South West Water

Environmental Assessment Report

Park Lake Drought Permit

663780

DECEMBER 2022

RSK GENERAL NOTES

Project No.: 663780-2 (00)

Title: Park Lake Permit Environmental Assessment Report

Client: South West Water

Date: 23 December 2022

Office: Bristol

Status: Final

Author	Hannah Hepworth	**Technical reviewer**	Paul Gratton
Signature		Signature	
Date:	23/12/2022	Date:	23/12/2022
Project manager	Hannah Hepworth	**Quality reviewer**	Tim Cramp
Signature		Signature	
Date:	23/12/2022	Date:	23/12/2022

Wrtitten in colaboration with RSK Envireau Water, RSK Biocensus, RSK Headland Archaeology, RSK Stephenson Halliday, and RSK Fishtek Consulting.

EXECUTIVE SUMMARY

In periods of exceptionally low rainfall, when water resources become scarce, powers are available to grant ordinary and emergency drought orders under the Water Resources Act 1991 (as amended by the Environment Act 1995 and the Water Act 2003). Drought permits and drought orders are drought management actions that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment. In the case of drought permits, the Environment Agency (EA) must be satisfied that a serious deficiency of supplies of water in any area exists or is threatened and that the reason for the deficiency is an exceptional shortage of rain.

South West Water Limited (SWW) have commissioned RSK Environment Limited to produce an Environmental Assessment Report (EAR) to support a Drought Permit application in relation to Park Lake, Cornwall. Park Lake is located within the Bodmin Moor section of the Cornwall Area of Outstanding Natural Beauty (AONB), approximately 1 km southeast of Colliford Reservoir, c. 7.9 km northwest of Liskeard and c. 13 km northeast from Bodmin. Park Lake abstraction is currently operated under licence 15/48/018/G/118/R01 granted in 2018. This allows a maximum abstraction of 8 ML/d and has a cut-off level of 217.99 m AOD (measured at the lake outfall) whereby abstraction cannot exceed 4 ML/d until the level returns to 223.99 m AOD.

Due to the period of extended dry weather and exceptional shortage of rain affecting England in 2022, SWW is seeking a drought permit to aid refill of Colliford Reservoir over the winter of late 2022 and early 2023. Although this permit alone will not allow the target storage of 80% to be achieved, it is one of many measures to support winter recharge of Colliford Reservoir.

The proposed drought permit seeks to:

- Alter the destination of the abstracted water from St Cleer WTW to Colliford Reservoir.
- Increase instantaneous abstraction from 139 L/s to 243 L/s.
- Increase daily abstraction from Park Lake from 8 ML/d to 14 ML/d.
- Increase in annual abstraction limit from 2,920 ML to 3,232 ML.

This EAR has assessed the potential impacts on the environment from this proposed drought permit and has found the following:

- Hydrology – the only hydrological feature to be impacted is Park Lake itself as overflow to the Fowey rarely occurs. The lake level will fall faster, further, and for longer than it has historically. The lake is sensitive to abstraction in terms of water level but the impact of abstraction as proposed is concluded to be of ‘Minor’ significance due to the established hands-off level within the abstraction licence remaining in place as mitigation.
- Water quality – the baseline water quality of Park Lake and Colliford Reservoir are considered comparable by SWW and transfer between the sources is already established. The additional drawdown in level within Park Lake is not expected to introduce additional pollutants into the system, will prevent any overspill into the Fowey and the impact of the drought permit operation is concluded to be of ‘Negligible’ to ‘Minor’ significance.

- Ecology – following a review of existing ecological data for the site, the drought permit is considered to have a 'Minor/Negligible' impact on the ecological receptors assessed. No significant negative impacts to ecology were identified through the assessment (for the purposes of this report significant negative impacts are defined as those of at least moderate significance). As such, no mitigation is proposed at this stage. Further baseline monitoring is however recommended to increase the confidence in this assessment.
- Designated sites – aside from a minor visual impact from increased drawdown, the impact of the drought permit on designated sites is deemed to be of 'Negligible' significance.
- Heritage – the only asset identified with the potential to be affected by the proposals is Park Lake itself which is deemed to be a non-designated heritage asset. The sensitivity of this asset is assessed as being 'Not Sensitive'. The magnitude of impact arising from fluctuating water levels in the former quarry pit would be 'Negligible', resulting in a 'Negligible' significance of impact.
- Landscape – while the sensitivity of the landscape is considered to be 'High', the extent and nature of any impacts fall within the existing parameters of water level variance on both lakes. The magnitude of impact is therefore assessed as 'Negligible' resulting in a 'Minor' significance.
- Tourism and Recreation – the sensitivity of the tourism and recreation in the area is determined to be 'Low', and the impact to be 'Minor'.

