Portsmouth Water Drought Plan

Drought Triggers Technical Note

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16 March 2026

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1 Groundwater Trigger

1.1 Background

Groundwater from boreholes and natural springs contribute approximately 90% of Portsmouth Water's supply network. There are 18 groundwater sources actively used for public water supply across the supply area. In addition there is a surface water source on the River Itchen at Source A, which lies outside of the company boundary. Table 1.1 shows the breakdown of the Portsmouth Water supply sources. The strategic resource zone map for the area is given in Figure 1.1.

Table 1.1: Portsmouth Water supply sources

Source	Supply contribution (%)
Boreholes and wells	60
Natural springs	30
River Itchen abstraction	10

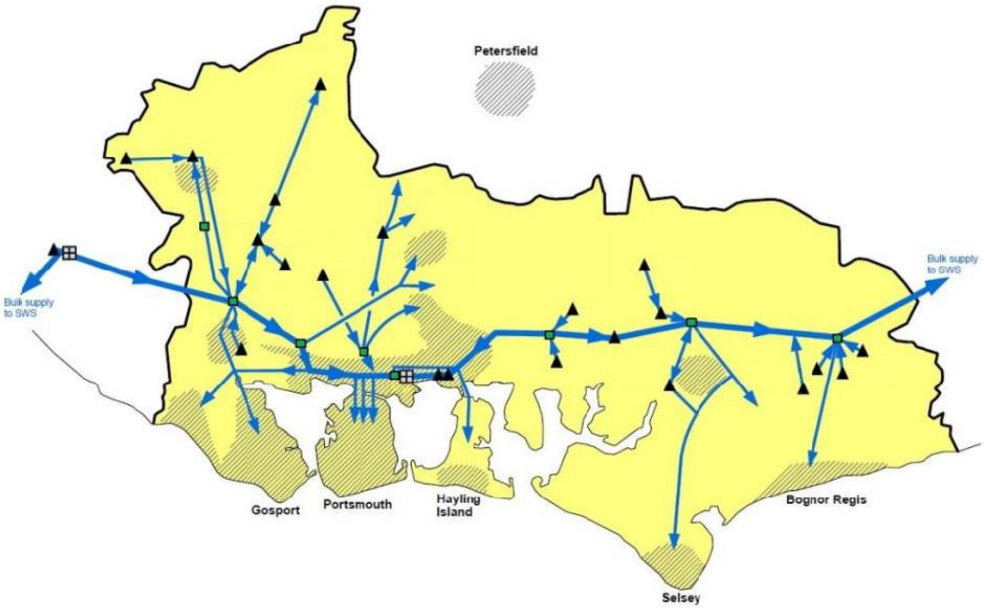

Figure 1.1: Strategic Resource Zone map

1.2 Data

1.2.1 Monitoring

Portsmouth Water use Well 'X' as an observation borehole to monitor the groundwater level situation. This has been monitored for over eighty years providing a good record of data. Well 'X' is largely unaffected by abstraction so water levels at the site represent the regional water resources situation. Well 'X' is located in the White Chalk subgroup geology.

Portsmouth Water provided HR Wallingford with Well ‘X’ groundwater levels. The records, provided by Portsmouth Water’s PowerBi dashboard to monitor and forecast groundwater levels, have been compared to identify the most suitable observations to use for further analysis. The record shown in Figure 1.2. was chosen as the most suitable record due to the length of record.

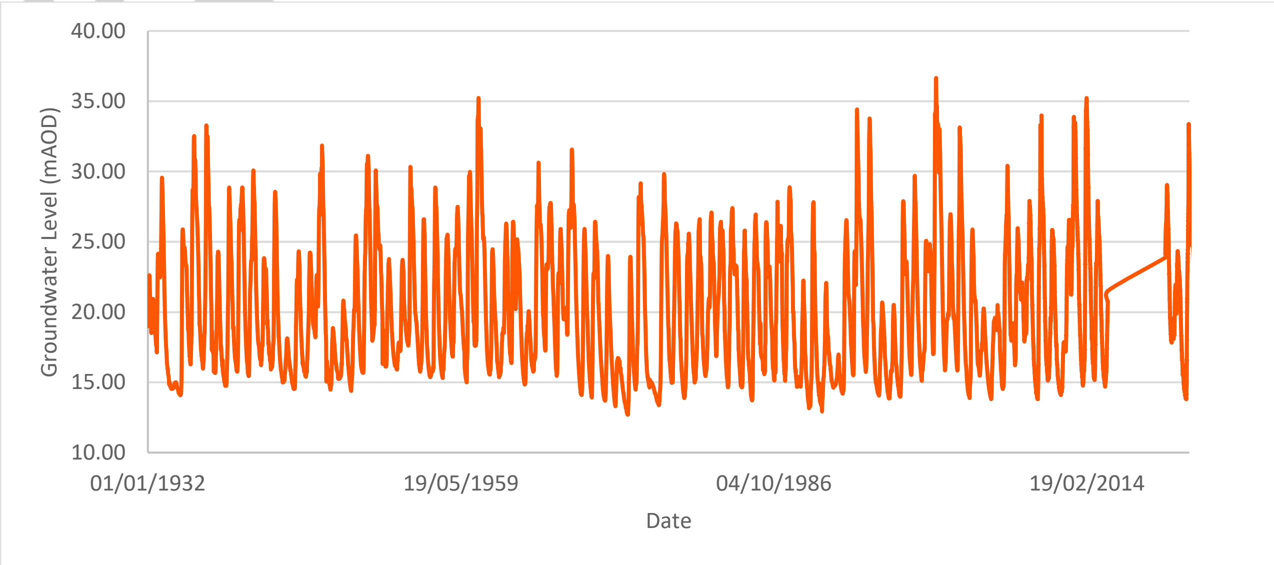

Figure 1.2: Well ‘X’ groundwater levels (1932 – 2024)

Well ‘X’ is an appropriate borehole to use to understand the chalk aquifer, because it is situated in the chalk and has a long historic record, however additional groundwater monitoring could be used to support the data at Well ‘X’, for instance during a drought more information on local conditions may be helpful in understanding drought impacts on groundwater yields. We have therefore reviewed additional monitoring locations based on data provided by CEH and the Environment Agency.

Possible river flows and groundwater sites that could be used by Portsmouth Water are shown below from the CEH website (Figure 1.3).

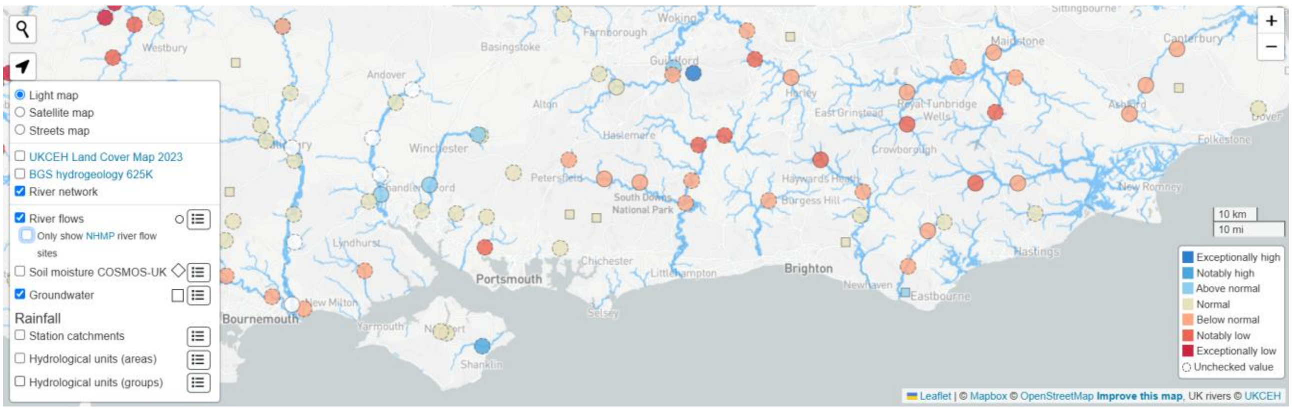

Figure 1.3: River and groundwater monitoring sites

Source: *CEH website*

A number of river flows and groundwater monitoring points are also shown in the Environment Agency Data Hydrology Explorer. A number of monitoring stations have been investigated as possible supporting data sources for the monitoring at Well ‘X’. These boreholes either have a long record, and/or are in other parts of the region, where Well ‘X’ may not be representative of local hydrological conditions.

There are 4 Environment Agency monitoring stations within 3 km of Well 'X' which will contribute to a greater understanding into the reaction of groundwaters across the zone. The names and locations of these sites have been removed from this public version of the report for security reasons.

The data from these stations and the groundwater data provided by Portsmouth Water have been reviewed together to identify trends between the sites (Figure 1.4).

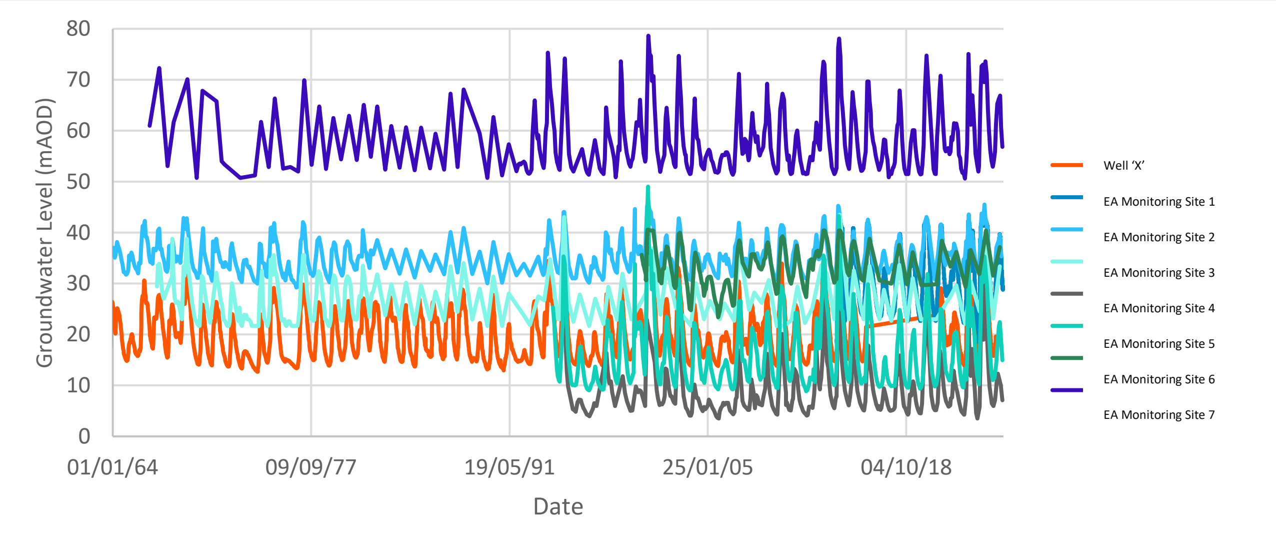

Figure 1.4: Well 'X' groundwater levels compared with nearby EA Data Hydrology Explorer monitoring stations

Further analysis was completed to standardise the groundwater level measurements to allow trends to be extracted from proxy monitoring sites. This was completed by dividing the observation values by the average for that monitoring record. The standardised groundwater levels are shown in Figure 1.5. The series for Environment Agency Monitoring Site 1 and Well 'X' groundwater levels show a close relationship, especially for the low flow conditions.

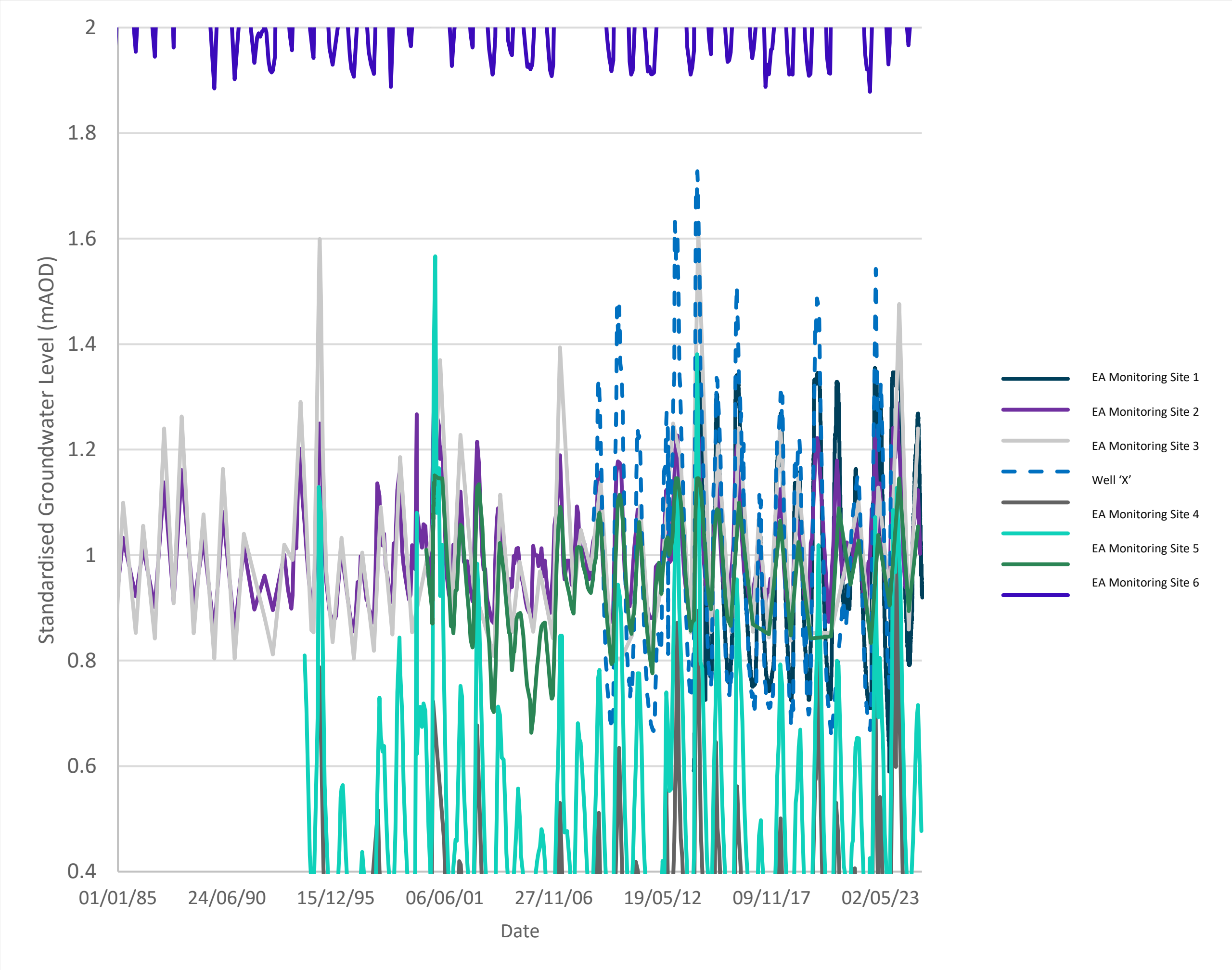

Figure 1.5: Standardised groundwater levels compared for Well 'X' and neighbouring stations

Our recommendation is that Portsmouth Water should use more groundwater sources than only Well 'X' to monitor groundwater levels during a drought. When Well 'X' is just about to reach the Level 1 trigger level, Portsmouth Water should begin monitoring groundwater levels at other sources. These should be monitored every day. This will provide assurance on how the local hydrogeological conditions across the supply area are affecting different source yields.

We do not suggest stochastic analysis is undertaken on these additional sites, but we do suggest that in the event of a drought, data from these boreholes is reviewed to determine any local trends which may impact on local groundwater yields.

1.3 Stochastic Analysis

As part of the groundwater trigger review, the current triggers used in the previous Drought Plan 2022 (based on levels at Well 'X') have been reviewed against the latest WRSE stochastics and historical data. The WRSE stochastics rainfall and PET sequences were used to generate groundwater levels for different return periods based on Portsmouth Water's Level of Service. These return periods within the WRMP24 have recently been validated in Portsmouth Water's PyWR model. The return periods are appropriate for triggering drought actions (TUBs and NEUBs etc).

The current Level of Service are:

- 1 in 20 years for Temporary Use Bans, representing an annual risk of 5%
- 1 in 80 years for Non-Essential Use Bans, representing an annual risk of 1.25%
- 1 in 200 years for Emergency Drought Orders, representing an annual risk of 0.5%

Stochastic data was used for WRMP24, however there is uncertainty in its use, particularly around the heavy influence of the 1976 drought. WRSE are exploring new stochastic datasets to use for sensitivity testing. Once the testing has been completed, this will provide Portsmouth Water with more certainty in the data and the triggers will be reviewed annually and updated, as necessary. The current trigger levels are therefore appropriate for Portsmouth Water at this point in time.

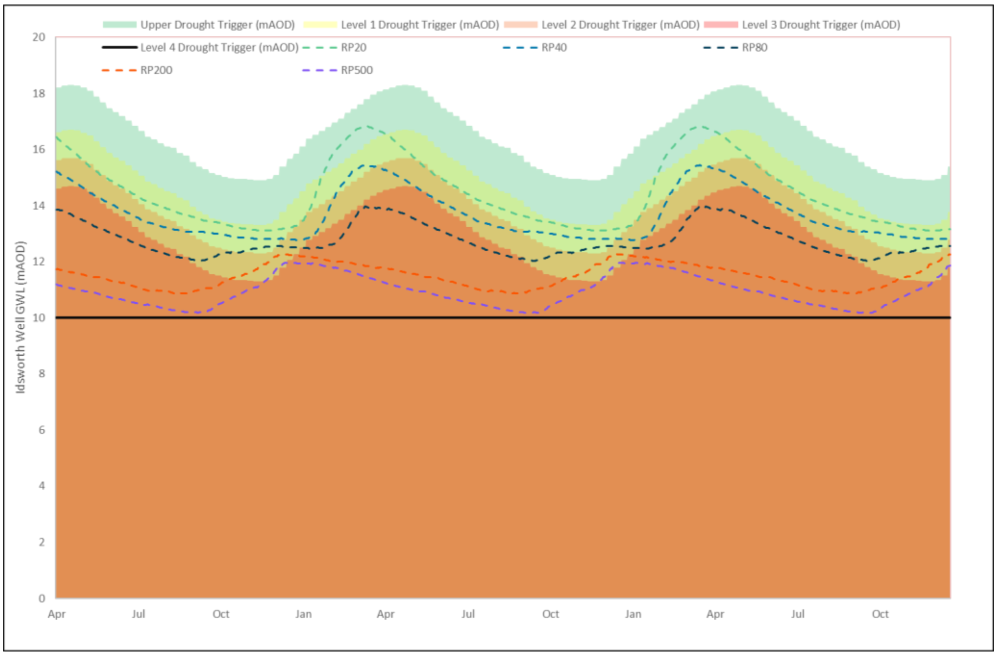

Figure 1.6: Drought trigger curves with WRSE stochastics

Table 1.2 and Table 1.3 show that applying the stochastic RP20 trigger would materially increase the frequency of TUBs, introducing additional trigger years in 1989, 1990 and 1991 that are not captured by the current Level 2 trigger.

Table 1.2: Years with weeks below stochastic trigger through the period 1932 to 2024 (RP20)

Year	Minimum groundwater level (mAOD)	Trigger level (mAOD)	Time of year
1934	14.54	15.02	February
1973	12.70	13.12	December
1974	12.70	13.17	January
1976	13.37	13.66	September
1989	13.15	13.33	November
1990	12.92	13.14	December
1991	15.45	15.52	February
1992	14.77	15.52	February

Table 1.3: Years with weeks below current Level 2 trigger through the period of 1932 to 2024

Year	Minimum groundwater level (mAOD)	Trigger level (mAOD)	Time of year
1934	14.60	16.41	March
1973	15.22	15.21	June
1974	12.70	13.17	January
1976	13.41	13.81	September
1992	15.26	16.75	April

For this drought plan, HR Wallingford recommends not updating the groundwater trigger with the latest stochastic data. The rationale for this is:

- Across the period of the current and stochastic record, the former maintains a Level of Service as agreed by Portsmouth Water's customers of 1 in 20 (5% risk). This stochastic record exceeds this by 1 in 12.5 (8% risk). This is demonstrated in Table 1.2 and Table 1.3 with 8 breaches across the period of the record in the former and 5 breaches in the latter. By adopting the stochastic trigger Portsmouth Water would be exceeding their Level of Service.
- As shown in Figure 1.6 the current Level 2 drought trigger is broadly consistent with the stochastic RP20 drought trigger from April to August during the onset of a drought. This is when TUBs is likely to be implemented. The stochastic RP20 trigger gradient is shallower as the drought persists in the autumn and winter months and peakier during the drought recovery. As a result, if the stochastic RP20 trigger were to be adopted, this would result in TUBs being implemented slightly sooner and removed quicker than the current Level 2 trigger. Level 4 is also broadly consistent with RP200 during this period while Level 3 looks too high against RP80.
- The shallower nature of the stochastic RP20 drought trigger in the autumn and winter period is a result of a heavy influence of the 1976 drought and the 48-year replicates of stochastic data may also misrepresent the likelihood and severity of multi-year droughts, something important for Portsmouth Water. As a result the level of confidence in the stochastic RP20 drought trigger is quite low and level of uncertainty quite high.
- Table 1.2 and Table 1.3 show that stochastic trigger breaches occur during winter months (November – February), when groundwater recharge is underway and customer demand is low, reducing the operational benefit of restrictions. This indicates that the stochastic data would have generated drought interventions in historically non-drought conditions, suggesting that updating the triggers in this way would lead to overly conservative outcomes and an increased risk of unnecessary restrictions.
- Using the WRMP24 critical period DI of 223 Ml/d and an assumed TUB saving of 7.2%, the implementation of TUBs would reduce demand by approximately 16 Ml/d if introduced 6 weeks earlier under the stochastic RP20 trigger level, this equates to an additional saving of approximately 672 Ml. Table 1.4 shows that apportioning this across key production sites shows relatively small benefits. When considered alongside modelling uncertainty and implementation impacts, this highlights that using the stochastic RP20 trigger level would provide limited operational benefit to Portsmouth Water's supply system.

Table 1.4: Key production sites and TUBs saving benefit

	TUBs saving benefit
Source A 1 in 20 ADO	3%
Source B 1 in 20 ADO	4%
Source C 1 in 20 ADO	1%

With the current triggers in place, this therefore means Portsmouth Water initiates enhanced leakage reduction, pressure management and enhanced comms at Level 1 of the drought. Demand restrictions (Temporary Use Bans) are initiated at Level 2 and has been set one metre below the Level 1 trigger. The trigger to initiate Non-Essential Use Bans and Portsmouth Water's Drought Permit (Level 3) is set two metres below the Level 1 trigger. An upper trigger has been set 1.6m above Level 1. This trigger represents the end of the drought when there is groundwater recovery. The annual groundwater profile is shown in Figure 1.7.

