2022 Drought Plan

Veolia Water Projects Limited (VWPL)

Date: September 2nd, 2022
Version: 1.0
Due for Review: 2027

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1. NON-TECHNICAL SUMMARY

Under its Inset appointment, Veolia Water Projects Limited (VWPL) is responsible for the water supply of Tidworth, Perham Down and the eastern part of Ludgershall.

Water is abstracted from two groundwater sources at three sites (Tidworth BH2, Tidworth BH3 and Chalkpit) under an abstraction licence issued by the Environment Agency. The treated water is then treated and distributed through the water distribution network to around 2,000 civilian properties, over 120 commercial properties, a large garrison and some 1,300 Service Families Accommodation [SFAs] properties in the town and community.

These sources provide sufficient water to meet the needs of VWPL customers as well as providing bulk supplies to Wessex Water (WW) for the Leckford Bridge Zone to the north of Tidworth, as well as the three Enclaves in Tidworth town.

While historical events show that there is a low probability of adverse impact of a drought on levels of service to customers, analysis indicates that VWPL is resilient against four consecutive dry years. The VWPL Drought Management Plan (DMP) has been developed to demonstrate how VWPL plans to provide a secure supply of water and protect the environment during dry weather and droughts.

VWPL monitors indicators such as rainfall, groundwater levels, reservoir storage, and customer demand within the water resource zone, in order to detect the onset of a drought, assess its severity, and implement appropriate actions through its duration. From these indicators, drought triggers have been defined to identify when the different levels of a drought are reached and what actions need to be taken. Drought actions will be implemented to reduce water demand (demand side actions) and to maintain the water supply (supply side actions).

Demand side actions include voluntary water saving initiatives, implementation of Temporary Use Bans (TUBs), reduction of the Leckford Bridge export, and ultimately Non-essential Use Bans, which would be subject to an Emergency Drought Order.

Supply-side actions will focus on maximising the abstraction primarily from Tidworth BH2 and Chalkpit to compensate for the loss of BH3 should the groundwater level drop below the bottom of the well.

Note: the supply side actions would not require drought permits as the abstraction sites will continue to be operated within the permitted abstraction limits. The environmental impacts of those actions should be limited to those already identified within the abstraction licence, so specific Habitats Regulation Assessment (HRA) and a Strategic Environmental Assessment (SEA) will not be required. The recent Hampshire - Upper Avon investigation highlighted that Veolia (as well as Wessex and the MOD) abstraction sites have an impact on the Nine Mile River and the River Bourne however all three parties are proposing options to remediate the impact.

Throughout a drought, VWPL will communicate with its customers, the regulators and other key stakeholders in order to raise awareness of the drought situation, promote good practice of water conservation and efficiency, and enforce water usage restrictions (when applicable).

VWPL will manage droughts through its Drought Management Group (DMG) who will ensure that drought actions, communication and reporting are delivered in a timely manner, and who will monitor their effectiveness.

Finally, upon closure of the drought event, VWPL will carry out a “lessons learned” exercise that will enable future processes to be improved.

2. INTRODUCTION

2.1. DROUGHT PLAN REQUIREMENT

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.

Drought conditions have the potential to negatively impact public potable water supply, groundwater regimes and the wider environment. The purpose of the Drought Management Plan is to demonstrate how Water Companies plan to provide a secure, sustainable supply of water and protect the environment during dry weather and drought conditions. This plan documents the actions Veolia Water Projects Ltd (VWPL) will take before, during and after drought conditions and will state how VWPL will manage and monitor any potential environmental impacts.

Drought Management Plans are developed in line with the “Water company drought plan guideline”, issued in December 2020 (version 1.2) by the Environment Agency (EA). They are first issued as draft for public consultation after receiving authorisation from the Secretary of State (SoS). Then the revised (final) versions are published once approved by the Secretary of State, and provide a tool to aid decision making by Water Companies during drought events.

Drought Management Plans are to be reviewed at least every five years.

2.2. VWPL DROUGHT MANAGEMENT PLAN

VWPL’s Drought Management Plan has been developed following the structure proposed in the EA guidelines, and in consultation with key stakeholders such as the EA and Natural England who hold expertise in areas associated with water resources and the environment), Wessex Water, the neighbouring water undertaker to whom VWPL provide a bulk water supply, the Ministry of Defence (MoD), and CCW, the independent voice for water consumers in England and Wales.

It also takes into account drought management requirements which should be defined in the West Country Water Resources Plan and may affect the VWPL supply area, mainly with regards to the joint approach and communications on customer restrictions.

The document outlines six main sections:

(i) an introduction to VWPL’s supply area, water resources and its vulnerability to droughts

(ii) a description of the drought triggers

(iii) a description of drought management actions

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

(v) a description of the Communications Plan, and

(vi) an outline of post-drought actions.

VWPL’s Drought Management Plan is closely linked to VWPL’s Water Resources Management Plan as a component of a larger planning framework regarding how to manage, protect and sustain the water resources within the supply area, now and in the future.

3. VWPL SUPPLY AREA

3.1. BACKGROUND

VWPL has operated the water supply and sewerage function of a small water resource zone in Tidworth on the edge of Salisbury Plain within Wiltshire, since 2009 under an Inset Appointment, which was transferred from Thames Water Utilities Limited (TWUL) to VWPL.

Under this appointment, VWPL is responsible for management of the water resources throughout the 25 year planning period and for guaranteeing the provision of water services (clean and waste) to over 2,000 civilian properties and over 120 commercial properties in Tidworth, Perham Down and the eastern part of Ludgershall. The number of properties supplied will increase by approximately 400 between now and 2024 due to new developments within the supply area.

Through a PFI agreement between VWPL and the MoD, VWPL services a large garrison that can house up to 6,000 personnel at any one time together with some 1,300 Service Families Accommodation [SFAs] properties in the town and community.

All of the water supply comes from groundwater, abstracted from three boreholes wells located in the vicinity of Tidworth within an unconfined principal chalk aquifer. The underlying groundwater regime provides sufficient water to meet the current water demand within the VWPL supply area, as well as providing the adjacent water supplier, Wessex Water (WW), with a bulk supply.

3.2. SUPPLY SYSTEM

3.2.1. Water Resources

100% of the raw groundwater supply comes from three borehole wells: Chalkpit, BH2 and BH3 within an unconfined chalk principal aquifer.

The underlying groundwater regime provides sufficient water to meet the current water demand within the VWPL supply area, as well as providing a bulk supply to Wessex Water (WW) for the Leckford Bridge Zone to the north of Tidworth, as well as the three Enclaves in Tidworth town.

The table below represents the average and peak production for the Tidworth (BH2 and BH3) and Chalkpit (CKP) abstraction sites compared with the permitted abstraction limits.

Figure 1 – Network layout, current production (2019 – 20) and available licence

(Ml/d)		Tidworth BH2 Daily flow	Tidworth BH3 Daily flow	Chalkpit CKP Daily flow	Tidworth Group Daily flow
Output	Average	2.23	1.98	2.31	6.52
	Peak day	2.78	3.42	2.79	8.99
Licence	Average	3.68	3.68	3.64	9.02
	Peak day	4.32	4.32	4.69	12.00

Note: while the abstraction licence allows for a peak flow of 4.69 Ml/d at Chalkpit, it is worth noting that the licence also requires abstracting routinely and preferentially from the Tidworth boreholes before using Chalkpit.

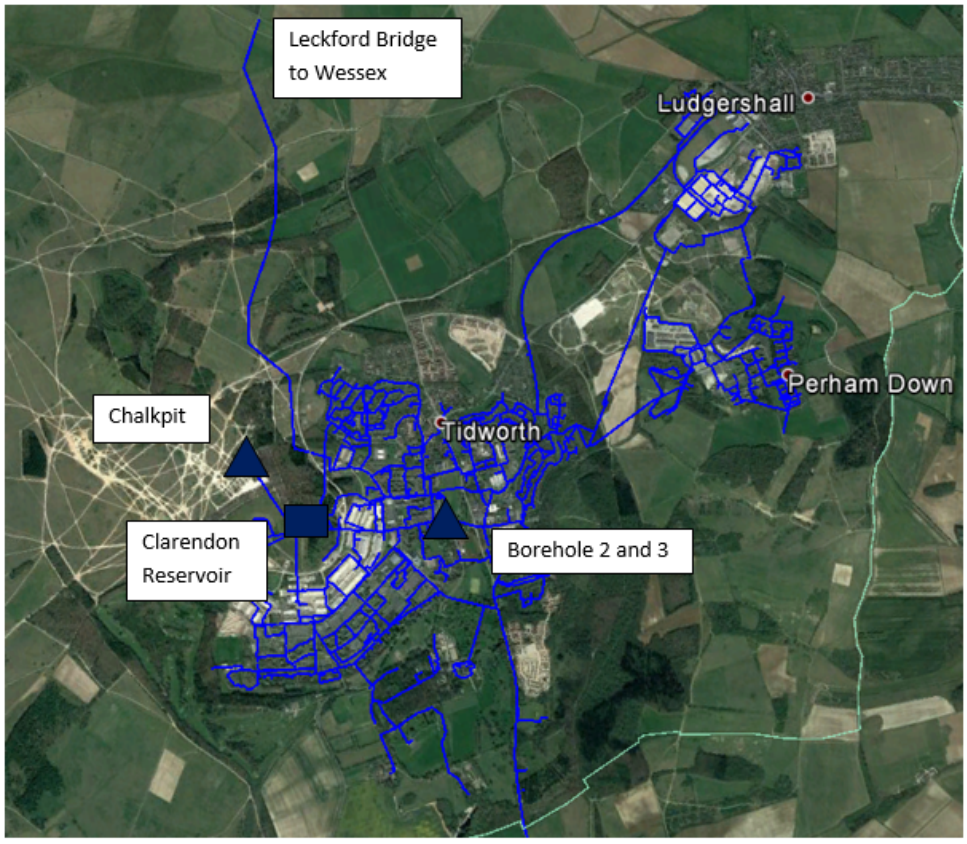
3.2.2. Water Resource Zone (WRZ)

A resource zone is the largest possible zone in which all water resources, including the external transfers to WW can be shared. Therefore, within drought conditions all customers would experience the same risk of supply failure from a resource shortfall.

