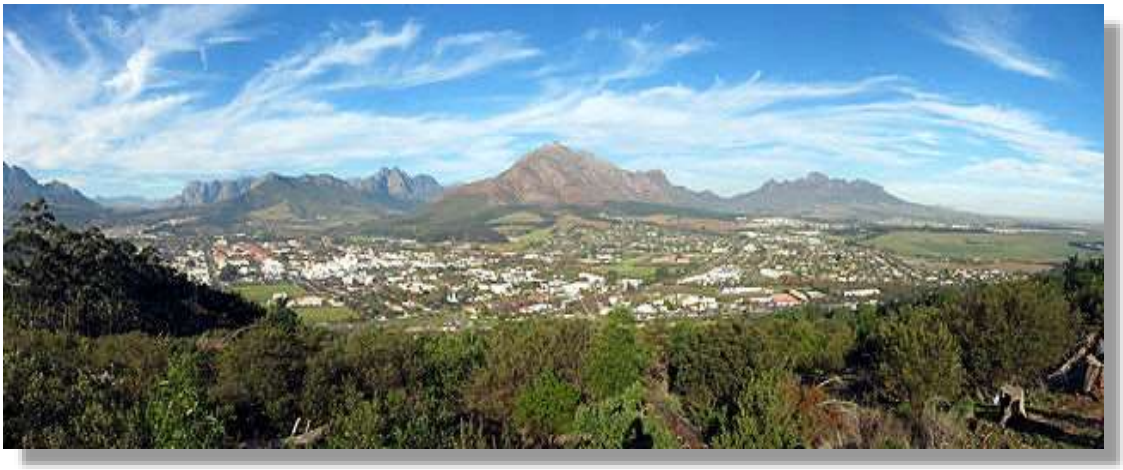
UNIVERSITEIT STELLENBOSCH UNIVERSITY

Stellenbosch University Drought Response Plan



Revision 2

November 2017

HATCH

Drought Response Plan

27 Nov 2017	2	Draft	P de Kock	J Bessinger	C de Wet	
24 Nov 2017	1	Draft	P de Kock	J Bessinger	C de Wet	
23 Aug 2017	0	Draft	P de Kock	J Bessinger	C de Wet	
DATE	**REV**	**STATUS**	**PREPARED BY**	**CHECKED BY**	**APPROVED BY**	**APPROVED BY**
HATCH						**CLIENT**

Table of Contents

Schedule of Abbreviations

SM	Stellenbosch Municipality
CoCT	City of Cape Town
WCWSS	Western Cape Water Supply System
DWS	Department of Water and Sanitation
WCWDM	Water Conservation and Demand Management
WTP	Water Treatment Plant
DMA	Demand Management Area
Ml/day	Mega litres per day / Million litres per day
Mm^3/a	Million cubic meters per annum
PRV	Pressure Reducing Valve
FM	Flow Meter
MDG	Municipal Disaster Grants
PDG	Provincial Disaster Grants
MDRG	Municipal Disaster Recovery Grants

Foreword

Introduction

The Western Cape Government has declared the entire Province a disaster area due to the ongoing drought. The National Disaster Management Framework and the National Disaster Management Act (Act No. 57 of 2002) requires that water service providers take proactive steps to mitigate the effects of the drought and ensure a sustainable water supply to its customers.

While an external event such as this drought lies outside of the span of control of both the University and the Municipality, we are compelled to take actions that will reduce the risk of the negative impact of this drought and protect our critical water resources to ensure that campus activities can proceed with no undue disruption. Developing and maintaining a proactive response plan to mitigate the effects and impact of the drought is essential to ensure and secure a sustainable supply of potable water to the University campuses.

Stellenbosch University (SU) Facilities Management department has made the decision to prepare a Drought Response Plan. This plan will document the measures that need to be implemented to protect all its campuses and other dependent water consumers against the progressively negative effects of this drought. The key stakeholders in the drought response includes SU, Stellenbosch Municipality, City of Cape Town, Breede Valley Municipality and the Department of Water and Sanitation. The three above-mentioned Municipalities are the respective Water Services Authorities for the various campuses and are implementing their own drought response plans.

Drought Response Approach

The Drought Response Plan for the University campuses will include a tier-based response with specific triggers/thresholds for actions appropriate for each stage of the drought. The Stellenbosch Municipality and City of Cape Town have already been implementing water conservation and water demand management measures for the last 5 years and have in the last year implemented various levels of water restrictions to protect water resources and reduce consumer water demand. The Drought Response Plan is based on 4 tiers of severity relating to the direct and indirect impacts of the drought. The main driver being the dam levels and water supply security associated with the relevant dam levels for each supply area and Water Services Authority responsible for the potable water supply to each campus. The Drought Response Plan being developed is multi-faceted and is not reliant on a single solution but rather an integrated number of separate actions each contributing to the strengthening of the security of water supply to the campuses. The aim is ultimately to ensure that the facilities can be operated as close to normal and that the academic and administrative functions of the SU can be maintained. The Plan also details emergency measure that should be taken in the event that water supply from the municipality becomes severely disrupted. Included in the Plan are measures to augment potable and non-potable water supply be tapping into groundwater resources and changing, where required the modus operandi to ensure an improved level of water security.

Western Cape Water Supply System Drought Assessment

Recent statistics indicates that dam levels under the control of the City of Cape Town and Department of Water & Sanitation (DWS) have recovered to 36 % (20 November 2017) from 19.7 % in May. The six largest dams as noted in the graph below supply Cape Town and other local municipalities,. This includes Stellenbosch which is supplied via the Western Cape Water Supply System (WCWSS). This water distribution network consists of a system of dams, tunnels, pipelines, treatment plants, reservoirs and distribution networks. The combined capacity of the six major dams within the WCWSS contributes approximately 99.6% and the minor dams an additional 0.4%.

Stellenbosch Municipality has two raw water sources/schemes i.e. the Riviersonderend Government Water Scheme (Theewaterskloof Dam supply to Paradyskloof WTP and is supplied via the Franschhoek, Dasbos and Jonkershoek tunnels). The Idas Valley Dams owned by the SM and Kleinplasie Dams in Jonkershoek supplies water to the Idas Valley Dams. The Stellenbosch Municipality is dependant on the Riviersonderend Government Water Scheme via the Franschhoek, Dasbos and Jonkershoek tunnels supply to Paradyskloof WTP. The volume is estimated at 26% of its total daily water demand under normal conditions. The Stellenbosch Campus receives all their potable water from the Stellenbosch municipal distribution network. Irrigation water is obtained from the Eerste River and pumped to the two dams at Coetzenburg. Water abstraction from the Eerste River is also allowed during winter months.

City of Cape Town has implemented level 4B water restrictions from July 2017 water restrictions and embarked on an extensive water conservation and water demand management (WCWDM) programme. The lower than normal rainfall in the catchment areas of the major dams has resulted below normal dam levels. There is now a real risk of water shortages and resulting water rationing which was recently implemented by the CoCT. The CoCT consumption is at 550-600 Ml/day with a target of 500Ml/day. Combined dam levels were dropping by around 0.8-1.0% per week until the recent early winter rains and gains of up to 1.4% per week were recorded during spring 2017. Now, however, dam levels drop by around 1% per week is summer. The CoCT publishes a Water Dashboard weekly on their website and the latest key figures are presented below.

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

City of Cape Town: Water Dashboard

20 November 2017

DAM STORAGE (%)	WEEKLY DAM LEVEL CHANGE (%)	AVERAGE DAILY PRODUCTION (Ml/d)
36.2	-0.6 ↓	602
	decrease since last week	(Target 500Ml/d)

All figures are for 20 November for each year except for those in the second column, which gives the figures for the previous week of this year.

NOTE: the last 10% of a dam's water is difficult to use, the useable water in the dam is approximately 10% less than the dam level.

http://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/damlevels.pdf

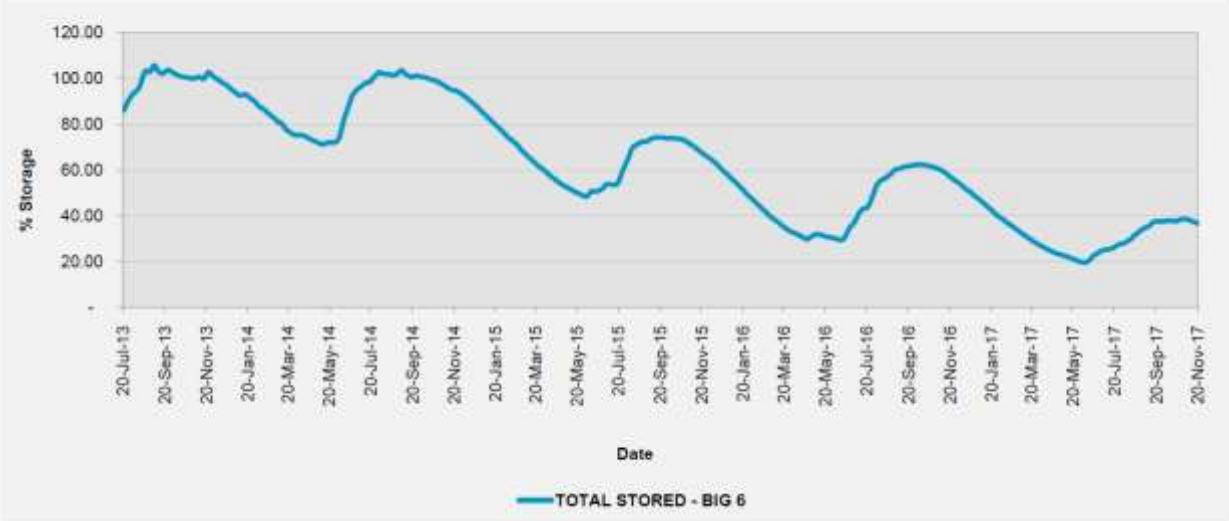
Dam levels are significantly lower that in the preceding 3-4 years and are now reaching critically low levels. This now requires special emergency interventions both on the demand management side as well as the supply side to find alternative sources. Winter rainfall continues to be well below the long-term average for the major dam catchment areas.

Major dam levels in Cape Town

MAJOR DAMS	STORAGE						
	CAPACITY	%	%	%	%	%	%
	Ml	20 November 2017	Previous week	2016	2015	2014	2013
BERG RIVER	130 010	65.9	67.3	69.8	82.3	98.4	101.0
STEENBRAS LOWER	33 517	54.4	52.2	53.3	76.1	79.6	100.3
STEENBRAS UPPER	31 767	100.4	99.3	84.4	85.1	97.4	99.3
THEEWATERSKLOOF	480 188	24.3	25.2	47.9	69.3	95.8	105.5
VOËLVLEI	164 095	26.7	27.1	66.1	39.8	93.4	97.4
WEMMERSHOEK	58 644	49.4	49.2	55.6	64.4	84.0	99.8
TOTAL STORED	898 221	325 169	330 768	506 556	595 355	848 270	921 462
% STORAGE		36.2	36.8	56.4	66.3	94.4	102.6

Capacity of the major dams of the Western Cape Water Supply System is 99.6% and that of the minor dams 0.4% of the combined capacity of the major and minor dams. Kindly note that all the Major Dams show gross capacity.