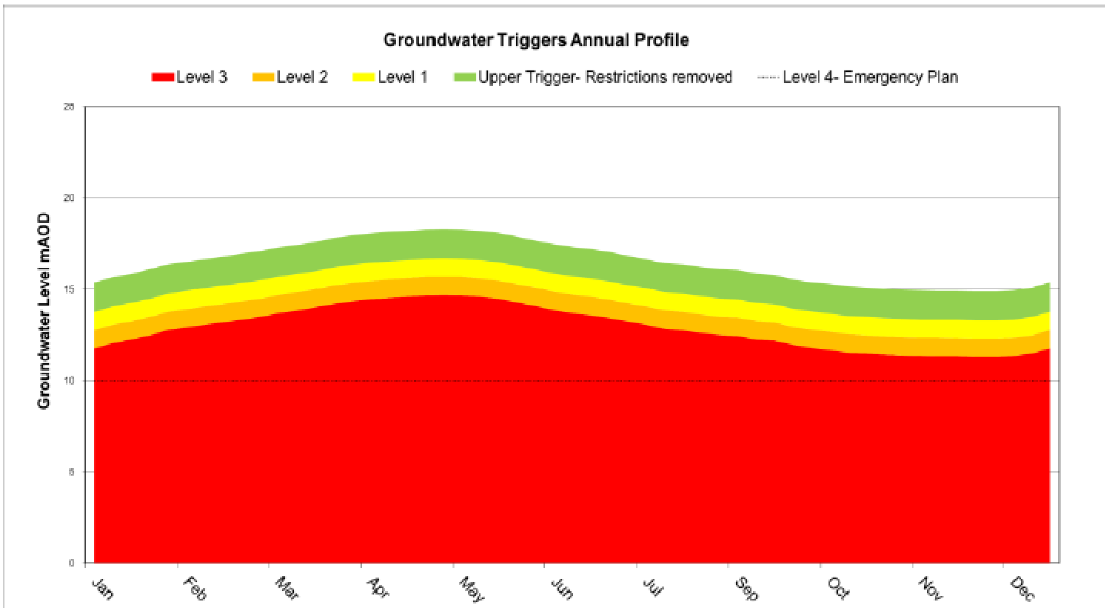

Figure 1.7: Annual groundwater trigger profile

2 Rainfall Trigger

2.1 Background

Portsmouth Water's yield from their groundwater sources is entirely dictated by groundwater levels, which are principally dependent on aquifer recharge from rainfall during the winter period. Therefore, Portsmouth Water currently monitor both rainfall and groundwater levels to enable them to estimate the expected output from their sources during the months ahead.

Rainfall is monitored as it is an important early indicator of drought severity. Portsmouth Water use Havant rain gauge to monitor rainfall, as well as aerial rainfall data from the Environment Agency. Havant is situated centrally in Portsmouth Water's supply area, thus providing a useful indicator of the rainfall for the whole area. In addition, historic data has been analysed to explore the relationship between the amount of rainfall experienced across the whole year and just in winter (when most recharge occurs) and the likelihood of this occurring each year. Long-Term Average (LTA) annual rainfall and LTA winter rainfall (from months October to April) are shown in Figure 2.1 and Figure 2.2. The two graphs show the differences in rainfall in 1976, with annual rainfall being about 120mm below LTA, but winter rainfall being the lowest in the record.

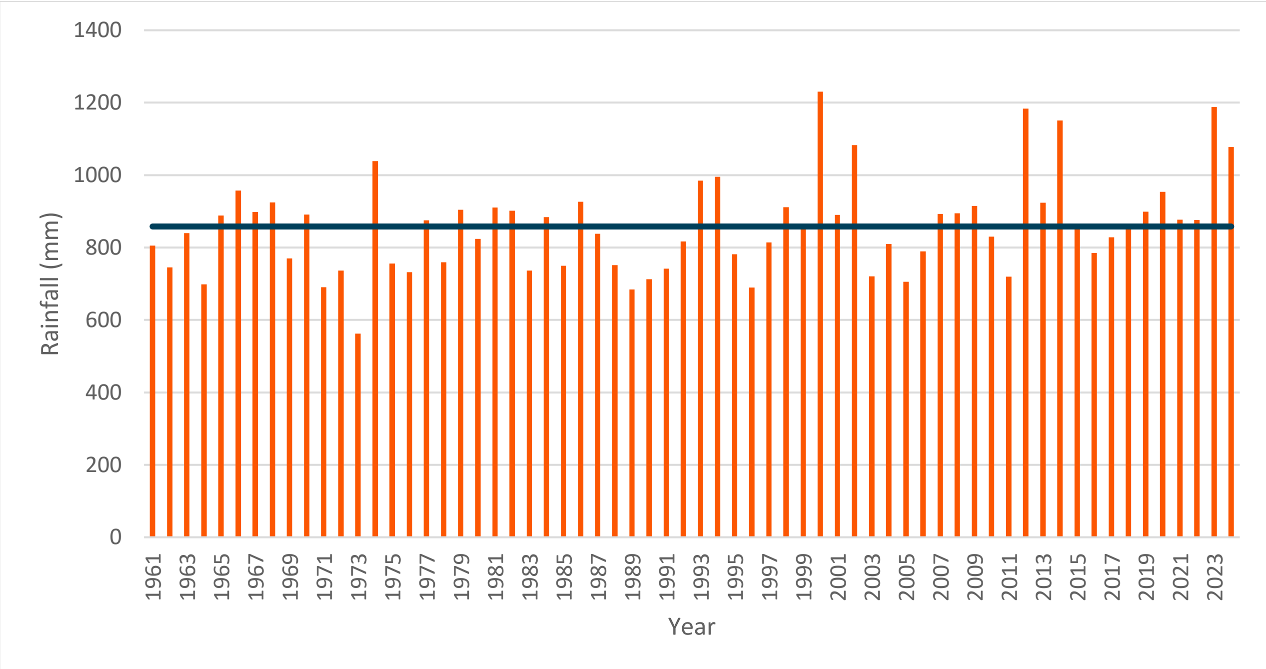

Figure 2.1: Total rainfall from 1961 to 2024

Source: Daily rainfall data provided by Portsmouth Water

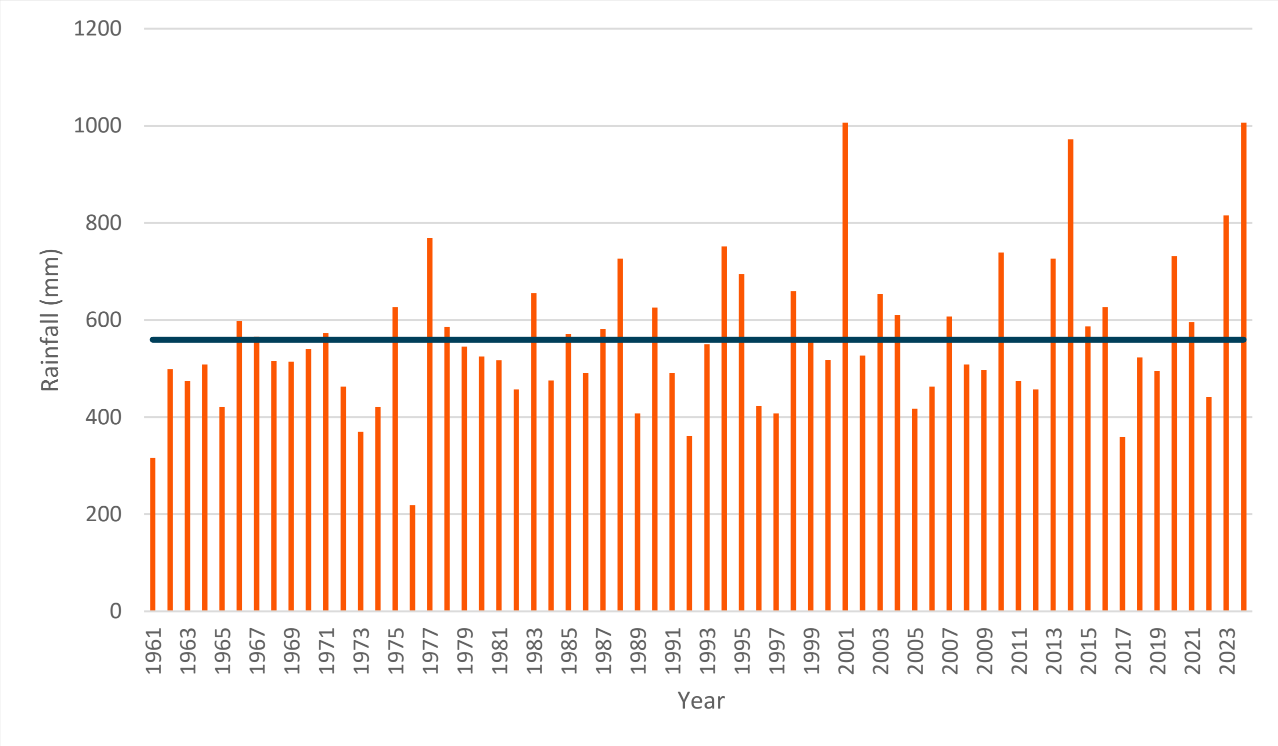

Figure 2.2: Total winter rainfall from 1961 to 2024

Source: *Daily rainfall data provided by Portsmouth Water*

Standard Precipitation Index (SPI) indices were explored during the development of the Drought Plan 2022 to help understand the different stages of drought in terms of rainfall deficit and how well that links with the response of groundwater resources (Figure 2.3). The indices, however, were not formalised as triggers in the final Drought Plan 2022 but were intended to provide additional early warning, prior to crossing the formal groundwater triggers. Additionally, they provide a useful link to the 'exceptional shortage of rain' requirements necessary for the application for drought permits/orders.

These have been reviewed and explored further for this Drought Plan in section 2.2.2.

Level of restriction	SPI Indices	SPI Description	Drought Plan Stage Description
Level 1	SPI < -1	Moderately Dry	Developing
Level 2	SPI < -1.5	Severely Dry	Drought
Level 3	SPI < -2	Extremely dry	Severe Drought

Figure 2.3: SPI indices and how they link to levels of restrictions

Source: *Portsmouth Water's Drought Plan 2022*

2.2 Data

HR Wallingford have reviewed the rainfall triggers and updated them as part of Drought Plan 2027. As part of this review, there has been meeting with the Environment Agency to understand what data is available to use for further monitoring and to support the rainfall trigger update.

2.2.1 Rainfall stations

The Environment Agency Data Hydrology Explorer[1] provides historic rainfall readings for hydrometric stations across England. Figure 2.4 shows a snapshot of rainfall stations that sit in and around the Portsmouth Water's supply area.

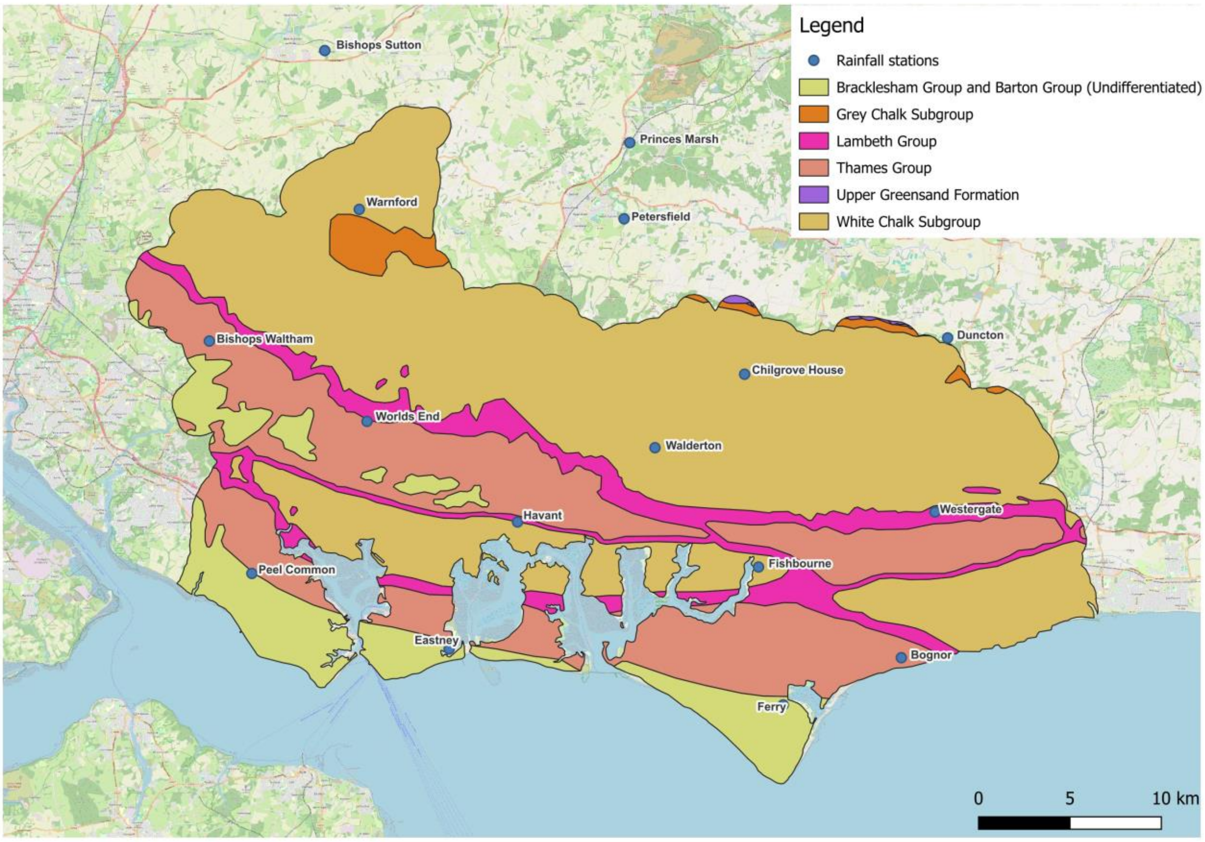

Figure 2.4: Rainfall stations

Source: *EA Data Hydrology Explorer*

Figure 2.5 shows the daily total rainfall for Bishop Sutton near New Alresford compared to the daily total rainfall at Havant from 1988 to 2024.

[1] Hydrology Data Explorer - Explore

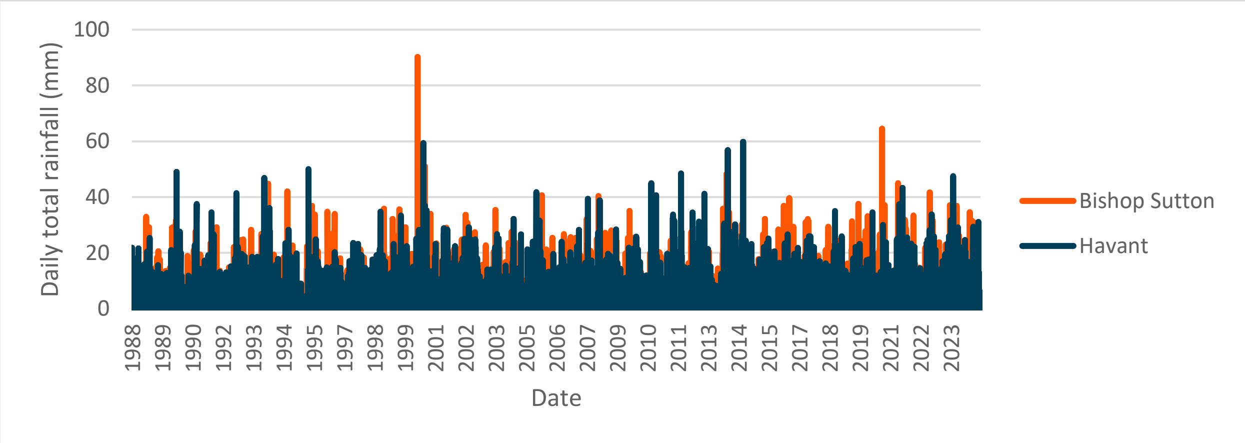

Figure 2.5: Daily total rainfall (mm) at Bishop Sutton and Havant from 1988 to 2024

Source: EA Data Hydrology Explorer

Given there are differences in rainfall across the supply zone, we suggest that there should be additional focus on monitoring rainfall levels at the top of the South Downs National Park to monitor direct rainfall in the upper area of the recharge zone. Portsmouth Water's supply area sits within this area. Most infiltration into the chalk is going to take place up-catchment of Havant. Monitoring rainfall in these upper catchment areas therefore provides a more representative indication of how much water is entering the aquifer. During a drought, Portsmouth Water should use additional rainfall data, alongside the Havant rain gauge, to assess spatial rainfall deficits and improve estimates of aquifer recharge.

2.2.2 Standard Precipitation Index and Soil Moisture Deficits

Whilst total rainfall is a useful indicator of regional hydrological conditions, rainfall alone does not take into account factors such as rainfall intensity and evaporation and transpiration. Standard Precipitation Indices (SPI) calculates rainfall over different periods (e.g. 3 months, 6 month, 12 months and 18 months) and compares rainfall amounts to historic averages. Soil moisture deficits indicate how dry conditions are and how much rainfall will be required before recharge next takes please.

For updating the triggers for Drought Plan 2027 SPI indices have been explored further. These indices provide more evidence of rainfall as drought triggers as they can be used to indicate severity of low rainfall and if a drought may be developing.

The World Meteorological Organisation (WMO) user guide[2] has ranked the severity of event by SPI as shown in Table 2.1. For example, an SPI of 0 to -0.99 has been ranked as a 1 in 3 year event while an SPI of <-2.00 has been ranked as a 1 in 50 year event.

Table 2.1: SPI return period ranking

SPI	Drought category	Severity of event
0.00 to -0.99	Mild drought	1 in 3 years
-1.00 to -1.49	Moderate drought	1 in 10 years
-1.50 to -1.99	Severe drought	1 in 20 years
< -2.00	Extreme drought	1 in 50 years

[2] Standardised Precipitation Index User Guide, World Meteorological Organisation

The Environment Agency produces monthly South East Soil Moisture Model (SESMM) updates showing the rainfall, effective rainfall and Soil Moisture Deficit (SMD) calculated up to the 12th of the month using PE LTA 1961-1990. For this trigger review the Environment Agency has provided HR Walingford with the timeseries for rainfall, effective rainfall and SMD for East Hampshire Chalk and West Sussex Chalk. These areas fall within Portsmouth Water's supply area.

The rainfall timeseries for each chalk area has been converted into monthly totals and then a R script has been used to calculate the SPI for 6, 12, 18 and 24-month timescales. Figure 2.6 to Figure 2.9 shows the SPI for East Hampshire chalk and Figure 2.10 to Figure 2.13 shows the SPI for West Sussex chalk. It is important to explore different timescales because drought impacts vary depending on duration. A short term SPI (6 months) is useful to understand the immediate rainfall deficits while a long term SPI (18 months) is useful to understand the impacts on groundwater recharge and ecosystem health.

The graphs show rainfall deficit from the drought in 2022. Again 1976 has a strong signal in the data set, particularly in the 6 month data.

East Hampshire Chalk

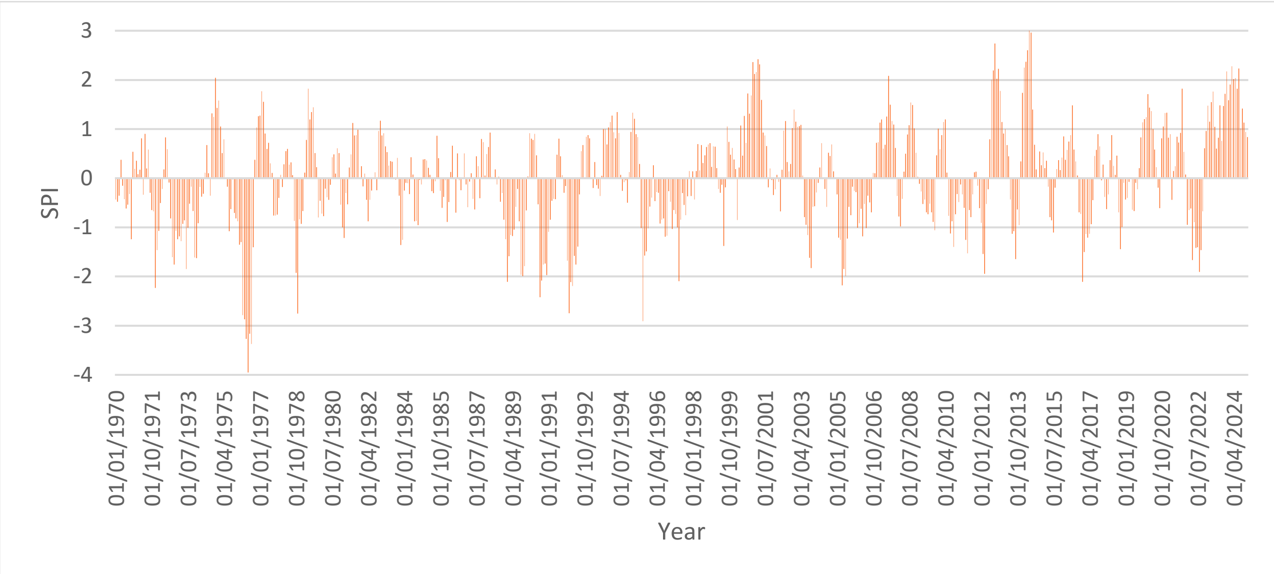

Figure 2.6: 6-month SPI for East Hampshire chalk (1970-2024)

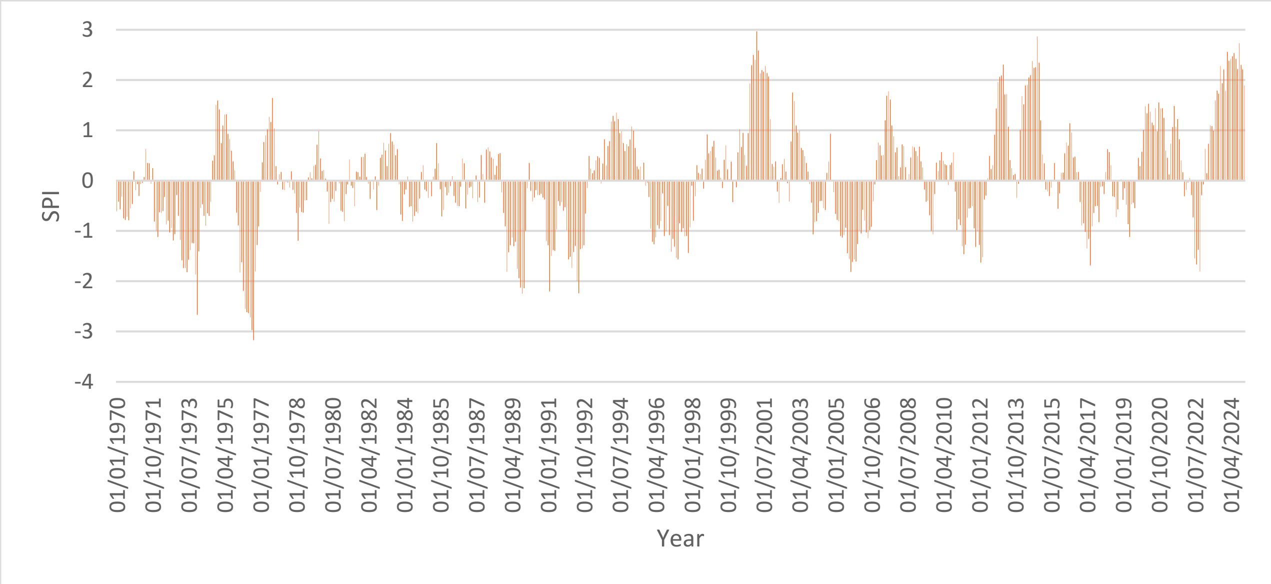

Figure 2.7: 12-month SPI for East Hampshire chalk (1970-2024)