The potable water supply for the wider Tidworth network, including Perham Down is highly integrated and as such, is classified as a single WRZ.

3.2.3. Distribution System

The distribution network is fed from one strategic reservoir and another secondary reservoir. The network is small and therefore 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 multi-day outages depending on which source was not operating.



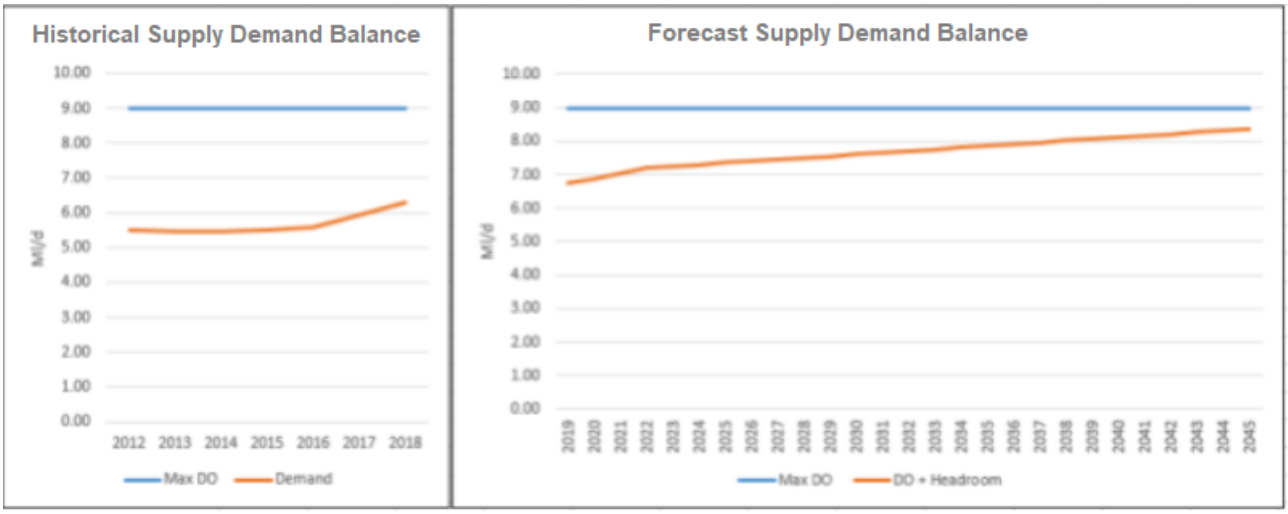
Because of the need to meet Crown firefighting standards at MoD sites the network has been designed to meet a very high instantaneous demand, ensuring network capacity is not an issue.

3.2.4. Water Supply/Demand Balance

VWPL has maintained a healthy supply/demand balance which is reflected in the graph below (figure 2).

The demand prediction is shown in orange compared to the Deployable Output (DO) in blue. Our assumption shows a rapid increase in demand until 2022 when all the major housing developments within Tidworth will have been completed. There is then a gradual increase in demand from 2022 to 2045 (assuming slow and gradual infill developments). The predicted demand growth will be reassessed for WRMP 2024 after the major developments have been completed. This will then provide improved confidence in the demand growth from 2024 onward.

Figure 2 – Annual peak supply/demand balance



3.2.5. Bulk Supply

3.2.5.1. Leckford Bridge Bulk Supply Agreement

VWPL has a bulk supply in the form of inter-company transfer to WW. This is known as the 'Leckford Bridge Bulk Supply Agreement' (LBBSA). Under this agreement, VWPL will endeavour to provide up to a maximum of 3 Ml/d, with a maximum instantaneous flow of 36 l/s. Currently, Wessex Water does not take its full allowance.

Also, VWPL will have the right to instruct Wessex Water to reduce the 3Ml/d on a 'litre by litre' basis, should:

- the demand within the VWPL area of supply exceeds 5.4 Ml/d - excluding the LBBSA volume.
- the maximum quantity of water permitted to be abstracted under the Licence be reduced

Note: the LBBSA may be subject to change as it is currently being renewed.

3.2.5.2. Wessex Water enclaves

There are three Wessex Water 'enclaves' which are treated by VWPL as part of the main customer network as they are entrenched within the VWPL boundary. However, as the users are not VWPL bill paying customers WW would be relied upon to legally enforce drought bans in conjunction with this plan to help manage demand. Further details of this are contained in the communications section.

3.3. VULNERABILITY TO DROUGHT

3.3.1. Historical data

Neither VWPL nor its predecessors have had occasion to resort to formal restrictions in over 15 years, including through recent drought conditions in 2006/07, 2011/12 and more recently 2018 when many water companies' sources in Southern England were under extreme pressure.

Note: enquiries to MoD personnel who were in post pre-1998 indicate that there have probably been no garrison-wide restrictions in the 20 years prior to that date.

Historical events show that there is a low probability of adverse impact of a drought on levels of service to customers.

Figure 3 – Historical Level of Service - all customer groups

Level	Situation	Impact to Customers	Probability	Historical Events
1	High demand	No restrictions	1 in 5 years (20%)	1
2	2 years of high demand	Proactive approach to water efficiency	1 in 10 years (10%)	0
3	Temporary ban	Temporary use bans	1 in 50 years (2%)	0
4	Emergency Drought Order	Non-essential use bans	1 in 200 years (0.5%)	0

3.3.2. Assessment of VWPL Resilience

In order to assess the underlying groundwater regime at the supply abstraction boreholes, VWPL monitors the groundwater levels within observation borehole OBH1, the Clanville Lodge Gate and the Shipton Bellinger observation boreholes.

In August 2021, VWPL commissioned John Wood Group Plc to undertake hydrogeological modelling to confirm the vulnerability of the Tidworth and Chalkpit groundwater regimes using the Wessex Groundwater Model. The vulnerability assessment is described in detail within Appendix 2 of this document.The purpose of this section is to summarise critical information and findings that may influence the Drought Management Plan.

The historical data was modelled in the following scenarios;

- 1920 which represents a 1 in 100 year drought event. It should be noted that the observation boreholes were not operational within the 1920s, as such the modelled data has been produced from groundwater data obtained between 1965 and 1970.
- 1974 which represents a 1 in 200 year drought event. The model was created from groundwater data obtained between 1974 and 1977.
- 1974 with the data extrapolated to represent a 1 in 500 year drought event. The model was created from groundwater data obtained between 1982 and 1985.

The modelling analysis indicates that groundwater sources only start to show signs of strain when there have been two or more consecutive dry years. At that point, the measured groundwater level dropped to 77m AOD, below the base of the steel casing within the VWPL operated abstraction boreholes.

When the vulnerability model produced by Woods Plc was transposed into daily operations of VWPL and the Deepest Available Water Pumping Level (DAWPL) of the active abstraction boreholes were applied, the modelling suggested VWPL are resilient against four consecutive dry years and throughout 1 in 100 and 1 in 200 drought event conditions. This is due to the groundwater levels within both chalk aquifers not falling below the respective DAWPL of the Chalkpit abstraction well and abstraction borehole BH2.

However, the vulnerability model suggests that the abstraction borehole BH3 water source is likely to be made redundant in a 1 in 100 and 1 in 200 drought event as the groundwater level falls below the active DAWPL of 84m AOD.

Figure 4 – Drought occurrences and Borehole levels

Consecutive dry years	Lowest borehole level observed	Number of events in 100 years
1	92m	5
2	87m	7
3	82m	5
4	77m	0
5	72m	0

Refer to Appendix 2 of VWPL 2020 Water Resource Management Plan in attachment

Future groundwater levels have been predicted using a climate change model, as initially referenced within Appendix 2- Resilience of VWPL's Water Resource Management Plan.

The prediction modelling suggests that an additional drought episode, similar to the conditions modelled within the 1974 (1 in 200 year) drought event and in 2011/2012 is likely to occur in 2031. However, according to the findings of the vulnerability assessment undertaken in 2021, VWPL operations would be resilient to this predicted drought.

3.3.3. Resilience of supply assets

Audits of the asset management and maintenance processes occur on an annual basis. These audits ensure that the abstraction, treatment, storage and distribution infrastructure remains reliable and resilient.

In addition, a programme of work relating to the Security Emergency Measures Directive (SEMD) is being implemented.

A compliance audit in December 2018 by the Environment Agency raised no concerns and abstraction meters are calibrated on a regular basis to ensure accuracy of reporting.

4. DROUGHT TRIGGERS

4.1. GENERAL

In order to detect the onset of drought conditions, assess its severity, and implement appropriate actions through the duration, VWPL monitors indicators such as rainfall, groundwater levels, reservoir storage, and customer demand within the water resource zone.

Drought triggers have been defined to identify when the different stages of a drought are reached and what actions need to be taken (see section 4.3). However, the crossing of a drought trigger does not mean that action must automatically be taken. The drought management team will decide on whether the action is needed based on a range of factors, including the current and forecast conditions and how effective the action would be.