The mitigation recommended includes:

- Ceasing abstraction from Park Lake when the water level is at the HoL.
- If a marked decrease in flows in the Trenant Stream is observed, abstraction shall return to the maximum licenced rate whilst SWW seek advice from the EA.

The monitoring recommendations include:

- The proposed hydrological monitoring will cover:
    - Pre-implementation readings and subsequently weekly readings from groundwater piezometers for the duration of the drought permit implementation.
    - Abstraction rates from Park Lake.
    - Level readings at Park Lake (cease abstraction if the level is dropping too quickly against curve or crosses Hands-Off level).
    - Outflow readings from Park Lake.
    - Flow rates in the Trenant Stream (compensation outflows will be increased if river flows drop).
    - Visual inspection of Park Lake sides as level draws down.
    - Water quality monitoring below the Park Lake outflow prior to abstraction commencing.
- The proposed water quality monitoring will cover:
    - Monthly water samples of water abstracted from Park Lake.
- The proposed ecological monitoring will cover:
    - Baseline monitoring of protected species prior to implementation of drought permit, and regular monitoring of aquatic habitat and species during and post implementation.

CONTENTS

TABLES

FIGURES

1 INTRODUCTION

1.1 Background

South West Water Limited (SWW) have commissioned RSK Environment Limited to produce an Environmental Assessment Report (EAR) to support a Drought Permit application in relation to Park Lake, Cornwall.

SWW provides drinking water across Devon, Cornwall, Dorset and parts of Somerset. Since merging with Bournemouth Water, they also supply Hampshire and Wiltshire. In addition to the above, SWW also supply the Isles of Scilly.

Three large reservoirs supply the southwest area; Colliford, Roadford, and Wimbleball, together they store more that 84,000 million litres of water. In addition, Colliford and Wimbleball have winter pumped storage systems to assist in the reservoirs' recovery after severe and extended dry periods.

As part of SWW's strategy to improve their resilience to droughts, they produced a Drought Plan which was published in 2022. As part of this, a variety of approaches are considered to reduce the stress on SWW's sources of supply and water supply system.

SWW have categorised drought severity into 4 levels with each level triggering a type of action. These go through from Level 1 (defined as 'less severe but more frequent droughts') to Level 4 (defined as 'very rare but very severe droughts'). The Drought Plan only includes actions up to Level 3 as Level 4 is for Emergency Drought Orders for very extreme droughts that occur beyond once every 500 years. To prevent Level 4 actions, Level 3 is split into separate actions: Level 3 and More before 4. The More before 4 is defined as extreme drought which is considered to be a drought with a 1 in 500 year return period in which drought permits are required to be able to action the drought measures (SWW, 2022a).

1.2 Drought orders and drought permits

In periods of exceptionally low rainfall, when water resources become scarce, powers are available to grant ordinary and emergency drought orders under the Water Resources Act 1991 (as amended by the Environment Act 1995 and the Water Act 2003). Drought permits and drought orders are management actions that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment (EA & Defra, 2019).

In the case of drought permits, the Environment Agency (EA) must be satisfied that a serious deficiency of supplies of water in any area exists or is threatened and that the reason for the deficiency is an exceptional shortage of rain.

Drought permits can be applied for under the Water Resources Act 1991 (Section 79A) where the main change is variation of an abstraction licence condition, such as the maximum yearly allocation or a compensation flow. They are authorised by the EA which can hold a public hearing to discuss the application if it deems one is necessary.

Following the severe drought in northern England in 1995/96, the Government set out a wide range of actions to be taken by the water industry, including the need for water companies to demonstrate that they have adequate drought contingency plans. As required under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 and in accordance with the Drought Plan Regulations 2005 and the Drought Plan Direction 2020, water companies have a duty to prepare and maintain a Drought Plan.

