Municipality needs to evaluate the existing O&M schedules for the Swartland WTW against the above recommended O&M tasks and needs to ensure that all required activities are adequately monitored and recorded.

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Record keeping and reporting for the WTWs generally occurs on the following three levels.

- Level 1: The plant operator collects and records data.
- Level 2: The plant supervisor uses the Level 1 data to inform the technical manager on a weekly or monthly basis.
- Level 3: The technical manager must submit a monthly report to the DWS's Regional Office on water quality. The technical manager should also submit a quarterly report to the Council describing issues such as capital expenditure, O&M costs as well as other pertinent matters.

The monthly report from the WTW supervisor to the technical manager should contain the following information.

- Status of personnel: Number of operators; details of vacancies; and other notes such as work hours lost due to injury or illness, training needed and safety issues that need attention.
- Production figures: Total monthly volume of raw water abstracted; average daily flow; total monthly volume of potable water produced; total monthly volume of sludge produced; and water quality status as per own tests and lab report.
- Consumed items: Chlorine consumption and stock for month; value of consumed chlorine; coagulation chemicals consumption for month; value of coagulation chemicals consumed; diesel consumption and stock for month; value of consumed diesel; electricity consumption for the month; maximum electricity demand for month; value of consumed electricity; and total value of consumed items for the month.
- General remarks: A short report on the repair of the mechanical equipment and any other activities and/or problems experienced at the plant during the past month. Also include major planned maintenance and repair activities for the next month.

It is recommended that Swartland Municipality ensure that at least the following four record types are kept and maintained for the Swartland WTW.

- Daily Occurrence Book: Should record the daily activities as well as any unusual occurrences at the works during the day e.g. visitors, breakdowns, power failures, etc.
- Daily Operational Log: Should provide a record of operational details such as flow, meter readings, chemical usage, times of desludging and pumping, etc. The data can be recorded hourly, two hourly or once per shift as required.
- Analytical Data Log: Is a record of the results of any analysis. Some of this data may not be determined at the works, but by outside laboratories. Such data should also be filed and kept at the works. The operators can use the results of these tests to effect operational adjustments as and when required.
- Order Book Record: Is a record of the orders placed for chemicals, parts and tools.

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4.1.5 Water Pump Stations



Moorreesburg Booster PS



Ongegund PS



Riebeek Wes PS



Riebeek Kasteel booster PS



Mount Royal Booster PS



Panorama Booster PS

The water pump stations are in a good condition and adequately maintained and secured against possible theft or vandalism. Mobile generators are available for some of the pump stations for use during load shedding periods. Control and monitoring systems are also in place to ensure adequate operation and maintenance of the water pump stations, with weekly inspections by the operational personnel.

Pump Maintenance: Most pumps require limited maintenance, if correctly selected and of sufficient quality. All pumps require at least weekly attention. All pump stations should be inspected at least once a week, whether maintenance is required or not. Always follow the manufacturer's O&M instructions. The following minimum **WEEKLY** maintenance is required with conventional centrifugal pumps.

- Check oil level;
- Check condition of gland packing and adjust to provide a steady drip;
- Lightly grease the threads of the gland follower studs with a copper coat or water-resistant grease;
- Check tightness of the base plate mounting bolts;
- Check for abnormal vibration;
- Check for abnormal temperature;
- Listen for any strange noises (bearing whine or cavitation);
- Start the pump and monitor the full load current;
- Check operating pressures on the delivery pressure gauge;
- Check the alignment on the motor shaft to pump shaft coupling;
- Check the condition of the coupling and coupling guard; and
- Check the operation of the non-return valve.

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The above maintenance actions are fairly generic to most types of pumps including positive displacement pumps.

Electrical Maintenance: The municipality should have either an in-house maintenance electrician or an arrangement with a private contractor to conduct regular preventative maintenance. A maintenance electrician should visit all pump stations at least **WEEKLY** to do the following basic maintenance.

- Check functioning of all starters, contactors, trip mechanisms and overloads, etc.
- Check over/under voltage relay operation;
- Start the pump manually and check the operation of all instruments, such as ammeters and voltmeters;
- Check that all panel lamps and site lights are working;
- Check the operation of the level control system, if the pump station is equipped with one;
- Check operation of the telemetry system (if installed);
- Listen to all motor bearings for excessive wear (a worn bearing makes a cyclic whining noise which can be heard by putting your ear against a screwdriver which is touching the bearing housing); and
- Clean the distribution and control panels.

In addition to weekly inspections, the following general quarterly electrical maintenance, **EVERY THREE MONTHS**, should be done.

- Clean all enclosures thoroughly by washing down with a wet cloth on the outside and blowing out all dust, spider webs and insects on the inside with an electrical industrial blower;
- Remove and clean all contactors with a solvent approved for electrical components;
- Tighten all cable glands;
- Ensure that cables are properly secured on cable racks and in conduits;
- Check all terminals for integrity, signs of corrosion and “hotspots”
- Clean level sensors and check settings;
- Check and tighten motor terminals;
- Grease all motor bearings; and
- Check all earthing systems and lightning arrestors for correct functioning and replace if faulty.

Preventative maintenance should also be carried out on a three monthly basis on the transformers and surge arrestors and on a weekly basis for the generators, compressors and air blowers.

Swartland Municipality needs to evaluate their existing O&M schedules for their water pump stations against the above recommended weekly and monthly maintenance O&M tasks and needs to ensure that all required activities are adequately monitored and recorded. The operational personnel needs to continue to inspect all the water pump stations on a weekly basis.

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4.1.6 Reservoirs



Wesbank Reservoir 0.988 MI, Cover locked.



Two Chatsworth Reservoirs



Moorreesburg Reservoir No.2, 4.582 MI



Riebeek Kasteel Reservoir No.2, 0.903 MI



Yzerfontein Reservoir No.2, 2.553 MI



Mount Royal Reservoir, 2.500 MI

Not all the reservoirs in Swartland Municipality's Management Area are fenced. The covers of the reservoirs are locked and the air vents of the reservoirs are also covered. The Operational Personnel regularly inspect reservoirs. The O&M problems to be addressed at the various reservoirs, as identified during the WSDP site visits, are summarised under Section 3.2.6.

The four general problems that can affect reservoirs include contamination of open reservoirs, silt build-up in the reservoir, overly long retention times in large reservoirs and sabotage. The recommended daily, weekly, monthly and annual O&M activities for the reservoirs, the associated piping and fittings and the reservoir premises include the following.

Daily:

- Check fence, gate and gate lock and repair (replace lock if broken) immediately if necessary.
- Check that the water meters are running properly and that there are no leaks in valve chambers. Attend to any leaks. Dysfunctional water meters should be repaired or replaced immediately.
- Check for any leaks in the pump house. Check the pressure gauge and ensure that the pump is pumping against the right pressure. Check the chlorinator devices in the pump house if applicable. Investigate and attend to any problems.
- Walk along the pipeline route and check for any leaks. Check the pipe connections to reservoirs for leaks. Ensure all valves are in the correct position (closed or open).
- Inspect the exterior of the reservoir for leaks and report for immediate action. Check the discharge for any water from the under floor drainage.
- Check that lamps in pump house and on the premises are OK. Replace bulbs or repair faulty lamps.

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Weekly:

- Check water level indicators. Move them a little up and down to ensure they are OK. If necessary, grease the outside indicator rail. Patch up the level markings when necessary.
- Clean yard and keep grass short. Remove any vegetation on roof and around the concrete reservoir apron and stormwater and scour/drainage channel. Make sure that any drainage water can flow freely out from the premises. Remove all potential bushes and trees within the premises.

Monthly:

- Check all valve and meter chambers and the various installations in them to ensure that they are in good operational order. Clean chambers from any sand and mud intrusion. Open the strainer and remove any trapped solids. Take the meter readings and wipe off the meters. Check the chamber lids and locks, and oil the hinges.
- Check all valves by partly opening and closing all inlet, outlet, scour and other valves on the premises. Attend to any leaking valves. Wipe off spindles and handles, patch up any corrosion protection. Be careful when opening and closing any gate valve to avoid damages to the piping system through water hammer.
- Check the pump house door lock, gate lock and access manhole cover lock and oil them. Oil the access lid hinges and the locks.
- Check that the text on the entrance sign is clearly legible.
- Check pH, turbidity and free residual chlorine at the outlet from the premises. Take water samples for water quality testing at laboratory.
- Take the water meter readings. Compare the readings of the inlet and the outlet meters. Investigate any abnormalities. Take the electrical meter reading. Compile all information regarding production, consumption and O&M activities in a brief monthly report. Edit the records and report and share it with the municipal manager, O&M Support Unit and others as required.
- Grease movable parts on all valves (Every three months).

Once a year:

- Drain and clean the reservoir. Check the roof for leakages and remove any obstacles to rainwater runoff.
- Organise for a specialised contractor or engineer to do a thorough inspection of the interior and exterior of the reservoirs. Attend to any rust, cracks and potential leaks. Pay special attention to the joints and call for a specialised contractor if the joints and sealants have deteriorated to the extent that there is a risk of leaks. This inspection should be done in conjunction with the annual cleaning of the reservoir.
- Draft and submit annual O&M summary report.

Swartland Municipality needs to evaluate their existing O&M schedules for the reservoirs and water towers against the above recommended maintenance activities and needs to ensure that all the required activities are adequately monitored and recorded.

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4.1.7 Remote Monitoring and Control Systems



Moorreesburg WWTW: Scada for inlet works Reservoir levels of bulk distribution systems Darling WWTW: Scada system for Belt Press

A SCADA system is in place for the bulk water distribution systems, which is managed and maintained by the West Coast District Municipality. SCADA systems are also in place for Swartland Municipality's WWTWs, water pump stations, sewer pump stations, reservoirs and control valves. Budgets are allocated on an ad-hoc basis towards the upgrading of the systems when necessary.

Maintenance of a SCADA system has many facets and is much wider than just telemetry equipment technical functionality. It involves the equipment, which is being monitored and controlled, as well as the ancillary equipment necessary for the successful operation of such equipment. If this equipment is not in good functioning order, the SCADA system loses much of its purpose.

Telemetry Equipment: All the equipment used for signal processing and communication is grouped under this heading. The electronic equipment, including radios, does not require maintenance as such, apart from ensuring it is clean and protected from excessive heat and environmental threats (rain, dust, insects, etc.). The central station equipment is housed indoors and is well-protected. The cabinet and equipment should be inspected on a **four monthly** basis for damage, signs of overheating and dust ingress. The latter should be carefully blown out by low pressure air, or removed by vacuum extraction.

Outstations are more vulnerable and prone to environmental damage. The panels and equipment should be inspected and cleaned as described above on a **two monthly** basis, or more frequently, depending on local conditions. Outdoor-type outstations must be protected against direct sunlight, and I/O terminals should be tightened annually. The following in particular must be attended to:

- Door seals – to prevent dust and sand ingress;
- Moisture ingress – the source must be identified and eliminated;
- Paintwork – external paint finishes must be kept in good condition and damage repaired immediately. Any internal and external rust detected must be treated immediately;
- Cable glands must be checked for tightness;
- Insect ingress – the point of entry must immediately be sealed off; and
- Earthing arrangement of the antenna and steelwork – connections must be checked for tightness and the earth resistance should be checked annually.

Batteries: Batteries both at outstations and at the central stations should be checked at the scheduled intervals, at least **twice a year**. The battery charges and battery voltage should be checked. A subsequent load test in accordance with the manufacturer's recommendation for the specific battery must also be done to determine whether the battery is serviceable or should be replaced.

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Central station computer and outstation input/output modules: The computer does not require any specific maintenance other than making sure that it is well ventilated and operating in a relatively dust-free room at normal room temperature. The computer internal cooling fans must be checked **daily**. This is done by feeling the airflow or listening to hear that the fan is operating. The outstation I/O needs to be verified for correct functioning approximately **once a year** to ensure the integrity of the system. This serves the dual purpose of testing the control and protection functions of protection equipment and instrumentation.

Follow up on alarms: An important aspect of I/O maintenance is the follow-up of alarms. Any alarm is the result of some sort of failure. Whether it is a real alarm caused by system failure or a protection device, or a false alarm caused by a component failure or human error, it needs to be investigated and the cause established, to retain system integrity. Sometimes a recurrent alarm due to a system malfunction is just ignored as a nuisance, instead of rectifying the cause. This could lead to an actual system failure without warning, or to the system being seen as unreliable, so that other critical alarms are ignored.

Maintenance Management: One person within the organisation must have overall responsibility for the maintenance function. This person must have a reasonable electrical background and a thorough understanding of overall system functioning. They can do the maintenance themselves, if they have the necessary skills, or only manage the maintenance function, with an external service provider doing the actual work.

It may be a viable option to let an external service provider do the specialised maintenance on a contract basis. There is no general rule and the needs of each system must be assessed individually. Factors to consider are the available in-house expertise and the cost of outsourcing, which depends on the distance from the service centre, the size of the system, the number of outstations, the area involved and accessibility (e.g. boreholes on private property). Most service providers can also provide an online diagnostic service on a dial-in basis. A typical contract would include the following main items

- Conditions of service such as overall purpose of the contract, what needs to be done, how and when, how often, costs and terms of payment
- A description of the system to be maintained
- Inspections and reports
- Instrumentation
- Work, travel and time schedules
- Charge schedule
- Capacity building of departmental staff
- After hours call-outs.

Even if the maintenance is outsourced, there must still be a responsible person in the department to manage the contract, to be accountable and report to management. The contract must clearly define the scope of work to be performed, and work done must be fully documented and auditable.

A comprehensive O&M Manual specific to the system can be compiled once all of the above has been put in place.

Routine Inspections: Each system is unique and therefore warrants a unique inspection schedule. Many items, as listed below, need to be checked twice a year. Some of the items can be checked by in-house staff; others require specialist competence. The municipality needs to agree with their service provider what maintenance can be done in-house, depending on the competence of available staff, and how selected staff members should be trained on-the-job by the service provider. Routine inspections of the antennas, batteries, computers, earthing, mains and power supply, mimic panel, outstation commissioning, radio, solar panel, telemetry enclosure and UPS can be necessary.

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Swartland Municipality needs to continue to maintain their SCADA systems and maintenance checklists need to be compiled for the above activities.

4.1.8 Sewer Pump Stations



Rosenburg sewer PS



PPC Transfer sewer PS



Darling Industrial sewer PS

Most of the sewer pump stations are adequately protected against possible theft or vandalism. Control and monitoring systems are in place for the sewer pump stations to ensure adequate operation and maintenance of the sewer pump stations, with weekly inspections by operational personnel. Some of the sewer pump stations are provided with backup generators at the pump station and mobile generators are also available for some of the other pump stations for load shedding periods. The O&M problems to be addressed at the sewer pump stations, as identified during the WSDP site visits, are summarised under Section 3.2.9 of the WSDP Master Plan Report.

It is important to maintain accurate information concerning the sewer pump stations. Another important issue for technical managers and supervisors is to respond rapidly to any overflow or wastewater. Failure to do so can create a health hazard in the community. The law also requires that overflows be reported to the DWS. All sewer pump stations should be inspected at least once a week, whether maintenance is required or not. Submersible pumps require limited maintenance, if correctly selected and of sufficient quality. Regular horizontal end-suction centrifugal pumps require at least weekly attention.

Submersible pumps require the following **regular** maintenance:

- Remove blockages from the impellor when required.
- Start the pump and monitor the full load current to ensure correct operation, at least once a week.
- Remove the pump from the sump every six months and remove coagulated grease and fat deposits with a jet of clean water.
- Change the oil at least once a year.

The following minimum **weekly** maintenance is required for centrifugal pumps:

- Check oil level.
- Check condition of gland packing and adjust to provide a steady drip.
- Check tightness of the base plate mounting bolts.
- Check for abnormal vibration.
- Check for abnormal temperature.
- Listen for any strange noises.
- Start the pump and monitor the full load current.
- Check operating pressures on the delivery pressure gauge.

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- Check the alignment of the motor shaft to the pump shaft coupling.
- Check the condition of the coupling and coupling guard.
- Check the operation of the non-return valve (failure of this valve can result in a sheared pump shaft).
- Check operation of the motor cooling fan.

Sump maintenance: Swartland Municipality needs to ensure that a schedule exist for the cleaning of pump station sumps. It is preferable to clean out all sumps at least once a year, depending on the volume of solids and grit in the wastewater stream.

Electrical Maintenance: The municipality should have either an in-house maintenance electrician or an arrangement with a private contractor to conduct regular preventative maintenance. A maintenance electrician should visit all sewer pump stations at least **WEEKLY** to do the following basic maintenance.

- Check functioning of all starters, contactors, trip mechanisms, etc.
- Check over/under voltage relay operation;
- Start the pump manually and check the operation of all instruments, such as ammeters and voltmeters;
- Check that all panel lamps and site lights are working;
- Check the operation of the level control system;
- Check operation of the telemetry system (if installed); and
- Listen to all motor bearings for excessive wear (a worn bearing makes a cyclic whining noise which can be heard by putting your ear against a screwdriver which is touching the bearing housing).

In addition to weekly inspections, the following general quarterly electrical maintenance, **EVERY THREE MONTHS**, should be done.

- Clean all enclosures thoroughly by washing down with a wet cloth on the outside and blowing out all dust, spider webs and insects on the inside with an electrical industrial blower;
- Remove and clean all contactors with a solvent approved for electrical components;
- Tighten all cable glands;
- Ensure that cables are properly secured on cable racks and in conduits;
- Check all terminals for integrity and signs of corrosion.
- Clean level sensors and check settings;
- Check and tighten motor terminals;
- Grease all motor bearings; and
- Check all earthing systems and lightning arrestors for correct functioning and replace if faulty.

Swartland Municipality needs to evaluate their existing O&M schedules for the sewer pump stations against the above recommended weekly and quarterly maintenance activities and needs to ensure that all the required activities are adequately monitored and recorded. The operational personnel needs to continue to inspect all centrifugal pump stations on at least a weekly basis.

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Procedures in case of wastewater overflow: The following steps must be taken as soon as becoming aware of an overflow/spillage:

- Try to contain the spilled wastewater by placing earth berms around the spill.
- Call a suction tanker to remove spilled wastewater and empty the pump sump.
- Sprinkle the area affected by the spill with HTH granular chlorine or slaked lime after excess liquids have been removed. It will combat odour and prevent the breeding of flies and other nuisance causing insects.
- Assess the cause of the problem – electricity failure, pump failure, etc.
- In case of electricity failure, contact the local electrical department to restore the supply.
- In case of a pump failure, remove the faulty pump and replace it with a stand-by unit as soon as possible.
- In many cases, a simple blockage in the pump is the cause of an overflow. The pump may be running, but not pumping a drop of liquid. Nylon stockings are notorious for blocking pump impellers. In such a case, stop the pump, remove it from the piping to gain access to the impeller and remove the stocking by cutting it out with a knife. Place the pump back into position and reconnect the piping.
- As soon as the pump station is operational again, organise the clean-up operation. This entails removal of any liquid, faeces and debris from the spillage area. These materials must be disposed of at the sewage treatment plant, or by incineration.
- Sprinkle lime over the area affected by the overflow to control flies.

4.1.9 Bulk and sewer drainage networks

Bulk and sewer drainage networks: Municipalities should clean their entire collection system, including all pipes and manholes, at least once a year. This requires dedicated teams equipped with the correct tools and instruments. Annual, monthly and weekly schedules or team activity programmes should be drawn up by the technical manager or supervisor.

A **weekly** schedule and programme should include the following:

- Name of the team supervisor.
- Name of the area to be cleaned that week.
- Sewer network to be cleaned from manhole number – to manhole number.
- A map of the specified area.
- A section to record what cleaning materials and equipment were removed from the store.
- A section to record debris and foreign objects removed and measured from the sewers.
- Proof of how foreign materials were disposed of, i.e. delivered to the sewage treatment plant, incinerated or buried.

Regular cleaning of sewer lines is the most typical O&M issue that should be carried out in a systematic and scheduled way so as to cover the whole system over a year's time (Rodding, Flushing, Jetting, Handling emergencies and clearing blockages, chemical cleaning, bio-augmentation, root removal, etc.)

Record Keeping: It is of utmost importance that all blockages and their precise locations are recorded. This serves several purposes. Firstly, a recurring blockage in the same place warrants further investigation. There may be a problem with either the design or faulty construction of the system. Secondly, it allows the technical manager to budget for the operational expenses incurred by the sewer cleaning team, and to determine if staffing is sufficient. In addition, members of the public usually report these blockages. The

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reaction time from the complaint until the blockage is cleared is an excellent performance indicator for the municipality. The aim should be to make this as short as possible, and provide excellent service to consumers who pay rates and taxes.

4.1.10 Waste Water Treatment Works

A photograph of a printed table with multiple columns and rows of data, likely representing flow meter readings over time. The table is titled 'Riebeeck Valley WWTW' and contains numerical data.

Riebeeck Valley WWTW: Daily flow meter readings

A photograph of a handwritten logbook with multiple pages. The text is written in cursive and appears to be a daily record of operations or observations at the Riebeeck Valley WWTW.

Riebeeck Valley WWTW: Daily Logbook

A photograph of a printed table with multiple columns and rows of data, likely representing flow meter readings over time. The table is titled 'Darling WWTW' and contains numerical data.

Darling WWTW: Daily flow meter readings

A photograph of a handwritten logbook with multiple pages. The text is written in cursive and appears to be a daily record of operations or observations at the Darling WWTW.

Darling WWTW: Daily Logbook

A photograph of a printed table with multiple columns and rows of data, likely representing flow meter readings over time. The table is titled 'Malmesbury WWTW' and contains numerical data.

Malmesbury WWTW: Daily flow meter readings

A photograph of a handwritten logbook with multiple pages. The text is written in cursive and appears to be a record of incidents or events at the Malmesbury WWTW.

Malmesbury WWTW: Incident log book

The Activated Sludge WWTW sites are fenced and locked with access control. Alarms are also in place for some of the WWTWs. Adequate control and monitoring systems in place for the WWTWs to ensure proper process control. The O&M problems to be addressed at the WWTWs, as identified during the WSDP site visits, are summarised under Section 3.2.10.

Oxidation Pond Systems: Oxidation ponds require a much smaller operational input than conventional plants, due to the nature of the processes and the fact that very few parameters can be controlled. O&M duties of the operators, supervisors and technical manager for oxidation pond systems include the following:

- set chemical dosages and feed rates (if the final effluent is chlorinated);
- monitor flow rates;
- desludge ponds;
- monitor the condition of plant and equipment;
- manage irrigation using plant effluent;
- keep records and submit reports;
- analyse basic plant parameters and take corrective action;
- perform and follow-up regular maintenance activities;
- monitor quality of treatment; and
- maintain safety procedures.

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It is essential for the successful functioning of an oxidation pond system that the work carried out is recorded in a suitable format.

The Plant Superintendent should inspect and sign the log sheets daily, to ensure that they are filled in properly, and also to obtain any information that may require action by him or her. The same principle applies to basic analysis of results. The Plant Supervisor should scrutinize the results daily, as these are a barometer of plant efficiency. Major items in log sheets, analysis sheets and the occurrence book should be summarized in a monthly report to the Technical Manager.

Parameters that should be recorded in a typical log sheet, occurrence book page and in the monthly report include the following:

- **Log Sheet:** Day and date, incoming wastewater flow, incoming wastewater flow rate, consumption of potable service water, pump running hours, volume of screenings removed, number of night soil buckets received, volume of night soil received, electricity consumption and electricity – maximum demand should be recorded in a logbook. The total volume passing through the plant should be read and recorded in the plant logbook once every **24 hours** by the operator. The operator should clean recording and measuring devices daily.
- **Occurrence Book Page:** Typical parameters that should be recorded in a log/occurrence book are date and day, time of shift, name of Process Controller on duty, hourly entries of occurrences and activities, process readings, signature of Process Controller and signature of Supervisor.
- **Monthly Report:** A monthly report should be generated from the above logs by the Plant Supervisor for the Technical Manager. The report should include the Status of Personnel (Number of operators, details of any vacancies), Production figures (Monthly volume treated, average daily flow, volume of screenings removed for the month and volume of night soil received for the month) and Consumed items (Electricity consumption for the month, electricity maximum demand for the month, value of consumed electricity and total value of consumed items for the month).

The table below gives a typical checklist for the O&M tasks for Process Controllers at an oxidation pond system.

Table 4.1.10.1: O&M tasks for Process Controllers at an oxidation pond system								
No.	O&M Tasks	06:00	08:00	10:00	12:00	14:00	16:00	18:00
1	Inlet Works							
1.1	Check operation of Automated Screen (if fitted)							
1.2	Operate air-lift pump to remove grit from grit trap							
1.3	Operate grit classifier to remove grit from wastewater stream							
1.4	Use rake to remove screenings from hand-raked screen bars							
1.5	Allow screenings to dry out and place in a wheelbarrow for disposal							
1.6	Count number of wheelbarrows for the day and record							
1.7	Bury or burn dry screenings							
1.8	Check operation of flow measurement system							
1.9	Check operation of flow data recorder							
2	Grit Removal							
2.1	Check operation of channels							
2.2	Block off one channel and drain liquid							
2.3	Remove grit from channel							
2.4	Place grit in wheelbarrow and record volume							
2.5	Bury or burn removed grit							
3	Main Pump Station							

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Table 4.1.10.1: O&M tasks for Process Controllers at an oxidation pond system								
No.	O&M Tasks	06:00	08:00	10:00	12:00	14:00	16:00	18:00
3.1	Check for any RED lights on electrical panel (trip indication)							
3.2	Check pumps for temperature							
3.3	Check pressure gauge readings							
3.4	Inspect gland packings for excessive leakage and adjust							
3.5	Check liquid level in suction sump							
4	Primary Ponds							
4.1	Check inlet valve operation. Close and open completely							
4.2	Scrub off algal growth on inlet and outlet structures							
4.3	Check pond water level. Increase in level indicates an outlet blockage							
4.4	Check for different smell of the pond							
4.5	Check for colour changes in the pond contents							
4.6	Remove screenings from the surface							
4.7	Remove weeds from embankments and water fringes							
5	Facultative Pond							
5.1	Scrub off algal growth on inlet and outlet structures							
5.2	Check for different smell of the pond							
5.3	Check for colour changes in the pond contents							
5.4	Check pond water level. Increase in level indicates an outlet blockage							
5.5	Remove screenings from the surface							
5.6	Remove weeds from embankments and water fringes							
6	Secondary Ponds							
6.1	Scrub off algal growth on inlet and outlet structures							
6.2	Check for different smell of the pond							
6.3	Check for colour changes in the pond contents							
6.4	Check pond water level. Increase in level indicates an outlet blockage							
6.5	Remove screenings from the surface							
6.6	Remove weeds from embankments and water fringes							
7	Connector Piping							
7.1	Ensure pipes are open and flowing freely							
7.2	Remove any stones, rags from pipe inlets							
7.3	Clean out stilling chambers and weirs							
8	Chlorination							
8.1	Check the scale and record the chlorine mass							
8.2	Check all gas connections with ammonia vapor for leaks							
8.3	Test the Chlorine gas alarm operation							
8.4	Ensure that the chlorine gas rotameter indicates the correct flow of gas							
8.5	Ensure that all service water valves are open							
8.6	Take a sample of Final Effluent and test the Free Chlorine level (record)							
8.7	Adjust the Chlorine dosage to maintain 1 mg/l free chlorine content							
9	Final Effluent Storage Pond							
9.1	Check available storage capacity							
9.2	If dam is full, operate irrigation outlet valve							
9.3	Irrigate the effluent on the demarcated irrigation area							
10	Administrative Activities							
10.1	Record incoming flow reading in log							
10.2	Record service water flow in log							
10.3	Record average flowrate (l/s) in log							

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Table 4.1.10.1: O&M tasks for Process Controllers at an oxidation pond system								
No.	O&M Tasks	06:00	08:00	10:00	12:00	14:00	16:00	18:00
10.4	Record total consumption of chlorine for 24 hours in log (kg)							
10.5	Record average chlorine dosage in log							
10.6	Record hour meter readings of pumps							
10.7	Record storage dam level and indicate if irrigation was done or not							
11	General							
11.1	When handing over the shift, walk through the plant with next operator							
11.2	Check the perimeter fence for holes and repair if required							
11.3	Operator on dayshift must ensure that gates are locked at 17:00							
11.4	Answer all telephone and radio calls to the plant							
	Time of required activity							

Conventional Plants:

The various aspects in the operation of a WWTW are as follows:

- Operation: Physical activities required to treat the water.
- Supervision: Overseeing of operating activities by a competent person.
- Control: The processes and routines that ensure operation of a suitable standard.
- Management: The activities to ensure overall proper functioning and sustainability, such as long-term planning, etc.
- Public relations: An important function that provides feedback on the acceptability and quality of the wastewater treated and services.

The operational tasks of the Process Controllers at the WWTW include the following:

- Monitoring flow rates;
- Setting chemical dosages and feed rates;
- Basic analysis of plant parameters and corrective actions;
- De-sludging of sedimentation tanks;
- Monitoring the condition of plant and equipment;
- Basic first-line maintenance;
- Start-up and shut-down of plant;
- Sampling for process control analysis;
- Record keeping;
- Maintenance Schedules;
- Safety procedures;
- Handling of chemicals; and
- Retraining of operators.

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It is essential for the successful functioning of a WWTW that the work carried out is recorded in a suitable format.

- Parameters that should be recorded in a log sheet are day and date; incoming wastewater flow; incoming wastewater flow rate; consumption of potable service water; diesel consumption by incinerator; mass reading of chlorine scale; chlorine consumption; pump running hours; storage dam flow meter reading; volume of grit/sand removed; volume of rags/screenings removed; number of night soil buckets received; volume of night soil received; electricity consumption; electricity – maximum demand; number of drying beds emptied; volume of dried sludge in stock; and volume of dried sludge sold.
- Parameters that should be recorded in an occurrence book are date and day; time of shift; name of Process Controller on duty; name of works assistant on duty; hourly entries of occurrences and activities; process readings; time of handover to next shift, and names of next shift Process Controller; signature of Process Controller; signature of Supervisor.
- Monthly Report: A monthly report should be generated from the above logs by the Plant Supervisor for the Technical Manager. The report should include the Status of Personnel (Number of operators, number of plant assistants, number of labourers, details of any vacancies), Production figures (Monthly volume treated, average daily flow, volume of screenings removed for the month, volume of grit/sand removed for the month and volume of night soil received for the month), Consumed items (Chlorine consumption, value of consumed chlorine, diesel consumption for month, value of consumed diesel, electricity consumption for the month, electricity – maximum demand for month, value of consumed electricity and total value of consumed items for the month) and Sales of Dried Sludge (Volume of dried sludge at the beginning of the month, volume of dried sludge produced during the month, volume of dried sludge sold during the month and total volume of dried sludge in stock at the end of the month).

The table below gives a typical checklist for the O&M tasks for Process Controllers at a conventional WWTW.

No.	O&M Tasks	06:00	08:00	10:00	12:00	14:00	16:00	18:00
1.	Main Pump Station							
1.1	Check for any RED lights on electrical panel (trip indication)							
1.2	Check pumps for temperature							
1.3	Check pressure gauge readings							
2.	Lifting Station							
2.1	Inspect gland packings for excessive leakage and adjust							
2.2	Check pumps for temperature							
2.3	Check liquid level in suction sump							
3.	Primary Settling Tanks							
3.1	Check rotating bridges for free operation							
3.2	Check desludging mechanisms for free operation							
3.3	Desludge the primary settling tanks by operating desludge valve							
3.4	Remove any floating debris such as rags and plastic off the surface							
3.5	Observe the colour of the tank contents (change of colour indicates a problem)							
4.	Inlet Works							
4.1	Check operation of Automated Screen							
4.2	Operate air-lift pump to remove grit from grit trap							
4.3	Operate Grit Classifier to remove grit from wastewater stream							
4.4	Check operation of Flow Measurement system							
4.5	Check operation of Flow Data Recorder							
5.	Biological Filters							

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS
TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

Table 4.1.10.2: O&M tasks for Process Controllers at a conventional WWTW								
No.	O&M Tasks	06:00	08:00	10:00	12:00	14:00	16:00	18:00
5.1	Check operation of Flow Division Box							
5.2	Check operation of Biofilter Distributors (leakage and scraping of arms)							
5.3	Check biofilter effluent canals and clean if needed							
6.	Activated Sludge Reactor							
6.1	Check aerator motors for excess temperature and vibration							
6.2	Measure the DO Levels and record (must be more than 2 mg/l)							
6.3	Ensure that aerators change over automatically							
6.4	Check that the odour of the mixed liquor is healthy							
6.5	Measure the pH level and record the reading							
6.6	Measure the settleable solids content of the mixed liquor and record							
6.7	Check that the Waste Activated Sludge outlet sluice is set correctly							
6.8	Ensure that the Return Activated Sludge stream is running.							
7.	Return Activated Sludge Pump Station							
7.1	Check for any RED lights on electrical panel (trip indication)							
7.2	Check pumps for temperature							
7.3	Check pressure gauge readings							
7.4	Check operation of automated level control							
7.5	Check oil levels of the pumps							
7.6	Sweep out dust and wipe electrical panels							
8.	Secondary Settling Tanks (Clarifiers)							
8.1	Check rotating bridges for free operation							
8.2	Check desludging mechanisms for free operation							
8.3	Check for carry-over of sludge at the overflow weirs							
8.4	Adjust continuous desludging valves to maintain sufficient rate.							
8.5	Observe the colour of the overflow liquid (should be clear)							
9.	Chlorination							
9.1	Check the scale and record the chlorine mass							
9.2	Check all gas connections with ammonia vapor for leaks							
9.3	Test the Chlorine gas alarm operation							
9.4	Ensure that the chlorine gas rotameter indicates the correct flow of gas							
9.5	Ensure that all service water valves are open							
9.6	Take sample of Final Effluent and test the Free Chlorine level (record)							
9.7	Adjust the Chlorine dosage to maintain 1 mg/l free chlorine content							
10.	Control Room							
10.1	Record incoming flow reading in log							
10.2	Record service water flow in log							
10.3	Record average flowrate (l/s) in log							
10.4	Record total consumption of chlorine for 24 hours in log (kg)							
10.5	Record average chlorine dosage in log							
10.6	Write down at what time Primary Tanks were deslugged							
10.7	Record hour meter readings of pumps							
10.8	Record Storage Dam level and indicate when return pump is started							
11.	General							
11.1	When handing over the shift, walk through the plant with next operator							
11.2	Operator on Dayshift must ensure that gates are locked at 17:00							
11.3	Answer all telephone and radio calls to the plant							
	Time of required activity							

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

Operating and maintaining a conventional treatment plant is a complex and challenging endeavour. It requires the best of managerial skills and committed staff. The plant itself is an expensive municipal asset with a long expected life span that needs to be cared for properly. The service it delivers is a national priority due to its importance for the improved health, dignity and living standards of people. Effective wastewater treatment is also essential to protect the environment and water resources, which in turn affects public health and the quality of life.

Swartland Municipality needs to evaluate their existing O&M schedules for their oxidation pond systems and conventional WWTWs against the above recommended O&M tasks and needs to ensure that all required O&M activities are adequately monitored and recorded.

Swartland Municipality's Operational and Maintenance Plans, as required by the DWS, are included at the end of this Topic. The plans provide a framework for further development and aim to address those aspects of the assessment that do not meet the minimum required level.

DWS's minimum requirements for a Maintenance Team at WTWs and WWTWs are as follows:

- An organogram of the Maintenance Team used for general maintenance work at the plant (both Mechanical and Electrical);
- In cases where the maintenance function is outsourced, a copy of the contract between the Municipality and the Service Provider is required to serve as evidence of engagement of external maintenance expertise;
- Proof is required on team competency (internal or external). The Municipality must present evidence on the Qualification and Experience of the supervisors of the Mechanical, Electrical and Civil sections of the Maintenance Team individual. A trade-test certificate is accepted as adequate evidence, and
- Records of planned maintenance schedules and planned and reactive maintenance undertaken for selected infrastructure must be presented to indicate that maintenance does take place on an on-going basis.

Responding to breakdowns cannot be scheduled, but Swartland Municipality needs to plan and prepare for such situations. Scheduled O&M should not be allowed to occupy the entire workforce 100% of the time. There must always be a certain percentage of time and other resources reserved for responding to emergencies and breakdowns.

The entire staff must be organised in a flexible manner, and the more staff that are multi-skilled, the better. Rigid job descriptions should be abandoned in favour of multi-skilling, multi-tasking and flexibility. The motto must be "the best of services to our customers at all times!" Every staff member must be focused on quality services, resulting from the best of their collective ability. Individual staff members must be able and willing to step in to help each other whenever needed.

Planned and proactive O&M should be systematic and scheduled and activities need to be recorded and reported. **Without records, there is no history as a basis for professional planning and budgeting.** Pipes can last a long time, but not forever. Certain parts of the network are more seriously affected by irregular pressure or other factors and are prone to have more leaks than other sections, and thus need to be checked more often.

The future O&M Expenditure and Income budgets for water and sanitation services for the next three financial years are included under Topic 7, Sections 7.1.3. and 7.2.1.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS
TOPIC 4: WATER SERVICES OPERATION AND MAINTENANCE

A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of existing infrastructure. In the case of the operations and maintenance of the systems, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the systems remain in good condition (Best Practice).

The table below gives an overview of the Opening Cost (OC) and Book Value (BV) of the water and sewerage infrastructure included in Swartland Municipality's Asset Register (June 2023). The recommended budgets for the replacement of the existing infrastructure and the operation and maintenance of the existing infrastructure, based on the CRC of the water and sewerage infrastructure in the WSDP, are also indicated.

Table 4.1.10.3: Recommended budgets for the replacement and the operation and maintenance of the existing water and sewerage infrastructure.						
Asset Type	Asset Register June 2023		CRC of water and sewerage infrastructure in WSDP	Recommended Annual Replacement Budget (Best Practice)	Recommended Annual O&M Budget (Best Practice)	Depreciation, Property, Plant and Equipment: Actual Expenditure
	Opening Cost	Book Value		2.0% of CRC	1.5% of CRC	2022/2023
Internal Water Infrastructure						
Borehole	R6 169 524	R6 364 420	R3 000 000	R60 000	R45 000	R16 260 078
Pump Station	R17 770 078	R7 870 026	R27 063 000	R541 260	R405 945	
Reservoirs	R135 231 874	R61 711 730	R253 636 000	R5 072 720	R3 804 540	
Reticulation Pipeline	R348 482 573	R173 704 719	R549 192 000	R10 983 840	R8 237 880	
Bulk Water Pipeline	R146 680 189	R92 491 996				
Dam	R36 350 585	R4 379 828	-	-	-	
Water Consumer Connections	R148 476 673	R29 307 359	-	-	-	
Electrical	R997 031	R614 612	-	-	-	
Other Assets	R39 904 296	R26 712 074	-	-	-	
WTW	-	-	R2 000 000	R40 000	R30 000	
Sub Total Water	R880 062 822	R403 156 763	R834 891 000	R16 697 820	R12 523 365	R16 260 078
Swartland Bulk Water Distribution System						
Pump Station	R6 886 347	R4 453 668	R50 467 000	R1 009 340	R757 005	Included in the above amount
Reservoirs	R48 884 416	R33 359 602	R157 771 000	R3 155 420	R2 366 565	
Reticulation Pipeline	R69 750 948	R39 433 654	R977 729 000	R19 554 580	R14 665 935	
Water Meter	R389 711	R289 950	-	-	-	
WTW	R23 191 967	R15 271 540	R307 192 000	R6 143 840	R4 607 880	
Electrical	R1 028 455	R636 220	-	-	-	
Total Water	R150 131 844	R93 444 634	R1 493 159 000	R29 863 180	R22 397 385	
Sewerage Infrastructure						
Sewer Pump Station	R16 655 331	R7 149 256	R36 499 000	R729 980	R547 485	R16 414 351
Sewage Treatment Works	R249 463 337	R201 844 640	R583 000 000	R11 660 000	R8 745 000	
Sewer Reticulation Pipeline	R278 306 190	R146 508 794	R911 192 000	R18 223 840	R13 667 880	
Bulk Sewer Pipeline	R60 769 892	R37 671 726				
Sewer Consumer Connections	R106 390 949	R19 925 241	-	-	-	
Other Assets	R9 737 532	R77 265 978	-	-	-	
Sub Total Sewerage	R721 323 231	R490 365 635	R1 530 691 000	R30 613 820	R22 960 365	R16 414 351
Total Water and Sewerage	R1 751 517 897	R986 967 032	R3 858 741 000	R77 174 820	R57 881 115	R32 674 429

4.1 WATER SERVICES OPERATION AND MAINTENANCE: OPERATIONAL PLAN													
Item	EXISTING GROUND WATER INFRASTRUCTURE				EXISTING SURFACE WATER INFRASTRUCTURE			EXISTING WASTE WATER TREATMENT WORKS INFRASTRUCTURE			EXISTING WATER TREATMENT WORKS INFRASTRUCTURE		
	Function	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan
4.2 Resource	Staff	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	External Resources	Not required	-	-	Above min. requirement	-	-	Not required	-	-	Above min. requirement	-	-
	Spare Parts	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Tools and Equipment	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Budget	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
4.3 Information	Manuals	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Asset Register	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	As-built Information	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Contingency and Safety plan	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
4.4 Activity Control and Management	Policies and Procedures	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Record Keeping	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Quality Control	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Risk Management	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Reporting	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
Item	EXISTING PUMP STATION INFRASTRUCTURE				EXISTING BULK PIPELINE INFRASTRUCTURE			EXISTING RESERVOIR & WATER TOWER INFRASTRUCTURE			EXISTING RETICULATION INFRASTRUCTURE		
	Function	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan
4.2 Resource	Staff	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	External Resources	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Not required	-	-
	Spare Parts	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	Tools and Equipment	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Budget	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
4.3 Information	Manuals	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Asset Register	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	As-built Information	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Contingency and Safety plan	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
4.4 Activity Control and Management	Policies and Procedures	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Record Keeping	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Quality Control	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Risk Management	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Reporting	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-

4.1 WATER SERVICES OPERATION AND MAINTENANCE: MAINTENANCE PLAN													
Item	EXISTING GROUND WATER INFRASTRUCTURE				EXISTING SURFACE WATER INFRASTRUCTURE			EXISTING WASTE WATER TREATMENT WORKS INFRASTRUCTURE			EXISTING WATER TREATMENT WORKS INFRASTRUCTURE		
	Function	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan
4.2 Resource	Staff												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	External resources												
	●Condition monitoring	Not required	-	-	Above min. requirement	-	-	Not required	-	-	Above min. requirement	-	-
	●Planned maintenance	Not required	-	-	Above min. requirement	-	-	Not required	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Not required	-	-	Above min. requirement	-	-	Not required	-	-	Above min. requirement	-	-
	Spare Parts												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Tools & Equipment												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Budget												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
4.3 Information	Manuals												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Asset Register												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	As-built information												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Contingency and Safety plan												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
4.4 Activity Control and Management	Policies and Procedures												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Record keeping												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Quality Control												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Risk management												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Reporting												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-

4.1 WATER SERVICES OPERATION AND MAINTENANCE: MAINTENANCE PLAN

Item	EXISTING PUMP STATION INFRASTRUCTURE				EXISTING BULK PIPELINE INFRASTRUCTURE			EXISTING RESERVOIR & WATER TOWER INFRASTRUCTURE			EXISTING RETICULATION INFRASTRUCTURE		
	Function	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan	Status Quo	Requirements (to comply with basic requirements)	Action Plan
4.2 Resource	Staff												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	External resources												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Not required	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Not required	-	-
	●Unplanned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Not required	-	-
	Spare Parts												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	Tools & Equipment												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	Budget												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
4.3 Information	Manuals												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Asset Register												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	As-built information												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	Contingency and Safety plan												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
4.4 Activity Control and Management	Policies and Procedures												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Record keeping												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Quality Control												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Risk management												
	●Condition monitoring	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-
	Reporting												
	●Condition monitoring	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-
	●Planned maintenance	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-	Above min. requirement	-	-
	●Unplanned maintenance	Min. basic requirement	-	-	Min. basic requirement	-	-	Min. basic requirement	-	-	Above min. requirement	-	-

5. CONSERVATION AND DEMAND MANAGEMENT

The National Development Plan stresses that economic growth should be environmentally sustainable and that Water Conservation must be a priority to ensure sufficient water to support equitable economic growth and to support the achievement of the national developmental goals. Thus, all sectors of the economy need to prioritise Water Conservation in their development plans.