4.2. INDICATORS

4.2.1. Rainfall

Rainfall data is collected and recorded locally at Tidworth Sewage Treatment Works on a daily basis. It is also shared by the Environment Agency on a regular basis.

Under normal conditions, the operations team reviews the rainfall data on a quarterly basis. However, as drought conditions develop, VWPL would increase the reviews to monthly intervals in order to track the development of the drought and its impact on VWPL operations. If required, VWPL may increase the monitoring to either daily or weekly intervals in order to achieve real time trends against the supply network demands.

4.2.2. Groundwater level

Groundwater levels are recorded locally at five observation boreholes within the Tidworth catchment on a daily basis via on-site loggers. The data is then collected manually on a monthly basis.

Under normal conditions, the operations team reviews the groundwater level data on a monthly basis. If required, VWPL may increase the monitoring to either daily or weekly intervals in order to achieve real time trends against the supply network demands.

4.2.3. Reservoir level

Levels of the service reservoirs are monitored in real time through the telemetry system. Minimum and maximum thresholds have been defined and alarms are generated whenever those thresholds are reached.

Under normal conditions, the operations team reviews the pattern of reservoir levels as part of the weekly and daily site monitoring. As a drought develops, the levels will be monitored continuously.

4.2.4. Customer demand

Customer demand is monitored in real time through the telemetry system via flow meters at the outlet of the service reservoirs.

Under normal conditions, the operations team reviews flow patterns on a quarterly basis during winter months and monthly during summer months. If required, VWPL may increase the monitoring to either daily or weekly intervals in order to achieve real time trends against supply network demands.

4.3. TRIGGERS

The drought triggers are presented in the below table. They have been defined based on:

- Groundwater level: characteristics of the abstraction system (pump level and well depth)
- Reservoir level: operational philosophy and water retention capacity
- Customer demand: peak demand and maximum Deployable Output (DO)

Table 1 – Drought triggers

Level	Trigger
Level 1 - Normal	Groundwater level above 90m AOD* Reservoir level reaching low threshold Customer demand < 8.4 ML/d
Level 2 - Developing Drought	Groundwater level between 90m and 84m AOD* Reservoir level dropping below the low threshold over less than a week Peak customer demand at 8.4 ML/d
Level 3 - Drought	Groundwater level below 84m AOD* Reservoir level dropping below the low threshold over less than 36 hours Peak customer demand at 8.4 ML/d
Level 4 - Severe Drought	Groundwater level below 78m AOD* Reservoir level dropping below the low threshold over less than 24 hours Peak customer demand at 8.4 ML/d

**AOD: Above Ordnance Datum (with datum as mean sea level)*

Note: These triggers have been derived from hydrological modelling undertaken by John Woods Plc in August 2021.

4.4. TESTING TRIGGERS

The drought triggers defined in Table 1 have not been tested fully but VWPL have confidence in these being the correct measurement points following a supply demand event in 2017, where these points were key in alerting us to the issue and in our operational response and recovery activity - the detail of which is included in appendix 1.

In addition to the above, VWPL commissioned Woods Plc in August 2021 to undertake an additional vulnerability assessment to confirm the accuracy of the trigger points outlined in Table 1. The vulnerability assessment is described within section 3.3.2 of this Drought Management Plan and is presented in details within Appendix 2.

VWPL also plan to conduct a drought exercise after two consecutive non-drought years. These exercises will test the planned triggers and VWPL response actions.

5. DROUGHT ACTIONS

5.1. GENERAL

During a drought, VWPL will implement actions to reduce water demand (demand side actions) and actions to maintain the water supply (supply side actions). VWPL will aim to prioritise demand side actions, such as reducing customer demand, leakage, and outages, and supply side actions with the least damaging impact to the environment before considering applying for drought permits and orders.

However, it is worth noting that based on our current vulnerability assessment and the abstraction limits defined in our abstraction licence and the hydrological modelling, VWPL does not envisage needing to apply for a Drought Permit or Order.

The table below provides a summary of the drought actions VWPL will implement at different stages of a drought. Specific drought actions will be carried out under the supervision and management of the Drought Management Group (DMG) whose roles and responsibilities are detailed in section 9.

Table 2 – Drought Actions

Level	Demand side actions	Supply side actions
Level 1 - Normal	1. Water saving activities (level 1)	1. Change reservoir operation thresholds to increase abstraction regime from CKP
Level 2 - Developing Drought	1. Water saving activities (level 2) 2. Temporary Use Bans (TUBs) (level 2) Note: VWPL will also consider gathering data for an environmental assessment at this stage	1. Maximise pumping capacity of all abstraction sites within current pumping arrangement/treatment capacity *(abstraction within permitted limits)*
Level 3 - Drought	1. Level 2 demand side actions 2. Temporary Use Bans (TUBs) (level 3) 3. Proportionate reduction of Leckford Bridge export Note: VWPL will also consider gathering environmental data at this stage	1. Further increase the abstraction capacity of CKP and BH2 to compensate for the loss of BH3. Note: Lowering the pumps may also be considered *(abstraction within permitted limits)*
Level 4 - Severe Drought	1. Level 3 demand side actions 2. Emergency drought order - Non-Essential Use Bans (NEUBs)	1. Further increase the abstraction capacity of CPK and potentially BH2 by replacing and upsizing abstraction pumps 2. Tankering

Note: The supply side actions have been reviewed based on the outcomes of the hydrological modelling undertaken by John Woods Plc in August 2021.

5.2. DEMAND SIDE ACTIONS

As a drought develops, VWPL will implement demand side actions to reduce water demand across the Tidworth Inset area. VWPL will liaise closely with relevant stakeholders such as Wessex Water

and the MOD, to ensure a consistent approach across the Water Supply Zone (Tidworth Inset and Enclaves), especially with regards to Temporary Use Bans.

This section presents demand side actions at each level of a drought in more detail.

Note: Where use bans are requested, this will refer to the powers VWPL holds as a statutory undertaker. However any actions requested of the MoD would assume co-operation in good faith between client and service provider. VWPL's previous experience indicates that the Garrison Commander will co-operate fully and frequently requests water resources updates to keep abreast of developments.

5.2.1. Water saving activities (level 1)

At level 1, water saving activities represent water operations activities and water efficiency activities that VWPL will initiate and/or implement as part of its normal operation and business activities.

Lead-in times: the outcomes from Level 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.

Water operations

- 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.
- Bulk supply - monitor the Leckford Bridge export to Wessex Water *(limited only by the maximum flow defined in the Bulk Supply Agreement at this stage).*
- Planned maintenance/outage - ensure that there are no planned capital works occurring during the peak demand period that may impact on deployable output of the sources.

Water efficiency

- Internal water efficient culture – develop water awareness programmes for employees and expect them to become water efficiency ambassadors for VWPL.
- Metering – encourage metering of domestic properties using an opt-in arrangement.

  Using the water balance and known consumption values, metered customers in Tidworth use over 5% less water than unmetered customers. This shows water efficiency could slightly improve if more properties are metered. Currently more than 85% of the domestic properties within the zone are metered.
- Customer awareness – inform our client and customers of the challenge on water resources and water savings they can implement to reduce consumption using multiple communication channels.

5.2.2. Water saving activities (level 2)

At level 2, as a drought develops, VWPL will heighten its water saving activities.

Lead-in times: the level 2 actions set out below will have been rehearsed previously by VWPL and will be rolled out within one week. Communication with the MoD will commence on day one of the declaration of the level 2 status and experience shows us that any requirements for water saving will be promulgated across the Garrison within 24 hours and will be effective soon thereafter.

Water operations

- Enhanced Leakage Reduction – unlikely to yield a significant increase in savings, but important to rapidly fix bursts and visible leaks and supply pipes to maintain customer support.
- Demand monitoring - real time monitoring of telemetry data to ensure that demand within the military areas and Wessex enclaves is not excessive.
- Bulk Supply - engage with Wessex Water in line with the communication protocol set out in the LBBSA to discuss the potential need to reduce the maximum transfer on a proportional basis and implement water restrictions in their area. It is anticipated that up to 1 Ml/d may be made available to the Tidworth Service Area through this route. However, such discussions will need to consider security of supply to Wessex Water customers.
- Planned maintenance/outage - ensure that there are no planned capital works and planned maintenance outages occurring during the peak demand period that may impact on the deployable output of the sources.
- An increased level of communication with Wessex Water, Cholderton Water Company [advisory only] and the MoD, the latter through the regular Garrison Commander's meetings, will keep all key parties advised on the water resource situation and the potential requirement for formal restrictions.

Water efficiency

- Public relations campaign – customer awareness focusing on drought implications e.g. 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.

5.2.3. Temporary Use Bans (TUBs)

5.2.3.1. General

From 1st October 2010 Section 36 of the Flood & Water Management Act (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. It provides detailed definitions of uses, exemptions and conditions in relation to these new powers.

The Drought Direction 2011 sets out those water uses that will still require an ordinary drought order if they are to be restricted during a drought. These pieces of legislation supplement each other and together they set out the categories of water use that can be restricted by a company and the ones which can only be restricted under a Drought Order.

The changes introduced by this legislation 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.

The following table sets out the Temporary Use Bans (TUBs) that VWP will consider enforcing as a drought develops in level 2 towards level 3, and in level 3 towards level 4. These activities will be applicable to civilian customers in the supply area as well as SFAs (Service Family Accommodation) outside of the military sites.