Prospective drought permit options are identified within Drought Plans. Over the last 12 months SWW's Drought Plan has been going through the routine statutory update process with DEFRA. The Drought Plan details the range of actions that SWW will consider implementing during drought conditions to maintain essential water supplies to its customers and minimise environmental impact.

The environmental assessment of drought permits is undertaken in recognition of the guidance from the EA and Defra, as contained in:

- EA and Defra Guidance on Drought Permits and Drought Orders (May 2019); and
- EA environmental assessment for water company drought planning supplementary guidance (July 2020).

The environmental assessment of a drought permit is not a statutory Environmental Impact Assessment (EIA), as recognised, for example, within the Town & Country Planning regime and its enabling regulations. However, this environmental assessment has been undertaken in accordance with best practice guidance wherever applicable.

An EAR, which includes a monitoring plan and mitigation measures, is required for any supply-side management action (e.g., drought permits) included within a Drought Plan. EARs should provide details of baseline flow conditions, assess impacts of potential changes to the flow regime due to implementation of a drought permit, and provide an Environmental Monitoring Plan (EMP) to support the requirement for baseline, during and post drought permit implementation monitoring. SWW has prepared this "application ready" EAR in line with its Drought Plan.

1.3 Scope and objectives

This report constitutes an EAR for the potential Park Lake drought permit option. The report is structured as follows:

- Section1 – Introduction
- Section 2 – Description of proposal
- Section 3 – Environmental Assessment Methodology
- Section 4 – Hydrological Assessment
- Section 5 – Water Quality Assessment
- Section 6 – Ecological Assessment
- Section 7 – Designated Sites
- Section 8 – Assessment of other environmental considerations
- Section 9 – Summary
- Section 10 – Mitigation Measures
- Section 11 – Monitoring Plan

- Section 12 - Conclusion

2 DESCRIPTION OF PROPOSAL

2.1 Site setting and background

Park Lake is located within the Bodmin Moor section of the Cornwall Area of Outstanding Natural Beauty (AONB), approximately 1 km southeast of Colliford Reservoir (also known as Colliford Lake), c. 7.9 km northwest of Liskeard and c. 13 km northeast from Bodmin. Park Lake is not publicly accessible and is surrounded by agricultural farmland.

Previously Park Lake was operated as a China clay quarry, constructed over the historical course of the Trenant Stream. To prevent inundation of the quarry pit, the Trenant Stream was diverted around the periphery of the site via an artificial leat channel, re-joining the natural stream course downstream of the site boundary. Since quarrying activity ceased at the site the former pit has naturally flooded via groundwater recharge.

2.2 Current operation and abstraction regime

Park Lake abstraction is currently operated by SWW under licence 15/48/018/G/118/R01 granted in 2018. This allows a maximum abstraction of:

- 0.5 ML an hour
- 8 ML a day
- 2,920 ML a year

These abstractions should not exceed an instantaneous rate of 139 L per second.

The licence states a Hands-off Level at which abstraction must cease if the water is measured to be less than 217.99 m AOD.

Abstraction is licenced to be via two variable speed submersible pumps, which transfer water into the public water supply at St Cleer Water Treatment Works (WTW).

2.3 Proposed drought measure

Due to the period of extended dry weather and exceptional shortage of rain affecting the UK in 2021 and 2022, water levels in Colliford Reservoir reached the lowest levels recorded since the mid-1980s. A dry winter is forecast for 2022, which combined with the current low level of the reservoir represent a risk to public water supply. Target operating level at Colliford Reservoir is 80% for April 2023; this will not be achieved even if we were to experience the same conditions as seen in the wettest winter on record – this would only recharge the reservoir to 43% capacity. Therefore, SWW is seeking a drought permit to aid refill of Colliford Reservoir over the winter of late 2022 and early 2023. Although this permit alone will not allow the target storage to be achieved, it is one of many measures to support winter recharge of Colliford Reservoir.

The proposed drought permit seeks to:

- Alter the destination of the abstracted water from St Cleer WTW to Colliford Reservoir.
- Increase instantaneous abstraction from 139 L/s to 243 L/s.
- Increase daily abstraction from Park Lake from 8 ML/d to 14 ML/d.