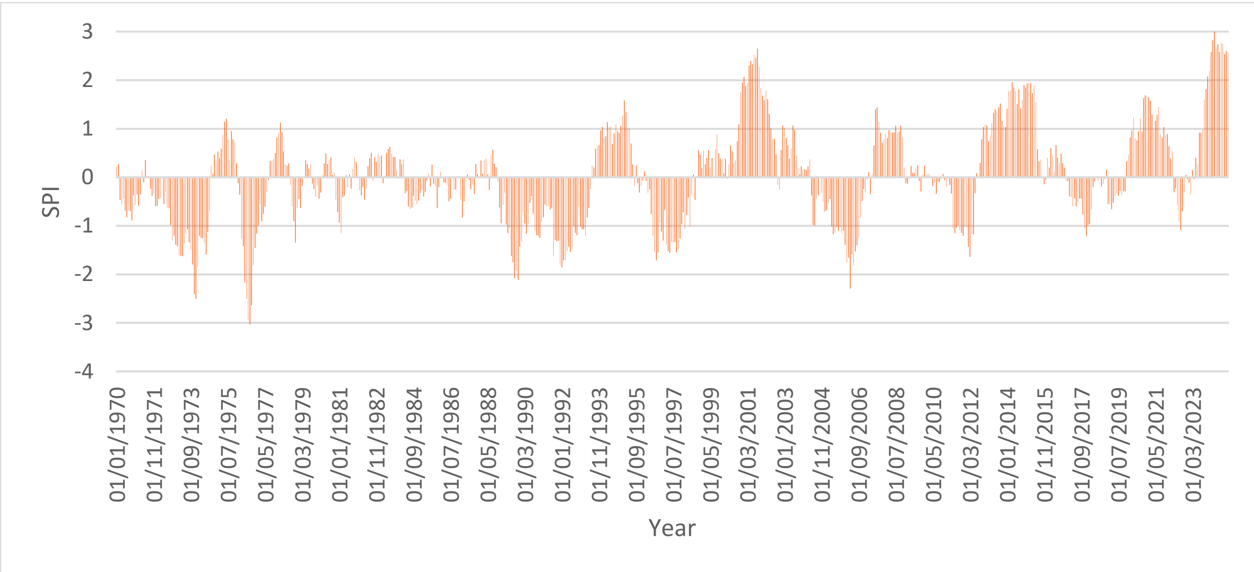

Figure 2.8: 18-month SPI for East Hampshire chalk (1970-2024)

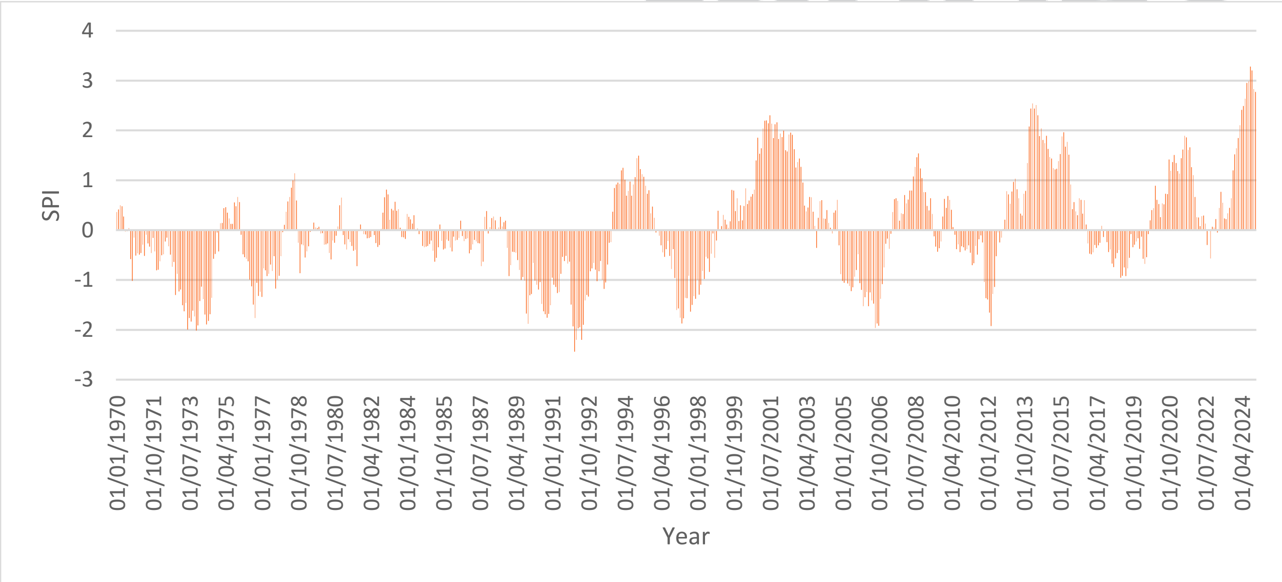

Figure 2.9: 24-month SPI for East Hampshire chalk (1970-2024)

West Sussex Chalk

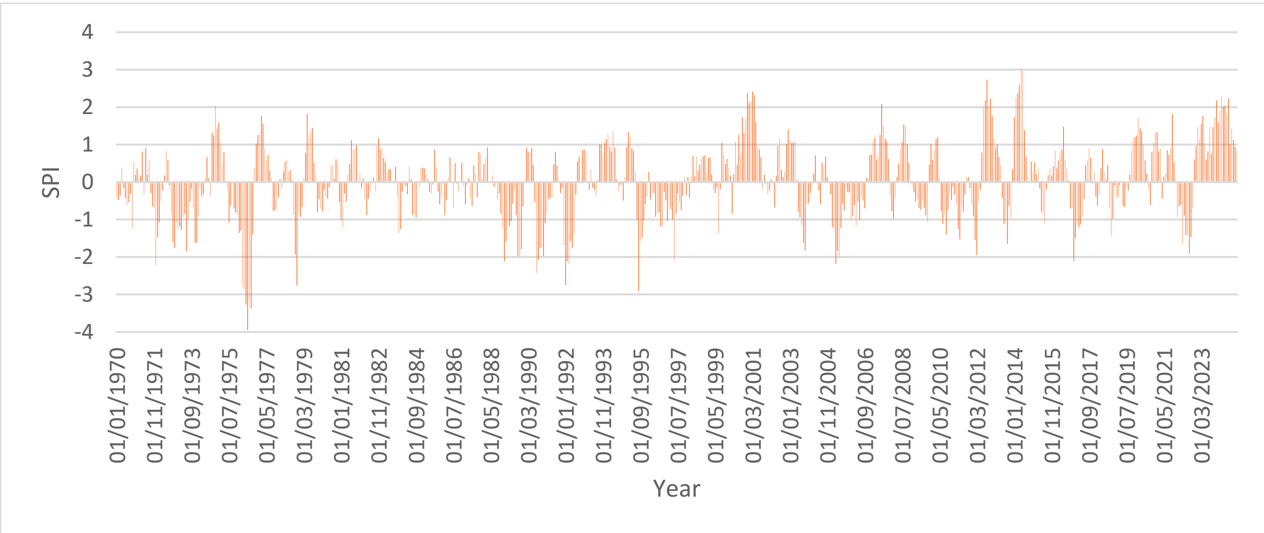

Figure 2.10: 6-month SPI for West Sussex chalk (1970-2024)

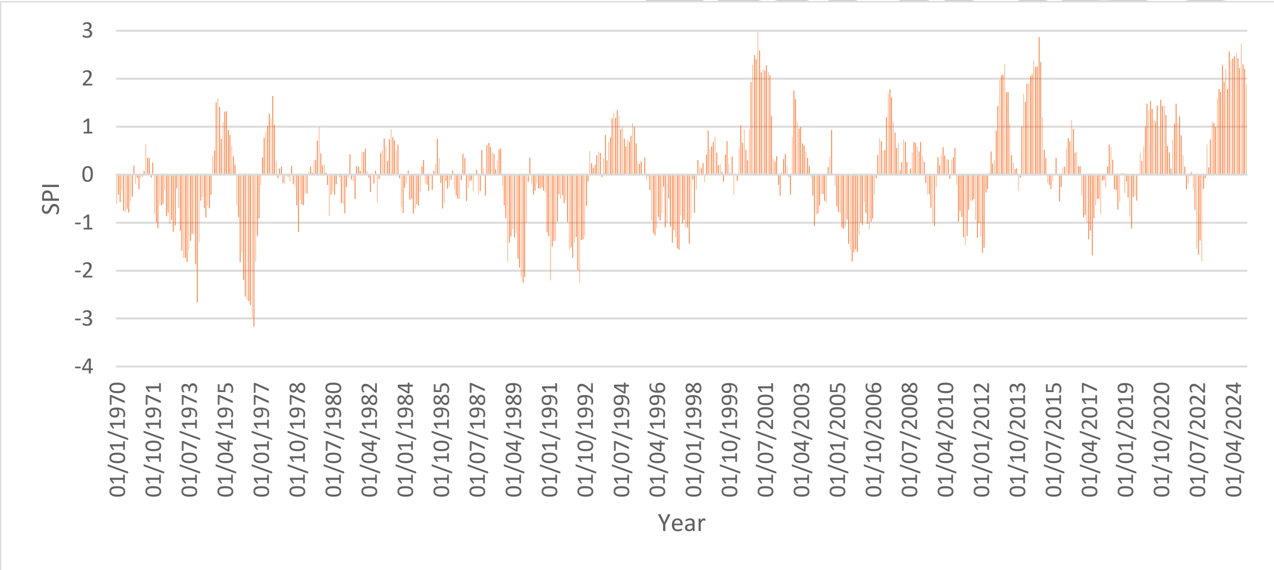

Figure 2.11: 12-month SPI for West Sussex chalk (1970-2024)

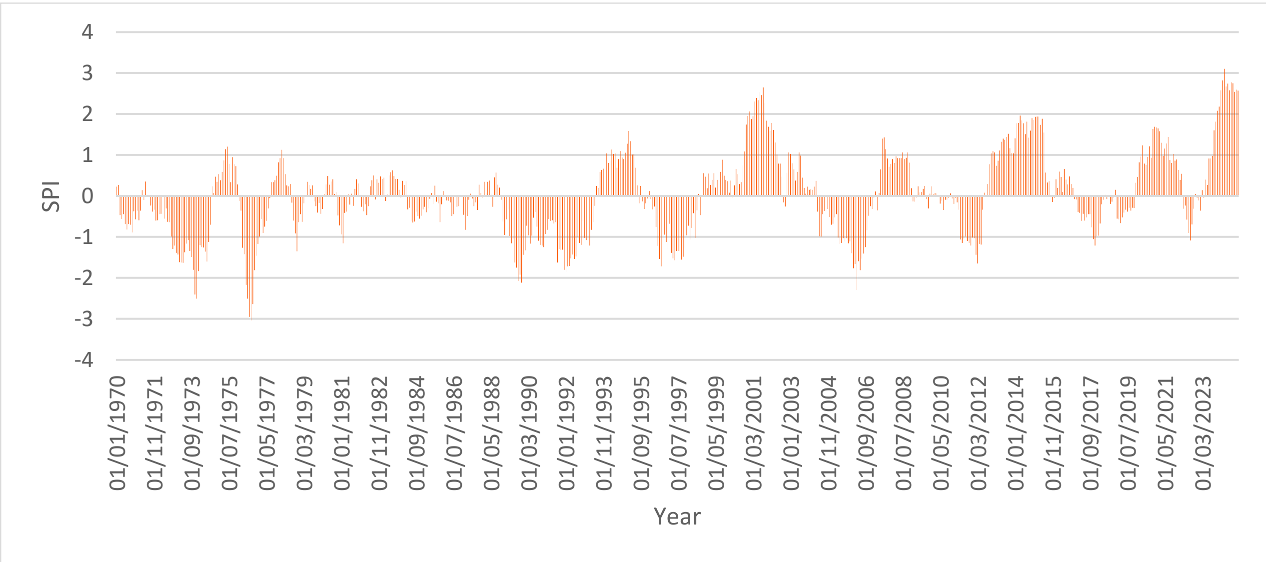

Figure 2.12: 18-month SPI for West Sussex chalk (1970-2024)

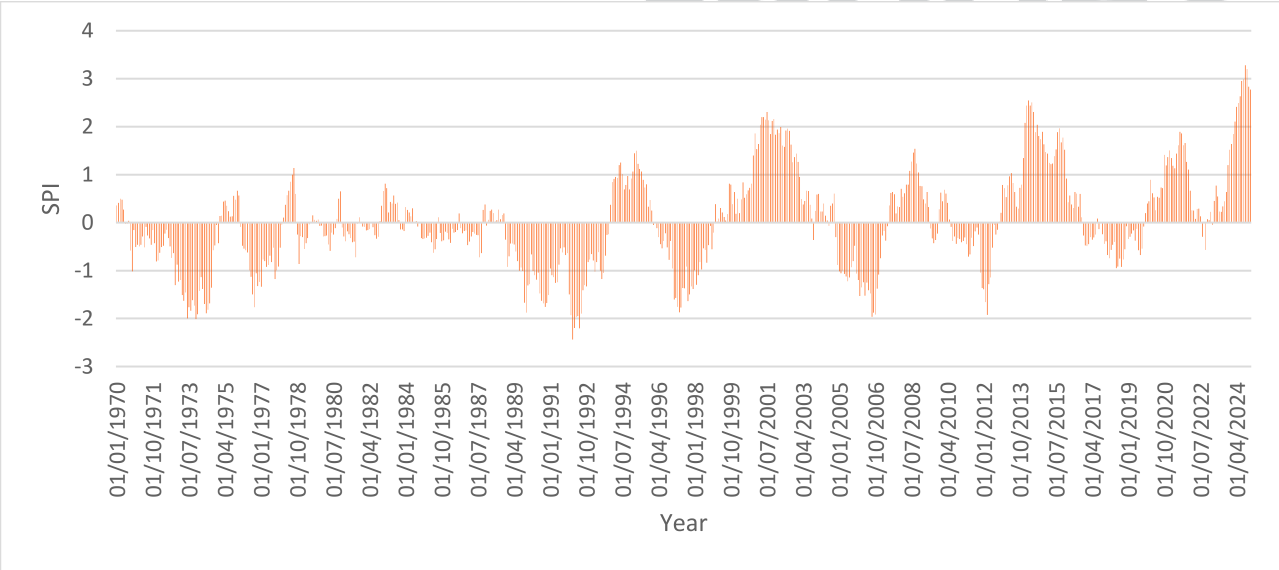

Figure 2.13: 24-month SPI for West Sussex chalk (1970-2024)

In addition to the SPIs above for East Hampshire and West Sussex chalk, Portsmouth Water should also use SPI data by CEH for monitoring. SPI across timescales of 6, 12, 18 and 24 months have been calculated for the different Environment Agency hydrological catchments. This allows for a broader coverage of data and a better understanding of hydrological conditions across the supply area in dry, drought periods. Figure 2.14 shows an example of the 12-month SPI on the Rother at Iping Mill rainfall station from 1960-2024.

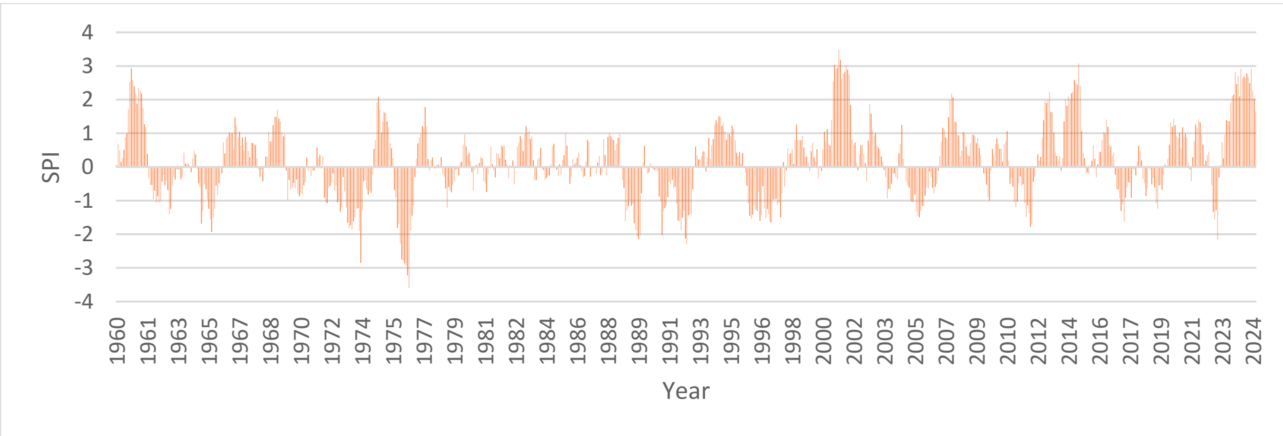

Figure 2.14: 12-month SPI on the Rother at Iping Mill rainfall station (1960-2024)

Source: *CEH data*

2.3 Soil Moisture Deficit

Portsmouth Water should also use Soil Moisture Deficit (SMD) as part of their rainfall triggers. It is important to look at the SMD against the effective rainfall to consider which SMD level is an indication of drought (and recharge). Figure 2.15 is an example of the SMD against the effective rainfall for East Hampshire chalk. A high SMD in winter would indicate a delayed seasonal recharge at groundwater sources. Effective rainfall is used to see if recharge is likely and helps to identify during the winter months where issues in the following spring and summer might be, due to the lack of recharge. In 1976 the SMD was exceptionally high which resulted in an unusually dry winter in 1975-76, an extremely dry spring and very little rainfall from May-August. More recently, the SMD was high in 2022 which occurred due to an exceptionally hot, dry spring and summer. High temperatures increased evaporation, accelerating soil moisture loss and increasing the SMD.

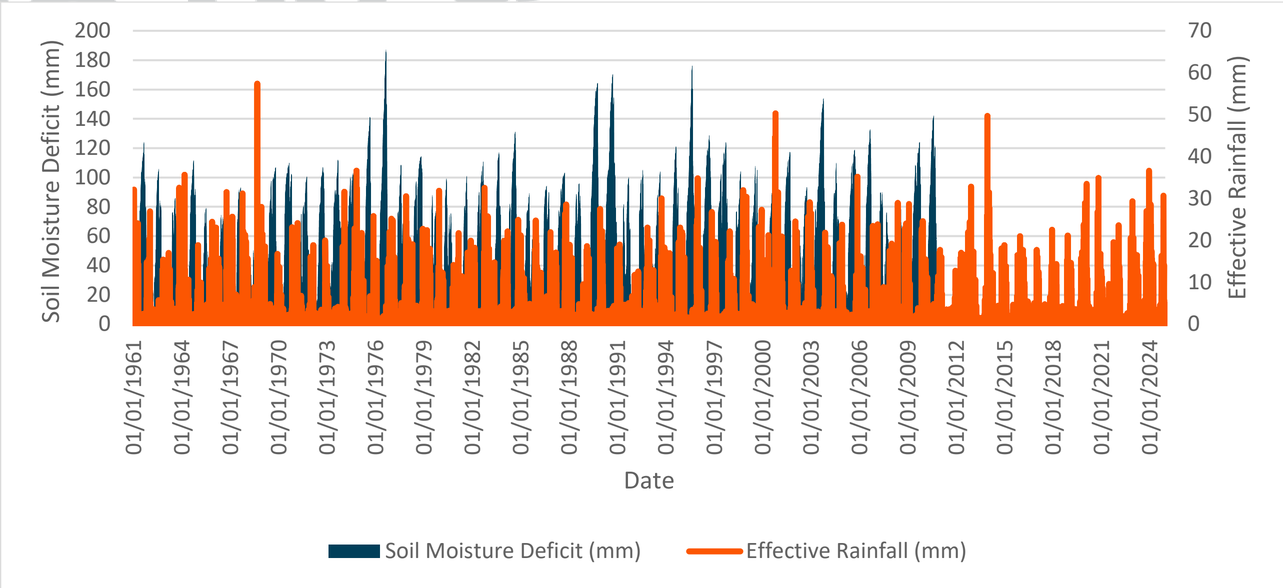

Figure 2.15: Soil Moisture Deficit versus effective rainfall for East Hampshire

2.4 Comparing SPI and groundwater levels

The next sections compare the calculated SPI against groundwater levels.

2.4.1 SPI versus Well 'X' Groundwater Levels

Groundwater levels from a range of sites across Portsmouth Water's supply area were compared against the SPI for Portsmouth Water. The minimum groundwater levels and minimum SPI across 6, 12, 18, and 24-month timescales were compared. The analysis showed a strong correlation between SPI and groundwater levels at Well 'X' (Figure 2.16 to Figure 2.23). The other groundwater sites analysed can be found in Appendix A of this report.