Table 3 – Temporary Use Bans

Level	Civilian (including SFAs and WW 'enclaves')	MoD (all 'behind the wire' activity)
Level 2 - Developing Drought	• 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 • Filing 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 • Cleaning paths or patios using a hosepipe • Cleaning other artificial outdoor surfaces 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 Junior Ranks Single Living Accomodations (JRSLAs) and canteens • Watering plants and lawn areas • Unnecessary workshop use • Suspension of wet hydrant testing relating to flow rate.
Level 3 - Drought	• 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

5.2.3.2. 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 a notice on the website at the same time as publishing a 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 6 for further details).

While 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 Use Ban Notices - two weeks will be allowed for representations before implementation.

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

Making Representations

Before a restriction is implemented under these new provisions, VWPL 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:
    - An online form will be available for customers to complete and send back to VWPL customer services by email. The customer will also be able to print the form, fill it in manually and return it by post to the nominated VWPL office.

      The form will be developed in the early phases of our drought response.
- 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.

Note: Appropriate consideration will be given to vulnerable customers.

Although on-going communication with Wessex Water will have occurred as the prospect of restrictions approaches [see above], discussions will be held around the need for Wessex Water to impose the same restrictions to their customers within the Tidworth Wessex Enclaves, as VWPL

deems appropriate to impose on its customers. This will be done in order to allow Wessex Water to make a formal representation.

Handling Representations

Representations received will be collected and reviewed on a weekly basis. A panel of members from the Drought Management Group will convene to discuss the outcome of representations, with a final decision made by all representatives on the eligibility of the representation within five 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 VWPL (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.

Application for Concessions

VWPL will consider applications based on the grounds of health and safety and biosecurity. Customers must apply by contacting VWPL by one of the means outlined above. Details of how VWPL will handle representations received have been outlined in the section above.

VWPL 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.

MoD restrictions – Secure Areas and Service Families Accommodation [SFAs]

Also summarised in table 3 are the restrictions the MoD will be requested to put in place when specific drought triggers are reached. 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 a significant effect on the military operational work up to deployment training and will be discussed with the Garrison Commander in advance, normally through the quarterly meetings, the frequency of which may move to monthly, fortnightly or even weekly if the situation demands. Given the close liaison that VWP maintains with the military, both with the Garrison and SFA Estates, it is expected that responses to demand controls will be immediate and proportionate to the level of stress.

Table 3 Column 2, Civilians and SFAs - sets out the measures that would apply to regulated domestic household customers and, where applicable, SFA occupants. The MoD, through the Defence Infrastructure Organisation [DIO], would be required to promulgate the same advice to SFA occupants and ultimately the same restrictions through Levels 2 & 3. SFA occupants may also be subject to early restrictions to save water, instructed by DIO working in cooperation with VWPL. From the early stages of a drought, the DIO Housing Office Staff would be requested to oversee their particular estate's water demand and to encourage water use reduction through communication and engagement.

5.2.3.3. Demand Savings

The demand savings associated with imposing Temporary Use Bans can be difficult to quantify; there is little or no evidence of the savings associated with the majority of individual water use covered by the FWMA, 2010. Using the UKWIR (2011) code of practice (CoP) we can estimate that 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 0.16 Ml/d at peak DI or 0.146 Ml/d on average. This is lower than the savings suggested by the UKWIR guidance to reflect the higher proportion of metered customers in our region (83%) compared to the UK average.

Savings from the MoD's activities could be significant when taken as a whole and could be worth up to 0.2 Ml/d depending upon the prevailing 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 e.g. very little hose pipe use and no appreciable garden watering. A modest saving of 0.1 Ml/d could be anticipated from this sector.

Total demand savings due to the Temporary Use Bans (Level 2 & 3) are estimated to be 0.45 Ml/d.

Effectiveness of the restrictions will be monitored when reviewing the water demand profile on a weekly and daily basis.

5.3. SUPPLY SIDE ACTIONS

As a drought develops, VWPL will implement supply-side actions to maintain the water supply and meet the water demand across the Tidworth Inset area. It is important to note that these supply side actions would not require drought permits (hence environmental assessment) as the abstraction sites will continue to be operated within the permitted abstraction limits.

This section presents the supply side actions at each level of a drought in more detail.

5.3.1. Increase of abstraction regime

As a drought develops into Level 2, the operating thresholds of the service reservoirs which control the operation of the pumps and valves at the abstraction sites will be adjusted to a high level of demand profile. This will result in an increase of the operation of the abstraction pumps to their maximum capacity.

VWPL will gradually increase the pumping capacity of BH2, BH3 and CKP. As the drought develops towards level 2 it is expected that all three abstraction sites will be running at their

maximum capacity (but still below the abstraction limits), producing a Deployable Output of up to 8.6 mld.

5.3.2. Maximum abstraction at BH2 & Chalkpit (only)

As the level 3 trigger approaches the BH3 source will start to come under threat of outage due to groundwater levels reaching the Deepest Advisable Pumping Water Level (DAPWL), which is currently 84m AOD. In order to preserve this source if demand has not been sufficiently restricted, the source's outputs will be reduced by adjusting the variable speed pumps. This will aim to reduce the drawdown (cone of depression) of the water table around the source and prevent complete source outage. Should this measure be implemented, then the BH2 and CKP abstractions would need to be increased and run at maximum capacity to compensate for the loss of BH3 while continuing to meet demand.

VWPL envisages that in such a configuration, BH2 and CKP will still be operating within their current abstraction limits. As such, there will be no need for Drought Permitting.

Another short term operational solution would be to modify the operating pattern of the reservoirs by lowering the filing threshold level by 10% to 20% below their normal operating levels - but within a controlled level to guarantee continuous water quality compliance. Although this is not a sustainable solution it could help meet daily 'peaks' without increasing water abstraction and therefore drawdown of the water table.

The effectiveness of supply side actions will be monitored as part of continuous site monitoring.

5.3.3 Water Quality

Under drought conditions, it is likely that the groundwater level will fall below the base of the steel casing of the abstraction boreholes (when reaching level 2 for BH3 and level 3 for BH2). There is limited to no grouting present within all three abstraction boreholes and this could provide a preferential pathway for surface water ingress during periods of rainfall within drought conditions. It is likely that the surface water will contain elevated concentrations of a range of commonly occurring contaminants, including coliforms which will reduce the overall bacteriological quality.

VWPL Disinfection policy has been reviewed accordingly and will ensure that the abstracted water is adequately treated and disinfected so that it remains 'wholesome' – and compliant with Drinking Water Standards.

5.4. EXTREME DROUGHT

In case of extreme drought VWPL has considered:

- Demand side actions such as Non-Essential Use Bans in order to reduce water demand even further. These actions will be subject to an emergency drought order.
- Supply side actions such as replacing the abstraction pumps at BH2 and BH3 to increase further the abstraction capacity while continuing to operate within the permitted limit, or water tankering as a last resort.

Based on the revised vulnerability assessment carried out in August 2021, such events have a frequency lower than 1 in 200.

5.5. ENVIRONMENTAL ACTIONS

VWPL has not carried out a Strategic Environmental Assessment [SEA] in the preparation of this Plan as no Drought permit or Drought order requirements will be required. However VWPL is planning to gather data in order to assess the potential environmental impact of its abstraction activity (if any) in case drought permit/order options are required in the future.

6. COMMUNICATIONS

6.1. GENERAL

Throughout a drought, VWPL will communicate with its customers, regulators and other key stakeholders in order to raise awareness of the drought situation, promote good practice of water conservation and efficiency, and enforce water usage restrictions (when applicable).

The table below presents VWPL's key stakeholders and the different levels of engagement:

Table 4 – Key stakeholders and communications

Stakeholder	Liaison	Means
Household customers	- Communicate on importance of and opportunities for water savings & efficiencies - Consult/communicate on water usage restrictions	Communications in bills, call centre, website update, letter drop, social media, traditional media e.g. local newspapers
Non-household customers	- Communicate on importance of and opportunities for water savings & efficiencies - Consult/communicate on water usage restrictions	Through retailers - email, letter drop, website update
MOD (Garrison Commander)	- Communicate on importance of and opportunities for water savings & efficiencies - Provide situation updates - Communicate on water usage restrictions	Local radio, newspaper, calls and meetings, written communication
Regulators - Environment Agency, Defra, Ofwat	- Engage at the differents levels of a drought to share information, data - Discuss potential issues and effective mitigations in a collaborative approach	Regular meetings Written communications (email/ letter) Communication via Water UK
Local authorities, CCW, Natural England	- Provide situation updates and drought messages to be communicated to a wider audience	Written communication as required Meetings
Neighbouring companies (Wessex Water, Southern Water, Cholderton Water)	- Share data and drought management information - Promote collaborative and consistent approach across the regional area and develop joint communications - Communicate on restrictions/flow reductions	Regular meetings, workshops Written correspondence
Staff	- Provide situation updates and actions in place/required - Brief employees on customer messages	Internal briefing Team meeting Intranet

The Drought Management Group will be responsible for managing internal and external communications - including frequency, means, and content of messages and will aim to do so following the communication principles defined in the Water UK codes of practice:

