Veolia Water Projects

Draft Drought Management Plan

Final Draft Plan 2017

VEOLIA WATER

DOCUMENT INITIAL REVIEW AND AUTHORISATION SHEET

Document

FINAL DRAFT PLAN

Project or Subject:

Drought Management Plan

Job:

Preliminary Check

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Signature	*Date: 30/11/17*	*signature*	*Date: 30/11/17*
Comments			

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Electronic File Reference:

LMS C.01.04

AUTHORISATION FOR ISSUE/USE

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Executive Summary

Veolia Water Projects [VWP] Tidworth is an Inset Appointment which supplies Regulated Water and Waste Water services to over 900 civilian properties and over 120 commercial properties in and around the Wiltshire town of Tidworth. In addition the overarching PFI agreement with the Ministry of Defence includes services to the Tidworth Military garrison where up to 6,000 personnel can be based on the site at any one time. The Contract also includes the provision of similar services to some 1300 Service Families accommodations [SFA's] in the town and surrounding community. The water supply comes from groundwater, drawn from a supply of robust unconfined chalk aquifer boreholes. These water sources provide sufficient water to meet all the needs of the customers as well as providing neighbouring company Wessex Water with a number of treated bulk supplies.

No significant problems were encountered during previous groundwater drought period in the South of England, 2006-2007 or during the peak demand of the hot and dry weather (including the recent high demand period of July 2017). As the Company's supply/demand balance has remained in a very stable, comfortable position the likelihood of any problems due to drought is very low. Any drought in the future would have to be much more severe in intensity or duration than experienced hitherto to require the implementation of demand management measures provided for in this plan (The impact of the proposed new developments has been discounted from drought planning as the headroom Veolia Water Projects operates with will remain constant).

Drought management plans are a statutory requirement for all water companies as prescribed under Section 39B of the Water Industry Act 1991 (WIA) and as introduced by the Water Act 2003. The overall objective of this document is to establish a comprehensive set of plans and procedures that define the process for managing any potential drought conditions.

This will be achieved by;

- Being prepared for drought at any time and having a plan ready to deal with it via affective monitoring.
- Identifying the onset of drought and mobilising additional resources.
- Assessing drought duration and severity and the impact on water available to our customers.
- Minimising environmental impact of drought by optimising the use of our resources.
- Implementing measures to reduce the demand for water or increasing capacity of our assets to maintain security of supplies. The actions will become more strenuous as drought deepens and lengthens.
- Acting and communicating with customers and other stakeholders in partnership.

Abbreviations

ADSL	Aspire Defence Services Limited
AGA	Above Ground Asset
BGA	Below Ground Asset
CC	County Council
CCW	Consumer Council for Water
CoP	Code of Practice
DAPWL	Deepest Advisable Pumping Water Level
DI	Distribution Input
DMA	Demand Management Area
DEFRA	Department for Environment, Food and Rural Affairs
DMG	Drought Management Group
DMP	Drought Management Plan (Statutory Document)
DO	Deployable Output (from water sources)
DWI	Drinking Water Inspectorate
DZ	Drought Zone
EA	Environment Agency
EMP	Environmental Monitoring Plan
JRSLA	Junior Ranks Single Living Accommodation
LBA	Leckford Bridge Agreement (with Wessex Water)
LoS	Level of Service
LTA	Long Term Average
mAOD	Meters Above Ordnance Datum (Sea Level)
mBHP	Meters Below Head Plate
MoD	Ministry of Defence (Refers to Tidworth Garrison)
OBH	Observation Borehole
Ofwat	Office of Water Services, Industry Regulator
PFI	Private Finance Initiative
Serk	System for control and data capture of operating sites
SFA	Services Family Accommodation
SoS	Secretary of Sate (refers to the Minister for Environment)
SRO	Source Reliable Output
STW	Sewage Treatment Works
TWUL	Thames Water Utilities Limited
The 'wire'	Refers to MoD secure land boundary
UKWIR	Water Industry Research Group
VWP	Veolia Water Projects (Part of Veolia Water UK)
WAFU	Water Available for Use
WaSC	Water and Sewerage Companies
WIA	Water Industry Act, 1991
WR	Water Resources
WRMP	Water Resources Management Plan (Statutory Document)
WRZ	Water Resource Zone
WW	Wessex Water
9MR	Nine Mile River

NOTE.
For security purposes all abstraction locations are referred to by codes.
Namely; CP, BH1, BH2, BH3, export to Wessex is known as LB
****** Indicates information that has been redacted**
The geographic locations are known to the Environment Agency.

Table of Contents

1. Introduction

1.1 Objectives

Drought management plans (DMP) are a statutory requirement for all water companies as prescribed under the Water Industry Act as introduced by the Water Act. The purpose of the DMP is to demonstrate how Veolia Water Projects (VWP) plans to monitor and manage future drought related events, restrain demand and mobilise extra resources. The plan is agreed with the Environment Agency (EA) and approved by the Secretary of State (SoS) following public consultation and provides a decision aid tool for use by the VWP Drought Management Group (DMG).

The DMP is subject to consultation both prior to and following the preparation of the draft plan. The pre-consultation process involved feedback from key stakeholders including the EA and Ofwat as well as other water companies. This document outlines VWP DMP in six main sections:

(i) introduction to VWP supply area and water resources;

(ii) a description of the drought scenarios;

(iii) a description of drought management actions;

(iv) an outline of the Environmental Monitoring Plan (EMP);

(v) a description of our Communications Plan;

(vi) and an outline of post-drought actions.

The overall objective for the DMP is to establish a comprehensive set of plans and procedures that define the process for managing drought conditions. The DMP includes action plans for how the company will manage any restrictions on non-essential use as well as provisions for environmental monitoring and communications.

VWP cannot envisage there to be a need for Drought Permitting in any of the scenarios described in this Plan and therefore will focus the narrative on processes which culminate with the issuing of Drought Orders only. Consequently the Plan will not detail actions around Strategic Environmental Assessments [SEA's].

The report has been assembled under the regulatory framework shown below in Figure 1

PREVENTIVE December	REACTIVE October	MONITORING June
Water Resources Management Plan Supply over next 20 years Demand for next 20 years Supply / Demand Balance Works required to maintain the balance	**Drought Management Plan** Management Triggers and Scenarios Drought Action Plan Environmental Impacts Post Drought Actions	**Small business Return / July Return** Risk and Compliance statement Key Performance Indicators Customer experience Reliability and availability of supply Environmental impacts Finance **Supply / Demand Table** Production Import / exports Billing and leakage
INTERNAL REVIEW		
Annual commentary and review Forecast of growth v production Update on capital works required Resubmit to regulators every 5 years	Annual review of the plan Resubmit to regulators every 5 years	Submitted annually to the regulators
EXTERNAL REGULATORS AND REVIEW		
Department Environment Food Rural Affairs Drinking Water Inspectorate Water UK (working to deliver solutions) Market Operation Services Ltd (non-household) Environment Agency	Environment Agency Natural England	Environment Agency Natural England OFWAT (economic regulator)

Figure 1: Key Components of a DMP

The Drought Management Plan forms part of a larger VWP strategy aimed at prevention of supply issues by monitoring performance and minimising risk through the implementation of the wider regulatory framework.

However it is possible that climate pressures can lead to a situation where reactive action is required. This drought management plan outlines the activities required to minimise the impact of such an emergency situation.

1.2 Background information

In November 2007, Veolia Water acquired several businesses from Thames Water Utilities Ltd (TWUL) including the water and waste water services for the Tidworth PFI. Ofwat, has granted VWP the appointment to provide water and sewerage services to domestic and commercial customers in the Tidworth and Perham Down areas. Through a novated PFI Contract with the MoD Veolia now also delivers water services to the MoD. Veolia Water also provides water services expertise to private industrial and commercial customers through its outsourcing wing.

"*Veolia Water is the world's leading operator of water services, providing among the highest quality drinking water and wastewater services in the world. Veolia Water is a global company and we take pride in providing excellent customer service around the world. We will continue to draw on our expertise to deal with all customer needs and queries locally."*

Within the Tidworth Inset Appointment VWP provides water services for over 900 civilian properties (this figure is set to rise significantly in the light of new developments) and over 120 commercial properties. The PFI agreement with the MoD involves VWP servicing a garrison that can accommodate some **** personnel on the military site at any one time. A further 1,300 Service Families Accommodation (SFA) properties are located in the local community and town environs.