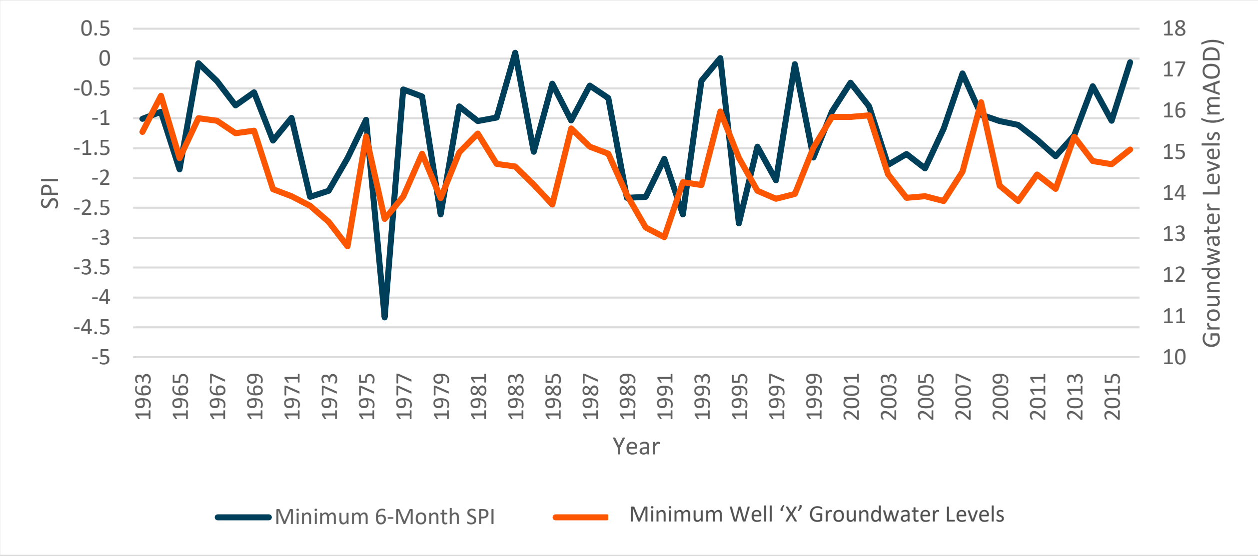

Figure 2.16: Well 'X' minimum groundwater levels versus minimum 6-month SPI

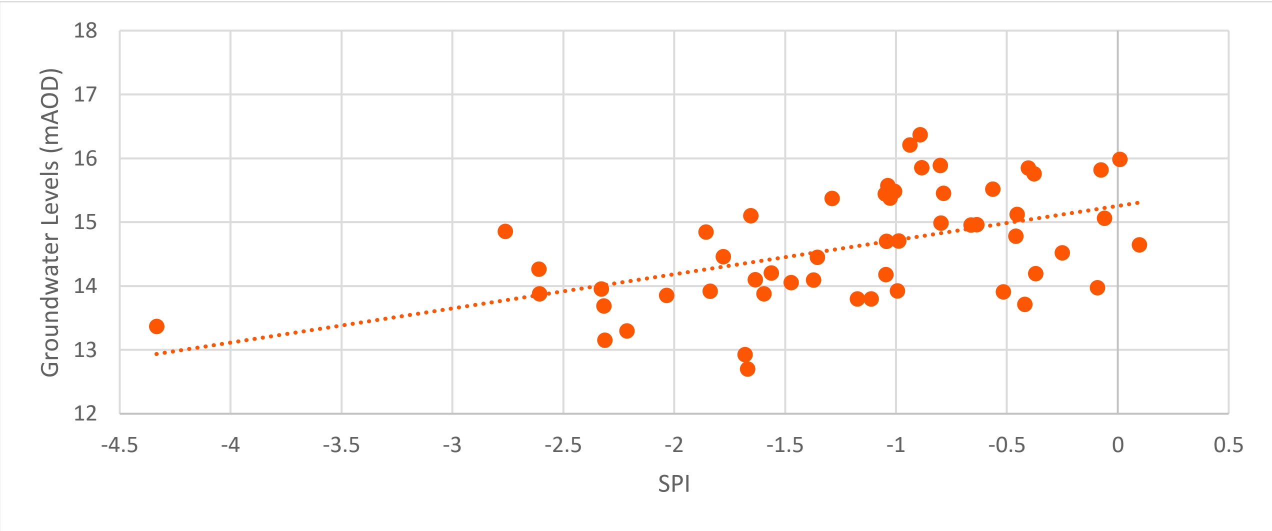

Figure 2.17: Correlation of Well 'X' minimum groundwater levels versus 6-month SPI

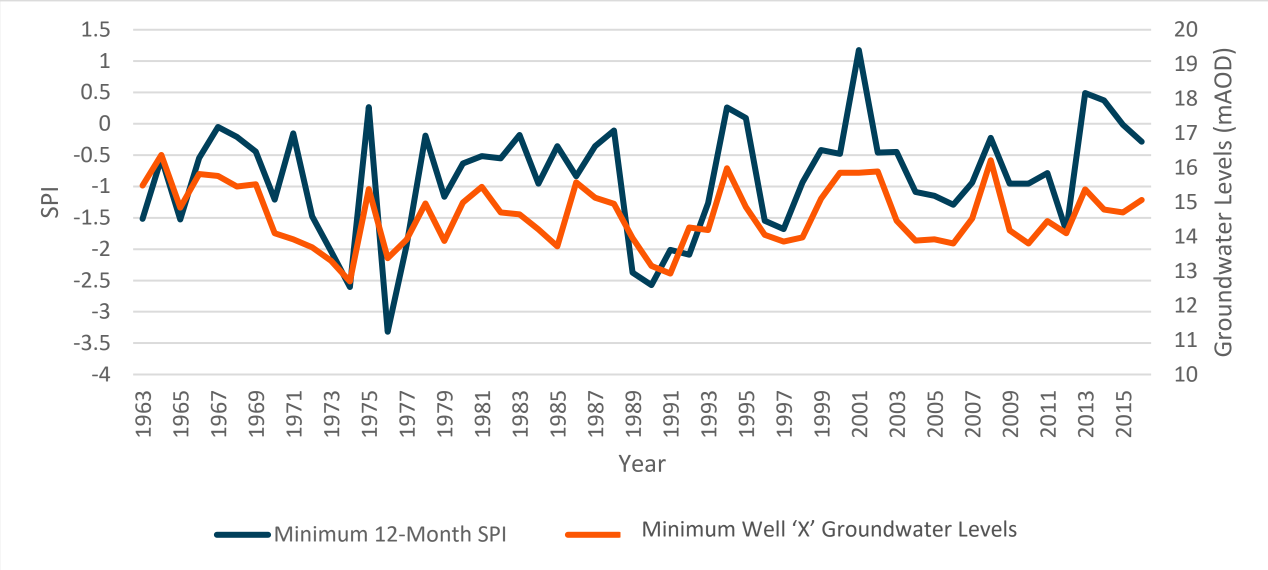

Figure 2.18: Well 'X' minimum groundwater levels versus minimum 12-month SPI

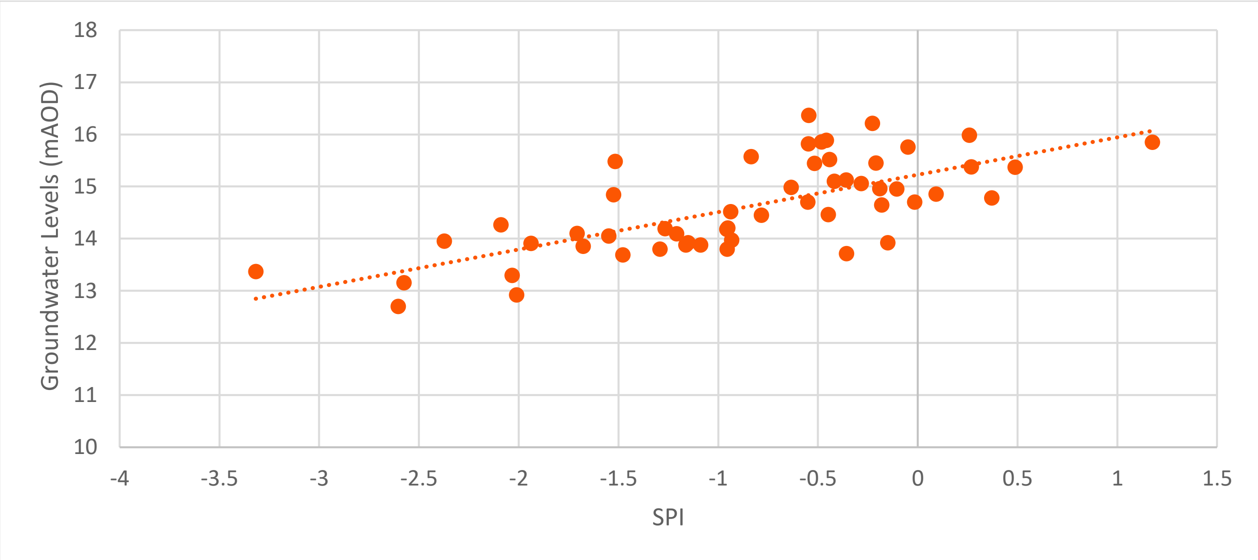

Figure 2.19: Correlation of Well 'X' minimum groundwater levels versus 12-month SPI

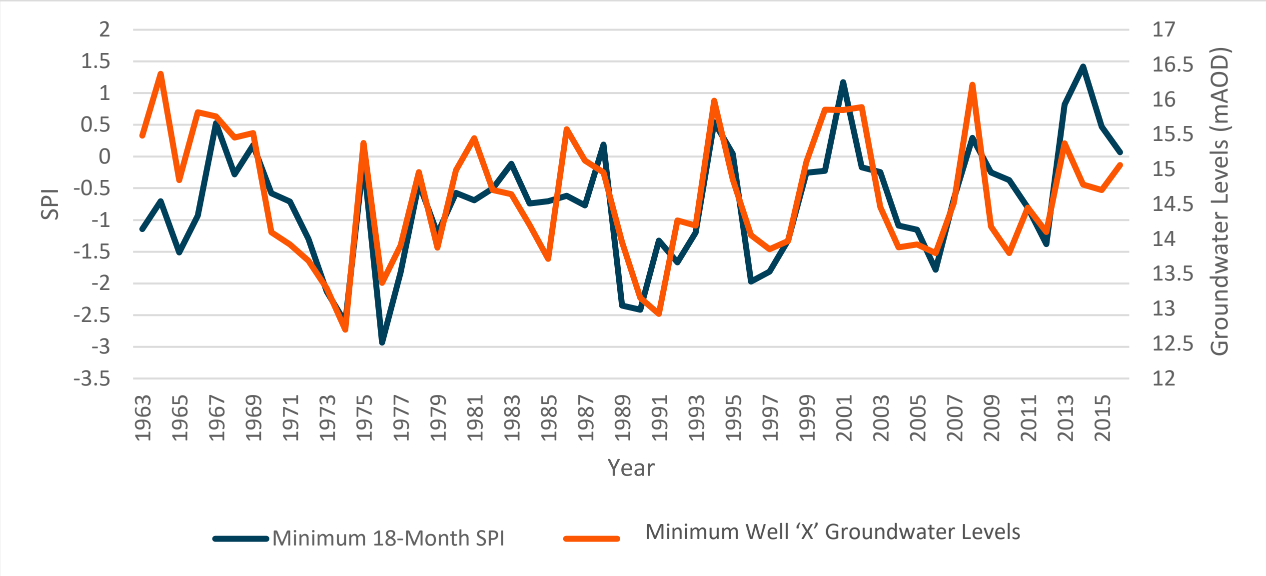

Figure 2.20: Well 'X' minimum groundwater levels versus minimum 18-month SPI

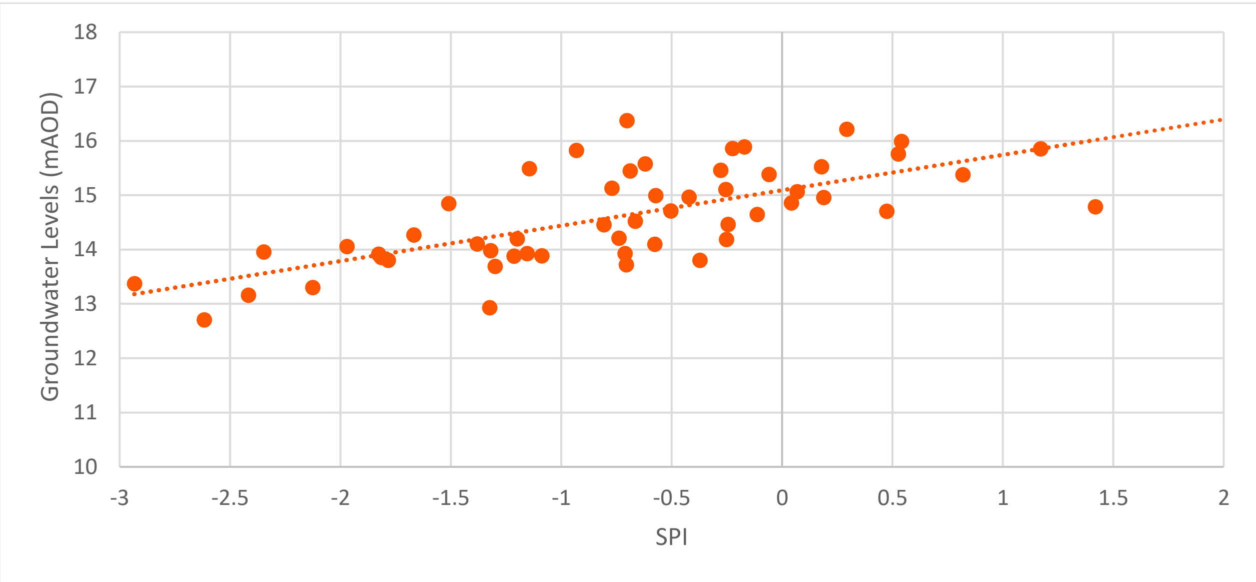

Figure 2.21: Correlation of Well 'X' minimum groundwater levels versus 18-month SPI

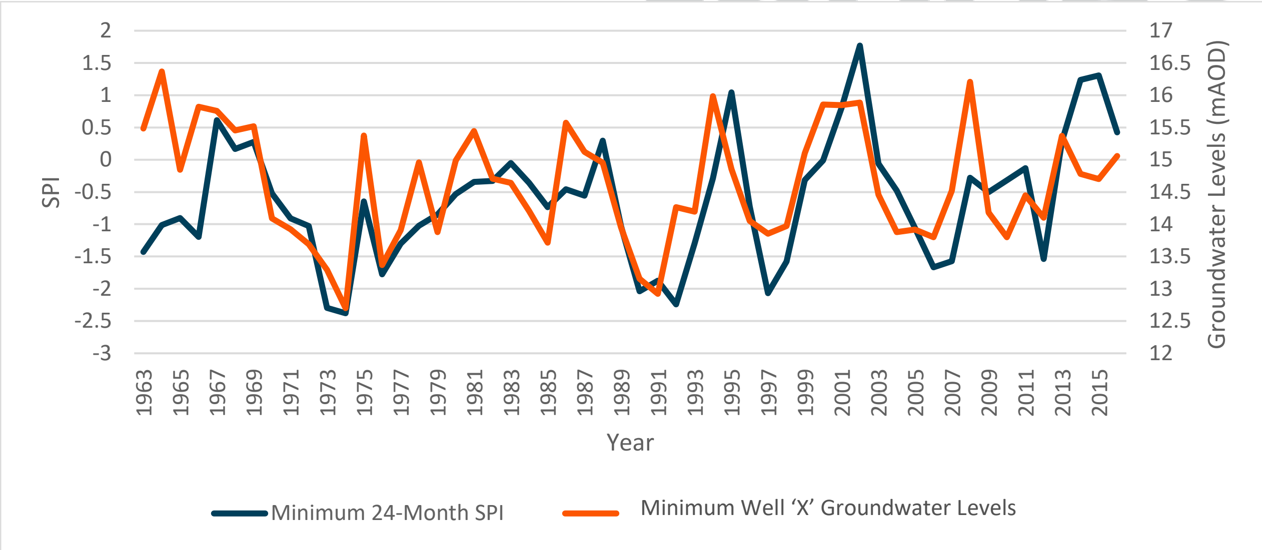

Figure 2.22: Well ‘X’ minimum groundwater levels versus minimum 24-month SPI

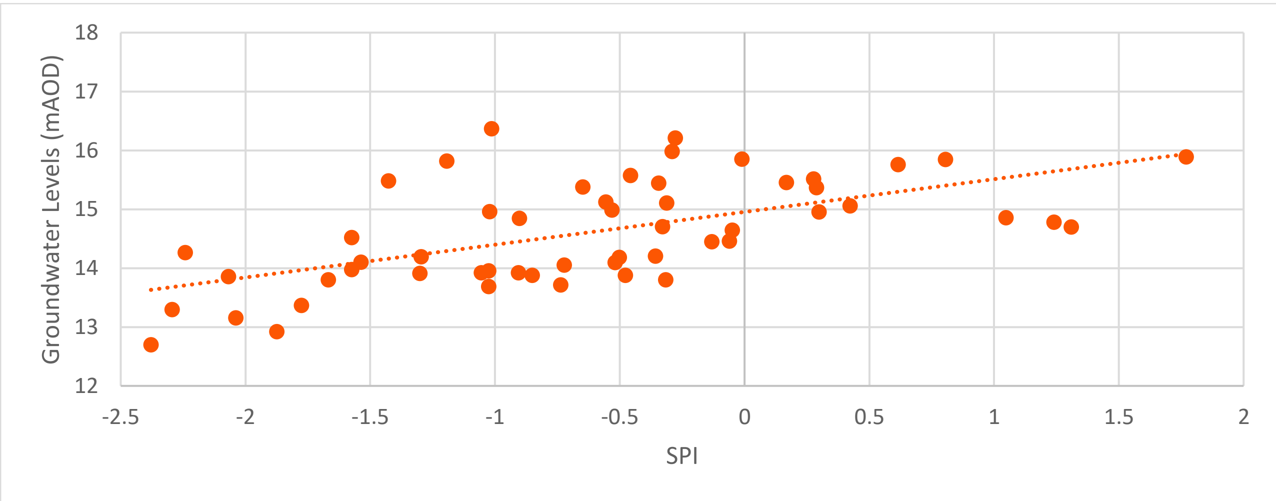

Figure 2.23: Correlation of Well ‘X’ minimum groundwater levels versus 24-month SPI

2.5 Discussion

The analysis above shows that there is correlation between SPI and groundwater levels. Therefore, during a drought event rainfall and SPI monitoring should be carried out across multiple sites. This will provide a clearer understanding of the hydrological conditions across the supply area than just at Well ‘X’. We recommend therefore that there is further analysis of rainfall and SPI to get a broader understanding of hydrological conditions .

Table 2.2

~~Table 2.2~~ shows a number of monitoring actions against different SPI levels. If Level 1 was crossed (with an SPI of 0.00 to -0.99) then Portsmouth Water will continue to increase the monitoring frequency of rainfall and groundwater levels across their supply area.

Table 2.2: SPI and SMD trigger

Drought level	SPI	SMD	Drought severity	Action
Level 1	0.00 to -0.99	Moderate	Mild drought	Increase monitoring frequency of rainfall and groundwater levels
Level 2	-1.00 to -1.49	High	Moderate drought	Daily monitoring at groundwater monitoring sites
Level 3a/b	-1.50 to -1.99	Very high	Severe drought	Satellite imagery to assess recharge conditions
Level 4	< -2.00	Extreme	Extreme drought	Conduct real-time stress monitoring on all abstraction sources

3 Demand Trigger

3.1 Background

A demand trigger is important for a drought plan because it helps water companies identify when to take action to manage water supply and demand during dry weather or drought conditions. Demand may be a response to periods of hot weather, even when groundwater levels are relatively high, but high demands can cause service issues (e.g. low pressure) and therefore demand triggers can be useful to help identify situations when high demands may cause service issues. Other companies (e.g. South East Water) have included demand triggers in their drought plans.

Portsmouth Water should include a demand trigger as part of their Drought Plan 2027 to support the enhanced communications to customers and stakeholders.

3.2 Data

Portsmouth Water provided HR Wallingford Distribution Input (DI) data from January 2012 to July 2025. Using this data, the first step, was to calculate a 3-day rolling average. The maximum average was then calculated for each month (see Table 3.1 to Table 3.4). To create the demand trigger for the 3-day rolling average, the maximum value for a month across each year was extracted. For example, the maximum average in January across the years is in 2023 with 188.45 Ml/d. This was repeated for a 7-day rolling average.

Table 3.1: Maximum distribution input for 3-day rolling average (2012-2018)

Month	LTA	2012	2013	2014	2015	2016	2017	2018
January	169.07	174.92	174.02	166.78	166.15	166.81	172.22	173.38
February	170.86	185.37	171.05	169.57	176.00	167.45	178.03	177.37
March	171.56	184.30	171.83	168.67	172.83	170.15	173.47	207.87
April	173.86	178.61	178.88	171.41	178.73	168.50	183.39	181.74
May	178.30	201.03	184.37	177.59	174.91	182.36	196.99	187.43
June	183.81	178.35	183.88	194.10	199.50	189.40	216.01	220.37
July	188.32	191.13	216.81	204.96	197.76	198.82	208.15	223.31
August	178.18	183.21	186.42	189.10	185.94	192.94	182.25	204.59
September	174.37	179.03	189.82	173.46	169.26	173.24	173.20	178.53
October	168.33	170.08	171.17	167.25	168.89	170.97	170.91	172.16
November	165.93	170.23	163.47	163.42	165.87	168.01	171.26	174.19
December	166.66	171.26	166.03	163.27	162.68	168.53	175.70	166.44

Table 3.2: Maximum distribution input for 3-day rolling average (2019-2025)

Month	LTA	2019	2020	2021	2022	2023	2024	2025
January	169.07	169.74	170.34	178.59	186.71	188.45	187.75	188.24
February	170.86	169.83	177.05	184.25	188.18	182.53	184.84	187.21
March	171.56	172.49	176.18	180.55	192.82	179.83	180.25	184.80
April	173.86	184.79	189.83	196.51	192.10	183.88	183.82	192.25
May	178.30	187.15	224.79	204.82	193.87	207.70	198.37	204.05
June	183.81	194.00	223.43	204.65	202.87	214.01	208.13	205.70
July	188.32	198.28	210.93	214.34	225.63	190.42	203.02	204.68

Month	LTA	2019	2020	2021	2022	2023	2024	2025
August	178.18	192.57	225.86	190.33	206.29	179.85	202.94	
September	174.37	187.50	201.26	194.42	176.56	200.59	184.26	
October	168.33	178.16	176.10	177.45	173.73	187.87	182.89	
November	165.93	165.76	180.61	180.34	176.77	181.66	181.58	
December	166.66	163.62	180.70	180.66	185.38	177.79	187.18	

Table 3.3: Maximum distribution input for 7-day rolling average (2012-2018)

Month	LTA	2012	2013	2014	2015	2016	2017	2018
January	169.07	178.07	171.92	165.31	164.70	166.14	171.43	171.60
February	170.86	180.19	169.41	165.60	169.49	166.11	171.79	188.48
March	171.56	182.90	169.64	166.75	168.46	167.70	172.19	192.79
April	173.86	176.84	181.11	168.93	176.86	169.94	179.54	178.03
May	178.30	197.09	182.49	172.57	171.66	180.02	187.30	184.56
June	183.81	173.90	182.80	190.60	196.88	187.22	209.92	217.67
July	188.32	185.91	216.30	201.99	192.34	197.04	201.92	217.17
August	178.18	178.55	187.02	185.18	179.87	189.09	178.99	200.06
September	174.37	177.60	181.14	171.62	168.02	169.86	171.17	177.42
October	168.33	169.44	167.78	164.94	166.56	168.95	169.53	170.42
November	165.93	167.59	161.44	161.91	161.48	167.00	169.30	170.51
December	166.66	170.65	163.47	163.25	160.18	166.41	172.97	165.31

Table 3.4: Maximum distribution input for 7-day rolling average (2019-2025)

Month	LTA	2019	2020	2021	2022	2023	2024	2025
January	169.07	168.97	168.12	176.19	182.67	183.35	186.18	185.43
February	170.86	168.88	173.88	179.47	186.26	177.90	179.55	181.69
March	171.56	168.91	175.75	179.15	188.83	177.89	176.80	181.56
April	173.86	179.35	186.30	193.24	189.85	181.62	179.49	189.59
May	178.30	183.34	219.91	196.99	190.19	206.36	189.81	194.73
June	183.81	190.22	206.72	195.24	198.01	211.52	205.35	200.69
July	188.32	190.53	205.61	207.54	223.70	185.44	200.12	201.24
August	178.18	189.58	222.23	187.22	201.42	183.44	195.98	
September	174.37	186.32	197.51	189.74	173.24	195.91	180.55	
October	168.33	174.51	171.50	175.44	172.79	182.94	178.09	
November	165.93	162.65	175.49	176.21	170.77	176.44	181.36	
December	166.66	160.78	173.92	178.38	181.18	176.35	181.05	

3.3 Results

Demand triggers, based on historic droughts, have been developed below. The demand triggers have been developed based on a 3-day and 7-day DI rolling average. When demand is expected to meet or exceed these values then enhanced communication will be implemented as set out in the communication strategy.