- Increase in annual abstraction limit from 2,920 ML to 3,232 ML.

This would be achieved by refurbishing the existing pumps and replacing the impellers. If this does not meet the requirements, boost pumps will be installed at the valve chamber. In addition, a 2 mm eel screen will be installed on the lake pumps to prevent entrainment of eels and other fish.

Collectively, these measures would allow SWW to abstract additional water and to provide another source of refill for Colliford Reservoir during times of extended drought.

2.4 Need for a drought permit

The National Drought Group, made up of senior decision makers from the EA, government, water companies and key representative groups, joined by Water Minister Steve Double, met on Friday 12th August 2022 to discuss the response to the driest summer in fifty years and the continued action needed. The group discussed the current outlook and the associated risks and impacts and agreed to further collaborative work across sectors to balance water needs and conserve water.

At the meeting, the EA said that the drought trigger threshold had been met to move parts of the South West, parts of Southern and Central England, and the East of England into Drought status.

The EA confirmed drought status in eight of its 14 areas, including that of Devon and Cornwall.

The triggers used to confirm the move to Drought status for Devon and Cornwall include the hydrological position (including rainfall, river flows, groundwater levels, reservoir levels, and the dryness of soils), as well as the impacts these conditions have on public water supply, abstractors (including farmers) and the environment. This is determined by the EA at a local level, rather than nationally.

Prolonged dry weather in 2022 has led to exceptionally low river flows and reservoir levels falling across much of England, exacerbated by high temperature, which add additional pressures on the water environment and wildlife.

The EA published its water situation national report for July on 12th August 2022, providing a picture of the rainfall, soil moisture deficit, river flows, groundwater levels and reservoir levels over the last month. The report highlights that July was the driest July across England since 1935, with monthly rainfall totals for most river catchments classed as exceptionally low for the time of year.

There have been five consecutive months of below average rainfall across all geographic regions in England and above average temperatures. River flows, groundwater levels and reservoir stocks all decreased during July. Thirteen EA monitored indicator rivers fell to the lowest levels ever recorded and soil moisture deficit is comparable to that seen at the end of the 1976 drought.

The current reservoir levels in Park Lake, along with the drought Levels that SWW utilise, are shown in Figure 4.1.

2.5 Consultations

South West Water applied for a drought permit from the EA on the 2nd November 2022 which was supplemented with an Interim Environmental Assessment Report (EAR). This drought permit has been accepted on the basis of a full EAR being submitted by the 31st December 2022.

3 ENVIRONMENTAL ASSESSMENT METHODOLOGY

The methodology implemented in this report is in line with the latest EA guidance on environmental assessment for water company drought planning (EA, 2020) and draws on industry good practice for undertaking ecological impact assessments (CIEEM, 2018) and on NRW technical guidance for water company Drought Plans (NRW, 2017). Figure 3.1 illustrates the process used to categorise the impact of the drought permit/order on each receptor.