Swartland Municipality can also develop a vision and mission for their WC/WDM Strategy. The vision should deal on the one hand with the quantity and quality of the water provided and on the other hand with the efficient and equitable use of water.

A number of key features flowed from the vision statement of the City of Cape Town with regard to WC/WDM and could be included similarly in the Municipality's Vision.

Equitable: A tariff system that ensures that large consumers pay the appropriate tariff rate. A flat tariff for water usage is counterproductive to Water Conservation. One of the key principles of water conservation is in fact addressing the tariff structure. This promotes equity since consumers who use more than their equal share of existing water resources should be made liable / accountable for any new bulk infrastructure and water resources.

People Centred: The WC/WDM model should place an emphasis on the consumers, the environment and their needs. The availability and supply of water in surrounding rural areas needs to be addressed as critical component of water services.

Affordable: The WC/WDM Strategy and implementation plan should be affordable and measurable. The process to ensure affordability will be to capitalise on the projects that have a sustained saving factor, e.g. Pressure Management.

Sustainable: Limited water resources generally threaten the sustainability of water services. WC/WDM can extend the assurance of supply of the existing water resources and can go a long way in reconciling future demand and supply.

Services to All: WC/WDM can greatly increase the ability to supply water services to all by reallocating existing bulk capacity and water resources from inefficient use to new consumers and ensuring that new water supply projects are sustainable and affordable.

Some of the current causes / challenges that contribute to high NRW and Water Losses for water distribution systems in South Africa are as follows:

- Water lost during pipe breakages or leakages, which include underground leakages, is difficult to quantify. It include the flushing of the networks after repairs.
- By-passed water meters in certain areas, especially consumers with pre-paid water meters.
- Inaccurate billed metered consumption, due to inaccurate domestic or conventional meter readings (Old water meters and prepaid water meters).
- There has been a growing concern about the lack of action by municipalities to attend to high water consumption caused by water leaks in households.
- Vandalism and theft of water infrastructure.
- Building contractors of low cost housing projects not metering their water usage.
- Ageing infrastructure and insufficient funds for adequate replacement and refurbishment is one of the biggest challenges. Water losses will not drop to below 15% and might even increase as water networks deteriorate and collapse.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 5: CONSERVATION AND DEMAND MANAGEMENT

WC/WDM Strategy

Water is scarce and it is important that water be used wisely and that due attention be paid to water conservation and water demand management. One of the visions of the Sector is that water is used effectively, efficiently and sustainably in order to reduce poverty, improve human health and promote economic development.

Swartland Municipality's WC/WDM Strategy is included under Section 5 of Topic 5 of the Administration, Information and Comprehensive Overview Report.

DWS's Municipal Scorecard for assessing the potential for WC/WDM efforts in Municipalities was used to assess the potential for WC/WDM efforts in Swartland Municipality. The status quo score for Swartland Municipality is 85 out of 100 suggesting that the Municipality is making good progress with regard to the implementation of specific WC/WDM activities.

The proposed WC/WDM Strategy for Swartland Municipality is based on the 25 items included in the Scorecard and the sections below discuss each of these items in detail.

ITEM 1: DEVELOPMENT OF A STANDARD WATER BALANCE

Introduction: The development of a standard water balance based on the IWA methodology is considered as one of the most important actions that all water utilities must undertake in order to establish the levels of water loss and NRW in their supply systems.
Situation in Swartland LM: Detail IWA Water Balances are available for each of the water distribution systems. The percentage NRW and Water losses for the systems are summarised in Table 5.3.2 under Topic 5 of the Administration, Information and Comprehensive Overview Report. A WSDP Performance- and Water Services Audit Report, which include the IWA water balances, is also compiled annually by the municipality.
Recommendation and Strategy: - Continue with the monthly updating of the IWA Water Balances for all the systems and reporting on the NRW and Water Losses for each of the systems to management. Continue to manage NRW analysis on a monthly basis. - Continue with the drafting of an annual WSDP Performance and Water Services Audit Report, as required by the Water Services Act, which include the IWA Water Balances. - Implement the recommended WC/WDM activities in order to reduce the NRW and Water Losses even further. - Determine all unbilled authorized consumption by firstly identify all the relevant consumers, e.g. Municipal buildings, parks, fire services, sport fields, etc. Unbilled consumption do not generate income, but will enable the municipality to better quantify their actual water losses.
Funding and Budget Requirements: The IWA Water Balances for the systems are updated on a monthly basis by the municipality.
Scorecard Result: 4 out of 4: Indicating that the municipality has developed reliable water balance and results indicate UAW/NRW less than 20%.

ITEM 2: PRESSURISED SYSTEM AT ALL TIMES

Introduction: All water utilities must aim to keep their reticulation systems pressurised 100% of the time as any level of intermittent supply can lead to serious health problems as well as causing damage to the reticulation system.
Situation in Swartland LM: The water reticulation networks are always pressurised. There are therefore no intermittent supply, which can lead to serious health problems and can cause damage to the reticulation networks. Table 5.1.1.3.3 under Topic 5 of the Administration, Information and Comprehensive Overview Report includes the Average Head for the different zones. The following PRVs were installed and refurbished during the 2017/2018 financial year. - New PRV installations: 1 x Darling, 1 x Koringberg, 2 x Moorreesburg, 4 x Malmesbury, 2 x Riebeek Valley and 1 x Yzerfontein, - Refurbishment of existing PRVs: 4 x Chatsworth, 1 x Malmesbury and 6 x Riebeek Valley. No further PRVs were installed or refurbished during the last number of financial years.
Recommendation and Strategy:

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TOPIC 5: CONSERVATION AND DEMAND MANAGEMENT

- Adequate human resources, technical skills and O&M budgets need to be allocated towards the operation, maintenance and refurbishment of the existing infrastructure, in order to ensure that the systems are always pressurised.
- Ensure proper maintenance of the existing PRVs.
- The Water Master Plans to be consulted in conjunction with the WC/WDM priority projects to identify future areas where pressure reduction can be implemented. Recommended future PRV zones are included in Table 5.1.1.3.3.

Funding and Budget Requirements:

- Budgets as indicated under the individual items of the WC/WDM Strategy.
- Increase O&M budget allocations towards the refurbishment and replacement of old water infrastructure.
- A budget of R5 000 000 is required for the implementation of the future recommended PRV zones.

Scorecard Result:

4 out of 4: Indicating that the municipality maintains a pressurised supply to all areas within the water distribution network all of the time at a minimum of 20m pressure.

ITEMS 3 AND 4: METERING SYSTEM

Introduction: Swartland Municipality needs to continue to properly meter and bill all consumers. It is important that systems are in place to undertake monthly meter reading and billing with the necessary back-up customer complaint services.

Situation in Swartland LM:

More than 98% of all residential and non-residential connections, including fire supply connections, are metered and billed on a monthly basis based on metered water usage. Required systems are also in place to undertake monthly meter readings and billing with the necessary back-up customer complaint services.

Recommendation and Strategy:

- All un-metered water connections need to be provided with water meters. Meters need to be read on a monthly basis and consumers need to be billed monthly according to their actual water usage. In addition to water theft, many water accounts go unnoticed in the system or have some type of data inconsistency that results in no revenue being generated for the particular water use event. The SWIFT data needs to be used to clean the Treasury data and the municipality needs to identify and correct any inaccurate data in the system (Linkage of Treasury data with cadastral data).
- Consumer consumption checks / investigations need to be carried out where water usage are very low, but there are households on the property (Use SWIFT data). This project will give a clear indication of where illegal or unregistered connections is being made and whether the meter is under reading the actual consumption, thus water is being used but not billed or recorded.
- Use the SWIFT data to identify all unmetered erven and all meters with zero consumption. All illegible / broken / old meters should be replaced. Any un-metered stands should be metered and meter readings in the billing system should be updated where required. All meter boxes should also be cleaned as part of the inspections.
- Municipality needs to continue with the implementation of their Meter Management / Replacement program. An effective Meter Management / Replacement Program needs to achieve the following objectives:
 - Determine the on-going meter replacement programme;
 - Determine exception reports on meters which are suspected to be faulty;
 - Test and replace faulty meters; and
 - Size meters correctly.

The activities of this program that needs to be budgeted for are as follows:

- SWIFT analysis of treasury data.
- Research and development of a meter replacement policy and meter management / replacement programme;
- Implementation of a uniform meter management information system;
- Testing and replacing faulty meters reported by consumers (Part of reticulation function).
- Replacement of domestic meters with AMR enabled format (where appropriate) in accordance with meter management / replacement programme.

Funding and Budget Requirements:

Allow a budget of approximately R200 000 for an annual SWIFT analysis to identify unmetered erven and erven with no or very low consumption. Estimated annual budget requirement for the installation of individual water meters is R1 500 000.

Scorecard Result:

4 out of 4: More than 98% of all connections are metered and billed.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 5: CONSERVATION AND DEMAND MANAGEMENT

ITEM 5: EFFECTIVE AND INFORMATIVE BILLING SYSTEM

Introduction: An effective and informative billing system is used to help consumers understand how much water they are using and how their water bill is made up. It is usually very helpful in explaining how the block-tariffs are applied to each customer so that they can see exactly what they pay for water in each block. This in turn will encourage many customers to reduce their water use and, in this regard, such informative billing becomes another WDM intervention.
Situation in Swartland LM: - Customer's meters are read on a monthly basis and customers are always billed on a monthly basis according to the actual volume of water used for the specific month. - Commercial data analysis is also done on the billed metered consumption data, which include the identification of un-metered erven, investigating meters with zero consumption, investigating abnormal low and high consumption readings, oversized / undersized meters, etc.
Recommendation and Strategy: - Municipality needs to continue to ensure that all customer's meters are read on a monthly basis and that the customers are billed on a monthly basis according to the actual volume of water used for the specific month. - Municipality needs to continue with the commercial data analysis done on the billed metered consumption data, which include the identification of un-metered erven, investigating meters with zero consumption, investigating abnormal low and high consumption readings, oversized / undersized meters, etc. - The Municipality can consider the following additional measures to make the current consumer bills more informative. - Adding a graph of the previous 12 months' consumption and helpful hints on effective water usage on the monthly bills. - Alert consumers of possible leaks on their properties. For instance if the consumption for a particular month is >25% than the average consumption of the previous months the consumer may be alerted of a possible leak on the property. - Monitor trends and follow up telephonically.
Funding and Budget Requirements: Estimated cost to enhance the user friendliness of the municipal bill is R400 000.
Scorecard Result: 4 out of 4: Indicating that the municipality produces informative billing to all customers based on meter readings.

ITEMS 6 AND 7: GENERAL COMPLAINTS SYSTEM

Introduction: Every municipality should have a complaints system where consumers can lodge technical or billing complaints and where water leaks can be reported. Residents should be encouraged to report any leaks they find. This is one of the key elements of an efficient WC/WDM strategy since most leaks repaired in South Africa result from such Passive Leakage Control and not Active Leakage Control.
Situation in Swartland LM: A Customer Complaints System is implemented by the municipality. The Customer Complaints System include the logging of complaints, response times to address complaints and the reporting of complaints and response times to management. A Client Service Charter is also in place as a commitment to excellent service delivery. Help-desks were developed at all the municipal administrations with the objective to assist customers. Disabled people are supported to do business from the help-desks. Requests by the illiterate are being captured and forwarded to the relevant official / section. Most of the municipal buildings are accessible and wheel-chair friendly. After hour emergency requests are being dealt with by the control room on a twenty-four hour basis. Requests are furthermore captured through the Complaints system to ensure execution thereof.
Recommendation and Strategy: The municipality needs to continue to ensure that all consumers are familiar with the telephone numbers to lodge complaints and report leaks. Telephone numbers to lodge complaints and report leaks are included on the monthly water bills and on the Municipality's website. Suggestions would be to also include it on strategically located notice boards, radio broadcasts, etc. The projects and measures that can be implemented for passive leakage control are as follows: - Improve the help-line and install an automated answering system. - Advertise the help-line. - Investigate current problems in responding to leaks and allocate adequate resources to avoid lengthy delays. - Review and develop a policy regarding responses to leaks with the aim of reducing response time, prioritising and keeping consumers informed. - Develop a monitoring system and quality assurance measures to ensure problems are resolved adequately. Link such a KPI to the SDBIP. The Consumer Services Charter should include the following information: - Commitment to deliver excellent services to our clients (Executive Mayor and Municipal Manager). - Standards of services (Enquiries written and telephonic; Accounts enquiries and distribution of accounts). - Response times for different services (Water: Repairs to networks, installation of new household water connections, etc.)

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- Contact details for different areas.

Funding and Budget Requirements:

Budget requirement for improved customer awareness raising with regard to the Municipality's Complaints System R150 000/annum.

Scorecard Result:

4 out of 4: Indicating that efficient reporting systems are in place for both network (leakage) complaints (90% of reported leaks are repaired within 24 hours) and billing and metering complaints (90% dealt with within 14 days).

ITEM 8: ASSET REGISTER FOR WATER INFRASTRUCTURE

Introduction: It is essential for all water utilities to establish a proper asset register as a pre-requisite to some form of asset management programme. Unless a proper asset register has been developed, the water utility cannot allocate the appropriate maintenance budget to ensure that the water reticulation system is kept in good condition.

Situation in Swartland LM:

A Comprehensive Asset Register is in place, which include all the water and sewerage infrastructure. The Asset Register include the Opening Cost, Book Value, RUL and the Age of the infrastructure. See Topic 3 of the Administration, Information and Comprehensive Overview Report for the summary of the different components.

Recommendation and Strategy:

- Continue with the annual updating of the Asset Register.
- Continue to ensure that all the existing water and sewerage infrastructure are included in the Asset Register.

Funding and Budget Requirements:

None - To be done as part of the annual updating of the Asset Register by the municipality.

Scorecard Result:

4 out of 4: Indicating that the municipality has a comprehensive and accurate asset register in place, which is available digitally.

ITEM 9: ASSET MANAGEMENT CAPITAL WORKS

Introduction: Water utilities should allocate a budget of approximately 2% of the total asset value per annum to undertake replacement of existing infrastructure. The 2% is calculated based on an approximate design life of 50 years for the different infrastructure components. If components of the system has a design life of 100 years then at least 1% of the asset value should be spend annually on replacing those components of the system. It is important to differentiate between budget allocated to maintenance of the water infrastructure and budget for the replacement of the infrastructure.

Situation in Swartland LM:

The historical capital expenditure for water and sewerage infrastructure is included in Table 7.1.4.1.1 and Table 7.1.4.2.1 of Topic 7 of the Administration, Information and Comprehensive Overview Report. It is estimated that between 1% - 2% of the value of the existing water infrastructure is invested annually into new capital works.

Recommendation and Strategy:

Allocate a budget of at least 2% of the total water asset value per annum towards the replacement of existing infrastructure. Municipality needs to differentiate in their capital budget between new projects and projects that are for the replacement of existing infrastructure, in order to accurately calculate the annual percentage allocated towards the replacement of existing infrastructure (Best Practice).

Funding and Budget Requirements:

Capital budget of at least 2% of the total water and sewerage asset value allocated annually towards the replacement of the existing water and sewerage infrastructure (Best Practice).

Scorecard Result:

3 out of 4: Indicating that 1% - 2% of the value of the water network is invested annually into new capital works related to the existing infrastructure.

ITEM 10: ASSET MANAGEMENT OPERATION AND MAINTENANCE

Introduction: Lack of maintenance of water infrastructure is one of the key problems facing most municipalities in South Africa. It is important for a water utility to differentiate between budget allocated to maintenance of the water infrastructure and budget for the replacement of infrastructure. In the case of operations and maintenance of the system, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the system remains in good condition.

(The 1% - 2% guideline is based on discussions with technical staff from some municipalities and will obviously vary from area to area. Very few municipalities in South Africa spend enough on operations and maintenance and as a result, there is a serious backlog of maintenance developing in many areas – and the problem continuous to grow with each year that insufficient maintenance budget is allocated to the water infrastructure.)

Situation in Swartland LM:

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TOPIC 5: CONSERVATION AND DEMAND MANAGEMENT

The current O&M Budget allocated towards the refurbishment and maintenance of the existing water and sewerage infrastructure is inadequate. The historical water and sewerage O&M expenditure are indicated in Tables 7.1.3.1.1 and 7.1.3.2.1 of the Administration, Information and Comprehensive Overview Report. The water and sewerage infrastructure currently included in the municipality's asset register is included under Topic 3 of the Administration, Information and Comprehensive Overview Report.

Recommendation and Strategy:

The municipality needs to differentiate between budget allocated towards the operation and maintenance of the water infrastructure and the budget allocated towards the replacement of the water and sewerage infrastructure. A budget of approximately 1% to 2% of the value of the system is typically required for the operations and maintenance of the system to ensure that the system remains in good condition.

The municipality needs to compile an Asset Management Plan (AMP) to ensure efficient, effective and optimal management, operation and maintenance of all assets, which includes treatment plants, reservoirs, structures, buildings, pipelines, sites, etc. The purpose of the AMP is to:

- Ensure the operation and maintenance functions are well planned;
- Demonstrate responsible management;
- Justify and communicate funding requirements; and
- Service provisioning complies with regulatory requirements.

An AMP normally includes the following:

- documents the nature, extent, age, utilization, condition, performance and value of the infrastructure work;
- identifies existing and target levels of service, as well as expected changes in demand;
- identifies the life-cycle management needs of the infrastructure (development, renewal, operations and maintenance);
- assesses capital and operational budget needs; and
- identifies infrastructure asset management improvement needs.

It is important for the municipality to develop an AMP from their Asset Register. The objective of an AMP is to support the achievement of the strategic goals of the Municipality and facilitate prudent technical and financial decision-making. It is also a vehicle for improved internal communication and to demonstrate to external stakeholders the Municipality's ability to effectively manage its existing infrastructure as well as the new infrastructure to be developed over the next 20 years.

This plan must be based on the principle of preventative maintenance in order to ensure that, as far as this is practical, damage to assets is prevented before it occurs. The municipality needs to ensure that the maintenance and rehabilitation plan is part of the WSDP and that the plan is implemented. Assets must be rehabilitated and / or replaced before the end of their economic life and the necessary capital funds must be allocated for this purpose. Priority should be given to rehabilitating existing infrastructure as this generally makes best use of financial resources and can achieve an increase in (operational) services level coverage's most rapidly. The preparation of maintenance plans and the allocation of sufficient funding for maintenance are required to prevent the development of a large condition backlog. The potential renewal projects for the water infrastructure need to be identified from the Asset Register. All assets with a condition grading of "poor" and "very poor" need to be prioritised.

The O&M Budget allocated towards repairs and maintenance should include the replacement of malfunctioning and old bulk water meters and consumer water meters, clearing of meter chambers, buying replacement mechanisms for bulk water meters, speedy repair of leaks, leak detection in areas with high water losses and NRW and higher than expected night flows, etc. The budget should also be used for preventative maintenance, which include the following:

- Inspection of isolation valves and packing.
- Control valve inspection and maintenance.
- Inspection of cathodic protection of steel pipes.

Funding and Budget Requirements:

Additional budget should be allocated towards the repairs and maintenance of the existing water and sewerage infrastructure. The additional budget should be determined by the municipality once an AMP is developed. A budget of approximately 1% to 2% of the value of the system is typically required for the operations and maintenance of the system to ensure that the system remains in good condition (Best Practice).

An estimated budget for the drafting of an AMP for all the water and sewerage infrastructure is R750 000.

Scorecard Result:

3 out of 4: Indicating that 1% - 2% of the value of the water network is invested annually into the maintenance of the existing infrastructure.

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TOPIC 5: CONSERVATION AND DEMAND MANAGEMENT

ITEM 11: DEDICATED WC/WDM SUPPORT

Introduction: Municipalities should have a dedicated section that deals with WC/WDM initiatives.
Situation in Swartland LM: The municipality currently does not have staff only dedicated to WC/WDM. The managers and operational personnel within the various towns all assist with WC/WDM where possible.
Recommendation and Strategy: The municipality should allocate at least one (1) person to head WC/WDM for a start. The number of people involved with WC/WDM measures can later be increased as and when required.
Funding and Budget Requirements: The municipality may be able to use one of their existing staff members. If a new person has to be appointed the municipality can determine the costs involved with such an appointment.
Scorecard Result: 2 out of 4: Indicating that a WDM section is in place, which requires major resources and capacity building.

ITEM 12: ACTIVE LEAKAGE CONTROL

Introduction: Active Leakage Control involves sending teams out to search for unreported leaks as opposed to Passive Leakage Control which involves relying on residents to report leaks.
Situation in Swartland LM: The overall NRW and Water Losses are low and no visible leakages were noticed during the WSDP site visits. The IWA Water Balances and the night flow analysis are used to identify the zones with higher than expected night flows (leakages).
Recommendation and Strategy: The following process needs to be followed for active leakage control of the reticulation network: <u>Decide on how the work will be undertaken:</u> - Option 1: The appointment and training of additional staff. - Option 2: The training of existing staff. - Option 3: Appoint an external contractor in the first few years with the objective of using this contractor to train the internal teams and build capacity to do all work internally. - Option 4: Complete outsourcing of the activity. The first three options need to include the purchase or re-allocation of equipment. <u>Leak detection:</u> Identify areas with highest leaks and send teams into the field to detect leaks. <u>Repair of leaks once identified:</u> Once leaks were detected they will need to be repaired. Depending on the extent of the leaks and other workloads, the leak repairs need to be carried out by either the internal teams or a contractor.
Funding and Budget Requirements: R400 000 to undertake leak detection in zones with high excess night flows. In addition allocate approximately R200 000 per year for general visual leak inspections.
Scorecard Result: 2 out of 4: Indicating that active leakage detection and repair is undertaken on an ad-hoc basis

ITEM 13: SECTORIZATION OF RETICULATION SYSTEMS

Introduction: In order to manage a large water reticulation system it is necessary to split the system into smaller zones which can then be monitored individually in order to identify and localize key problem areas. This process is called Sectorization and is one of the key elements of an effective WC/WDM programme.
Situation in Swartland LM: The individual water reticulation systems have already been sectorized in reservoir and PRV supply zones. These zones have however not yet regularly checked for discreteness.
Recommendation and Strategy: The billed metered data is currently linked to the distribution systems and should also be linked to the different zones in the future where possible, in order to accurately determine the NRW and water losses for the specific zones in the future. Faulty bulk water meters need to be replaced and new meters need to be installed for the zones with no bulk water meters. The current bulk water meters are indicated in Table 5.1.2.3.1 of Topic 5 of the Administration, Information and Comprehensive Overview Report. The Financial Department needs to provide the billed metered consumption data separately for the different zones in the future in order to assist with the following: Clear indication of how much water is being used per area / zone.

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- Areas with high NRW and water losses can easily be identified.
- Leakage and pressure control can be better managed.
- Water demand per area / zone can be determined.

Night flows need to be measured for zones with expected high water losses. It is recommended to re-log the night flows every few years to determine if there was an increase in leakage.

Funding and Budget Requirements:

The estimated cost for the logging of flows and pressures for zones with expected high water losses is R450 000. The logging exercise should be repeated at least every three years.

A budget should be allocated to investigate and resolve possible zone interconnections. It is however difficult to price such investigations at this stage.

Scorecard Result:

2 out of 4: Indicating that only portions of the reticulation network have been sectorised

ITEM 14: EFFECTIVE BULK METERING MANAGEMENT SYSTEM

Introduction: Bulk meters are typically used to measure the water supplied from the source, at the inlet and outlet of the WTWs, on the rising mains of the water pump stations and on the inlet and outlet of storage reservoirs.

Situation in Swartland LM:

The existing bulk water meters are summarised in Table 5.1.2.3.1 of Topic 5 of the Administration, Information and Comprehensive Overview Report. Most of the bulk water meters are adequately protected from possible vandalism and are in a good condition. Some of the current challenges with regard to the bulk water meters are as follows:

- Adequately protecting the meters from vandalism.
- Some of the reservoirs and water pump stations are not supplied with bulk water meters and the meter readings are not always taken of the reservoirs and pump stations supplied with bulk water meters. This makes the calculation of the actual water usage for specific zones sometimes difficult.

Recommendation and Strategy:

- Municipality needs to continue to read all the bulk water meters at the existing WTWs, reservoirs and pump stations and need to record the readings on at least a monthly basis.
- All bulk water meters need to be installed in lockable meter chambers and reservoir sites and water pump stations need to be secured in order to prevent unauthorised access and possible damage to the water meters.
- New bulk water meters need to be installed correctly. Ideally a straight pipe section upstream of the meter of at least 5x the meter dia. and 3x the meter dia. downstream of the meter. Strainers need to be installed to protect the meters. These strainer elements must be removable from the top, for ease of cleaning. Gate valves are required for maintenance before and after meters.
- Every informal area with unmetered communal services to be supplied with a bulk water meter in order to determine the unbilled metered consumption. All discrete zones are to be supplied with a bulk water meter. The meter readings must be recorded on at least a monthly basis. The readings can be used to quantify both the water supplied and the leakage for a specific area.

Funding and Budget Requirements:

- Allow an annual budget of approximately R400 000 for the installation of new bulk water meters, the replacement of faulty bulk water meters and to adequately protect existing bulk water meters.

Scorecard Result:

4 out of 4: Indicating all bulk water sources to the WSA are metered by the WSA using some form of check metering (either permanent or temporary).

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TOPIC 5: CONSERVATION AND DEMAND MANAGEMENT

ITEM 15: EFFECTIVE ZONE METER MANAGEMENT AND ASSESSMENT OF NIGHT FLOWS

Introduction: Zone meters are used to monitor the water supplied into the zones with particular emphasis on the recording of the MNFs. From the analyses of the MNF it is possible to establish the level of leakage and/or wastage in each zone after which selective WDM interventions can be properly prioritised.
Situation in Swartland LM: Most of the reservoir and PRV zones are metered, but all the readings of the bulk water meters at the reservoirs and pump stations are not always taken. The night flows for all the various zones are not yet all monitored.
Recommendation and Strategy: See recommendations under Item 14.
Funding and Budget Requirements: See funding and budget requirements included under Item 14.
Scorecard Result: 3 out of 4: Indicating that all inlet points to discrete zones are metered and accurate but no Minimum Night Flow analyses are undertaken.

ITEM 16: PRESSURE MANAGEMENT

Introduction: Pressure management is one of the key WDM interventions that can be used to reduce leakage and extend the life of the reticulation system in areas which experience high leakage. The basic principle is that any reduction in pressure will result in a reduction of water leakage. The volume of losses experienced as well as the volume of water used by consumers is related to the pressure in the system. The concept of pressure management is to reduce the excess system pressure in order to reduce leakage, the occurrence of pipe bursts and also reduce excessive consumption by consumers.
Situation in Swartland LM: See Item 2.
Recommendation and Strategy: See Item 2.
Funding and Budget Requirements: See Item 2.
Scorecard Result: 4 out of 4: Indicating that the reticulation is comprehensively sectorised into pressure zones which are all discrete. All PRVs are maintained under a maintenance schedule.

ITEM 17: AS-BUILT DRAWINGS OF BULK AND RETICULATION INFRASTRUCTURE

Introduction: Proper “as-built” drawings are essential to any water utility. In many parts of South Africa it is found that even if the municipality has drawings of the reticulation system the drawings do not always match the pipes as laid in the ground and this in turn can result in operational difficulties and water supply problems. It is therefore necessary for a water utility to have some form of system whereby the drawings can be updated to reflect the “as-built” conditions and that measures are taken to clarify the situation in areas where it is known that the available drawings may not be accurate.
Situation in Swartland LM: As-built drawings are available for all water reticulation networks in Swartland Municipality.
Recommendation and Strategy: Continue with the updating of as-built drawings on an ongoing basis. Continue also with the regular updating of the Water and Sewer Master Plans.
Funding and Budget Requirements: Allow a budget of approximately R1.50 million for the updating of the Water and Sewer Master Plans every three to five years.
Scorecard Result: 3 out of 4: Indicating that as-built drawings are available digitally for the majority of the network and available in hardcopy for the remainder of the network

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ITEM 18: SCHEMATIC LAYOUTS OF WATER RETICULATION SYSTEMS

Introduction: Schematic layouts of the water distribution systems are necessary in order to understand the systems better and to indicate the position of the sources, WTWs, reservoirs, pump stations and bulk water meters. The schematic layouts also assist with the development of an accurate water balance.
Situation in Swartland LM: Schematic layouts are available for all the systems (Annexure C of the Administration, Information and Comprehensive Overview Report).
Recommendation and Strategy: Municipality needs to continue to update the schematic layouts on a regular basis, in order to ensure they remain accurate.
Funding and Budget Requirements: None
Scorecard Result: 4 out of 4: Indicating that up-to date and detailed schematic of the whole bulk reticulation network is available showing all bulk mains, pumps, reservoirs, meters and control valves.

ITEM 19: REGULATION AND BYLAWS

Introduction: Water Services By-laws need to be in place and enforced by the WSA. Water utilities should regulate the type of water fittings that may be installed in buildings and enforce the use of these fittings through by-laws. Water utilities should also have by-laws that relates to water conservation and effective water usage and enforce these by-laws when required.
Situation in Swartland LM: By-law relating to Water Supply, Sanitation Services and Industrial Effluent (11 July 2014) is in place. The By-law includes the following "Water Conservation" sections: • Unauthorised use of water services; • Defective meters; • Water audit; • Water demand management; • Water restrictions; and • Waste of water.
Recommendation and Strategy: The existing By-law relating to Water Supply, Sanitation Services and Industrial Effluent needs to be updated, in order to ensure that the by-law adequately allow for WC/WDM measures.
Funding and Budget Requirements: Allow a budget of R180 000 for the updating of the existing Water Supply, Sanitation Services and Industrial Effluent By-law.
Scorecard Result: 4 out of 4: Indicating that Regulation and Bylaws are in place, which address WDM issues and some form of enforcement is undertaken.

ITEM 20: TARIFFS

Introduction: Wasteful or inefficient use of water is discouraged through an increased step block tariff system. The determination of tariff policies should seek to address both commercial and social welfare concerns. The CAFES -principles are outlined below: • Conserving: Tariffs should encourage consumers to purchase enough water to meet their needs without being wasteful. • Adequate: Future investment should also be considered when setting the tariffs. • Fair: The utility should achieve financial sustainability while maintaining access for poor communities. • Enforceable: Tariffs that cannot be enforced are unlikely to be sustained. • Simple: The tariffs should be easy for the Municipality to administer and easy for customers to understand. Consumers generally show greater willingness to pay water bills that they understand.
Situation in Swartland LM: The existing water tariff structure adequately differentiate between the different type of consumers. The current step block tariff structure discourages the wasteful or inefficient use of water. Swartland Municipality's existing water and sanitation tariffs are summarised in Table 7.3.1 under Topic 7 of the Administration, Information and Comprehensive Overview Report.
Recommendation and Strategy: See Section 7.3 under Topic 7.

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Funding and Budget Requirements:

Financial study to determine the impact of changing the sanitation tariff structure from a fixed monthly amount, which is fix for residential consumers and based on the number of toilets for businesses, hotels, flats, schools, hostels and old age homes to a stepped tariff based on water consumption in the future. Estimated cost of a financial analysis is R250 000.

Scorecard Result:

4 out of 4: Indicating that the municipality has rising block tariffs in place that encourage water use efficiency

ITEM 21: TECHNICAL SUPPORT TO CUSTOMERS

Introduction: Municipalities should be able to offer support to customers (especially large customers) on WC/WDM initiatives.

Situation in Swartland LM:

Swartland Municipality is not yet providing technical support on WDM to any of their consumers.

Recommendation and Strategy:

The objective of a Technical Support programme is not limited to assisting consumers in reducing their water demand, but is also to look at wastewater, monitor compliance with by-laws and service conditions and offer general customer support. Once a dedicated person has been allocated to WC/WDM it is recommended to engage with large customers and to identify areas where the municipality can provide assistance. The proposed activities of this programme that can be budgeted for are as follows:

- Train existing staff;
- Identify and visit large consumers (Checking that large consumers are correctly metered and billed, providing tips on WC/WDM, test the accuracy of all large consumer meters, install data-loggers on all large consumer meters and informing consumers of any sudden change in consumption patterns).
- Arrange leakage inspections in public buildings;
- Provide assistance and technical know-how for large consumers; and
- Introduce compulsory water management plan for large consumers.

Funding and Budget Requirements:

No additional funding – pending the appointment of a dedicated person for WC/WDM.

Scorecard Result:

2 out of 4: Indicating that the municipality only offers technical support on WDM on a reactive basis.

ITEM 22: REMOVAL OF UN-AUTHORISED CONNECTIONS

Introduction: Illegal or un-authorized water connections is a serious problem in South Africa and one with which very few municipalities can deal with effectively. Un-authorized connections directly impacts on the NRW and can also negatively impact on the operation of the system if too many illegal connections are made in one area.

Situation in Swartland LM:

The SWIFT analysis is done when the Municipality update their Water Master Plans. There is no known un-authorized connections according to the municipality.

Recommendation and Strategy:

Swartland Municipality should continue to remove un-authorized connections as and when they are detected. See Section 5.1.1.5.

Funding and Budget Requirements:

Estimated annual budget of R200 000 is required to install water meters at any unmetered even.

Scorecard Result:

4 out of 4: Indicating that the municipality actively monitors and removes all unlawful connections

ITEM 23: COMMUNITY AWARENESS ON WDM

Introduction: Community awareness programmes are required to ensure that any WDM interventions are clearly understood and supported by the community they are designed to serve. In many cases, WDM interventions that are technically sound and have been properly implemented fail due to the fact that they do not carry the support of the community. It is therefore essential that any water utility wishing to promote water use efficiency or any form of WC/WDM intervention has a proper community awareness programme in place to support any technical interventions.

Situation in Swartland LM:

See Section 5.1.3 under Topic 5 of the Administration, Information and Comprehensive Overview Report. Awareness is being done on an ad-hoc basis via pamphlets, notices, newspaper articles and the local radio stations.

Recommendation and Strategy:

See Section 5.1.3

Funding and Budget Requirements:

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It is estimated that R150 000 / year should be allocated for WC/WDM awareness campaigns and activities, material to be included with monthly water bills, placing notices in newspapers, billboards, competitions, etc.

Scorecard Result:

3 out of 4: Indicating that the municipality is involved in conducting workshops on water conservation within the communities, however no dedicated team exists.

ITEM 24: SCHOOLS EDUCATION ON WDM

Introduction: Schools are often key problem areas with regard to water wastage and often the situation within schools is so bad that they are not fit to house the scholars they teach. Education on the value of water and how to conserve water does not form part of any formal curriculum in schools and where such training is provided, it is normally through the local water service provider.

Situation in Swartland LM:

See Section 5.1.3.1 under Topic 5 of the Administration, Information and Comprehensive Overview Report.

Recommendation and Strategy:

See Section 5.1.3.1

Funding and Budget Requirements:

Allow a budget of approximately R50 000 per year for the implementation of WC/WDM measures at schools (Competitions, Awareness Raising events, etc.). The DWS can also assist the municipality with pamphlets and posters on WC/WDM initiatives.

Scorecard Result:

3 out of 4: Indicating that the municipality is involved in conducting workshops on water conservation within the schools, however no dedicated team exists.

ITEM 25: RETROFITTING

Introduction: In the context of WDM, retrofitting refers to projects that focus on fixing internal leaks and fitting of water efficient devices (i.e. water savings toilets, taps, etc.). In South Africa these types of projects have been mostly undertaken in the following buildings:

- Houses of Indigent users with high internal plumbing leakage, where consumers don't always have the funds or knowledge to fix the leaks themselves or to purchase water efficient devices.
- Public buildings with high internal plumbing leakage (i.e. schools, prisons, police stations, hospitals, etc.) It is a common problem in South Africa that many public buildings have high internal plumbing leakage and that water inefficient devices are still being used in the ablution facilities. One of the key contributors to water wastage in public buildings is tip-tray urinals. These urinals flush continuously and can be retrofitted with push button flush mechanisms, which will only flush when activated by a user.

Situation in Swartland LM:

See Sections 5.1.2.1 and 5.1.2.2 of the Administration, Information and Comprehensive Overview Report.

Recommendation and Strategy:

See Sections 5.1.2.1 and 5.1.2.2

Funding and Budget Requirements:

Leak repair assistance programmes: R250 000 per annum for ongoing exercise to repair leakages at indigent properties using in excess of 20 kl/month. WSIG funding or "War on Leaks" funding from DWS can be requested in this regard.

Retrofitting: R500 000 for a pilot project in one of the public buildings.

Scorecard Result:

3 out of 4: Indicating that the municipality has undertaken limited plumbing repairs in public buildings and inside properties of indigent users.

The way forward for Swartland Municipality with the implementation of the proposed WC/WDM Strategy is as follows:

- Develop a detailed methodology for measuring the performance criteria for each of the twenty-five (25) WC/WDM Strategy items;
- Allow for budget required to implement the various measures;
- Monitor the impact of all WC/WDM measures on an on-going basis;
- Develop key benchmarks for all KPIs and categories and assign responsibility; and
- Review WC/WDM Strategy as necessary.

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Swartland Municipality needs to ensure that adequate funding is allocated under their Capital and Operational budgets towards the implementation of the WC/WDM Strategy. Key WDM projects to be taken into account during Swartland Municipality's capital budgeting process are as follows:

- Replacement of old water networks (Areas with regular pipe bursts);
- Replacement of old bulk and consumer water meters (Meter replacement programme);
- Telemetry systems to provide for early warning;
- Installation of zone meters;
- Pressure Management;
- Leak detection; and
- Data loggers to establish MNFs

The WDM initiatives can deliver excellent return on investment if well implemented and well managed. All external funding that could be utilised by Swartland Municipality for this purpose should be sourced. The O&M Budget allocated to repairs and maintenance should be increased to address amongst other tasks the following:

- Replacement of malfunctioning and old bulk water meters and consumer meters;
- Construction of meter chambers for all bulk water meters not adequately protected against vandalism;
- Cleaning of bulk water meter boxes;
- Buying replacement mechanisms for bulk meters;
- Speedy repair of leaks; and
- Leak detection in areas with higher than expected night flows.