All water companies are required to produce a DMP to demonstrate the strategy to be followed and the measures to be taken to ensure that customers have sufficient water should a drought occur. Available data is studied to predict the onset of drought and the DMP outlines the actions to be taken to manage the various drought scenarios that could be encountered. We have developed a Communications Strategy (Section 5) to outline the key communications objectives and actions required in support of the DMP.

In preparing this Plan VWP have consulted widely across adjacent Water Companies, Local Authorities, the Military and other key environmental stakeholders and Consultees. Comments made in the formal responses have been taken into account in this the Final Report.

1.3 Water resources

VWP have had a healthy supply-demand balance, such that any drought in the future would have to be much more severe in intensity or duration than experienced hitherto to require the implementation of the special measures provided for in this plan. VWP have forecast a baseline situation with a surplus of supply over demand until beyond 2040, as shown in Figure 2.

A new water resources management plan (WRMP) has been produced that encompass the expected change in demand and also considers the available supply of water. The DMP has been updated after the WRMP to ensure that the plan is realistic and aligns with the overall company supply / demand strategy.

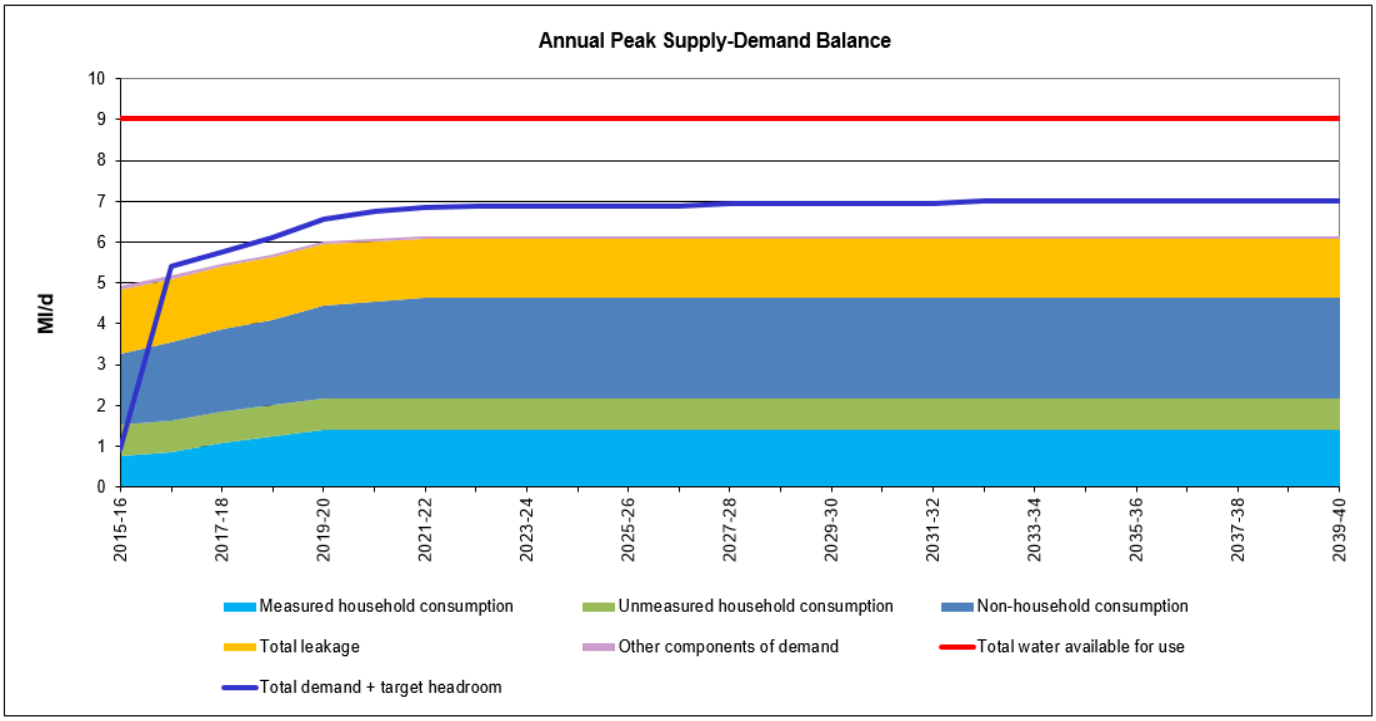

Figure 2: Annual peak supply – demand balance

1.3.1 Groundwater

100% of the raw water supply derives from groundwater sources from an unconfined chalk aquifer via boreholes. The boreholes have a long history of good bacteriological quality and have proved robust and reliable within TWUL and VWP operating history.

These sources provide sufficient water to meet the needs of VWP customers as well as providing bulk supplies to a neighbouring Water Company - Wessex Water (WW) via Leckford Bridge.

The diagram on the following page indicates the catchment area from which the boreholes draw their water. This is a strip of land called the 'Ground Water Safezone' that stretches 6 km due north from the boreholes with an approximate width of 1 km.

Figure 3 – Ground water safezone (redacted **)**

1.3.2 Distribution system

Two separately treated water sources feed the distribution network from one strategic reservoir and another secondary reservoir. The network being small is also highly flexible allowing for outages from either source to be met by the other source supplying the whole distribution network (during peak demand periods this would not be viable for multiple day outages depending on which source was not operating).

NETWORK DIAGRAM REDACTED ****

Date	BH2 Daily Flow	CP Daily Flow	BH3 Daily Flow	Group Daily Flow
Output				
Average	2.15	1.54	2.14	5.82
Peak Day	2.41	2.69	2.41	7.28
Licence				
Average	3.68	3.64	3.68	9.02
Peak Day	4.32	4.69	4.32	12

Figure 4 – Network layout, current production (2016 – 17) and available licence

1.3.3 Water resource zone (WRZ)

A resource zone is the largest possible zone in which all resources, including external transfers can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall. The supply network is highly integrated and the risk of supply failure is shared throughout the area so the network is classed as a single WRZ.

1.4 Level of service (LoS)

VWP nor its predecessors have had occasion to resort to formal restrictions in over 15 years including through recent drought conditions in 2006/07 when many water companies' sources in Southern England were under extreme pressure.

There was an apparent high demand situation that occurred from 1st June to 19th June 2017 which corresponded with record breaking high temperatures. CR level reduced as demand exceeded available supply. All customers received adequate supplies during the event with no need to implement the drought management plan. However lessons were learned from this event and have been incorporated into this drought plan.

A subsequent investigation revealed a number of reasons for this high demand event which are not attributed to normal peak demand conditions:

- Work had commenced on installing improved treatment facilities at CP and this impacted on the reliability of the output of the plant. This was resolved once the permanent treatment process was fully installed. Project work will not occur during periods of predicted high demand.

- Wessex Water took more water from the LB export than was being reported. Closer communications with Wessex Water have been organised to allow better management of the transfer of flow.

- A 6 inch wheel valve was subsequently discovered to be fully open allowing in excess of 1 Ml/d of water to escape in an uncontrolled fashion to a vehicle washing facility within the military complex. All such valves have been locked to prevent unauthorised and wasteful operation.

- Better monitoring of existing telemetry data will provide early warning of problems with reliability at CP, increased LB export and significant non-legitimate demand occurring within the military facility.

The lack of historic data before the PFI Contract commencement in 1998 is as a result of the previous ownership by the MoD, who operated their abstraction regime under Crown Immunity. Having a smaller civilian customer base previously and the ability using their Immunity, to abstract water to suit demand without recourse to reduced consumptions, has meant that no records of restrictions exist.

Enquires to MoD personnel who were in post pre-1998 indicate that there has probably been no Garrison wide restrictions in the 20 years prior to that date.

Table 1: Levels of Service

Zone	Situation	Impact to Customers	Probability	Historic Events
1	High Demand	No restrictions	1 in 5 years (20%)	0
2	2 years of High Demand	Proactive approach to water efficiency	1 in 10 years (10%)	0
3	Temporary Ban	Hosepipe Ban	1 in 25 years (4%)	0
4	Drought Order	Possible rota-cuts in worst case scenario	1 in 100 years (1%)	0

There has been no evidence of water restrictions in the Tidworth area. The probability of future events has been based upon 100 years of rainfall data history which has then been used to predict likely impact on the ground water table. The water network has been sized in many cases to meet Crown Fire Fighting standards and so there is no obvious restriction in terms of capacity of the network to meet the needs of the customers.

1.5 Security of supply measures

The two treated source waters are strongly linked in the distribution system such that the whole company area is one water resource zone. As mentioned in section 1.3.2 the distribution network can also cope with significant source outage events.