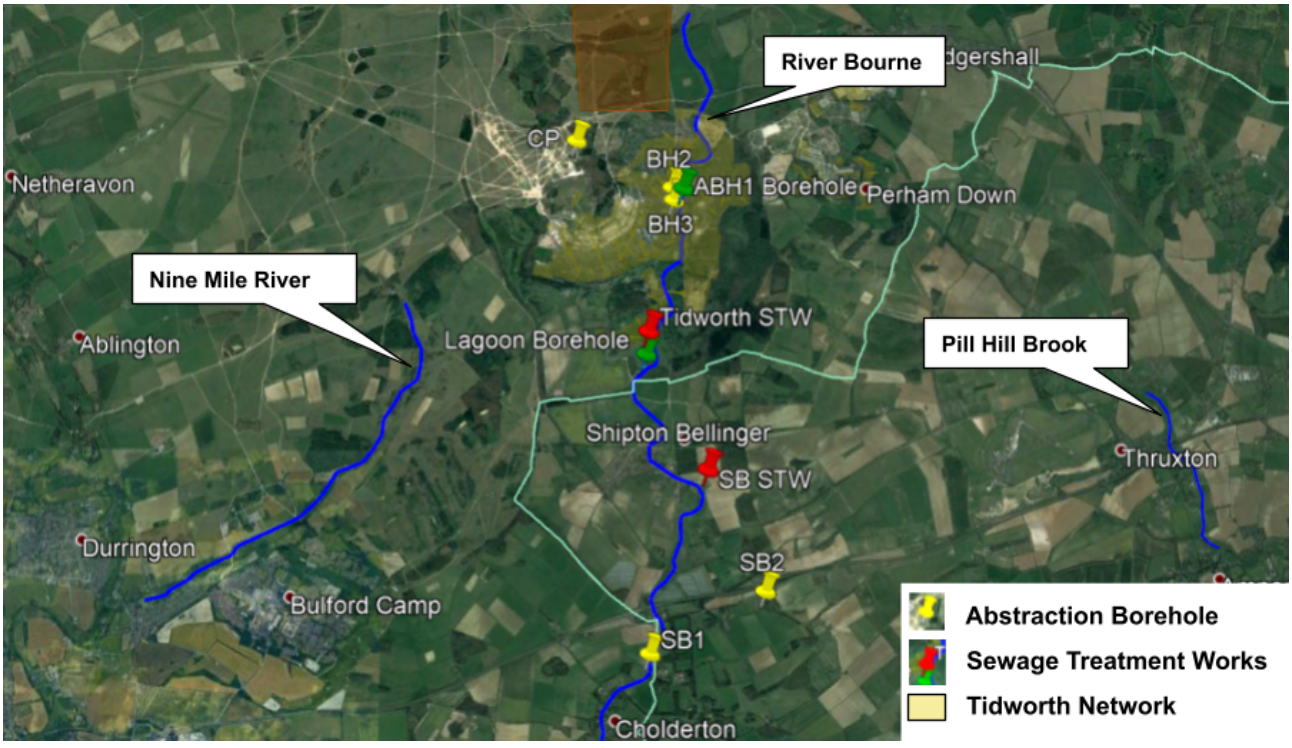
- Ensure a consistent and transparent approach
- Ensure that water use restrictions are proportionate
- Communicate clearly with customers and the wider public/users
- Consider representations in a fair way

The effectiveness of communications will be measured in the adoption of timely measures and responses in order to maintain the security of public water supplies and reduce water demand.

7. ENVIRONMENTAL ASSESSMENT

The following diagram indicates environmental areas which may potentially be impacted when operating the abstraction sites at their maximum capacity to meet the requirements of a drought situation.

Environmental impacts are covered in more detail in the sections below.



It is worth noting that all supply side options included in the Drought Management Plan are available within the operational limits of the existing abstraction licence, so the environmental impacts should be limited to those already identified within the abstraction licence (and specific Habitats Regulation Assessment (HRA) and a Strategic Environmental Assessment (SEA) should not be required).

7.1. NINE MILE RIVER & RIVER BOURNE

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) Rivers. 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 modelling was conducted. The effects of the Tidworth abstractions on the Nine Mile River 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 were to take flow from the Whiteway Rock (outcropping at Leckford Bridge), Chalk Rock (outcropping between Collingbourne Kingston and Collingbourne Ducis). The abstraction may extend the period when the river is dry, as well as the length of the 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.

Further modelling work carried out as part of the Bourne and Nine Mile Rivers RSA Project - Phase 2 Investigations in 2004, confirmed that the overall impact of Tidworth abstractions sites on the Nine Mile River and the River Bourne was small:

“The overall impact of Tidworth abstraction is small, with the total average depletion flows in the model area being approximately 0.0074 m^3/s (sum of impacts at Salisbury model outflow and Kimbridge). The average impact on the Bourne, Nine Mile, Avon (upstream of Nadder) and Test at Kimbridge is 0 m^3/d, - 0.0003 m^3/s, - 0.0024 m^3/s, - 0.005 m^3/s respectively.”

Under the Hampshire - Upper Avon AMP7 Investigation, VWPL investigated further the impact of its abstractions on the ability of the Nine Mile River to achieve the Water Framework Directive (WFD) objectives. For this, VWPL commissioned further hydrogeological modelling to assess any potential impact. The additional modelling work confirmed that when the MOD, Wessex Water and VWPL abstractions are operating at full licence, the Nine Mile River does not achieve its flow targets at all times and the drying period of its winterbourne reach increases by an average of 11 days per year (5.6%) compared to Natural.

Note: the WINEP/AMP7 report produced by VWPL is currently being reviewed by the EA and is not finalised. As such, VWPL is unable to share further details within the final drought plan.

7.2. PILLHILL BROOK

Pillhill Brook is a 9.9km long tributary of the River Anton situated to the east of Tidworth. EA groundwater modelling indicates the operation of the Tidworth abstraction sites to their maximum permitted limit could have a slight impact on the flow of this river.

Under the Hampshire - Upper Avon AMP7 Investigation, VWPL also investigated the impact of its abstractions on the Pillhill Brook to achieve the Water Framework Directive (WFD) objectives. The modelling work confirmed that when the MOD, Wessex Water and VWPL abstractions are operating at full licence, the Pillhill Brook does not achieve its flow targets at Q95 and the drying period of its winterbourne reach increases by an average of 5.5 days per year (2.6%) compared to Natural with a maximum variation of 12.9 days.

Note: the WINEP/AMP7 report produced by VWPL is currently being reviewed by the EA and is not finalised. As such, VWPL is unable to share further details within the final drought plan.

7.3. TIDWORTH NETWORK

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

As part of good operating practice a system has been put in place by VWPL to constantly review health and safety aspects during site visits. This will be extended to include environmental aspects. Environmental awareness training has already been delivered to the operational staff.

Monitoring of environmental impact will continue during drought conditions and will be escalated to the Drought Management Group whenever appropriate.

In addition to the above, under the Hampshire - Upper Avon AMP7 Investigation, VWPL also investigated the impact of water abstractions on great crested newt ponds located along the Nine Mile River. The assessment confirmed that the ponds would contain water during the newt breeding season.

VWPL also commissioned Daniel Ahern Ecology Ltd to produce ecological assessments at the Chalkpit and Tidworth abstraction sites. The sites were surveyed for invasive and/or non-native species and the surveys did not record any species of concern. To ensure the potential risk is regularly managed by Veolia, biodiversity champions have been appointed and will implement watching briefs on the sites.

The ecological assessments also provided recommendations to increase site biodiversity. This includes the revision of the ground maintenance schemes, the creation of reptile refugias and the installation of bat and bird boxes as well as further species monitoring, including bat static monitoring, breeding birds monitoring and invertebrate and reptile monitoring surveys to establish an ecological baseline for the referenced sites. Veolia has reviewed them and considered the implementation of a number of the proposed biodiversity enhancement measures.

8. END OF DROUGHT

8.1. IDENTIFYING THE END OF A DROUGHT

The end of a drought can be defined as when the risk to the security of supply and to the environment from drought are no greater than they would be during a normal year, and where normal conditions have resumed for a specified 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.

VWPL will confirm first and foremost with the EA that the water resource situation has returned to normal before taking any action.Then, the end of a drought will be determined using the company's triggers. The following stakeholders would also be notified before any actions are taken: DEFRA, Ofwat, Water UK, CCW, DWI, environmental groups, Wessex Water and Cholderton Water, VWPL Board and employees.

All restrictions can be removed when drought triggers have moved out of level 2. 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.

8.2. POST DROUGHT ACTIONS

Directly after a drought event, it will be the responsibility of the Senior Operations Manager to produce a "lessons learned" 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, as well as any additional, ongoing monitoring requirements in order understand how the environment is recovering
- A review of the timeline and the effectiveness of the drought triggers and the drought actions 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 Drought Management Group).

The Drought Management Plan and the Water Resource Management Plan will be updated based on the recommendations and improvement actions agreed through the review process.

9. DROUGHT MANAGEMENT STRUCTURE

9.1. STRUCTURE

VWPL will manage droughts through the Drought Management Group (DMG) which includes:

- General Manager
- Contract Manager
- Senior Operations Manager
- Water Operations Manager
- Water Quality Manager
- Customer Services Manager
- Regulatory Specialist

As the drought develops, the level of personnel involved, the frequency of meeting/communication, and the decision makers will evolve. This is presented in the following table

In the case of a severe drought, the incident will be escalated to the Veolia Corporate Crisis Management Team who will provide additional support and oversight of the event to ensure optimum decision-making efficiency in the shortest possible time.

Table 5 – Drought Management through the drought

Level	Drought Management Group	Communication/ Reporting	Decision maker
Level 1 - Normal	Initial DMG	Weekly update Monthly meeting	General Manager
Level 2 - Developing Drought	Initial DMG Asset Manager	Daily update Weekly meeting	General Manager in consultation with Regional Director
Level 3 - Drought	Initial DMG Asset Manager Regional Director	Daily update Daily meeting	Regional Director in consultation with VWPL board
Level 4 - Severe Drought	Initial DMG Asset Manager Regional Director CEO	Twice daily update Daily meeting	VWPL board in consultation with Crisis Management team

9.2. ROLES AND RESPONSIBILITIES

Drought management will be overseen by relevant sectors of the business as detailed below.