5.1 WATER RESOURCE MANAGEMENT

Table 5.1.1: Master Plan for Water Resource Management		
Section	Master Plan	Yes / No
Reducing Unaccounted for Water and Water Inefficiencies	Is there a Master Plan that addresses this problem?	WC/WDM Strategy
	Does this Plan address this problem 100%?	Yes
Leak and Meter repair programmes	Is there a Master Plan that addresses this problem?	Part of WC/WDM Strategy
	Does this Plan address this problem 100%?	Yes
Consumer/end-use demand management: Public Information and Education Programmes	Is there a Master Plan that addresses this problem?	Part of WC/WDM Strategy
	Does this Plan address this problem 100%?	Yes
Conjunctive use of surface- and groundwater	Is there a Master Plan that addresses this problem?	No
	Does this Plan address this problem 100%?	-
Working for Water	Is there a Master Plan that addresses this problem?	No
	Does this Plan address this problem 100%?	-

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5.1.1 Reducing Unaccounted Water and Water Inefficiencies

During droughts (as experienced in the Western Cape over the period 2015-2017), some WC/WDM measures are often enforced by local government through water restrictions; however, and appropriate municipal water control (metering) and pricing structure (billing and revenue collection) could ensure that these measures become routine. The sustainability of future water services will largely depend on the ability of municipalities to properly maintain the reticulation systems, to minimise household plumbing leakages and to maintain pressurised supplies (assurance of supply) to justify payment from their clients for those services.

Swartland Municipality has responded to the need to address NRW and water losses within their jurisdiction by implementing various WC/WDM initiatives over the last number of years. The Municipality will also continue to actively implement their WC/WDM Strategy in order to reduce the percentage of NRW and Water Losses even further and improve water use efficiency within the various schemes as follows.

Table 5.1.1.1: Commitment to reduce NRW and water inefficiencies				
Distribution System	2022/2023		Committed Future NRW	
	NRW (%/a)	Water Losses (%/a)	2027 (%/a)	2047 (%/a)
Koringberg	13.5%	10.4%	10.0%	10.0%
Ongegund	5.9%	4.9%	10.0%	10.0%
Riebeek Wes	11.2%	4.4%	10.0%	10.0%
Riebeek Kasteel	38.6%	37.4%	30.0%	15.0%
Yzerfontein	8.2%	3.8%	10.0%	10.0%
Darling	-1.5%	-3.3%	10.0%	10.0%
Moorreesburg	27.4%	25.1%	20.0%	10.0%
Malmesbury	15.0%	12.6%	12.5%	10.0%

The Municipality also investigated the large water users during the 2019/2020 financial year. The table below list the 44 largest water users in Swartland Municipality's Management Area.

Table 5.1.1.2: Large water users in Swartland Municipality's Management Area					
No.	Address	Consumer	System	AADD May 2020 (kl/d)	Percentage of Town's Daily Billed Metered Consumption (19/20)
1	Dagbreek Street	RSA - Aandag: Zukiswa	Malmesbury	288	4.91%
2	Caledon Street 7	CLB Eiendomme Pty Ltd	Darling	136	13.06%
3	Abattoirweg	Roelcor Vleis EDMS BPK	Malmesbury	96	1.64%
4	Abattoir Street	Swartland Volstruise BPK	Malmesbury	68	1.16%
5	Piketbergweg Informal Settlement	Theron Dibert Familietrust	Moorreesburg	61	4.73%
6	Piketbergweg Correctional Services	Swartland Munisipaliteit Piketbergweg Plakkerskamp	Malmesbury	45	0.77%
7	Schoonspruitweg	Yara Africa Fertilizer Pty Ltd	Malmesbury	40	0.68%
8	Wagener Street 10	Pioneer Foods Groceries Pty Ltd	Malmesbury	39	0.66%
9	Bokomoweg	Sasko EDMS Bpk Bokomoweg	Malmesbury	39	0.66%
10	Informal Settlement House 37	Theunis L Informele Nederset Huis	Riverlands	30	0.51%
11	Prospect Street	Du Plessis JT Prospectstraat	Malmesbury	27	0.46%
12	Fresia Street 96 Flats	Swartland Munisipaliteit	Wesbank	26	0.44%
13	Bokomoweg	Quantum Foods(Pty) Ltd Bokomoweg 0	Malmesbury	25	0.43%
14	Abattoir Street	Roelcor Vleis (EDMS) BPK	Malmesbury	24	0.41%

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Table 5.1.1.2: Large water users in Swartland Municipality's Management Area

No.	Address	Consumer	System	AADD May 2020 (kl/d)	Percentage of Town's Daily Billed Metered Consumption (19/20)
15	Gladiola Street (Saspark)	Transnet Property	Wesbank	23	0.39%
16	Caledonstraat 4404	Brewery Pty Ltd	Darling	23	2.21%
17	Darlingweg Schoonspruit	Dept Van Onderwys & Kultuur	Wesbank	22	0.37%
18	PG Nelson Street – Hospital	Provincial Government W Cape Nelsonstr-Hospitaal PG	Malmesbury	21	0.36%
19	Voortrekkerweg Die Bron	Amrichprop 20 Prop Pty Ltd	Malmesbury	21	0.36%
20	Kotze Street 11	Swartland Eiendomme (Pty) Ltd	Moorreesburg	19	1.47%
21	Ark Str – Smuts Malan H/S	Government Western Arkstr	Riebeek Wes	18	4.84%
22	Uniestraat 0	Moorreesburg Koringboere Uniestraat	Moorreesburg	17	1.32%
23	Rozenburg Hilltop Views	Ikratshi Investment 113 BK	Malmesbury	17	0.29%
24	Kerkstr Pleinstraat Eiland	Swartland Munisipaliteit	Moorreesburg	17	1.32%
25	Nywerheidsingel 15	Intshona Milk Products Pty Ltd	Malmesbury	16	0.27%
26	Hugenote Street 31	Hugenote Park	Malmesbury	16	0.27%
27	Iris Street / Protea D1	Huysamen S	Wesbank	16	0.27%
28	Loopstraat Swembad	Swartland Munisipaliteit	Moorreesburg	16	1.24%
29	Schoonspruitweg 13	Brink & Heath Civils	Malmesbury	16	0.27%
30	Laan Af Kloof Street 215	Morester Trust Laan AF	Riebeek Kasteel	16	3.33%
31	Pieter Bergh Street 4	Property Holdings PT Pieter	Malmesbury	15	0.26%
32	KL Amoskuil	Spice Route Wine Comp	Malmesbury	14	0.24%
33	Alfastraat 9109	Swartland Munisipaliteit	Ilinge Lethu	14	0.24%
34	Langstraat Huis Van Zyl 0	Provinsiale Regering Wes-Kaap	Malmesbury	14	0.24%
35	Voortrekkerweg Maresa 4A 22	Bester Cornelia Elizabeth	Malmesbury	14	0.24%
36	Amoskuil 0	Fair View Trust	Malmesbury	14	0.24%
37	Pieter Cruythofflaan 298	Bader W	Riebeek Kasteel	13	2.70%
38	Swartland Street	Moorreesburg Privaat Abbattoir	Moorreesburg	13	1.01%
39	Darlingweg Liebenberg Pri	Provinsiale Regering Wes-Kaap	Wesbank	13	0.22%
40	Durbanstr Vooruitsig Pri 05	Provincial Government-Western	Darling	12	1.15%
41	Michiel Heyns Kraal	Attaway AH	Riverlands	12	0.20%
42	Langfonteinstraat 2	Anicol Prop Pty Ltd	Darling	11	1.06%
43	Dolfynstr Karavaanpark	Swartland Munisipaliteit	Yzerfontein	11	2.10%
44	H/V Tui St Thomas Street	Fidusie Beleggings (Edms) Bpk	Malmesbury	10	0.17%

Non-residential large users in Swartland Municipality have potential to reduce water consumption via reuse of water. It is suggested that meetings should be arranged with these large users. These meetings should be informative on the current water consumption status; potential water saving volumes; cultivate a water saving awareness within each large user and at least involve 50% of the large water users. Issues to be taken into account include the end user, the water quality and the infrastructure required.

5.1.1.1 Night flow metering

The implementation of a WC/WDM strategy does not only refer to measures that reduce water wastage and inefficient use, but also include measures to effectively manage and sustain efficiency targets. Some of the priority requirements are to install systems that measure and identify certain key parameters such as MNFs and systems to enable detailed and regular water audits and water balances.

Ongoing night flow analyses should be implemented as part of the normal operational activities of the Municipality. This will provide information on system performance and give direction for interventions. Night flow analysis is one of the most practical and economical ways to identify water leaks and losses.

Swartland Municipality is committed to continue with the monitoring of the MNFs for specific zones in order to identify areas for the implementation of specific WDM activities (Pressure Management, Repair of leaks, etc.). The Municipality will also install zone meters in the future for the various distribution systems and link these to the financial data, in order to accurately determine the percentage of NRW for the specific zones.

The minimum night flow / average daily demand ratio needs to be used to prioritize leak detection for cost effectiveness (Note: 80% of losses come from 20% of leaks). The key performance indicators to be measured before and after the implementation of the various water demand management measures include the following:

- Total Consumption (MI / annum)
- Consumption per person (l / person / day)
- Consumption per property (KI / property / month)
- Minimum night flow (litres / second)
- Excess night flow (litres / second)
- Expected night flow (litres / second)

5.1.1.2 Day flow metering

Swartland Municipality is committed to continue to monitor the treated water supply by the West Coast District Municipality to the Municipality, the abstraction from all the Municipality's own water sources, the raw water supply to all their WTWs, the final water from all their WTWs (System Input Volumes), the volume of water supply to the various zones and to meter all water used by consumers within the various towns.

The Municipality will also continue with the reading of all the internal bulk zone meters to enable the identification of poor performing and leaking distribution infrastructure for specific zones. The following considerations need to be taken into account when zone meters are installed.

- A suitable strainer needs to be fitted with every zone meter (three to five pipe diameters before). For ease of cleaning these strainer elements must be removable from the top.
- Gate valves for maintenance before and after meters.
- Select meters with accurate forward and reverse flow capability.
- High frequency bi-directional pulse outputs capability.
- Pressure tapping for downstream pressure monitoring.
- Consider meters with fully shrouded pre-calibrated as-sized mechanisms.
- Counter sealed meters to IP68 to prevent condensation.

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The Municipality needs to try to measure and analyse the MNFs at least every three years. The Municipality needs to keep stock of the meters at the depot so that meters can be replaced as soon as the Municipality becomes aware of a faulty meter.

The SWIFT analysis need to be used to determine all the unmetered erven and the metered erven with no consumption and very low consumption. The unmetered erven should be metered and consumers in the billing system should be updated where required. All meter boxes should also be cleaned regularly.

5.1.1.3 Reticulation leaks

In addition to the current practices regarding the repair of reticulation leaks Swartland Municipality also needs to progress to the point of actively identifying and repairing reticulation leaks that are not visible to the human eye. Swartland Municipality therefore needs to focus on active leak detection in the future. The Municipality also needs to continue with their pipeline replacement programme.

Leak detection should be conducted by means of a specialized leak detection company in areas of high MNF. The activity can be performed after the MNFs were calculated and the specific areas with high MNFs were determined.

The location of all pipe failures (Leaks) should be recorded per system with accurate GPS coordinates. This would improve the integrity of the pipeline replacement programme.

The leakage management programme should focus on system operations by considering each of the following:

- **Raw water supply and treatment.** The focus should fall on bulk water metering, reduced filtration loss at the WTWs and staff training.
- **Distribution system:** The focus should fall on pressure management, leak repair, consumer metering and billing and staff training.
- **End-users.** The focus should fall on awareness campaigns (to encourage high-income users to reduce on-property leaks) and on water audits and leak repair at individual properties (for low-income users in the free-basic water category).

Table 5.1.1.3.1: Tasks and tools that can be included in the Leakage Management component of a WDM Strategy

Question/Solution	Task
How much water is being lost? Measure components	IWA Water balance ▪ Improved estimation/measurement techniques ▪ Meter calibration policy ▪ Meter checks ▪ Identify improvements to recording procedures
Where is it being lost from? Quantify leakage Quantify apparent losses	Network audit ▪ Leakage studies (reservoirs, transmission mains, distribution network) ▪ Operational/customer investigations
Why is it being lost? Conduct network and operational audit	Review network practices Investigate: ▪ Historical reasons ▪ Poor practice ▪ Quality management ▪ Procedure ▪ Poor materials/infrastructure ▪ Local/political influences ▪ Cultural/social/financial

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Table 5.1.1.3.1: Tasks and tools that can be included in the Leakage Management component of a WDM Strategy

Question/Solution	Task
<i>How to improve performance?</i> Upgrade the network Design a strategy and action plans	Strategy development - Update record systems - Introduce zoning - Introduce leakage monitoring - Address causes of apparent losses - Initiate leak detection/repair policy - Design short/medium/long term action plans
<i>How to sustain performance?</i> Ensure sustainability with appropriate staffing and organisational structures	Training and O&M - Improve awareness - Increase motivation - Transfer skills - Introduce best practice/technology - Community involvement - Water conservation/demand management programmes - Monitor action plan recommendations - Introduce O&M procedures

The table below indicate the potential savings on bulk water supply for each town within the Swartland Management Area, through the implementation of pressure management. The towns that should consider pressure management as a measure of water demand management (where the % potential saving > 3% of the total water demand), as identified in the Swartland Municipality WDM Strategy developed by CES, are also indicated in the table below.

Table 5.1.1.3.2: Potential savings on bulk water supply through the implementation of pressure management

Distribution System	Saving Potential	Pressure Management Priority (WDM Strategy)	Number of consumer connections where pressure rise above 900 kPa	
			Static Pressure	Residual Pressure
Koringberg	13%	High	No areas where pressures exceed 90m.	In the 24m to 90m range under peak hour demand conditions
PPC	-	Medium	No areas where pressures exceed 90m.	In the 24m to 90m range under peak hour demand conditions, except for the higher lying areas where the pressures are as low as 20m.
Riebeek Wes	6%	Medium	No areas where pressures exceed 90m.	In the 24m to 90m range under peak hour demand conditions.
Riebeek Kasteel	6%	Medium	No areas where pressures exceed 90m. Three PRVs in the system.	In the 24m to 90m range under peak hour demand conditions.
Yzerfontein	11%	High	No areas where pressures exceed 90m.	In the 24m to 90m range under peak hour demand conditions.
Darling	7%	Medium	No areas where pressures exceed 90m.	In the 24m to 90m range under peak hour demand conditions, except for the higher lying areas close to the reservoir and in the low-cost housing development
Moorreesburg	7%	Medium	No areas where pressures exceed 90m.	In the 24m to 90m range under peak hour demand conditions, except for the low-cost residential area where the pressures are as low as 20m, which is marginally less than the adopted design criteria.
Malmesbury	-	Medium	No areas where pressures exceed 90m. One PRV in the system.	The following areas could experience low residual pressures - Higher lying areas in Wesbank which is currently fed from the Wesbank reservoirs and not the tower. - Small area in the central part of Malmesbury, which is fed from the Kleindam reservoir.
Abbotsdale, Chatsworth, Kalbaskraal and	9%	Medium	No areas where pressures exceed 90m. Four PRVs in the system (3 in Chatsworth	In the 24m to 90m range under peak hour demand conditions

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Table 5.1.1.3.2: Potential savings on bulk water supply through the implementation of pressure management

Distribution System	Saving Potential	Pressure Management Priority (WDM Strategy)	Number of consumer connections where pressure rise above 900 kPa	
			Static Pressure	Residual Pressure
Riverlands			and 1 in Riverlands)	

The updated Water Master Plans will be consulted in conjunction with the WC/WDM priority projects to identify future areas where pressure reduction can be implemented.

A **pressure reduction study** was completed for all the towns in Swartland Municipality's Management Area during the 2017/2018 financial year. The table below gives an overview of the existing PRV and the proposed future PRV zones.

Table 5.1.1.3.3 Existing and proposed PRV zones

Zone	Description	Average Static Head (m)		Current AADD (kl/d)	Estimated Cost	Priority
		Current	Future			
Existing PRV zones						
Chatsworth PRV1	Chatsworth pressure management	54.1	54.1	374.8	-	-
Chatsworth PRV2		40.0	40.0		-	-
Chatsworth PRV3		40.0	40.0		-	-
Riverlands PRV	Riverlands pressure management	38.6	38.6	132.9	-	-
Panorama PRV1	Malmesbury pressure management: Panorama PRV1	45.2	35.2	348.2	-	7
Riebeek Kasteel PRV1	Riebeek Kasteel pressure management	50.9	39.5	195.36	-	-
Riebeek Kasteel PRV2		46.3	31.8	50.02	-	-
Riebeek Kasteel PRV3		29.5	26.5	275.5	-	-
Total Existing PRV zones				1 376.78	-	
Proposed PRV zones						
Darling PRV	Darling pressure management	74.60	33.28	1 118.3	R337 540	1
Koringberg PRV	Koringberg pressure management	65.40	33.80	86.4	R222 600	8
Moorreesburg PRV	Moorreesburg pressure management	68.10	36.90	744.8	R595 000	3
Old Golf Course PRV	Malmesbury pressure management: Old Golf Course PRV	60.60	44.80	385.0	R278 600	6
Panorama PRV2	Malmesbury pressure management: Panorama PRV 2&3	77.40	43.40	836.8	R462 000	2
PPC Riebeek	Ongegund pressure management	63.35	37.30	62.1	R140 000	
Prison PRV	Malmesbury pressure management: Prison PRV	72.20	31.30	60.8	R140 000	9
Riebeek Wes PRV	Riebeek Wes pressure management	74.30	33.30	276.5	R434 000	4
					R930 860	
Yzerfontein PRV	Yzerfontein pressure management	63.00	36.75	427.5	R1 451 380	5
Total Proposed PRV zones				3 998.2	R4 991 980	

5.1.1.4 Illegal connections

Swartland Municipality needs to monitor all erven with 0 kl consumption on a monthly basis from their financial data in order pick up on any illegal connections. The IMQS (Swift Analysis) will also be used to identify erven with zero consumption (See Table 5.1.1.4.1 of the Administration, Information and Comprehensive Overview Report). The Municipality will prioritise the installation of new water meters at the households with no meters or where the meters are faulty.

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Types of illegal connections / use that can be identified include the following:

- Illegal use from fire hydrants;
- Illegal connections by consumers not currently serviced;
- Illegal individual household connections by consumers who are authorised for yard or standpipe delivery; and
- Illegal connections by developers and construction companies.

The disconnection of illegal connections can be sensitive if it involves consumers who are not currently serviced by the Municipality. It is therefore necessary to develop appropriate policies and procedures on how to deal with such situations. The activities of such a programme that needs to be budgeted for are as follows:

- Review / develop policies, procedures and by-laws regarding illegal connections;
- Carry out an investigation to identify illegal connections throughout the Municipality;
- Disconnect or legalise existing illegal connections;
- Check fire hydrant seals every three years; and
- Police and enforce by-laws with regards to water connections for developers.

5.1.1.5 Un-metered connections

All potential un-metered consumer connections, as identified through the detail Swift analysis (See Table 5.1.1.5.1 of the Administration, Information and Comprehensive Overview Report), need to be provided with meters and the Municipality needs to continue to read all the meters on a monthly basis. All parks, which make use of irrigation water, and all communal facilities are also provided with meters.

In addition to water theft, many water accounts go unnoticed in the system or have some type of data inconsistency that results in no revenue being generated for the particular water use event. Swartland Municipality therefore continues with the cleaning of the data in the financial billing system in order to identify and correct any inaccurate data in the system. The Swift analysis is also used for this purpose.

5.1.2 Leak and Meter Repair Programmes

5.1.2.1 Leak Repair Assistance Programmes

Swartland Municipality should prioritise assistance programmes in the informal and low cost housing development areas. Such assistance programmes should include a number of measures that will ensure efficient water usage and build trust between consumers and the Municipality. Houses in these areas are not always adequately maintained, which often result in significant plumbing leaks. A Leak Repair and Assistance Programme that investigates and repairs leaks at all domestic households in low cost housing developments and poor areas with consumption above 15 kl / month should be implemented. Leak programmes should include the following tasks:

- Identify areas with high MNFs. Record these flows before the project starts in order to ensure that the overall savings achieved by the project can be calculated.
- Visit properties occupied by indigent households on a prioritized basis (highest consumption first).
- Educate the customer about the project and water saving measures.
- Audit of properties for plumbing leaks and repair the leaks.

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- Charge the owner for the plumbing repairs through the municipal account. If the consumption is maintained at a reasonable level for a period of 6 months and the current account is paid monthly and on time, the water arrears can be negotiated with the owner.
- Meters found to be faulty should be replaced.
- Identify where there may be inefficient water usage and water wastage.
- Identify the number of people living at the property so as to determine a reasonable water usage.
- Determine an affordable consumption.
- Social intervention – Awareness campaigns, education, public participation, etc.

Mechanisms for ensuring the customer repairs new water leaks, maintains an affordable consumption and does not build up arrears need to be addressed in the early stages of such a project, in order to ensure a sustainable solution (ongoing water and cost savings) is achieved. The consumptions of the repaired properties need to be monitored so that rapid action can be taken should leaks re-occur. Further efforts should be made to ensure that those who qualify as “Indigent” on an income basis will also qualify on a water consumption basis.

The challenges of effective management of water supply in low-income areas are significantly different from water supply in middle and higher income residential areas. Some of the common problems often linked to low-income areas that have existing individual house connections are as follows:

- Plumbing leaks (past the consumer meter) in excess of 20 kl / month;
- Poverty;
- Inferior or inadequate reticulation system;
- Inadequate consumer metering and billing;
- Very low levels of payment;
- High levels of reticulation losses;
- Very high levels of inefficient water usage;
- Consumer apathy; and
- Inferior plumbing installations

The aim of a comprehensive water management programme in low-income areas is to introduce a holistic approach that will capacitate consumers to take responsibility for their Water Services. The programme will introduce a combination of social, technical and regulatory interventions that will meet the requirements of the consumer and at the same time reduce non-revenue demand to sustainable levels. This approach recognises the social, technical and historical background of the many water supply problems and instead of focusing on getting the consumer to pay for excessive water demand, it assists the consumer in reducing and controlling the demand to affordable levels. It recognizes that rather than increase income to meet the cost of water supply in low-income areas, it is preferable to reduce the water supply and the costs to affordable levels for both the community and the Council.

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The proposed comprehensive water management programme for low-income areas will vary to the specific conditions of each area, but will generally consist of the following elements:

- Social Interventions: Awareness; Communication; Education; Public participation; and Refining and improving the Indigent Policy.
- Technical Interventions – Household: The installation or repair of meters or alternatively the installation of flow limiters and / or prepayment meters; the repair of plumbing leaks; and Retro fitting of toilets, taps and showers.
- Technical Interventions – Reticulation: Rehabilitation of reticulation system; Installation of pressure reducing valves; Leak detection and repair; and Installation of zones valves and meters.
- Regulatory / Financial Interventions: Credit Control; Enforcement of by-laws; Signing of service agreements; and Validation and correction of billing information.
- Maintenance Programme: Water forum; On-going awareness; and Establishment and support of a community water task team.

5.1.2.2 Retro-fitting of water efficient toilets

Lawn irrigation and toilet use are the two end-uses with the biggest impact on water demand in relation to other end-uses, with outdoor irrigation having by far the largest saving potential. In addition, water at these end-uses is not needed at potable standards. Improved, practical techniques for water supply and reuse with regards to garden watering and toilet flushing should be sought in addition to improved efficiency of use.

The nature of retro-fit projects can include the following:

- Change existing toilets to dual flush cisterns;
- Install high efficiency shower heads;
- Install flow controllers on taps and mixers;
- Balance plumbing systems (to be paid fully by consumer)
- Automated irrigation systems.

The retro-fit measures need to include education campaigns. Other considerations to take into account in considering the retrofit programmes are as follows:

- Limited experience of such projects in South Africa;
- Constraints on available products;
- Constraints on existing plumbing installations in households (i.e. should not install water efficient showers in a non-balanced system)
- Possible resistance by consumers;
- Overcoming the logistics of investing Council money in private properties.

Swartland Municipality needs to focus on the installation of water saving devices (specific water efficient toilets) in all their municipal buildings. The Municipality also needs to focus on raising awareness regarding conservation projects and the installation of these products in order to reduce the water demand and their percentage of NRW.

The use and installation of these fittings should be included as a condition for the approval of building plans as well as provided for in the Water Supply, Sanitation Services and Industrial Effluent By-law, which needs to be updated.

5.1.2.3 Meter repair programme

Swartland Municipality should place a very high priority on maintaining water meters in a good state or order by replacing old meters with new ones on a regular basis, and by identifying problem-meters for repair or replacement. All bulk water meters should also be located in meter chambers that adequately protect the meter from vandalism. Meter chambers also need to be cleaned regularly.

All consumer meters not working, as identified through the Swift analysis and follow-up inspections, need to be replaced and any leaks identified during the site inspections need to be repaired. The Municipality also needs to focus on a phased pro-active meter replacement programme in the future, where all the old water meters are replaced systematically.

Replacing all meters after a certain age is not economically feasible and a more sophisticated approach needs to be developed and implemented, which recognises that certain meters under certain conditions may be accurate for several more years than others. An effective meter repair programme needs to achieve the following objectives:

- Determine an ongoing meter replacement programme;
- Determine exceptions reports on meters which are suspected to be faulty;
- Test and replace faulty meters; and
- Size meters correctly.

A rough estimate of the number of meters that need to be replaced every year is the number of meters divided by 12, assuming that the life of the meters is not more than 12 years. Although it is assumed that the average lifespan of a meter is 12 years for budgeting purposes, it is necessary to carry out research to determine the most optimal replacement of age for each type of meter in various circumstances. The research should identify the different types of meters, in different pressure zones and carry out accuracy tests for a number of samples at different ages. In this way a policy can be developed of when each type of meter under various circumstances should be replaced. It is also recommended that, where deemed necessary new meters should be specified with AMR capacity to allow for remote meter reading. Such meters will assist in reducing meter-reading errors significantly.

The monthly consumption of all consumers should be checked to immediately identify a problem meter (where a reading suddenly becomes very high) and have it inspected. This will ensure that faulty or leaking meters are replaced as soon as possible and thus resulting in less water wastage and a greater income for the Municipality. Volume controllers can also be installed in areas where people cannot afford to pay for water. This ensures less water being wasted in the event of a leak or a tap left running.

5.1.3 Consumer / End-use Demand Management: Public Information and Education Programmes

The approach of promoting WC/WDM to consumers and society can be divided into a general consumer awareness education campaign for all consumers and a specific awareness campaign associated with focused projects such as plumbing leak repair, retrofitting projects, etc. The measures and projects that can be implemented are as follows:

- Generic consumer awareness campaign
- School education (Focus on schools)
- Special events
- Develop a WC/WDM web page

5.1.3.1 Schools Targeted by Education Programmes

Schools are considered to have a good potential to achieve water savings in the Swartland Municipality's area and of course have the added advantage of user education for the future generation. An extensive schools programme, which might also include annual competitions between schools (say with a prize for the lowest consumption, the lowest per capita consumption and for the best WDM-strategy poster design, etc.) can be implemented.

Water saving by schools often forms the basis of WDM programmes elsewhere, because it also involves learners who experience implementation of WDM measures first hand. Schools should be encouraged to make WDM programmes part of a long term project, where learners should be actively involved. A schools WDM programme should receive a high priority.

The activities of such a programme can include the following:

- Develop and distribute additional literature to schools;
- Hold school competitions (link to Water Week); and
- Assist / promote water audits, retrofitting of plumbing and use of boreholes.

5.1.3.2 Consumers Targeted by Public Information Programmes

Swartland Municipality will continue with their current approach of adding helpful hints on effective water usage to the monthly bills. Community awareness programmes are required to inform consumers of the importance of WC/WDM. These awareness programmes ensure that any WDM interventions are clearly understood and supported by the community they are designed to serve. In many cases, WDM interventions that are technically sound and have been properly implemented fail due to the fact that they do not carry the support of the community. It is therefore essential that any Municipality wishing to promote water use efficiency or any form of WC/WDM intervention has a proper community awareness programme in place to support any technical interventions.

Education and awareness-raising campaigns are important mechanisms to bring the need for WC/WDM to the public and to trigger committed public actions and response. Social awareness is one of the key pillars of WC/WDM and is essential for the balanced and sustained use of South Africa's water resources. Engagement with the public and stakeholders through media and other mediums will highlight important principles of the efficient use of water, to ensure that relevant information is shared and the public is educated and that the profile of WC/WDM is heightened to achieve buy-in, involvement and accountability from citizens.

The outcome of an awareness campaign may be difficult to measure and it is for this reason that it is difficult to determine the amount of resources and intensity of such campaigns. It is also important to keep such campaigns fresh and interesting in order to ensure a progress impact on behaviour change.

The objectives of a generic WC/WDM awareness campaign are as follows:

- Inform consumers on the reason why water needs to be saved;
- Inform consumers on how to save water (link to programmes to promote water-wise gardening, water-efficient plumbing fittings, use of alternative resources and large users); and
- Inform consumers of various projects or initiatives that may have an impact on them.

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The activities and programmes that need to be budgeted for are as follows:

- Press releases
- Development and distribution of leaflets, fliers and posters;
- Distribution of small gadgets and stickers;
- Billboards, shopping centres and washrooms;
- Competitions;
- Develop a WC/WDM information help-line (can be a recording)
- Hold public workshops and seminars.

5.1.4 Conjunctive Use of Surface- and Groundwater

The DWS developed an Artificial Recharge Strategy, which outlines all the environmental benefits of artificial recharge and details the global and southern African history of the technique. It also provides hydrogeological maps showing the areas with the greatest potential storage volumes. Clear criteria are also outlined for successful implementation, including high-quality surface water that is geo-chemically compatible with the existing groundwater and aquifer hydraulics which must allow for the recharged water to enter the aquifer rapidly and be contained within it. There is several management and technical issues around artificial recharge and good feasibility planning and testing are essential, with the correct siting of borehole injection points being an important factor. Clogging is identified as the key problem in most schemes around the world. Methods to prevent this from happening are detailed in the document along with the principles of 'safe yield' to ensure that groundwater levels are not raised or lowered beyond critical points.

Various new boreholes were drilled over the last number of years in order to augment the current surface water supply with groundwater. The additional supply from groundwater will also reduce the risk of no bulk water supply to the areas during drought periods. The potential for the artificial recharge of the aquifers in Swartland Municipality's Management Areas are options that will be investigated by Swartland Municipality in the future.

5.1.5 Working for Water

Working for Water Programme of the DWS is currently clearing invasive alien plants in many of the catchments. This initiative creates employment for previously disadvantaged communities as part of the Expanded Public Works Programme. The focus is on removing invasive alien plants from riparian zones and mountain catchments.

It is important for Swartland Municipality to identify ways in which they can support these initiatives of which the objectives should be as follows:

- Job creation and poverty relief through the eradication of alien invasive plant species.
- Provision of a sustainable source of drinking quality water.
- Protection of biodiversity through eradication of alien invasive species.
- Reducing the risk of fire in catchment areas.

Apart from the increased runoff gained from alien vegetation clearing these projects are often funded from "outside" and could thus become a valuable source of job creation and income to the Swartland Municipality's poorer population areas that are typically employed to conduct the clearing operations.

5.1.6 Water Resource Management Projects

Swartland Municipality is committed to ensure that adequate funding is allocated under their Capital and Operational budgets towards the implementation of the WC/WDM initiatives. All external funding that could be utilised by Swartland Municipality for this purpose should be sourced.

The O&M Budget allocated to repairs and maintenance should be increased to address amongst other tasks the following:

- Replacement of malfunctioning and old consumer meters;
- Clearing of meter boxes;
- Buying replacement mechanisms for bulk meters;
- Speedy repair of leaks; and
- Leak detection in areas with higher than expected night flows.

Key WDM projects to be taken into account during the capital budgeting process are as follows:

- Replacement of old water networks as identified through the PRP model (See Section 5.1.1.3 of the Administration, Information and Comprehensive Overview Report);
- Replacement of old bulk and consumer water meters (Implementation of Meter Management and Replacement Programme)
- Telemetry systems to provide for early warning
- Installation of zone meters
- Pressure Management
- Leak detection
- Data loggers to establish MNFs

The WDM initiatives can deliver excellent return on investment if well implemented and well managed.

5.2 WATER BALANCE

A segregated single variable future water requirement model was developed for the WSDP and is available in electronic format. The projected future water requirement models for the various schemes are included in Annexure B. The future water requirement for each of the schemes is obtained by means of this model. It is used in this analysis to estimate the future water requirement for each of the distribution systems. The model differentiates between the different income levels. Different litre per capita per day (l/c/d) was allocated for the different income levels, and also for the different time steps evaluated where necessary. The model was calibrated by balancing the measured demands for 2022/2023 with the projected water requirements for 2022/2023, by changing the allocated litre per capita per day (l/c/d).

Input variables for the water requirement model include the population for 2022, the litre per capita per day (l/c/d), the percentage NRW as well as the quantity (kl/d) of water used by industrial and other water users. The commercial and other water users' demands for 2022 were calculated from the 2022/2023 billed metered consumption data. An annual growth rate of 4% per year were estimated for the future commercial and industrial water usage and 2% for the other and farm water usage.

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The projected future water requirements for the various distribution systems are included in Annexure B. Swartland Municipality is committed to address the challenges with regard to the flow meters at the various WWTWs for the inflow to the plants, the quantity of treated effluent re-used and the quantity of treated effluent returned to the Water Resource System.

Water services must be provided in a manner that is consistent with the broader goals of integrated water resources management. There is therefore a need for an integrated planning approach between the development of water services and water resources.

The Infrastructure Leakage Index (ILI) can be used by Swartland Municipality to determine an appropriate benchmark for managing the water losses according to their own specific circumstances. This ILI can also be compared with the averages for other towns within South Africa. The annual water losses within the various towns' distribution networks are therefore important indicators of the performance of the water supply and distribution systems.

Swartland Municipality should assess the strategic gaps in their IWA water balance data (See Sections 5.2.1 to 5.2.8) and record those flows, both water and sewerage, which are strategic in terms of medium to long term planning. A prioritisation of these locations should subsequently follow with budget allocated to improve the availability and accuracy of the IWA water balance data.

Swartland Municipality should continue to update their IWA water balance models on a monthly basis in order to determine the locations of wastage and to enable the Municipality to manage their NRW and Water Losses. The water balance will not directly lead to the reduction of the demand, but is an imperative management tool that will inform the implementation of demand side management initiatives.

Swartland Municipality is committed to keep record of all bulk meter readings, flows at their WTWs and WWTWs and to update the IWA water balance models on a monthly basis in order to determine locations of wastage and to enable Swartland Municipality to actively implement the WC/WDM Strategy in order to reduce their current NRW and water losses. **All bulk zone water meters need to be recorded on at least a monthly basis (Meters at reservoirs and pump stations).**

5.2.1 Water Balance for Koringberg

The following areas need to be focused on for the IWA water balance of the Koringberg system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.
- The WWTW flow at the Koringberg WWTW needs to be metered.

5.2.2 Water Balance for Ongegund

The following areas need to be focused on for the IWA water balance of the Ongegund system.

- The one identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with a water meter.

5.2.3 Water Balance for Riebeek Wes

The following areas need to be focused on for the IWA water balance of the Riebeek Wes system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.

5.2.4 Water Balance for Riebeek Kasteel

The following areas need to be focused on for the IWA water balance of the Riebeek Kasteel system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.
- The oversized electromagnetic meters at the outlets of the Riebeek Kasteel reservoirs to be replaced with suitably sized smaller diameter mechanical (i.e. Sensus Meistream Plus) or electromagnetic (i.e. Siemens) water meters to enable accurate measuring of low flows (including MNF) and for WC/WDM and water balance purposes to effectively reduce NRW.

5.2.5 Water Balance for Darling

The following areas need to be focused on for the IWA water balance of the Darling system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.
- The bulk water meter needs to be calibrated, because of the drastic reduction in System Input volume over the last financial year.

5.2.6 Water Balance for Malmesbury

The following areas need to be focused on for the IWA water balance of the Malmesbury system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.
- The oversized electromagnetic meters at the outlets of the Klein Dam, Old Golf Course, Panorama and Wesbank reservoirs to be replaced with suitably sized smaller diameter mechanical (i.e. Sensus Meistream Plus) or electromagnetic (i.e. Siemens) water meters to enable accurate measuring of low flows (including MNF) and for WC/WDM and water balance purposes to effectively reduce NRW.
- The Old Golf Course Reservoir inlet flow meter should be replaced as the display is no longer attached to the meter body. The outlet meter needs to be dealt with in order to ensure that the meter is operational.

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- The pipework in the 150mm dia. Mount Royal Reservoir inlet chamber should be reconfigured to ensure that there is an adequate straight section of at least 5 ND upstream of the meter (upstream of the strainer), and at least 3 ND straight pipe downstream of the meter.
- The pipework in the 50mm dia. Tronk outlet chamber should be reconfigures to ensure that there is an adequate straight section of at least 3 ND downstream of the meter.
- The required maintenance on the Tronk inlet meter to be undertaken.
- The WWTW flows at the Kalbaskraal and Chatsworth WWTWs need to be metered.

5.2.7 Water Balance for Moorreesburg

The following areas need to be focused on for the IWA water balance of the Moorreesburg system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.

5.2.8 Water Balance for Yzerfontein

The following areas need to be focused on for the IWA water balance of the Yzerfontein system.

- The identified unmetered erven, as identified through the Swift analysis, to be inspected and supplied with water meters.
- The identified erven with water meters, but with zero demand, to be investigated.

5.3 WATER LOSSES

The IWA Water Balances for the various schemes are included in Annexure C of the Administrative, Information and Comprehensive Overview Report. Water losses from distribution systems are inevitable and cannot be completely eliminated. Such losses may be due to infrastructure-related problems, administrative related problems or theft and do have financial implications for Swartland Municipality.

The effective implementation of the proposed WC/WDM Strategy will enable Swartland Municipality to further reduce their current NRW and Water Losses for the various distribution systems over the next five years.

Koringberg: The NRW and Water Losses were drastically reduced during the last three financial years. The NRW and Water Losses stayed roughly the same for the period 2017/2018 to 2019/2020. The Municipality needs to keep the NRW percentage for Koringberg less than 15%. The ILI of 0.93 indicates an excellent management system, with no specific intervention required.

Ongegund: The NRW and Water Losses decreased drastically during the last financial year. The Municipality needs to keep the NRW percentage for Ongegund less than 10%.

Riebeek Wes: The NRW and Water Losses stayed roughly the same for the last two financial years. The current percentage of NRW of 11.2% and the Water Losses below 5% are excellent. The ILI of 0.29 indicates an excellent management system, with no specific intervention required.

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Riebeek Kasteel: The NRW and Water Losses increased drastically during the last two financial years. The Municipality needs to work towards a percentage of less than 20% for the NRW. The ILI of 4.21 indicates a poor management system, which requires attention.

Yzerfontein: The NRW and Water Losses were reduced over the last two financial years. The current percentages of NRW below 15% and Water Losses below 10% are excellent. The ILI of 0.21 indicates an excellent management system, with no specific intervention required.

Darling: The system input volume for Darling reduced drastically during the last financial year, which needs to be investigated. The NRW and Water Losses stayed roughly the same the four financial years prior to 2022/2023. The Municipality needs to keep the NRW below 15%. The ILI of 2.28 indicates a good management system, with no urgent action required. The ILI should however be monitored carefully.

Moorreesburg: The NRW and Water Losses increased over the last two financial years. The Municipality needs to work towards a percentage of less than 20% for the NRW. The ILI of 2.40 indicates a good management system, with no urgent action required. The ILI should however be monitored carefully.

Malmesbury: The NRW and Water Losses decreased during the last financial year. The Municipality needs to keep the NRW percentage less than 15%. The ILI of 1.46 indicates an excellent management system, with no specific intervention required.

The overall NRW and Water Losses decreased during the last financial year, mainly because of the decrease in the NRW and Water Losses of Malmesbury, Darling, Koringberg, Yzerfontein and Ongegund. The Municipality needs to work towards an overall NRW percentage of less than 20%.

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TOPIC 6: WATER RESOURCES

6. WATER RESOURCES

The key water resources strategic messages flowing from the DWS's detailed Reconciliation Strategies can be summarised as follows:

- WC/WDM is extremely important in all areas. South Africa cannot afford to waste any more water, anywhere.
- Groundwater is important, is currently under-valued and is under-used.
- There is huge potential for increasing re-use of waste water, at the coast as well as in inland systems.
- There is limited opportunity for more dams and transfer schemes, but this option is inevitable in certain areas; however, at great cost.
- Desalination:
 - Small-scale seawater desalination is already being used in certain areas;
 - Mine water desalination is becoming more important; and
 - Desalination of seawater on a large scale is imminent.
- Catchment rehabilitation, clearing of invasive alien plants and rainwater harvesting is growing in importance.
- It is possible to make more water available anywhere in the country in the future, but at sharply rising costs.
- The cost of water at the coast will, over the long term, increase and approach the cost of the desalination of seawater. However, it will be very expensive to support the inland areas with desalinated seawater as this option will require significant transfer costs.
- Additional water for increasing irrigation in South Africa is very limited and moving some water from irrigation to other uses is already being considered in certain areas.
- There is a debate about virtual water and importing food from neighbouring countries with high food production. The potential for this option must be broadened. No water should be used to produce bio-fuels under irrigation.