Risk assessments are under development for ongoing monitoring of resilience and capacity of the network and associated processes.

1.6 Responsibility for Management of Drought

Drought management will be overseen by relevant sectors of the business including;

1. **Customer Operations** are responsible for monitoring the state of available water resources and the prediction of likely impacts. With specific responsibility for ensuring that the company's water abstraction and production is at full capacity during months of low rainfall and high demand.

2. **Network Operatives** to ensure that the network is operating at its most efficient when demand is highest.

3. **Customer Services** to produce the necessary communication materials and set in motion the agreed communications channels.

4. **Customer Service** responsible for responding to customers queries regarding the drought and restrictions

All decisions on Drought Management are made by the DMG (see section 5.1 for all members). The Head of Customer Operations will lead on technical functions and the drought communications strategy.

The Supply-Demand Balance is considered by the Company's Management Committee. The VWP and VWOL Company Board can also be consulted if further escalation is needed and will be informed as routine practice.

1.7 Responsibility for key Actions under DMP

Responsibilities for actions are detailed in Table 2 below.

Table 2: Key Actions for Drought Management Plan responsibility table:

Action	Delegation	Timescale
Drought Monitoring	Senior Operations Manager	Ongoing/Monthly. Enhanced during drought
Review Drought Management Plan	Head of Customer Operations	Annually
Drought Triggers Breached	Head of Customer Operations	Upon Zone 1 breach
Convene Drought Management Group	South Region Director - Water	Upon Zone 2 breach
Drought Records/Filing	Senior Operations Manager	Under direction of DMG
Communications	Head of Customer Operations	Under direction of DMG
Customers, Group, Board	South Region Director - Water	Under direction of DMG
EA Liaison	Head of Customer Operations	Under direction of DMG
MoD Liaison	Head of Customer Operations	Under direction of DMG
OFWAT Liaison	Head of Customer Operations	Under direction of DMG
DWI Liaison	Head of Customer Operations	Under direction of DMG
Neighbouring Water Companies	Head of Customer Operations	Under direction of DMG
Capex Programme identified	Head of Assets and Programme	Under direction of DMG
Opex monitoring system	Head of Customer Operations	Cost Centre set up
Capex Delivery	Head of Assets and Programme	Under direction of DMG
Water Quality	Water Quality Manager	Under direction of DMG
Drought Order or Restriction removal	South Region Director - Water	Under direction of DMG
Promoting efficient use of water	Head of Customer Operations	Under direction of DMG
Appeals for Restraint	Head of Customer Operations	Under direction of DMG
Restrictions on Supply	South Region Director - Water	Under direction of DMG
Emergency Planning	South Region Director - Water	Under direction of DMG and VWP Board
Stand down of DMG	South Region Director - Water	Return to 'Normal' hydrological conditions

1.8 Environment Agency Liaison

Liaison with the Environment Agency takes place on a regular basis on a variety of water resources, environmental impact and water quality issues via the Assurance team. During a drought the Head of Water Operations will be the primary point of contact with the Environment Agency including their Drought Co-ordinators.

2. Drought triggers and scenarios

The frequency of shortage of water at the borehole has been determined by referencing historic rainfall (in particular deficit of rainfall over consecutive years). An activity will be performed with the EA to investigate whether additional borehole data and historic rainfall data is available to expand on the relationship between borehole levels and rainfall data.

Data is collected that monitors:

- Local rainfall data at Tidworth STW
- Groundwater levels at Abandoned Borehole 1 (ABH1) and at the lagoons just south of Tidworth STW's
- Met Office data is also available providing significant historic evidence

The worst case historic event is zone 2, there has never been a zone 3 or 4 historic event.

2.1 Scenarios/Historic droughts

Historically the Tidworth area has a very reliable set of long reaching rainfall data validated by the Met Office, which dates back to 1920. As part of a data share agreement with the EA, VWP records and submits rainfall data from a gauge at the STW. This data is then used to help VWP to asses on a month by month basis the water resources situation. A number of statistical and graphical analysis have been used on this data to help VWP understand the hydrometric trends that impact this most essential resource.

Groundwater receives a yearly 'top up' which in Tidworth occurs when the soil moisture and evaporation levels are at their most conducive (October to April). Rainfall is analysed during this crucial time period,

Figure 5 indicates the worst rainfall deficit in a single year occurred during 2011/12, but this caused no concern in terms of borehole depth and only triggered a zone 2 response.

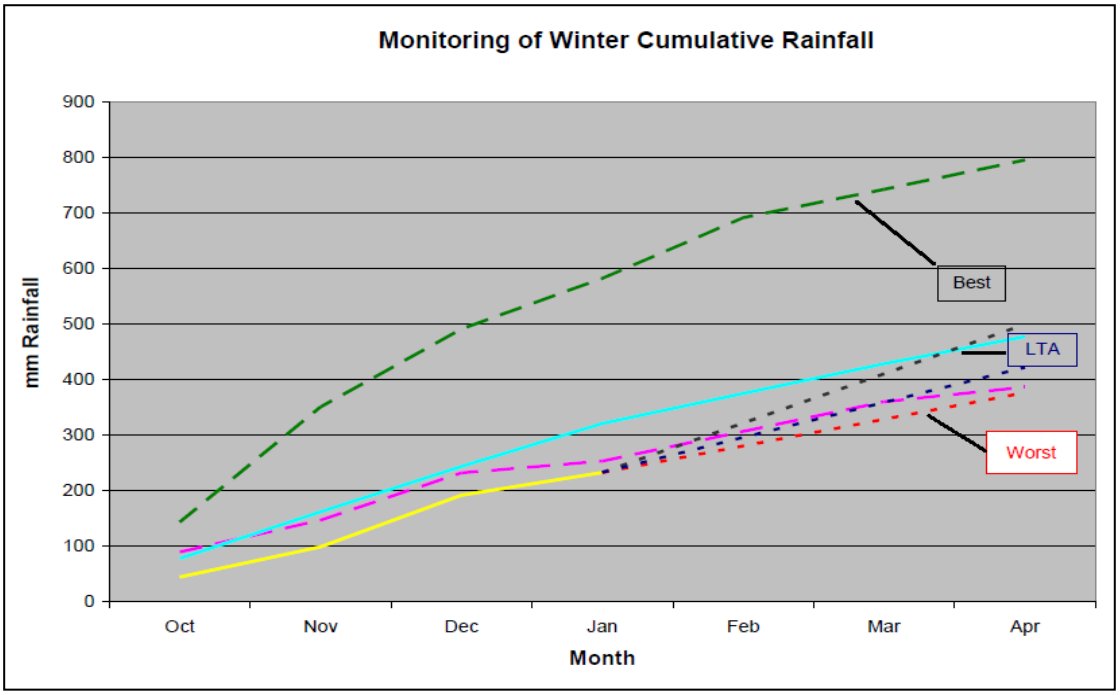

Figure 5: Cumulative rainfall of winter recharge over specific years

Figure 6 shows the deficit or surplus from the average rainfall over the 'recharge period'. It highlights the lack of deficit years experienced in the last 40 compared to the previous 60 years.

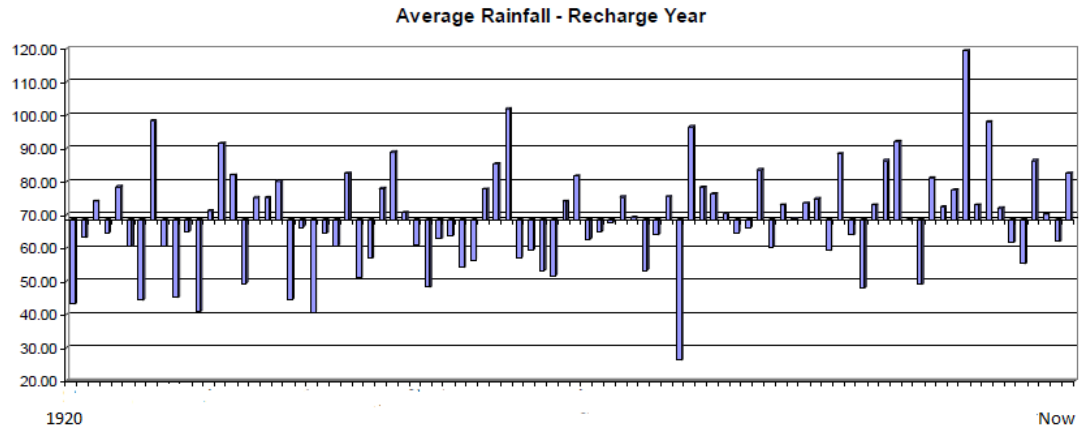

Figure 6: Rainfall for Tidworth area, deficit or surplus of average

Using the Weibull analysis, this binomial distribution shows the probability of rainfall events (during the recharge season only) relating to single years or multiple years average. Figure 7 demonstrates that in a single year the range of events is quite spread with extreme high and low recharge occurring. When examining 2 and 3 year rolling averages this pattern is not as pronounced but still exhibits a large range. This is crucial considering groundwater resources are usually resistant to single year droughts and it is multiple year recharge events that cause problems. Although most of the data shows a trend for high average rainfall some low level events have occurred and are likely to occur in the future.