City of Cape Town Dams: Graph indicating % of water stored



It is imperative that we protect our critical water resources and water supply upon which communities depend. Developing and maintaining a drought management capability within the Water Services Authorities responsible for potable water supply will ensure to reduce the negative effects of drought.

However, other stakeholders and major water consumers, such as the University needs to contribute to the local authority's Drought Response Plan in order to mitigate the effects of the drought and ensure that water saving made to date are maintained. The actions should include reducing water consumption and assisting in the planning for severe water restrictions or rationing of supplies and augmenting existing water sources. The following actions are considered and implemented in various stages by SU .

- Stop all irrigation with potable water.
- Public awareness campaign on campuses to promote water demand reduction.
- Water demand management through the retrofitting of shower heads with more water efficient fittings, reducing water pressure and water restrictions.
- Augment existing supply by using groundwater, re-use of greywater for non-potable uses.
- Treated effluent is being re-used by the Municipality for irrigation.

Stellenbosch Municipality's Drought Management Plan is based on the 10-Step Drought Planning Process, (by Dr Donald A. Wilhite). This Plan should be used as an organisational tool to guide all planning and implementation of a pro-active drought response to mitigate the effects of the drought. The 10-step process provides a set of guidelines of the key elements of a drought planning process and is summarised below.

10 Steps for Drought Planning:

1. Appoint a Drought Task Force/Committee
2. State the Purpose and Objectives of the Drought Action Plan
3. Seek Stakeholder Participation and Resolve Conflict
4. Inventory Resources and Identify Groups/Communities at Risk
5. Develop Organisational Structure and Prepare Drought Management Plan
6. Integrate Science and Policy, Close Institutional Gaps
7. Publicise the Proposed Plan, Solicit Stakeholder Participation
8. Implement the Plan
9. Develop Education Programs
10. Post-Drought Evaluation of Plan

This Drought Management Plan is intended to provide SU Facility Management department with a guide when making decisions and taking action need to effectively reduce the negative impact of this drought. This plan will ensure that we are capable of maintaining a sustainable supply potable water as far as possible. The Plan includes preventative as well as emergency response actions and may include actions pre-/during and post-the drought event.

The Plan also allows Facilities Management to motivate for emergency funding for projects and initiatives without being constrained by the conventional procurement processes, in order to ensure a timeous implementation.

Drought Management Plan Structure

This Drought Management Plan is structured to provide the following components:

- Foreword – Setting the Context
- Legislative Framework and Definitions
- Understanding a Drought
- Western Cape Water Supply System Overview
- Stellenbosch Water Supply System Overview
- Drought Management Actions by Stellenbosch Municipality to Date
- The Drought Management Plan:
- Part two: Introduces the basic objectives and operating principles of the Plan based on drought risk reduction strategies (mitigation and preparedness) within national legislative frameworks.
- Part three: Focuses on building and integrating institutional capacity (KPA 1) for drought management in the WM.
- Part four: Drought response and recovery (KPA 4) highlights activation levels for each drought phase and the procedure for the mobilisation of resources and funding.
- Accompanying annexures is structured according to the KPAs and provides examples of data collecting instruments and stakeholder contact lists.

Legislative Framework

The National Disaster Management Framework and the National Disaster Management Act (Act No. 57 of 2002) consists of four Key Performance Areas (KPAs) and three enablers.

The four KPA's are:

KPA1 *Integrated institutional capacity for (drought) disaster risk management*
KPA2 *Drought risk assessment*
KPA3 *Drought risk reduction*
KPA4 *Response and recovery*

The Drought Management Plan should be a proactive, effective and step-based approach to mitigate the effects of this drought by providing a specific set of actions and risk based decision in order to guide actions in a responsible and systemic manner. The Plan must be financially responsible, effective, and have a systematic approach to respond to the typically progressively negative effects of drought on SU communities and core business that of teaching and learning. This Risk Based Approach, the will include the use of early warning systems to define the risk and consequence of a drought induced event. A series of pre-determined actions and steps to be implemented to mitigate risk or reduce impact and consequence.

Mitigation actions must take account of both environmental and social impacts if implemented and must consider the medium to long-term effects of the actions taken. It further needs to include policies and steps for recovery after the drought event and the steps required to return to normal operational conditions if at all possible. The Plan must focus on the short to medium term actions but also integrate as much as possible with long-terms resiliency of the water supply system to ensure financially responsible decisions are taken that will not compromise long-term water supply augmentation options/schemes.

Primary Objectives of the Plan must include:

- Appropriate actions and recommendations to maintain and protect water resources
- Actions to be taken at each stage of a drought setting in
- Needs determination of the users for which the Plan has an impact
- Public / Stakeholder participation in planning and decision-making
- Public / Stakeholder participation in implementation
- Up to date information on the drought situation and context to empower decision makers
- Institutional arrangements and / or structures required for the Plan to be executed
- Information flow and responsibilities between all stakeholders
- Define workable definitions of drought/drought phases, furthermore determine indicators to be used for establishing the criteria for declaring drought emergencies and triggering various mitigation and response activities
- Establish and pursue a strategy to remove "obstacles" to the equitable allocation of water during water shortages and establish requirements or provide incentives to encourage water conservation
- Establish a set of procedures to continually evaluate and exercise the Plan. Periodically revise the Plan so it will stay responsive

Secondary Objectives of the Plan are:

- Guarantee water availability in sufficient quantities to meet essential human needs during a drought to ensure the community's health and support health
- To assist in retaining jobs of industrial workers and support the economy during a drought
- Maintain a current inventory of stakeholder contact details
- Provide incentives to encourage water conservation

Key Definitions:

A disaster is defined as an "*a sudden accident or a natural catastrophe that causes great damage or loss of life or an event or fact that has unfortunate consequences*". However, although disasters are not easily predictable and their effects are often unforeseen, their impact can be mitigated via a Disaster Risk Management Plan. It is important to understand the following definitions:

Water Services Act (Act No 108 Of 1997)

The Water Services Act defines the following:

Water Services Authority:

Means a Municipality, including a District or Rural Council as defined in the Local Government Transition Act, 1993, responsible for ensuring access to water services.

Where, Water Services:

Means water supply services and sanitation services

Where Water Services Provider:

Means any person who provides water services to consumers or to another Water Services Institution, but does not include a Water Services Intermediary.

Where Water Services Institution:

Means a Water Services Authority, a Water Services Provider, a Water Board and a Water Services Committee.

A Water Services Authority has, amongst others, the following obligation in terms of the Act Duty to provide access to water services, which includes:

"….a duty to all consumers or potential consumers in its area of jurisdiction to progressively ensure efficient, affordable, economical, sustainable access to water services in emergency situations a Water Services Authority must take reasonable steps to provide basic water supply and basic sanitation services to any person within its area of jurisdiction and may do so at the cost of that authority a Water Services Authority may impose reasonable limitations on the use of water services Norms and standards for tariffs in terms of the Act: in prescribing the norms and standards, the Minister must consider, among other factors-the financial sustainability of the water services in the geographic area in question; the recovery of costs reasonably associated with providing the water services; the redemption period of any loans for the provision of water services; the need to provide for drought and excess water availability Offences in terms of the Act no person may continue the wasteful use of water after being called upon to stop by the Minister, a Province or any Water Services Authority, and any person who contravenes this stipulation is guilty of an offence and liable, on conviction, to a fine or to imprisonment or to both such fine and imprisonment Right of access to basic water supply and sanitation everyone has a right of access to basic water supply and basic sanitation. every Water Services Institution must take reasonable measures to realise these rights every Water Services Authority must, in its Water Services Development Plan, provide for measures to realise these rights…"

Basic water supply

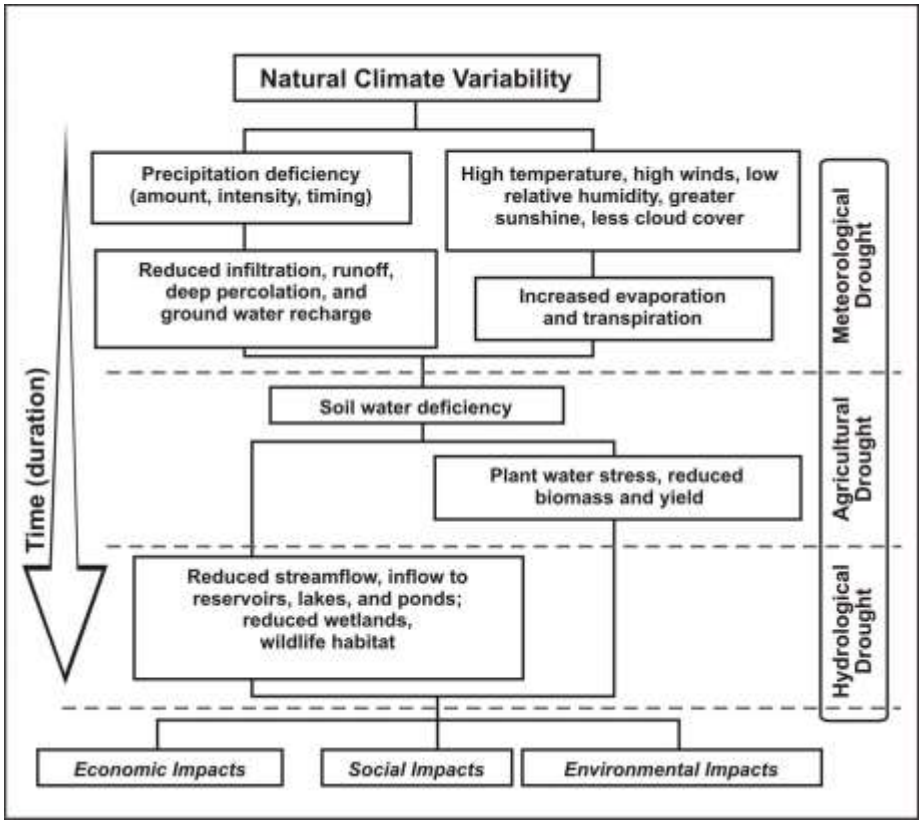
The minimum standard for basic water supply services is the provision of appropriate education in respect of water use; and a minimum quantity of potable water of 25 litres per person per day or 6 kilolitres per household per month. At a minimum flow rate of not less than 10 litres per minute; within 200 meters of a household; and with an effectiveness such that no consumer is without a supply for more than seven full days in any year. Provision of basic water supply and basic sanitation to have preference. If the water services provided by a Water Services Institution are unable to meet the requirements of all its existing consumers, it must give preference to the provision of basic water supply and basic sanitation to them. Preference should be given to the basic provision of water supply and basic sanitation in a disaster situation.

Where;
"Basic Water Supply" means the prescribed minimum standard of water supply services necessary for the reliable supply of a sufficient quantity and quality of water to households, including informal households, to support life and personal hygiene.