Table 6.1: Master Plan for Water Resources		
Section	Master Plan	Yes / No
Current Water Sources	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Additional Sources Available	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Monitoring	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Water Quality	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes
Operation	Is there a Master Plan that addresses this problem?	Yes
	Does this Plan address this problem 100%?	Yes

6.1 SOURCES AND VOLUMES

WSAs have the responsibility to comply with the NWA with regard to water resources management as follows:

- WSAs have the right to use water for any of the uses defined in Section 21 of the NWA, subject to conditions that may be set by the relevant authority (either the DWS or the relevant CMA), including the provision of water services to its constituent.
- WSAs have the responsibility to apply for water use licences for any water use defined in Section 21 of the NWA in accordance with the procedures and requirements defined in the Act, specifically noting the requirements of Section 27 of the NWA.
- Where the provision of water services has been contracted to a WSP in terms of a service delivery agreement or contract, such agreement or contract should specifically determine who is responsible for application of water use licences. If no such provision is made in the agreement or contract, it shall be assumed that this responsibility remains with the WSA.
- As an owner, controller or occupier of land where an installation may cause pollution of a water resource, such as a WWTW and effluent discharge works, the WSA must take all reasonable measure to prevent pollution from occurring, as provided for in Section 19 of the NWA, and must comply with the conditions set in any licence permitting effluent disposal.

Metering of all water supplied is one of the most significant steps in order to properly plan and manage water sources. Without metering no management is possible. Swartland Municipality needs to continue with the monthly reading of all their existing bulk water meters, which is a valuable source of information.

The uncertainty in projected water-related climate change impacts is one of the biggest challenges facing water managers. The managers must understand how this uncertainty influences the management decisions to be made and that decisions must be appropriate to a possible range of scenarios. A critical tool in this regard is adaptive management, in which water resource systems are carefully monitored and management actions are tailored and revised in relation to the measured changes on the ground. One cannot predict climate change impacts with any certainty, and the recognition of this uncertainty must be built into all climate change response strategies.

The Western Cape experienced a severe drought over the period 2015 to 2017, with some relief during the 2018 to 2022 winter months. This drought over the period 2015 to 2017 impacted severely on the availability of bulk water supply by the West Coast District Municipality to Swartland Municipality from the WCWSS and the yield of the Municipality's own existing surface and groundwater sources. WC/WDM measures to lower the current water requirements and the augmentation of the West Coast District Municipality's existing water sources, as well as the augmentation of Swartland Municipality's own water resources with groundwater were therefore critical over this period.

Future water requirement projection models were developed for each of the towns within Swartland Municipality's Management Area and are included in Annexure B. These models include the future projections up to 2047 and were calibrated by using historic billed metered consumption data and bulk metered abstraction data. The percentage NRW was determined for each of the distribution systems and growth in demand was based on agreed population and growth figures. The reduction in NRW, as indicated in Table 5.1.1.1, was taken into account for the projected future water requirements.

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TOPIC 6: WATER RESOURCES

The table below gives an overview of the different future water requirement projections for the various distribution systems.

Table 6.1.1: Projected future water requirements of towns						
Distribution System	Model	PROJECTED FUTURE WATER REQUIREMENTS (Ml/a)				
		2027	2032	2037	2042	2047
Moorreesburg	2% Annual Growth	793.363	875.936	967.105	1 067.762	1 178.895
	4% Annual Growth	874.254	1 063.664	1 294.109	1 574.482	1 915.598
	WSDP Model	762.355	863.648	981.820	1 119.905	1 281.509
Koringberg	2% Annual Growth	59.806	66.030	72.903	80.491	88.868
	4% Annual Growth	65.904	80.182	97.554	118.689	144.403
	WSDP Model	62.709	74.315	88.219	104.894	124.915
Total for Withoogte System	Low Projection	853.169	941.967	1 040.008	1 148.252	1 267.764
	High Projection	940.158	1 143.845	1 391.663	1 693.171	2 060.001
	WSDP Model	825.064	937.962	1 070.039	1 224.800	1 406.424
Malmesbury	2% Annual Growth	3 377.577	3 729.118	4 117.248	4 545.775	5 018.902
	4% Annual Growth	3 721.955	4 528.328	5 509.403	6 703.031	8 155.263
	WSDP Model	3 557.701	4 230.801	5 050.247	6 050.520	7 274.655
Darling	2% Annual Growth	665.449	734.710	811.179	895.607	988.823
	4% Annual Growth	733.299	892.170	1 085.461	1 320.629	1 606.748
	WSDP Model	677.446	761.673	858.386	969.727	1 098.246
Riebeek Kasteel	2% Annual Growth	438.848	484.523	534.953	590.631	652.105
	4% Annual Growth	483.593	588.365	715.835	870.923	1 059.611
	WSDP Model	450.406	561.019	707.114	900.802	1 158.493
Riebeek Wes	2% Annual Growth	194.922	215.210	237.609	262.340	289.644
	4% Annual Growth	214.796	261.333	317.951	386.836	470.645
	WSDP Model	212.887	259.908	320.022	397.284	497.061
Ongegund (PPC)	2% Annual Growth	23.407	25.843	28.532	31.502	34.781
	4% Annual Growth	25.793	31.381	38.180	46.452	56.516
	WSDP Model	24.811	27.542	30.658	34.223	38.310
Yzerfontein	2% Annual Growth	330.925	365.368	403.396	445.382	491.737
	4% Annual Growth	364.666	443.672	539.795	656.743	799.028
	WSDP Model	355.836	414.575	484.331	567.327	666.248
Total for Swartland System	Low Projection	7 588.429	8 378.239	9 250.253	10 213.026	11 276.006
	High Projection	8 362.145	10 173.828	12 378.018	15 059.751	18 322.490
	WSDP Model	7 962.425	9 435.171	11 237.946	13 453.819	16 188.558
All towns in Swartland Municipality's Management Area	2% Annual Growth	8 441.598	9 320.206	10 290.261	11 361.278	12 543.770
	4% Annual Growth	9 302.303	11 317.673	13 769.681	16 752.922	20 382.491
	WSDP Model	8 787.489	10 373.133	12 307.985	14 678.619	17 594.982

The table below gives an overview of the years in which the annual water requirements are likely to exceed the licence volumes from the WCWSS. The information is also presented on the graphs in the future water requirement projection models included in Annexure B.

Table 6.1.2: Years in which the annual water requirements are likely to exceed the total licence volumes for Swartland Municipality from the WCWSS				
Distribution System	Total Licence Volume for Swartland Municipality (Ml/a)	Annual Growth on 2022/2023 Demand (Low Growth)	Annual Growth on 2022/2023 Demand (High Growth)	WSDP Projection Model
Withoogte System	1 573.600	2037	>2047	2047
Swartland System	7 900.000	2028	2025	2026

Note: The severe drought in the Western Cape, over the period 2015 to 2017, impacted on the water availability and the security of supply from the WCWSS, which resulted in severe water restrictions implemented by the Swartland Municipality in order to lower the current water requirements and to ensure that the systems don't "run dry" during the drought period.

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Source Studies: A number of resource augmentation studies were previously completed by the DWS for the WCWSS, by the West Coast District Municipality for the West Coast Region and by Swartland Municipality for the towns in their Management Area. A desktop study of these previous augmentation studies was completed during the 2020/2021 financial year. The Conclusions and the Recommendations from the desktop study are indicated below.

Resource Augmentation Desktop Study Conclusions: The overall water requirements of the towns in Swartland Municipality in 2015/2016 was 5 483 MI/a (15.025 MI/d), which came down to a low of 3 442 MI/a (9.431 MI/d) in 2017/2018, due to the drought and the water restrictions and WC/WDM measures implemented by the Municipality. This is a reduction of 37.2% over a two-year period. There was a steady increase in water requirements again over the period 2018/2019 and 2019/2020. The likely “bounce back” after the drought is uncertain, but it is estimated that it would probably take about four to six years after 2017/2018 to reach the same water requirements as the period before the drought (2015/2016).

The future water requirements for the Swartland Voëlvlei and the Swartland Withoogte (Only Moorreesburg and Koringberg) bulk water distribution systems are expected to increase to 5 945 MI/a and 1 180 MI/a (High growth) by 2029. These volumes are still less than the new licence volumes of 7 900 MI/a and 1 573.6 MI/a that were issued in 2017.

Comprehensive historical metered data of the water requirements for the two bulk water distribution systems and the towns in Swartland Municipality's Management Area are available, which assist with the future requirement projections for the systems.

Various water resource augmentation studies/investigations were done over the last number of years for the West Coast Region, the WCWSS and the towns in Swartland Municipality's Management Area. These studies recommended various augmentation projects for the various systems. Most of the studies were done in the period before the drought in the Western Cape.

WC/WDM: The Withoogte and Swartland Voëlvlei bulk water distribution systems are already well managed with regard to reducing treatment losses and bulk water distribution losses. The scope to make additional water available through the implementation of specific WC/WDM measures is very limited. Swartland Municipality's NRW and Water Losses for their internal distribution systems (towns) for 2019/2020 was 15.93% and 15.73% respectively, which is also very low. A comprehensive WC/WDM Strategy is in place for the Municipality and the estimated volume of water saved on System Input Volume for the next five and ten years, with the implementation of the additional WC/WDM measures, is 342.098 MI/a for 2024 and 441.191 MI/a for 2029 respectively. Swartland Municipality is committed to continue with the implementation of their WC/WDM Strategy.

Reliability of Supply from the WCWSS: The towns in Swartland Municipality nearly ran out of water in 2018, due to the limited supply from the WCWSS and the low levels of the Voëlvlei dam. A combined effort by the Municipality, residents, business and government helped avoid a potential catastrophe through dramatic reduction of water use. Exclusive reliance on rainfall fed dams (WCWSS) is no longer wise over the longer term and Swartland Municipality must adopt a precautionary approach to water resource management in dealing with climate uncertainty and the future supply from the system.

WCWSS Augmentation Options: Various studies for the augmentation of the WCWSS were completed by the DWS over the last number of years. The Berg River to Voëlvlei Augmentation Scheme (BRVAS) was identified as the next surface water scheme in 2015 by the National DWS. It will form an integral part of the WCWSS and is being implemented by the TCTA. The URV of the proposed scheme was estimated at R1-31/kl in 2012. Assuming that the construction costs have escalated at 6% per annum in real terms then the 2021 URV would be R3-71/kl, including R1-50/kl for treatment costs. The growth in the West Coast's requirements could also be supplied from the BRVAS, depending on the actual growth in water requirements. The TCTA is currently in discussion with water users to formulate an institutional approach and to make a decision on a funding model. Indications are that water users from the WCWSS, including the CCT, are supportive of the project, currently scheduled for completion by mid-2023.

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Supply from the CCT at their Bulk Tariff: One of the augmentation options available to Swartland Municipality is to purchase treated water from the CCT, for supply from Atlantis to Chatsworth and Riverlands. The estimated cost of a pipeline from Atlantis to Chatsworth and Riverlands is R15.320 million and the annual purchase cost of the potable water will be roughly R1.5 million per year, against the current bulk purchase tariff of R8-13/kl of the CCT.

One of the CCT's current resource augmentation projects is the Atlantis Managed Aquifer Recharge Scheme Refurbishment project, with which the City is currently busy, and this scheme will therefore be independent from the WCWSS. The benefits of supplying Chatsworth and Riverlands with potable water from Atlantis are as follows:

- The Atlantis scheme is a groundwater scheme and the risk associated with surface water sources and the impact of less rainfall on the yield of the system (WCWSS) will therefore not be applicable for the supply to Chatsworth and Riverlands.
- More water will be available for Swartland Municipality's other towns, that are still dependent on supply from the WCWSS, if Chatsworth and Riverlands are supplied from the CCT.
- It will not be necessary to supply potable water from Kalbaskraal to Chatsworth and Riverlands anymore.

Surface Water Source Options: There are no other surface water sources located in close proximity to the various towns in Swartland Municipality's Management Area. The current supply from the WCWSS (from the Misverstand weir and the Voëlvelei dam) is the only real surface water sources available to the Municipality and where the required bulk water infrastructure is already in place.

Groundwater Options: The Pre-Feasibility Study of Potential Water Sources for the Area Served by the West Coast District Municipality Phase 1: Assessment of Development Potential of Groundwater Resources identified various target areas that can be investigated further by Swartland Municipality for possible groundwater augmentation schemes. The URVs of developing groundwater within the various proposed exploration target areas varies from R3-07/m³ to R12-73/m³.

Three existing production boreholes are already utilised in Riverlands and there is a possibility that the two newly drilled boreholes can also be commissioned and connected to the system. Koringberg and Riebeek Wes are the only other towns where the yields of the newly drilled boreholes are adequate to provide a high percentage of the town's existing demand. The groundwater will however require additional treatment and blending options will need to be considered.

The Desktop Feasibility Study into water supply to Yzerfontein from the Grootwater Aquifer indicated a URV of R25-39/kl for a groundwater supply scheme for Yzerfontein for water supply. The Study also indicated that a separate investigation has to be carried out into the Colenso Fault Zone close to Darling, based on boreholes with depths of between 100m and 150m, if the Municipality considers supplying Darling with groundwater.

Water reuse Options: Adequate treated effluent needs to be available for any water reuse scheme to be sustainable. The effluent quality from the respective WWTWs and the design of the necessary barriers to ensure the health and safety of the public are some of the most important considerations.

53.3% Of the total treated effluent discharged from the WWTW in 2019/2020 was already reused by end-users for irrigation and agricultural purposes. Therefore, there is limited scope for additional reuse options to be implemented at the Darling-, Moorreesburg-, Riebeek Valley- and Malmesbury WWTW. Swartland Municipality will continue to reuse treated effluent from the four main WWTWs for irrigation purposes and options of "indirect use" and "direct use" are only seen as long-term possible interventions.

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Desalination Options: The West Coast District Municipality previously proposed to construct and operate a sea water desalination plant in the Saldanha Bay area using sea water reverse osmosis (SWRO) technology. The proposed desalination plant and bulk infrastructure will cost an estimated R500 million, R300 million more than the original cost estimate. This project is however currently on hold, due to inadequate funding.

Yzerfontein is the only town in Swartland Municipality's Management Area where desalination is an option for future water supply. The town's 2019/2020 PDD was 1.552 Ml/d and it is expected to increase to a PDD of 1.887 Ml/d by 2029. The estimated capital cost for a desalination plant at Yzerfontein, with the marine infrastructure included, is roughly R35 million/Ml. It will also be very difficult to obtain environmental authorisation for the construction of a desalination plant at Yzerfontein due to the sensitivity of the coastal area.

Resource Augmentation Desktop Study Recommendations: The following recommendations with regard to water resource augmentation options available to Swartland Municipality were made based on the findings and conclusions contained in this desktop study:

- Swartland Municipality should continue to implement their WC/WDM Strategy for both the bulk water distribution systems and the internal water reticulation systems of the towns. Treatment Losses, NRW and Water Losses need to be monitored on a monthly basis.
- Investigate the cost of small groundwater schemes for Koringberg and Riebeek Wes. These are the only two towns where the yields of the newly drilled boreholes are adequate to provide a high percentage of the town's existing demand. The groundwater will require additional treatment and blending options will need to be considered.
- Compile a Feasibility Study for a bulk groundwater augmentation scheme for the Swartland Voëlvlei bulk water distribution system from the target areas included in the "Pre-Feasibility Study of Potential Water Sources for the Area Served by the West Coast District Municipality Phase 1: Assessment of Development Potential of Groundwater Resources" Report.
- The URV of R25-39/kl for a groundwater supply scheme for Yzerfontein from the Grootwater Aquifer is high and should be seen as a possible medium- to long-term possible intervention.
- An investigation has to be carried out into the Colenso Fault Zone close to Darling if the Municipality considers supplying Darling with groundwater. A possible groundwater scheme for Darling should be seen as a possible medium- to long-term possible intervention.
- Continue to reuse treated effluent from the four main WWTWs for irrigation purposes in order to reduce the demand for potable water used for irrigation purposes (Parks, Sport Fields, etc.). The options of "indirect potable reuse" and "direct potable reuse" of treated effluent should be seen as long-term possible interventions.
- Swartland Municipality should engage with the CCT with regard to the following:
 - The CCT's programme for implementing the additional infrastructure to provide the proposed 1 in 200 year level of assurance of supply (Atlantis Managed Aquifer Recharge Scheme Refurbishment Project).
 - The possibility of supplying the towns of Chatsworth and Riverlands with potable water from Atlantis.

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- The other options available to Swartland Municipality to purchase bulk potable water from the CCT, which include the following.
 - (1) Purchase potable water from the CCT through their Voëlvlei bulk water pipeline, which supply the Plattekloof reservoir.
 - (2) The possibility for the CCT to take over the Swartland WTW and to provide potable water to Gouda and the Swartland Municipality from the WTW.
 - (3) Any possible other arrangements with the CCT.
- Swartland Municipality should engage with DWS and the TCTA to discuss the options available for an increased future allocation from the WCWSS for Swartland Municipality, through the implementation of the Berg River Voëlvlei Augmentation Scheme (BRVAS) project or the other future augmentation projects.
- Engage with Saldanha Bay Municipality and the West Coast District Municipality if the proposed Saldanha Bay desalination plant project is started. A possible desalination plant for Yzerfontein should only be seen as a long-term possible intervention.

The DWS is currently busy with the updating of the All Towns Reconciliation Strategies for the Western Cape, but updated strategies for Swartland Municipality are not yet available. The table below gives an overview of the recommended potential future water resources, as included in the 2016 All Towns Reconciliation Strategies, for the towns in Swartland Municipality.

Table 6.1.3: Potential future water resources for the various towns (Recommended summary options of DWS's All Towns Reconciliation Strategies, March 2016)	
Distribution System	Recommended Summary Options
Koringberg	The current water sources do not have adequate supply to cater for the projected future water requirements. The following sources are identified as potential sources to augment the water supply: • Continue with the full implementation of the existing WC/WDM Strategy. • Increase the allocation from the Berg River for the Withoogte Regional Water Supply Scheme • Groundwater development.
Riebeek Wes and Ongegund	The current water sources do not have adequate supply to cater for the current and longer-term future water requirements. The following sources are identified as potential sources to augment the water supply: • Continue with the implementation of the existing WC/WDM Strategy in order to reduce water losses and NRW and achieve savings in water consumption. • Increase the allocation from the Voëlvlei Dam for the Swartland Regional Water Supply Scheme. • Groundwater development.
Riebeek Kasteel	The current water sources do not have adequate yields available to cater for the current and longer-term future water requirements. The following sources are identified as potential sources to augment the water supply: • Continue with the implementation of the existing WC/WDM Strategy. • Increased allocation for the Swartland Regional Water Supply Scheme from the Voëlvlei Dam (WCWSS). • Groundwater development • Re-use of water • Rainwater harvesting.
Yzerfontein	The current water sources do not have adequate supply to cater for the current and longer-term future water requirements. The following sources are identified as potential sources to augment the water supply: • Continue with the implementation of the existing WC/WDM Strategy. • Increased allocation for the Swartland Regional Water Supply Scheme from the Voëlvlei Dam (WCWSS). • Desalination of seawater for Saldanha and environs to make more water available for Yzerfontein from the Voëlvlei Dam.
Darling	The current water sources do not have adequate supply to cater for the projected future water requirements of Darling. The following sources are identified as potential sources to augment the water supply: • Continue with the implementation of the existing WC/WDM Strategy. • Increased allocation for the Swartland Regional Water Supply Scheme from the Voëlvlei Dam (WCWSS). • Consider re-use of water. • Groundwater development.

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Table 6.1.3: Potential future water resources for the various towns (Recommended summary options of DWS's All Towns Reconciliation Strategies, March 2016)

Distribution System	Recommended Summary Options
Moorreesburg	The current water sources do not have adequate supply to cater for the longer-term future water requirements. The following sources are identified as potential sources to augment the water supply: • Continue with the implementation of the existing WC/WDM Strategy. • An increased allocation from the Berg River for the Withoogte Regional Water Supply Scheme. • Groundwater development. • Re-use of water. • Rainwater harvesting
Malmesbury and Abbotsdale	The current water sources do not have adequate supply to cater for the current and longer-term future water requirements. The following sources are identified as potential sources to augment the water supply: • Continue with the full implementation of the existing WC/WDM Strategy in order to keep the water losses and NRW as low as possible and achieve savings in water consumption. • Increased allocation for the Swartland Regional Water Supply Scheme from the Voëlvlei Dam (WCWSS). • Water re-use. • Groundwater development for smaller communities.

Re-use of water is becoming more acceptable and feasible because of increasing water shortages, improved purification technology and decreasing treatment costs. Improvements in membrane technologies and their affordability have made a significant contribution in recent years. At present, up to 14% of water use is reused, mostly through wastewater return flows to rivers from which it is abstracted downstream for indirect re-use. Re-use of return flows could be significantly increased, particularly in coastal cities where wastewater ordinarily drains into the sea.

The direct re-use of treated wastewater can pose a risk to public health and safety; must be managed carefully and be subject to water quality management and control. Advanced treatment and proper monitoring of all processes and quality of potable water produced is essential. Public perceptions and opinions vary on the topic of water re-use, specifically as it relates to direct potable water re-use. Public perceptions are strongly informed by the general awareness of the poor operation, maintenance and performance of municipal wastewater treatment plants at present. This poses a significant challenge to building public acceptance of direct water re-use in the current situation. The performance of municipal wastewater and effluent treatment plants nationwide will have to be improved to meet high standards, resulting in consistently good quality discharges to the environment before direct water re-use can be placed on the national water supply agenda.

6.2 MONITORING

6.2.1 Percentage of Water Abstracted Monitored: Surface Water

The surface water supply to the Withoogte and Swartland bulk distribution systems are metered and the volumes are recorded daily by the West Coast District Municipality, which is a valuable source of information in terms of the water balances for the two bulk water distribution systems. The bulk potable water supply to the different towns in Swartland Municipality are also metered and the volumes are recorded monthly, which enable the Municipality to compile detail IWA water balances for each of the systems.

The West Coast District Municipality and Swartland Municipality are committed to continue with the monitoring of all surface water sources supplying the different systems with bulk water. The Municipality also plans to upgrade their Scada system for their bulk water meters, which will allow real-time data collection, immediate alerts to faulty meters and easy manipulation of bulk meter data to synchronize with timings of the Financial Department's consumer readings.

6.2.2 Percentage of Water Abstracted Monitored: Groundwater

The Municipality currently operates three production boreholes for potable water supply in Riverlands and Chatsworth. Swartland Municipality will keep on monitoring the volume of water abstracted from these three production boreholes. Monitoring of abstraction and groundwater levels is essential to ensure sustainable management of groundwater sources, by increasing understanding of the available water resource and to inform of any potential aquifer depletion. It will also indicate if an aquifer has potential to store surplus surface water and whether artificial groundwater recharge should be considered.

Swartland Municipality needs to continue with the implementation of the proposed well-field monitoring programmes (i.e. abstraction, water quality and water levels). Water quality indicators are useful tools for predicting stresses in the groundwater system. The key groundwater management functions that need to be implemented by Swartland Municipality are summarised in Table 3.2.1.1.

6.2.3 Percentage of Water Abstracted Monitored: External Sources (Bulk Purchase)

All bulk potable water supply by the West Coast District Municipality to Swartland Municipality is metered and monitored, with “check” monitoring done by Swartland Municipality.

6.2.4 Surface Water Levels

The West Coast District Municipality will continue with the monitoring of the water levels of the Berg River and the Voëlvlei dam for supply to the two bulk water distribution systems. The West Coast District Municipality will also continue with the recording of the daily and monthly rainfall data.

6.2.5 Groundwater Levels

The water level data of the three Riverlands production boreholes will enable Swartland Municipality to identify the development of “red flag” situations timeously and to take preventative action. All boreholes should have two observation pipes installed vertically from the pump depth to the surface. One should be 40mm OD (Class 10) for a water level logger and the other big enough for a manual water level measurement. The pipe must be closed at the bottom and the bottom 10m – 20m slotted.

6.2.6 Water Quality for Formal Schemes

The West Coast District Municipality and the Swartland Municipality is committed to continue with their current Operational and Compliance Water Quality Sampling Programmes for all their formal schemes. The Municipality will further continue to load all the water quality compliance sample results for the various distribution systems onto DWS’s IRIS on a monthly basis.

It is recommended that raw water quality samples also be collected of the three Riverlands production boreholes on at least an annual basis. A Groundwater Quality Monitoring Report also needs to be compiled for the three Riverlands boreholes.

As safeguard against water borne diseases it is strongly recommended that Swartland Municipality continue to ensure that all water used for human consumption are adequately disinfected by chlorination or other methods.

6.2.7 Water Quality for Rudimentary Schemes

Swartland Municipality is not involved with the water quality monitoring on farms in the rural areas, where farmers utilise their own water sources.

6.2.8 Borehole Abstraction

Swartland Municipality will keep on monitoring the abstraction and the sustainable yields of the three Riverlands production boreholes, in order to prevent any over abstraction of the aquifers and to ensure that the aquifers are managed in a sustainable manner.

To safeguard the boreholes against over-abstraction, low level cut-off switches need to be installed in all production boreholes. The monitoring data needs to be analysed by a geohydrologist on an annual basis in order to assess the effects of abstraction and recharge on the boreholes and aquifer. All production boreholes need to be fitted with a sampling tap and flow volume meter for monitoring purposes.

Swartland Municipality will continue with their groundwater monitoring on at least a monthly basis. Monthly monitoring of water levels, water chemistry and abstraction need to be conducted by the Municipal staff. Swartland Municipality also needs to ensure that all electronic data (i.e. dataloggers) are downloaded quarterly by a geohydrologist. Monitoring data needs to be reviewed at least annually by a geohydrologist.

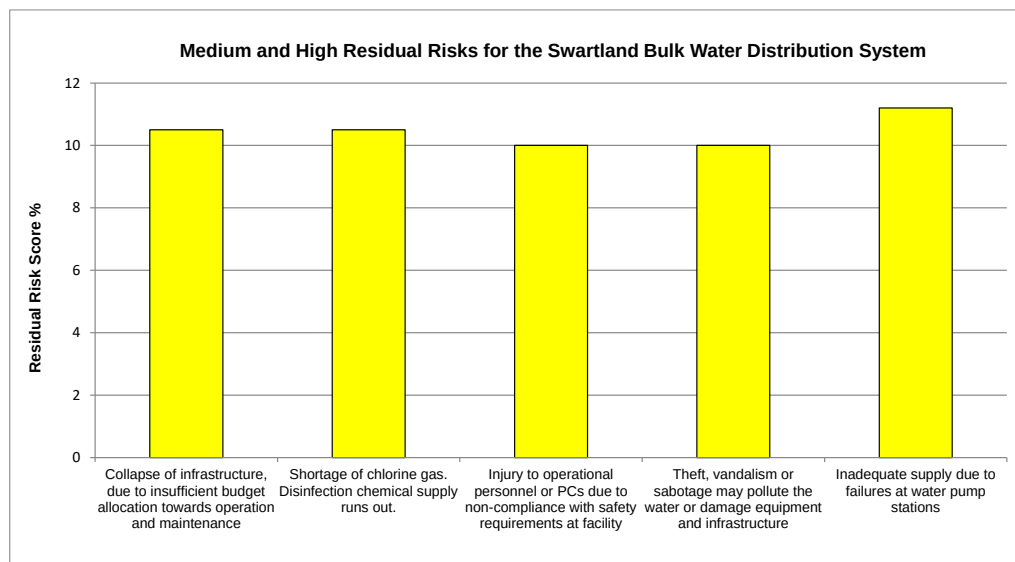
The above will increase the understanding of the aquifer response to abstraction and the possible interconnections between surface water sources and the aquifers. Furthermore, the monitoring programme serves to detect the impact of natural changes in the hydrological cycle on ecosystems and other water users.

6.3 WATER QUALITY

WATER SAFETY PLAN – IMPROVEMENT

The Water Safety Plan Teams of the West Coast District Municipality and the Swartland Municipality are committed to meet regularly to review the implementation and all the aspects of the Water Safety Plans and to determine whether the field assessments, monitoring results and trend analyses need updates or modifications.

The Water Safety Plans considered whether the existing control measures are effective. The graph and table below summarise the medium and high recalculated risks for the Swartland bulk water distribution system, as taken from the West Coast District Municipality's Water Safety Plan (June 2022).



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Table 6.3.1. Summary of medium and high risks and recommended Improvement Plan as included in the West Coast District Municipality's Water Safety Plan for the Swartland bulk water distribution system

Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
Collapse of infrastructure, due to insufficient budget allocation towards operation and maintenance	West Coast District Municipality and Local Municipalities to allocate a budget of approximately 2% of the total asset value per annum towards the replacement of existing infrastructure and between 1% and 2% towards the operation and maintenance of the existing infrastructure.
Shortage of chlorine gas. Disinfection chemical supply runs out.	Investigate alternative disinfection processes for "back-up" in case of an emergency.
Injury to operational personnel or PCs due to non-compliance with safety requirements at facility (Staff working with chlorine not adequately trained, emergency procedures and action plans not in place, inadequate chlorine signage, proper offloading and moving equipment not available, buildings and rooms not on standard, dosing equipment not on standard, PPE not in place, leak detection and contaminated air control equipment not in place).	Ensure a Water Safety Audit is done at least once every two years at all chlorine dosing facilities in order to monitor compliance with safety requirements.
Theft, vandalism or sabotage may pollute the water with chemicals or microbes or damage equipment and infrastructure	Ensure all reservoirs are fenced and locked and that all covers are locked.
Inadequate supply due to failures at water pump stations (Theft, vandalism, load shedding and lack of preventative maintenance).	Ensure adequate standby pumps and mobile generators are available at water pump stations and that pump stations are inspected weekly for possible maintenance work that needs to be carried out. Maintenance work needs to be carried out.

The graph and table below summarise the medium and high recalculated risks for Swartland Municipality's Internal Water Reticulation Networks, as taken from the Swartland Municipality's Water Safety Plan (August 2022).

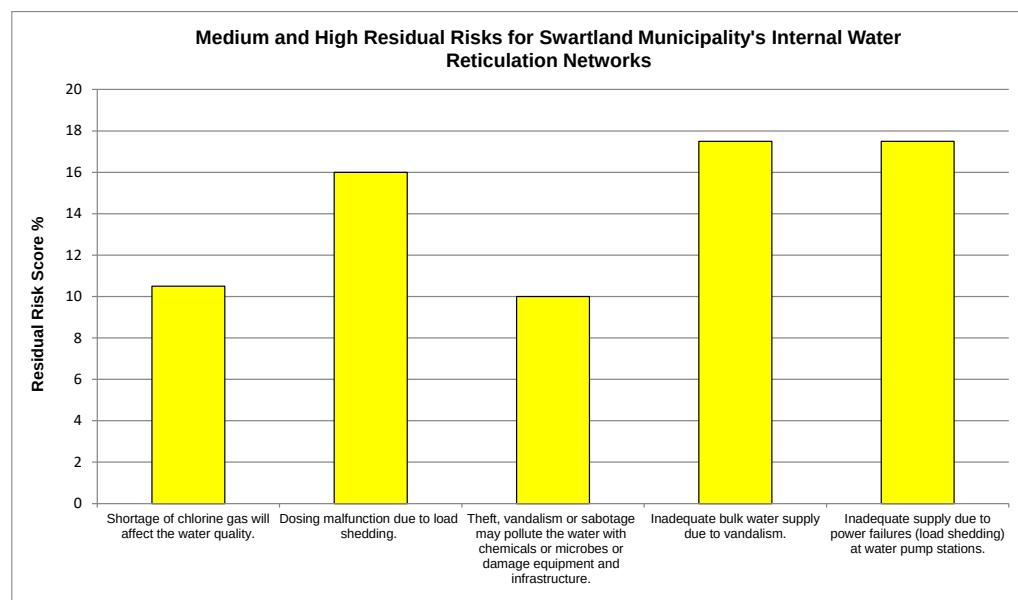


Table 6.3.2. Summary of medium and high risks and recommended Improvement Plan as included in the Swartland Municipality's Water Safety Plan for the internal water reticulation networks

Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
Shortage of chlorine gas will affect the water quality.	Investigate alternative disinfection processes for "back-up" in case of an emergency.

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Table 6.3.2. Summary of medium and high risks and recommended Improvement Plan as included in the Swartland Municipality's Water Safety Plan for the internal water reticulation networks	
Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
Dosing malfunction due to load shedding. Possible interruption to chlorination.	Investigate the feasibility to provide "back-up" power at the disinfection facilities.
Theft, vandalism or sabotage may pollute the water with chemicals or microbes or damage equipment and infrastructure.	Ensure all reservoirs are fenced and locked and that all covers are locked.
Inadequate bulk water supply due to vandalism.	Continue with the weekly inspection of all water pump stations for possible vandalism. Any vandalised infrastructure needs to be repaired / replaced.
Inadequate supply due to power failures (load shedding) at water pump stations.	Continue to ensure adequate reservoir storage levels before expected load shedding periods. Provide back-up generators to those pump stations most critical. Ensure mobile generators are available for pump stations without permanent back-up generators.

The West Coast District Municipality and Swartland Municipality are committed to implement the Water Safety Plans and specific the Improvement / Upgrade Plans. Data from the verification and validation measures need to be used to evaluate the accuracy of the Water Safety Plans. The evaluation will give an indication whether certain aspects of the risk assessment need to be updated or modified and whether there exists any gaps in the Water Safety Plans.

If the analyses indicates that critical limits are not achieved at critical control points, despite the implementation of control measures and preventative action plans, then it points to:

- risks have been identified incorrectly;
- control measures are insufficient;
- control measures were identified incorrectly; or
- the critical limits are inappropriate

The Water Safety Plans are dynamic documents and should be reviewed:

- every three years;
- after an incident as part of the debriefing;
- after any significant change in the value (production) chain; for example, a new water source is developed, major treatment improvements are planned and brought into use, or after a major water quality incident;
- when a weakness in the Water Safety Plan has been identified; and
- additional information is received that warrant a revised risk level for that system.

Swartland Municipality's Incident Management Protocol (IMP) and Emergency Response Plans should clearly specify responsibilities for co-ordinating measure to be taken, a communication plan to inform / alert users of supply and plans for providing / distributing emergency supplies of water. Key areas to be addressed in emergency response plans include the following:

- Response actions – including increased monitoring.
- Plans for emergency water supplies in order to ensure safe drinking water for the duration of the problem.
- Roles and responsibilities of individuals and organizations are clearly outlined to avoid miscommunication and duplication of effort.

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- Communication strategies and protocols including notification procedures to alert and inform users of the supply and other stakeholders, with staff contact details (internal, regulatory body, media, public, emergency services), in order to ensure that all stakeholders are kept fully informed.
- Mechanisms for increased public health surveillance.
- Responsibilities for coordinating measures to be taken in an emergency.
- Training to ensure that employees have the skills and knowledge to effectively manage any potential incident and/or emergency.
- A programme to review and revise documentation as required.

The goal of Water and Safety Management Procedures is to highlight the procedures / protocols implemented and adhered to by the West Coast District Municipality and Swartland Municipality and forms part of the Incident Management Protocols.

The Incident Management Protocol must be aligned to the communication requirements stipulated in the Compulsory National Standards for the Quality of Potable Water under Section 9 of the Water Services Act. The Compulsory National Standards for the Quality of Potable Water states that a Water Services Institution must ensure that a Drinking Water Quality Advisory is issued within 12 hours of confirmation of drinking water quality failure:

- A **Drinking Water Quality Advisory** must be issued when analysis results indicates a health risk associated with the domestic use of the sampled water. The Drinking Water Quality Advisory must specify the nature of the risk presented; indicate rectification measures taken by the Water Services Institution and indicate risk minimization measure to be taken by the public.
- A **Boil Water Notice** should be issued when the quality of drinking water poses a risk which can be adequately addressed by boiling the water in accordance with the notice, prior to human consumption.
- A **Do Not Use Water Notice** should be issued when there is a risk which cannot be adequately mitigated by means of domestic treatment.

It was not necessary for the West Coast District Municipality or Swartland Municipality to issue any Drinking Water Quality Advisories, as summarised above, for the last number of years. Mechanisms to issue such notices are however in place, should it become necessary to inform the public of any drinking water quality failure.

The West Coast District Municipality and Swartland Municipality need to ensure that evidence of adherence to the requirements of this protocol be recorded, preferably in the form of an Incident Register as summarised in Table 6.3.3 below.

Trigger	Sample Point	Nature of Incident	Risk Rating	Corrective Action	Communication of failure	Reference Documents
Laboratory reported E.Coli Failure	High Level Reservoir	9 E.Coli per 100 ml recorded on 24 May 2011	Alert Level 2 – Moderate Risk	Laboratory informed Operations, Water Quality Advisory issued, additional chlorine dosed, resampled on 26, 28 and 30 Jun 2011. All resample results 0 E.Coli per 100 ml	Failure, corrective action and resample results communicated to WSA Manager, DWS and DoH.	Water Quality Advisory and evidence of communication stored on network drive.

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Following any incident or emergency, an investigation should be undertaken and all individuals involved in the Water Safety Plan should be updated and a discussion of the performance of the Water Safety Plan and issues or concerns must be addressed. The investigation should consider factors such as the following:

- What was the cause of the problem?
- Was the hazard already identified in the Water Safety Plan risk assessment?
- How was the problem first identified or recognised?
- What were the most essential actions required and were they carried out?
- If relevant, was appropriate and timely action taken to warn consumers and protect their health?
- What communication problems arose and how were they addressed?
- What were the immediate and longer-term consequences?
- How well did the emergency response plan function?
- Should documentation be updated or reviewed?

W₂RAP – IMPROVEMENT

The W₂RAP Team of Swartland Municipality is committed to meet regularly to review all aspects of the W₂RAPs to ensure that they are still accurate. Operational monitoring results and trends will be assessed. In addition to the regular three year review, the W₂RAPs will also be reviewed when, for example, a new WWTW is developed, major treatment improvements are planned and brought into use, or after a major wastewater incident.

The W₂RAPS considered whether the existing control measures are effective. The table below summarise the priority risks and the proposed control measures, after evaluation of the existing control measures (January 2018).

Table 6.3.4. Summary of medium and high risks and recommended Improvement Plan as included in the W ₂ RAPs	
Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
Malmesbury WWTW and drainage network	
Infrastructure failure, due to lack of record keeping of maintenance work carried out and implementation of a Maintenance Plan.	Ensure all maintenance work carried out at the WWTW is recorded in logsheets. Develop and implement an Asset Management Plan.
Safety Audit: Staff working with chlorine not adequately trained and emergency procedures and action plans not in place.	Book First Aid Training for employees and schedule at least one first-aider per shift. Document details of training completed by employees in a register. Display site specific emergency procedures for Chlorine leaks at the Chlorine Room. Display a facility layout with evacuation routes and procedures at various points. Indicate the position of two emergency assembly points with appropriate signage. Implement an emergency action plan for the safe evacuation of the public in the surrounding area and conduct drills. Implement an emergency action plan for the safe evacuation of all staff members and site visitors and conduct drills. Install a windsock in a highly visible position.
Safety Audit: Inadequate chlorine signage at treatment facilities.	Mark all chlorine room entrances with a "No unauthorized entry" sign. Display a "Working with Chlorine" sign when working inside the Chlorine Room. Indicate the status of all chlorine vessels with "full" or "empty" signs. Display a sign at all chlorine room entrances indicating the need to wear rubber gloves, safety boots and respiratory equipment. Display a sign at all chlorine room entrances warning against lone entry. Display an "Emergency Shower" sign at the emergency shower. Display, at the Chlorine Room, instructions on how to operate and safely shut down the Chlorine dosing system.