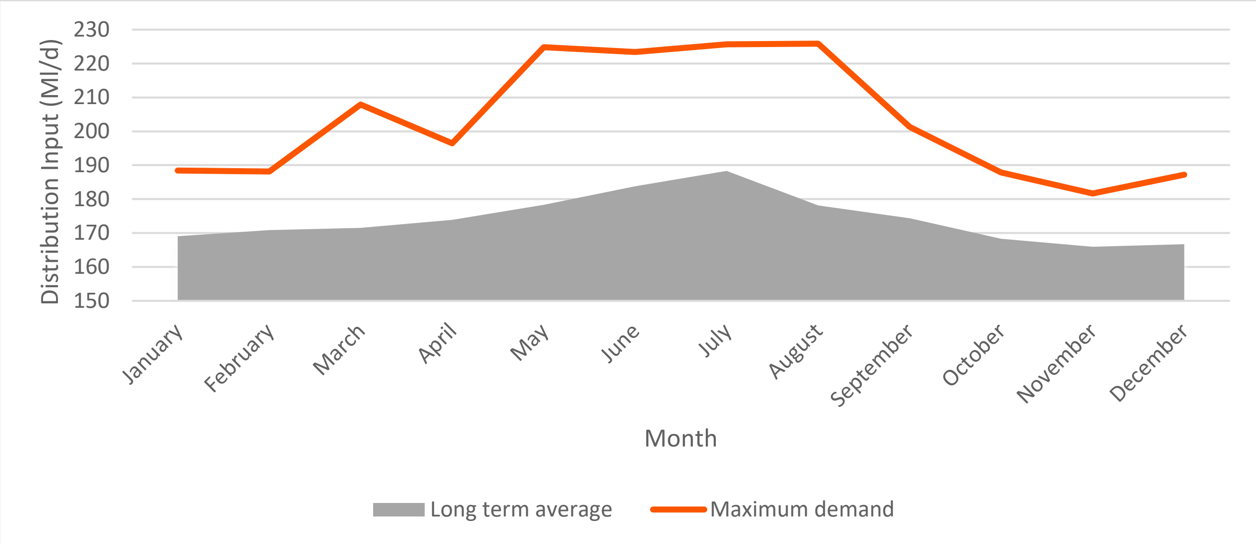

Figure 3.1: Demand trigger based on a 3-day rolling average

Source: Monthly demand, provided by Portsmouth Water

Table 3.5: Demand trigger based on a 3-day rolling average (absolute values)

Month	Maximum demand
January	188.45
February	188.18
March	207.87
April	196.51
May	224.79
June	223.43
July	225.63
August	225.86
September	201.26
October	187.87
November	181.66
December	187.18

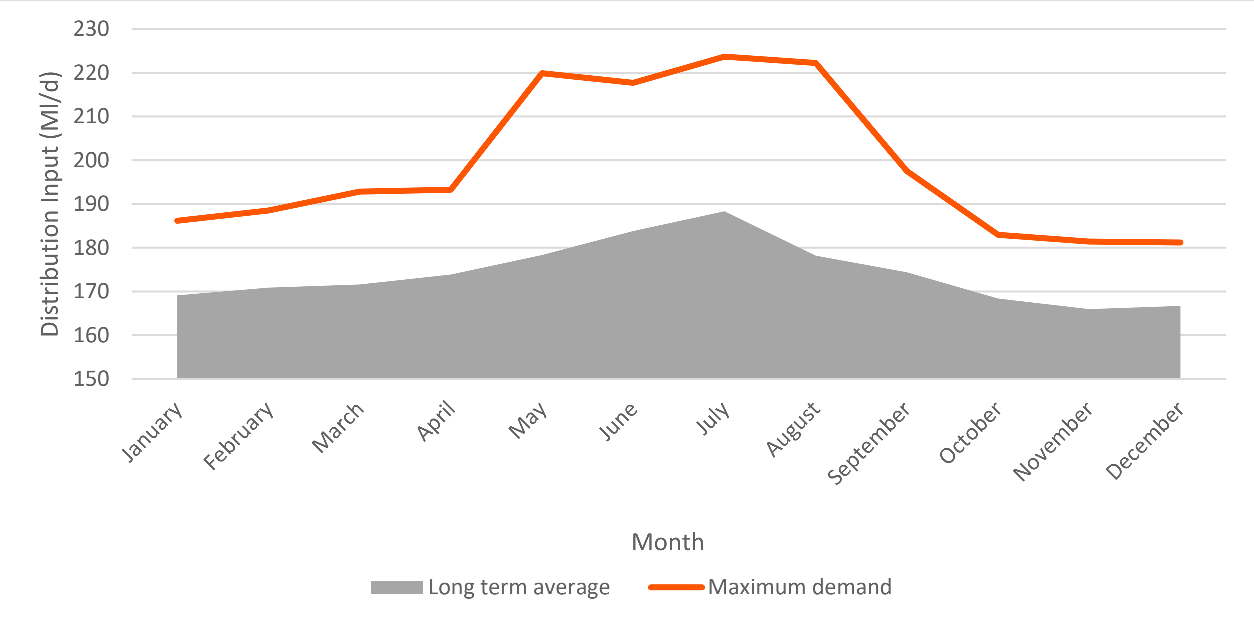

Figure 3.2: Demand trigger based on a 7-day rolling average

Source: Monthly demand, provided by Portsmouth Water

Table 3.6: Demand trigger based on a 7-day rolling average (absolute values)

Month	Maximum demand
January	186.18
February	188.48
March	192.79
April	193.24
May	219.91
June	217.67

Month	Maximum demand
July	223.70
August	222.23
September	197.51
October	182.94
November	181.36
December	181.18

The demand profile above should be the demands Portsmouth Water use as the DI trigger for the Drought Plan. Demand profiles have been created based on 3-day and 7-day rolling averages but 3-day rolling averages should be the preferred option to choose.

4 Environmental Trigger

4.1 Background

For this drought plan, no specific environmental triggers have been adopted. This is because Portsmouth Water's primary function is to ensure security of supply for their customers. Portsmouth Water, however, recognises the importance of environmental monitoring, particularly their chalk streams.

For example, there are existing environmental conditions in place for the augmentation of water on the River Ems at both Source U and Source N. The conditions are outlined below:

Source U & Source N

As it stands, the conditions on the licence means that when the natural flow in the river drops below a defined low-flow threshold, the licence holder must begin augmenting from Source U to help maintain levels. If this added flow remains below the required amount for an extended period, or falls to a critically low value, the licence holder must switch to using Source U and cease augmentation from Source N. This support continues until the natural river flow rises above the upper threshold at which augmentation is no longer needed.

This variation to the licence will expire on 31 March 2028. Portsmouth Water will be using WINEP to inform the renewal process.

4.1.1 Additional Environmental Conditions

In addition to the augmentation of water on the River Ems, there are a number of groundwater sites across the supply area which have environmental conditions in place to protect the environment. These sites are:

Sources P and O

The abstraction licences at Sources P and O were reduced in 2008 following the outcome of the Restoring Sustainable Abstraction (RSA) process.

Source A (on the River Itchen)

The licence holder shall not cause flows (Hands of Flow, HoF) in the River Itchen to fall below 2.25 cumecs over a 24 hour period at the allocated Environment Agency gauging station.

Sources C and D

There is a time limited variation on Source C and D which expires 31 March 2028.

The abstraction is required to be metered to demonstrate compliance with the terms of the licence and to provide information on actual water usage for water planning purposes.

Part of the licence is time-limited to reflect the timing of a future review of the catchment resources availability.

Sources F and G

The licence holder shall make a continuous release of compensation water of 2 Ml/d to the River Meon.

The above condition will only apply when the flow in the River Meon is equal to or less than 0.1 m3/s at the allocated Environment Agency gauging station.

Source H

The daily amount of water that can be taken may be temporarily increased for up to 15 days, or longer if the regulator agrees to an extension in writing. This higher allowance can only be used when the river being monitored is showing a healthy enough flow at the start of each day to meet the required minimum level.

Source I

Water can only be taken when there is enough natural flow in the relevant watercourses to ensure that abstraction does not reduce them below their required minimum levels. This includes limits on how much water can be taken when river flows are low, as well as rules stating that water may only be abstracted from certain spring systems when the combined flows feeding those systems are above set thresholds. These checks must be based on measured flows at several monitoring points, and abstraction must stop if taking water would cause those flows to drop below the required levels. These conditions only apply during specific tidal periods, meaning that the timing of high and low tide affects when abstraction is permitted.

Sources T & S

There is a time limited variation on Sources T & S which expires 31 March 2028.

Part of the licence is time-limited to reflect the timing of a future review of the catchment resources availability.

4.2 WINEP Investigations

Portsmouth Water are undertaking work to deliver its obligations under the Water Industry National Environment Programme (WINEP). WINEP represents a set of actions that the Environment Agency requires all water companies operating in England to complete in order to contribute towards meeting their environmental obligations. Under WRMP29 and WINEP, Portsmouth Water are doing extensive groundwater modelling which will support the work they are doing on WFD and ecological status.

Portsmouth Water fully understand the current level of concern over the stress chalk catchments are under and agree a programme of investigations is required on all abstraction sites. The investigations will identify any specific impacts or risks of impacts abstractions might present, whilst seeking to understand approaches to protect flows and water quality and maintaining access to sufficient water for public supply.

The initial options appraisals will be undertaken between 2026 and 2028 for the first set of investigations, with a second phase in 2030 to 2033. This is to reflect the phased approach to the investigations between the AMP8 and AMP9 planning periods.

There will be continual work with the Environment Agency to balance supply needs with environmental protection.

Appendix

A Additional SPI and Groundwater Comparisons

A.1 "~~Finchdean~~FD"

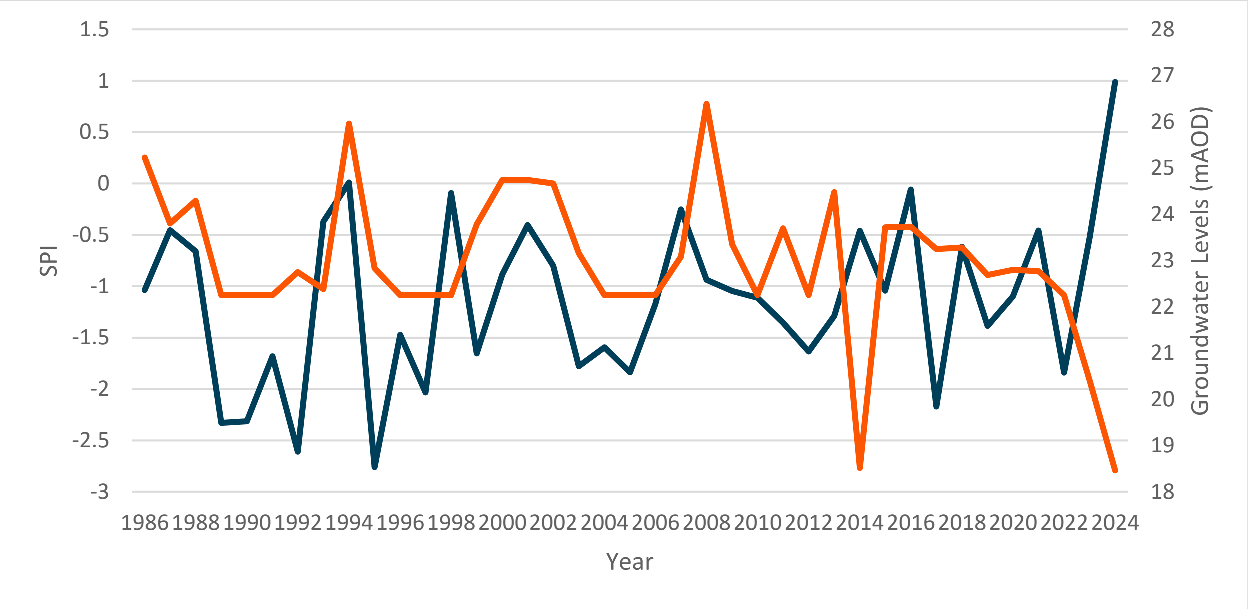

Figure A.1: ~~Finchdean~~ FD minimum groundwater levels versus minimum 6-month SPI

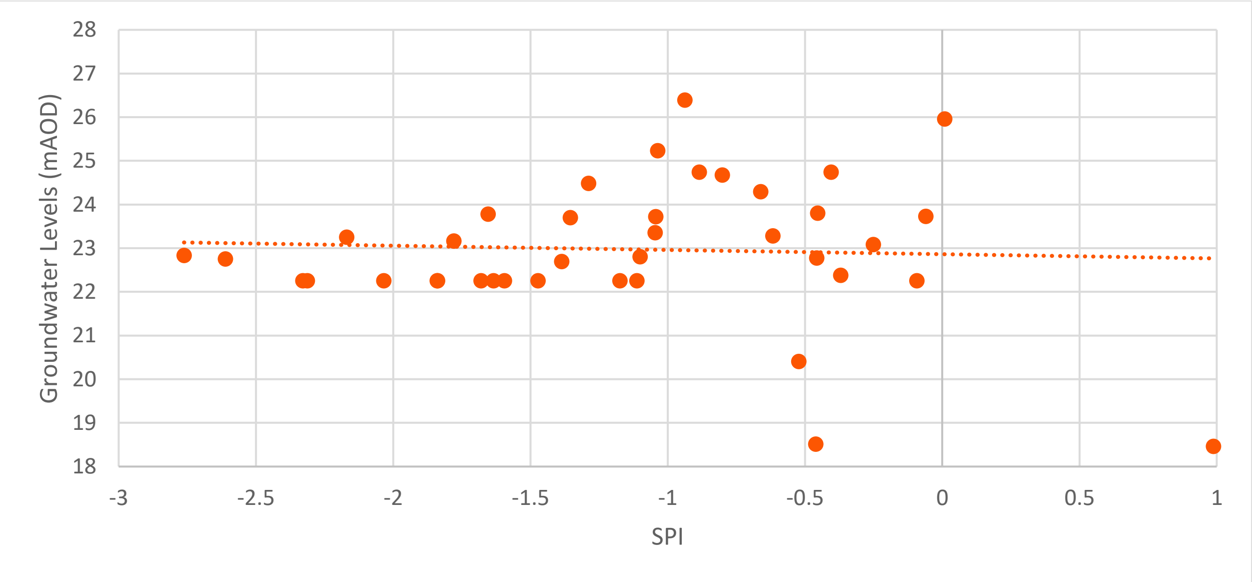

Figure A.2: Correlation of ~~Finchdean~~ FD minimum groundwater levels versus 6-month SPI

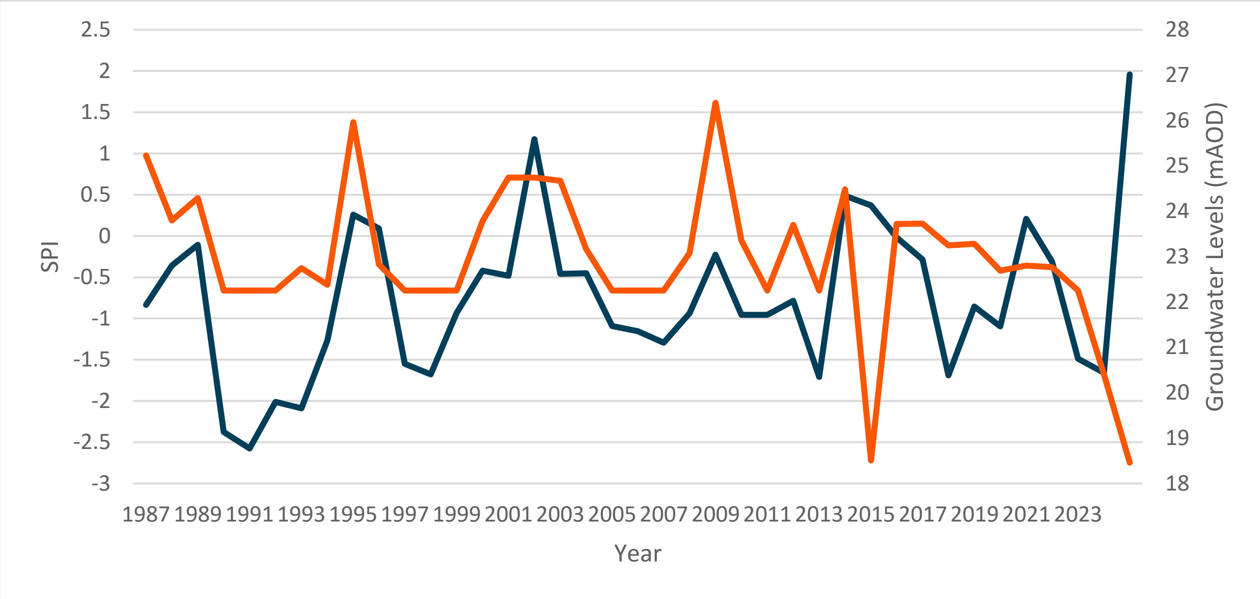

Figure A.3: ~~Finchdean~~ FD minimum groundwater levels versus minimum 12-month SPI

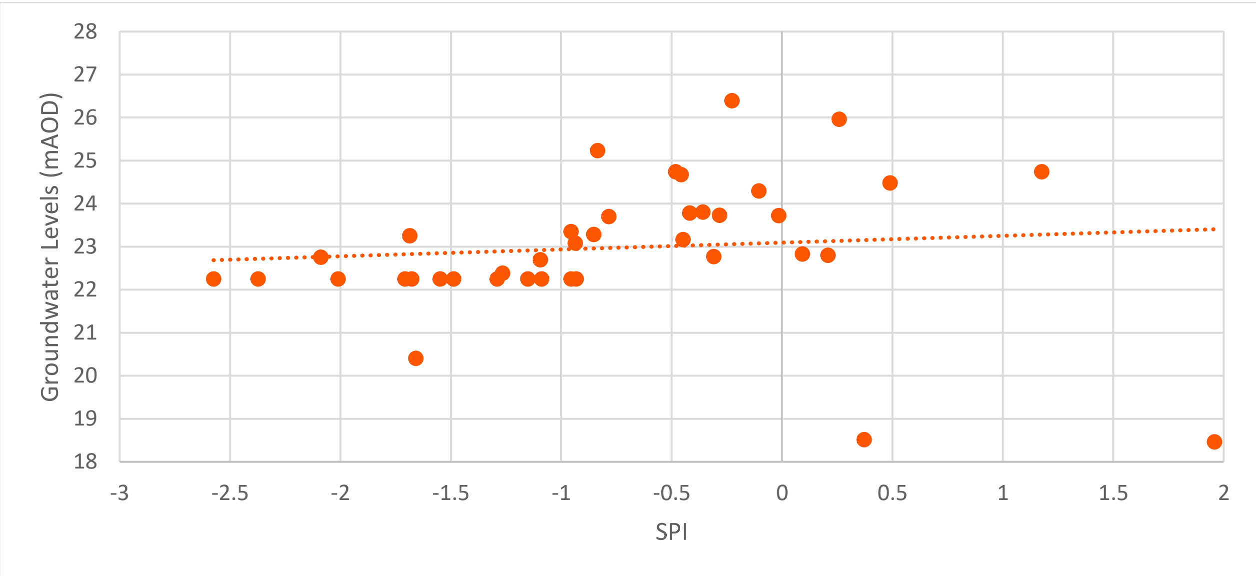

Figure A.4: Correlation of ~~Finchdean~~ FD minimum groundwater levels versus 12-month SPI

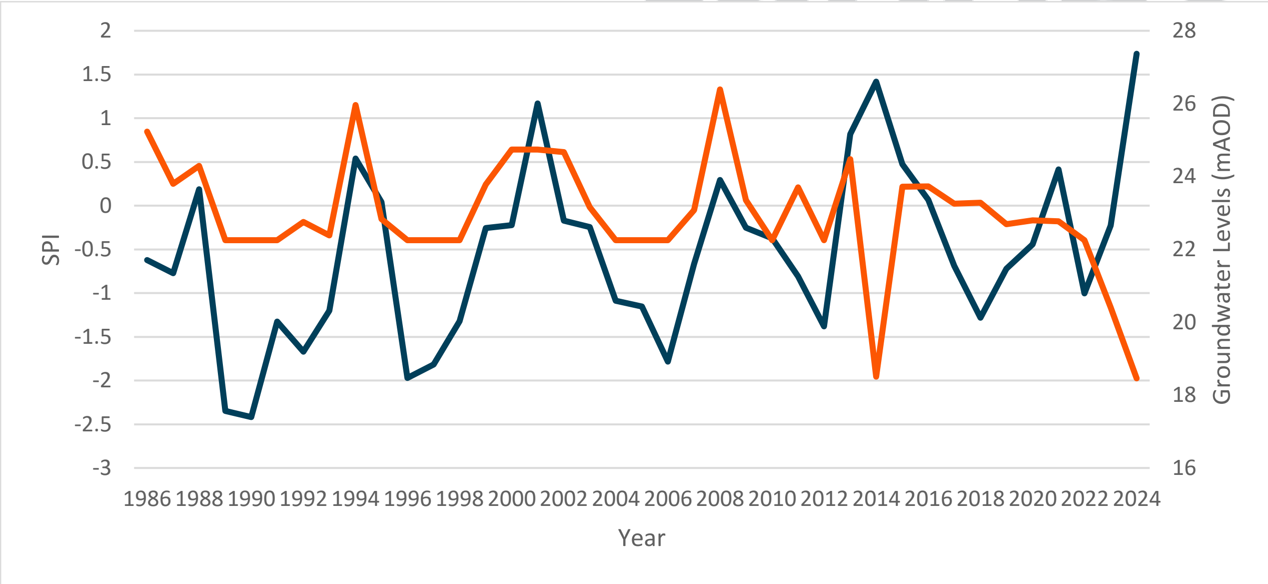

Figure A.5: ~~Finchdean~~ FD minimum groundwater levels versus minimum 18-month SPI