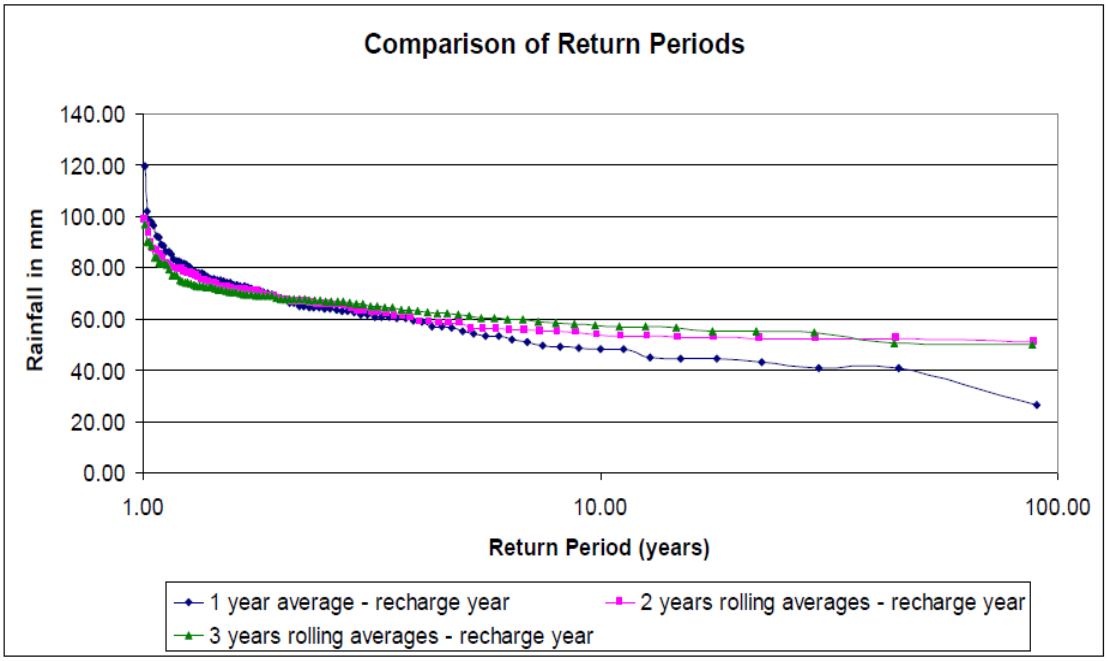

Figure 7: Return periods of average monthly rainfall

The resilience of groundwater means VWP can experience poor recharge years and even consecutive years of below LTA rainfall and have sources able to deliver their deployable output (DO). Figure 8 below shows where deficits have occurred in the cumulative rainfall over the recharge period. Over the last 50 years there have not been any deficits spanning 3 years or more. There have been a few of 2 years in length, but none of these exceeded 25mm total. This shows a period of consistently good recharge with any poor years being off-set by better rainfall during the following years.

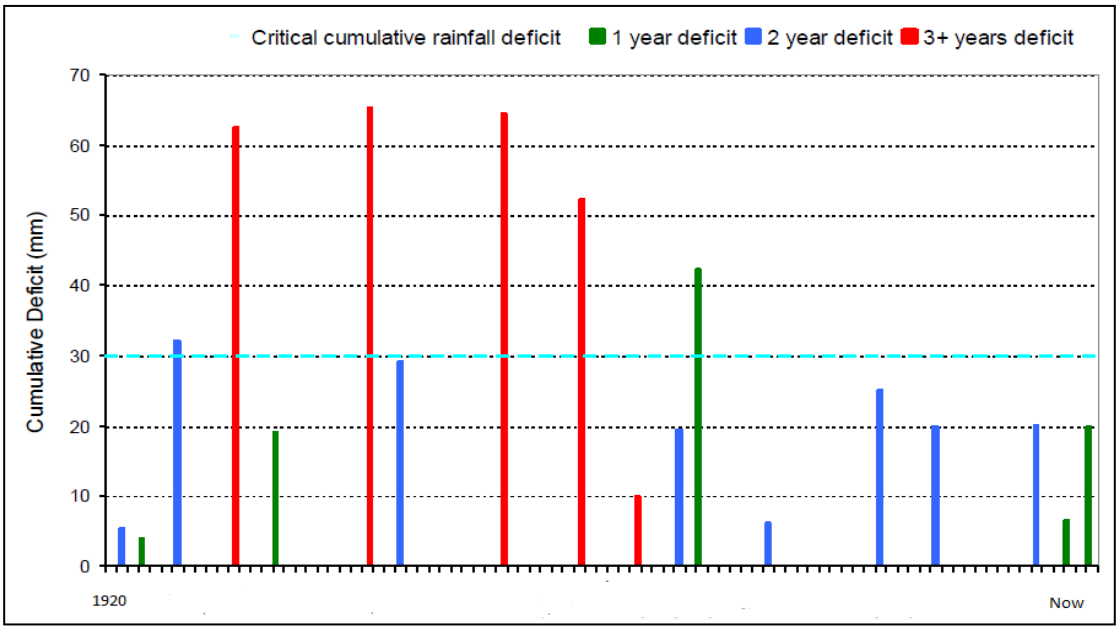

Figure 8: Critical cumulative rainfall deficit, history of hydrometric record

However it also shows that extremely large rainfall deficit events have occurred regularly in the past, with 3 consecutive poor recharge years or more not being uncommon. This could be a cycle as often with climate changes that VWP have just not experienced in recent memory or groundwater records, but could be a reality for the next 20 years. This rainfall record provides excellent quality data spanning a large time period.

The rainfall data has then been correlated against the groundwater levels to determine the impact of consecutive deficit years on the source reliable outputs (SRO).

Groundwater levels have been recorded by data loggers at several observation borehole locations since 1998. The most critical of these is the ground water level at abandoned BH 1 (ABH1) which is close to CP and BH2 and BH3.

Additional groundwater levels are monitored at the lagoons situated south of the Tidworth STW's. These groundwater levels are monitored to determine lagoon infiltration capabilities associated with the discharge licence of the STW's and this data is therefore used for the waste water monitoring and does not form part of this analysis.

The groundwater low level before recovery with winter recharge is usually November and it will peak in April before the summer decline. The fluctuation is usually over 10 metres, this alongside the trace of the rainfall (Figure 9) shows an aquifer that has very quick recharge mechanisms. Likely through the absence of confining layers above the chalk and 'swallow holes'. The lowest groundwater level recorded of 87.90mAOD was seen December 2011 and remains the worst case situation.

The data loggers give a high resolution of groundwater level movements and having boreholes well distributed across the aquifer gives VWP an excellent understanding of its water resource.

However in terms of drought scenarios and understanding previous events, there is no groundwater data prior to 1998 and no electronic source operational data prior to 2008. This time period has not seen any significant 'drought' or successive rainfall deficit and as such does not provide a drought scenario. Therefore the trigger levels offered in the following section are based on current operating data and worst case scenario.