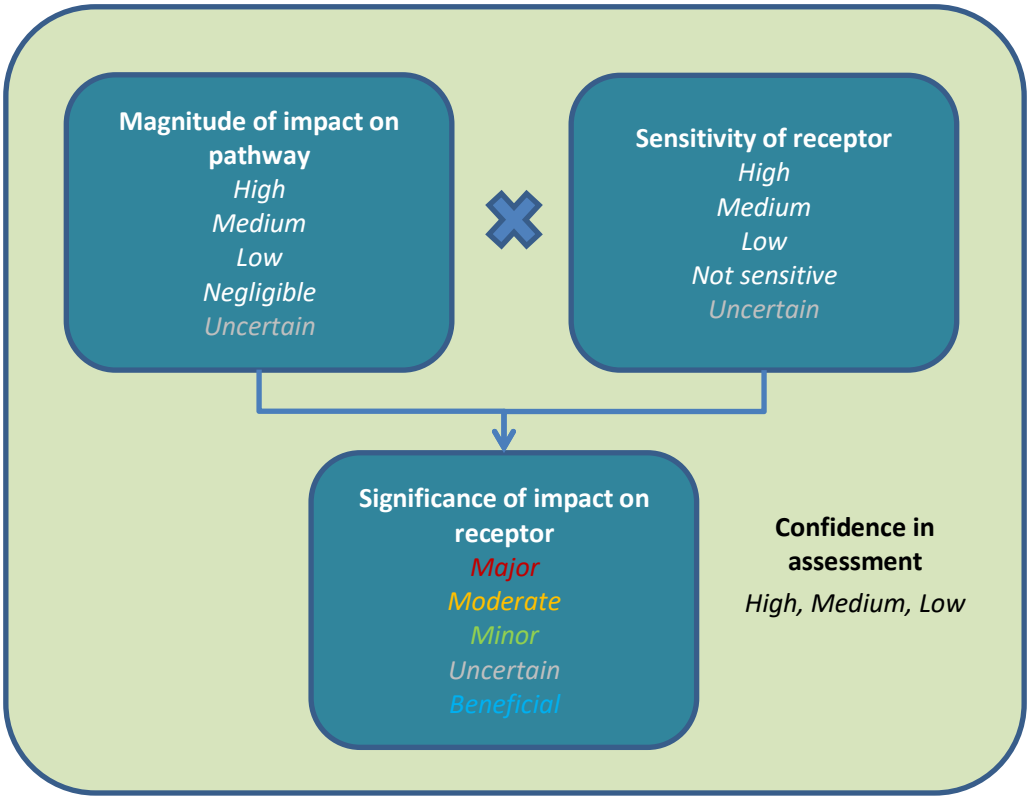

Figure 3.1: Process to understand the significance of the drought permit/order on a receptor (APEM, 2022).

3.1 Magnitude of impact

To assess the magnitude of impact on each pathway, a five-point scale based on the EA guidance for assessing the sensitivity of receptors has been used. The categories are: High, Medium, Low, Negligible, and Uncertain. These are described further in Table 3.1.

Table 3.1: Magnitude of impact definitions

Category	Definition
High	A large, extensive, long-term and/or very frequent change.
Medium	A medium-sized, substantial, medium-term and/or frequent change.
Low	A small, localised, short-term and/or infrequent change.
Negligible	A change unlikely to be noticeable / measurable.
Uncertain	Insufficient information is available to judge the magnitude of impact.

The assessment of magnitude takes into account some, or all, of the following factors (as necessary to understand the resulting impact on receptors):

- severity – the degree of change, relative to the baseline (large, medium, small);
- extent – the area over which the impact occurs (extensive, substantial, localised);
- duration – the time for which the impact occurs (short, medium, long-term); and
- frequency – how often the impact may occur (very frequent, frequent, infrequent).

The specific location and timing of any impacts can also be described when relevant.

Impacts on pathways can be positive or negative for receptors, so whilst the direction of change is important (e.g., increase or decrease), impacts on pathways are not described as being positive or negative.

3.2 Receptor Sensitivity

As per the EA guidance (EA, 2020), the sensitivity of each receptor is categorised as High, Medium, Low, Not Sensitive, or Uncertain. Table 3.2 provides the category definitions.

Table 3.2: Sensitivity of receptor definitions

Category	Definition
High	Receptor is highly sensitive to changing environments due to inability to tolerate and recover from changes.
Medium	Receptor is sensitive to changing environments due to limited ability to tolerate and/or recover slowly from the environmental change.
Low	Receptor is relatively insensitive to changing environments due to ability to tolerate and/or recover quickly from the environmental change.
Not Sensitive	Receptor is not sensitive due to high tolerance to environmental change and/or ability to recover rapidly.
Uncertain	Insufficient information is available to judge the sensitivity of the receptor.

Sensitivity is a function of the receptor's capacity to accommodate change and its ability to recover if it is affected. A receptor may be more sensitive to changes in certain pathways than others. The sensitivity is measured by the following factors (NRW, 2017):

- Adaptability – the degree to which a receptor can avoid or adapt to an impact.
- Tolerance – the ability of a receptor to accommodate change without a significant adverse impact.

- Recoverability – the temporal scale over and extent to which a receptor will recover following an impact.
- Value – a measure of the receptors importance, rarity and worth.