Understanding a Drought

Understanding what causes drought helps us to attempt to predict droughts more accurately. The immediate cause of droughts is the downward movement of air (subsidence). This causes compressional warming or high pressure that inhibits cloud formation and results in lower relative humidity and less precipitation. Prolonged droughts occur when large-scale high-pressure anomalies in atmospheric circulation patterns persist for months or seasons (or longer).

Drought has no universal definition as droughts are region specific and each drought differs in intensity, duration, and spatial extent. The four most common definitions describing the different types of drought are (1) meteorological drought, (2) agricultural drought, (3) hydrological drought and (4) socio-economical drought. There are complex interrelationships between the various components of the hydrological cycle and impacts. See figure below.



All droughts originate from a deficiency of precipitation or meteorological drought but other types of drought and impacts cascade from this deficiency. (*Source: National Drought Mitigation Centre, University of Nebraska-Lincoln, U.S.A.*)

Meteorological drought is usually defined by the measure of the departure of precipitation from the normal and the duration of the dry period. It is insufficient to meet the demands of human activities and the environment. This is the most important type of drought which drives the other type of droughts discussed below.

Agricultural drought links various characteristics of meteorological (or hydrological) drought to agricultural impacts, focusing on precipitation shortages, soil water deficits, reduced groundwater or reservoir levels below the optimal level required by a crop during each different growth stage needed for irrigation.

Hydrological drought usually refers to a period of below normal surface and subsurface water levels or supplies (such as stream flow, reservoir/lake levels, ground water). This can potentially result in significant societal impacts. Water in hydrologic storage systems such as reservoirs and rivers are often used for multiple purposes such as flood control, irrigation, recreation, navigation, hydropower, and wildlife habitat. Competition for water in these storage systems escalates during drought and conflicts between water users increase significantly.

Socio-economic drought refers to the situation that occurs when economic goods associated with the elements of meteorological, agricultural and hydrological drought fail to meet the demand. It represents the impact of drought on human activities, including both indirect and direct impacts. Droughts are predictable, slow-onset phenomena. Water scarcity, on one hand, and drought, on the other, should be considered different matters. Water scarcity refers to average water imbalances between supply and demand, while droughts, as a natural phenomenon, refer to important deviations from the average levels of natural water availability.

The Western Cape Water Supply System Overview

The WCWSS comprises an inter-linked system of six major dams, tunnels, large diameter pipelines, reservoirs, treatment plants and distribution networks. This system supplies potable water to the Cape Town metro and some surrounding municipalities. Components of this system is owned and operated by the DWS, TCTA and by the CoCT. The principal dams are all located in the Cape Fold Mountains to the east of Cape Town. The major dams are:

MAJOR DAMS	CAPACITY Ml
BERG RIVER	130 010
STEENBRAS LOWER	33 517
STEENBRAS UPPER	31 767
THEEWATERSKLOOF	480 188
VOËLVLEI	164 095
WEMMERSHOEK	58 644
TOTAL STORED	898 221

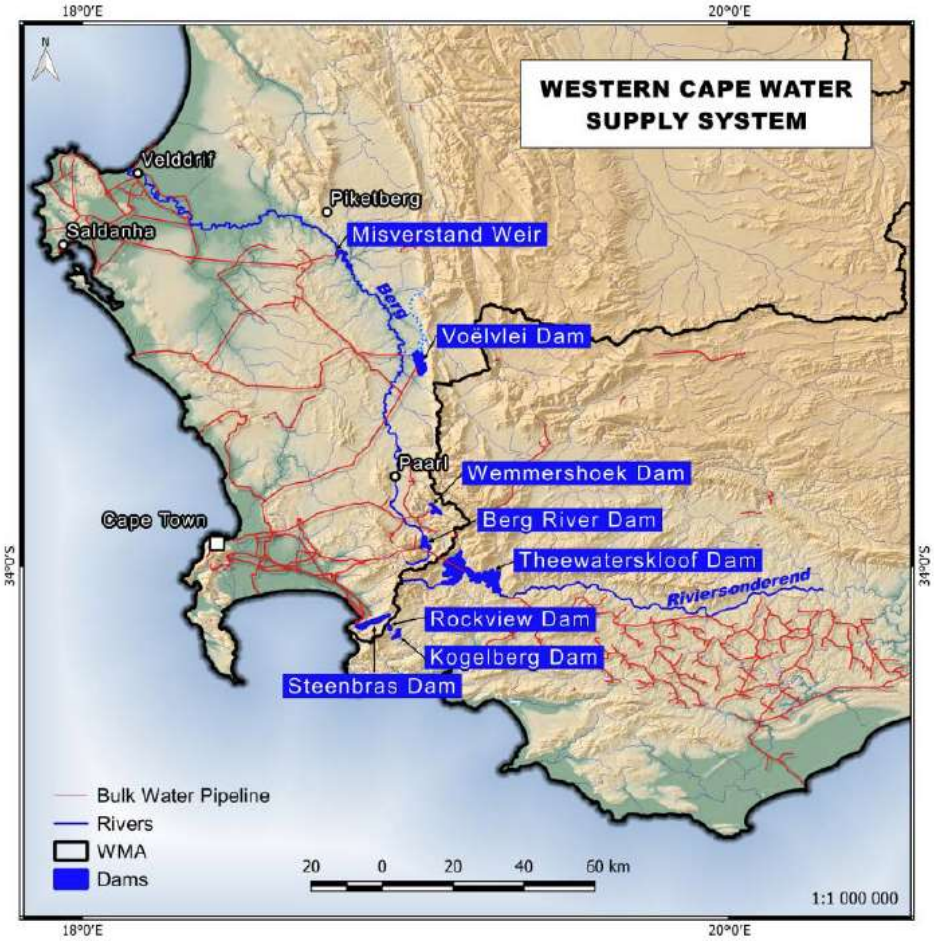
Major Dams in the WCWSS (Source: CoCT)

An estimated 63% of the water in the WCWSS is used for domestic and industrial purposes in the Cape Town metro. A further 5% is supplied to surrounding smaller municipalities and 32% is used for agriculture. The WCWSS is jointly operated by the DWS and CoCT. The WCWSS dams which supply to SM are Wemmershoek, Theewaterskloof/Bergrivier and Steenbras upper & lower dams. SM also has its own source of water at Idas Valley (2 dams) which is supplied from the Kleinplaas Dam located in Jonkershoek.

The largest component of the WCWSS is the Riviersonderend Government Water Scheme. This large inter-basin water transfer scheme regulates the flow of the Sonderend River flowing East towards the Indian Ocean. The Berg River flowing North-West towards the Atlantic Ocean and Eerste River that flows South into False Bay. The Theewaterskloof Dam, which is the largest of the six major dams in the WCWSS forms the heart of the scheme and is located at Villiersdorp on the Sonderend River. It has a storage capacity of 480 million cubic meter. The Theewaterskloof Dam is linked to the Berg River and Kleinplasie Dam supplies water via a tunnel system through the Franschhoek and Stellenbosch Mountains. This tunnel system conveys surplus winter flows (when water requirements are generally lower), from the Berg River and the tributaries of the Berg River to the Theewaterskloof Dam. Water is stored for use during summer months. During summer, when water requirements are generally higher, water can be supplied from Theewaterskloof Dam via the tunnel system into the Berg and Eerste River systems.

The Voëlvlei Dam located near Gouda supplies the WCWSS supplies water via two abstractions and pumped supplies with treatment plants located near the dam. The major supply from Voelvlei Dam is to the CoCT Plattekloof reservoir over a distance of some 80 km A smaller supply to Kasteelberg Reservoirs under control of the West Coast District Municipality.

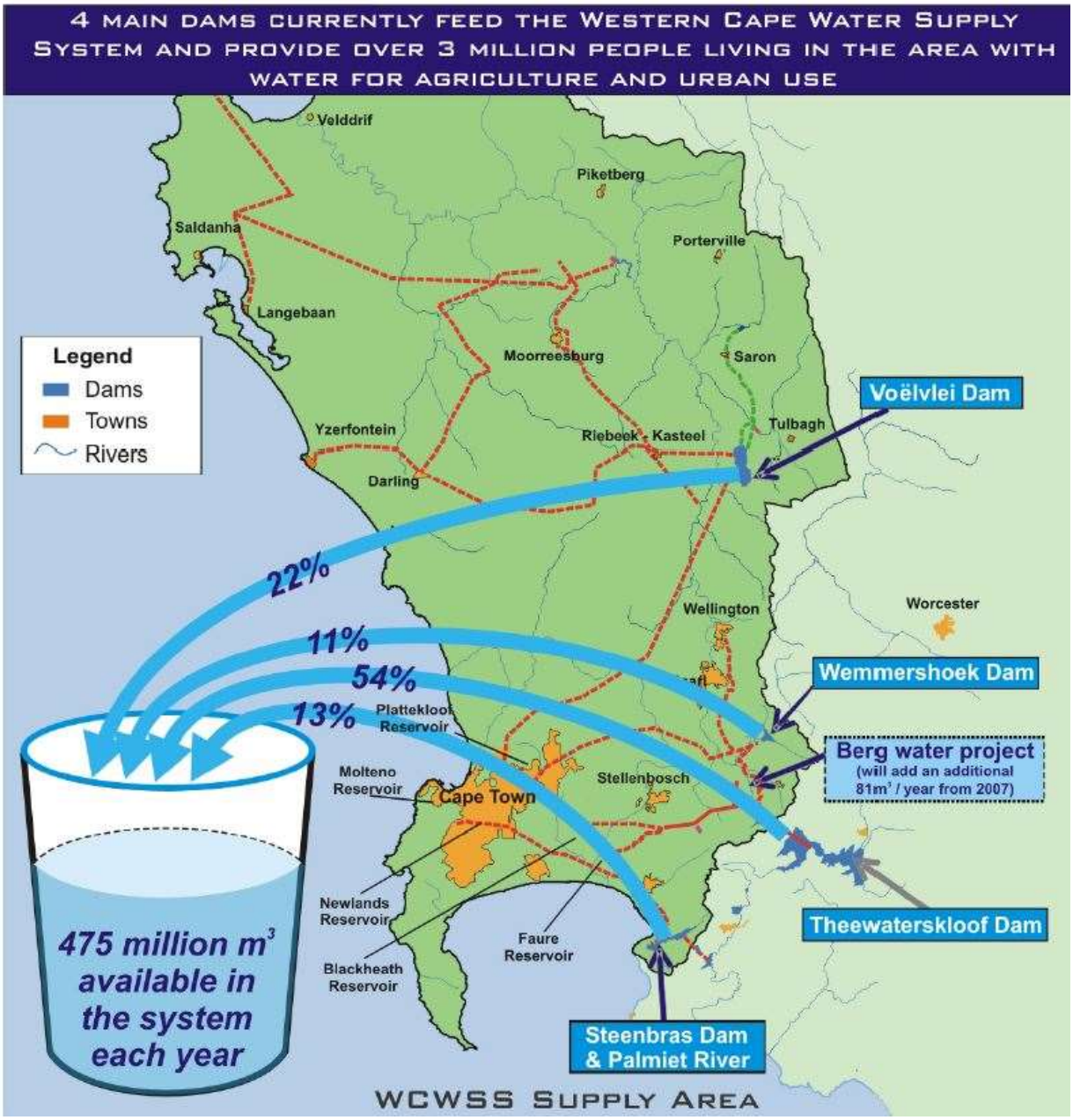
The Wemmershoek Dam is located in the Berg River basin and supplies Cape Town with water via the Wemmershoek Pipeline along the N1 national road to the Glen Garry Reservoir in Brackenfell.