The General and Contract Managers will lead on technical functions and the drought communications strategy.

1. **Water Operations** - responsible for:
    - Monitoring and reporting on the state of available water resources, the operational status of water supply assets, and the prediction of likely impacts.
    - Ensuring that the company's water abstraction and production is at full capacity during months of low rainfall and high demand.
    - Implementing approved supply side actions at the relevant stage
2. **Network Operatives** - responsible for:
    - Monitoring and reporting on leakage, water demand and Leckford Bridge export, the prediction of likely impacts.
    - Ensuring that the network is operating at its most efficient when demand is highest.
    - Implementing or facilitating the implementation of the demand side actions related to water savings activities - water operation (level 1 and level 2)
3. **Customer Services** - responsible for:
    - Sharing relevant customer information (e.g. vulnerable, retail customers)
    - Producing and circulating the necessary communication materials through the agreed communications channels.
    - Responding to customers' queries regarding the drought and restrictions, and reporting on it to the DMG.
4. **Stakeholder Management** - responsible for:
    - Liaising and communicating with key stakeholders at the relevant stage (EA, DWI, MOD, Wessex Water, Cholderton Water, local authorities/organisations etc.)
    - Reporting to the VWPL Board

Responsibilities for specific actions are detailed in the below table

Table 5 Key Actions for Drought Management Plan responsibility table

Action	Delegation	Timescale
Drought monitoring, reporting/recording	Senior Operations Manager	Monthly/Weekly Enhanced during drought
Review Drought Management Plan	Contract Manager	Annually
Drought Triggers Breached	General Manager	Upon Level 1 breach
Convene Drought Management Group and internal communication	Contract Manager/ General Manager	Monthly/Weekly/Daily Enhanced during drought
Communication to VWPL Board	Regional Director - IWE South	Upon Level 2 breach
EA Liaison	Contract Manager/ General Manager	Under direction of DMG Upon Level 3 breach
MoD Liaison	Contract Manager/ General Manager	Upon Level 2 breach
OFWAT Liaison	Contract Manager/ General Manager	Under direction of DMG
DWI Liaison	General Manager	Under direction of DMG
Neighbouring Water Companies (Wessex Water/Cholderton Water)	Contract Manager/ General Manager	Upon Level 2 breach

Capex Programme identified	Asset Manager	Under direction of DMG
Opex monitoring system	Senior Operations Manager	Cost Centre set up
Capex Delivery	Project Management team	Under direction of DMG
Water quality monitoring & compliance	Water Quality Manager	on-going
Drought Order or Restriction removal	Regional Director - IWE South	Once drought triggers are back to Level 1
Promoting efficient use of water	Contract Manager/ General Manager	Upon Level 1 breach
Appeals for reduction of water usage	Contract Manager/ General Manager	Upon Level 2 breach
Stand down of DMG	Regional Director - IWE South	Return to 'normal' hydrological conditions
Emergency Planning	Regional Director - IWE South	Under direction of DMG and VWP Board

10. APPENDICES

APPENDIX 1 - 2017 HISTORICAL DROUGHT

There was an apparent high demand situation that occurred from 1st June to 19th June 2017 which corresponded with record breaking high temperatures. Clarendon reservoir level reduced as demand exceeded available supply. However, customer demand was continuously met during the event and VWPL did not have to implement the Drought Management Plan. Nevertheless, lessons were learned from this event which 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 was being carried out at Chalkpit WTW to improve the treatment facilities which impacted on the reliability of the output of the plant. That was resolved once the permanent upgraded treatment process was fully operational. Project work will not occur during periods of predicted high demand.
- Wessex Water took more water from the Leckford Bridge 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 on the network 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 at water treatment facilities, increased Leckford Bridge export and significant non-legitimate demand occurring within the military facility.

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

Analysis indicates that VWP is resilient against four consecutive dry years and such an event has not been observed in the last 100 years of rainfall historical data and is not predicted in climate change modelling up to 2091. This will be reviewed as part of WRMP 2024.

APPENDIX 2 - VULNERABILITY ASSESSMENT (2022 REVISION)

1. Background

1.1. General

Drought conditions have the potential to negatively impact on public potable water supply, groundwater regimes and the wider environment. Water companies therefore have a legal obligation to provide a secure supply of water and protect the environment during dry weather and droughts. This should be documented and reported to stakeholders in a Drought Plan.

Veolia Water Projects Ltd (VWPL) published its draft drought plan for public consultation on 10th June after receiving authorisation from DEFRA.

VWPL directly received two written representations: one from the Environment Agency and one from Natural England. No further representations were forwarded from Defra.

The Environment Agency (EA) stated that VWPL had not presented enough evidence within its draft plan to demonstrate compliance with all Directions and requested VWPL to provide more evidence to show how it complies with the following:

- (c) how the sequencing of measures has been designed to limit impacts on customers and the environment;
- (d) the magnitude and duration of the drought scenarios against which the drought plan has been tested to provide security of supply; and
- (g) the measures that will be used to monitor, prevent and mitigate any adverse effect on the environment resulting from the implementation of drought management measures.

VWPL engaged with the EA to confirm and agree the scope of the additional groundwater modeling work required to provide confidence that VWPL's plan will work effectively during a drought. VWPL's reply to the consultation was published in the 2021 VWPL Drought Plan Consultation - Statement of Response on September 23rd, 2021.

Finally, within a letter dated 11 February 2022, DEFRA stated that they were unable to recommend to the Secretary of State that the VWPL plan be published as material information was missing. In order to close out the concerns raised by DEFRA, VWPL needed to address the following:

- Complete your groundwater modelling and review and confirm drought triggers and supply actions
- Assess the materiality of the changes you're making to your drought plan and the need to re-consult on the plan
- Determine if VWPL should conduct a Habitats Regulation Assessment (HRA) and a Strategic Environmental Assessment (SEA) if additional drought options are needed.

This technical note presents:

- A review of the specifications of the abstraction boreholes.
- A review of groundwater levels at the three VWPL operated abstraction sources in different drought scenarios using the Wessex basin groundwater model produced by John Woods Plc. in order to confirm the drought triggers and actions of VWPL Drought Management Plan.

1.2. Hydrogeological Background

The published hydrogeological maps for the region, Sheet 9: Hydrogeological Map of Hampshire and the Isle of Wight (1:100,000)-1979 show groundwater contours sloping south/south east towards the Hampshire Basin as illustrated on Figure 1. When the VWPL operated abstraction boreholes are transposed onto this hydrogeological map, it is noted that the Chalkpit abstraction borehole is located up-hydraulic gradient along the contour line +93, while abstraction BH2 and BH3 are located down-hydraulic gradient along contour lines +86 and +85 respectively. Abstraction borehole BH3 is located furthest south.

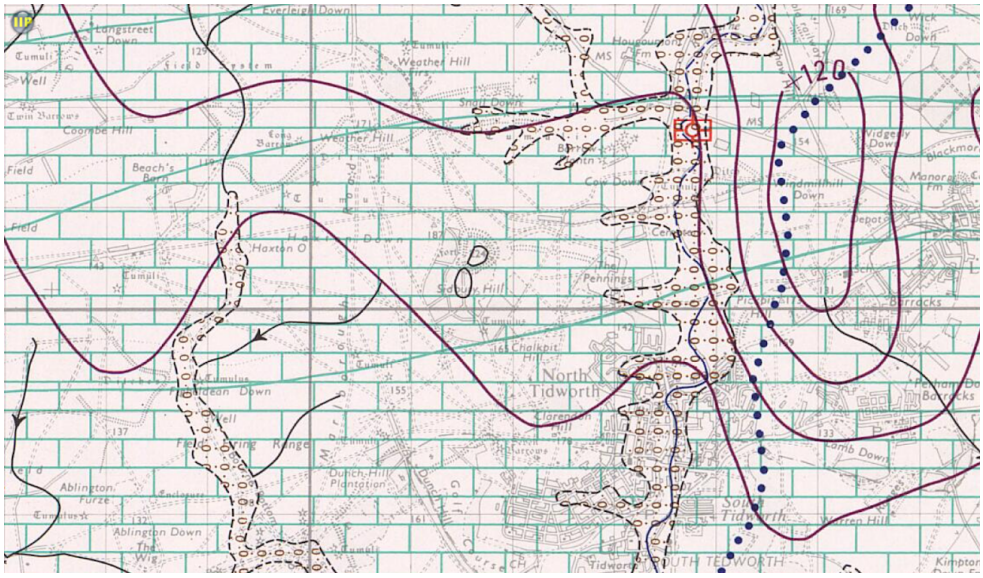


Figure 1- British Geological Society Sheet 9: Hydrogeological Map of Hampshire and the Isle of Wight (1:100,000)-1979

2. Borehole Specifications

2.1. European Geophysical Services Report - Chalkpit

VWPL commissioned European Geophysical Services in February 2020 to survey the condition of the Chalkpit abstraction borehole.

Chalkpit abstraction borehole site consists of a singular borehole well to an approximate depth of 66.5 metres below ground level (mbgl) and has a diameter of 457 millimetres (mm). The borehole has two pumps, one of which is located within the south-west quadrant to a depth of 64.3 mbgl; the second pump is located within the north-east quadrant to the well to a depth of 66 mbgl.

The survey reported that the well was lined with a brick lining between the depths of 3.1 to 19.35 mbgl. The brick lining was noted to be in good condition. The remainder of the borehole well was open-holed.

The deepest available pumping levels of chalkpit abstraction borehole is 77m AOD.