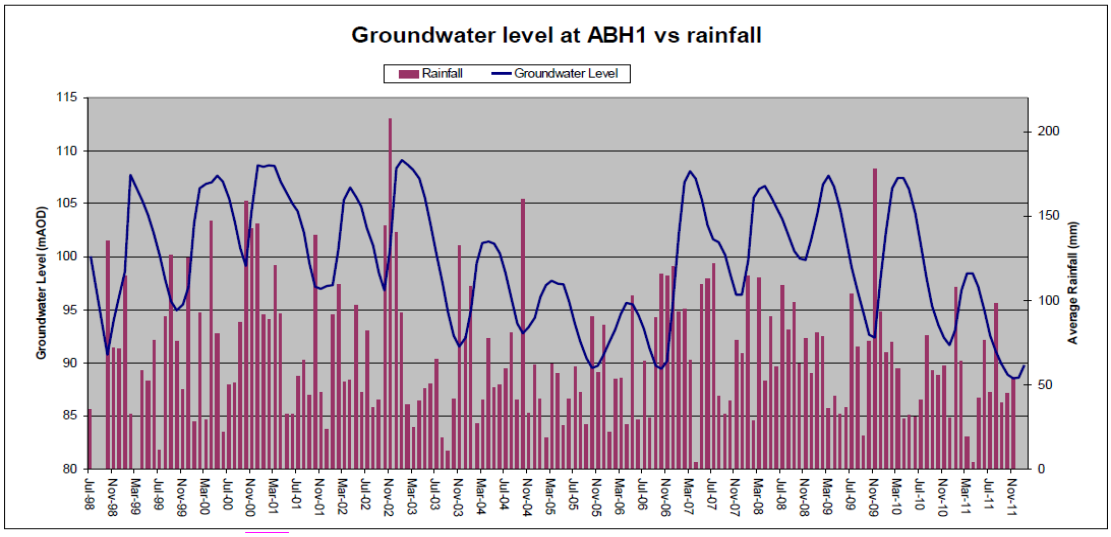

Figure 9: Groundwater levels at Abandoned Borehole 1 (ABH1) against Tidworth rainfall (at STW's)

2.2 Groundwater triggers

The groundwater triggers used are based on two different observation boreholes (OBH) which are associated with the main water supply boreholes (Figure 10 & Figure 11). Both include the LTA trace for an initial sign to show if the groundwater levels are in deficit or surplus.

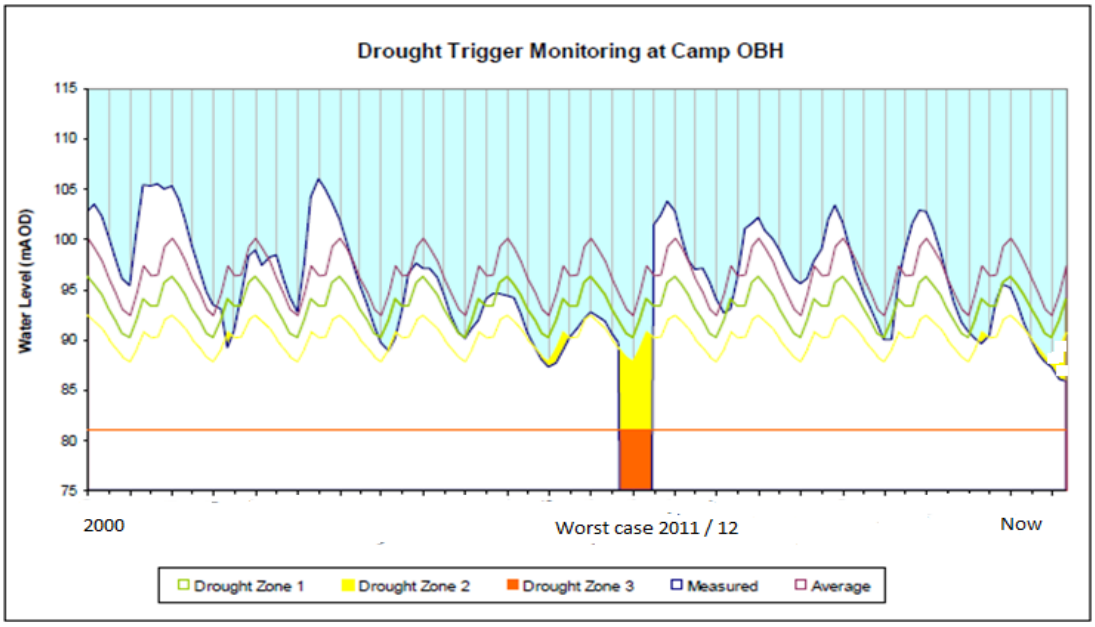

Figure 10: Drought Trigger Tier 1, using CP

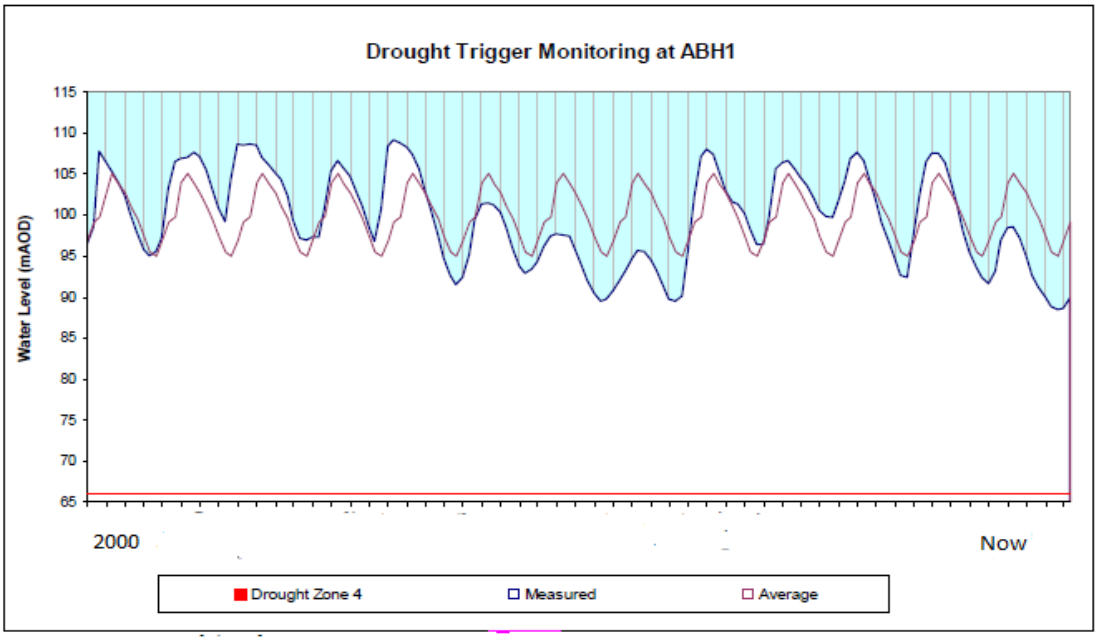

Figure 11: Drought Trigger Tier 2, using Abandoned Borehole 1 (ABH1)

Figure 10 shows the 'first tier' of the groundwater triggers, this OBH at location Camp is designed to correlate with the level at water supply borehole CP. This source has been assessed as the most vulnerable during a drought, as its deepest advisable pumping water level (DAPWL) is at a much higher elevation (~15m) above the other water sources DAPWLs. Drought Zone (DZ) 1 is set at 80% of the LTA water level, this will reflect one below LTA recharge season. DZ 2 is set at 60% below LTA and would likely reflect a situation where there has been consecutive below LTA recharge.

These two bands are very much warning bands (see drought management action section for further details), whereas DZ 3 is set to a level where a situation has arisen or is imminent. This zone is linked to the DAPWL for the CP source, therefore if breeched VWP would lose CP DO and its supply demand ratio would be accordingly affected.

In recorded history there is no evidence that this level has been exceeded, however 'word of mouth' according to previous MoD operators of the site indicate that historically during the groundwater low period this source has run dry while pumping continuously above its normal volume (usually only operated maximum of 10 hours daily in accordance with an agreement with the EA). Therefore this level has been set based on 'worse case scenarios' and the drought trigger will be used in conjunction with telemetry data to inform the DMG.

Figure 11 shows the 'second tier' of groundwater triggers, this OBH at location ABH1 is designed to correlate with the level at water supply boreholes BH1 and BH2. A flat line has been used for DZ 4 as there is no seasonal variability to meet the DAPWL. Historically this has never happened and looking at Figure 11 these sources appear extremely resistant to drought. As at the lowest recorded level in 15 years there is still 25 meters of groundwater depth above the DAPWL.

Table 3: Probability of ground water deficit and likely impact:

Drought Zone	Probability	Impact and response
1	1 in 5 years	None, 1 year of low rainfall does not impact on ground water levels. Monitoring will commence in case low rainfall event extends into following years
2	1 in 10 years	None. 2 year of low rainfall has no impact on sources
3	1 in 25 years (has not happened in the last 40 years)	CP not able to deliver DO due to low ground water levels as a result of 3 years of low rainfall. BH2 and 3 can increase their output to compensate, but requires operational intervention
4	1 in 100 years (never observed but still a risk)	Sources cannot provide sufficient output to meet demand

3. Drought management action

3.1 Introduction

Specific drought actions will be carried out under the supervision and management of the DMG. Details of internal roles and responsibilities concerning drought are contained within sections 1.6 and 1.7 and the Communications Plan in Section 5. VWP plan to follow a twin track approach using both Demand Management and Supply Side options as tools to manage the drought based on risk assessment of severity. The range of options to be considered are summarised in section 3.2 and 3.3.