3.3 Significance of Impact

The magnitude of impact is combined with the sensitivity of receptor to assess the significance of impact on each receptor (Table 3.3). Impacts are categorised as: Major, Moderate, Minor, Negligible, or Uncertain. As impacts on receptors can be positive as well as negative, a sixth category has been included – Beneficial – to identify any positive impacts. The categories are further defined in Table 3.4 (NRW, 2017).

Table 3.3: Matrix for assessing the significance of impact on a receptor

Magnitude of impact	Sensitivity of receptor				
	High	Medium	Low	Not Sensitive	Uncertain
High	Major	Major	Moderate	Minor	Uncertain
Medium	Major	Moderate	Minor	Minor	Uncertain
Low	Moderate	Minor	Minor	Negligible	Uncertain
Negligible	Minor	Minor	Negligible	Negligible	Uncertain
Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain

Table 3.4: Significance of impact definitions

Category	Definition
Major	Very large or large change in environmental or socio-economic conditions, which, if lost, cannot be replaced or relocated. The impacts are generally, but not exclusively associated with features and sites of national to regional importance because they contribute to achieving national / regional objectives. The impacts are likely to result in exceedance of statutory objectives and/or breaches of legislation (e.g., Likely Significant Effects or deterioration of WFD status).
Moderate	Intermediate change in environmental or socio-economic conditions. The impacts are likely to affect important considerations at a regional and local level. The impacts are unlikely to affect key decision-making processes (e.g., statutory objectives). Nevertheless, the cumulative effect of such impacts may lead to an increase of overall effect on a particular area or on a particular feature.
Minor	Small change in environmental or socio-economic conditions. These effects may be raised as local issues but are unlikely to be of importance in the decision-making process.
Negligible	Negligible change in environmental or socio-economic conditions. These effects are unlikely to be raised as issues and unlikely to be of importance in the decision-making process.
Uncertain	Insufficient information is available to judge the impact significance.
Beneficial	Any significant, moderate, or minor change predicted to have a net positive effect on environmental or socio-economic conditions.

Impact significance provides a consistent means of expressing impacts which, in turn, informs the need for mitigation measures to offset these impacts. The determination of impact significance, both pre and post mitigation, also provides a transparent means for regulators to understand the impacts of a drought permit/order.

In practice, determining the significance of impact carries a degree of subjectivity and requires expert judgement. This may be because of limited evidence / data on the sensitivity of the receptors and/or the complexity of interactions that require assessment to determine the magnitude of change. For example, receptors may experience direct impacts because of changes in pathways, but also indirect impacts as a secondary response to changes in other receptors. If a receptor is subject to different impacts via different pathways, then the combined effect of the different pathways is integrated to assess the overall significance of impact.

3.4 Degree of Confidence

The degree of confidence in the significance of impact assessment is categorised as High, Medium, or Low. Further definitions are provided in Table 3.5 (EA, 2020). Key sources of uncertainty identified are used to inform the monitoring plan.

Table 3.5: Degree of confidence definitions

Category	Definition
High	Judgments based on high-quality, robust information, and/or the nature of the impact makes it possible to render a solid judgement.
Medium	Credibly sourced and plausible information, but not of sufficient quality or corroboration to warrant a higher level of confidence.
Low	The information available is too fragmented or poorly corroborated to make solid analytic inferences, or significant concerns or problems with information sources exist.

4 HYDROLOGICAL ASSESSMENT

4.1 Hydrological Setting

Park Lake ('the lake') is a deep, groundwater fed excavation into underground strata, comprising low permeability, weathered, and kaolinised granite. It has a small, residual surface water catchment that mainly comprises spoil and made ground as a result of historic land modification and drainage activities when the site was operated as Park Pit China Clay Works.

In the valley area to the north-west of the pit, the underlying granite bedrock is overlain by peat cover. Sloping land draining to the lake is underlain by less weathered granite bedrock, covered in places by low permeability head. The low permeabilities of these substrates severely constrain the extent of the lake's groundwater catchment.