2.2. Groundwater Surveys Undertaken by the British Geological Society

VWPL commissioned the British Geological Society (BGS) in 2015 to undertake an assessment on the groundwater sources in the vicinity of the Tidworth abstraction boreholes and to provide a demand overview for the supply area.

The geophysical logging of the North Tidworth observation borehole was undertaken as part of the BGS survey. It identified that the principal horizon of groundwater flow for the wider Tidworth region is a lense of chalk rock and flint known as the Whitway Rock. The Whitway Rock is located between 26 and 30 mbgl within the observation borehole and is dipping towards the south. When the cross section of the observation borehole is extended to VWPL-operated BH2 and BH3, the Whitway Rock would be intercepted at approximately 75 to 80m AOD. It is therefore likely to assume that under the current VWPL abstraction regime, the groundwater flow to the borehole wells is derived from the Whitway Rock.

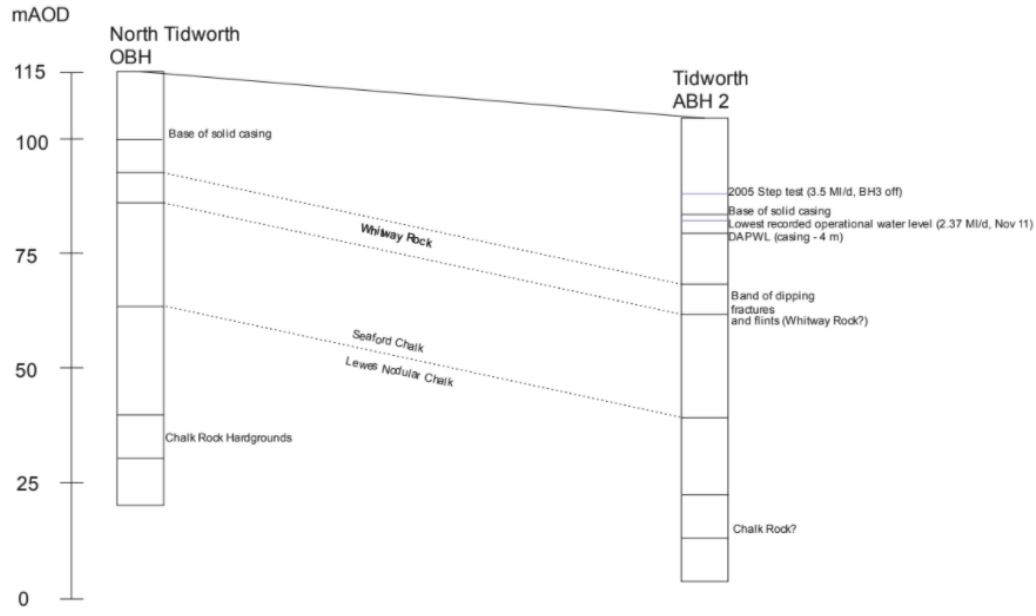


Figure 2- Geological cross section from the North Tidworth OBH to VWPL's BH2. Extrapolated from British Geological Survey (2000).

2.2.1 Abstraction Borehole BH2

The abstraction borehole BH2 site consists of a singular borehole well to an approximate depth of 107.2 mbgl and has a diameter of 457mm. There has been some uncertainty regarding the borehole datum, however, it is understood to be approximately 109.9 metres above ordnance datum (m AOD) and the well height is approximately 107.704m AOD.

The borehole well is steel cased to approximately 26 mbgl into competent chalk bedrock. The remainder of the borehole is open-holed.

The deepest available pumping levels of abstraction borehole BH2 is 31 mbgl or 78m AOD.

CCTV logs produced as part of the BGS assessment suggest the chalk bedrock within abstraction BH2 is well fissured. Immediately below the base of the steel casing at 26 mbgl, a large aperture within the chalk is present. In addition a number of large fissures and fractures are recorded between the depths of 31.4 mbgl and 47 mbgl. Based upon these observations, BGS stated that it

was likely the pumping regime of abstraction BH2 draws a large proportion of its water source from these water-bearing horizons.

2.2.2 Abstraction Borehole BH3

The abstraction borehole BH3 site consists of a singular borehole well to an approximate depth of 100.9 mbgl and has a diameter of 457mm. There has been some uncertainty regarding the borehole datum, however, it is understood to be approximately 110.0m AOD and the well height is approximately 108.4m AOD.

The borehole well is steel-cased to approximately 23.6 mbgl into competent chalk bedrock. The remainder of the borehole is open-holed.

The deepest available pumping level of abstraction borehole BH3 is 23.6 mbgl or 84m AOD.

BGS were unable to produce a CCTV log for abstraction BH3, however, they concluded that it would be likely that the borehole well shares similarities with abstraction BH2.

3. Hydrogeological Modelling Produced by John Woods Plc

The 2021 draft Drought Management Plan stated that when drought conditions approach Level 3 triggers, the Chalkpit source would start to come under threat of outage due to groundwater levels reaching the Deepest Available Pumping Water Level (DAPWL). The plan described that should this scenario occur, then BH2 and BH3 abstractions would need to be increased and run at maximum capacity to compensate for the loss of Chalkpit while continuing to meet demand.

In order to verify this model, VWPL commissioned John Woods Plc in August 2021 to undertake hydrogeological modelling to confirm the vulnerability of the Tidworth and Chalkpit groundwater regimes using the Wessex Basin groundwater model and drought scenarios created by Wessex Water and John Woods Plc.

There is an observation borehole (OBH1) that is monitored by VWPL to determine the levels of the groundwater at abstraction boreholes 2, 3 and Chalkpit. This data is available from 1968 when the local Tidworth supply network was created. However, BGS operates an observation borehole at Clanville Lodge Gate, which has been monitored since 1963.

John Woods Plc calibrated the groundwater data recovered from the Clanville Lodge Gate observation borehole with the data obtained by VWPL in OBH1. The groundwater data from the observation borehole was adjusted by 11.48m AOD to align with the Tidworth supply network. This therefore enabled John Woods Plc to expand the modelling for Tidworth sources vulnerability assessment.

Note: this was confirmed by the EA as a suitable modelling method for establishing the vulnerability of the Tidworth supply source.

The historical data from the wider Wessex basin displayed drought conditions in 1920, which represents a 1 in 100 year event and 1976, which represents a 1 in 200 year event, which have potential to significantly impact on VWPL's operations within the Tidworth supply network.

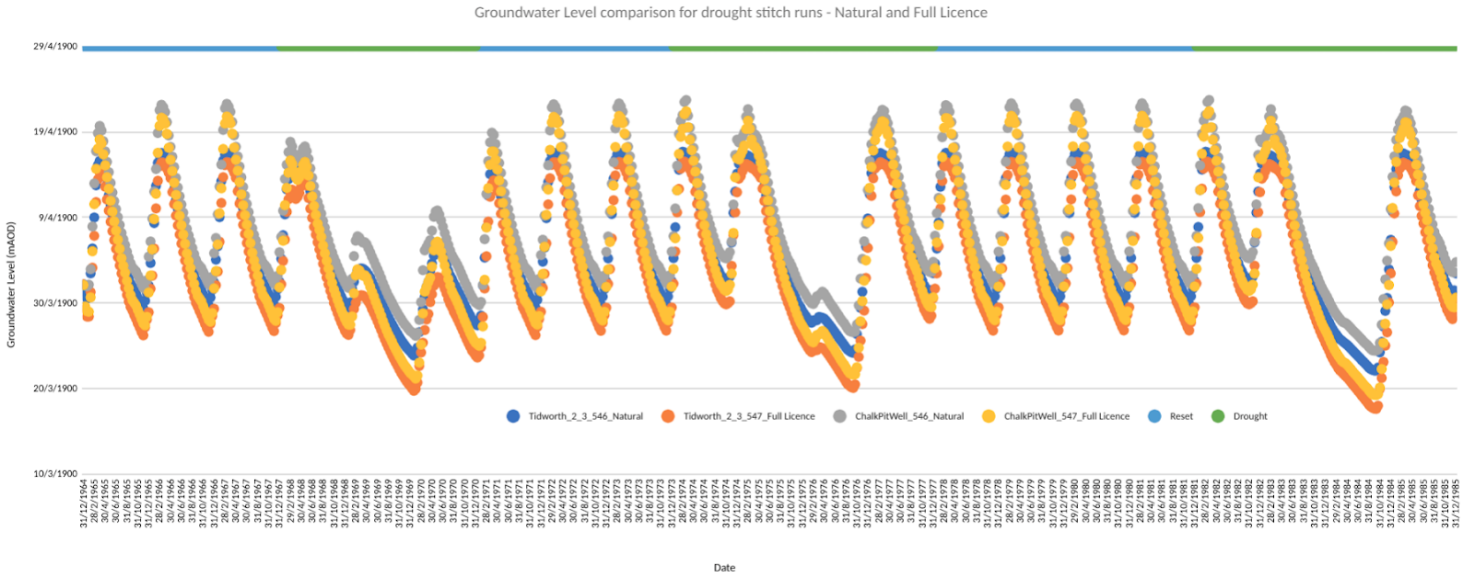
In order to align the drought modelling with the existing data set obtained from the Clanville Lodge Gate observation borehole and to have intervening reset years with correctly aligned leap years, the set-up shown on Figure 3 was used by John Woods Plc.

Figure 3- The set-up used by John Woods Plc within the vulnerability assessment.