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Table 6.3.4. Summary of medium and high risks and recommended Improvement Plan as included in the W ₂ RAPs	
Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried out, etc.)	Control forms and Inspection forms to be implemented.
Inadequate aeration, because aerators and mixers are not regularly cleaned / maintained.	Compile a schedule for cleaning and maintaining the aerators and mixers.
Moorreesburg WWTW and drainage network	
Not able to meet draft Regulation 17 requirements w.r.t. the number of Process Controllers.	Apply to the DWS for exemption w.r.t. the number of Process Controllers, once the WWTW is upgraded and the new plant is in operation.
Final effluent not meeting required standards, due to lack of proper process control by Process Controllers (PA).	The following additional operational samples need to be taken: Raw sewage - EC and Settleable Solids daily and COD and Ammonia Weekly; At Bioreactor - DO daily; At SST - DSVI weekly.
Infrastructure failure on sewer network and at WWTW, due to lack of adequate funding to ensure proper maintenance.	A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of existing infrastructure. In the case of the operations and maintenance of the systems, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the systems remain in good condition.
Infrastructure failure, due to lack of record keeping of maintenance work carried out and implementation of a Maintenance Plan.	Ensure all maintenance work carried out at the WWTW is recorded in logsheets. Develop and implement an Asset Management Plan.
Human and animal accidents, because the site is not secured and fenced.	Install fence in order to prevent any humans or animals to enter the WWTW.
Inadequate storage of chemicals can compromise staff safety.	Provide secure storage room for all chemicals
No showers and warning alarms for chlorine leakage for operational staff.	Install an emergency shower. Preferably with a step on plate and eye wash fountain. Install a Gas Monitoring System
Staff accidents, because hand rails and lifting equipment are not securely fitted.	Ensure all hand rails and lifting equipment is securely fitted.
Safety Audit: Staff working with chlorine not adequately trained and emergency procedures and action plans not in place.	Book First Aid Training for employees and schedule at least one first aider per shift. Document details of training completed by employees in a register. Display site specific emergency procedures for Chlorine leaks at the Chlorine Room. Display a facility layout with evacuation routes and procedures at various points. Indicate the position of two emergency assembly points with appropriate signage. Implement an emergency action plan for the safe evacuation of the public in the surrounding area and conduct drills. Implement an emergency action plan for the safe evacuation of all staff members and site visitors and conduct drills. Install a windsock in a highly visible position.
Safety Audit: Inadequate chlorine signage at treatment facilities.	Mark all chlorine room entrances with a "Chlorine Room" sign Mark all chlorine room entrances with a "No unauthorized entry" sign Display a "Working with Chlorine" sign when working inside the Chlorine Room Indicate the status of all chlorine vessels with "full" or "empty" signs Display a sign at all chlorine room entrances indicating the need to wear rubber gloves, safety boots and respiratory equipment. Display a sign at all chlorine room entrances warning against lone entry. Display, at the Chlorine Room, instructions on how to operate and safely shut down the Chlorine dosing system.
WWTW Process Failure, due to power failures.	Ensure adequate availability of backup power (Standby generator) at the critical components of the WWTW. Upgrade the WWTW to allow adequate capacity to handle short periods of power failures.
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried	Control forms and Inspection forms to be implemented.

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Table 6.3.4. Summary of medium and high risks and recommended Improvement Plan as included in the W₂RAPs

Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
out, etc.).	
Flow and load variations that exceed the design limits, which result in final effluent not meeting required standards.	Upgrade the WWTW in order to increase the hydraulic and organic design capacity and to ensure compliance with final effluent standards.
Unsafe / inappropriate disposal of screenings and grit and size of screen is too big.	Determine the allowable method of disposal according to the environmental laws and regulations. Investigate possible delisting of the screenings and grit. Formalise procedures for the disposal of grit and screenings (including medical waste) as appropriate to the location.
Screens and grit channels are cleaned manually, which can negatively impact the health of the Process Controllers.	Installation of mechanical screens with the upgrading of the inlet works.
Efficiency of trickling filter compromised, because of very old infrastructure. Ponding occurs around trickling filters.	Implement proposed refurbishment interventions or upgrade the WWTW, because the biofilter is not achieving the desirable nitrification rates.
Clarigester is by-passed, not working, which impact on the treatment process.	Implement proposed refurbishment interventions or upgrade the WWTW, because the clarigester is blocked and has not been desludge for some months. Sludge to be pumped out and the sludge withdrawal mechanism needs to be refurbished to prevent future blockages. This will improve the separation of settleable solids currently blocking the biofilter.
Inadequate aeration, because aerators and mixers are not regularly cleaned / maintained.	Compile a schedule for cleaning and maintaining the aerators and mixers.
Activated sludge reactors are not regularly cleaned. Build-up of sand.	Schedule for the cleaning of the activated sludge reactors.
Dead spots in aeration basin.	Upgrade the WWTW.
Scum on the surface of the clarifier.	Ensure an even flow over the weir, proper weir maintenance and with regular scum removal. Develop SOPs for the proper operation of the aerators and clarifiers.
The physical structure of the clarifier is failing.	Implement proposed refurbishment interventions or upgrade the WWTW.
Clarigester is by-passed, not working, which impact on the treatment process. Scum is not skimmed in the clarigester.	Implement proposed refurbishment interventions or upgrade the WWTW, because the clarigester is blocked and has not been desludge for some months. Sludge to be pumped out and the sludge withdrawal mechanism needs to be refurbished to prevent future blockages. This will improve the separation of settleable solids currently blocking the biofilter.
Disinfection chemical supply runs out (Chlorine gas). No scale to weigh cylinders.	Ensure adequate scales are provided as part of the upgrading of the WWTW.
Inadequate disinfection, because dosing system is not working.	Implement proposed refurbishment interventions or upgrade the WWTW.
Dosing facility and safety equipment not meeting health standards.	Implement proposed refurbishment interventions or upgrade the WWTW.
Pollution of river. No upstream and downstream monitoring of quality of water in stream.	Upstream and downstream monitoring of quality of water in stream.
Sludge disposal is problematic, which results in the accumulation of sludge on site	Classify the sludge samples of all the WWTW on an annual basis. Dispose sludge in line with the Guidelines for the utilisation and disposal of wastewater sludge (WRC Report TT261/06)
Darling WWTW and drainage network	
Not able to meet draft Regulation 17 requirements w.r.t. the number of Process Controllers.	Employ qualified Process Controllers at the WWTW in order to ensure compliance with draft Regulation 17 requirements during all shifts.
Final effluent not meeting required standards, due to lack of proper process control by Process Controllers.	The following additional operational samples need to be taken: Raw sewage - pH, EC and Settleable Solids daily and COD and Ammonia Weekly; At Bioreactor - DO daily; At SST - DSVI weekly; At final effluent pH and total chlorine residual.
Infrastructure failure, due to lack of record keeping of maintenance work carried out and implementation of a Maintenance Plan.	Ensure all maintenance work carried out at the WWTW is recorded in logsheets. Develop and implement an Asset Management Plan.
Human and animal accidents, because the site is not secured and fenced.	Install fence in order to prevent any humans or animals to enter the WWTW site.
Safety Audit: Staff working with chlorine not adequately trained and emergency procedures	Respiratory Equipment Training for all employees working with chlorine.

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Table 6.3.4. Summary of medium and high risks and recommended Improvement Plan as included in the W ₂ RAPs	
Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
and action plans not in place.	Chlorine Handling Training for all employees working with chlorine. Book First Aid Training for employees and schedule at least one first aider per shift. Document details of training completed by employees in a register. Display site specific emergency procedures for Chlorine leaks at the Chlorine Room. Display a facility layout with evacuation routes and procedures at various points. Indicate the position of two emergency assembly points with appropriate signage. Implement an emergency action plan for the safe evacuation of the public in the surrounding area and conduct drills. Implement an emergency action plan for the safe evacuation of all staff members and site visitors and conduct drills. Install a windsock in a highly visible position.
Safety Audit: Inadequate chlorine signage at treatment facilities.	Mark all chlorine room entrances with a "Chlorine Room" sign Mark all chlorine room entrances with a "Toxic Gas" sign Mark all chlorine room entrances with a "No unauthorized entry" sign Display a "Working with Chlorine" sign when working inside the Chlorine Room Indicate the status of all chlorine vessels with "full" or "empty" signs Display a sign at all chlorine room entrances indicating the need to wear rubber gloves, safety boots and respiratory equipment. Display a sign at all chlorine room entrances warning against lone entry. Display, at the Chlorine Room, instructions on how to operate and safely shut down the Chlorine dosing system.
WWTW Process Failure, due to power failures.	Ensure adequate availability of backup power (Standby generator) at the critical components of the WWTW. Upgrade the WWTW to allow adequate capacity to handle short periods of power failures.
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried out, etc.)	Control forms and Inspection forms to be implemented.
Unsafe / inappropriate disposal of screenings and grit	Determine the allowable method of disposal according to the environmental laws and regulations. Investigate possible delisting of the screenings and grit. Formalise procedures for the disposal of grit and screenings (including medical waste) as appropriate to the location.
The anaerobic ponds are filling up with sludge and silt over time, which impact on the capacity of the plant and the quality of the effluent.	Sludge and silt to be removed from the anaerobic ponds.
Inadequate aeration, because aerators and mixers are not regularly cleaned / maintained.	Compile a schedule for cleaning and maintaining the aerators and mixers.
Activated sludge reactors are not regularly cleaned. Build-up of sand.	Schedule for the cleaning of the activated sludge reactors.
Final clarification appears to be problematic. Sludge carryover occurs, excessive solids in the overflow.	Upgrade the capacity of the SSTs in order to ensure that the solids are effectively separated from the liquid.
Inadequate dewatering of sludge, because belt press is not working.	Repair Belt Press.
Low microbiological compliance, because chlorine dosing equipment is not working.	Repair Chlorine Dosing Equipment
Disinfection chemical supply runs out (Chlorine gas).	Dosing rates and weight of cylinders to be recorded by Process Controllers.
Sludge disposal is problematic, which results in the accumulation of sludge on site	Classify the sludge samples of all the WWTW on an annual basis. Dispose sludge in line with the Guidelines for the utilisation and disposal of wastewater sludge (WRC Report TT261/06)
Riebeeck Valley WWTW and drainage network	
Infrastructure failure, due to lack of record keeping of maintenance work carried out and	Ensure all maintenance work carried out at the WWTW is recorded in logsheets. Develop and implement an Asset Management Plan.

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Table 6.3.4. Summary of medium and high risks and recommended Improvement Plan as included in the W ₂ RAPs	
Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
implementation of a Maintenance Plan.	
Safety risks to staff, because lack of first aid kit and emergency equipment, PPE and leak detection and contaminated air control equipment.	Install and provide all the required first aid kit and emergency equipment, PPE and leak detection and contaminated air control equipment.
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried out, etc.)	Control forms and Inspection forms to be implemented.
Unsafe / inappropriate disposal of screenings and grit	Determine the allowable method of disposal according to the environmental laws and regulations. Investigate possible delisting of the screenings and grit. Formalise procedures for the disposal of grit and screenings (including medical waste) as appropriate to the location.
Inadequate aeration, because aerators and mixers are not regularly cleaned / maintained.	Compile a schedule for cleaning and maintaining the aerators and mixers.
Activated sludge reactors are not regularly cleaned. Build-up of sand.	Schedule for the cleaning of the activated sludge reactors.
Koringberg WWTW and drainage network	
Final effluent not meeting required standards due to the current flow that exceed the design capacity by about three times (PA).	Upgrade oxidation pond system
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried out, etc.)	Control forms and Inspection forms to be implemented.
Flow and load variations that exceed the design limits, which result in final effluent not meeting required standards.	Upgrade the WWTW in order to increase the hydraulic and organic design capacity and to ensure compliance with final effluent standards.
Unauthorised overflow from secondary ponds	Upgrade the WWTW in order to ensure no unauthorised discharge.
The ponds are filling up with sludge and silt over time, which impact on the capacity of the plant and the quality of the effluent.	Remove accumulated sludge / silt from ponds.
Chatsworth WWTW and drainage network	
Final effluent not meeting required standards due to the current flow that exceed the design capacity (PA).	Upgrade oxidation pond system
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried out, etc.)	Control forms and Inspection forms to be implemented.
Flow and load variations that exceed the design limits, which result in final effluent not meeting required standards.	Upgrade the WWTW in order to increase the hydraulic and organic design capacity and to ensure compliance with final effluent standards.
The ponds are filling up with sludge and silt over time, which impact on the capacity of the plant and the quality of the effluent.	Remove accumulated sludge / silt from ponds.
Kalbaskraal WWTW and drainage network	
Final effluent not meeting required standards due to organic overloading or high sludge levels in the ponds or both (PA).	Ponds should be cleaned and the sludge removed from the bottom.
Inefficient / inadequate / inappropriate Process Control, due to lack of documentation available at works (WULA, SOPs, O&M Manuals, Incident recording, Maintenance work carried out, etc.)	Control forms and Inspection forms to be implemented.

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Table 6.3.4. Summary of medium and high risks and recommended Improvement Plan as included in the W₂RAPs

Recalculated Priority Risks: (M) Medium / (H) High	Recommended Improvement Plan (Proposed Control Measures)
The ponds are filling up with sludge and silt over time, which impact on the capacity of the plant and the quality of the effluent.	Remove accumulated sludge / silt from ponds.

Improvement / Upgrade Plans were developed, as part of the W₂RAPs, for all the existing significant risks where the existing controls were not effective or absent and will be implemented by Swartland Municipality over the next few years.

An Incident Response Management Procedure is in place for the following incidents/emergencies with regard to the sewer drainage systems or the WWTWs.

- Network blockages (Also through Customer Complaints System)
- Sewer network breakages (Also through Customer Complaints System)
- Electricity failure (WWTWs/Network PS)
- Mechanical equipment failure (WWTWs/Network PS)
- Civil infrastructure failure (WWTWs)
- Human Injury / Fatality

The purpose of the Incident Response Management Protocol is to plan for failures and subsequent methods to address such failures. An incident is any situation where loss of control over the system occurs, or where there is any reason to suspect non-compliance or danger to the environment or a health risk. Significant deviations in the operational monitoring such as where critical limits are exceeded, is also referred to as an "incident".

Some incident triggers can include the following:

- Non-compliance with operational monitoring criteria;
- Inadequate performance of a sewage treatment plant discharging to source water;
- Spillage of a hazardous substance into source water;
- Sewer losses during reticulation and pumping of wastewater – not arriving at treatment plant;
- Failure of the power supply to an essential control measure;
- Extreme rainfall in a catchment;
- Detection of unacceptable levels of metals, ammonia, etc.;
- Unusual odour or appearance of returned effluent water;
- Detection of microbial indicator parameters, including unusually high faecal indicator densities and unusually high pathogen densities in returned effluent; and
- Public health indicators or a disease outbreak for which water is a suspect vector.

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Following any incident or emergency, an investigation should be undertaken involving all concerned staff. The investigation should consider factors such as:

- What was the cause of the problem?
- How was the problem first identified or recognised?
- What were the most essential actions required?
- What communication problems arose and how were they addressed?
- What were the immediate and longer-term consequences?
- How well did the emergency response plan function?
- Did the turnaround plan match the seriousness of the incident?
- Should documentation (e.g. SOPs) be updated or reviewed?

Appropriate documentation and reporting of the incident or emergency should also be established. The Municipality should learn as much as possible from the incident or emergency to improve preparedness and planning for future incidents. Review of the incident or emergency may indicate necessary amendments to existing protocols.

Swartland Municipality understands the importance of documentation and up-dated records of information as it becomes available, because it forms an essential part of their management processes. It enables the municipality to have control over the wastewater treatment systems, notice trends, taking effective corrective actions when non-compliance trends are noticed, etc. It also reduces the amount of work at the end of the operational year when the W₂RAPs are reviewed or when Green Drop Assessments takes place.

A set of Compliance Alert Levels, corresponding to the requirements of the Licences and the General Authorisations is in place and monitored on a monthly basis. **The proposed Operational Alert Levels, as included in Table 6.3.2.1, should be used by Swartland Municipality to ensure that the various unit processes in the plants perform optimally.** If these pre-determined Alert Levels are exceeded at any of the control points where samples are taken for operational purposes, specific actions need to be taken to bring the operational parameters back to within the target ranges.

6.3.1 Reporting on Quality of Water Taken From Source: Urban and Rural

Regular sampling and reporting is part of Swartland Municipality's operating procedures and the Municipality is committed to ensure that the results are given through to the DWS. Swartland Municipality realises the importance of good communication with its inhabitants in the various towns to ensure consumer trust and confidence. Total transparency is therefore one of the main objectives when public notifications are distributed. High on the list of priorities in these communications is regular communication on water quality and in particular how efficient the water treatment plants performs and whether the required standards are met.

Swartland Municipality therefore understands the importance of involving community members on a regular basis and not only when there is a crisis. Community Members should be made aware of safe handling of water, hygienic sanitation practices and how to conserve and not misuse water. Good communication ensures consumer trust and confidence.

Swartland Municipality makes their water quality results available to the inhabitants in their Management Area through their annual WSDP Performance and Water Services Audit Report. The water quality notifications or reports can also be inserted in one or more of the following media used for communicating with the public: the municipality's website, newsletters accompanying the bills and the local newspapers. Swartland Municipality will also make this information available to the learners at the local schools in the

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future, so that they can learn about the importance of effective water quality management. Involving the public at every stage means:

- Making monitoring results or summaries available and easily accessible, such as on the Internet or via newsletters and public fora;
- Notifying the public about risks to their health and what the WSA is doing to address the risks;
- Issuing regular reports about drinking water systems, including improvements and areas that need further attention;
- Educating the public on a number of issues, including: the benefits of disinfection over the risks of microbiological contamination and disease, the difference between health-related and aesthetic drinking water quality failures and the true cost of providing safe drinking water;
- Incorporating public consultations into decision-making processes which affect public health, including the development process for new guidelines and regulations, and
- Education about water resource protection and conservation issues.

Percentage compliance to Drinking Water Acceptable Limits:

Swartland Municipality is committed to continue with the taking of chemical and bacteriological samples on a monthly basis at all sample sites as included in their Water Quality Monitoring Programme. The Municipality will also continue with the loading of the compliance sampling results onto DWS's IRIS on a monthly basis. The Water Safety Plans and detail WTW Process Audits include various recommendations to further improve the overall water quality compliance percentages for the various towns, which will be implemented by the Municipality.

The target towards which Swartland Municipality needs to work is 99% Compliance for microbiological results and at least 95% compliance for chemical results. DWS's requirements and penalties for drinking water quality compliance are included in Table 6.3.2 of the Administration, Information and Comprehensive Overview Report.

Number of Monitoring Points for Drinking Water Sufficient:

See Table 8.1.7.2 under Section 8.1.7 of the Administration, Information and Comprehensive Overview Report for the proposed additional water quality samples to be taken by Swartland Municipality.

Swartland Municipality need to continue with the analysing of the following water quality constituents to optimise treatment processes for drinking water quality.

Table 6.3.1.1: Water quality constituents to be analysed to optimize treatment processes for drinking water quality.	
Physico-Chemical	Microbiological (Recommended when physico-chemical constituents indicate a loss of process control)
• pH (Taste, corrosivity) • Turbidity (turbidity indicates poor water treatment, cross-contamination and / or corrosion, and is problematic in that it prevents effective disinfection). • Water treatment residual chemicals and disinfectants (for example, aluminium from aluminium sulphate dosing, free chlorine residual from disinfection via chlorination).	• Total coliforms (evaluation of the efficiency of water treatment processes, microbial growth in the distribution system or post-treatment contamination of drinking water); • Faecal coliforms or E.coli (water is contaminated with faecal waste of human or animal origin).

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Swartland Municipality need to continue with the implementation of the O&M Manuals at all their WTWs. Examples of preventative and corrective actions for which operational procedures should be documented include the following:

- Selection of alternate raw water source if available;
- Altering plant flow rate (for example, by reducing the loading on the works, but managed to ensure ability to supply demand);
- Jar testing for coagulant control and optimisation;
- Altering mixing intensity, changing treatment chemicals;
- Adjusting pH;
- Varying chemical feed rates and feed points;
- Adjusting filtration loading rate and / or operation;
- Adjusting the frequency and manner of backwashing cycles of the filters;
- Implementation of a filter evaluation and maintenance programme;
- Increasing disinfectant dose; secondary / booster disinfection;
- Mains flushing, cleaning and localised disinfection, and
- Developing standard operating procedures for handling leakages and pipe breakages.

It is also important to note that all operational manuals of treatment unit processes such as chemical dosing, coagulation sedimentation, filtration, disinfection etc. should contain operational limits, monitoring programmes, verification procedures and pre-determined corrective actions.

Monitoring data provide important feedback on how the water supply system is working and should be frequently assessed. The strategies and procedures for monitoring the various aspects of the water supply system should always be documented. Monitoring plans should include the following:

- **Parameters to be monitored.**

Operational and Compliance Monitoring: Parameters included in Swartland Municipality's Sampling Programmes.

- **Sampling location and frequency**

Operational and Compliance Monitoring: Location and frequency of samples to be taken are included in the Municipality's Operational and Compliance Sampling Programmes.

- **Sampling needs and equipment**

Operational Monitoring: The Plant Superintendents at the two WTWs (West Coast District Municipality) ensure that adequate equipment is available at the WTWs for the operational monitoring.

Compliance Monitoring: Samples are analysed by the West Coast District Municipality's own laboratory and bi-annual full SANS 241 analysis by an accredited external laboratory. Swartland Municipality's samples are analysed at an external accredited laboratory.

- **Schedules for sampling**

Operational Monitoring: Existing schedules are available at the two WTWs and recorded by the Process Controllers (West Coast District Municipality).

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Compliance Monitoring: Recorded by the West Coast District Municipality's own laboratory and full SANS 241 analysis is recorded by the external laboratory and given through to the West Coast District Municipality. Swartland Municipality's samples are analysed at an external accredited laboratory. The Compliance sample results are loaded onto DWS's IRIS.

- **Methods for quality assurance and validation of sampling results.**

Operational Monitoring: The Chemical Technician and the Plant Superintendent ensures that the correct techniques are used for the operational sampling and that the laboratory equipment is properly calibrated (West Coast District Municipality).

Compliance Monitoring: External Service Provider for Swartland Municipality's samples (Accredited Laboratory is used).

- **Responsibilities and necessary qualifications of staff.**

Operational Monitoring: The Plant Superintendents and Process Controllers at the two WTWs are responsible for the operation of the plants and for the taking of the necessary samples.

Compliance Monitoring: Samples for the two bulk systems are analysed by the Chemical Technician at the West Coast District Municipality's own Laboratory. Swartland Municipality's samples are done by an External Accredited Laboratory.

- **Requirements for documentation and management of records including how monitoring of results will be recorded and stored.**

Operational Monitoring: The records are currently documented, managed and stored at the two WTWs and the records are only given through to the Chemical Technician on request. The operational sampling records are not yet captured electronically.

Compliance Monitoring: The records are documented and recorded at the West Coast District Municipality's own laboratory and the bi-annual full SANS 241 analysis done by the external laboratory are given through to the Chemical Technician in electronic format. Swartland Municipality's records are documented and recorded at the external laboratory and also given through to the Municipality in electronic and hard copy format.

- **Requirements for reporting and communication of results.**

Operational Monitoring: The records for the two bulk water distribution systems are reported and communicated to the Chemical Technician and the Operational Manager by the Plant Superintendents on request.

Compliance Monitoring: The West Coast District Municipality's and the Swartland Municipality's compliance sample results are loaded onto DWS's IRIS.

6.3.2 Quality of Water Returned to the Resource: Urban

The municipality does operational and compliance monitoring of the effluent at all their WWTWs according to a comprehensive operational and compliance monitoring program, which meets the minimum requirement of DWS as stipulated in the Green Drop certification criteria. Operational sampling is done on a frequent basis by the treatment plant personnel at the various WWTWs. Compliance sampling is done by and external accredited laboratory.

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To ensure that the WWTWs of Swartland Municipality functions optimally and produces final effluents that comply with the requirements of the Water Act on a continuous basis, it is necessary to ensure that three important aspects are checked on a regular basis:

- Condition of infrastructure
- Correct and sustainable functioning of mechanical and electrical equipment and instrumentation.
- Whether the unit treatment processes are operated within the prescribed operational parameters.

It is therefore recommended that Swartland Municipality undertake the following regular inspections and audits:

- Annual Detailed Audit of Assets, Infrastructure and Wastewater Section Personnel.
- Annual Monitoring of the Wastewater Treatment Plants (Treatment Processes).

Annual Detailed Audit of Assets, Infrastructure and Wastewater Section Personnel:

This audit may be carried out by the Municipality's own personnel or external Asset Management Consultants. It comprises a survey and inspection of all the wastewater collection, treatment and disposal infrastructure (civil works, mechanical equipment, buildings, grounds), and updating the existing asset register. Of particular importance is recording the condition of the infrastructure, reassessing the useful life time of the same, and controlling whether the scheduled maintenance tasks have been performed.

The organogram of the wastewater treatment should also be updated, with specific attention being paid to the required number and qualifications of personnel required by DWS at each wastewater treatment plant under their new Regulation 3630 (June 2023). The organogram should be aligned with the following two programmes of the municipality:

- Skills Development Programme
- Career Path Planning

Where there are gaps in the organogram related to the DWS requirements, these should be included in the WSDP and Skills Development Programmes of Swartland Municipality.

Annual Monitoring of the Wastewater Treatment Plants:

These monitoring visits should comprise an audit of all the operational practices at the treatment plant and an assessment of the performance of the different unit processes observations, taking samples at various points in the treatment train, and comparing the results with the target levels set for each process.

Samples are typically taken of the following (and analysed for the parameters indicated in parenthesis):

- Raw sewage (COD, TKN, TP, pH, alkalinity, EC, ammonia, metals (if industrial effluents present))
- After Primary settling (COD, pH, EC)
- After biofilters (COD (filtered), ammonia (filtered), pH)
- After humus tanks (COD, TSS, ammonia, pH)
- In activated sludge reactor (MLSS, VMLSS, DO, DSVI, pH, COD (filtered), ammonia (filtered); nitrate (filtered))
- After secondary settling tanks (COD, ammonia, TSS, DO)
- After maturation ponds (COD, ammonia, pH, TSS)
- Final effluent (COD, ammonia, nitrate, orthophosphate, TSS, pH, EC)

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The Annual Process Audits could typically be carried out by a wastewater treatment specialist.

It is further recommended that Swartland Municipality also undertake their own internal process audits from time to time, and the Water Research Commission guideline document Guideline for the Inspection of Wastewater Treatment Works, Boyd and Mbelu, 2008, that was developed to assist municipalities with these inspections. The following is an excerpt from this guideline document, indicating the aims and rationale for various types of inspections as may be required for the various WWTWs in Swartland Municipality's Management Area:

PURPOSE OF THE GUIDELINE DOCUMENT:

This guideline document deals with the requirements for undertaking an inspection at a WWTW. The purpose of the guideline document is to:

- *Assist the Process Controller to:*
 - *prepare for an inspection at the WWTW; and*
 - *take corrective action where a problem is identified.*
- *Assist the Inspector to:*
 - *undertake an inspection at a WWTW; and*
 - *give guidance where a problem is identified.*

The guideline describes checklists for those unit processes that are most frequently encountered at South African WWTW. A list of proposed additional reading material that every WWTW should have on site is set out in Appendix A of the guideline.

OVERVIEW OF THE GUIDELINE

Part I: Guidelines

Part I of the document sets out a guideline for undertaking an inspection at a WWTW to support the checklists set out in Part II. The guideline sets out the why, what and how of undertaking an inspection for various performance areas and lists performance indicators to guide the Inspector.

This section gives the Inspector, the Process Manager and the Process Controller a better understanding of the importance of the inspection, whether it is a daily visual inspection or a more comprehensive external or internal inspection. It is important to note that this section should be read in conjunction with a reputable handbook, such as those set out in Appendix A, for the operation of a WWTW.

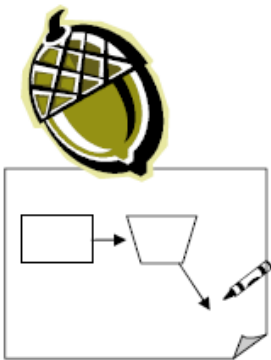
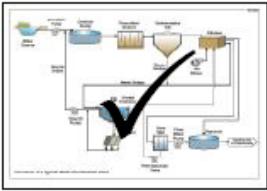
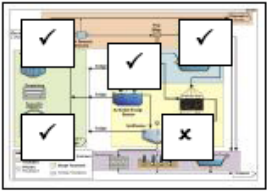
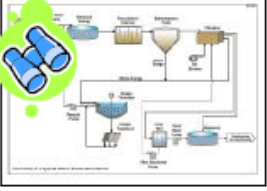
Part II: Checklists

Part II of this document sets out checklists that should be completed at various times throughout the year, depending on the operational status of the WWTW.

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The table below sets out the various checklists and when they should be used.

Checklist	When should the checklist be used?
1 <i>The WWTW in a nutshell</i> 	This checklist will help the person undertaking the inspection to get an understanding of the unit processes making up the WWTW and should be undertaken with the Process Manager. • All Process Managers and Process Controllers should complete this checklist when commencing employment at the WWTW and again if any upgrades are done to the works. External Inspectors should complete this checklist prior to undertaking an inspection. Examples of flow diagrams of various configurations are set out in Appendix B and C.
2 <i>Primary Assessment</i> 	This checklist gives an overall evaluation of the WWTW. • The inspection should be undertaken by an experienced person, preferably external to the WWTW who will make a decision on whether the comprehensive inspection needs to be undertaken or not.
3 <i>Comprehensive Inspection</i> 	This checklist includes individual checklists for each unit process. It should be used by the regulators and other Inspectors (both external and internal) when a WWTW has failed the primary assessment i.e all aspects have failed or certain parts of the WWTW have serious failures. This checklist will aid in the identification of the problems and will help to make improvements.
4 <i>Quarterly Inspection</i> 	This inspection should be undertaken quarterly once the WWTW has been subjected to a comprehensive inspection and/or primary assessment, and has been deemed to be running optimally. Ideally the regulator should undertake this inspection, however the Process Manager or Process Controller could also undertake this inspection.

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Industrial Consumers: Swartland Municipality can promote WDM activities at the wet industrial consumers in order for them to potentially lower their current water demand by means of improved practices or reuse of waste water. The revenue could potentially decrease as a result of re-use practices. It is suggested that a detailed financial analysis should be conducted as part of the investigation into wastewater re-use.

Swartland Municipality can encourage the large users to implement suggested re-use practices by means of incentives, informative billing to communicate monthly water consumption and monitoring and communicating actual savings achieved.

All industries formally apply for the discharge of industrial effluent into the Municipality's sewer system. The quality and volume of industrial effluent discharged into the sewer system are monitored by the Municipality, in order to determine whether the quality comply with the standards and criteria. It is also necessary to consider limits above which volumetric monitoring will be necessary at new industries and existing smaller industries, where expansion is likely to take place. The Municipality needs to continue to ensure that all industrial consumers apply for discharge permits and they must supply and maintain a flow meter measuring the volume of water that is discharged into the sewer system. It is also recommended that the accounts generated by the Municipality include for each cycle a summary of the COD and flow results to enable industries to keep a record and look at ways of improving where possible.

Swartland Municipality is committed to ensure that no industrial effluent is discharged into the sewer system unless it complies with the standards and criteria, as included in the by-laws ("Limits of concentrations of substances that may be discharged into the Swartland Municipality's sewer system").

Percentage compliance to Effluent Release Acceptable Limits:

Swartland Municipality will continue with the implementation of their Operational and Compliance Sampling Programmes at all their WWTWs. The target towards which Swartland Municipality needs to work is at least 90% compliance against critical criteria as included in the license or General Authorisation for the plant. DWS's requirements and penalties for effluent quality compliance are included in Table 6.3.3 of the Administration, Information and Comprehensive Overview Report. The final effluent quality compliance percentages, for the last three financial years, are included in Tables 6.3.2.2 to 6.3.2.4 of the Administration, Information and Comprehensive Overview Module. The Municipality's W₂RAPs and detail WWTW Process Audits include various recommendations to further improve the overall wastewater quality compliance percentages for the various WWTWs, which will be implemented by the Municipality.

The purpose of the W₂RAP and the upgrading of the WWTW are to reduce the CRRs of the WWTWs even further and to improve the quality of the effluent discharged from the various WWTWs.

Number of Monitoring Points for Effluent Release Sufficient:

Swartland Municipality's existing Operational and Compliance Sampling Programmes are included in Tables 8.1.9.2 and 8.1.9.3 of the Administration, Information and Comprehensive Overview Report. **The Municipality's existing Operational and Compliance Sampling Programmes for the various WWTWs are adequate and no additional sampling points are recommended.**

The current Operational Alert Levels should be checked regularly by the municipality in order to ensure that the various unit processes in the plant performs optimally. If these pre-determined Alert Levels are exceeded at any of the control points where samples are taken for operational purposes, then certain actions should be taken to bring the operational parameters back to within the target ranges.

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The proposed Operational Alert Levels for the various WWTWs and the corresponding actions that should be taken when these levels are reached or exceeded are included in the table below.

Table 6.3.2.1: Recommended operational alert levels for the various WWTWs		
Operational Samples	Alert Level	Actions to be taken
Activated Sludge Systems (Recommended)		
Raw Sewage	COD > 1 000 mg/L Ammonia > 100 mg/L as N 5.5 > pH > 9.5 EC > 150 mS/m Settling Solids > 20 mL/L	- Check for possible illegal industrial effluent discharge. - Do more frequent measurements of DO levels, pH and MLSS in the activated sludge reactor.
At outlet of bioreactor	DO < 0.5 mg/L	Increase aeration capacity or cycles.
	MLSS < 2 000 mg/L	Reduce discharge of WAS and allow MLSS levels to increase to 4 000 mg/L.
	MLSS > 6 000 mg/L	Gradually waste more sludge on a daily basis to reduce the MLSS to 4 000 mg/L.
	pH < 7.0	- Add lime to the inlet works to maintain the pH in the reactor at 7.0 or slightly above. - Check denitrification process.
Secondary settling tank	COD > 75 mg/L	- Check for sludge carry over from secondary settling tanks. - Check RAS recycle rates. - Check for bulking sludge. - Check for rising sludge. Take action to rectify as appropriate
Oxidation Pond Systems (Recommended)		
Raw Sewage	COD > 1 000 mg/L Ammonia > 100 mg/L as N 5.5 > pH > 9.5 EC > 150 mS/m Settling Solids > 20 mL/L	Check for possible illegal industrial effluent discharge.
Tertiary Pond	COD > 400 mg/L Ammonia > 100 mg/L as N 6 > pH > 9 EC > 200 mS/m SAR > 5 Faecal Coliforms > 100 000 per 100ml	Aerate ponds or provide additional ponds for a total retention period of 25 days.

Samples to be monitored at the WWTWs must include inflow, outflow, process flows, industrial effluent and sludge. Determinants and frequencies as required by the Licence or General Authorisation or as per best practice: Low end techn / small size = 1x / month, medium techn / size = 1x / week and high techn / macro size = 1x / day.

6.3.3 Quality of Water Returned to the Resource: Rural

This function is with the EHPs of the West Coast District Municipality and the quality of the water returned to the Water Resource system in the rural areas is not monitored by Swartland Municipality.

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6.3.4 Pollution Contingency Measures Plan

Swartland Municipality will continue to undertake the following measures to prevent pollution of the Water Resource Systems.

- Investigating all sewage pump stations to ensure that emergency storage capacities and backup generators are available at the sewage pump stations, to prevent any possible spillages.
- Timeous upgrading of the WWTWs, to handle both volume and nutrient loading, in order to reduce the risk of spills and sub-standard effluent.
- Regular monitoring of treated effluent discharged to the Water Resource System at all the WWTWs.
- Enforcing their Water Supply, Sanitation Services and Industrial Effluent By-law.

Swartland Municipality is also committed to regularly update their W₂RAPs, in order to reduce the CRRs of the various WWTWs even further. The Wastewater Risk Ratings for the various WWTWs, from which the trends can be noted, are included in Table 6.3.7.2.

6.3.5 Quality of Water Taken from Source: Urban – Percentage Monitored by WSA

The raw water quality monitored by Swartland Municipality and the West Coast District Municipality is indicated in the Water Quality Sampling Programmes included in Table 8.1.7.2 and Table 8.1.7.3 under Topic 8 of the Administration, Information and Comprehensive Overview Report. The additional sampling required is also indicated in the table.

6.3.6 Quality of Water Taken from Source: Rural – Percentage Monitored by WSA

Swartland Municipality will not be involved in any water quality monitoring on the farms in the rural areas, where the farmers utilise their own water sources. This function is with the EHPs of the West Coast District Municipality and they take samples on the farms when requested by the farm owners.

6.3.7 Quality of Water Returned to the Source: Urban – Percentage Monitored by WSA

Swartland Municipality is committed to focus on the timeous upgrading of the WWTWs, to handle both volume and nutrient loading, in order to reduce the risk of spills and sub-standard effluent. The table below gives an overview of the design and operating capacities of the WWTWs as included in DWS's 2022 Green Drop Report and the design and operating capacities as included in the WSDP.

Table 6.3.7.1: Design and operating capacities of the various WWTWs						
WWTW	DWS's 2022 Green Drop Report			WSDP		
	Hydraulic Capacity (Ml/d)	Operating Flow (Ml/d)	% Operational i.t.o. Capacity	Hydraulic Capacity (Ml/d)	Operating Flow 22/23 (Ml/d) *	% Operational i.t.o. Capacity
Malmesbury	10.000	5.300	53.0%	10.000	5.807	58.07%
Kalbaskraal *	0.157	0.075	48.0%	0.157	0.084	53.50%
Riverlands/Chatsworth *	0.270	0.246	91.0%	0.270	0.341	126.30%
Moorreesburg	1.500	1.095	73.0%	2.000	1.234	61.70%
Riebeek Valley	1.900	0.836	44%	1.900	0.800	42.11%
Koringberg *	0.030	0.082	273%	0.030	0.090	300.00%
Darling	1.500	1.245	83.0%	1.500	1.307	87.13%

Note: * Calculated as a percentage of billed metered consumption, because there are no flow meters at the oxidation pond systems.

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The DWS also followed a risk-based regulatory approach that provides early warning signs of WWTWs that contain a certain measure of risk, and in directing the type of intervention required to manage and mitigate the identified risk and move to a more favourable position of compliance and ultimately, excellence. The current Cumulative Risk Ratios (CRR = A*B+C+D) of the WWTWs in Swartland Municipality's Management Area, as calculated by the DWS during 2011, 2013, 2022 and 2023 were as follows:

Table 6.3.7.2: Cumulative Risk Ratio of the various WWTWs (% Deviation = Actual CRR / Max CRR)				
WWTW	2011	2013	2022	2023
Malmesbury	83.0%	71.0%	36.4%	40.9%
Kalbaskraal	72.0%	35.0%	23.5%	66.7%
Riverlands/Chatsworth	72.0%	59.0%	70.6%	66.7%
Moorreesburg	61.0%	53.0%	76.5%	76.5%
Riebeek Valley	67.0%	59.0%	23.5%	70.6%
Koringberg	56.0%	53.0%	88.2%	83.3%
Darling	72.0%	53.0%	29.4%	64.7%

Note: Low < 50%, Medium 50% - < 70%, High 70% - < 90%, Critical 90% - 100%

Currently the DWS is working towards a revised Cumulative Risk Ratio which is as follows:

$CRR_r = CRR * H * I$, where

H = Environmental Sensitivity Weighting

I = Effective Management Weighting (Green Drop Score)

Swartland Municipality therefore needs to address the following, in order to further reduce their current CRR.

- Forward planning and upgrading / refurbishment of treatment plants to ensure adequate capacity for the flows received;
- Operate and maintain the WWTWs within design- and equipment specifications;
- Have trained, qualified and registered staff in place;
- Get mentoring / coaching contracts in place where there is a great demand for adequately skilled process controllers and supervision;
- Monitoring of flow to- and from the plants;
- Sampling and monitoring of effluent quality;
- Appropriate authorisation in accordance with the National Water Act (36 of 1998); and / or
- Where plant is overloaded, introduce unorthodox methods to ensure enhancement of effluent quality.

Swartland Municipality works towards improving the quality of the treated effluent discharged from their various WWTWs and W₂RAPs are in place for all their WWTWs.

6.3.8 Quality of Water Returned to the Source: Rural – Percentage Monitored by WSA

Swartland Municipality will not be involved in any water quality monitoring on the farms in the rural areas, where water is returned to the Water Resource System. This function is with the EHPs of the West Coast District Municipality.

6.3.9 Water Quality Results Available in Electronic Format?

Swartland Municipality is committed to ensure that all water quality and final effluent quality sample results are loaded onto DWS's IRIS as required for the Blue and Green Drop Assessment Processes.

6.3.10 Percentage Time (Days) within SANS241 Standards per Year

See Table 8.1.7.5 for the summary of the July to June water quality compliance percentages for the last three financial years for each of the water distribution systems. Swartland Municipality will continue to include their water quality compliance percentages for each financial year in their annual WSDP Performance and Water Services Audit Report.

6.4 OPERATION

Volumes are registered on the DWS's WARMS for the various resources. A registered water use however does not guarantee that the water use is accurate or lawful. Validation and verification of the accuracy and lawfulness of the water use is needed to qualify as an Existing Lawful Use. **It is important for the municipality to confirm the correct registration volumes and existing lawful use volumes for all their sources. This information, with the safe yields of the surface and groundwater sources, is critical to accurately determine which sources need to be augmented for the different schemes. Swartland Municipality further needs to continue to ensure that all the individual sources are metered and that the abstraction volumes are recorded on at least a monthly basis.**

7. FINANCIAL PROFILE

One of the goals of the Sector is that all water services providers are accountable, cost-effective, efficient, and viable, and implement appropriate employment and gender equity policies. The WSA can influence the financial viability of water services and water services providers through the following mechanisms:

- Investment choices
- Choices related to the use of the local government equitable share
- Tariff policy and the setting of tariffs
- Credit control policies and revenue management
- The contract (service delivery agreement) between the water services authority and an external water services provider, specifically the service obligations and the financial conditions of the agreement.

The following policies are in place and available on Swartland Municipality's Website.