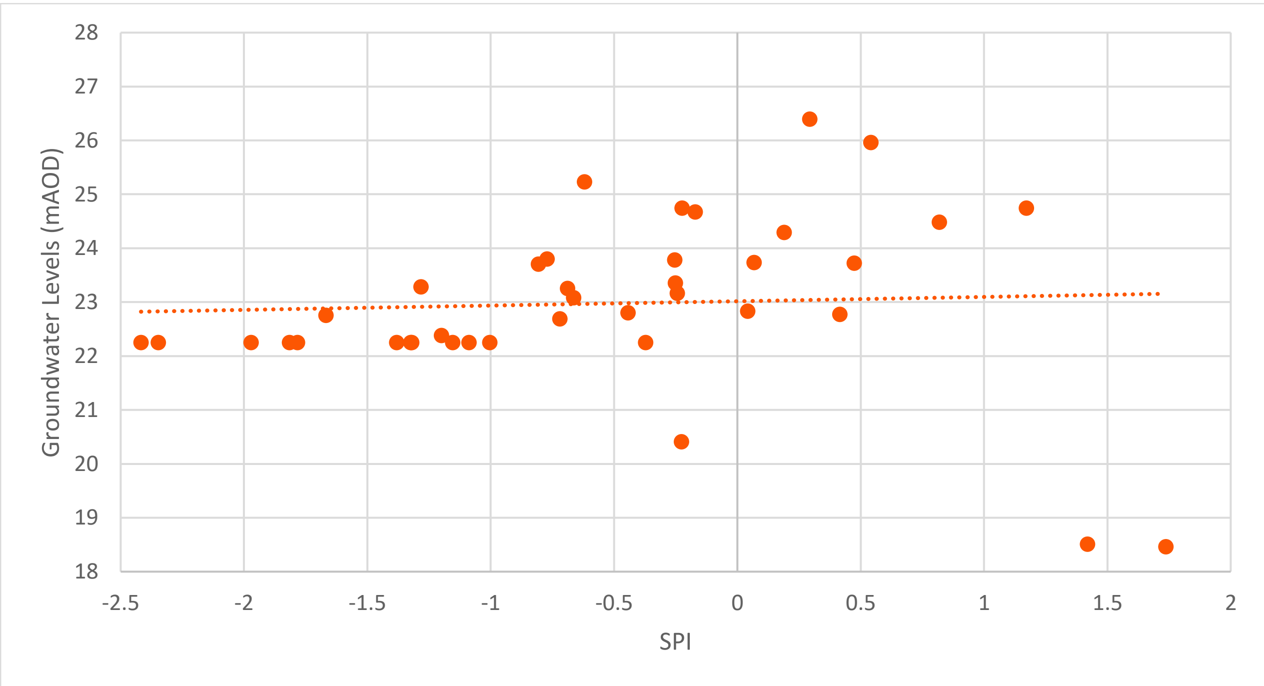

Figure A.6: Correlation of ~~Finchdean~~ FD minimum groundwater levels versus 18-month SPI

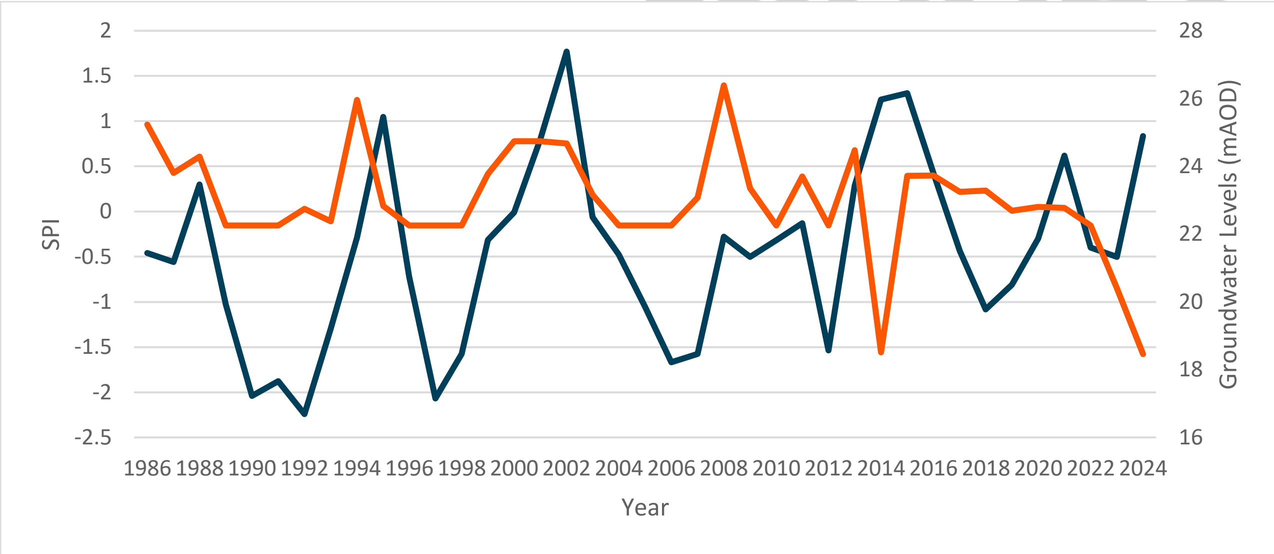

Figure A.7: ~~Finchdean~~ FD minimum groundwater levels versus minimum 24-month SPI

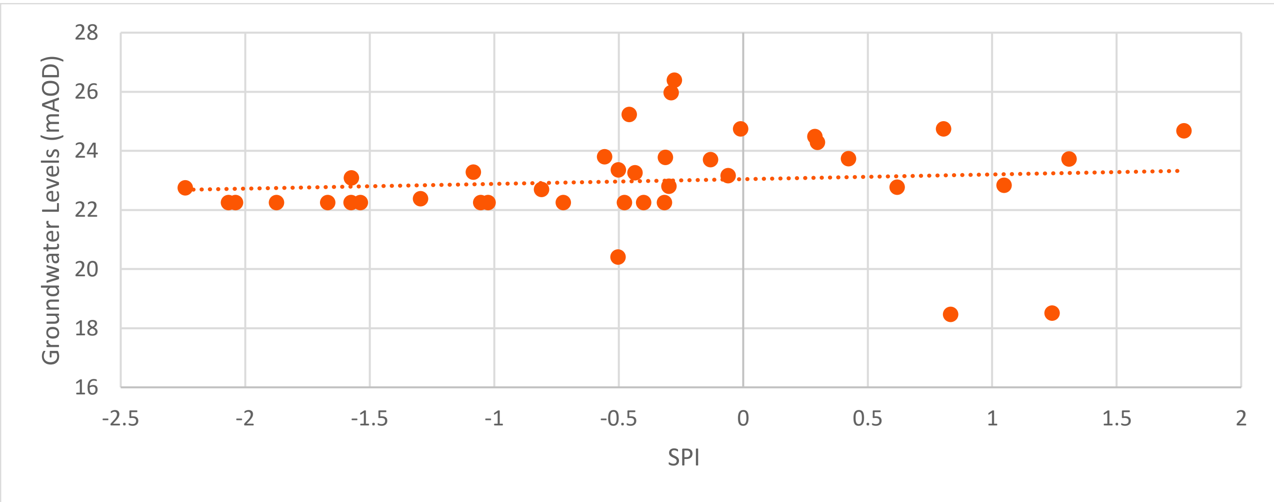

Figure A.8: Correlation of ~~Finchdean~~ FD minimum groundwater levels versus 24-month SPI

A.2 ~~Sheepwash Lane~~SWL

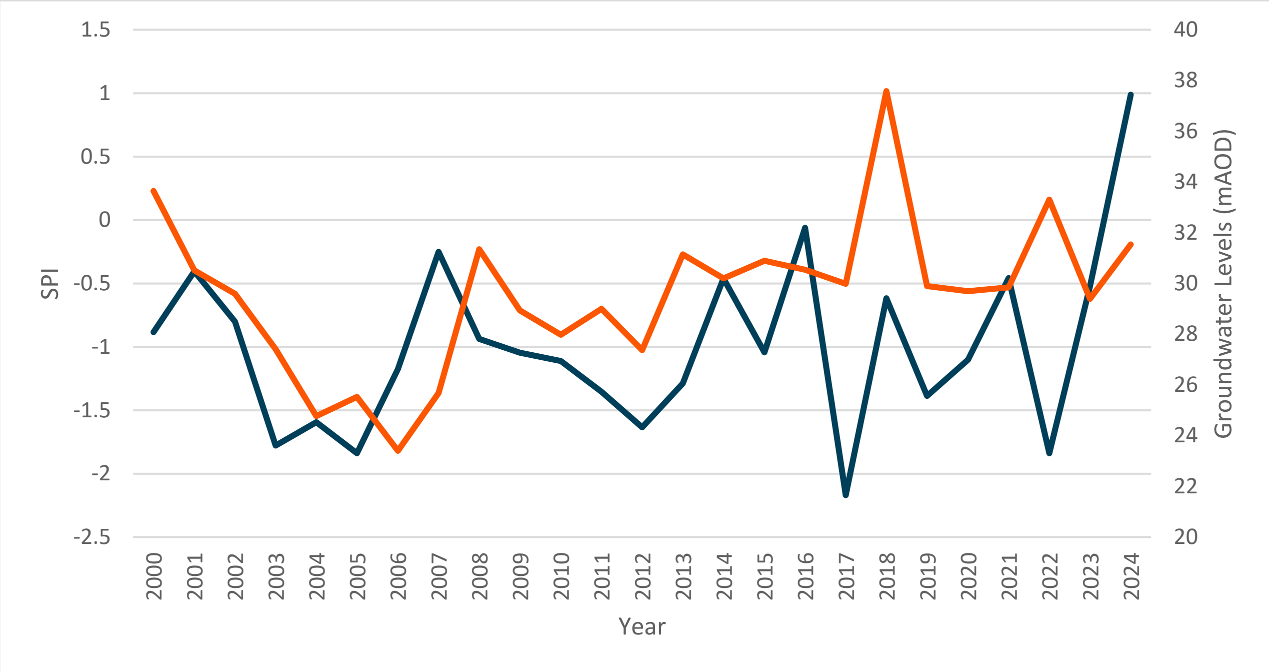

Figure A.9: ~~Sheepwash Lane~~SWL minimum groundwater levels versus minimum 6-month SPI

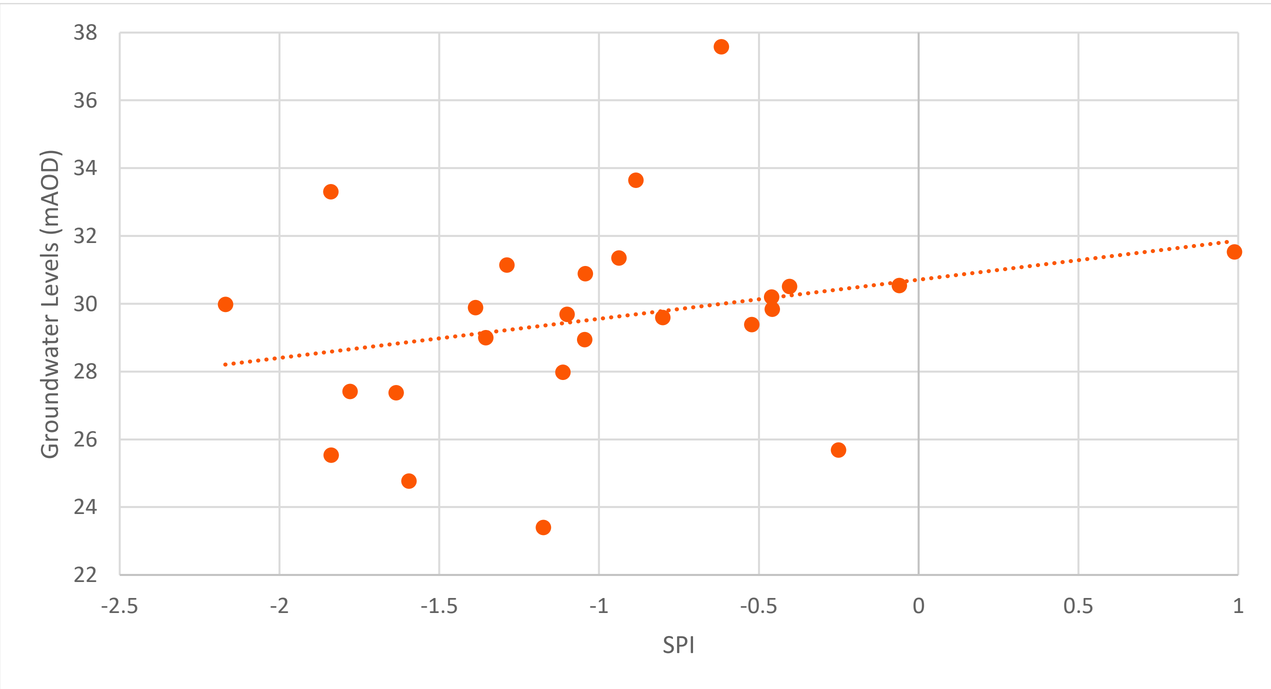

Figure A.10: Correlation of ~~Sheepwash Lane~~SWL Minimum groundwater levels versus 6-month SPI

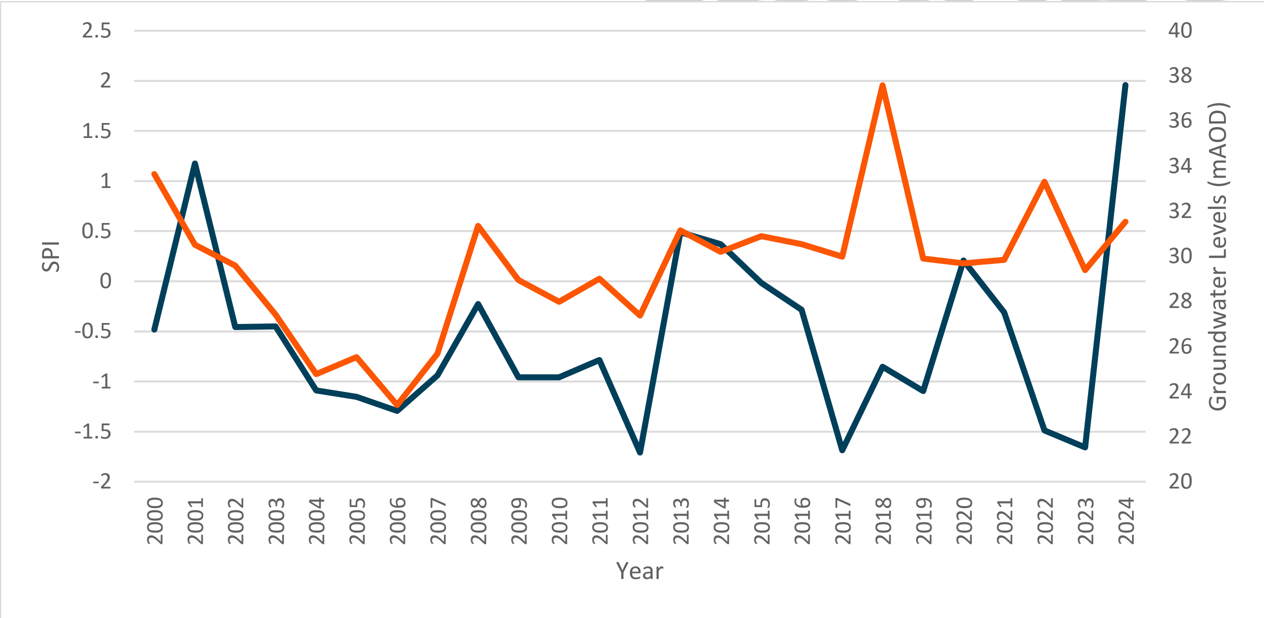

Figure A.11: ~~Sheepwash Lane~~SWL minimum groundwater levels versus minimum 12-month SPI

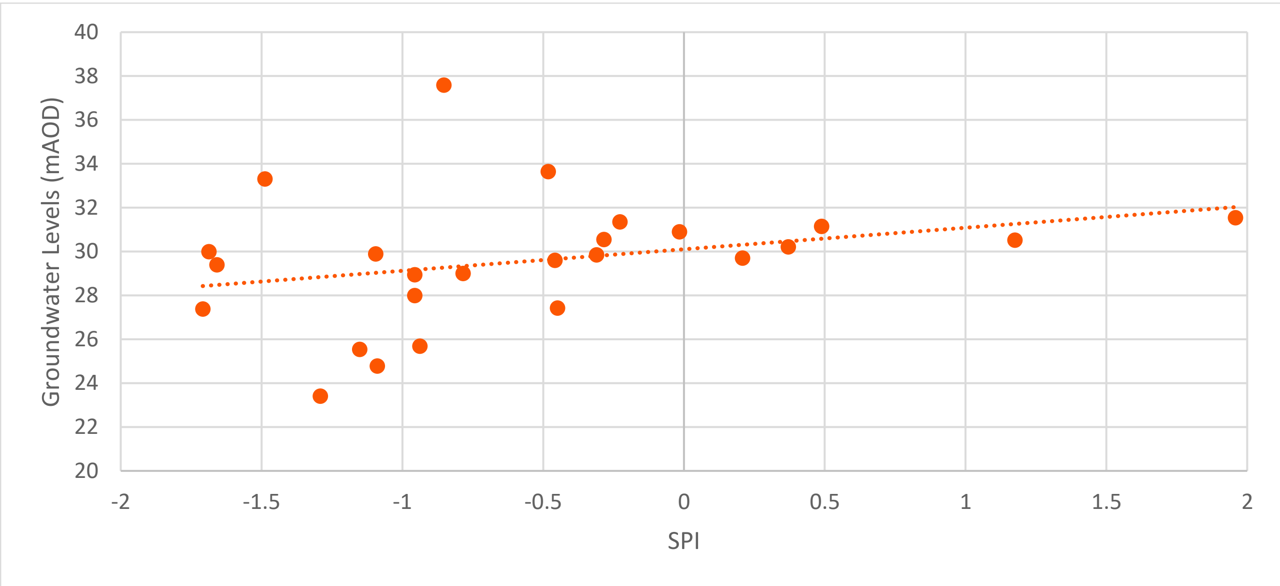

Figure A.12: Correlation of ~~Sheepwash Lane~~SWL Minimum groundwater levels versus 12-month SPI

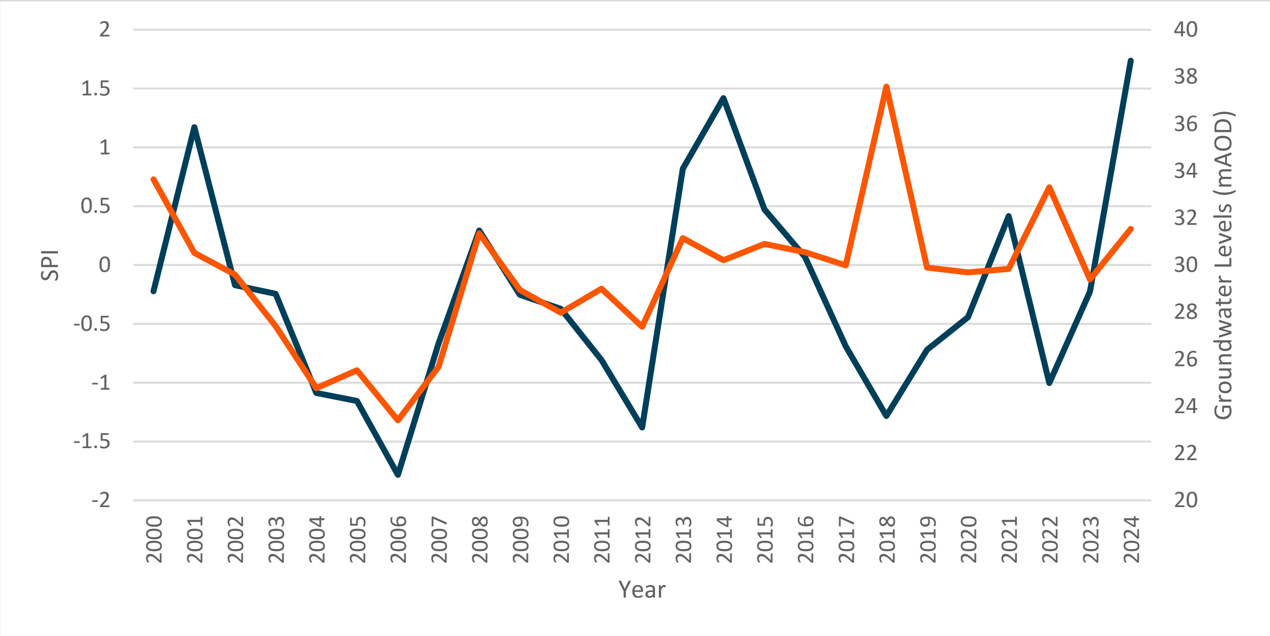

Figure A.13: ~~Sheepwash Lane~~SWL minimum groundwater levels versus minimum 18-month SPI

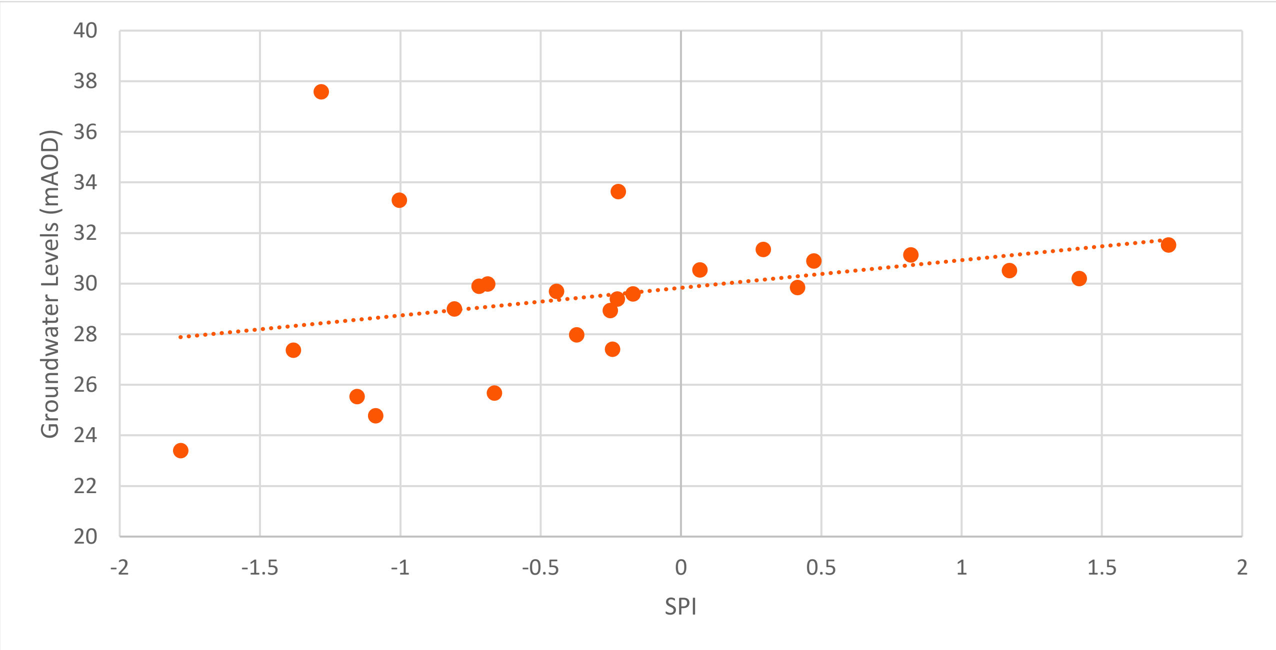

Figure A.14: Correlation of ~~Sheepwash Lane~~SWL Minimum groundwater levels versus 18-month SPI