Restoration work since SWW acquired the lake has included re-routing the headwaters of the Trenant Stream along the western edge of the valley floor, so that flow from the headwaters upstream bypass the lake. Historically, a high-level leat system was constructed across the higher slopes of surrounding land to the north west and south of the lake to intercept down-slope drainage and lead this into the Trenant Stream downstream of the lake. The lake is therefore effectively isolated from the adjacent stream system, except under extreme weather conditions

When the excavation was abandoned and allowed to fill to form the lake, an outfall was engineered at its southern end so that when full, in flood conditions overflow can occur into the Trenant Stream. This has only occurred five times in the last thirteen years (Mar 2009 – Jun 2010, Feb – Jul 2013, Mar – Jul 2014, Apr – Oct 2020, Apr – Oct 2021). The longest continuous spill was for 397 days in 2009-10. The recorded lake outflow is plotted alongside the lake levels and abstraction rate in Figure 4.1. The current abstraction licence does not require a compensation flow from the lake into the Trenant Stream.

The Trenant Stream lies within the catchment of the River Fowey. The 'Fowey (Upper)' Water Framework Directive (WFD) water body (in which the Trenant Stream is located) has a WFD classification of moderate ecological status, impacted by pH. The downstream waterbodies of 'Fowey (Warleggen to St Neot)' and 'Lower River Fowey' are classified as good ecological status (EA, 2022a).

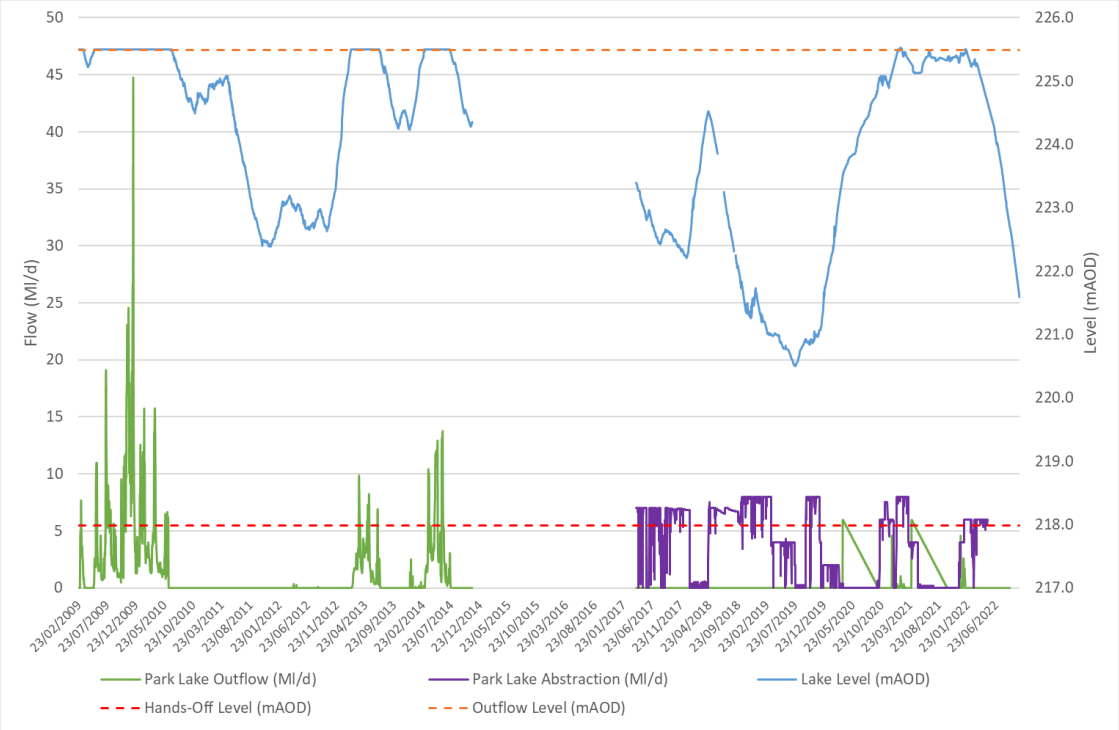

Figure 4.1: Park Lake Level, Outflow and Abstraction (2009 – 2022)

4.2 Surface Water Impacts

4.2.1 Park Lake

4.2.1.1 Potential routes of impact

This drought permit applies for the increases in abstraction rates from Park Lake as set out in Table 4.1.