3.2 Demand-side actions

Table 4 shows a summary of how the company has outlined the priority, order, timing and combination of demand side actions it will take in a drought. These have been linked to specific groundwater trigger levels. Each zone and demand measure will be discussed in more specifics below. Noting that where a ban has been requested this refers to the powers VWP hold as a statutory water company. Any actions requested of the MoD would be as cooperation in good faith between client and service provider.

Previous experience indicates that the Garrison Commander will cooperate fully and frequently requests water resources updates to keep abreast of developments.

3.2.1 Zone 1

3.2.1.1 Water Operations

Lead-in times: The outcomes from Zone 1 activities are immediate, on-going and advisory in nature. Therefore the actions at this level are designed to set the scene for the need for future restrictions.

- Leakage – Continue to monitor leakage and ensure it is maintained at a sustainable and cost efficient level.
- Pressure – Continue to maintain pressure management as a tool for minimising leakage
- Water use at operational sites – Carry out water audits at operational sites and set targets for water use
- Developing water efficient culture – Develop water awareness programmes for employees and expect them to become water efficiency ambassadors for VWP
- Monitor the LB export to Wessex Water – while at Zone 1 there is no need to limit this export on a litre by litre basis
- Ensure that there is no planned capital works occurring during the peak demand period that may impact on deployable output of the sources

3.2.1.2 Water Efficiency

Metering currently sits at; 66% penetration of domestic homes, this is expected to increase to 86% by 2020 / 2021 after the completion of the new developments.

Wessex Water trials showed that metered customers used on average 17% less water than unmetered. Using the water balance and known consumption values, metered customers in Tidworth use over 5% less water than unmetered. This shows water efficiency should slightly improve with the new developments and population increase as all new properties will be metered.

- Encourage metering of domestic homes
- Reducing VWP own use of water and promotion of water efficiency within the Company

3.2.2 Zone 2

Lead-in times: The need for Zone 2 actions set out below will have been rehearsed previously by VWPL and will be rolled out within a week of the DMG deciding that the event has escalated. The communications to the MoD will commence on day 1 of the declaration of the Zone 2 status and experience tells us that any requirements for water saving will be promulgated across the Garrison within 24 hours and will be effective soon thereafter.

- Public Relations Campaign – Customer awareness focussing on drought implications Eg customer information point[s] at a key location[s] in Tidworth town to reach the maximum number of civilian customers.
- Liaison with the MoD to spread good water efficiency practices as they are the major water user.
- Enhanced Leakage Reduction – Unlikely to yield a significant increase in savings, but important to fix visible leaks and supply pipes to maintain customer support.

- Real time monitoring of telemetry data to ensure that demands within the military areas are not excessive.
- An increased level of communication with WW, CWCo [advisory only] and the Military, the latter through the regular Garrison Commanders meetings will keep all key parties advised on the water resource situation leading to the more formal Restrictions scenarios.
- Approaches will be made to WW - To utilise a clause in the LB Agreement relating to a “litre for litre” reduction in water supplied during a drought situation. It is anticipated that up to 1 Mld may be made available to the Tidworth Service Area through this route. However such discussions will also need to consider security of supply to WW customers.

3.2.3 Zone 3 & 4

Lead-in times: Notwithstanding the Restrictions as they would relate to the Regulated Customer base require consultation and representation periods [see 3.2.3.2 below] before coming into force, VWPL anticipate that the MoD’s responsibilities both in secure areas of the Garrison and in SFA estates would result in their imposing their own internal restrictions and promote the requirements in advance of the more formal process. This would lead to an earlier realization of the anticipated demand side savings described in 3.2.4 below.

3.2.3.1 Temporary Water Use Restrictions

From the 1st October 2010 Section 36 of the FWMA, 2010 allows water companies a wider range of temporary water use restrictions that they can implement during a drought without requiring a drought order.

The Order provides detailed definitions of uses, exemptions and conditions in relation to these new powers. The Drought Direction 2011 sets out those uses that still require an ordinary drought order to restrict in a drought. These three pieces of Legislation supplement each other and together they set out the categories of water use that can be restricted by a company and additionally with a Drought Order.

Climate change scenarios and historic information suggests a multi-year drought could occur once in every 20 years affecting various parts of the country. Such prolonged shortages of rain will require the implementation of restrictions on water use to conserve water supplies and protect the environment.

The changes introduced by the government have made the powers clearer and have enabled more effective and equitable restrictions during times of drought. It is hoped that through introducing these new powers better conservation of water earlier on in a drought will occur thus ensuring supplies are protected for essential domestic use.

Table 4 below sets out the restrictions VWP has chosen to enforce and at what trigger stage they will come into effect. These activities will be applicable to civilian customers in the supply area as well as SFA outside of the military sites.

Table 4: Demand management options using Temporary Ban powers and MoD co-operation

Zone	Civilian (Including SFAs and WW 'enclaves')	MoD (all 'behind the wire' activity)
Zone 3 –Temporary Ban (FWMA 2010) measures introduced in single phase	• Watering a garden using a hosepipe • Cleaning a private-motor-vehicle using a hosepipe • Watering plants on domestic or other non-commercial premises using a hosepipe • Cleaning a private leisure boat using a hosepipe • Filling or maintaining a domestic swimming or paddling pool • Drawing water, using a hosepipe, for domestic recreational use • Filling or maintaining a domestic pond using a hosepipe; and • Filling or maintaining an ornamental fountain • Cleaning walls, or windows, of domestic premises using a hosepipe	• Sensible use in mess catering activities • Vehicle washer restraint on non-essential use • Increased maintenance by Aspire (contractor for MoD) of all MoD assets that could be 'wasting water' e.g. sand/oil filters, taps in JRSLAs and canteens • Watering plants and lawn areas • Unnecessary workshop use • Suspension of wet hydrant testing relating to flow rate.

	• Cleaning paths or patios using a hosepipe • Cleaning other artificial outdoor surfaces using a hosepipe	
Zone 4 –Drought Order measures introduced in single phase	• Cleaning non-domestic premises • Cleaning a window of a non-domestic building • Operating a mechanical vehicle-washer • Cleaning any vehicle, boat, aircraft or railway rolling stock • Cleaning industrial plant • Suppressing dust • Operating cisterns	• Watering sports pitches, e.g. Oval, cricket pitches and polo fields • No vehicle washing

3.2.3.2 Representations and actions prior to implementation of restrictions

Before any restriction is implemented under these new provisions, VWP will provide the opportunity for representations to be made

Publicity Requirements

Section 76B of the WIA 1991 has enhanced previous publicity requirements with regard to imposing restrictions. Before any prohibitions can be applied, VWP must:

- Publish notice on the website at the same time as publishing notice in two local newspapers
- Provide details in the notice of how to make representations about proposed prohibition
- Give notice each time the scope of any prohibition imposed under section 76 of the WIA 1991 is altered in any way; and
- Give notice in relation to the lifting of any prohibitions on the website and in two local newspapers. (see section 5 for future details)

Whilst there will be a lead in time for the implementation of restrictions to allow for representations, there is no such lead in time necessary for the revocation of restrictions; the lifting of a ban will take effect as soon as notice is given by one of the required means.

Timescales;

Temporary Ban Notices – 2 weeks will be allowed for representations before implementation.

Subsequent Notices or Changes - 1 week will be allowed for representations before changes.

Making Representations

Before a restriction is implemented under these new provisions, VWP will provide the opportunity for representations to be made. The time allowed for representations will depend on the scale of the proposed restrictions. The proposed timescales are outlined above. Customers seeking to make a representation will be able to do so by a variety of means. The following forms of media will be available for customers to make such representations:

- Website:
    - A simple form will be available for download to be printed off and returned to the nominated VWP office
- Telephone:
    - A customer service advisor will be able to post a copy of the form to a customer address
    - A customer service advisor will be able to complete an e-copy of the form by taking customer details on the phone – it is anticipated that this will be the most common route for representations.

Although on-going communication with WW will have occurred as the prospect of Restrictions approaches [see above], discussions allowing WW to make a formal representation will be held around the need for WW to impose such Restrictions as VWP deem appropriate for its own customers on to their WW “Enclave Customers” in the Tidworth Service Area.