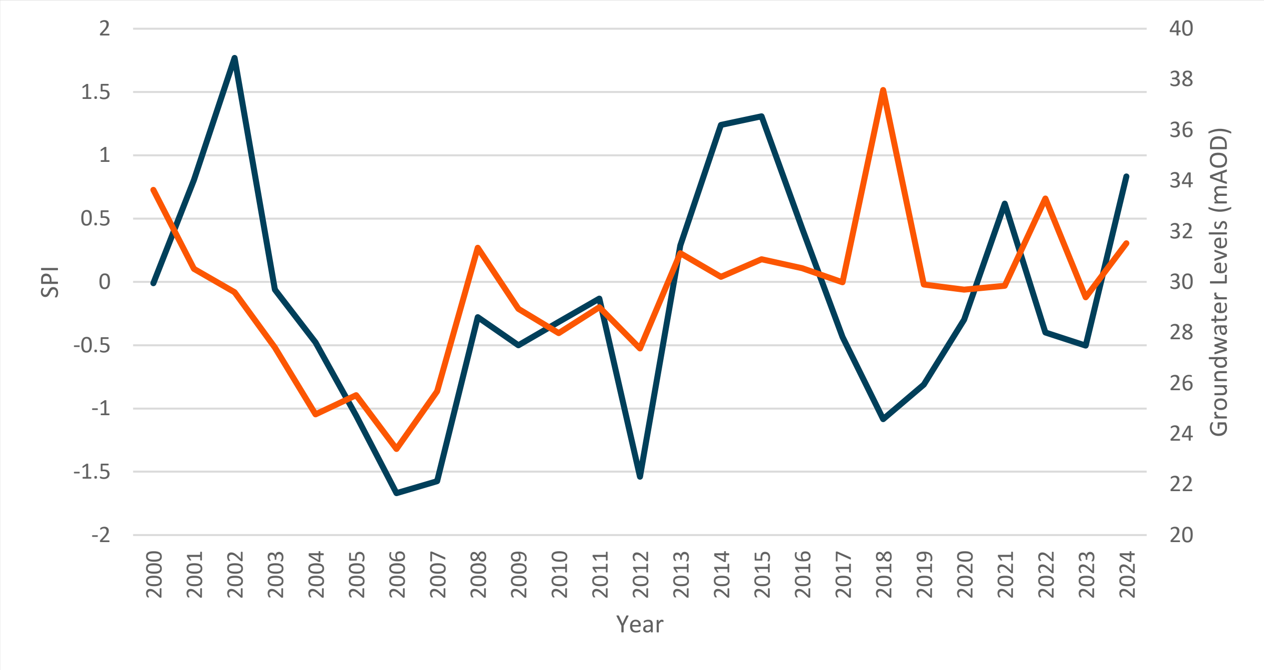

Figure A.15: ~~Sheepwash Lane~~SWL minimum groundwater levels versus minimum 24-month SPI

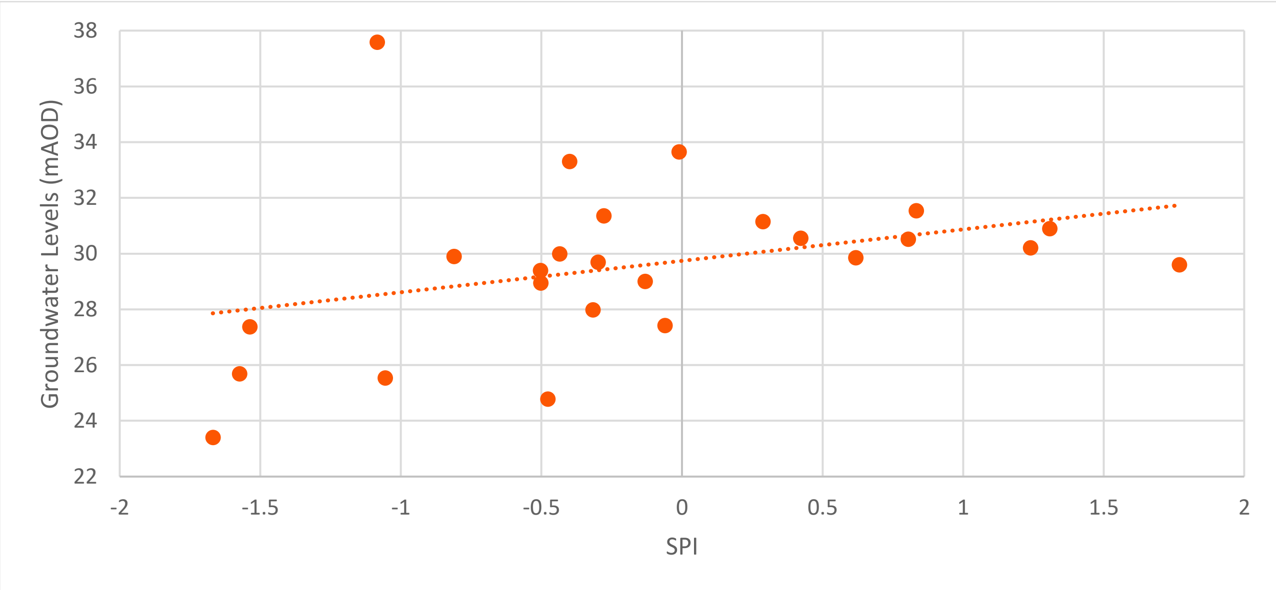

Figure A.16: Correlation of ~~Sheepwash Lane~~SWL Minimum groundwater levels versus 24-month SPI

A.3 ~~Woods Copse Forest~~"WCF"

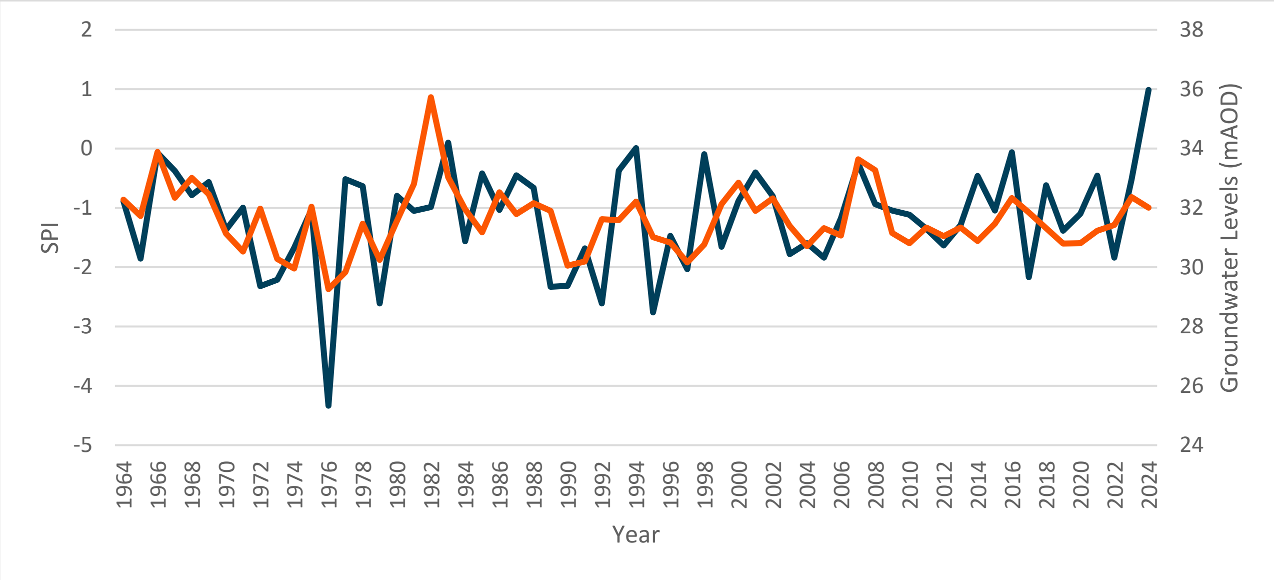

Figure A.17: ~~Woods Copse Forest~~WCF minimum groundwater levels versus minimum 6-month SPI

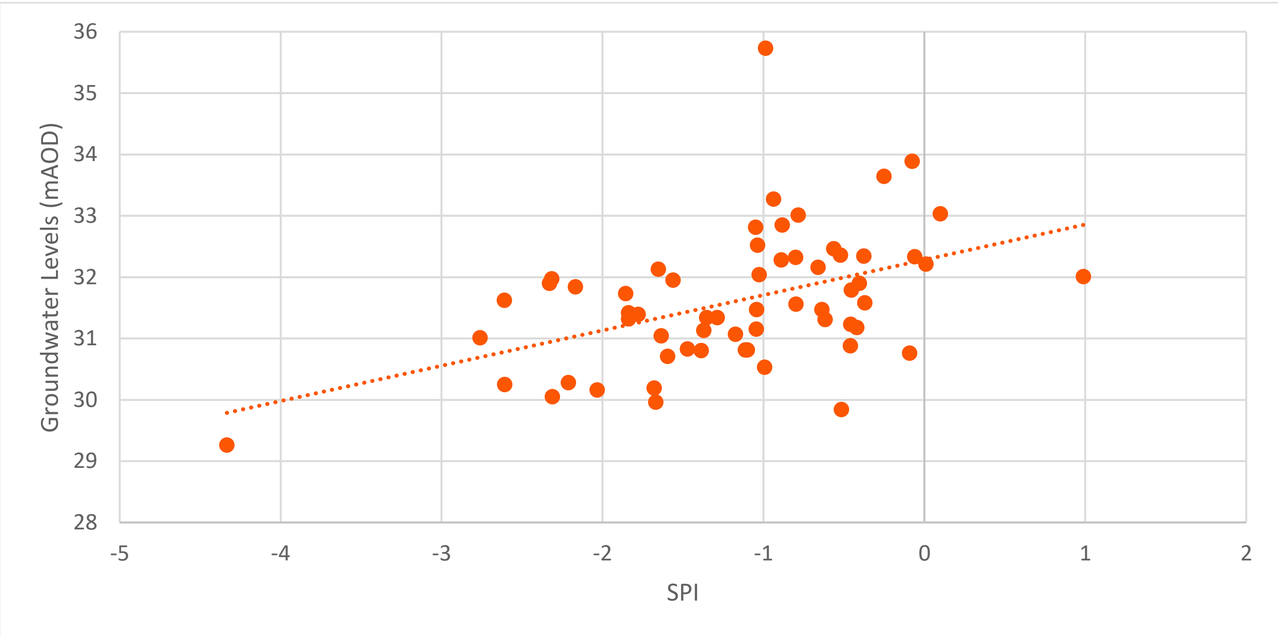

Figure A.18: Correlation of ~~Woods Copse Forest~~WCF minimum groundwater levels versus 6-month SPI

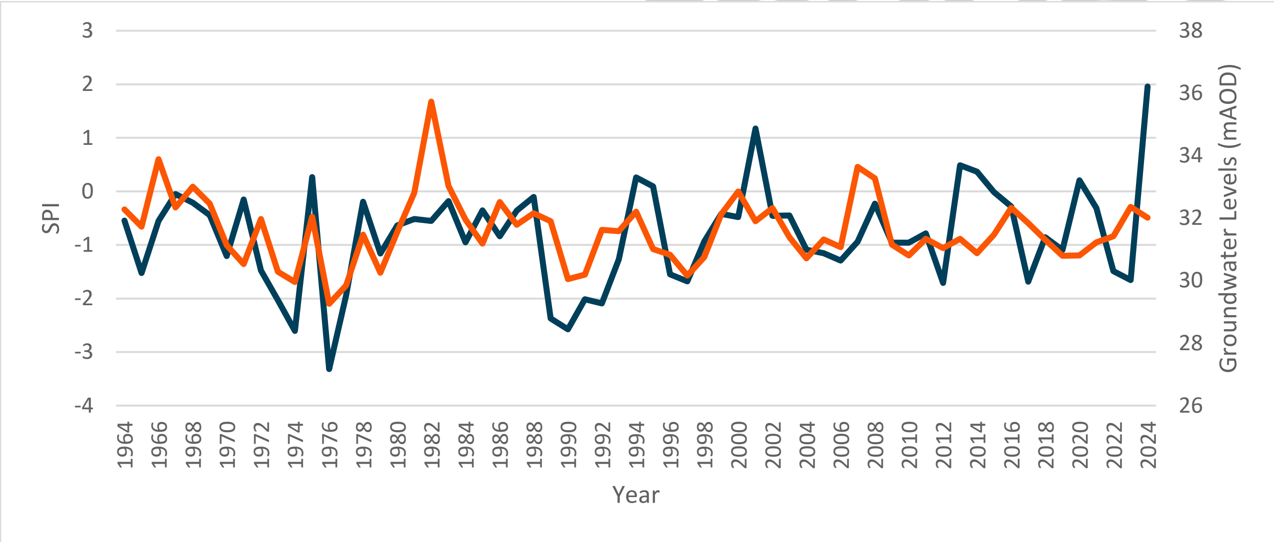

Figure A.19: ~~Woods Copse Forest~~WCF minimum groundwater levels versus minimum 12-month SPI

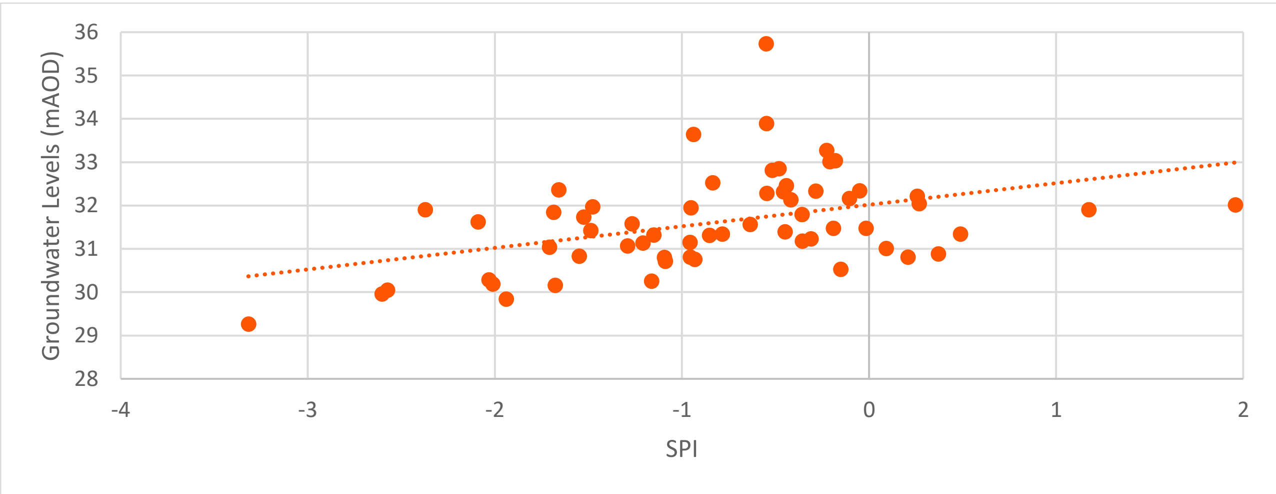

Figure A.20: Correlation of ~~Woods Copse Forest~~WCF minimum groundwater levels versus 12-month SPI

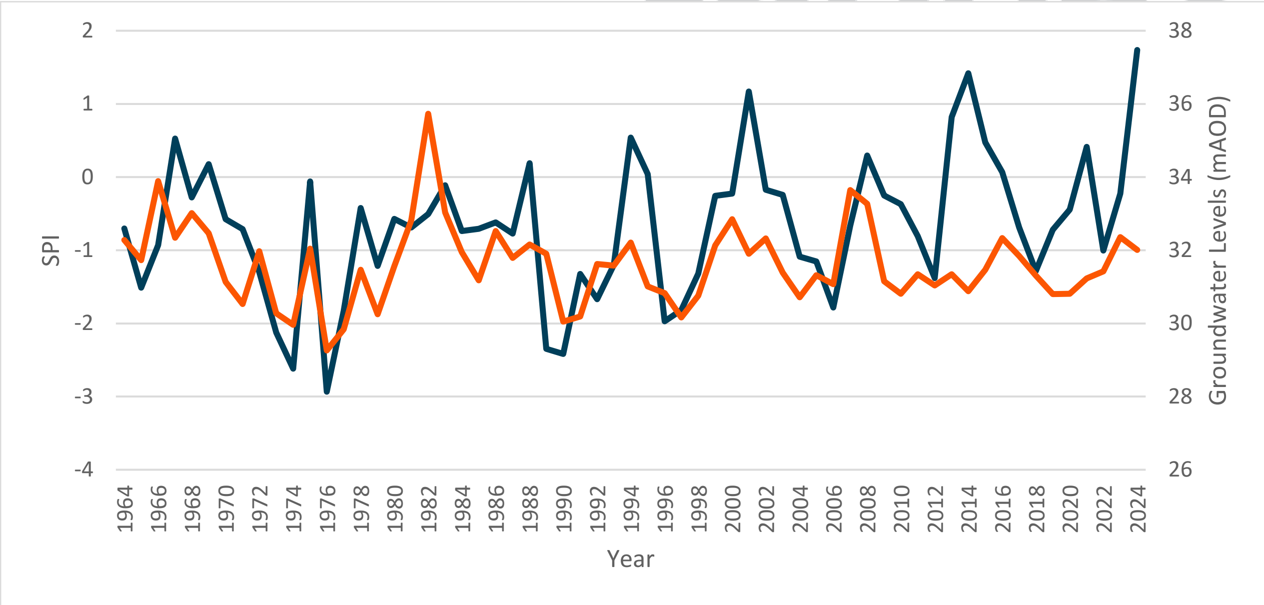

Figure A.21: ~~Woods Copse Forest~~WCF minimum groundwater levels versus minimum 18-month SPI

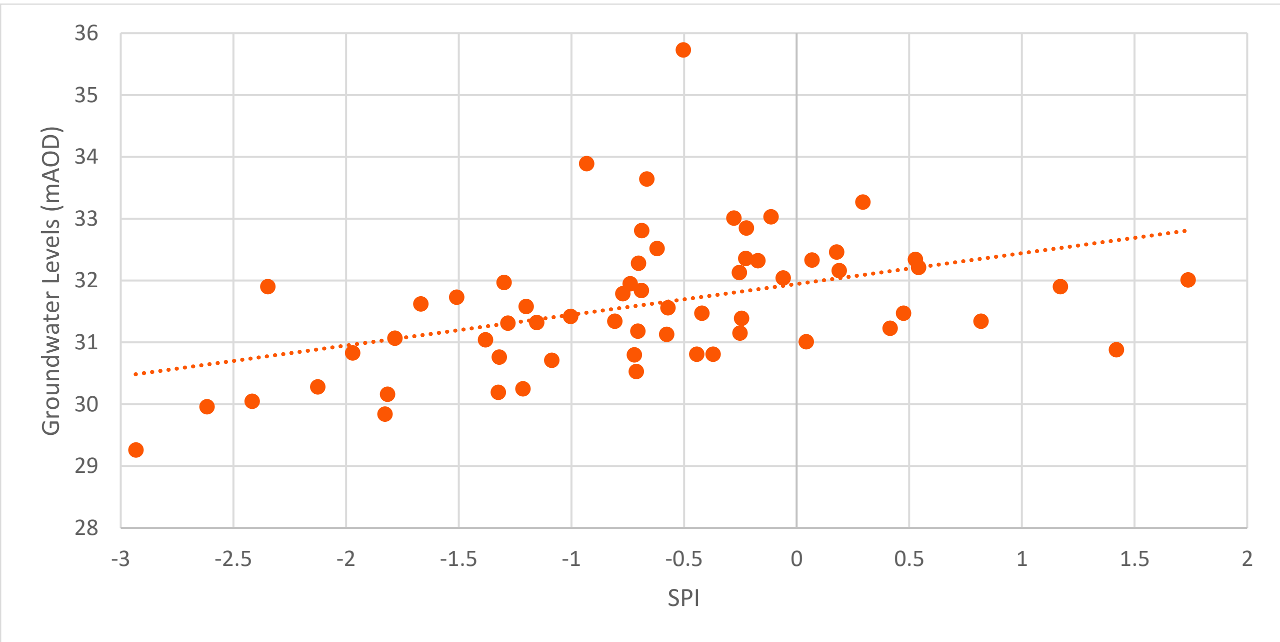

Figure A.22: Correlation of ~~Woods Copse Forest~~WCF minimum groundwater levels versus 18-month SPI

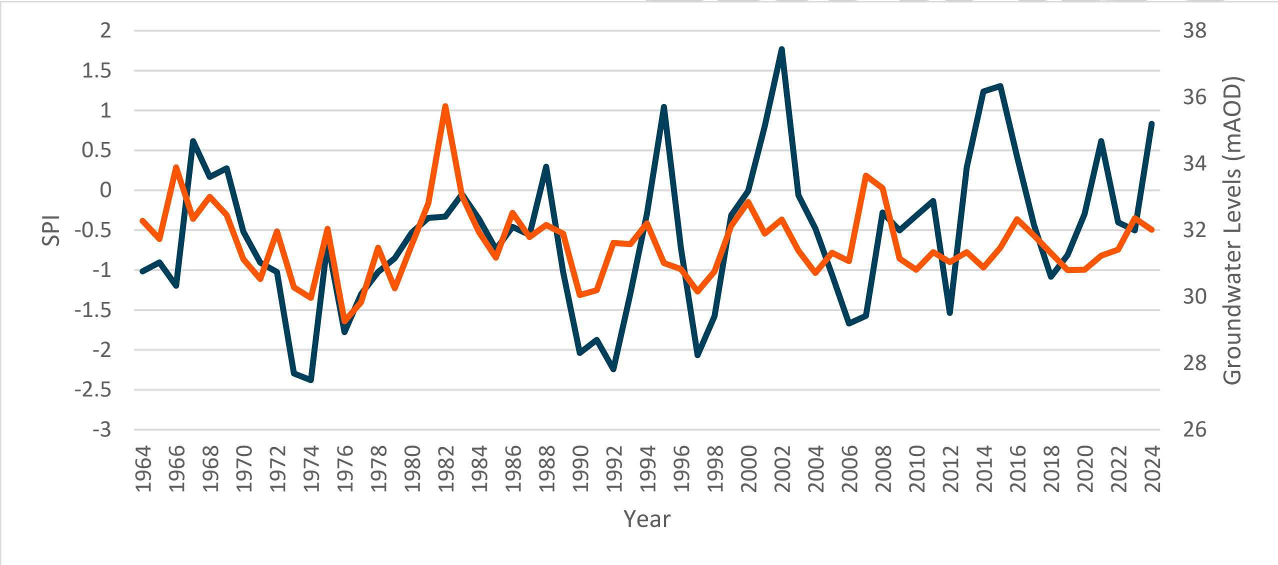

Figure A.23: ~~Woods Copse Forest~~WCF minimum groundwater levels versus minimum 24-month SPI