WCWSS Dams (Source DWS Website)

The Upper and Lower Steenbras Dams on the Steenbras River is operated together with the Palmiet Pumped Storage Scheme dams on the Palmiet Rive. Water can be transferred from the Palmiet River to the Steenbras dams. Water is transferred from here to the Faure WTP from where it is distributed into the Cape metropole.

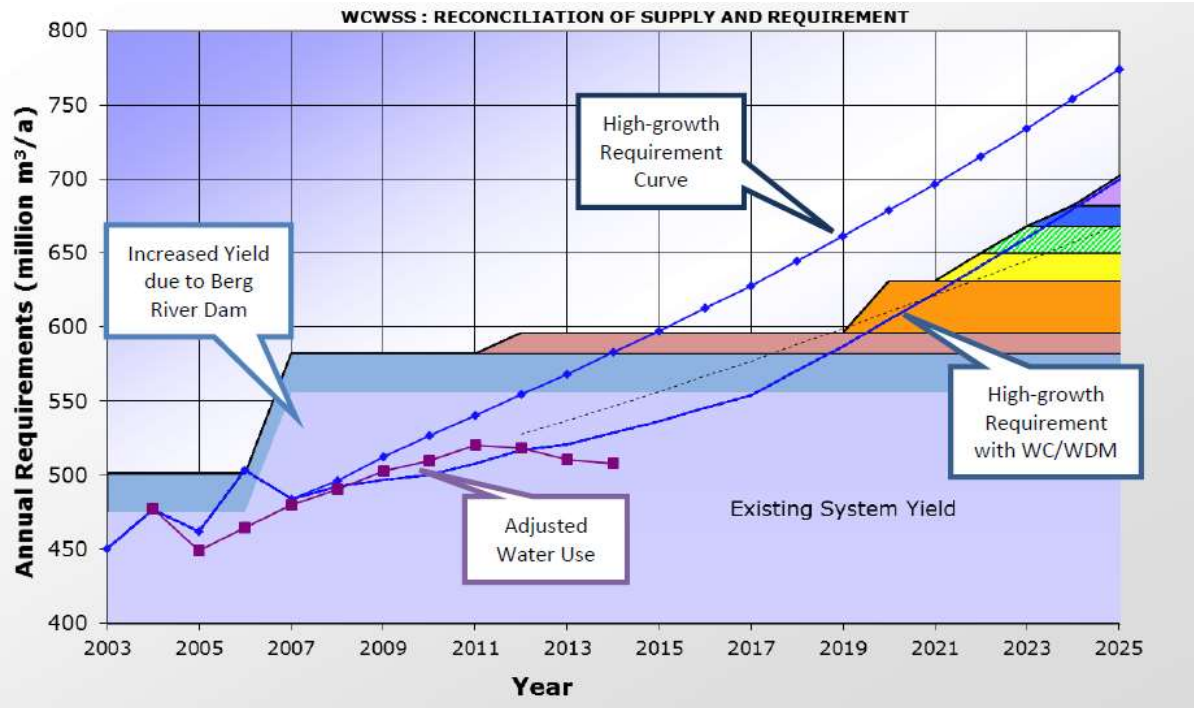
The Berg River Project was completed in 2009 and added an additional storage capacity of 898 million cubic metres. It is connected to the Riviersonderend GWS via the Dasbos tunnel and provide additional winter runoff storage capacity to the WCWSS.



The WCWSS: Source: DWS Website:
http://www.dwa.gov.za/Projects/RS_WC_WSS/Docs/Reconciliation%20Strategy.pdf

The WCWSRSS has mapped out a plan for augmentation of water supplies for the region. The current impact of the drought requires immediate and concise action to prevent a disaster. The augmentation schemes planned are typically long-term projects which cannot be brought on line in less than 2-3 years which renders them unsuitable for a drought mitigation plan in the short term.

This however does not mean that the augmentation schemes presented in the WCWSRSS should be delayed in any way and it is imperative that the DWS and CoCT proceed with these projects along the planned timeline. In the short to medium term other actions need to be taken to mitigate the effects of the drought and resiliency planning in water supply schemes must be considered as part of the operational procedures and planning for potable water supply schemes.

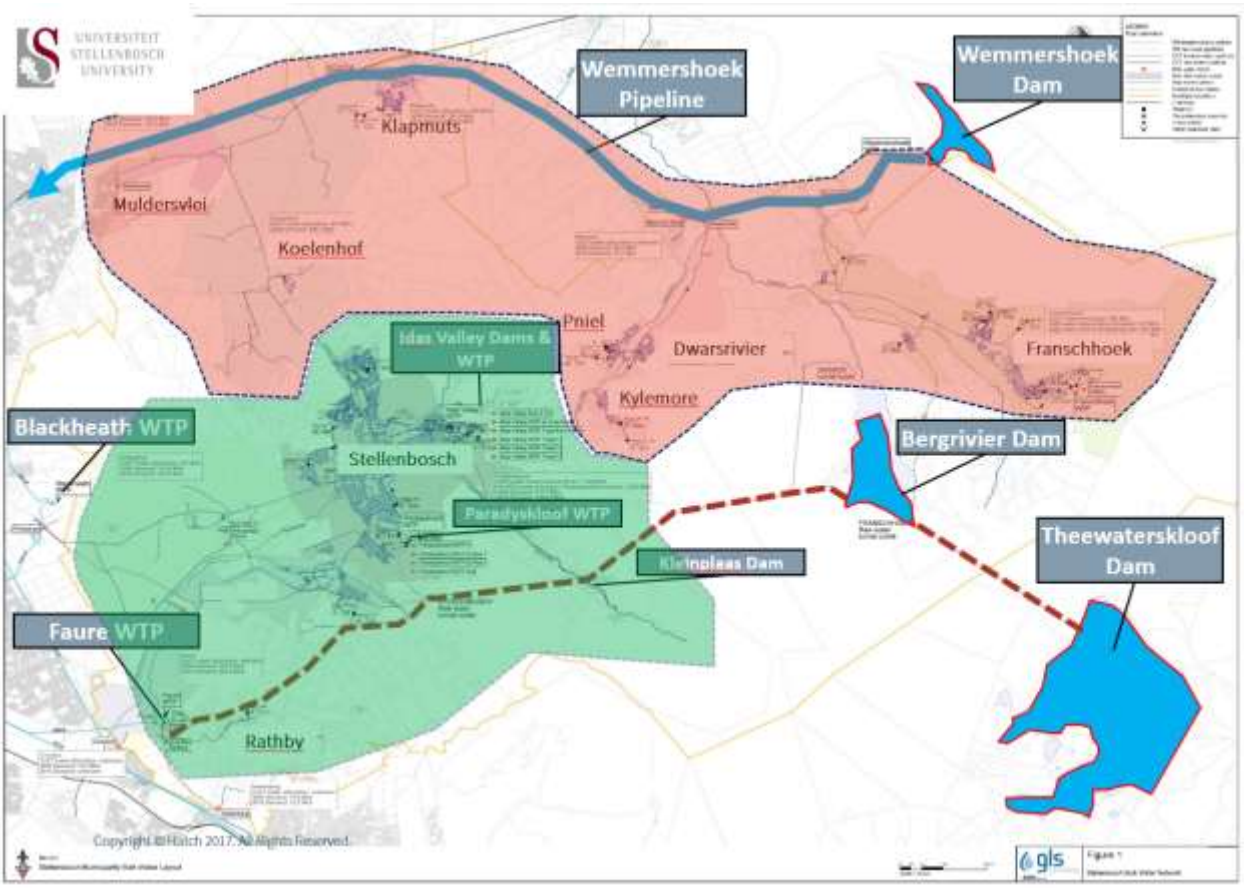


The WCWSS: Source: DWS Website:
http://www.dwa.gov.za/Projects/RS_WC_WSS/Docs/Reconciliation%20Strategy.pdf

The CoCT and surrounding municipalities that depend on the WCWSS have collectively made significant strides to reduce consumption and slow down water demand growth as illustrated in the graph above. WCWDM has had a substantial impact and has resulted in the CoCT and DWS postponing some of the planned water augmentation schemes. However, the WCWSSWRSS is based on a certain "safe yield" from the surface water sources it relies on. Due to the drought, the yield from the WCWSS is reduced and although the system is designed on a high assurance of supply, it is normal that a large regional system could experience a disruption in supply for 2-3 years in 100 years. The only effective emergency measure in such an event is severe water restrictions or the augmentation of sources from non-surface water resources which is typically orders of magnitude more expensive to develop and operate and it is therefore normal practice to delay the implementation of non-surface water sources for as long is possible to postpone the inevitable water tariff increases.

The Stellenbosch Municipality Water Supply System

SM falls within the Berg Management Area and includes towns such as Stellenbosch, Franschhoek, Klapmuts, Lanquedoc, Johannesdal, Kylemore, Pniel, Great Drakenstein, Wemmershoek, La Motte, De Novo, Muldersvlei, Elsenburg, Koelenhof, Vlottenburg, Lynedoch, Raithby and Jamestown.



The northern parts of the Municipal area is supplied from the Wemmershoek Pipeline while Stellenbosch Town is supplied with raw water from mainly two sources;

- Eerste River – Kleinplaas Dam (7.224 Mm³/a)
- Western Cape Water Supply System (3 Mm³/a) – via Theewaterskloof Tunnel

Water from the Eerste River in the Jonkershoek Valley at Kleinplaas Dam is diverted by means of a weir and a gravity pipeline to two off-channel storage dams in Idas Valley. The registered abstraction from this source is 7.224 Mm³/a. This source is estimated in the 1/100 year drought analysis not to supply less than 6Ml/day. This combined with the two Idas Valley dams is the most important source of water for Stellenbosch town.

Kleinplaas Dam – Jonkershoek (Source: Google Earth)

Idas Valley Dams (Source: Google Earth)

Water is supplied out of the Idas Valley Dam to a slow sand filtration WTP and into the town via the Idas Valley Reservoirs. The treatment capacity of the Idas Valley WTP is 28 Ml/day.

The WCWSS supply to Paradyskloof WTP arrives via a pipeline leading from the Stellenboschberg Tunnel outlet from the Riviersonderend GWS tunnel system. A volume of 3 Mm^3/a is available from this source under normal operating conditions. The treatment capacity of the Paradyskloof WTP is 10 Ml/day.