Handling Representations

Representations received into the business will be collected and reviewed on a weekly basis. A panel of members from the DMG will convene to discuss the outcome of representations, with a final decision made by all representatives on the eligibility of the representation within 3 working days of the form being sent in by the customer. There will be no appeal process if the application for a concession or exemption is denied.

Concessions and Exemptions

The DMP only includes formal statutory exemptions outlined in the model code of practice. In order to conserve water and ensure a safe and secure supply during a drought, no other concessions will be granted by VWP (excluding MoD as a customer). A summary of these exemptions is listed below.

The FWMA, 2010 lists statutory exemptions which can be regarded as concessions.

1) On the grounds of health and safety:

- to clean the surfaces of a private leisure boat to prevent it from transferring invasive species to new waters.
- to clean the walls or windows of domestic premises.
- to clean paths or patios or other artificial outdoor surfaces
- to fill or maintain a domestic pond or ornamental fountain in which fish or other aquatic animals are being reared or kept in captivity.

2) To fill or maintain a domestic swimming or paddling pool:

- where necessary in the course of its construction.
- that is designed, constructed or adapted for use in the course of a programme of medical treatment.
- used for the purpose of decontaminating animals from infections or disease.
- used in the course of a programme of veterinary treatment.
- in which fish or other aquatic animals are being reared or kept in captivity.

3.2.3.3 Application for Concessions

The company will consider applications based on the grounds of health and safety and bio-security. Customers must do so must by contacting VWP by one of the means outlined above. Details of how the company will handle representations received have been outlined in section 3.2.3.2.

The company will not consider any applications for compensation in the event that temporary bans on water usage are introduced. The company has to plan on the basis that it may have to impose restrictions during long periods of very dry weather or drought. This means that the bills customers pay already reflect the potential for restrictions. Further clarification on this matter can be found on the Ofwat website.

3.2.3.4 MoD Restraint – Secure Areas and Service Families Accommodation [SFA's]

Also summarised in Table 5 are the restraints the MoD would put in place and at the specific trigger points. These range from advising the mess catering facilities who are large users to cut back on unnecessary water use and wastage. Escalating to the cessation of vehicle washers and not watering sports pitches. Such prohibition may have significant effect on the Military Operational work up to deployment training and will be discussed with the Garrison Commander in advance, normally through the regular monthly meetings, the frequency of which may move to fortnightly or even weekly if the situation so demanded. What is beyond doubt given the close liaison that VWP maintains with the Military, both the Secure Area and SFA Estates responses to demand controls will be immediate and proportionate to the level of stress.

Table 4 Column 2, Civilians and SFA's - sets out the measures that not only apply to Regulated domestic household customers but, insofar as they could apply to SFA occupants, the MoD through the Defence Infrastructure Organisation [DIO], would be required to promulgate the same advice and ultimately the same restrictions through Zones 3 & 4. It is anticipated that this group of customers will experience additional internal pressures ["landlord" generated] through DIO, working in cooperation with VWP, to save water from the early stages of the Drought. The DIO Housing Office Staff would probably be instructed to oversee their particular estate's water demand

and through peer pressure etc. there would be enhanced encouragement to work for the wider community good. Such an initiative would be applauded by VWP as the Regulated customer base would not necessarily witness such drivers to reduce demand.

3.2.3.5 Drought Order measures (NEUDO)

Due to the limited data available in terms of rainfall deficit and its impact on borehole water levels a 1 in 100 year (1% chance per annum) probability of a drought order event has been assumed. The first efforts to remedy such a situation will be the delivery of water using water tankers to service reservoirs. Should the situation continue to worsen then water bowsers will be installed on the network and activities will proceed in line with the response to a serious emergency event (such as contamination of the water source) in line with the Security Emergency Measures Directive (SEMD).

3.2.4 Demand Savings

The demand savings associated with imposing restrictions on customer use can be difficult to quantify – there is little or no evidence of the savings associated with the majority of individual water uses covered by the FWMA, 2010. Using the UKWIR (2011) code of practice (CoP) we can estimate the savings (particularly associated with restricting the use of hosepipes for garden watering) in our region would amount to ~2.5% of the water we put into distribution. This would equate to a 0.16 Ml/d at peak DI or 0.146 Ml/d on average. This is lower than the saving suggested by the UKWIR guidance to reflect the higher proportion of metered customers in our region (55%) compared to the UK average (35%). This data is based on tariff trials carried out by WW.

Savings from the MoD's Military activities could be significant when taken as a whole and could be worth up to 0.2 Ml/d depending upon the prevailing overarching Military need at the time. The savings anticipated from the SFA estates will be lower than Industry Standards for Regulated domestic customers due to their reduced leisure water use behaviours EG very little hose pipe use and no appreciable garden watering. A modest saving of some 0.1 Ml/d could be anticipated from this sector.

Total demand savings due to the restrictions are estimated to be 0.45 Ml/d.

3.3 Supply-side actions

(See Table 4 for timings and options summary)

3.3.1 Re-commissioning of Abandoned/Disused Sources

VWP has one abandoned borehole, the Licence volume for which has been revoked and incorporated in to BH2 & BH3. Therefore this section is not expanded upon.

3.3.2 Source Abstraction & Network Management

As the level/zone 3 trigger approaches CP source starts to come under threat of outage due to groundwater levels reaching the DAPWL. In a bid to help support this source if demand has not been sufficiently restrained, this source's outputs can be reduced. As it does not have variable speed pumps this has to be done via reduced hours of usage. To meet the required demand and hence DI, sources BH2 and BH3 output needs to be increased to peak demand. The reduced output from CP aims to

reduce its draw down (cone of depression) of the water table around the source and prevent complete source outage. Should this occur then the remaining sources would need to be run at peak capacity while constraining demand.

Investigations have revealed that BH2 and BH3 can deliver a greater output by bypassing the GAC treatment process which introduces a throttle after the pumps.

Water quality at the sources of BH2 and BH3 would need to be closely monitored to ensure compliance whilst the GAC treatment was bypassed.

VWPL envisage the actions around utilising the various Licenced Sources described above and elsewhere in this document would achieve the objective of managing Drought scenarios within current abstraction limits. At no time would VWPL anticipating breeching its existing Abstraction Licence.

As a consequence no Drought Permitting is described in the DMP. In association with the decision not to enter the realms of Drought Permitting, VWPL has not seen a requirement to carry out a Strategic Environmental Assessment [SEA] in the preparation of this Plan.

Another short term operational solution would be to allow reservoir levels to fall below their lower level indicators before borehole pumps begin to 'top-up'. Although this is not a sustainable solution it could help meet daily 'peaks' without increasing water abstraction and therefore drawdown of the water table.

3.3.3 Bulk Supply

VWP has bulk supply in the form of inter-company transfer to Wessex Water (WW). This is known as the 'Leckford Bridge Agreement' (LBA).

The LBA states VWP will endeavour to provide up to a maximum of 3 Ml/d, with a maximum instantaneous flow of 36 l/s. In reality WW does not take its full allowance and this agreement may change as it is due to expire in the year 2022

The provisos of this condition essentially rest on a 'Critical Figure' which has been determined to be 5.4 Ml/d. If VWP cannot meet this figure (excluding the LBA volume) then the 3Ml/d can be reduced on a 'litre by litre' basis. However this critical figure includes the DO of VWP sources during drought conditions, as VWP Tidworth has no operational experience of a 'true' or 'severe' drought the critical figure may not cover the SRO's actual abilities. This would then involve the effective communication between the EA, WW and VWP (see communication plan section).

There are 3 WW 'enclaves' which are seen by VWP as part on the main customer network as they are entrenched within VWP boundary. However, as the users are not VWP bill paying customers WW would be relied upon to legally enforce drought bans in conjunction with this plan to help restrain demand. Further details of this are mentioned in the communications section.

The table below is a summary of both the demand and supply side options VWP may implement in the event of a drought. It also shows the strategic sequence that VWP would consider implementing these actions and the linked trigger points (groundwater observation borehole derived). These actions marry to communication actions which are explained in their own section.