- | | |
|---|---|
| • Asset Management Policy | • Supply Chain Management Policy |
| • Budget Implementation Policy | • Summary Swartland SD Policy and Strategy |
| • Cash Management and Investment Policy | • Swartland Fraud Prevention & Anti-Corruption Strategy |
| • Cost Containment | • Swartland Human Settlement Plan 2014 - 2017 |
| • Credit Control and Debt Collection By-law and Policy | • Swartland Municipal Social Development Policy and Strategy |
| • Debt and Borrowing Policy | • Swartland Municipal Social Development Policy And Strategy 2013 Addendums Supplementary To Document |
| • Expanded Public Works Programme Policy | • Tariff Policy |
| • Final Rewards Policy | • Travel-Accommodation-and-Subsistence Policy |
| • Financial by-law | • Virement Policy |
| • Fleet Management Policy | • Insurance Management Policy |
| • Funding and Reserve Policy | • Unauthorised Irregular Fruitless Expenditure Policy |
| • Indigent Policy | |
| • Management and administration of immovable municipal property | |
| • Policy and procedures for ward committees | |
| • Property Rates By-law and Policy | |

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS
TOPIC 7: FINANCE

7.1 EXPENDITURE

7.1.1 Ratios and Efficacy Indicators

The table below indicates the key financial indicators and ratios as included in the 2023/2024 MTREF Budget.

Table 7.1.1.1: Financial Performance Indicators and benchmarks					
Financial Indicator	Basis of Calculation	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Borrowing Management					
Capital Charges to Operating Expenditure ⁽⁶⁾	Interest & Principal Paid / Operating Expenditure	2.4%	2.2%	2.4%	2.6%
Capital Charges to Own Revenue	Finance charges and repayment of borrowing / Own Revenue	-	-	-	-
Borrowed funding of "own" capital expenditure	Borrowing / Capital expenditure excl. transfers and grants and contributions	0.0%	0.0%	48.4%	0.0%
Safety of Capital					
Gearing	Long Term Borrowing / Funds and Reserves	32.8%	24.8%	30.6%	24.3%
Liquidity					
Current Ratio	Current assets / Current liabilities	6:1	6:1	6:1	7:1
Current Ratio adjusted for aged debtors	Current assets less debtors > 90 days/current liabilities	-	-	-	-
Liquidity Ratio ⁽¹⁾	Monetary Assets / Current Liabilities	6:1	5:1	6:1	6:1
Revenue Management					
Annual Debtors Collection Rate (Payment level %)	Last 12 months receipts / Last 12 months billing	97.0%	97.0%	97.0%	97.0%
Creditors Management					
Creditors System Efficiency ⁽⁵⁾	% of Creditors paid within terms	100.0%	100.0%	100.0%	100.0%
Creditors to Cash and Investments		-	-	-	-
Other Indicators					
Electricity Distribution Losses	Total volume losses (kW)	12096519	12117484	12481009	12855439
	Total cost of losses	17308534	20490666	23564266	27098905
	% Volume (units purchased and generated less units sold/units purchased and generated)	6.0%	6.0%	6.0%	6.0%
Water Distribution Losses	Total volume losses (KI)	857395	865969	891948	918706
	Total cost of losses	5538772	6096421	6401242	6721305
	% Volume (units purchased and generated less units sold/units purchased and generated)	21.0%	21.0%	21.0%	21.0%
Employee Costs ⁽⁷⁾	Employee costs / (Total Revenue – Capital Revenue)	29.3%	29.2%	27.8%	25.1%
Remuneration	Total remuneration / (Total Revenue – Capital Revenue)	30.4%	30.3%	28.8%	26.0%
Repairs and Maintenance ⁽⁸⁾	R&M / (Total Revenue excluding Capital Revenue)	6.5%	6.1%	5.7%	5.9%
Finance Charges and Depreciation	FC&D / (Total Revenue – Capital Revenue)	12.0%	11.7%	12.2%	10.7%
IDP Regulation Financial Viability Indicators					
Debt Coverage ⁽⁴⁾	Total Operating Revenue – Operating Grants) / Debt service payments due within financial year)	18.1	17.2	17.6	20.6

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

TOPIC 7: FINANCE

Table 7.1.1.1: Financial Performance Indicators and benchmarks

Financial Indicator	Basis of Calculation	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
O/S Service Debtors to Revenue ⁽³⁾	Total outstanding service debtors / annual revenue received for services	11.1%	11.3%	11.5%	11.4%
Cost Coverage ⁽²⁾	(Available cash + Investments) / monthly fixed operational expenditure	9.7	10.0	10.4	9.0

Source: Medium Term Revenue and Expenditure Framework for Swartland Municipality 2023/2024: Table SA8 – Performance indicators and benchmarks

Notes:

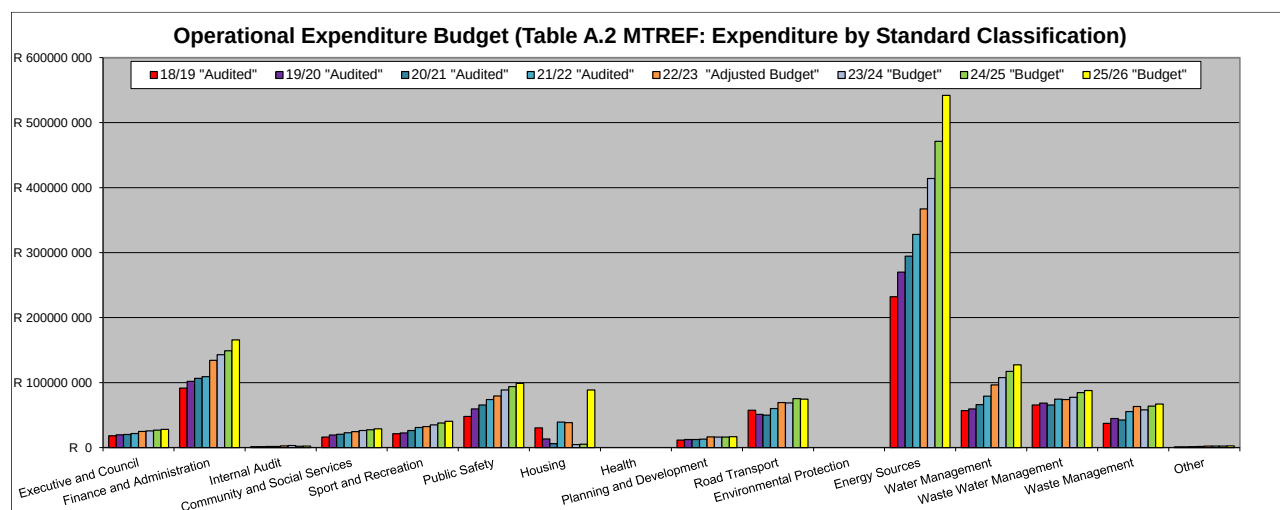
- (1) **Liquidity Ratio:** Measures the municipality's ability to pay its bills and is calculated by dividing the monetary assets (due within one year) by the municipality's current liabilities. A higher ratio is better.
- (2) **Cost Coverage:** It explains how many months expenditure can be covered by the cash and other liquid assets available to the Municipality excluding utilisation of grants.
- (3) **Outstanding Service Debtors:** Measures how much money is still owed by the community for water, electricity, waste removal and sanitation compared to how much money has been paid for these services. It is calculated by dividing the total outstanding debtors by the total annual revenue. A lower score is better.
- (4) **Debt Coverage:** The number of times debt payments can be accommodated within Operating revenue (excluding grants). This in turn represents the ease with which debt payments can be accommodated by the municipality.
- (5) **Creditors System Efficiency:** The proportion of creditors paid within terms (i.e. 30 days). This ratio is calculated by outstanding trade creditors divided by credit purchases.
- (6) **Capital Charges to Operating Expenditure:** Is calculated by dividing the sum of capital interest and principle paid by the total operating expenditure.
- (7) **Employee Costs:** Measures what portion of the revenue was spent on paying employee costs. It is calculated by dividing the total employee cost by the difference between total revenue and capital revenue.
- (8) **Repairs and Maintenance:** This represents the proportion of the operating expenditure spent on repairs and maintenance.

7.1.2 Water Balance Cost / Revenue

See Topic 5 for the WC/WDM measures to be implemented by Swartland Municipality in order to reduce the current NRW and Water Losses for the various water distribution systems. The NRW and Water Losses are a direct loss of income for the Municipality. The Municipality's existing seven block stepped rising water tariff structure adequately discourages the wasteful or inefficient use of water.

7.1.3 Operating Cost

The following graph gives an overview of the historical and planned future operational expenditure budgets of Swartland Municipality.



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It is evident from the previous graph that the largest portion of the budget is spent on buying electricity from Eskom.

The future planned expenditure by type for Swartland Municipality, as included in the 2023/2024 MTREF Budget, is as follows.

Table 7.1.3.1: Expenditure items by type, as included in the 2023/2024 budget					
Expenditure Items	% of total 2022/2023 Expenditure	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Employee related costs	29.1%	R298 367 000	R316 394 000	R332 235 000	R351 024 000
Remuneration of Councillors	1.1%	R11 560 000	R12 081 000	R12 565 000	R13 067 000
Bulk purchase – Electricity	30.5%	R312 398 000	R356 097 000	R408 444 000	R476 654 000
Inventory Consumed	5.1%	R52 621 000	R61 034 000	R67 025 000	R74 197 000
Debt Impairment	3.1%	R31 448 000	R4 424 000	R5 138 000	R5 405 000
Depreciation and Asset Impairment	10.5%	R106 565 000	R112 614 000	R126 454 000	R131 662 000
Interest	1.5%	R15 565 000	R14 486 000	R18 879 000	R18 143 000
Contracted Services	10.7%	R109 982 000	R70 092 000	R68 966 000	R163 056 000
Transfers and Subsidies	0.4%	R4 607 000	R5 060 000	R5 018 000	R5 229 000
Irrecoverable debts written off	-	-	R32 910 000	R35 961 000	R39 121 000
Operational costs	5.1%	R52 718 000	R57 831 000	R60 361 000	R62 552 000
Losses on disposal of Assets	2.9%	R29 745 000	R16 413 000	R19 695 000	R16 741 000
Other Losses	-	-	R11 894 000	R13 392 000	R15 080 000
Total	100.0%	R1 025 576 000	R1 071 330 000	R1 174 133 000	R1 371 931 000

Source: Medium Term Revenue and Expenditure Framework for Swartland 2023/2024: Table A4 – Budgeted Financial Performance (Revenue and Expenditure)

7.1.3.1 Operating Costs: Water

The total estimated future operational costs for water services for the next three years are summarised in the table below.

Table 7.1.3.1.1: Estimated future operational costs for water services				
Description (Functional Classification)	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Water Management	R96 426 000	R107 650 000	R117 248 000	R127 435 000

Source: Medium Term Revenue and Expenditure Framework for Swartland 2023/2024: Table A2 –Budgeted Financial Performance (Revenue and Expenditure by Functional Classification)

7.1.3.2 Operating Costs: Sanitation

The total estimated future operational costs for sanitation services for the next three years are summarised in the table below.

Table 7.1.3.2.1: Estimated future operational costs for sanitation services				
Description (Functional Classification)	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Waste Water Management	R73 962 000	R77 428 000	R84 741 000	R87 863 000

Source: Medium Term Revenue and Expenditure Framework for Swartland 2023/2024: Table A2 –Budgeted Financial Performance (Revenue and Expenditure by Functional Classification)

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Maintenance activities have been increasingly focused on reactive maintenance as a result of the progressive deterioration and failure of old infrastructure. Consequently, there has been dilution of preventative maintenance of other infrastructure. Expenditure on repairs and maintenance does not keep track with the increase in asset values as well as the ageing of the infrastructure.

An Integrated Maintenance Plan is necessary that optimises maintenance activities, appropriate to its specific needs and the local environment, and identifies the systems and resources required to support this. A regime of planned preventative maintenance should be established for all infrastructure assets classified as critical and important in the Asset Register. Consideration should be given to the establishment of a maintenance management system to enable Swartland Municipality to better manage its risks, and more effectively plan and prioritise the wave of renewals that are going to be required over the next 20 years.

It is important to note that the maintenance budget requirements are going to increase substantially over the next twenty years in real terms, in line with the envisaged pace of development and the upgrading of the wastewater treatment works that were completed over the last number of years. It is estimated that the budget requirements will double over this period.

The recommendations for Swartland Municipality, with regard to their Operational Budgets, are as follows:

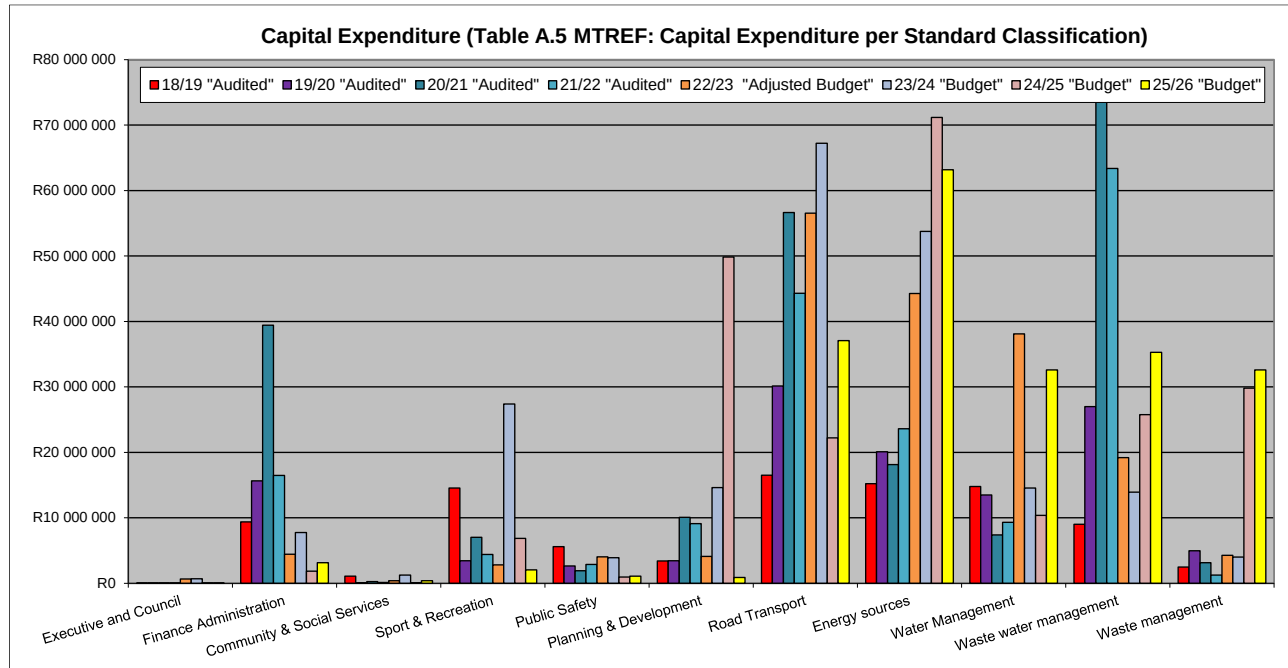
- Develop an AMP, which will indicate the real replacement values and service lives of the assets and the funds required to provide for adequate operation and maintenance of the infrastructure. Current gaps include unrealistically low depreciation charges, which have to be rectified and ring-fenced into an asset replacement fund, as well as additional budget requirements above inflation for infrastructure development.
- The new depreciation charges will have to form part of the operating budget and subsequent tariffs, linked to a ring-fenced asset replacement fund.
- It is critical for Swartland Municipality to ensure that sufficient funding is allocated towards an asset replacement fund, in order to ensure adequate rehabilitation and maintenance of the existing water and sewerage infrastructure.
- Water services operational surpluses have to be allocated to essential water services requirements in the future.
- Swartland Municipality needs to continue with the strict enforcement of their Credit Control and Debt Collection Policy and By-law.

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7.1.4 Capital Expenditure

The graph below gives an overview of the historical and planned future capital expenditure per Standard Classification for Swartland Municipality.



The future estimated capital expenditure per functional classification are summarised in the table below.

Capital Expenditure Standard	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Executive and Council	R651 000	R704 000	R24 000	R24 000
Finance Administration	R4 441 000	R7 740 000	R1 836 000	R3 152 000
Community and social Services	R408 000	R1 250 000	R100 000	R400 000
Sports and Recreation	R2 817 000	R27 390 000	R6 848 000	R2 035 000
Public Safety	R4 047 000	R3 899 000	R944 000	R1 086 000
Planning and Development	R4 114 000	R14 612 000	R49 844 000	R906 000
Road Transport	R56 533 000	R67 231 000	R22 223 000	R37 075 000
Energy Sources	R44 253 000	R53 741 000	R71 180 000	R63 157 000
Water Management	R38 109 000	R14 564 000	R10 383 000	R32 584 000
Waste Water Management	R19 204 000	R13 915 000	R25 759 000	R35 276 000
Waste Management	R4 262 000	R4 007 000	R29 826 000	R32 607 000
Total Capital Expenditure	R178 839 000	R209 053 000	R218 967 000	R208 302 000

Source: Medium Term Revenue and Expenditure Framework for Swartland 2023/2024: Table A5 - Capital Expenditure by Vote, Functional Classification and Funding Source

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The Opening Cost of the water and sewerage infrastructure that will need to be replaced over the next five years (RUL < 5 yrs) is R38.364 million. The asset renewal needs for the water infrastructure assets over the next ten years is R3.378 million per year. The reinvestment required is R28.394 million in the first five years and R5.391 million in the second five-year period. The age of 60.22% of the water infrastructure assets is greater than twenty years. The asset renewal needs for the sewerage infrastructure assets over the next ten years is R2.351 million per year. The reinvestment required is R9.970 million in the first five years and R13.544 million in the second five-year period. The age of 49.71% of the sewerage infrastructure assets is greater than twenty years. These values are based on the Opening Cost of the water and sewerage infrastructure currently included in the Asset Register. Table 4.1.10.3 however indicates the required annual budget for the replacement of the old water and sewerage infrastructure and the required annual O&M budget, which is based on the CRC of the water and sewerage infrastructure included in the WSDP.

The extent to which each type of water and sewerage asset portfolio has been consumed are summarised under Topic 3 in the Tables under Section 3.1.1 of the Administration, Information and Comprehensive Overview Report. The infrastructure components with low percentage figures (% BV/OC) need dedicated renewals programmes targeting these assets. If this is not done, there is the risk that the on-going deterioration will escalate to uncontrolled proportions, with considerable impact on consumers, the economy of the area and the service levels that can be provided in Swartland Municipality.

The recommendations for Swartland Municipality, with regard to their Capital Funding, are as follows:

- Take the recommended projects, as identified through the Water and Sewer Master Plans and the WSDP, into account during the planning and prioritization process for new infrastructure. Prioritize from the desired list, those items which can be implemented from available funding in the particular financial year.
- Undertake revised master planning at least every three to five years and to use the Master Plans to list the desired infrastructure development requirements and reflect these in the IDP.
- Assign a high priority to the implementation of the WC/WDM Strategy in order to postpone additional capital investment for as long as possible, both from the water availability perspective as well as from the treatment of increased effluent volumes. The costs of physical water loss, the capital requirements for new water resources infrastructure, and the constraints of poor water availability on water dependent economic growth means that WC/WDM is a critical management priority for stretching the financial resources of the Municipality. WC/WDM is almost always a more cost-effective solution than the implementation of new infrastructure, and no new infrastructure should be developed until unauthorized water has been reduced to manageable volumes.
- To adopt appropriate technology solutions for the water and sewerage infrastructure challenges. Techniques such as value engineering should also be adopted to ensure that investments in infrastructure and other solutions are cost effective over the full life-cycle and designed to be fit for purpose.
- To ensure adequate funding for the full lifecycle cost of the new water and sewerage infrastructure, which will include funds for the operation and maintenance of the infrastructure and regular refurbishment.
- Balance land-use and development planning (SDFs) in accordance with the availability of water and the capacity of WTWs and WWTWs that are in place or that will be implemented.
- To focus strongly on revenue collection, in order to improve the Municipality's own funding sources, over and above the Grants received from National and Provincial Government. The Municipality also needs to continue to actively implement their Credit Control and Debt Collection Policy in order to minimize the percentage of non-payment for municipal services.

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- To identify all possible sources of external funding over the next three years to assist Swartland Municipality to address the bulk infrastructure backlogs that exist in the various towns as indicated in the tables under Topic 3.
- Develop IAMPs for all water and sewerage infrastructure, which will indicate the real replacement values, the service life of the assets and the funds required to provide for adequate asset replacement. The renewals burden is set to increase sharply over the next 20 years and it is therefore important for Swartland Municipality to commit to a substantial and sustained programme of capital renewal works. The current level of expenditure on capital renewal is inadequate and there is a critical need for Council to commit to increase the budget for the maintenance and rehabilitation of the existing infrastructure substantially.

7.1.4.1 Capital Expenditure: Water

The future three year water capital infrastructure projects of Swartland Municipality are summarised in the table below (Draft 2024/2025 Capital Budget).

Table 7.1.4.1.1: Future water infrastructure capital projects			
Project	2024/2025	2025/2026	2026/2027
Water networks: Upgrades and Replacement	R2 000 000	R4 000 000	R4 000 000
Darling water network upgrades for housing project (SDW 2.4 & SDW 2.5, SDW 1.2 & SDW 2.1)	R2 855 286	-	R1 500 000
Moorreesburg water network upgrades for housing project (SMoW2.3)	R604 214	-	-
Water: Upgrading water reticulation network: PRVs, flow control, zone metering and water augmentation	R200 000	R800 000	R800 000
Upgrading: Ongegund Water Supply System (Reservoir and Pump Station)	-	R500 000	R4 500 000
Malmesbury SMW1.3 Wesbank Reservoir to Malm/Abbotsdale	R500 000	R800 000	R4 346 127
Malmesbury SMW1.4 Wesbank Reservoir to Malm/Abbotsdale	-	-	R10 753 982
Swartland System S2.1 Kasteelberg to Riebeek (D-line) Phase 1	-	-	R1 500 000
Swartland System S12.2 CoCT WTP to Swartland WTP pipe connection	-	R500 000	R1 500 000
Chatsworth / Riverlands upgrade bulk water supply	R500 000	R5 000 000	R15 099 335
Water reticulation and connection: Illinge Lethu	R2 083 221	-	-
Replace existing water pipe: Illinge Lethu	R4 074 921	-	-
Kalbaskraal Booster: Replace pumpsets	-	R480 000	-
Malmesbury Irrigation: Replace pumpsets	R500 000	-	-
Riebeek Kasteel: New Reservoir	-	-	R1 000 000
Mobile water pumps x 4 (replacement)	R150 000	-	-
Compactor replacement x 3	R280 000	-	-
Bulk water emergency spending	R500 000	R700 000	R800 000
Equipment: Water	R53 000	R55 000	R57 000
Connections: Water Meters (New/Replacements)	R940 993	R1 035 092	R1 138 602
Water CK10564 Toyota Hilux 3.0 D4D 4x4	-	-	R613 985
Water CK43172 Trailer	-	-	R48 875
Total	R15 241 635	R13 870 092	R47 657 906

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The future water capital requirements per system are summarised in the table below.

Table 7.1.4.1.2: Future water capital requirements per system	
Project	Cost
Swartland Bulk Water System	
CCT Voëlville WTW to Swartland WTW, Swartland WTW to Kasteelberg & Gouda (A, B & C lines)	R176 108 000
Kasteelberg to Riebeek Valley (D & E lines)	R22 945 000
Kasteelberg to Glen Lily and Moorreesburg (F & H lines)	R110 290 000
Glen Lily to Darling and Yzerfontein (I & J lines)	R250 923 000
Rural water schemes (Weltevrede, Langgewens, Goudapad 1 & WBK line)	R16 020 000
Upgrade Swartland WTW (Additional 36.4 Ml/d over two phases)	R728 000 000
Sub Total	R1 304 286 000
Withoogte Bulk Water System	
Withoogte to Moorreesburg and Koringberg (MB, WB & G lines)	R6 888 000
Rural water schemes (Goudapad 2, Koringberg Rural and Nootgedaght)	R56 714 000
Sub Total	R63 602 000
Malmesbury	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R40 725 000
Ensure adequate reservoir storage capacity (WMP)	R15 190 000
Ensure adequate water pump station capacity (WMP)	R2 663 000
Ensure adequate bulk water pipeline capacity (WMP)	R45 917 000
Sub Total	R104 495 000
Abbotsdale	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R25 850 000
Ensure adequate reservoir storage capacity (WMP)	R31 496 000
Ensure adequate water pump station capacity (WMP)	R4 315 000
Ensure adequate bulk water pipeline capacity (WMP)	R16 150 000
Sub Total	R77 811 000
Kalbaskraal	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R6 160 000
Ensure adequate reservoir storage capacity (WMP)	R12 172 000
Ensure adequate water pump station capacity (WMP)	R7 160 000
Ensure adequate bulk water pipeline capacity (WMP)	R2 101 000
Sub Total	R27 593 000
Chatsworth / Riverlands	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R13 804 000
Ensure adequate reservoir storage capacity (WMP)	R15 190 000
Ensure adequate water pump station capacity (WMP)	R1 008 000
Ensure adequate bulk water pipeline capacity (WMP)	R53 115 000
Sub Total	R83 117 000
Darling	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R10 533 000
Ensure adequate reservoir storage capacity (WMP)	R11 920 000
Ensure adequate water pump station capacity (WMP)	R512 000
Ensure adequate bulk water pipeline capacity (WMP)	-
Sub Total	R22 965 000
Koringberg	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R1 739 000
Ensure adequate reservoir storage capacity (WMP)	R5 040 000
Ensure adequate water pump station capacity (WMP)	-
Ensure adequate bulk water pipeline capacity (WMP)	-
Sub Total	R6 779 000

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Table 7.1.4.1.2: Future water capital requirements per system	
Project	Cost
Moorreesburg	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R17 320 000
Ensure adequate reservoir storage capacity (WMP)	-
Ensure adequate water pump station capacity (WMP)	R470 000
Ensure adequate bulk water pipeline capacity (WMP)	-
Sub Total	R17 790 000
Riebeeck Kasteel	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R8 083 000
Ensure adequate reservoir storage capacity (WMP)	R14 223 000
Ensure adequate water pump station capacity (WMP)	-
Ensure adequate bulk water pipeline capacity (WMP)	R563 000
Sub Total	R22 869 000
Riebeeck Wes	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R7 187 000
Ensure adequate reservoir storage capacity (WMP)	R5 040 000
Ensure adequate water pump station capacity (WMP)	R269 000
Ensure adequate bulk water pipeline capacity (WMP)	R1 552 000
Sub Total	R14 048 000
Ongegund	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R631 000
Ensure adequate reservoir storage capacity (WMP)	R3 206 000
Ensure adequate water pump station capacity (WMP)	R1 976 000
Ensure adequate bulk water pipeline capacity (WMP)	R891 000
Sub Total	R6 704 000
Yzerfontein	
Ensure adequate internal water reticulation capacity and Water Demand Management Items (WMP)	R5 764 000
Ensure adequate reservoir storage capacity (WMP)	-
Ensure adequate water pump station capacity (WMP)	-
Ensure adequate bulk water pipeline capacity (WMP)	-
Sub Total	R5 764 000
Total	R1 757 823 000

7.1.4.2 Capital Expenditure: Sanitation

The future three year sewer capital infrastructure projects of Swartland Municipality are summarised in the table below (Draft 2024/2025 Capital Budget).

Table 7.1.4.2.1: Future sewerage infrastructure capital projects.			
Project	2024/2025	2025/2026	2026/2027
Sewerage Works: Darling	-	R500 000	R500 000
Replace mobile generator	-	R380 000	-
Malmesbury WWTW: Replace clarifier mechanical equipment	R1 500 000	-	-
Upgrading of bulk collectors: Darling (SDS3.1)	R3 716 105	-	-
Upgrading of bulk collectors: Moorreesburg	R2 111 370	-	-
Sewer reticulation and connection: Illinge Lethu	R517 214	-	-
Equipment: Sewerage Telemetry	R40 000	R42 000	R44 000
Equipment: Sewerage	R34 000	R36 000	R38 000
Pipe Replacement: Obsolete Infrastructure	-	R1 500 000	R3 000 000
Schoonspruit: Pipe Replacement	R3 000 000	-	-

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Table 7.1.4.2.1: Future sewerage infrastructure capital projects.

Project	2024/2025	2025/2026	2026/2027
Abbotsdale: Rising main	-	-	R800 000
Riebeek Kasteel network upgrade, Master Plan SRkS1.2 & 1.3	-	-	R600 000
Sewerage: CK18526 Isuzu FSR750	R2 510 572	-	-
Total	R13 429 261	R2 458 000	R4 982 000

The future sewer capital requirements per system are summarised in the table below.

Table 7.1.4.2.2: Future sewer capital requirements per system

Project	Cost
Malmesbury and Abbotsdale	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R76 232 000
Ensure adequate sewer pump capacity (SMP)	R15 172 000
Sub Total	R91 404 000
Chatsworth / Riverlands	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R45 635 000
Ensure adequate sewer pump capacity (SMP)	R3 185 000
Upgrading of the WWTW	R7 000 000
Sub Total	R55 820 000
Kalbaskraal	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R13 680 000
Ensure adequate sewer pump capacity (SMP)	R4 853 000
Sub Total	R18 533 000
Darling	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R6 168 000
Ensure adequate sewer pump capacity (SMP)	R2 201 000
Upgrading of the WWTW	R37 500 000
Sub Total	R45 869 000
Koringberg	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R15 697 000
Ensure adequate sewer pump capacity (SMP)	-
Upgrading of the WWTW	R5 000 000
Sub Total	R20 697 000
Moorreesburg	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R25 247 000
Ensure adequate sewer pump capacity (SMP)	-
Sub Total	R25 247 000
Riebeek Valley	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R26 040 000
Ensure adequate sewer pump capacity (SMP)	R192 000
Sub Total	R26 232 000
Yzerfontein	
Ensure adequate internal sewer drainage and rising capacity (SMP)	R8 802 000
Ensure adequate sewer pump capacity (SMP)	R2 074 000
Sub Total	R10 876 000
Total	R294 678 000

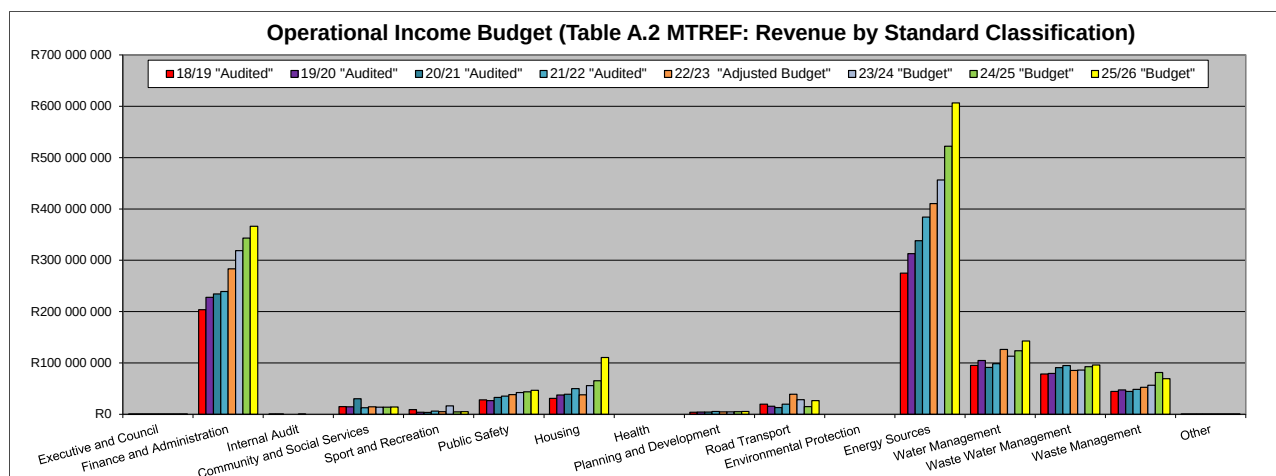
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7.2 INCOME

7.2.1 Operating Income

The following graph gives an overview of the historical and planned future operational income budgets of Swartland Municipality.



The future planned revenue by source for Swartland Municipality, as included in the 2023/2024 MTREF Budget, is as follows.

Revenue Item	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Service Charges - Electricity	R385 969 000	R421 006 000	R483 837 000	R556 046 000
Service Charges - Water	R80 786 000	R91 857 000	R98 465 000	R105 542 000
Service Charges – Waste Water Management	R51 797 000	R51 053 000	R53 679 000	R56 475 000
Service Charges – Waste Management	R32 591 000	R32 997 000	R37 089 000	R41 710 000
Sale of Goods and Rendering of Services	-	R13 113 000	R13 899 000	R14 732 000
Agency Services	R6 040 000	R6 403 000	R6 787 000	R7 194 000
Interest earned from Receivables	R3 161 000	R2 640 000	R2 798 000	R2 966 000
Interest earned from Current and Non-Current Assets	R55 754 000	R55 954 000	R52 954 000	R49 954 000
Rental from Fixed Assets	R1 807 000	R1 967 000	R2 085 000	R2 210 000
Operational Revenue	R16 412 000	R3 933 000	R4 149 000	R4 374 000
Property Rates	R148 224 000	R167 830 000	R183 323 000	R193 833 000
Fines, penalties and forfeits	R30 263 000	R32 076 000	R33 993 000	R36 025 000
Licences or Permits	R4 902 000	R5 158 000	R5 464 000	R5 787 000
Transfers and subsidies - Operational	R189 755 000	R168 036 000	R184 740 000	R286 976 000
Interest	-	R1 060 000	R1 124 000	R1 191 000
Operational Revenue	-	R15 402 000	R16 989 000	R18 681 000
Gains on disposal of Assets	R11 666 000	R14 613 000	R14 081 000	R14 340 000
Total	R1 019 127 000	R1 085 098 000	R1 195 456 000	R1 398 036 000

Source: Medium Term Revenue and Expenditure Framework for Swartland 2023/2024: Table A4 – Budgeted Financial Performance (Revenue and Expenditure)

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7.2.1.1 Operating Income: Subsidies

The main subsidy for funding the operational costs associated with water and sanitation supply is the equitable share. The total estimated future operational income from transfers and grants are summarised in the table below.

Table 7.2.1.1.1: Operating Income: Transfers and Grants				
Transfers and Grants	Record Prior (R)			
	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
National Government				
Local Government Equitable Share	R126 228 000	R143 235 000	R160 825 000	R181 597 000
Finance Management	R1 550 000	R1 550 000	R1 550 000	R1 688 000
EPWP Incentive	R1 873 000	R1 830 000	-	-
Sub Total	R129 651 000	R146 615 000	R162 375 000	R183 285 000
Provincial Government				
Community Development Workers	R38 000	R38 000	R38 000	R38 000
Human Settlements	R33 500 000	-	-	R80 106 000
Municipal Accreditation and Capacity Building Grant	R256 000	R245 000	R249 000	R249 000
Libraries	R11 573 000	R11 788 000	R11 930 000	R12 459 000
Proclaimed Roads Subsidy	R4 470 000	R170 000	R170 000	R190 000
Financial Management Support Grant: Student Bursaries	R300 000	-	-	-
Thusong Grant	-	-	R146 000	-
Establishment of K9 Unit	R2 390 000	R3 305 000	R3 772 000	R4 400 000
Establishment of a Rural Safety Unit	R4 000 000	R5 509 000	R5 712 000	R5 838 000
WC Financial management Capability Grant	R418 000	-	-	-
Municipal Water Resilience Grant	R600 000	-	-	-
Sub Total	R57 545 000	R21 055 000	R22 017 000	R103 280 000
Total	R187 196 000	R167 670 000	R184 392 000	R286 565 000

Source: Medium Term Revenue and Expenditure Framework for Swartland Municipality 2023/2024: Table SA18 Transfers and Grants Receipt

7.2.1.2 Operating Income: Water

The total estimated future operational income for water services for the next three years are summarised in the table below.

Table 7.2.1.2.1: Estimated future operational income for water services				
Description (Standard Classification)	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Water Management	R126 281 000	R113 187 000	R123 773 000	R142 646 000

Source: Medium Term Revenue and Expenditure Framework for Swartland Municipality 2023/2024: Table A2 –Budgeted Financial Performance (Revenue and Expenditure by Standard Classification)

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7.2.1.3 Operating Income: Sanitation

The total estimated future operational income for sanitation services for the next three years are summarised in the table below.

Table 7.2.1.3.1: Estimated future operational income for sanitation services				
Description (Standard Classification)	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
Waste Water Management	R85 247 000	R86 097 000	R92 789 000	R96 111 000

Source: Medium Term Revenue and Expenditure Framework for Swartland Municipality 2023/2024: Table A2 –Budgeted Financial Performance (Revenue and Expenditure by Standard Classification)

7.2.2 Capital Income

It is important for Swartland Municipality to manage their charges for water and sanitation services and the control of consumer payments effectively, in order to ensure that adequate income is generated to fund their water and sewerage capital projects. The future funding sources of Swartland Municipality's total capital budget are summarised in the table below.

Table 7.2.2.1: Sources of funding for the future capital budgets of Swartland Municipality				
Capital Funding Source	2022/2023 Adjusted Budget	2023/2024 Budget	2024/2025 Budget	2025/2026 Budget
National Government	R51 410 000	R48 366 000	R50 664 000	R61 660 000
Provincial Government	R16 277 000	R57 796 000	R64 930 000	R30 000 000
District Municipality	-	-	-	-
Transfers and Subsidies	R11 203 000	R1 225 000	-	-
Borrowing	-	-	R33 000 000	R17 000 000
Internally generated funds	R99 949 000	R101 665 000	R70 375 000	R99 643 000
Total Capital Funding	R178 839 000	R209 052 000	R218 969 000	R208 303 000

Source: Medium Term Revenue and Expenditure Framework for Swartland 2023/2024: Table A5 - Capital Expenditure by Vote, Standard Classification and Funding

7.2.2.1 Capital Income: Water

The future water capital infrastructure projects will be mostly funded through own municipal funding. The future capital funding sources for the water capital infrastructure projects are as follows.

Table 7.2.2.1.1: Future capital funding sources for the water capital projects					
Project	Own	WCED	MIG	WSIG	RBIG
2024/2025					
Water networks: Upgrades and Replacement	R2 000 000	-	-	-	-
Darling water network upgrades for housing project (SDW 2.4 & SDW 2.5, SDW 1.2 & SDW 2.1)	R263 822	-	R2 591 464	-	-
Moorreesburg water network upgrades for housing project (SMoW2.3)	R124 055	-	R480 159	-	-
Water: Upgrading water reticulation network: PRVs, flow control, zone metering and water augmentation	R200 000	-	-	-	-
Malmesbury SMW1.3 Wesbank Reservoir to Malm/Abbotsdale	R500 000	-	-	-	-
Chatsworth / Riverlands upgrade bulk water supply	R500 000	-	-	-	-
Water reticulation and connection: Illinge Lethu	-	R2 083 221	-	-	-
Replace existing water pipe: Illinge Lethu	-	R4 074 921	-	-	-
Malmesbury Irrigation: Replace pumpsets	R500 000	-	-	-	-

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Table 7.2.2.1.1: Future capital funding sources for the water capital projects					
Project	Own	WCED	MIG	WSIG	RBIG
Mobile water pumps x 4 (replacement)	R150 000	-	-	-	-
Compactor replacement x 3	R280 000	-	-	-	-
Bulk water emergency spending	R500 000	-	-	-	-
Equipment: Water	R53 000	-	-	-	-
Connections: Water Meters (New/Replacements)	R940 993	-	-	-	-
Total	R6 011 870	R6 158 142	R3 071 623	R0	R0
2025/2026					
Water networks: Upgrades and Replacement	R4 000 000	-	-	-	-
Water: Upgrading water reticulation network: PRVs, flow control, zone metering and water augmentation	R800 000	-	-	-	-
Upgrading: Ongegund Water Supply System (Reservoir and Pump Station)	R500 000	-	-	-	-
Malmesbury SMW1.3 Wesbank Reservoir to Malm/Abbotsdale	R800 000	-	-	-	-
Swartland System S12.2 CoCT WTP to Swartland WTP pipe connection	R500 000	-	-	-	-
Chatsworth / Riverlands upgrade bulk water supply	R5 000 000	-	-	-	-
Kalbaskraal Booster: Replace pumpsets	R480 000	-	-	-	-
Bulk water emergency spending	R700 000	-	-	-	-
Equipment: Water	R55 000	-	-	-	-
Connections: Water Meters (New/Replacements)	R1 035 092	-	-	-	-
Total	R13 870 092	R0	R0	R0	R0
2026/2027					
Water networks: Upgrades and Replacement	R4 000 000	-	-	-	-
Darling water network upgrades for housing project (SDW 2.4 & SDW 2.5, SDW 1.2 & SDW 2.1)	R1 500 000	-	-	-	-
Water: Upgrading water reticulation network: PRVs, flow control, zone metering and water augmentation	R800 000	-	-	-	-
Upgrading: Ongegund Water Supply System (Reservoir and Pump Station)	R4 500 000	-	-	-	-
Malmesbury SMW1.3 Wesbank Reservoir to Malm/Abbotsdale	R4 346 127	-	-	-	-
Malmesbury SMW1.4 Wesbank Reservoir to Malm/Abbotsdale		-	R10 753 982	-	-
Swartland System S2.1 Kasteelberg to Riebeek (D-line) Phase 1	R1 500 000	-	-	-	-
Swartland System S12.2 CoCT WTP to Swartland WTP pipe connection	R1 500 000	-	-	-	-
Chatsworth / Riverlands upgrade bulk water supply	R4 760 661	-	R10 338 674	-	-
Riebeek Kasteel: New Reservoir	R1 000 000	-	-	-	-
Bulk water emergency spending	R800 000	-	-	-	-
Equipment: Water	R57 000	-	-	-	-
Connections: Water Meters (New/Replacements)	R1 138 602	-	-	-	-
Water CK10564 Toyota Hilux 3.0 D4D 4x4	R613 985	-	-	-	-
Water CK43172 Trailer	R48 875	-	-	-	-
Total	R26 565 250	R0	R21 092 656	R0	R0

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7.2.2.2 Capital Income: Sanitation

The future sewerage capital infrastructure projects will be mostly funded through own municipal funding. The future capital funding sources for the sewerage capital infrastructure projects are as follows.