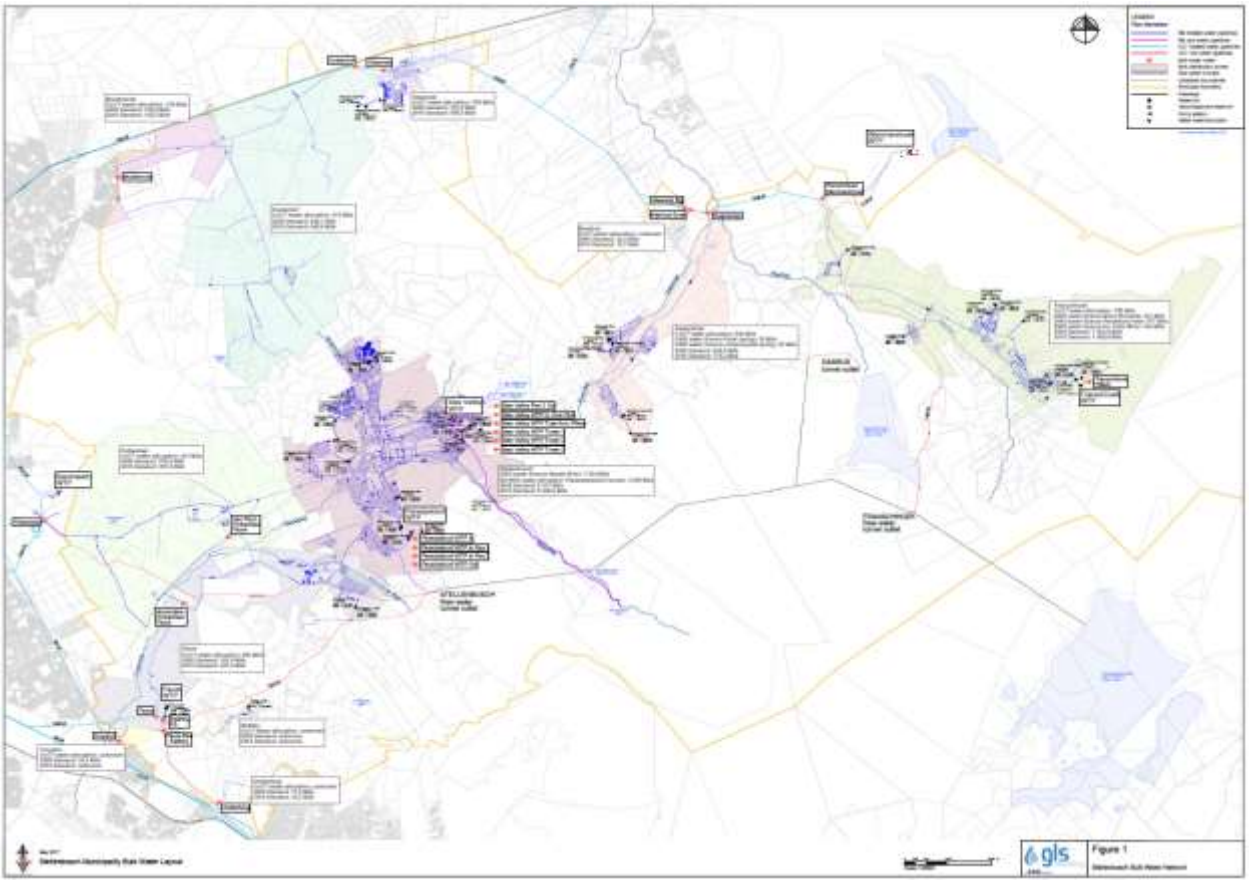
Paradyskloof WTP (Source: Google Earth)

Franschhoek which includes the smaller settlements of Groendal, La Motte, Wemmershoek and Robertsvlei is currently supplied with water from local sources in the catchments of the Mount Rochelle Nature Reserve and Perdekloof and with water purchased from the Wemmershoek Dam scheme from CoCT. The licensed abstraction from the perennial streams in the Mount Rochelle Nature Reserve is 0.221 M m³/a, from the Perdekloof Weir 0.577 M m³/a and from the Du Toits River 0.104 M m³/a.

Dwarsrivier which includes Pniel, Kylemore, Lanquedoc, Johannesdal and Groot Drakenstein receive treated water from the Wemmershoek Scheme directly from the CoCT bulk water pipeline with metered take-off local reservoirs. The local sources, which is currently not in use, include the Pniel Mountain stream (0.053 M m³/a), Pniel Spring (0.025 M m³/a), and the Pniel Kloof Street Borehole (0.079 M m³/a).

Klapmuts is supplied with treated water from the Wemmershoek Dam pipeline, which forms part of the WCWSS.

Boreholes exists in certain areas but is not in use for municipal potable supply and their condition and safe has now recently been tested and 7 No of these boreholes will potentially be utilised to augment the municipal potable surface water supply. The University has also identified a number of existing boreholes on the Stellenbosch and Tygerberg campuses and has completed a testing programme to determine the yield and water quality of these boreholes as a possible alternative or supplementary supply for potable and non-potable uses. The results from the borehole testing programme is discussed in KPA3 - Drought Response later in this report.



Stellenbosch Bulk Water System Layout (Source: GLS)

KPA1 – Integrated Institutional Capacity for Drought Response

SU has the necessary institutional capacity for the effective implementation of their Drought Response Plan. This includes the following key stakeholders who will act as the Drought Response Committee:

- Facilities Management
- Stellenbosch Municipality – Engineering
- Stellenbosch Municipality – Disaster Response
- Department of Water & Sanitation – WC regional office
- Research Institutes – Stellenbosch University Engineering Faculty
- City of Cape Town – Bellville and Tygerberg Campuses
- Breede Valley Municipality – Worcester Campus
- Catchment Management Agencies – Eerste/Kuilsriver Catchment
- Consultants and Technical Advisors – Hatch Africa, JG Afrika, GEOSS and GLS

The Drought Response Risk Mitigation Committee has regular liaison with stakeholders with formal progress meetings, distribution of weekly Drought Monitoring Reports published by the Stellenbosch Municipality and City of Cape Town and technical meetings as required. This integrated and co-ordinated approach to this drought includes sharing of ideas via workshops and ad-hoc meetings and telephone and email communication.

A 2-weekly formal meeting was introduced to monitor progress on the drought situation and implementation of the action plan required. This includes sharing of vital information on the drought and the impact of the drought response. Meetings with the Provincial Government takes place at least once a month with updates as required.

The role of each of the committee members is outlined below:

Facilities Management

- Implement active drought monitoring
- Review and implement technical solutions
- Prepare and distribute drought monitoring reporting
- Monitoring drought response impact
- Oversee the management of all interventions

Stellenbosch Municipality – Engineering Services

- Collaborate on joint initiatives for drought response
- Report on municipal water supply security and risks

Stellenbosch Municipality – Disaster Response

- Implement emergency response actions for the Town
- Support Engineering Department on drought response

Department of Water & Sanitation – WC regional office

- Report on regional drought situation and augmentation schemes
- Inform the committee on Policy decisions and Drought Response for the region
- Allocate emergency funding for priority projects
- Report to National Government on regional response to the drought

Research Institutes – Stellenbosch University Engineering Faculty

- Review technical solutions and evaluate against industry best practice
- Carry out theoretical review and provide advice
- Carry our research

City of Cape Town

- Inform committee on WCWSS drought response and risks to Municipal water security
- Provide early warning of any drastic changes to the WCWSS operation and water allocations
- Monitoring drought response impact in Cape Metropole an provide feedback
- Provide technical advice and guidance from projects implemented in Metropole

Breede Valley Municipality

- Inform committee on drought response and water supply security in Worcester town

Catchment Management Agencies – Eerste/Kuilsriver Catchment

- Monitor and report on impact of drought on catchment
- Monitor Eersterivier irrigation abstractions and restrictions affecting irrigation of the campus

Consultants and Technical Advisors

- Technical guidance on drought response measures
- Provide designs for technical interventions
- Contract administration for projects implemented
- Costing of projects and initiatives
- Procurement of specialist services
- Monitoring of capital projects
- Reporting

It is proposed that Facilities Management issue written communication to all stakeholder and request their active participation in the Drought Response Plan for the University.

KPA 2 - Drought Risk Assessment

Key to the formulation of a pro-active and effective drought response is understanding and reporting on the drought situation. The City of Cape Town and SM have both implemented weekly drought monitoring and reporting meeting to assess the drought risk and monitor the impact on its water availability. Refer to the latest Weekly Drought Monitoring Report for SM below. The SM reports on availability of water as well as the latest progress on the drought intervention projects. An extract from the latest report is provided below:

WEEKLY DROUGHT MONITORING STELLENBOSCH MUNICIPALITY					
Name of municipality: Stellenbosch Municipality				Date completed: 13/11/2017	
AVAILABILITY OF WATER:					
Dams (DWS and Municipal):					
Name of dam	% Full this week	% Full last week	% Full previous year	Month/weeks/days water supply left	Towns being supplied by this dam
Idas Valley 1 +2	98%	98%		+-4 months	Stellenbosch
Steenbras Upper Lower (Faure WTW + Blackheath WTW)	99%* 53%*	100%* 53%*	87.7% 58%		Raithby, Polkadraai Helderberg SH, Croyden,
Theewaterskloof	26.4%*	28.7%*	50%		Stellenbosch
Wemmershoek * Levels not available due to data not updated on DWS Web page.	48%*	45%*	60%		Koelenhof, Klapmuts, Meerlust, Muldersvlei, Franschhoek, Dwarsrivier
Level of Water Restrictions: 5- Implemented July 2017					

The CoCT's weekly drought monitoring website can be accessed via the hyperlink below:

http://resource.capetown.gov.za/documentcentre/Documents/City%20research%20reports%20and%20review/damlevels.pdf

KPA3 – Drought Risk Reduction and Mitigation

SM and City of Cape Town has implemented several initiatives as part of their WCWDM programme which form part of the Drought Risk Reduction programme. SM prepared a WCWDM strategy, initiated 7 years ago and has started implementation the following projects:

- Water restrictions and water demand management
- Weekly report and early warning mechanisms
- Identification of high water consumers and taking action to investigate these
- The publication of articles to increase public awareness via the media and posters
- Household Leak Repair and Water Meter Replacement Projects as part of the "War on Leaks" campaign
- Water Meter and Water Consumption Audit Projects
- Revenue Enhancement through customer meter billing database updating and data improvement
- Design and implementation of additional pressure managed zones
- Evaluation of emergency Drought Response Action Plan
- Scenario Planning for Water Rationing measures