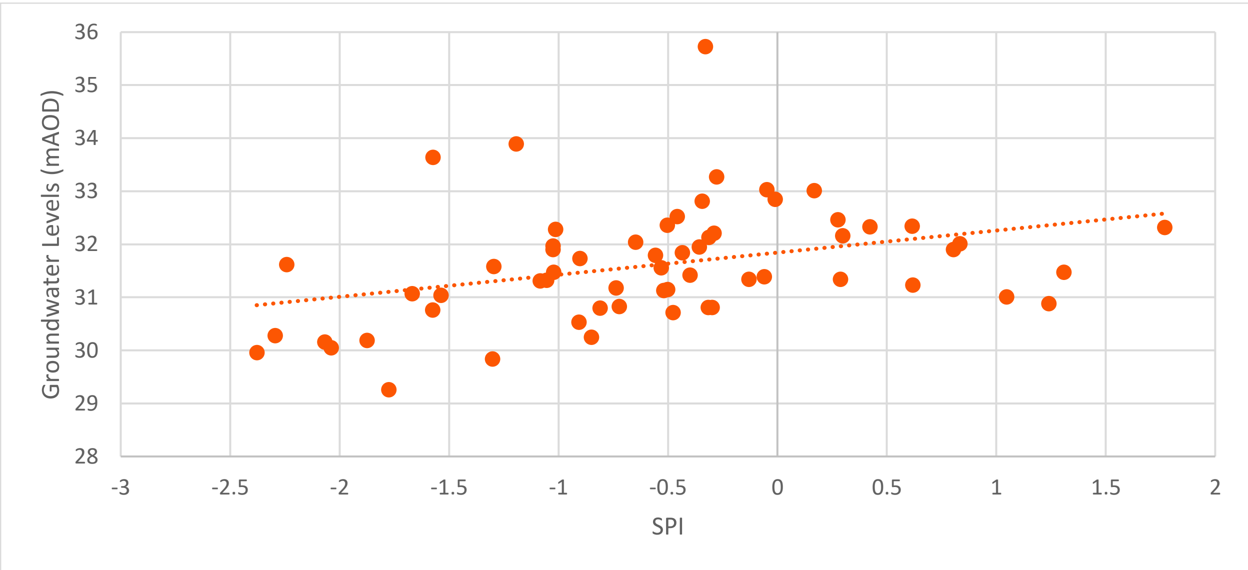

Figure A.24: Correlation of ~~Woods Copse Forest~~WCF minimum groundwater levels versus 24-month SPI

A.4 ~~Pyle Farm Cottages~~“PFC”

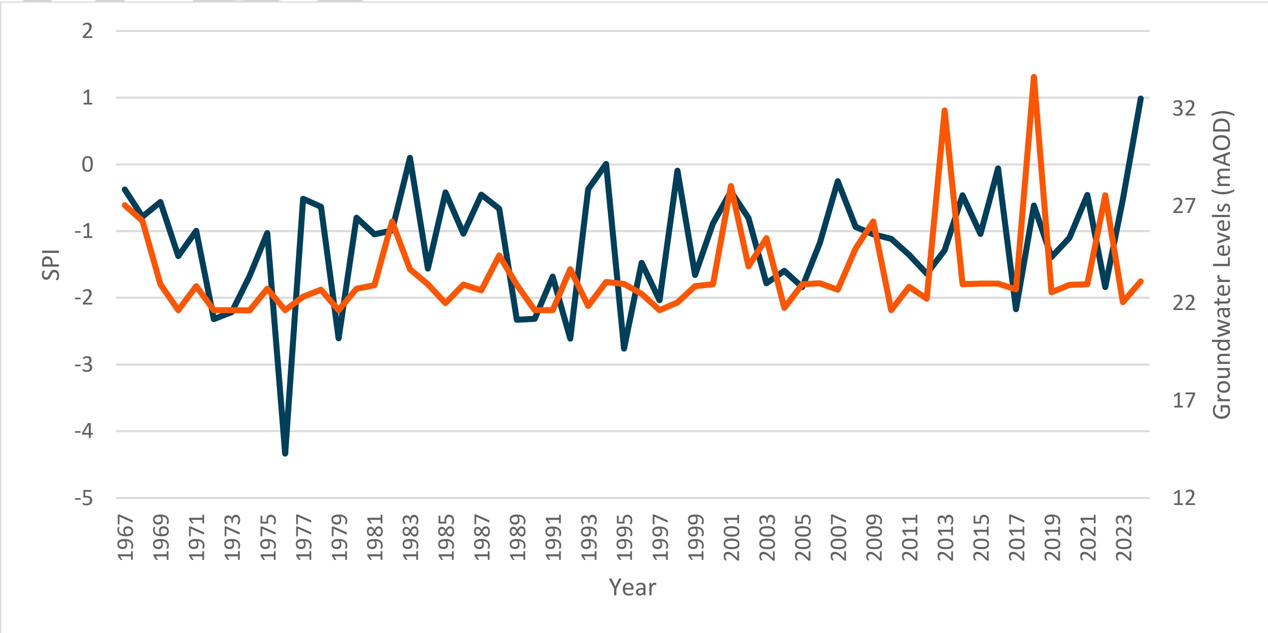

Figure A.25: ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus minimum 6-month SPI

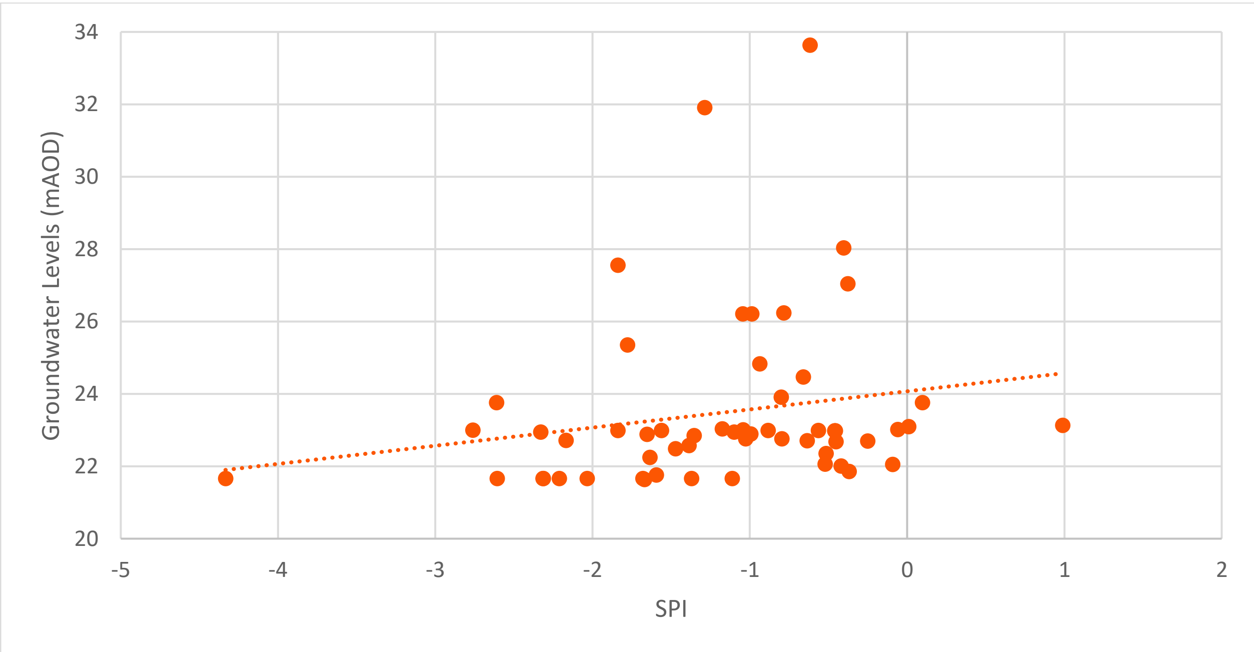

Figure A.26: Correlation of ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus 6-month SPI

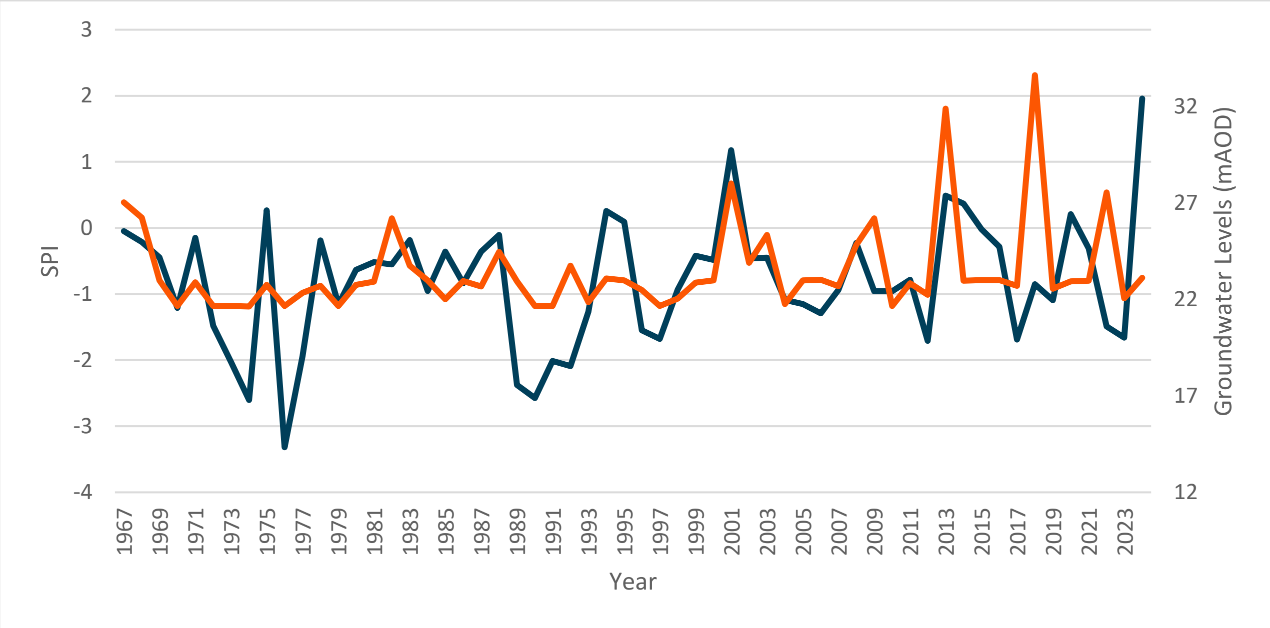

Figure A.27: ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus minimum 12-month SPI

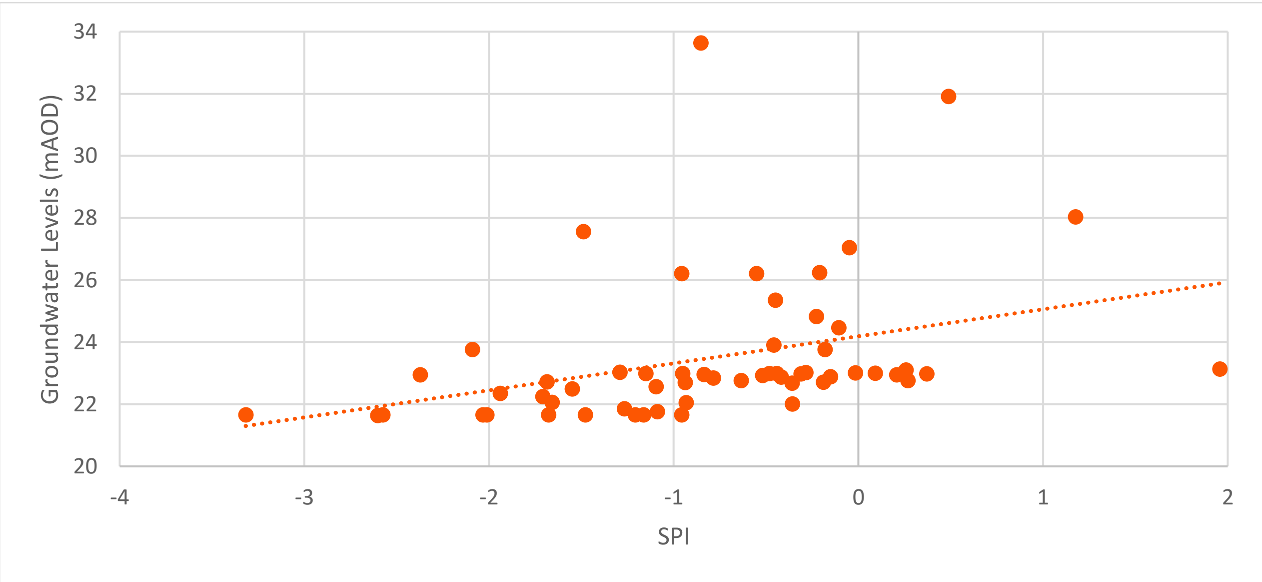

Figure A.28: Correlation of ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus 12-month SPI

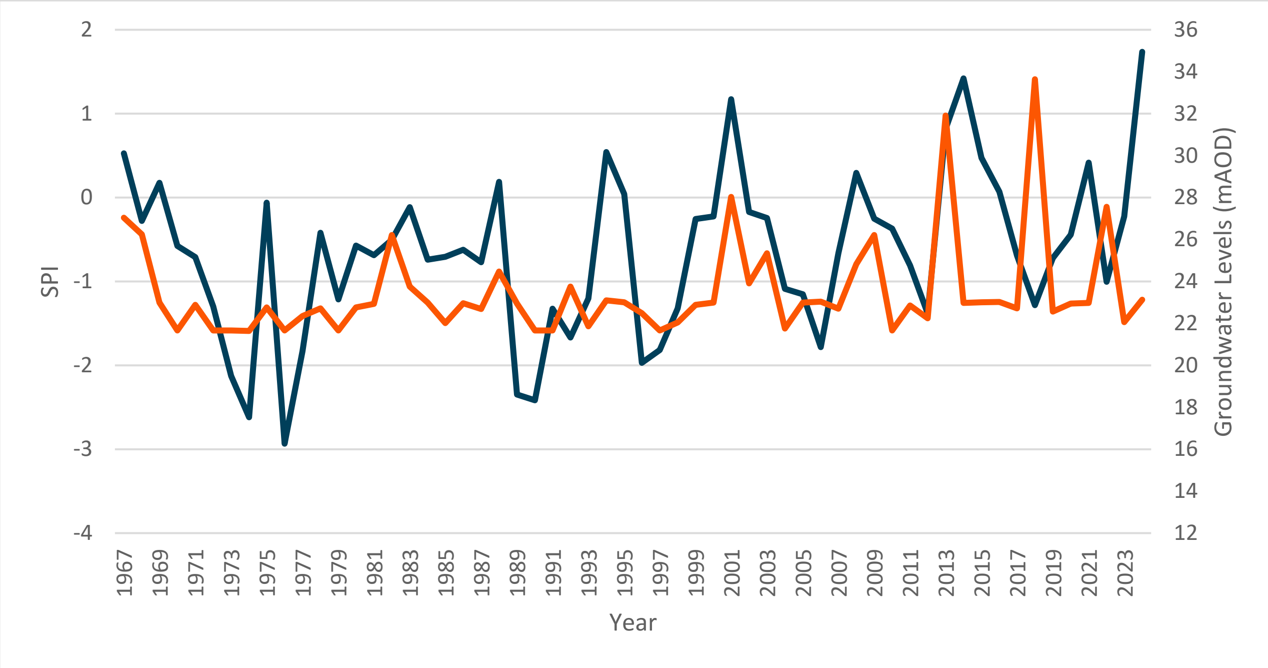

Figure A.29: ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus minimum 18-month SPI

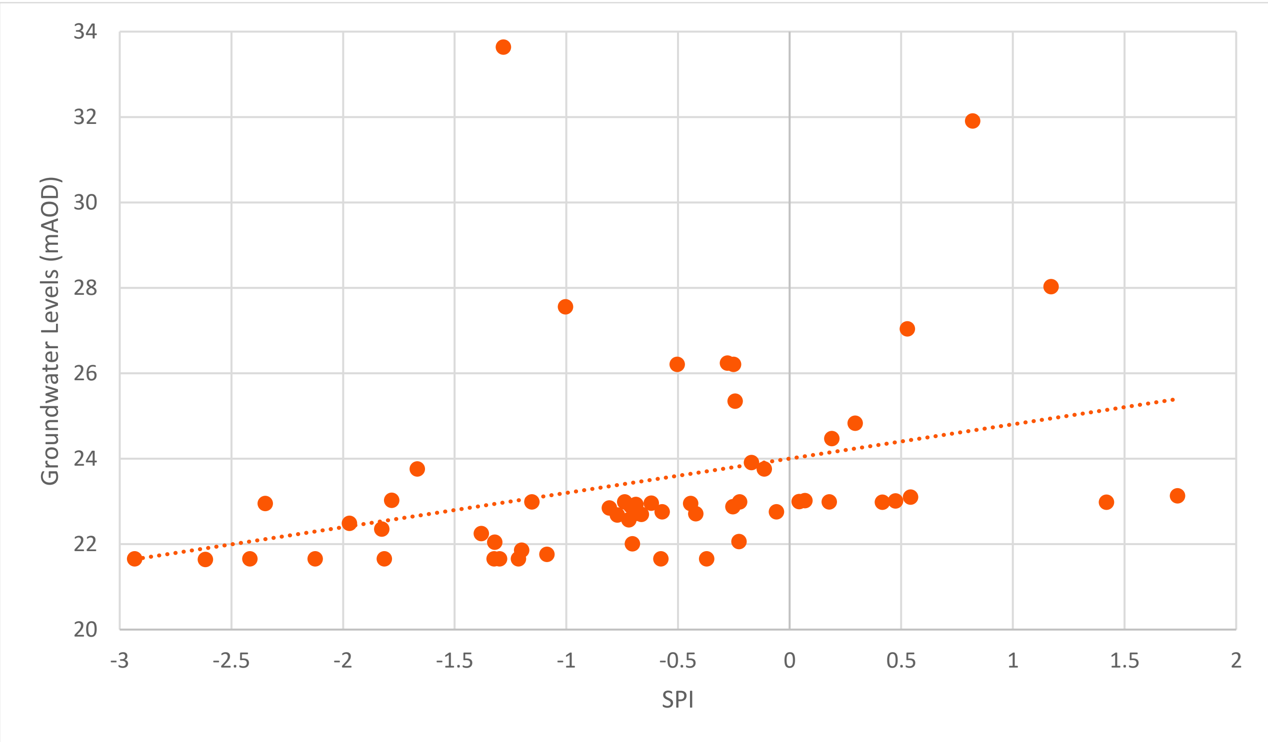

Figure A.30: Correlation of ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus 18-month SPI

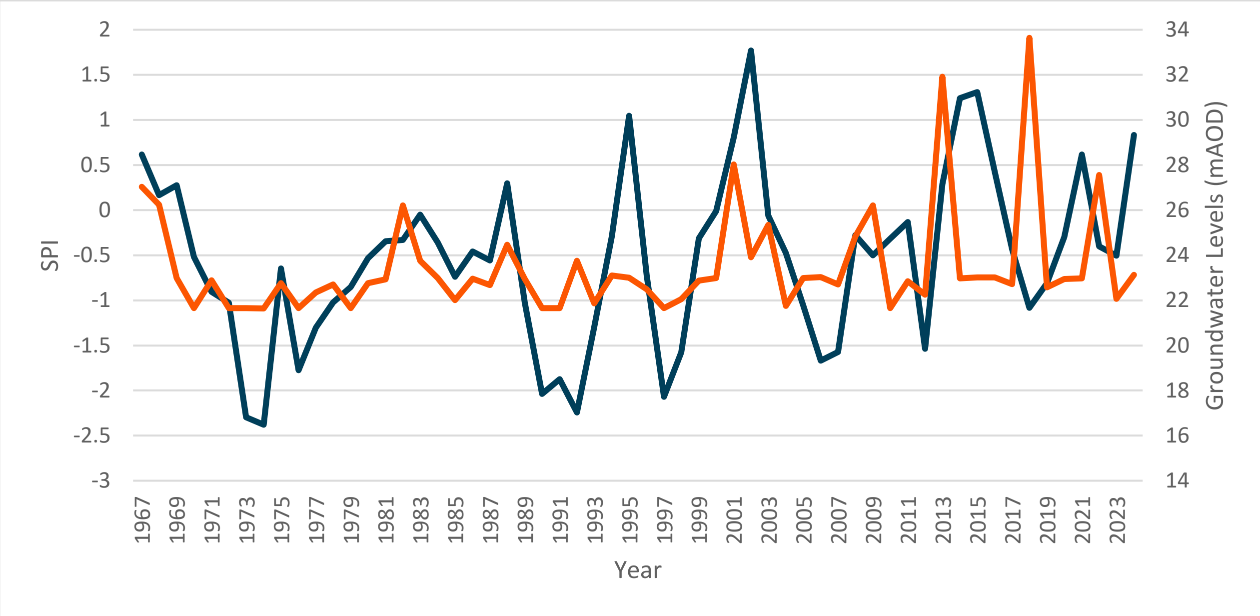

Figure A.31: ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus minimum 24-month SPI

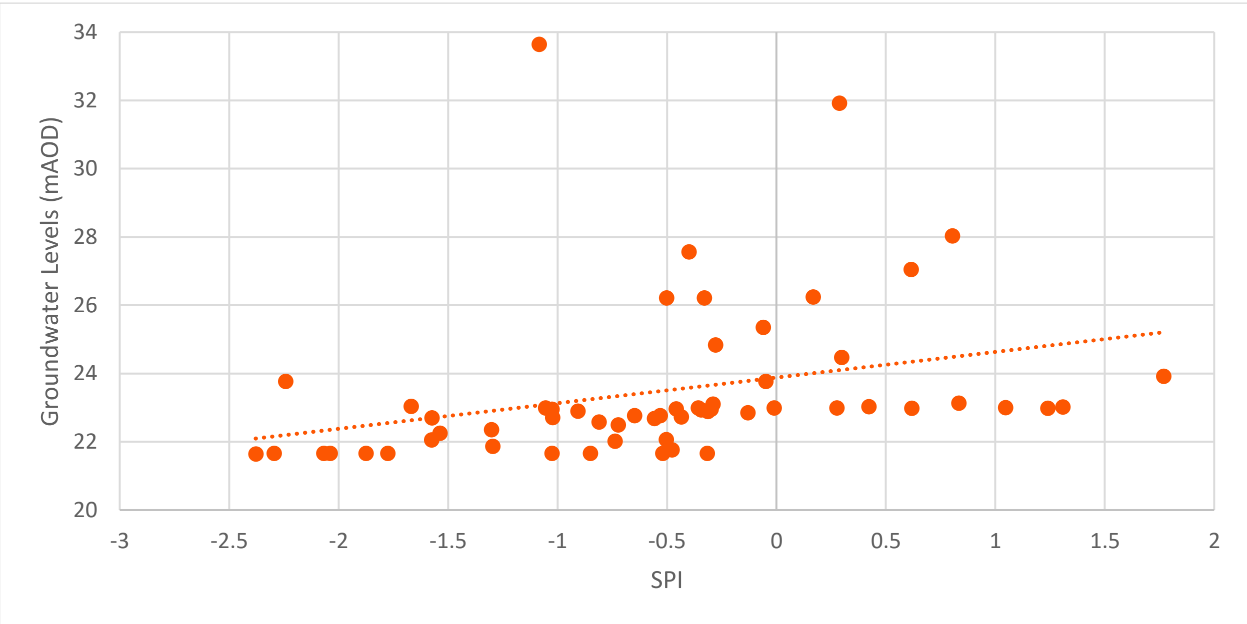

Figure A.32: Correlation of ~~Pyle Farm Cottages~~PFC minimum groundwater levels versus 24-month SPI

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