Existing Model Year	Year Modelled	Comment
1965	1995	Average year warmup/reset
1966	1995	Average year warmup/reset
1967	1995	Average year warmup/reset
1968	1920	Drought Episode 1_1920 (check matching month vs leap)
1969	1921	Drought Episode 1_1921
1970	1922	Drought Episode 1_1922
1971	1995	Average year warmup/reset
1972	1995	Average year warmup/reset (29th Feb = 28th Feb)
1973	1995	Average year warmup/reset
1974	1974	Drought Episode 2_1974
1975	1975	Drought Episode 2_1975
1976	1976	Drought Episode 2_1976
1977	1977	Drought Episode 2_1977
1978	1995	Average year warmup/reset
1979	1995	Average year warmup/reset
1980	1995	Average year warmup/reset (29th Feb = 28th Feb)
1981	1995	Average year warmup/reset
1982	1974_1_500	Drought Episode 3_1974_1 in 500
1983	1975_1_500	Drought Episode 3_1975_1 in 500
1984	1976_1_500	Drought Episode 3_1976_1 in 500
1985	1977_1_500	Drought Episode 3_1977_1 in 500

The modelling analysis (figure 4) indicates that groundwater sources only start to show signs of strain when there have been two or more consecutive dry years. At that point the measured groundwater level dropped below the base of the steel casing within the VWPL-operated abstraction boreholes to 77m AOD (recorded in September 1984).

Figure 4 - the model runs for the VWPL operated abstraction boreholes (Chalkpit, BH2 and BH3) produced by John Woods Plc.



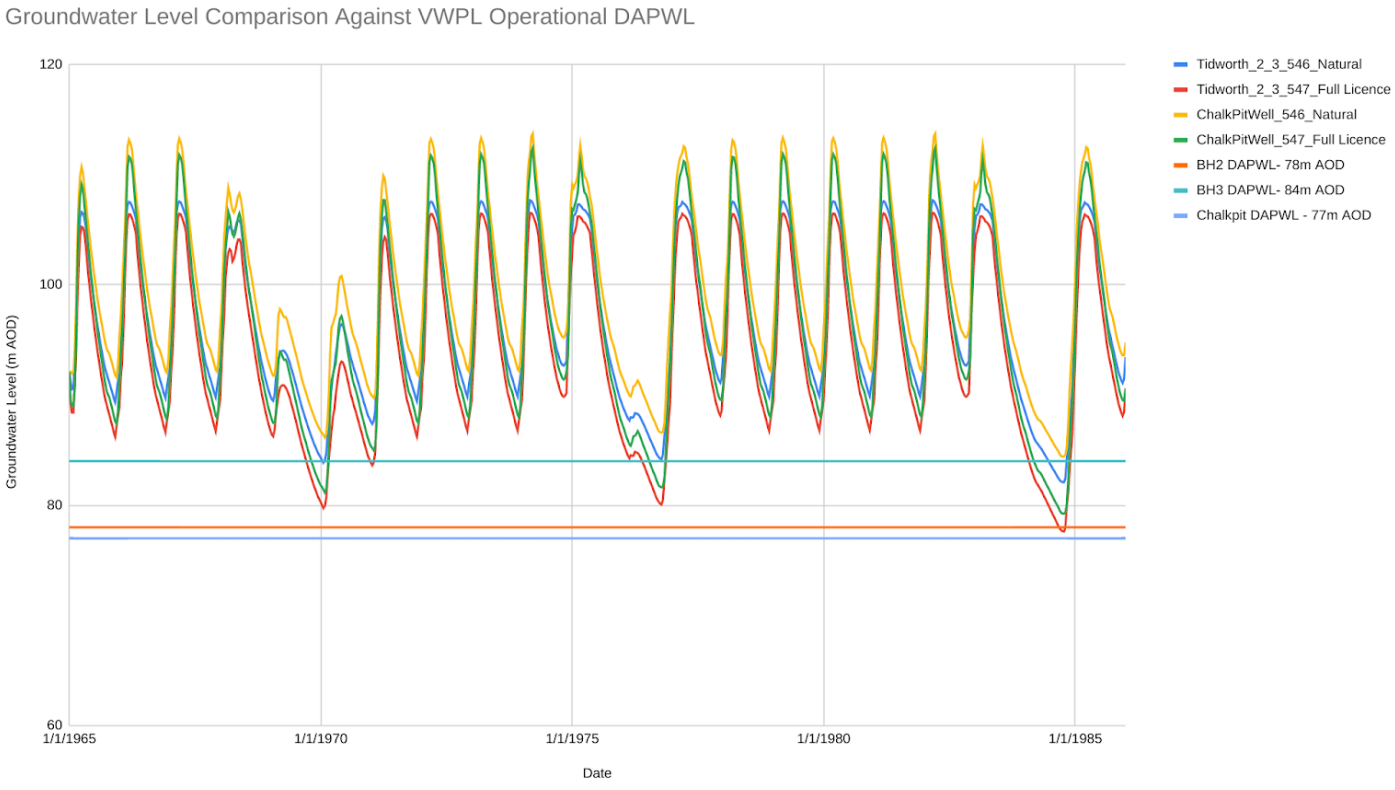
When the vulnerability model is transposed into daily operations of VWPL and the DAWPL of the active abstraction boreholes are applied, the modelling suggests that VWPL supply is resilient

throughout the 1920 (representing a 1 in 100 event) and 1950 (representing a 1 in 200 event) drought conditions. This is due to the groundwater levels within both chalk aquifers not falling below the respective DAWPLs of the Chalkpit abstraction well and abstraction borehole BH2, as shown in figure 5.

However, the vulnerability model suggests that the abstraction borehole BH3 water source is likely to be made redundant in the 1920 (representing a 1 in 100 event) and 1950 (representing a 1 in 200 event) drought conditions as the groundwater level falls below the active DAWPL of 84m AOD.

Note: in the event that the groundwater levels drop below the steel casing of the abstraction boreholes, water quality of the abstracted water may vary so the water quality team will need to monitor the recorded levels of commonly occurring contaminants, including but not limited to coliforms in accordance with VWPL Disinfection Policy (2016).

Figure 5 - VWPL produced diagram comparing the measured groundwater levels against the operational DAWPL.



Note: a 1 in 500 year drought event was modelled within the vulnerability assessment. This was carried out by extrapolating data from 1972 drought conditions (1 in 200). VWPL has undertaken a limited review of the data generated from this but the model suggests that the water source present within the chalk aquifer underlying abstraction boreholes BH2 and BH3 will come under strain as the groundwater levels fall below the respective DAPWL for both boreholes in such drought conditions. Based upon this initial assessment it is likely that VWPL will need to review its drought management strategy to meet the requirements of the 2024 Water Resource Management Plan guidelines.

4. Environmental Considerations

Under its Drought Plan VWPL will continue to operate within the permitted limits of its EA abstraction licence, so an environmental assessment (such as SEA/HRA) is not required. However VWPL recognises that the current Environment Agency abstraction licence (SW/043/0024/006) prefers VWPL to abstract supply water from abstraction boreholes BH2 and BH3 over the Chalkpit abstraction due to regulatory concern over the pumping regime negatively impacting the wider surrounding environment.

Recent modelling carried out by John Woods Plc on behalf of VWPL in the framework of the Hampshire - Upper Avon AMP7 Investigation established that the impact on the adjoining water bodies (Pillhill Brook and Nine Mile River) was within one order of magnitude greater of the impact generated from abstraction boreholes BH2 and BH3. VWPL does not consider that the use of the Chalkpit abstraction borehole within the agreed remit of the abstraction licence will have a greater impact on the wider environment than the usage of abstraction boreholes BH2 and BH3 within a 1 in 200 year drought event.

In addition to the above, under the Hampshire - Upper Avon AMP7 Investigation, VWPL also investigated the impact of the water abstractions on great crested newt ponds located along the Nine Mile River. The assessment confirmed that the ponds would contain water during the newt breeding season, so it was assumed that abstraction would have a negligible impact on great crested newts.

Note: The WINEP/AMP7 report produced by VWPL is currently being reviewed by the EA and is not finalised. As such, VWPL is unable to share further details within the final drought plan.

5. Conclusions

The additional modelling carried out by John Woods Plc in August 2021 highlighted that within both a 1 in 100 year and 1 in 200 year drought event, the groundwater level falls below the active DAWPL of BH3 (i.e. the abstraction borehole BH3 is likely to be made redundant) but remains above the active DAWPL of BH2 and Chalkpit.

Hence the assumptions made on the resilience of Tidworth sources in the 2021 VWPL draft Drought Management Plan were partially incorrect. The water source likely to be made redundant in a Level 3 drought is Borehole 3 (and not Chalkpit). However, VWPL would continue to have resilience within daily operations as the water sources within the Chalkpit abstraction borehole and abstraction borehole BH2 would remain consistently above the respective DAWPLs.

In such drought conditions, VWPL will still continue to operate inside the agreed remit of the abstraction licence (SW/043/0024/006). As such, VWPL will not be required to obtain a drought permit or undertake an environmental assessment (such as SEA/HRA).

In the event that groundwater levels drop below the steel casing of the abstraction boreholes, water quality of the abstracted water may vary so the water quality team will need to monitor the recorded levels of commonly occurring contaminants, including but not limited to coliforms in accordance with VWPL Disinfection Policy (2016).

6. References

1. British Geological Society, Groundwater Sources and Demand Review at Veolia Water Project Tidworth (report reference CR/15/087) dated 2015.

2. European Geophysical Services, Report on the Video Survey of the Chalkpit Well at the Chalkpit Pumping Station, North Tidworth (report reference SU24) dated March 2020.

3. John Woods Plc, Tidworth Drought Vulnerability powerpoint dated 13th August 2021.

4. Veolia water Projects Ltd Treatment and Disinfection Policy (report reference SSO 003) dated June 2016.