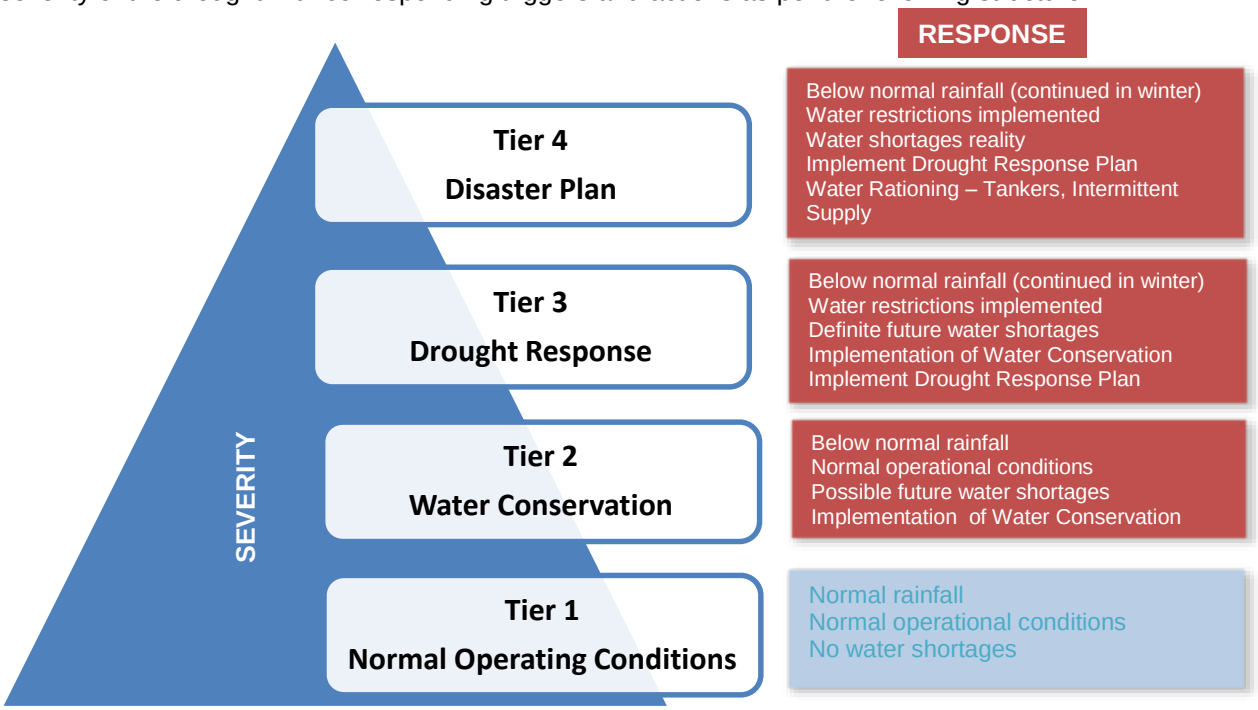
The actions taken by the SM replicate and compliment many similar initiatives taken by the CoCT and other surrounding municipalities. The CoCT has implemented the following measures to date:

- A visual media campaign reflecting that is dam levels etc. on Electronic Sign Boards
- Workshop's to discuss the water crisis with a panel of experts
- Various media campaigns and regular reporting by the Mayor's office

The SU Facilities Management has recognised the need to also urgently prepare a Drought Response Plan. USFM has proactively implemented several actions in order to prepare for the drought and ensure security of a sustainable supply of potable water to the SU community. The various initiatives are discussed in more detail in the following sections.

Initiative 1 - Drought Response Plan

A Drought Response Plan was prepared in accordance with pre-determined tiers based on the level of severity of the drought with corresponding triggers and actions as per the following structure.



The Drought Response Plan defines specific actions to be taken for each Tier up to Tier 4. The Drought Response Plan is updated as new information becomes available and the drought situation develops.

Initiative 2 - Water Restrictions

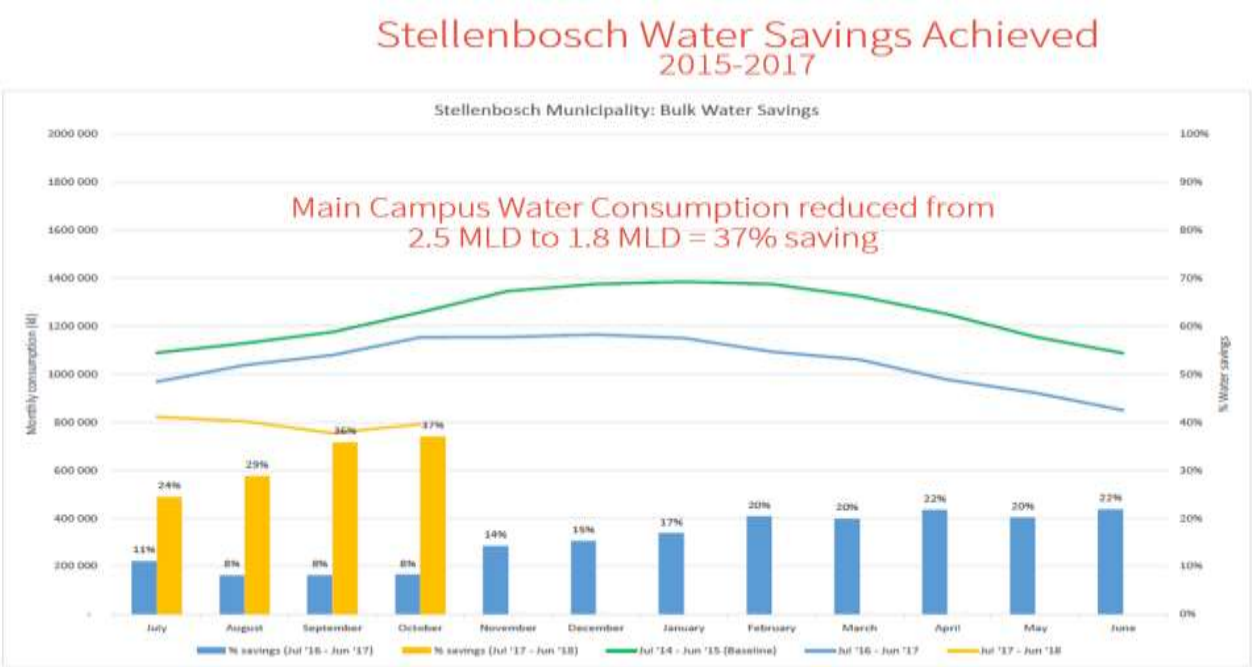
The SM and CoCT have both implemented Level 1 water restrictions on the 1st of November 2015 to achieve a 10% reduction in consumption water. This was due to low levels in the supply dams and low rainfall figures during the 2016 winter season. This was followed with the implementation of Level 2 water restrictions from March 2016 due to extreme hot weather conditions and even lower levels of the supply dams in Stellenbosch and the WCWSS. The Level 2 restrictions included the increased tariffs for water consumption to achieve a 20% savings of water consumed. In Stellenbosch more stringent water restrictions, i.e. Level 3 water restrictions were imposed with effect from 1st December 2016 due to the lower than the normal dam levels and continued drought, followed by Level 4 and 4B.

The CoCT and SM have recently introduced Level 5 Water Restrictions from 1 July 2017. The associated punitive new water tariffs will be applied from 1 July 2017.

The SM and CoCT recognises the inconvenience caused by severe water restrictions. In the light of the continued drought, these restriction are necessary and are currently the only option to prolong the remaining water supplies. The restrictions imposed to date are inline with the restrictions implemented by CoCT and other Western Cape municipalities.

Initiative 3 - War on Leaks Programme

SM has implemented various short to medium term leak reduction and related water loss reduction interventions as part of their 10 year WCWDM programme. These include domestic leak repairs, water meter replacement, water meter audits, billing database corrections and pressure management in selected areas. To date a meter audit in Klapmuts and Dwarsrivier has been undertaken along with domestic leak repairs and meter replacement to over 250 properties in Klapmuts, Lanquedoc and Kayamandi. These interventions have proven to be successful and together with the water restrictions, a noticeable reduction in water demand, water losses and non-revenue water has been achieved as illustrated below.



Domestic leak repairs and meter replacement in selected areas with higher than normal consumption will continue and will help reduce physical losses and non-revenue water. Pressure management will also be implemented in selected areas. This is an effective method to reduce network pressures on a large scale for a selected supply zone and reduce leakage and background losses in the reticulation network especially at night in areas where pressures exceed 3-4 bar. GLS has identified a number of pressure management opportunities where pressures are as high as 8-9 bar. This was achieved using their network models of the Stellenbosch reticulation network. This will help identify the excessive number of pipe bursts and implement pressure reduction. The application of pressure management at these locations will require the rezoning of the network to create new pressure zones/DMA's. In order to implement this installation of new pressure reducing valves, flow meters and new zone boundary valves are required as detailed in the proposals by GLS. New PRV/Flow Meter Chambers will be installed at Klapmuts Merchant Street, at two locations in Franschhoek and at Technopark.

Initiative 4 - Reticulation Network Optimisation

The SM has installed a new pipeline to connect the Idas Valley and Paradyskloof WTP supply zones to allow supplying water to the Paradyskloof system in the event that the Theewaterskloof tunnel supply is reduced or eventually possibly lost due to CoCT restrictions.

Initiative 5 – Augmentation of Sources - Groundwater

The SM has also recently identified 7 No existing boreholes in the town that are unused and have carried pump tests on these boreholes to confirm their safe yield and test the water quality. GLS have been appointed to test the feasibility of incorporating a water supply from these boreholes directly into the existing reticulation network using the Wadiso network model.

Test priority/ order	Borehole name	Yield l/s
1	**Cloetesville Borehole**	**8.5**
2	Doorn Bosch	10
3	Van Der Stel	12
4	Kylemore BH3 (Jackson Street)	9.5
5	Pniel Spring	4
6	Die Braak	15
7	Kayamandi	11

Note: Borehole yields are estimated based on 72 hour pump test and production rates will be based on pumping over 12-16 hours with a 8-12 hour rest period every 24 hours.

The SU has approached the SM to ensure that the campus water supply remains sustainable during the drought. The University has embarked on their own Drought Response Action plan which includes various initiatives such as a drought awareness campaign,

- a study to investigate grey water harvesting and re-use options
- testing and commissioning 6 No existing unused boreholes for potable supply
- finding alternative irrigation water sources for the gardens and sports field etc.

The SM has commissioned GLS to investigate options for sectioning the reticulation network for to improve water demand management and zone metering as well as pressure management. This will enable the SM to implement water rationing if required as a last resort.

Initiative 6 - Invasive Alien Plants

Invasive alien plants (IAP) are plant species that have been introduced, either intentionally or unintentionally, to South Africa. They can reproduce rapidly in their new environments and tend to out-

compete indigenous plants. Invasive alien species pose the biggest threat to biodiversity after direct habitat destruction. IAPs can significantly alter the composition, structure and functionality of ecosystems. As a result, they degrade the productive potential of the land, intensify the damage caused by veld fires and flooding, increase soil erosion, and impact on water run-off, the health of rivers and estuaries. The National Environmental Management Biodiversity Act, 10 of 2004, Section 76, states that all organs of state are required to draw up an invasive and alien monitoring, control and eradication plan for the land under their control. The SM: Alien Invasive Plants Management Plan was prepared in response to this obligation and brought before Council during February 2017. This plan was approved under condition that it is advertised from public comment. This was done and the plan will again serve before Council in May 2017 for final approval.