Table 5: Summary of drought Actions

Drought Band	Demand Side Options	Supply Side Options
Zone 1 – Normal Operation (Levels below LTA)	• Water Operations • Water efficiency • Informal liaising with EA and MoD	• Normal supply activity • Reporting of rainfall data and groundwater levels to operations managers
Zone 2 – Initial Dry Weather (Significant reduction below LTA, probably second dry year)	• Increased Water Operations • High profile water efficiency to domestic customers and MoD • Drought group formal meetings with EA and MoD • Prepare Temporary Restriction Plans/Docs for representations	• Cut back on CP source usage as levels approach Zone 3 if rainfall outlook is poor • Increase BH 2+3 output to peak if no demand reduction
Zone 3 – Drought Actions (Levels cause average DO no longer possible)	• Website, local newspaper and radio announcements • Temporary Water Use Restrictions (As per table) • MoD ban on activities (not dependant on national security) • Veolia 'presence' in the community	• CP DO now 0Ml/d as DAPWL reached • Inform WW VWP can no longer meet critical figure for 'Leckford Bridge Agreement' • Allow reservoir depletion to below normal levels during peak periods before refilling • BH 2+3 maximum output •
Zone 4 – Drought Emergency (Record low levels and civil emergency)	• NEUDO • Drought emergency declared to EA and Ofwat	• BH2+3 unable to deliver DO as DAPWL reached • Lowering of borehole pumps (all sources) • Tanker deliveries to water reservoirs • Possible Rota Cuts and Standpipe usage as last option

4. Environmental Impacts

The following diagram indicates areas of potential environmental impact due to pumping at peak licence to meet the requirements of a drought situation.

Each environmental impact is covered in more detail in the sections below and further investigations will take place to expand on these initial observations for inclusion in future Drought Management Plan updates.

This will include the use of the Hampshire Basin model to establish the impact of pumping at volumes to meet extreme weather events.

GROUND WATER DIAGRAM REDACTED ****

4.1 Nine Mile River

The supply side options included as drought management actions will not involve any environment damage as all options are available within the operational limits of existing abstraction licences.

The former National Rivers Authority (NRA) commissioned a study of the Upper Hampshire Avon catchment, which in 1993 reported indications that abstractions of water were to the detriment of the ecology of both the Bourne and Nine Mile (9MR) River's. The perception of a trend towards lower flows, particularly in the upper reaches of the rivers, was exacerbated by low rainfall and recharge experienced in 1992 and 1997. Other drivers such as the UK Biodiversity Action Plan identifying chalk stream habitats as a priority and low flow complaints led to a further study and assessment by the EA of the 9MR.

The conclusions from this study (River Bourne & Nine Mile River Conceptual Modelling Report, EA South West Region, 2001) were based on purely a conceptual understanding as no numerical, three-dimensional groundwater modeling was conducted. The effects of the Tidworth abstractions on the 9MR were summarised as very minor in comparison to abstractions in the Avon catchment and its depletion of flows.

"In wet years some groundwater flow may be induced from the Bourne surface water system and minimal through flow. Up-catchment effects will be to take flow from the Whiteway Rock (outcropping at LB), Chalk Rock (outcropping between Collingbourne Kinston and Collingbourne Ducis). The abstraction may extend the period when the river is dry, as well as the length of river that is dry"

This is compared to the impact of the Tidworth STW discharges back into the aquifer. "This discharge is via multiple lagoons which act as a soakaway. The water is thus returned directly into the aquifer albeit at a shallower level than the abstraction. 85-100% of Tidworth Abstraction is therefore likely to be discharged back to the surface system which will re-infiltrate into the Seaford Chalk and in wet months may flow south to the Bourne catchment."

Source: River Bourne & Nine Mile River Conceptual Modelling Report, EA South West Region, 2001.

Ultimately, the EA were happy to grant the current abstraction licence for the Tidworth boreholes.

4.2 River Bourne

There is no impact on the River Bourne as a result of abstraction. Refer to section 4.1 above for details of the catchment area.

However, Tidworth STW's discharges back into the aquifer at a set of lagoons adjacent to the River Bourne. The risk of impact on the River Bourne is most acute when water table levels are high as lagoon infiltration can be negatively impacted. This means that the risk is during periods of high rainfall, not drought periods. This risk is being managed as part of the Tidworth STW discharge variation activities.

4.3 Pilhill Brook

Pilhill Brook is a 9.9km long tributary of the River Anton situated to the east of Tidworth. EA ground water modelling indicates a possibility of a slight impact on the flow of this river if the Tidworth sources produce water at peak licence.

Further investigation is required over the coming 5 years to determine the scale of the impact.

4.4 Tidworth Network

Biodiversity has been indicated as a concern, particularly during drought conditions, by Natural England and the Environment Agency.

As part of general housekeeping a system has been put in place by VWP to constantly review health and safety aspects during site visits. This will be extended to include environmental observations. Environmental awareness training has been delivered to operational staff.

Monitoring of environmental impact will continue during a drought condition as will other standard housekeeping activities.

5. Management and communications strategy

5.1 Management structure

The DMG would be made up of the following personnel;

- South Region Director - Water
- Head of Customer Operation
- Senior Operations Manager
- Customer Services Manager

5.2 Roles and responsibilities

The Company's roles and responsibilities for a drought is shown in section 1.7. The communications plan in section 5.3 is a skeleton which would be fleshed out according to the severity and timing of a drought.

5.3 Communications plan

VWP is a small water company without a PR department at its disposal, but is close to its customers. Direct contact and local media are used to communicate with the public and other stakeholders such as the MoD (directly through the Garrison Commander).

VWP has a very robust supply-demand balance and undoubtedly benefits from "drought" publicity initiated by others or from generally heightened public awareness in national media during dry periods.

Issues uniquely affecting Tidworth PFI are the WW enclaves, which are not VWP bill paying customers but are reliant on the same water source. When coordinating messages and potential temporary drought restrictions, VWP would expect them to impose the same bans to help reduce demand on their bulk supply taken from VWP.

The media outlets VWP would expect to use are listed below;

Radio – Spire FM (Salisbury radio station), Garrison Radio
Newspapers – Andover Advertiser and Salisbury Journal
Webpage - https://www.veolia.co.uk/our-services/what-we-do/water-services/water-projects/tidworth-operations

This communication plan will be expanded to link the methods and content of communication with the drought band. A table will be developed that lists the drought bands, the media outlet to be contacted and a summary of the content of the communication to be delivered via that media outlet.

5.4 Monitoring of Demand

VWP will enhance its current monitoring activities with the assistance of its Network Consultants, who will interrogate all available telemetered meters, District, Network and where fitted with telemetry, Customer Revenue meters to assess the effects of the various stages of the Temporary Restrictions from Zone 2 onwards.

Operational performance monitoring tools are being implemented and are due to be available by the end of 2019. This will allow data gathered as part of real events to be analysed and used to predict future performance.

Such information will not only inform the event dialogue with the Regulatory Authorities but will act as a barometer of MoD demand which will be high on the Garrison Commander's agenda at the regular quarterly update meetings.

6. Post drought actions

6.1 Identifying the end of a drought

The end of a drought can be defined as when the risk of impact from drought is no greater than during a normal year, and where normal conditions have continued for a period of time. The hydrological conditions as a drought recedes can be complex and identifying the end of a drought can be difficult to determine. VWP will confirm first and foremost with the EA that the water resource situation has returned to normal before taking any action. The following stakeholders would also be notified before

any actions are taken: DEFRA, Ofwat, Water UK, CCW, DWI, Environmental Groups, Board and Employees.

The end of a drought will be determined using the company's triggers, with all restrictions able to be removed when groundwater levels have moved out of zone 3. The lifting of the ban will first require notice in relation to the lifting of prohibitions to be published on the company website and in two local newspapers. Unlike the imposition of restrictions however, there is no such lead in time necessary; restrictions will be revoked instantly after the notice is given.

6.2 Post drought actions

Directly after a drought event, it will be the responsibility of the service delivery manager to produce a "lessons identified" report that will enable future processes to be improved. This report will be produced within 3-6 months of a drought ending and will be followed up within a year with evidence that recommendations were acted upon. The report will include:

- A review of the environmental impact of the drought by analysing baseline, in-drought and post-drought data.
- Determining if the appropriate environmental monitoring of baseline, during and after a drought was carried out to measure the impact of any drought orders.
- A review of the effectiveness of any mitigation measures implemented.
- An assessment of how well individual sources delivered additional water and determine where any re-assessments of yields may be needed or invested to maintain yields of sources.
- An assessment of the estimates of demand reduction from the implementation of demand side drought management actions.
- An investigation into whether or not the company would need to make any changes to its demand forecast or longer term demand forecast

Additionally a drought workshop would be held to assess the efficacy of the management process and review whether any improvements or changes to the drought plan were required (involving ideally the entire DMG).