Table 7.2.2.2.1: Future capital funding sources for the sewerage capital projects					
Project	Own	WCED	MIG	WSIG	RBIG
2024/2025					
Malmesbury WWTW: Replace clarifier mechanical equipment	R1 500 000	-	-	-	-
Upgrading of bulk collectors: Darling (SDS3.1)	R2 200 000	-	R1 516 105	-	-
Upgrading of bulk collectors: Moorreesburg	R1 600 000	-	R511 370	-	-
Sewer reticulation and connection: Illinge Lethu		R517 214	-	-	-
Equipment: Sewerage Telemetry	R40 000	-	-	-	-
Equipment: Sewerage	R34 000	-	-	-	-
Schoonspruit: Pipe Replacement	R3 000 000	-	-	-	-
Sewerage: CK18526 Isuzu FSR750	R2 510 572	-	-	-	-
Total	R10 884 572	R517 214	R2 027 475	R0	R0
2025/2024					
Sewerage Works: Darling	R500 000	-	-	-	-
Replace mobile generator	R380 000	-	-	-	-
Equipment: Sewerage Telemetry	R42 000	-	-	-	-
Equipment: Sewerage	R36 000	-	-	-	-
Pipe Replacement: Obsolete Infrastructure	R1 500 000	-	-	-	-
Total	R2 458 000	R0	R0	R0	R0
2026/2027					
Sewerage Works: Darling	R500 000	-	-	-	-
Equipment: Sewerage Telemetry	R44 000	-	-	-	-
Equipment: Sewerage	R38 000	-	-	-	-
Pipe Replacement: Obsolete Infrastructure	R3 000 000	-	-	-	-
Abbotsdale: Rising main	R800 000	-	-	-	-
Riebeek Kasteel network upgrade, Master Plan SRkS1.2 & 1.3	R600 000	-	-	-	-
Total	R4 982 000	R0	R0	R0	R0

7.3 TARIFF AND CHARGES

The state of the economy has an adverse effect on the consumers. As a result municipalities' revenues and cash flows are expected to remain under pressure. Furthermore municipalities should carefully consider affordability of tariff increases, especially as it relates to domestic consumers while considering the level of services versus the associated cost. Water tariffs should always be cost reflective and the water tariff structure must therefore ensure that:

- Water tariffs are fully cost-reflective, including the cost of maintenance and renewal of purification plants, water networks and the cost associated with reticulation expansion;
- Water tariffs are structured to protect basic levels of service and ensure the provision of free water to the poorest of the poor (indigent); and
- Water tariffs are designed to encourage efficient and sustainable consumption.

Swartland Municipality's current seven block step water tariff structure adequately promotes the efficient use of water by consumers and discourages the wastage of water. Higher tariffs are charged for the higher consumption blocks. The first 6 kl of water is provided free to residential consumers who qualify for indigent relief. It is expected that this tariff structure will continue to be implemented in the future.

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The sustainable supply of potable water is becoming an ever increasing challenge. This scarce commodity has to be optimally managed. The increase in the price of electricity and chemicals for purification has contributed to the cost of delivering the service.

The table below gives some comments on the specific blocks, with regard to Swartland Municipality's residential block stepped tariff structure, for the various years for water services.

Table 7.3.1: Comments on the Municipality's residential block stepped water tariff structure						
Block (kl/month)	2019/2020	2020/2021	2021/2022	2022/2023	2023/2024	Comments
0 - 6	R5-03	R5-03	R5-21	R5-44	R6-02	Free Basic Water
7 – 10	R8-64	R8-64	R8-94	R9-34	R9-99	Low volume use
11 – 15	R15-77	R16-54	R17-12	R17-89	R18-95	
16 – 20	R19-99	R20-97	R21-70	R22-98	R24-34	Typical use volume, including garden irrigation
21 – 25	R29-64	R31-09	R32-18	R34-08	R36-09	
26 – 30	R61-75	R64-78	R47-94	R50-77	R53-77	Above average use, including garden irrigation
31 - 35						
36 - 45	R85-22	R89-40	R89-40	R94-67	R100-26	Wasteful use and/or severe garden irrigation
46 – 70						Significant waste and/or unnecessary garden irrigation
>70						

The Compulsory National Standards (Regulations under section 10 of the Water Services Act) state the following on the supply of water to a household through a water services work or consumer installation designed to provide an uncontrolled volume of water.

- 1) A tariff set by a water services institution for the supply of water through a water services work or consumer installation designed to provide an uncontrolled volume of water to a household must include a volume based charge that –
 - a) support the viability and sustainability of water supply services to the poor;
 - b) discourages wasteful or inefficient water use; and
 - c) take into account the incremental cost that would be incurred to increase the capacity of the water supply infrastructure to meet an incremental growth in demand.
- 2) The requirements of sub regulation (1) are deemed to have been met where the tariff is set as a volume based charge that provides for a rising block tariff structure which includes –
 - a) three or more tariff blocks with the tariff increasing for higher consumption blocks;
 - b) a consumption level for each block defined as a volume consumed by a household during any 30 day period;
 - c) a first tariff block or lowest tariff block with a maximum consumption volume of six kilolitres and which is set at the lowest amount, including a zero amount, required to ensure the viability and sustainability of water supply services; and
 - d) a tariff for the last block or highest consumption block set at an amount that would discourage high water use and that reflects the incremental cost that would be incurred to increase the capacity of the water supply infrastructure to meet an incremental growth in demand.

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The water tariff structure of Swartland Municipality should remain a rising block tariff system, which discourages wasteful or inefficient use of water. The determination of tariff policies should seek to address both commercial and social welfare concerns. The **CAFES**-principles (Sansom et al. 2002) are outlined below:

- **Conserving.** Tariffs should encourage consumers to purchase enough water to meet their needs without being wasteful.
- **Adequate.** Future investment should also be considered when setting the tariffs.
- **Fair.** The utility should achieve financial sustainability while maintaining access for poor communities.
- **Enforceable.** Tariffs that cannot be enforced are unlikely to be sustained.
- **Simple.** The tariffs should be easy for the Municipality to administer and easy for customers to understand. Consumers generally show greater willingness to pay water bills that they understand.

Wasteful or inefficient use of water is discouraged through increased tariffs. It is suggested that the following tariff structure characteristics should remain in Swartland Municipality's Structure in order to ensure efficient water use (WDM Strategy):

- Maintain a rising block tariff structure.
- Keep number of blocks in the tariff to a minimum. One block to address free basic water (the first step) and another to address the "cut-off" volume where consumers are discouraged to use water above this monthly volume (highest block) are required. In addition another three blocks could be used to distinguish between low users, typical use of high water use. Six blocks in a tariff often make good sense, as indicated in Table 7.3.1.
- The volumetric steps should be kept the same for all the areas within Swartland Municipality's Management Area.
- The cost of water in the maximum step should severely discourage use in this category. The volumetric use for the highest category could be 60 kl/month, above which residential water use could be considered to be wasteful or unnecessary. Garden use requiring in excess of this volume should be reduced in accordance with xeriscape practices.

The MFMA Circular No.78 of 7 December 2015 stipulated the following w.r.t. the water and sanitation tariff increases:

Municipalities should consider the full cost of rendering the water and sanitation services when determining tariffs related to these two services. If the tariffs are low and result in the municipality not recovering their full costs, the municipality should develop a pricing strategy to phase-in the necessary tariff increases in a manner that spreads the impact on consumers over a period of time.

Municipalities are urged to design an Inclining Block Tariff (IBT) structure that is appropriate to its specific circumstances, and ensures an appropriate balance between low income consumers and other domestic, commercial and business customers, and the financial interests of the municipality. While considering this structure, municipalities are advised to evaluate if the IBT system will be beneficial to them depending on consumption patterns in their areas.

In light of the current drought being experienced across large parts of the country, and to mitigate the need for water tariff increases, municipalities must put in place appropriate strategies to limit water losses to acceptable levels. In this regard municipalities must ensure that water used by its own operations is charged to the relevant service, and not simply attributed to water losses.

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The recommendations for the water and sewage tariffs of Swartland Municipality are as follows:

- Swartland Municipality can investigate the financial viability of changing the sanitation tariff structure from a fixed monthly amount, to a stepped tariff based on water consumption in the future. Volumetric usage for sanitation services, whereby charges are determined according to water usage, with maximum ceilings and charged accordingly. This will need to include a free sanitation bracket, similar for free water, for indigent registered households. This will also further deter wasteful water use.
- Swartland Municipality will continue to re-evaluate the tariffs they charge for their water and sanitation services on an annual basis in order to continue to ensure the good financial position of the Municipality and to ensure that all the O&M expenditure for water and sanitation services are always recovered through their water and sanitation services income, to address the bulk infrastructure backlogs and to ensure the adequate rehabilitation and maintenance of all existing water and sewerage infrastructure within the various towns.
- The large commercial and industrial consumers could lower their current water demand by means of improved practices or re-use of wastewater. Swartland Municipality should note that revenue could potentially decrease as a result of reuse practices.
- Swartland Municipality will continue to monitor the volume and nutrient loading of all industrial effluent discharged by industrial consumers into the sewer system. A formula for the calculation of the extraordinary treatment cost to industrial consumers for the industrial effluent they discharged into Swartland Municipality's sewer system is in place and form part of the existing tariff structure. The performance of the WWTWs in general can be severely compromised by certain industrial effluent discharges. It is therefore also important for Swartland Municipality to recalculate their treatment costs annually, in order to ensure that there is no under or over recovery of costs from industrial consumers. The charges for wastewater discharged by industrial consumers can also be linked to their water usage in the future.

Swartland Municipality needs to continue to regularly sample the quality of industrial effluent discharged into the sewer system and all industrial consumers need to be charged according to the quality of the effluent discharged into the Municipality's sewer system.

- The current water tariff codes adequately differentiate between the different type of consumers and their water usage. The Municipality can investigate the possibility to uniquely describe the "Departmental" water usage with a distinction between the different user types, for example parks, office usage, fire-fighting, etc.

7.4 FREE BASIC SERVICES

Swartland Municipality will keep on using part of their equitable share for the funding of the free basic services to the indigent registered households. Swartland Municipality only provides free services to the indigent registered households and this service is subsidized from the equitable share allocation.

Swartland Municipality's tariffs support the viability and sustainability of water supply services to the poor through cross-subsidies (where feasible) and discourage the wasteful or inefficient use of water. Free basic water and sanitation services are linked to Swartland Municipality's Indigent Support Policy and all indigent households receive free basic water and sanitation services. Poor consumers, who are not registered as indigent and who are residing in formal housing, receive no free basic water services.

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It is important for Swartland Municipality to enforce their indigent qualification criteria rigorously in order to ensure that those who do not qualify are removed from the allocation list. The Municipality needs to determine whether the current Indigent Support Policy is not too generous and creates a situation where too many citizens in Swartland Municipality's Management Area are making no monetary contribution toward the cost of delivering services to the community.

Swartland Municipality can investigate the financial viability of changing the fixed sanitation tariff structure to a stepped tariff based on water consumption in the future. This will need to include a free sanitation bracket, similar to free water, for the indigent households. This will also further deter wasteful water use.

7.5 METERING, BILLING AND INCOME

It is important for Swartland Municipality to continue with the reading of all their bulk water meters. The bulk meters and meter chambers also need to be properly maintained and the meters need to be protected from vandalism.

Consumer friendly billing: Swartland Municipality provides consumers with accounts that are clear and easy to understand. A graphical presentation will make the account even more consumers friendly.

Swartland Municipality's Credit Control and Debt Collection Policy and By-law provide for credit control procedures which are fair and equitable, provide for warnings and adequate notice, provide for consumer representations, allow alternative payment arrangements, and set out a fair procedure that will be applied in the event of non-payment. Where a consumer continues to fail to pay for services provided after the application of such procedures and a fair warning, Swartland Municipality credit control and debt collection by-law allows for actions that will limit its financial loss and promote good payment habits.

Swartland Municipality is committed to actively implement their Credit Control and Debt Collection By-law in order to reduce the percentage of non-payment by their consumers even further.

The Engineering Department needs to work with the Finance Department in order to ensure that all water used is metered, which include the free basic water, unbilled metered consumption, unbilled unmetered consumption and also the water used for irrigation purposes on the parks. Swartland Municipality is committed to ensure that all connections providing an uncontrolled volume of water supply are metered and that tariffs are applied in proportion to water use.

The following occupied stands, as indicated in Table 7.5.1 under Topic 7 of the Administration, Information and Comprehensive Overview Report, need to be investigated.

- Treasury records without GIS link;
- Identified unmetered erven included in the Treasury data;
- Developed erven with a meter, but with zero consumption;
- Developed erven with a meter, but with consumption less than 0.1 kl/d; and
- Developed erven with a substantial increase or decrease in water demand.

8. WATER SERVICES INSTITUTIONAL ARRANGEMENTS AND CUSTOMER SERVICES

The primary pieces of legislation for WSAs are as follows:

- The Constitution of the Republic South Africa Act 108 of 1996
- The Water Services Act 108 of 1997
- The Local Government: Municipal Structures Act 117 of 1998
- The Local Government: Municipal Systems Act 32 of 2000 (the Systems Act)
- The Local Government : Municipal Finance Management Act 56 of 2003 (MFMA)

In addition to the key pieces of local government legislation, the following legislation also impact on the role of the WSA:

- The National Water Act 36 of 1998
- The Division of Revenue Act (DORA) (published annually)
- The National Health Act 61 of 2003
- The Disaster Management Act 57 of 2002

8.1 MUNICIPAL STRATEGIC SELF-ASSESSMENT (MuSSA)

8.1.1 Water and Sanitation Services Planning

Sections 12 and 13 of the Water Services Act (Act No 108 of 1997) place a duty on WSAs to prepare and maintain a WSDP, as part of the process of preparing an IDP. The DWS has developed a new eWSDP website to assist WSAs with the WSDP process and to provide a framework for the capturing of the data. The WSDP of Swartland Municipality needs to be updated regularly.

The Municipality will also continue to report annually and in a public way on progress in implementing the plan (WSDP Performance- and Water Services Audit Report), as part of Swartland Municipality's Annual Report, as required in terms of Section 18 of the Water Services Act, 1997 (Act No.108 of 1997), as well as the "Regulations relating to compulsory national standards and measures to conserve water", as issued in terms of Sections 9(1) and 73(1)(j) of the Water Services Act.

The Water Safety Plans for the various WTWs and water distribution systems and the W₂RAPs for the WWTWs and drainage networks need to be updated regularly. The WTW and WWTW Process Audits also needs to be updated regularly.

The 2020 Water and Sewer Master Plans and the 2021 Bulk Water Master Plan of Swartland Municipality summarise the projects (Master Plan Items) necessary in order to cope with the increased future demands and developments within the Swartland Municipality's systems. The Water and Sewer Master Plans need to be updated regularly.

8.1.2 Management Skill Level (Technical)

The required Director for Civil Engineering Services and the Senior Manager for Solid Waste and Trade Services positions are filled and Performance Agreements are signed with the Director and Manager annually. Swartland Municipality is committed to fill any future vacant positions on the approved organogram as soon as possible. Swartland Municipality is committed to work towards the following compliance, with regard to the Management Skill Levels of the Municipality.

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TOPIC 8: WATER SERVICES INSTITUTIONAL ARRANGEMENTS AND CUSTOMER SERVICES

- Approved Technical Management Organisational Organogram which meets the Municipality's water and sanitation business requirements and that key posts are filled (Technical Director, Water Services Manager and Sanitation Services Manager, etc.)
- Sufficient Technical Management and Technical Support staff.
- Technical management and technical support staff have the correct skills / qualifications and experience as per Job Description requirements.
- Managers and technical support staff regularly attend appropriate water and sanitation services skills development / training to support professionalisation.
- Key technical managers (Section 56 and other Senior Management) have signed and monitored Performance Agreements.

8.1.3 Staff Skill Level (Technical)

A Work Place Skills Plan for Swartland Municipality is in place, which lists the training to be provided during the new financial year. The training of Swartland Municipality's personnel involved in the management of water and sanitation services are the most important factors that determine the ability of Swartland Municipality to deliver safe and reliable water and to treat the effluent at the WWTWs to an acceptable standard. Training of all staff involved in water supply and sanitation services on matters related to treatment processes and quality monitoring and control is essential because their actions (or failure to act) will have a major impact on the well-being of the communities and the environment.

Swartland Municipality can also start to actively focus on in-house training, which requires the identification of trainers (from senior operators / officers / professional ranks) for the development and facilitation of courses which relate to specific organizational knowledge and systems requirements. Swartland Municipality's internal reports such as the Water Safety Plan, Wastewater Risk Abatement Plans, Operation and Maintenance Manuals and this WSDP have the necessary information on which the in-house courses can be based. This will assist Swartland Municipality's Human Resource Department in general and the skills development facilitator in particular to develop and implement effective workplace skills plans relevant to Human Capacity Development requirements.

WTWs: It is important for Swartland Municipality to classify all WTW and operators along the lines of the regulations by establishing a programme for certification of works, operators, technicians and managers. The process will include reviewing the skills needed and aligning resources to these needs as well as reviewing total staff numbers necessary to meet all the objectives in the National Water Act.

It is important for Swartland Municipality to establish a mentoring role for all their operators and ensuring an adequately trained and classified workforce with dedicated training programmes for supervisors and operators. Budgets need to be established to address the shortfall of skilled staff, rethink methods to retain qualified personnel and plan for succession and clear career paths for experienced staff. With such a program a source of specific resources of skilled operators, technicians and managers will be established.

Process Controller registration renewal is conditional on meeting specified training requirements. Swartland Municipality must ensure that every Process Controller employed must complete the required hours of training every year, over the five years between registration renewals.

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The following training is required per Process Controller / Supervisor per year.

Table 8.1.3.1: Annual Process Controller and Supervisor training requirements		
Class of Process Controller	Unit Standard Credits	Training
In Training	30	Continued Education
Class I	30	
Class II	30	
Class III	30	
Class IV	30	
Class V	10*	Continued Education / Refresher Training
Class VI	10*	

Note: * Professional Credits: From Class V, Process Controllers must register for Professional Process Controller Registration

Process Controller Registration Certificate renewal is also conditional on having at least 6 months operating or related experience within the past five years. The current number of Process Controllers at the two bulk WTWs and the required number of Process Controllers are included in Table 8.1.3.2 of Topic 8 of the Administration, Information and Comprehensive Overview Report. **The current Supervisors and Process Controllers at the two bulk WTWs comply with the required number and Class of Supervisors and Process Controllers according to the classification of the plants.**

The Occupational Health and Safety Act contain provisions directing employers to maintain a safe workplace and to minimize the exposure of employees and the public to workplace hazards. It is therefore important for Swartland Municipality to compile a Legal Compliance Audit of their WTWs, which will provide the management of Swartland Municipality with the necessary information to establish whether the Municipality is in compliance with the legislation or not. **It is further recommended that Swartland Municipality arrange for chlorine audits to be done at all their disinfection facilities, in order to identify any potential shortcomings.**

WWTWs: It is important for Swartland Municipality to classify all WWTWs and operators along the lines of the regulations by establishing a programme for certification of works, operators, technicians and managers. The process will include reviewing the skills needed and aligning resources to these needs as well as reviewing total staff numbers necessary to meet all the objectives in the National Water Act.

Swartland Municipality is also committed to manage and operate their sewage pump stations effectively to prevent any possible spillages. It is important for Swartland Municipality to upgrade their WWTWs when necessary, in order to reduce the risk of source contamination. The WWTWs will be managed and operated to comply with the permitted standards.

It is important for Swartland Municipality to establish a mentoring role for all their operators in order to ensure an adequately trained and classified workforce with dedicated training programmes for supervisors and operators. Budgets need to be established to address the shortfall of skilled staff, rethink methods to retain qualified personnel and plan for succession and clear career paths for experienced staff. With such a program a source of specific resources of skilled operators, technicians and managers will be established.

The current number of Process Controllers at each of the WWTWs and the required number of Process Controllers are included in Table 8.1.3.4 of Topic 8 of the Administration, Information and Comprehensive Overview Report. **Additional Process Controllers need to be appointed from some of the WWTWs, as indicated under Section 8.1.3 of Topic 8 of the Administration, Information and Comprehensive Overview Report.**

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The Occupational Health and Safety Act contain provisions directing employers to maintain a safe workplace and to minimize the exposure of employees and the public to workplace hazards. It is therefore important for Swartland Municipality to compile a Legal Compliance Audit of their WWTWs, which will provide the management of Swartland Municipality with the necessary information to establish whether the Municipality is in compliance with the legislation or not.

8.1.4 Technical Staff Capacity (Numbers)

All critical water vacant positions as indicated on the approved Organogram needs to be filled as soon as possible. Swartland Municipality needs to review the skills needed at each of the WTWs and WWTWs according to the classification of the plants and need to align resources to these needs as well as reviewing total staff numbers necessary to meet all the objectives in the National Water Act.

Aligning the career paths to the occupational categories will assist the personnel to understand levels within across teams. Simplification of job titles to conform to respective occupational categories will assist in developing compatible and comparable career paths within the different Departments. Occupational categories will provide differentiation between levels. This approach will allow for more specific job designations in organograms with explicit career path connotations.

8.1.5 Water Resource Management (WRM)

See Topic 6 for the future demand of the water resource management of the municipality.

8.1.6 Water Conservation and Water Demand Management (WC/WDM)

See Topic 5 for the functionality requirements for WC/WDM of the municipality.

8.1.7 Drinking Water Safety and Regulatory Compliance

Drinking Water Quality Monitoring Programme: Operational monitoring of process indicators shall comply with the minimum requirement specified in SANS 241:2015 for characterising raw water quality, on-going levels of operational efficiency in a water treatment system and acceptable final water quality to the point of delivery, as summarised in Table 8.1.7.1 below.

Table 8.1.7.1: Minimum monitoring frequency for process risk indicators (SANS241-2:2015: Table 1)			
Determinand	Raw Water	Final Water	Distribution System
Conductivity or total dissolved solids	Daily	Daily	Not applicable
pH value	Daily	Once per shift ^a	Fortnightly
Turbidity	Daily	Once per shift ^a	Fortnightly
Disinfectant residuals	Not applicable	Once per shift ^a	Fortnightly
E.Coli (or faecal coliforms) ^b	Not applicable	Weekly	Fortnightly but dependent on population served ^d
Heterotrophic plate count ^c	Not applicable	Weekly	Fortnightly
Treatment chemicals ^d	Not applicable	Monthly	Not applicable
a: A shift is defined as an eight-hour work period. b: If non-compliant with the numerical limits specified in SANS 241-1, implement corrective action and immediate follow-up sampling at an increased sampling frequency. c: If non-compliant with the numerical limits specified in SANS 241-1, implement corrective action and follow-up sampling. d: Includes all risk determinands that are added or formed as a result of the use of treatment chemicals (for example aluminium, iron and chlorine). If non-compliant with the numerical limits specified in SANS 241-1 in the final water, the distribution system monitoring frequencies of Table 3 in SANS241-2:2015 apply.			

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Table 8.1.7.2 of the Administration, Information and Comprehensive Overview Module indicates the required additional samples to be taken by Swartland Municipality.

These requirements may be relaxed to a monthly frequency for groundwater supply systems (due to the reduced variability of groundwater quality), provided that no health-related determinands are detected at levels exceeding the numerical limits in SANS 241-1 during the risk assessment.

The minimum microbiological monitoring frequency (for E.Coli or faecal coliforms) within the distribution system shall comply with the requirements set out in Table 8.1.7.2 (from SANS 241:2015), provided that the water services institution or water services intermediary (or both) is able to provide appropriate guarantee that the water complies with the numerical limits specified in SANS 241-1.

Table 8.1.7.2: Minimum sample numbers for E.Coli (or faecal coliforms) in schemes (SANS 241-2:2015: Table 2)	
Population Served	Total number of samples per month ^a - Minimum
< 5 000	2
5 000 – 100 000	1 per 5 000 head of population + 1 additional sample ^b
100 000 – 500 000	1 per 10 000 head of population + 11 additional samples ^b
> 500 000	1 per 20 000 head of population + 36 additional samples ^b
a: During a rainy season, sampling should be carried out more frequently to ensure that all spatial and temporal risks are identified.	
b: See WHO, Guidelines for drinking-water quality.	

The table below indicates the compliance of the E.Coli monitoring frequency in the water distribution systems of Swartland Municipality, in terms of the minimum requirements of SANS:241-2: 2015 (Table 2). The period assessed was for samples taken from July 2022 to June 2023.

Table 8.1.7.3 Swartland Municipality's compliance of the monthly E.Coli monitoring frequency for the water distribution systems and at the WTWs in terms of the minimum requirements of SANS 241-2:2015 (Table 2).					
Distribution System	Population served	Required number of monthly samples (SANS 241-2:2015: Table 2)	Number of monthly E.Coli samples taken on the network by Swartland Mun. and the West Coast DM	Number of monthly E.Coli samples taken at the Withoogte and Swartland WTW by the West Coast DM	Total monthly E.Coli samples taken for the potable water
Koringberg	1 869	2	4.8	8.8	13.6
Riebeek Wes and Ongegund	8 742	2	2.1	5.1	7.2
Riebeek Kasteel	10 021	2	4.1	5.1	9.2
Yzerfontein	1 755	2	4.2	5.1	9.3
Darling	12 956	2.6	6.5	5.1	11.6
Moorreesburg	19 824	4.0	4.1	8.8	12.9
Malmesbury	58 256	11.7	12.6	5.1	17.7
Abbotsdale	5 207	2	2.1	5.1	7.2
Kalbaskraal	4 124	2	2.1	5.1	7.2
Riverlands and Chatsworth	7 692	2	4.6	5.1	9.7

The above sampling done by the Swartland Municipality plus the daily sampling done at the Withoogte WTW and the Swartland WTW by the West Coast District Municipality, as well as their monthly E.Coli sampling throughout the various towns on the systems ensure that the number of monthly E.Coli samples taken, as required by SANS 241, is adequate.

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The purpose of a Water Quality Compliance Risk Assessment is to obtain an overview of the ability of Water Services Institutions to meet the numerical limits specified in SANS 241-1 on a sustained basis. Pending the nature of any hazards / risks identified, adequate monitoring of the identified hazards / risks needs to be maintained while the Water Services Institutions also puts in place the necessary corrective and verification measures. This is not a once-off process since the nature of risks could vary as social, economic and environmental activities are subject to constant change.

It is therefore required under the Blue Drop Certification Programme that a Water Quality Compliance Risk Assessment is done on an annual basis; requiring that Monitoring Programmes would require amendment as informed by the Water Safety Planning Process.

The Water Quality Compliance Risk Assessment plan should therefore include at least one full SANS 241 analysis per year and if any changes in the environment or process or delivery (or all) occur, at least monthly drinking water quality monitoring from source, through treatment and distribution, to the end user. The outcome of the risk assessment and the objectives of the monitoring programmes should further influence the design and implementation of the monitoring programmes.

Risk defined monitoring programmes require additional monitoring of all determinands identified in the risk assessment that might result in non-compliance with the numerical limits specified in SANS241-1. To verify that ongoing optimized operations of water treatment and distribution systems are sustained, determinands exceeding the numerical limits specified in SANS241-1 shall be monitored in the following manner:

- Raw water non-compliance – risk defined monitoring on raw and final waters;
- Final water non-compliance – risk defined monitoring on raw, final and critical distribution system sampling points; and
- Distribution water non-compliance – risk defined monitoring on the critical distribution system sampling points at the minimum frequencies indicated in Table 8.1.7.4 below:

Table 8.1.7.4: Frequency of analysis for determinands identified during the risk assessment exceeding the numerical limits in SANS 241-1 (SANS 241-2:2015: Table 3)			
Risk	Frequency		
	Raw water	Final water	Critical distribution system points
Acute health bacteriological risk determinands	Table 8.1.7.1	Table 8.1.7.1	Table 8.1.7.2
Protozoan parasite risk determinands.	Not applicable	Monthly	Not applicable
Acute health chemical risk determinands	Weekly	Weekly	Monthly
Chronic health risk determinands	Monthly	Monthly	Monthly
Aesthetic risk determinands	Monthly	Monthly	Quarterly
Operational risk determinands ^a	Weekly	Weekly	Monthly
a: Aluminium should be monitored on the final water in accordance with Table 8.1.7.1 and monthly on the distribution system			

The monitoring frequencies given in Table 8.1.7.4 above also apply to determinands that deteriorate between the points of delivery (input points to contracted bulk customers and the distribution delivery points to customers) to the extent that the determinands exceed the numerical limits specified in SANS 241-1.

Monitoring for all determinands included in the risk informed monitoring programme shall continue until such time that the water services institution or water services intermediary (or both) can substantiate that the identified determinand no longer constitutes an unacceptable risk.

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The Drinking Water Quality Compliance Risk Assessment may be interpreted as follows:

- If the determinand exceeds the numerical limit specified in SANS241-1 in both the raw and final water, it implies that the existing treatment system or operation thereof is not removing the determinand.
- If the determinand that exceeds the numerical limit in the raw water is removed to the extent that it complies with SANS 241-1 in the final water, it implies that the installed infrastructure is adequate to deal with the problem.
- If both raw and final water comply with the numerical limits specified in SANS241-1, risks are deemed within acceptable limits.
- Drinking water treatment chemicals can contribute to the risks present in treated waters. Aluminium, iron, disinfectant residuals and ammonia are examples of determinands that can be impacted by operational processes. The treatment process shall be optimized and these determinands shall be included in the prescribed monitoring programme if determinands exceed the limits specified in SANS241-1. Determinands, such as trihalomethanes, that may form between the input points to contracted bulk customers and the distribution delivery points to the extent that they exceed the numerical limits given in SANS241-1, shall be included as part of the risk defined monitoring programme.
- If enteric viruses are detected in source waters or if there is any evidence that source waters are affected by human faecal pollution then evidence of the efficacy of treatment barriers should be obtained. Demonstrations of the effective operation of these barriers within the water treatment system includes the maintenance of data records of determinands for final water as given in Table 8.1.7.1.
- Although the monitoring for viruses in the final water is not compulsory, such analysis currently provide the only direct indication of the overall efficacy of a treatment plant to remove viruses and should be included wherever possible.

The water quality of all the water distribution systems in Swartland Municipality was either “Excellent” or “Good”, according to the SANS0241 classification, except for Yzerfontein that was “Unacceptable” for Operational Efficiency, due to pH and turbidity failures, and Riverlands and Chatsworth that were “Unacceptable” for Acute Health Microbiological, due to E.Coli and Total Coliform Count failures. The water quality compliance sample results for the 2022/2023 financial year are included in Annexure E for each of the water distribution systems. The overall percentage of compliance of the water quality samples taken over the last three financial years are summarised in the table below per distribution system (SANS 241: 2015 Limits).

Table 8.1.7.5: Percentage compliance of the final water quality samples for the last three financial years per performance indicator									
Performance Indicator	Performance Indicator categorised as unacceptable Yes / No (Table 4 of SANS 241-2:2015)			% Sample Compliance according to SANS241-2015 Limits			Number of Samples taken into account		
	22/23	21/22	20/21	22/23	21/22	20/21	22/23	21/22	20/21
Moorreesburg									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	10	10	10
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	53	37	40
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	95	79	82
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	122	90	96
Operational Efficiency	No (Excellent)	No (Excellent)	No (Excellent)	95.6%	96.4%	97.4%	205	140	152
Koringberg									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	No (Excellent)	No (Good)	No (Excellent)	100.0%	96.4%	100.0%	59	55	49
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	69	73	61
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	110	110	98

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Table 8.1.7.5: Percentage compliance of the final water quality samples for the last three financial years per performance indicator									
Performance Indicator	Performance Indicator categorised as unacceptable Yes / No (Table 4 of SANS 241-2:2015)			% Sample Compliance according to SANS241-2015 Limits			Number of Samples taken into account		
	22/23	21/22	20/21	22/23	21/22	20/21	22/23	21/22	20/21
Operational Efficiency	No (Good)	No (Excellent)	No (Excellent)	92.5%	97.1%	98.8%	214	204	166
Malmesbury									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	33	28	40
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	98.6%	100.0%	163	140	148
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	305	279	311
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	99.7%	100.0%	98.9%	383	334	368
Operational Efficiency	No (Excellent)	No (Excellent)	No (Excellent)	96.8%	97.4%	97.8%	627	536	536
Darling									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	10	10	10
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Excellent)	97.6%	98.5%	100.0%	82	65	63
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	122	103	96
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	98.3%	100.0%	99.2%	176	138	132
Operational Efficiency	No (Good)	No (Good)	No (Excellent)	90.7%	91.3%	97.7%	311	242	215
Riebeeck Kasteel									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Good)	100.0%	100.0%	96.3%	51	51	54
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	72	71	66
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	110	108	106
Operational Efficiency	No (Excellent)	No (Excellent)	No (Good)	97.0%	95.5%	92.3%	199	199	183
Riebeeck Wes									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	10	5
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	27	31	26
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	98.6%	100.0%	48	73	47
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	62	78	60
Operational Efficiency	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	104	116	100
Yzerfontein									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Excellent)	98.1%	100.0%	100.0%	52	51	51
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	71	71	60
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	108	106	94
Operational Efficiency	Yes (Unacceptable)	Yes (Unacceptable)	No (Excellent)	84.3%	88.3%	97.5%	197	196	163
Riverlands									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	Yes (Unacceptable)	No (Excellent)	No (Excellent)	90.0%	100.0%	100.0%	30	26	26
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	48	47	47
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	62	60	60
Operational Efficiency	No (Good)	No (Excellent)	No (Excellent)	90.0%	96.0%	93.0%	110	101	100
Abbotsdale									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	27	26	26
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	48	47	47
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	62	60	60
Operational Efficiency	No (Excellent)	No (Excellent)	No (Excellent)	93.3%	95.0%	96.0%	105	100	100
Chatsworth									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	Yes (Unacceptable)	No (Excellent)	No (Excellent)	89.7%	100.0%	100.0%	29	27	26
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	47	50	47
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	60	63	60
Operational Efficiency	No (Excellent)	No (Excellent)	No (Excellent)	94.2%	95.3%	94.0%	104	106	100
Kalbaskraal									
Acute Health Chemical	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	5	5	5
Acute Health Microbiological	No (Good)	No (Excellent)	No (Excellent)	96.3%	100.0%	100.0%	27	26	26

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Table 8.1.7.5: Percentage compliance of the final water quality samples for the last three financial years per performance indicator									
Performance Indicator	Performance Indicator categorised as unacceptable Yes / No (Table 4 of SANS 241-2:2015)			% Sample Compliance according to SANS241-2015 Limits			Number of Samples taken into account		
	22/23	21/22	20/21	22/23	21/22	20/21	22/23	21/22	20/21
Chronic Health	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	48	47	47
Aesthetic	No (Excellent)	No (Excellent)	No (Excellent)	100.0%	100.0%	100.0%	62	60	60
Operational Efficiency	No (Excellent)	No (Excellent)	No (Excellent)	94.3%	94.1%	100.0%	106	101	100

The table below gives an overview of the four categories under which the risks posed by micro-organism, physical or aesthetic property or chemical substance of potable water is normally classified.

Table 8.1.7.6: Four categories under which the risks posed by micro-organism, physical or aesthetic property or chemical substance of potable water is normally classified	
Category	Risk
Acute Health	Determinand that poses an immediate unacceptable health risk if present at concentration values exceeding the numerical limits specified in this part of SANS 241.
Aesthetic	Determinand that taints water with respect to taste, odour and colour and that does not pose an unacceptable health risk if present at concentration values exceeding the numerical limits specified in SANS 241.
Chronic Health	Determinand that poses an unacceptable health risk if ingested over an extended period if present at concentration values exceeding the numerical limits specified in SANS 241.
Operational	Determinand that is essential for assessing the efficient operation of treatment systems and risks from infrastructure

It is also important to note that all operational manuals of treatment unit processes such as chemical dosing, coagulation sedimentation, filtration, disinfection etc. should contain operational limits, monitoring programmes, verification procedures and pre-determined corrective actions. Corrective actions identified for each control measure need to be adhered to as soon as critical limits have been exceeded. The corrective actions are an important component of the management aspects of the Water Safety Plans and should be effective in restoring performance to acceptable levels when critical limits are exceeded.

Corrective actions must be supported by a contingency plan. This plan is a detailed management response to failures and will identify individual responsibilities and a time constraint for remedy. The corrective actions identified by the Water Safety Plan Team should also include long term actions designed to prevent non-compliance and reduce the need for contingency plans to be re-actioned.

Monitoring data provide important feedback on how the water supply system is working and should be frequently assessed. Regularly assessed monitoring records are a necessary element of the Water Safety Plan as they can be reviewed, through external and internal audit, to identify whether the controls are adequate and also to demonstrate adherence of the water system to the water quality targets. The strategies and procedures for monitoring the various aspects of the water supply system should be documented.

Monitoring plans should include the following:

- Parameters to be monitored.
- Sampling location and frequency
- Sampling needs and equipment
- Schedules for sampling
- Methods for quality assurance and validation of sampling results.
- Responsibilities and necessary qualifications of staff.

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- Requirements for documentation and management of records including how monitoring of results will be recorded and stored.
- Requirements for reporting and communication of results.

The parameters selected by Swartland Municipality for operational monitoring should

- reflect the effectiveness of each control measure;
- provide a timely indication of performance;
- be readily measure; and
- provide opportunity for an appropriate response.

Drinking Water Sample Analysis (Credibility): Swartland Municipality should continue and improve the level and frequency of regular sampling (Operational and Compliance Monitoring) and reporting on water quality.

The knowledge, skills, motivation and commitment of staff involved in the management of drinking water quality are the most important factors that determine the ability of Swartland Municipality to deliver safe and reliable water. Training of all staff involved in water supply services on matters related to treatment processes and quality monitoring and control is essential because their actions (or failure to act) will have a major impact on the well-being of the communities.

It is important for the Process Controllers to check all sampling equipment every time before use, in order to ensure that test results are reliable and not “contaminated” by faulty instruments. All field instruments used for checking physical properties must also be calibrated in accordance with the manufacturer’s manual before any water sample is collected. Buffer solutions are required for correct calibration to ensure accuracy of measurements.

Blue Drop Status: Swartland Municipality is committed to work with the DWS and the other role-players in order to further improve Swartland Municipality’s 2023 Blue Drop Score for the various water distribution systems. The West Coast District Municipality and Swartland Municipality will regularly update the Process Audits for the two bulk WTWs. The West Coast District Municipality will also ensure that the Operation and Maintenance Manuals of the two bulk WTWs are used by the Process Controllers at the plants. The existing Water Safety Plans for the WTWs and water distribution systems will be updated regularly. Swartland Municipality is committed to implement the Preventative Actions and Control Measures identified as part of the Water Safety Plans in order to address the potential risks identified through the Water Safety Plan process.

8.1.8 Basic Sanitation

See Topic 2 for the future requirements for the basic sanitation facilities of the municipality.

8.1.9 Wastewater / Environmental Safety and Regulatory Compliance

Wastewater Quality Monitoring Programme: Regular sampling (Operational and Compliance Monitoring) and reporting on quality of treated sewage effluent discharged from the WWTWs is part of Swartland Municipality’s monitoring procedures, as indicated in Table 8.1.9.2 of the Administration, Information and Comprehensive Overview Module. The following requirements from the DWS should also be adhered to, as part of the ongoing monitoring of the various WWTWs:

- What is the current condition of the Works?
- Does the Works comply with the license agreement?
- Is there monitoring and recording of the final effluent quality?

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- Is there monitoring and recording of incoming sewage to the Works?
- Are monitoring records available on site?
- Is there compliance to the monitoring frequency?
- Are the monitoring results and records submitted to DWS?
- Does an external consultant visit the Works on a regular basis (Process Audit)?
- How is the sludge managed and disposed?
- Is the plant fenced off with proper entrance gate?
- Is the O&M manual up to date according to the operation of the Works?

Accurate and full records of all aspects of the operation and maintenance of the WWTWs should always be kept. The Process Controllers on site should keep a pocket book in which they should note any significant event on the works, such as a peculiar colour of the water, failure of equipment or strange smells and they must record the date and time at which these events occur. All incidents also need to be recorded in an Incident Register.

The Process Controllers at the WWTW will continue to implement the control measures included in Table 6.3.2.1 under Topic 6 in order to ensure that the various unit processes at the WWTWs performs optimally. If these predetermined Alert Levels are exceeded at any of the control points where samples are taken for operational purposes, specific actions are taken to bring the operational parameters back to within the target ranges.