Initiative 7 - Treated Waste Water Effluent Re-use/Exchange

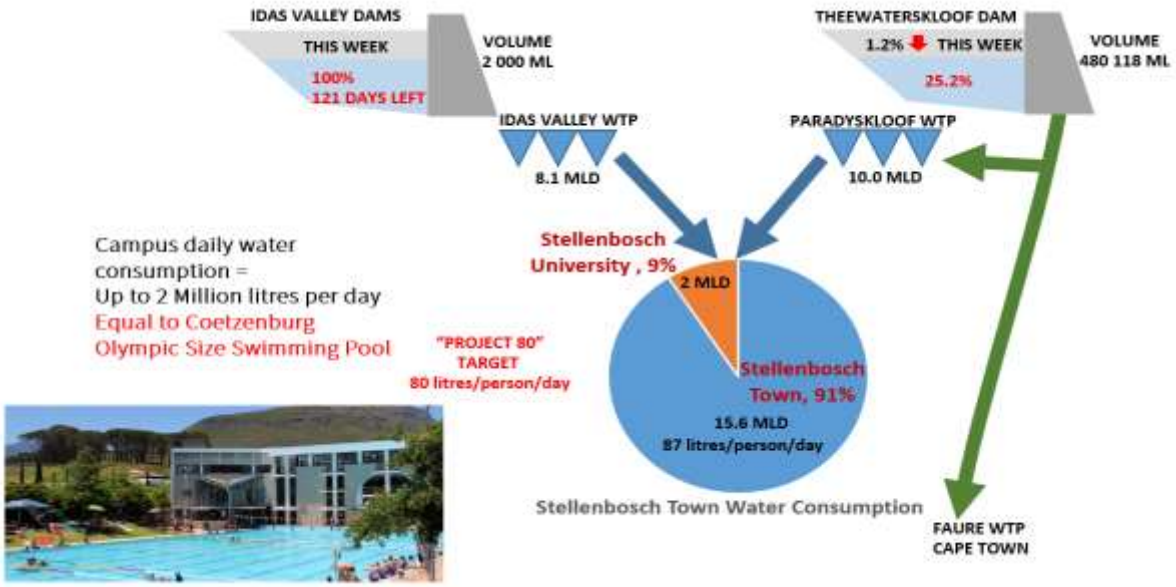
The Stellenbosch Municipality is currently implementing a major upgrade of the Stellenbosch WWTW. The treated effluent from the plant will be suitable for irrigation use. Currently the treated effluent will be discharged into the Eerste Rivier catchment and will be used for irrigation by the farmers downstream. The municipality is considering the feasibility of utilising the treated effluent for irrigation in the town. An application for an allocation of treated effluent for irrigation purposes has been received from De Zalze estate. The Stellenbosch Golf Course and the sports fields at the schools (Renish, Eikestad and Paul Roos) as well as the Coetzenburg sports fields could also benefit if such a scheme was implemented. However, an alternative exists which is based on an exchange of treated effluent from the Stellenbosch WWTW for an allocation from the Theewaterskloof Tunnel which is currently released into the Eerste Rivier for irrigation use. This proposal could have major benefits in terms of the cost of the scheme and could also have lower operating costs as it will probably be a gravity supply scheme feeding directly into the Coetzenburg irrigation dams vs the pumped treated effluent scheme envisaged. These options need to be assessed in greater detail which will be done as part of the water masterplan for the Stellenbosch Municipality which GLS is preparing.

Stellenbosch Campus Drought Response Update

SU fortunately identified and started investigating three initiatives for drought mitigation in 2016. The three initiatives are the following:

1. Sustainability Water Use Optimisation Plan
2. Alternative Irrigation Plan
3. Drought Response Plan

These plans are integrated and provide the necessary information to make sound decisions. Implementing the recommended interventions will result in reduced water demand, more sustainable water consumption and ultimately improved drought resiliency. The University's potable municipal supplied water normally constitutes approximately 10% of Stellenbosch Municipality water supply (2.5MLD of a total supply of 25 MLD), however, due to measures taken by Facilities Management to date reduce consumption this has reduced to 1.8 MLD. At the monthly Property Services and Municipal Technical Services, department's operational meeting it was agreed that it would be mutually beneficial for both the parties to collaborate to mitigate the effects of the drought. The university's water network forms an integral part of the town's water supply network. The town and university's bulk service networks is so closely integrated that it cannot be reasonably separated and it was therefore agreed that the university would appoint the Municipalities Water Master Plan consulting engineers. This is the same group of consulting engineers commissioned by the Municipality to create the Stellenbosch Municipal Potable Water supply Master Plan and Drought Response Plan. The SU Drought Response Plan would therefore be integrated and co-ordinated with the Municipal Drought Response Plan. This will secure a sustainable supply of potable water to the town and SU main campus. The Stellenbosch campus is entirely reliant on the municipal water supply for potable water and on the Eerste Rivier and the Coetzenburg Dams for irrigation water for the gardens and sports fields.



The University has identified a number of other potential water sources and have launched various studies to investigate feasibility of exploiting these sources as a drought mitigation measure. This will also help reduce their reliance on the municipal supply of water in future. The following studies are currently underway:

SU Initiative 1 - Water Demand Management and Greywater re-use

JG Afrika was commissioned to complete a water balance study for the main campus. This study investigated the potential to reduce the potable water consumed. This includes utilising greywater harvested from showers and wash hand basins as an alternative source to flush toilet, irrigate gardens and potentially contribute to recharge the underground aquifer.

The study showed a significant potential and the proposals for partial implementation of some of these proposals are being finalised. The cost of distribution of greywater in relatively small quantities is prohibitive and it is therefore likely that the greywater re-use schemes will remain localised around clusters where there is a high number of residents in a building. It is estimated that the use of greywater for toilet flushing alone could reduce potable water usage by up to 5%.

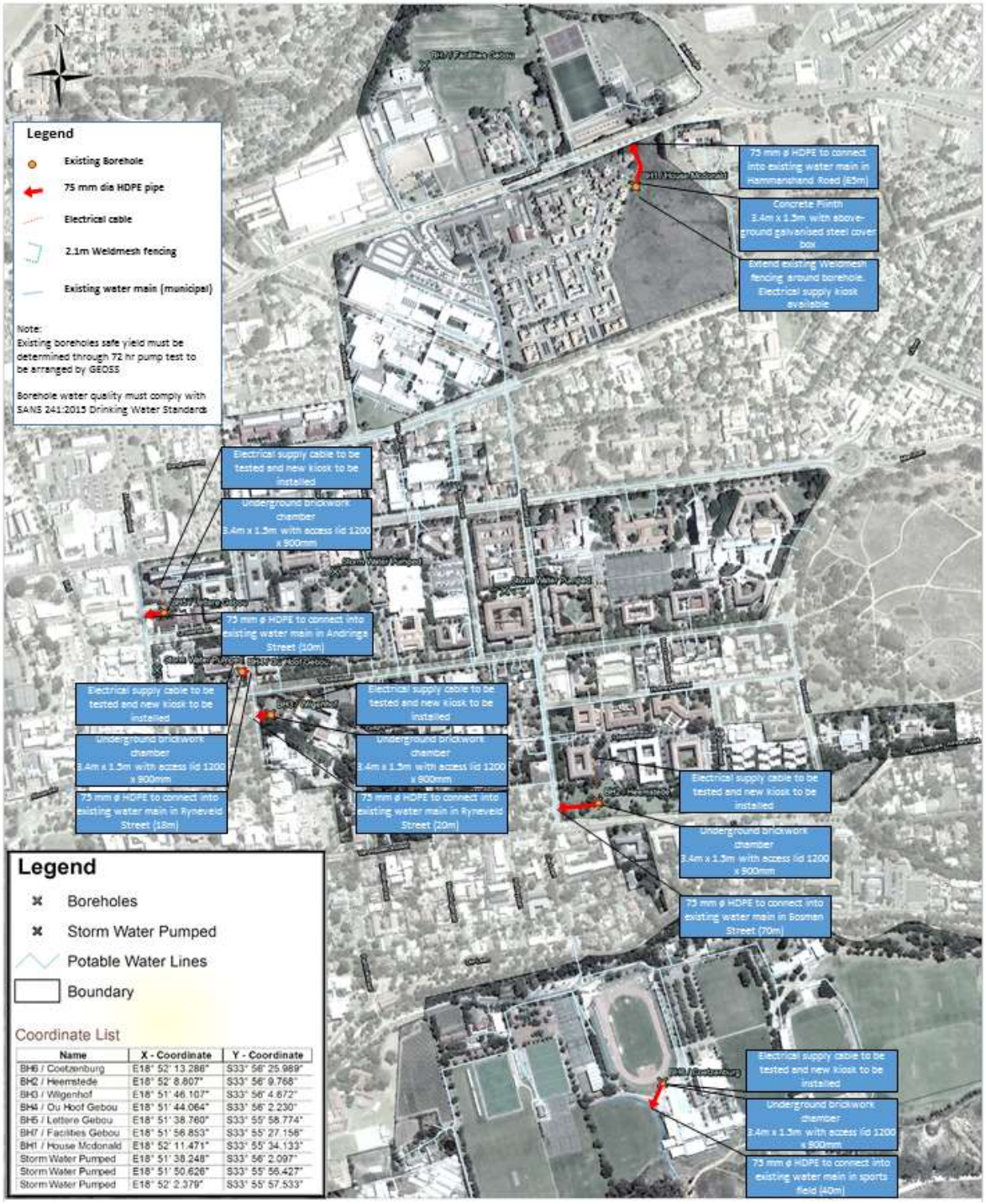
Several water saving infrastructure and equipment are being investigated and tested. These include water saving showerheads, aerators on taps, red dot diverters and pressure reduction. Full implementation could result in a potential 49% saving of potable water.

Rainwater harvesting is also being investigated and the possibility of collecting rainwater, which will be stored in tanks and used for non-potable uses. This could reduce potable water demand by further 8%. (Only during winter months).

It was estimated that if all the above interventions were implemented an estimated maximum potential 63% reduction in potable water consumption could be realised if implemented in full.

SU Initiative 2 – Groundwater Exploitation

GEOSS has completed an investigation involving the pump testing and water quality testing of at least 7 No boreholes at various locations on the campus. These historical boreholes were previously used for irrigation but have fallen into disuse in recent years. Although most boreholes tested show elevated levels of iron, the water from these boreholes can be used to supplement the existing irrigation system in summer.



Name	X - Coordinate	Y - Coordinate
BH6 / Coetzenburg	E18° 52' 13.286"	S33° 56' 25.989"
BH2 / Heemstede	E18° 52' 8.807"	S33° 56' 9.768"
BH3 / Wilgenhof	E18° 51' 46.107"	S33° 56' 4.672"
BH4 / Ou Hoof Gebou	E18° 51' 44.064"	S33° 56' 2.230"
BH5 / Lettere Gebou	E18° 51' 38.760"	S33° 55' 58.774"
BH7 / Facilities Gebou	E18° 51' 56.853"	S33° 55' 27.156"
BH1 / House Mcdonald	E18° 52' 11.471"	S33° 55' 34.133"
Storm Water Pumped	E18° 51' 38.248"	S33° 56' 2.097"
Storm Water Pumped	E18° 51' 50.626"	S33° 55' 56.427"
Storm Water Pumped	E18° 52' 2.379"	S33° 55' 57.533"

Although not planned for now, it would be possible to treat the borehole water to drinking water standard in case of an emergency using an iron / manganese removal filtration plant.

Example of Containerised Water Treatment Plant

The Stellenbosch Municipality is currently procuring at least 4 No for a package type containerised water treatment plant for the treatment of borehole water and will be expanding this to potentially 15 No boreholes in town and surrounding areas to augment potable supply. Hatch is assisting the municipality on this project and is constantly providing the University with updates on the water security situation for Stellenbosch and the Tygerberg and Bellville campuses.

A project has been initiated to fit out the existing campus boreholes with new pumps and pump directly into the existing irrigation network on campus. Up to 15 l/s may be available from the existing boreholes over a pumping time of 12 hours per day. One of these boreholes will be used to top up the Coetzenburg swinig pools and also for irrigation of the AstroTurf pitches.

A large scale water resource study is also underway for the Stellenbosch/Paarl/Franschhoek area and will investigate a large scale exploitation of groundwater as a supplementary source of potable water by tapping into the Table Mountain aquifer at certain suitable locations possibly utilising horizontal drilling. The findings of the study will be incorporated into the Stellenbosch Water Masterplan being prepared by GLS.

GLS Consulting were commissioned to complete a modelling study to optimise the water supply and distribution network on campus. GLS are currently conducting an audit of existing information and compiling plans of the water distribution network and building a Wadiso model of the network. Once the model is available it will be used to optimise the existing network and identify hydraulic anomalies which would require investigation. The aim is to ensure adequate pressure and supply for fire fighting purposes on campus. The model will also be used to determine the optimum flow and pressure for direct injection of the available borehole supplies into the network as an emergency water supply.

GLS are also building a model of the existing irrigation water network on campus which will enable the design and optimisation of the incorporation of the available borehole supplies into the irrigation network as a supplementary potable supply.

SU Initiative 3 – Water Consumption Monitoring

Facilities Management has initiated a project to install new water meters to all buildings on campus and to monitor consumption on a live dashboard. Terrafirma has been appointed to install electronic water meters to measure and manage water usage on the campuses. New meter has been installed downstream of the municipal meters and the Municipality has commenced a project to replace all faulty meters on campus within the next 6-8 weeks. Once the live monitoring of all meters is operational, Facilities Management will focus on high consumption buildings on campus and investigate the reasons and rectify any problems.

Having actual consumption data for each building will also allow tracking of usage patterns and trends which will place the power of change into the hand of the building users to reduce consumption.

SU Initiative 4 - War on Leaks Campaign

A team consisting of plumbers and managers gather fortnightly to proactively discuss the detection and repair of leaks on campus with the aim of reducing water consumption. Irrigation system leaks are being attended to quickly and operational improvements are being implemented to reduce consumption and reaction times to reduce water wastage.

Bellville Business School Campus Drought Response Update

The current potable water supply to the Bellville Business School campus is from a metered connection from the City of Cape Town water distribution network. The University uses water from the adjacent Tygerberg quarry for irrigation which has a constant water supply. The supply from the quarry is pumped from a floating pump set to a booster pump from where it is supplied directly into the irrigation network on the campus. As part of the Drought Response Plan for this campus, the water quality from the quarry has been tested and found to be suitable for potable use with normal filtration and disinfection. It is therefore proposed that as an emergency water supply a take-off from the irrigation system be taken via a package type containerised water treatment plant unit and pumped directly into the potable water supply main just downstream of the municipal meter.

A suitable site has been identified to place a container housing the treatment plant. It is recommend that the University proceed with the design and costing of this emergency water supply scheme. If the cost is found to be acceptable, the scheme must be implemented without delay. The unit cost of water must also be calculated and compared with the cost of water supplied by the City. If comparable, the treated quarry water could become the main supply of potable water and the cost saved in water purchased could be allocated to pay for the maintenance and operation of the pumps and water treatment plant. It is however imperative that the University register the water used from the quarry with the Department of Water and Sanitation as an existing lawful use. Alternatively, the treatment plant could be leased for a period of time at a cost per month or per kl of water supplied.

Stellenbosch University
Bellville Campus – Emergency Water Supply Proposal

Tygerberg Campus Drought Response Update

City of Cape Town supplies Tygerberg campus with potable water from a metered connection. Water from the City supply is transferred to an underground reservoir located just east of the main building entrance under the lawn. All potable water is pumped to a number or roof tanks all-academic buildings on campus. A number of the new men's residences located north of the entrance road is supplied directly from the municipal main. GEOSS was recently appointed to test and investigate the feasibility and potential yield of the underground water sources.

The Tygerberg campus has a borehole which was drilled a few years ago that is currently used to irrigate on the sports field on campus. GEOSS tested the existing borehole and the results showed very poor water quality and low yield. GEOSS will investigate the feasibility and potential yield of a second borehole and drilling will commence in November 2017. The proposal is to develop both boreholes which could supplement or potentially replace the potable supply to the campus. The water from these boreholes could be treated in a package type containerised treatment plant and then pumped into the underground reservoir in case of an emergency situation if water rationing starts impacting on supply.

The University should proceed to design and procure a borehole water treatment plant and the connecting pipework. Similarly, to the Bellville campus the borehole supply could potentially become the primary potable water source paid for by the offset of savings realised from a reduced municipal supply or as a temporary lease. Water for irrigation should be from Elsies, Kraal river, and grey water from the residences.

Worcester Campus Drought Response Update

The Worcester campus is supplied from a metered municipal connection on the Breede Valley Municipality network. Geoss has been appointed to investigate the feasibility of drilling a productive borehole on this campus as a supplementary supply. In the event that we are able to locate a suitable bore with a sustainable yield and quality of supply this could potentially replace the municipal supply as the primary potable water source. This would require that the installation of a package type containerised water treatment plant on this campus.

Conclusions - SU Drought Response Plan

In order for the Plan to be successful there must be buy in from the stakeholders. This requires good marketing of the Plan using various modes of communication including the following;

- social media,
- official media platforms such as the university website
- the communications boards in each faculty building and residence.
- published articles (the impact of the drought and the university's response and plan of action will be published shortly)
- messages to students and staff and water Wednesday messages in the campaign to reduce the use of water
- informing service providers to be proactive to reduce water consumption and wastage

SU Disaster Risk Management Response Plan

Tier 4 Triggers

In the unlikely event that the CoCT cuts off the Theewaterskloof Tunnel supply to Paradyskloof WTP, the Idas Valley Dams in Stellenbosch has approximately 4 months of water supply remaining if no further rainfall is received in the catchment area.

Tier 4 Drought Severity will be triggered by the following conditions:

- Below normal rainfall (continued in winter) causing dam levels to deplete to below usable volumes
- Water Rationing implemented including Intermittent Supply
- Water shortages become a reality

At this stage it is not clear what the actions of the municipality will be when water rationing becomes a reality. It is therefore imperative that a meeting be held between the University and the Municipality to understand the sequence of events and actions that will happen and define the various levels and triggers of actions within Tier 4 in the eventuality of intermittent supply and severe water rationing.

Should Tier 4 level of severity be reached the Drought Response Plan includes a number of disaster risk management actions which must be detailed and executed. The points and actions considered are the following:

Action 1 – Set up Emergency Water Collection Points

It is envisaged that in the unlikely but worst case scenario is that the Municipality is not capable of supplying potable water via the existing distribution network when the Idas Valley dams reach the zero usable volume level or the Municipality may introduce water rationing where certain supply zones will receive intermittent supply. In this case the Municipality will make available emergency water collection points for residents and businesses to collect potable water from tankers or temporary storage tanks during certain times of the day. It is proposed that the University discuss this scenario with the Municipality and commence planning for this possible eventuality. The information about the location of water collection points in thy town and on the campuses must be confirmed and public awareness material and media must be compiled and approved for issue well in advance. It is proposed that an article be published on the university website to detail the Drought Response Plan and that management and stakeholders on each campus be informed on the details of the plan and the appropriate response to public and student queries.

Action 2 - Firefighting Water Supply

The Stellenbosch, Bellville and Worcester Fire Brigades must be consulted about the mitigation actions to be taken to ensure firefighting capability in the event of water rationing or intermittent supply. This may also impact an any activities or university functions which present a potentially high fire risk. It is recommended that meetings with the Fire Chiefs in each if these areas be held asap.

Action 3 – Augment Potable Supply from Boreholes

When water rationing is implemented, the SU should consider the treatment of its own borehole supplies to potable standard for drinking water. The existing boreholes on campus have all been tested and although iron and manages is present this water could easily be treated to drinking water standard. This would however be costly and leave Facilities Management with a maintenance burden and responsibility for public health. This situation should be avoided, however, it is recommended that the SU liaise with treatment plant contractors and negotiate a lease agreement for a number of containerised treatment plant units at the Bellville and Tygerberg campus.

Time-frames

The Stellenbosch Municipality has completed yield testing on the existing boreholes and plan to implement at least 5 to 8 production boreholes in the Stellenbosch Municipal area by early 2018. A specification for various capacities of containerised package borehole water treatment plants ranging between 5l/s and 15l/s in peak flow capacity is being prepared and a tender for the procurement of the first phase of these package plants will be advertised in September 2017.

SM hopes to implement the borehole supplies and provide a supplementary potable supply to the town and avoid intermittent supply. The borehole test results received to date indicate that a yield of between 10-15 l/s is available from each of the 7 No existing boreholes and it is anticipated that the town will be able to be supplied from groundwater sources by autumn of 2018.

The City of Cape Town has also launched a 3 phased water supply resiliency strategy which includes small, medium and large desalination, borehole supplies and re-used of treated effluent. The City plans to have implemented and add up to 200 MLD of additional capacity by autumn 2018 and will increase to 400-500 MLD over the next 2 years. The successful implementation of these risk mitigation projects by the CoCT will ensure that we averted the intermittent supply of potable water.

KPA4 – Drought Response and Recovery

If and when a drought occurs of such severity and magnitude that prevents Water Service Providers from continuing with normal water provision, despite the implementation of water conservation and drought mitigation measures, Section 23 of the Disaster Management Act (Act No. 57 of 2002) allows for the declaration of a state of disaster by the Minister of Water and Sanitation.

When a state of disaster is declared, a different set of operating rules and procedures come into effect and the implementation of these measures will largely shift to the Provincial and National Treasury for funding.

Although the Western Cape has been declared a Disaster Area, the SM still have at least 120 days of water remaining and will therefore continue to implement at Tier 3 Drought Response Plan which includes water restrictions, supplementary ground water sources and preparation for water rationing. The SM will continue to monitor the drought and the availability of water and will adjust its response as the drought situation develops and the impact on its water availability becomes more critical. The Recovery from the drought will take a number of years as dam levels are restored to normal operating levels and rainfall hopefully return to long-term averages. New non-surface water sources implemented by the CoCT and Stellenbosch Municipality will make the water supply system more resilient and better able to cope with a drought.