Wastewater Sample Analysis (Credibility): Swartland Municipality should continue and further improve the level and frequency of regular sampling (Operational and Compliance Monitoring) and reporting on wastewater quality.

The knowledge, skills, motivation and commitment of staff involved in the management of wastewater quality are the most important factors that determine the ability of Swartland Municipality to comply with the quality of treated effluent discharge from the WWTWs. Training of all staff involved in sanitation services on matters related to treatment processes and quality monitoring and control is essential because their actions (or failure to act) will have a major impact on the environment.

It is important for the Process Controllers to check all sampling equipment every time before use, in order to ensure that test results are reliable and not “contaminated” by faulty instruments. All field instruments used for checking physical properties must also be calibrated in accordance with the manufacturer’s manual before any effluent sample is collected. Buffer solutions are required for correct calibration to ensure accuracy of measurements.

Green Drop Status:

Swartland Municipality is committed to work with the DWS and the other role-players in order to further improve on their 2022 Green Drop Scores for the various WWTWs and to get the Municipality ready for the next round of assessments. Swartland Municipality will update their W₂RAPs as necessary in order to reduce their current CRRs for the various WWTWs even further. The following processes will also further assist the Municipality in the process of reducing the CRRs for their WWTWs.

- Forward planning and upgrading / refurbishment of treatment plants to ensure adequate capacity for the flows received;
- Operate and maintain the WWTWs within design- and equipment specifications;
- Have trained, qualified and registered staff in place;

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TOPIC 8: WATER SERVICES INSTITUTIONAL ARRANGEMENTS AND CUSTOMER SERVICES

- Get mentoring / coaching contracts in place where there is a great demand for adequately skilled process controllers and supervision;
- Monitoring of flow to- and from the plants;
- Sampling and monitoring of effluent quality;
- Appropriate authorisation in accordance with the National Water Act (36 of 1998); and / or
- Where plant is overloaded, introduce innovative methods to ensure enhancement of effluent quality.

8.1.10 Infrastructure Asset Management (IAM)

See Topic 3, Section 3.1.1. for the future demand requirements for Asset Management.

8.1.11 Operation and Maintenance of Assets

See Topic 4 for the future demand requirements for the operation and maintenance of the water and sewerage infrastructure assets of the municipality.

8.1.12 Financial Management

See Topic 7 for the future financial management functionality requirements.

8.1.13 Revenue Collection

See Topic 7 for the future revenue collection functionality requirements.

8.1.14 Financial Asset Management

See Topic 3, Section 3.1.1. for the future demand requirements for the financial asset management of the municipality

8.1.15 Information Management (IT)

The Information and Communication Technology (ICT) services aid and assist in achieving the IDP Strategic Objectives in the following manner.

- A stable technology environment and infrastructure to support business units and departments in achieving their objectives.
- Reduced down time of systems.
- Increased support and optimized application and infrastructure resulting in increased productivity within Swartland Municipality.
- Secure and govern IT assets.
- Reduce cost through IT without compromising support and productivity.
- Bring innovation through IT when required to support economic growth.

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TOPIC 8: WATER SERVICES INSTITUTIONAL ARRANGEMENTS AND CUSTOMER SERVICES

8.1.16 Organisational Performance Monitoring

Swartland Municipality has a comprehensive Performance Management System in place. The performance indicators as included in the SDBIP are regularly reviewed in order to promote a culture of performance management among its political structures, political office bearers and councillors and in its administration and administer its affairs in an economical, effective, efficient and accountable manner.

The future water and sanitation KPIs and targets, as included in the Draft SDBIP 2023/2024, are summarised in the table below.

Table 8.1.16.1: Future water and sanitation KPIs (SDBIP)		
KPI Name	Unit of Measurement	2022/2023 Target
Capital expenditure in line with budget and timeframes	% of capital budget spent	Between 95% and 105%
Capital project implementation	Average % completion of capital projects	95% for the year
Operating expenditure in line with budget and timeframes	% of operating budget spent	Between 90% and 100%
Improved water sustainability	% total water losses	Maintain the annual average below 17%
Percentage of households with access to basic level of water, sanitation, electricity and solid waste removal	Number of formal residential properties with piped water connections	22 602
	Number of formal residential properties with access to sewerage services	20 409

8.1.17 Water and Sanitation Service Quality

Access to safe drinking water is essential to health and is a human right. Safe drinking water that complies with the SANS:241 Drinking Water specification does not pose a significant risk to health over a lifetime of consumption, including different sensitivities that may occur between life stages. Swartland Municipality is therefore committed to ensure that their water quality always complies with national safety standards.

Water Safety Plans are in place for the two bulk water distribution systems and for Swartland Municipality's internal water reticulation systems and these include Improvement / Upgrade Plans for the residual medium and high risks. The purpose of the Improvement / Upgrade Plans is to address the existing significant risks where the existing controls are not effective or absent.

Barriers implemented by Swartland Municipality against contamination and deteriorating water quality include the following:

- Service Delivery Agreement between the West Coast District Municipality and Swartland Municipality. A Monitoring Committee with the following powers and functions are in place:
 - To co-ordinate integrated development planning in respect of the services;
 - To monitor the performance of the District Municipality in respect of service levels;
 - To monitor the implementation of this agreement;
 - To provide a forum for the local municipalities to interact with the District Municipality;
 - To accept delivery, on behalf of the Local Municipalities, of reports which the District Municipality is required to produce in terms of this agreement;
 - To consider and make recommendations to the District Municipality on the District Municipality's high-level budget and key performance indicators and targets;
 - In consultation with the District Municipality, to handle, manage and make recommendations to the parties in respect of any matter related to the services which is not dealt with by this agreement;

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- To ensure that the expenses incurred by the District Municipality in respect of the services do not exceed the amount allocated therefore in the District Municipality's annual budget;
- To formulate a written document that records the rules and procedures, which will be binding on itself, regulating the manner and legislative obligations, powers and functions to the Monitoring Committee.
- Protection at points of abstraction such as Paardenberg Dam and the boreholes (Abstraction Management).
- Protection and maintenance of the distribution systems. This includes ensuring an adequate disinfectant residual at all times, rapid response to pipe bursts and other leaks, regular cleaning of reservoirs, keeping all delivery points tidy and clean, etc.

Three other important barriers implemented by Swartland Municipality against poor quality drinking water that are a prerequisite to those listed above are as follows:

- A well informed Council and municipal managers that understand the extreme importance of and are committed to providing adequate resources for continuous professional operation and maintenance of the water supply system.
- Competent managers and supervisors in the technical department who are responsible for water supply services lead by example and are passionate about monitoring and safeguarding drinking water quality.
- Well informed community members and other consumers of water supply services that know how to protect the water from becoming contaminated once it has been delivered, that have respect for water as a precious resource and that adhere to safe hygiene and sanitation practices.

8.1.18 Customer Care (CRM)

Swartland Municipality is committed to maintain the existing high level of customer service in their urban areas and to record all the necessary information for the WSDP on an annual basis. The present Customer Services and Complaints Management System allows for the recording and management of all water and sanitation related complaints. The Municipality is committed to ensure that all water and sanitation related complaints are recorded and that the complaints are addressed within the required time period.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES

9.1 EXISTING NEEDS PERSPECTIVE

The table below gives an overview of the Existing Needs Perspective for Swartland Municipality.

Table 9.1.1: Existing Needs Perspective for Swartland Municipality																		
Section	Interpret Situation Assessment	Intervention Required?	%	Solution Description	%	Is there an existing project / activity addressing this problem?	%	Project Reference	Does this current listed project / activity address the problem totally?	%	Project / Activity approved by Council as part of WSDP database?	%	Approved by Council in project / activity database and part of 5 yr IDP cycle projects?	%	Project / Activity listed in 3 yr MTEF Cycle?	%	Total Points	Current Demand Overall Scoring %
Topic 1: Settlement Demographics and Public Amenities																		
Settlements summary	Various Spatial Planning and Housing challenges	No	100	Continue with the implementation of the recommended environmental strategies as included in the draft 2023-2028 SDF for each of the towns and ensure that new developments are in line with these priority action plans.	100	Yes	100	Various	Partially	50	Yes	100	Yes	100	Yes	100	650	78.6
	Insufficient infrastructure capacity to accommodate new developments. Bulk water and sewerage infrastructure need to be aligned with the Water and Sewer Master Plans and housing projects can only continue once the required bulk water and sewerage infrastructure are in place.	No	100	All resources, especially surface water resources, need to be re-evaluated, especially where demand is close to the safe one in twenty year yields. Establish assurance of supply levels of all water sources. Ensure that the provision of bulk water and sewerage infrastructure are aligned with the Housing Strategy (Human Settlement Housing Pipeline) and that housing projects only continue once the required bulk water and sewerage infrastructure are in place, as indicated in the Water and Sewer Master Plans and this WSDP.	100	Yes	100	Various	Partially	50	Yes	100	Yes	100	Yes	100	650	78.6
Summary by settlement group	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Assessment score by settlement type	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Amenities summary	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Topic 2: Service Levels Profile																		
Direct Backlog: Water	There are still an estimated 700 households in the informal area in Chatsworth without basic water services.	Yes	100	Install communal taps for the Chatsworth informal area.	100	No	0	Part of O&M Budget	Yes	100	Yes	100	No	0	No	0	400	57.1
	There are still an estimated 157 households on the farms in the rural areas without basic water services.	Yes	100	Assist private landowners as far as possible with the provision of basic water services to all the households in the Municipality's Management Area with existing water service levels below RDP standard, once practical guidelines and funding become available from the DWS.	100	No	0	SM2526001	Yes	100	Yes	100	No	0	No	0	400	57.1
Direct Backlog: Sanitation	There are still an estimated 700 households in the informal area in Chatsworth without basic sanitation services.	Yes	100	Install communal toilet facilities for the Chatsworth informal area.	100	No	0	Part of O&M Budget	Yes	100	Yes	100	No	0	No	0	400	57.1
	There are still an estimated 1 645 households on the farms in the rural areas without basic sanitation services.	Yes	100	Assist private landowners as far as possible with the provision of basic sanitation services to all the households in the Municipality's Management Area with existing sanitation service levels below RDP standard, once practical guidelines and funding become available from the DWS.	100	No	0	SM2526002	Yes	100	Yes	100	No	0	No	0	400	57.1
Water services infrastructure supply level profile	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Water reliability profile	There are still an estimated 700 households in the informal area in Chatsworth without basic water services. There are still an estimated 157 households on the farms without basic water services.	Yes	100	Install communal water services for the Chatsworth informal area in order to ensure that the ratio of number of households per facility complies with the target of 25 or less households per tap. Assist private landowners as far as possible with the provision of basic water services to all the households on the farms in the rural areas with existing water service levels still below RDP standard, once practical guidelines and funding become available from DWS.	100	No	0	SM2526001	Yes	100	Yes	100	No	0	No	0	400	57.1
Sanitation services infrastructure supply level profile	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Sanitation reliability profile	There are still an estimated 700 households in the informal area in Chatsworth without basic sanitation services. There are still an estimated 1 645 households on the farms without basic sanitation services.	Yes	100	Install communal sanitation services for the Chatsworth informal area in order to ensure that the ratio of number of households per facility complies with the target of 5 or less households per toilet facility. Assist private landowners as far as possible with the provision of basic sanitation services to all the households on the farms in the rural areas with existing sanitation service levels still below RDP standard, once practical guidelines and funding become available from DWS.	100	No	0	SM2526002	Yes	100	Yes	100	No	0	No	0	400	57.1
Water services: Education	The water service levels of the primary schools in the rural areas are not known.	Yes	100	Confirm the water service levels of the primary schools in the rural areas. Provide basic water services to the schools if the current water service levels are below RDP standard.	100	No	0	Part of O&M Budget	Yes	100	Yes	100	No	0	No	0	400	57.1
Water services: Health	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES																		
Table 9.1.1: Existing Needs Perspective for Swartland Municipality																		
Section	Interpret Situation Assessment	Intervention Required?	%	Solution Description	%	Is there an existing project / activity addressing this problem?	%	Project Reference	Does this current listed project / activity address the problem totally?	%	Project / Activity approved by Council as part of WSDP database?	%	Approved by Council in project / activity database and part of 5 yr IDP cycle projects?	%	Project / Activity listed in 3 yr MTEF Cycle?	%	Total Points	Current Demand Overall Scoring %
Sanitation services: Education	The sanitation service levels of the primary schools in the rural areas are not known.	Yes	100	Confirm the sanitation service levels of the primary schools in the rural areas. Provide basic sanitation services to the schools if the current sanitation service levels are below RDP standard.	100	No	0	Part of O&M Budget	Yes	100	Yes	100	No	0	No	0	400	57.1
Sanitation services: Health	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Health and education facilities	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Topic 3: Water Services Asset Management																		
General information	Asset Management Plan is not in place.	Yes	100	Develop an Asset Management Plan.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	No	0	No	0	450	64.3
	Raw water quality of boreholes not adequately monitored.	No	100	Implement Groundwater Management Plan for three production boreholes (Water levels, abstraction volumes and water quality).	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Partially	50	Partially	50	550	78.6
Operation	Shortcomings were identified in the Water Safety Plans and WTW Process Audits.	No	100	Implement recommendations from the Water Safety Plans and WTW Process Audits. Implement proposed interim solutions for improving the operation of the WTW, as well as proposed refurbishment and upgrade and extension work. Ensure adequate budget is allocated for the future upgrading and refurbishment work.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
	Shortcomings were identified in the W ₂ RAPs and WWTW Process Audits.	No	100	Implement recommendations from the W ₂ RAPs and WWTW Process Audits. Implement proposed interim solutions for improving the operation of the WWTW, as well as proposed refurbishment and upgrade and extension work. Ensure adequate budget is allocated for the future upgrading and refurbishment work.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Functionality observation	Inadequate capacity of existing water and sewerage infrastructure to meet future requirements	No	100	Provide additional reservoir storage capacity for the towns with inadequate storage capacity. Upgrade existing water pump stations and provide new water pump stations for the identified areas. Upgrade existing WTWs and WWTWs as recommended. Upgrade existing sewer pump stations and provide new sewer pump stations for the identified areas.	100	Partially	50	Various	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Asset assessment spectrum	Insufficient funds to support maintenance of existing infrastructure. Deteriorated water and sewerage infrastructure. Inadequate O&M allocation for the replacement of old water and sewerage infrastructure and the operation and maintenance of the existing infrastructure.	No	100	Increase O&M budget for repairs and maintenance of infrastructure. A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of the existing water and sewerage infrastructure (Best Practice). In the case of operations and maintenance of the system, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the system remains in good condition (Best Practice).	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Water and Sanitation schemes	Inadequate capacity of existing water and sewerage infrastructure to meet future requirements	No	100	Upgrade sections of the water reticulation network and sewer drainage network as proposed in the Water and Sewer Master Plans.	100	Partially	50	Various	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Topic 4: Water Services Operation and Maintenance																		
O&M Plan	O&M tasks and O&M Schedules for the various water and sewerage infrastructure components not all in place	No	100	Operation and Maintenance tasks for the various water and sewerage infrastructure components, as indicated under Sections 4.1.1 to 4.1.10 of the "Future Demand and Functionality Requirements" WSDP Master Plan should be implemented. Ensure the required O&M schedules are in place and signed off.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Partially	50	Partially	50	550	78.6
Is there an O&M Plan?																		
Resources	Inadequate O&M allocation for the replacement of old water and sewerage infrastructure and the operation and maintenance of the existing infrastructure.	No	100	A budget of approximately 2% of the total asset value per annum should be allocated towards the replacement of existing water and sewerage infrastructure (Best Practice). In the case of operations and maintenance of the system, a budget of approximately 1% to 2% of the value of the system is typically required to ensure that the system remains in good condition (Best Practice).	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Yes	100	650	92.9
	Insufficient process controllers for the WTWs and WWTWs	No	100	Swartland Municipality needs to ensure that the number of process controllers at each of the WTWs and WWTWs and the class of process controller complies with the required number of process controllers and class of process controller per plant (New Regulation 3630).	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Partially	50	Partially	50	550	78.6
Information	All incidents at the WTWs and WWTWs to be recorded and Incident Management Protocols to be followed.	No	100	All incidents at the WTWs and WWTWs and on the water reticulation networks and sewer drainage networks need to be recorded and Incident Management Protocols, as included in the Water Safety Plans and W ₂ RAPs, need to be followed after an incident.	100	Yes	100	Part of O&M Budget	Yes	100	Yes	100	Partially	50	Partially	50	600	85.7
	Required O&M Manuals are not in place for all infrastructure.	No	100	Ensure that the required O&M Manuals are in place for all the water and sewerage infrastructure.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Partially	50	Partially	50	550	78.6
Activity control and management	O&M tasks and O&M Schedules for the various water and sewerage infrastructure components not all in place	No	100	Groundwater: Implement recommended daily, weekly, monthly and six monthly O&M activities for the boreholes.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Surface water infrastructure: Implement preventative maintenance procedures.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Bulk and water reticulation networks and fittings: Compile daily, weekly, monthly and annual maintenance checklists for the maintenance activities for the water reticulation networks and fittings.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES

Table 9.1.1: Existing Needs Perspective for Swartland Municipality																		
Section	Interpret Situation Assessment	Intervention Required?	%	Solution Description	%	Is there an existing project / activity addressing this problem?	%	Project Reference	Does this current listed project / activity address the problem totally?	%	Project / Activity approved by Council as part of WSDP database?	%	Approved by Council in project / activity database and part of 5 yr IDP cycle projects?	%	Project / Activity listed in 3 yr MTEF Cycle?	%	Total Points	Current Demand Overall Scoring %
		No	100	WTWs: Evaluate the existing O&M schedules for the WTWs against the recommended O&M tasks and ensure all required activities are adequately monitored and recorded.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Water PSs: Compile weekly and monthly maintenance checklists for the recommended activities for all the water PSs and all PSs need to be inspected on at least a weekly basis.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Reservoirs: Compile maintenance checklists for the recommended reservoir maintenance activities and document all inspections.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Remote monitoring and Control Systems: Ensure adequate maintenance is carried out on the SCADA systems and compile maintenance checklists for the recommended activities.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Sewer PSs: Compile weekly and quarterly maintenance checklists for the recommended activities for all the sewer PSs and all centrifugal pump stations need to be inspected on at least a weekly basis.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	Bulk and sewer drainage networks: Annual, monthly and weekly schedules for maintenance should be drawn up for the bulk and sewerage networks. Regular cleaning of sewer lines and all blockages and their precise locations should be recorded.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
		No	100	WWTWs: Evaluate the existing O&M schedules for the WWTWs against the recommended O&M tasks and ensure all required activities are adequately monitored and recorded.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Topic 5: Conservation and Demand Management: Water Resource Management																		
Reducing unaccounted for water and water inefficiencies	2022/2023 NRW 16.51% and Water Losses 14.00%	Yes	100	Implement the proposed WC/WDM Strategy and the 25 WC/WDM items. Ensure adequate budget is allocated under the Capital and Operational budgets towards the implementation of the WC/WDM initiatives.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
	Large water users (AADD > 20 kl/d) were identified from the Swift data	Yes	100	Set up meeting with the Large Water Users to discuss water consumption status, potential water saving volumes and to cultivate a water saving awareness within each large water user.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Leak and meter repair programmes	Leak Repair and Assistance Programmes are required for the low cost housing developments.	Yes	100	Implement a Leak Repair and Assistance Programme that investigates and repairs leaks at all domestic households in low cost housing developments and poor areas with consumption above 15 kl/month. An exercise could also be initiated to check for visual leakage at public buildings, using more than 60 kl/month.	100	No	0	Part of O&M Budget	Yes	100	Yes	100	Yes	100	No	0	500	71.4
	Old water reticulation networks result in regular pipe bursts and add to the water losses.	Yes	100	Continue with the implementation of the pipeline replacement programme. The location of pipe failures should in the future be recorded preferably with accurate GPS coordinates. This improves the integrity of the output of the pipe failure model. If a longer and more comprehensive pipe failure record could be established, the integrity of the output could be further enhanced. It was recommended in the pipe replacement study that the pipe replacement in Swartland Municipality is performed in accordance with the PRP values calculated in the study. Pipes with the highest PRP values should be considered to be replaced first.	100	Partially	50	SM2526003	Yes	100	Yes	100	Yes	100	Yes	100	650	92.9
	There was an estimated 918 unmetered erven and 193 developed erven with a meter, but with zero consumption in 2018, as identified through the Swift data	Yes	100	Install water meters at all the unmetered erven and inspect metered erven with zero consumption.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Consumer / End use demand management: Public information and Education programmes	WDM measures not yet implemented at all schools	Yes	100	At least once a year, a schools education programme on water conservation should be undertaken. The Municipality should assist the school(s) with the monitoring (water audit) of their water consumption. Swartland Municipality can also focus on the implementation of an extensive schools WDM programme, which can include annual competitions between schools (Say with a prize for the lowest consumption, the lowest per capita consumption and for the best WDM Strategy poster design, etc.). A schools WDM programme should receive a high priority.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
	Informative billing and consumer education material is needed.	Yes	100	Continue to focus on the installation of water saving devices (specific water efficient toilets) and raising awareness regarding conservation projects and the installation of these products in order to reduce water demand. The use and installation of these fittings should be included as a condition for the approval of building plans as well as provided for in the Water Services By-law.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7
Conjunctive use of surface and groundwater	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Working for Water	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100
Topic 5: Conservation and Demand Management: Water Balance																		
Water balance	Shortcomings were identified with	No	100	Ensure that the volume of water supplied from all water resources are	100	Partially	50	Part of O&M	Yes	100	Yes	100	Yes	100	Partially	50	600	85.7

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES

Table 9.1.1: Existing Needs Perspective for Swartland Municipality																		
Section	Interpret Situation Assessment	Intervention Required?	%	Solution Description	%	Is there an existing project / activity addressing this problem?	%	Project Reference	Does this current listed project / activity address the problem totally?	%	Project / Activity approved by Council as part of WSDP database?	%	Approved by Council in project / activity database and part of 5 yr IDP cycle projects?	%	Project / Activity listed in 3 yr MTEF Cycle?	%	Total Points	Current Demand Overall Scoring %
	regard to the current bulk water metering for the various schemes and the flows at the WWTWs.			metered (each individual source separately), the raw water and final water at the WTWs and the volume of water supplied to the various zones (at Reservoirs). The inflow at the WWTWs, the volume of treated effluent re-used and the volume of treated effluent returned to the water resource system also need to be metered at all the WWTWs.				Budget										
Topic 6: Water Resources																		
Current water sources	Confirm existing lawful use and registration volumes for all systems.	No	100	Ensure the required authorisations (licences) are in place for all the water resources, as well as the required registrations.	100	Yes	100	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Yes	100	700	100.0
Additional sources available	Augmentation of the existing water resources in order to increase assurance of supply.	Yes	100	Continue to investigate the augmentation of the existing bulk water sources. The possible interventions that can be investigated include an increased allocation from the Berg River and supply from the CCT (Supply to Swartland WTW from CCT's Voëlvlei WTW and supply to Riverlands / Chatsworth from Atlantis)	100	Yes	50	Various	Partially	50	Yes	100	Yes	100	Yes	100	600	85.7
Monitoring	Groundwater Monitoring Programme not yet fully implemented.	No	100	Ensure that the key groundwater management functions are implemented. The monitoring data must be analysed by a geohydrologist on an annual basis in order to assess the effects of abstraction and recharge on the boreholes and aquifer. Groundwater monitoring must continue on at least a monthly basis. Monthly monitoring of water levels, water chemistry and abstraction must be conducted by the Municipal staff. Swartland Municipality needs to ensure that all electronic data (i.e. dataloggers) are downloaded once quarterly by a geohydrologist. Monitoring data must be annually reviewed by a geohydrologist.	100	Partially	50	Part of O&M Budget	Yes	100	Yes	100	Partially	50	Partially	50	550	78.6
Water quality	Adequate	No	100	-	100	-	100	-	-	100	-	100	-	100	-	100	700	100.0
Operation	All industrial consumers to be monitored w.r.t. the quality of effluent discharge into the Municipality's sewer system.	No	100	The current approach adopted by Swartland Municipality in which the various parameters at all industrial consumers are monitored should be continued, as well as volumetric monitoring at the larger users. Adaptation of the current procedures must be undertaken in accordance with any changes to the wastewater discharge criteria set by DWS. It will also be necessary to consider limits above which volumetric monitoring will be necessary at new industries and existing smaller industries, where expansion is likely to take place.	100	Yes	100	Part of O&M Budget	Yes	100	Yes	100	Yes	100	Yes	100	700	100.0

**WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS
EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL
TOPIC STRATEGIES**

9.2 WATER MASTER PLAN PERSPECTIVE

The table below gives an overview of the Water Master Plan Perspective for Swartland Municipality.

Table 9.2.1: Water Master Plan Perspective		
Question	Yes / No	Score
Is there a Water Master Plan that addresses future requirements with regard to the following?		
Existing needs that will take more than 5 years to resolve?	Yes	80%
Resource Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Infrastructure Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Functionality Needs Prediction for a 5, 10 and 15 year scenario?	Yes	60%
Did Council approve any projects that should have started this current year that address the following?		
Existing needs that will take more than 5 years to resolve?	Yes	80%
Resource Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Infrastructure Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Functionality Needs Prediction for a 5, 10 and 15 year scenario?	Yes	60%
Are these future projects included in the next 5 year IDP programme for the following?		
Existing needs that will take more than 5 years to resolve?	Yes	80%
Resource Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Infrastructure Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Functionality Needs Prediction for a 5, 10 and 15 year scenario?	Yes	60%
Taking into consideration the current financial and institutional capacity of the WSA, score the probability scenario of the timeous implementation of these projects in relation to:		
Existing needs that will take more than 5 years to resolve?	Yes	80%
Resource Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Infrastructure Development Plan for a 5, 10 and 15 year scenario?	Yes	80%
Functionality Needs Prediction for a 5, 10 and 15 year scenario?	Yes	60%
Total		75%

Swartland Municipality's draft 2024/2025 MTEF Budget list the following major water and sewerage infrastructure projects (Value above R1 million), which are planned for the short term (Next three years).

- Upgrading of Darling and Moorreesburg water reticulation networks, in order to accommodate future housing projects.
- Upgrading of the water reticulation networks: PRVs, flow control valves, zone metering and water augmentation.
- Upgrading of the Ongegund reservoir and water pump station.
- Upgrade of the bulk water pipeline from Wesbank reservoir to Malmesbury / Abbotsdale.
- Upgrade of the bulk water pipeline from Kasteelberg to Riebeek.
- Bulk water pipeline connection between City of Cape Town WTW and Swartland WTW.
- Bulk water supply upgrade for Chatsworth / Riverlands.
- New reservoir for Riebeek Kasteel.
- Bulk water emergency spending.
- Installation of new water meters and the replacement of old or faulty water meters.
- Replacement and upgrades of the water and sewerage networks (Implementation of the Pipeline Replacement Programmes)
- Refurbishment / Upgrade work at the Darling WWTW.
- Replace mechanical equipment of the clarifier at the Malmesbury WWTW.
- Upgrade of bulk sewer pipelines for Darling and Moorreesburg.
- Purchase of required vehicles for water and sanitation services.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES

The new NWRS 2 list the following steps to raise the water profile in development planning:

- Water must be placed at the center of integrated planning and decision-making, with a specific aim to respond to and support the achievement of national development and sector goals.
- Current budgets need to adequately provide for water, which might mean they have to be doubled to cater for the present needs.
- Current financial values need to appreciate water as a scarce resource and should thus reflect the real value of water. This requires a new value system across all sectors and stakeholders.
- Water efficiency and curbing water losses should be high on the agenda of each individual and institution in the country.
- Water management must be formally embedded in the sector businesses with associated accountability.

The DWS will insist in the future that all water infrastructure which they fund is value engineered against the life-cycle cost with a specific emphasis on energy costs. Evidence will be required that the technical design is appropriate for the nature of the resource and that operation and maintenance of the assets is reasonably within the capability of the responsible institution. New water resources infrastructure will also not be developed or authorized unless effective WC/WDM interventions have been put in place in the affected area.

The identification of projects necessary to ensure the provision of adequate levels of water and sanitation services is based primarily on the findings of the Water and Sewer Master Plans. Master Planning is typically based on a forward planning horizon of 20 years, but is usually updated every three to five years, taking into account improved water demand estimates and subsequent infrastructure developments which may have taken place. The recommended projects from the Swartland Master Plans were incorporated into the WSDP.

The Master Plans represent the ideal infrastructure development required to meet projected future water requirements over the next few years, while realistic capital investment in infrastructure projects is determined by budget availability. As a result, prioritization of projects is necessary to identify what can be done within the available and projected budget constraints. The prioritization of projects is done through the IDP and annual budget planning process.

Recommended infrastructure projects for implementation in the future by Swartland Municipality will be based on the following plans and processes:

- Water and Sewer Master Plans and Water and Waste Water Treatment Works Master Plans/studies;
- Infrastructure replacement needs (Asset Register);
- Ad-hoc technical investigations;
- Budget proposals; and
- Asset Management Plans.

The future master plan items for the bulk and internal water and sewerage infrastructure and networks are included under Topics 3. The future water and sewerage capital infrastructure projects for Swartland Municipality are included in Table 7.1.4.1.1 and Table 7.1.4.2.1 under Topic 7 (Draft 2024/2025 MTEF Capital Budget). The future master plan items for the bulk water networks and the internal water and sewer networks are included in the tables in Annexure A.

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES

9.3 OVERALL TOPIC STRATEGIES

The table below gives an overview of the Strategies and Objectives for Swartland Municipality

Table 9.3.1: Strategies, Objectives and Key Performance Indicators for Swartland Municipality									
Nr	Objective / Strategy	Key Performance Indicator	Baseline 2022/2023	Linked Project	FY2023/24	FY2024/25	FY2025/26	FY2026/27	FY2027/28
Topic 1: Settlement Demographics and Public Amenities									
	Implemented by other Department	-	-	-	-	-	-	-	-
Topic 2: Service Levels Profile									
14-0023	Access to water, sanitation and refuse removal	Number of formal residential properties with piped water connections.	22 602	Part of O&M Budget		Targets still to be set	Targets still to be set	Targets still to be set	Targets still to be set
14-0023	Access to water, sanitation and refuse removal	Number of formal residential properties with access to sewerage services.	20 409	Part of O&M Budget		Targets still to be set	Targets still to be set	Targets still to be set	Targets still to be set
New	Ensure all households on the farms are provided with at least basic water services, subject to DWS guidance.	Support all applications received for basic water services on the farms (Subject to availability of financial resources and sustainability of type of service).	-	Part of O&M Budget	-	-	100% of applications received are supported (Subject to availability of funding and sustainability of type of service)	100% of applications received are supported (Subject to availability of funding and sustainability of type of service)	100% of applications received are supported (Subject to availability of funding and sustainability of type of service)
New	Ensure all households on the farms are provided with at least basic sanitation services, subject to DWS guidance.	Support all applications received for basic sanitation services on the farms (Subject to availability of financial resources and sustainability of type of service).	-	Part of O&M Budget	-	-	100% of applications received are supported (Subject to availability of funding and sustainability of type of service)	100% of applications received are supported (Subject to availability of funding and sustainability of type of service)	100% of applications received are supported (Subject to availability of funding and sustainability of type of service)
New	Provision of communal taps to households in informal areas based on the standard of 1 water point to 25 households.	Number of communal taps installed in relation to the number of informal households.	-	Part of O&M Budget	-	-	Provide at least 1 water point to every 25 households in informal areas	Provide at least 1 water point to every 25 households in informal areas	Provide at least 1 water point to every 25 households in informal areas
New	Provision of communal toilet facilities to households in informal areas based on the standard of 1 toilet to 5 households.	Number of toilet structures provided in relation to the number of informal households.	-	Part of O&M Budget	-	-	Provide at least 1 toilet to every 5 households in informal areas.	Provide at least 1 toilet to every 5 households in informal areas.	Provide at least 1 toilet to every 5 households in informal areas.
Topic 3: Water Services Asset Management									
14-0001	Asset safeguarding	A condition assessment and a review of the remaining useful life of all assets in the department done and a certification in this regard provided to the Head Asset Management.	100%	Part of O&M Budget	100%	100%	100%	100%	100%
New	Ensure adequate storage capacity	Ensure adequate storage capacity for all towns (At least 48hrs AADD)	-	Various Projects	-	-	All towns with storage capacity above 48 hrs AADD	All towns with storage capacity above 48 hrs AADD	All towns with storage capacity above 48 hrs AADD
New	Implement projects included in the Water Master Plan	Ensure adequate water pump station and water reticulation capacity.	-	Various Projects	-	-	Upgrade existing water pump stations and provide new pump stations as identified in the Water Master Plan. Upgrade water reticulation networks as proposed in the Water Master Plan.	Upgrade existing water pump stations and provide new pump stations as identified in the Water Master Plan. Upgrade water reticulation networks as proposed in the Water Master Plan.	Upgrade existing water pump stations and provide new pump stations as identified in the Water Master Plan. Upgrade water reticulation networks as proposed in the Water Master Plan.
New	Implement projects included in the Sewer Master Plan	Ensure adequate sewer pump station and sewer drainage network capacity.	-	Various Projects	-	-	Upgrade existing sewer pump stations and provide new pump stations as identified in the Sewer Master Plan. Upgrade sewer drainage networks as proposed in the Sewer Master Plan.	Upgrade existing sewer pump stations and provide new pump stations as identified in the Sewer Master Plan. Upgrade sewer drainage networks as proposed in the Sewer Master Plan.	Upgrade existing sewer pump stations and provide new pump stations as identified in the Sewer Master Plan. Upgrade sewer drainage networks as proposed in the Sewer Master Plan.
Topic 4: Water Services Operation and Maintenance									
New	Implement recommendations from detail WTW Technical Process Audits.	% Of recommendations, as included in the WTW Process Audits, implemented.	-	Various Projects	-	-	60% of recommendations implemented	75% of recommendations implemented	90% of recommendations implemented
New	Implement recommendations from detail WWTW Technical Process Audits.	% Of recommendations, as included in the WWTW Process Audits, implemented.	-	Various Projects	-	-	60% of recommendations implemented	75% of recommendations implemented	90% of recommendations implemented
New	Implement recommendations as included in the Improvement / Upgrade Plan of the Water Safety Plan	% Of recommendations, as included in the Improvement / Upgrade Plan of the Water Safety Plan, implemented.	-	Various Projects	-	-	60% of recommendations implemented	75% of recommendations implemented	90% of recommendations implemented
New	Implement recommendations as included in the Improvement / Upgrade Plan of the W ₂ RAPs.	% Of recommendations, as included in the Improvement / Upgrade Plan of the W ₂ RAPs, implemented.	-	Various Projects	-	-	60% of recommendations implemented	75% of recommendations implemented	90% of recommendations implemented
New	Quality of potable water comply with SANS241	% Compliance with SANS241	-	Part of O&M Budget	-	-	90%	93%	95%
New	Quality of final effluent comply with authorisation limits for final	% Compliance with WWTW final effluent	-	Part of O&M	-	-	70%	80%	90%

WSDP MASTER PLAN: FUTURE DEMAND AND FUNCTIONALITY REQUIREMENTS

EXISTING NEEDS PERSPECTIVE, WATER MASTER PLAN PERSPECTIVE AND OVERALL TOPIC STRATEGIES

Table 9.3.1: Strategies, Objectives and Key Performance Indicators for Swartland Municipality									
Nr	Objective / Strategy	Key Performance Indicator	Baseline 2022/2023	Linked Project	FY2023/24	FY2024/25	FY2025/26	FY2026/27	FY2027/28
	effluent.	authorisations		Budget					
New	Water Quality sampling programme complies with requirements.	Water Quality Sampling Programme complies with the minimum SANS241:2015 monitoring frequency for process indicators.	-	Part of O&M Budget	-	-	90%	95%	100%
New	Ensure adequate budget for the O&M of the existing water and sewerage infrastructure	Ensure a budget of at least 1.5% of the total value of the water and sewerage assets is allocated towards the annual O&M of the systems.	-	Part of O&M Budget	-	-	A budget of 1.5% or more of the value of the water and sewerage assets is allocated towards the O&M of the systems.	A budget of 1.5% or more of the value of the water and sewerage assets is allocated towards the O&M of the systems.	A budget of 1.5% or more of the value of the water and sewerage assets is allocated towards the O&M of the systems.
New	Ensure adequate budget for the replacement of old water and sewerage infrastructure	Ensure a budget of at least 2% of the total value of the water and sewerage assets is allocated towards the replacement of existing infrastructure per annum.	-	Various Projects	-	-	A budget of 2% or more of the value of the water and sewerage assets is allocated towards the replacement of existing infrastructure.	A budget of 2% or more of the value of the water and sewerage assets is allocated towards the replacement of existing infrastructure.	A budget of 2% or more of the value of the water and sewerage assets is allocated towards the replacement of existing infrastructure.
New	Reporting on water quality and wastewater quality compliance percentages	Report at least annually on the percentage of water quality and wastewater quality compliance.	-	Part of O&M Budget	-	-	At least annual publication of water quality and wastewater quality compliance percentages.	At least annual publication of water quality and wastewater quality compliance percentages.	At least annual publication of water quality and wastewater quality compliance percentages.
Topic 5: Conservation and Demand Management: Water Resource Management									
12-0086	Improved water sustainability	% total water losses	< 17%	Part of O&M Budget	< 17%	< 17%	< 17%	< 17%	< 17%
Topic 5: Conservation and Demand Management: Water Balance									
New	Detail IWA Water Balances for all the systems and monthly WTW flows for all the treatment plants.	Ensure all bulk water is metered at source, at WTW (incoming and outgoing) and at all bulk storage reservoirs and the meters are read and recorded on at least a monthly basis.	-	Part of O&M Budget	-	-	90% Compliance	95% Compliance	100% Compliance
New	Monthly WWTW flows for all the treatment plants.	Ensure all incoming flow and outgoing flow at WWTWs are metered, as well as final effluent re-used for irrigation purposes and that meters are read and recorded on at least a monthly basis.	-	Part of O&M Budget	-	-	90% Compliance	95% Compliance	100% Compliance
Topic 6: Water Resources									
New	Implementation of Groundwater Management Programme	Ensure groundwater management programme for boreholes are implemented and raw water quality is monitored at least annually.	-	Part of O&M Budget	-	-	Implement Groundwater Management Programme and monitor raw water quality at least annually.	Implement Groundwater Management Programme and monitor raw water quality at least annually.	Implement Groundwater Management Programme and monitor raw water quality at least annually.
New	All water sources are authorised.	% of Abstraction from sources registered and authorised by the DWS.	-	Part of O&M Budget	-	-	95% Compliance	100% Compliance	100% Compliance
New	Ensure adequate yield and allocations from water resources to meet the projected future water requirements.	Ensure yields and allocations are adequate to meet the projected five year water requirements for all systems.	-	Part of O&M Budget	-	-	100% Adequate supply to meet water requirements for all systems	100% Adequate supply to meet water requirements for all systems	100% Adequate supply to meet water requirements for all systems
New	Monitoring of industrial consumers.	% Monitoring of effluent discharged by industrial consumers (Quantity and Quality) and charged according to the quality of effluent discharged by them.	-	Part of O&M Budget	-	-	85% Of all Industrial Consumers monitored w.r.t. quality and quantity of effluent discharged by them	90% Of all Industrial Consumers monitored w.r.t. quality and quantity of effluent discharged by them	95% Of all Industrial Consumers monitored w.r.t. quality and quantity of effluent discharged by them
Topic 7: Financial									
09-0013	Capital expenditure in line with budget and time frames	% of capital budget spent	95% - 105%	Various Projects	95% - 105%	95% - 105%	95% - 105%	95% - 105%	95% - 105%
09-0014	Capital project implementation	Average % completion of capital projects	95%	Various Projects	95%	95%	95%	95%	95%
09-0015	Operating expenditure in line with budget and time frames	% of operating budget spent	90% - 100%	O&M Budget	90% - 100%	90% - 100%	90% - 100%	90% - 100%	90% - 100%
17-0008	Spending of grants	% spending of grants	100%	Various Projects	100%	100%	100%	100%	100%
Topic 8: Institutional Arrangements and Customer Care									
09-0016	Workforce training roll-out	% of planned training sessions according to the Workplace Skills Plan realised.	100%	Part of O&M Budget	100%	100%	100%	100%	100%
New	Ensure adequate Process Controllers at the WTWs	% Compliance w.r.t the number of existing Process Controllers at the WTWs and the required number of Process Controllers	-	Part of O&M Budget	-	-	Both WTWs meeting the requirements, w.r.t. the number of Process Controllers per shift.	Both WTWs meeting the requirements, w.r.t. the number of Process Controllers per shift.	Both WTWs meeting the requirements, w.r.t. the number of Process Controllers per shift.
New	Ensure adequate Process Controllers at the WWTWs	% Compliance w.r.t the number of existing Process Controllers at the WWTWs and the required number of Process Controllers	-	Part of O&M Budget	-	-	70 % Of plants meeting the requirements, w.r.t. the number of Process Controllers per shift.	80 % Of plants meeting the requirements, w.r.t. the number of Process Controllers per shift.	90 % Of plants meeting the requirements, w.r.t. the number of Process Controllers per shift.