Table 4.1: Abstraction rates in current abstraction licence and proposed drought permit

Duration	Current Licence (15/48/018/G/118/R01) (Maximum ML)	Proposed Drought Permit (Maximum ML)
Daily	8	14
Hourly	0.5	0.875
Annual	2,920	3,232 (for 2022) 3,640 (for 2023)
Rolling 5-Year Daily Average	4	10

SWW would like the permit to commence as soon as possible, with the suggested end date to be when Colliford Reservoir has returned to 80% storage or on 30 April 2023, whichever is sooner. Based upon the rates applied for in the drought permit, the volumes in Table 4.2 would be permitted for abstraction between December 2022 and April 2023.

Table 4.2: Monthly maximum abstraction volumes in proposed drought permit

Month	Total Permitted Abstraction (ML)
Dec-22	434
Jan-23	434
Feb-23	392
Mar-23	434
Apr-23	420
Total	*2114*

The current licence includes a Hands-Off Level ('HoL'), whereby no abstraction can take place unless the water level in Park Lake, as measured at the outfall, is greater than or equal to 217.99 m AOD, equivalent to 7.5 m below the outfall's invert level. Abstraction must not cause the level to fall below the HoL. This drought permit application does not propose to change the HoL.

The changes in abstraction rates set out in the proposed permit will:

- Increase the rate at which water is abstracted
- Increase the rate at which the lake level is drawn down
- Draw the lake down to the HoL (which has not happened previously)
- Cause the lake to be held at this lower level for an extended period

4.2.1.2 Potential impact

The proposed maximum abstraction rates in the drought permit are higher than the historic abstraction rates from Park Lake. The monthly average abstraction rates since the licence was renewed (2018-2022) are presented in Table 4.3 below, alongside the proposed maximum rate for the drought permit, which is on average 4x higher than recent actual abstraction rates.

Table 4.3: Proposed maximum daily abstraction and recent actual average abstraction

Month	Proposed Maximum Daily Abstraction (ML/d)	Average Daily Abstraction (2018-2022) (ML/d)	Proposed % increase in abstraction
December	14	4.24	330 %
January		4.19	335 %
February		4.20	333 %
March		3.10	451 %
April		2.61	536 %

On average, SWW have utilised less than half of their total annual licensed volume for Park Lake since 2018, with a maximum annual abstraction during this period of 1,870 ML, equating to 64% of the annual licensed volume.

Park Lake level was 221.59 m AOD on 26 October 2022, which is 3.9 m below the top water level ('TWL') of 225.49 m AOD, and 3.6 m above the HoL. Park Lake's average

water level since 2009 is 223.97 m AOD, with a minimum recorded level of 220.50 m AOD in July 2019. Therefore, the water level has not reached the HoL since level monitoring began in 2009, as demonstrated in Figure 4.1. In 2019, the lake drew down by 4 m over 3 months, then took over 5 months to fully recharge. The average daily abstraction rate during this 8-month period was 3.55 ML/d. This is approximately 4x lower than the proposed maximum daily abstraction rate in the drought permit, therefore faster drawdown to the HoL and slower recharge back to TWL will be expected with the higher abstraction rates.

Envireau Water synthesised monthly recharge profiles for Park Lake to allow mass-balance calculations to be carried out, to assess the rate of lake drawdown under different abstraction scenarios. Historic level data were converted into storage volume using a bathymetric survey of the lake; however, the lake was below TWL at the time of the survey being undertaken (221.9 m AOD, 6258 ML storage), therefore storage above this level had to be linearly interpolated. The historic daily change in storage volume was compared to actual abstraction volume (2018-2022) to determine an estimate of recharge to the lake.

Profiles of abstraction and recharge volumes were applied on a weekly timestep starting from the most recently available lake level measurement (221.59 m AOD on 26 October 2022) to assess the volume and duration of abstraction that would be possible under each scenario, taking the HoL into account. The modelling assumes that the drought permit will be implemented from 1 December 2022 to 30 April 2023.

When applying an average winter recharge profile, the maximum daily abstraction rate proposed in the drought permit (14 ML/d) should be achievable continuously until mid-March 2023, at which point the lake level would reach the HoL. As the lake recharges, a further 21 days of abstraction at 14 ML/d should be possible before the end of April. In a scenario with low winter recharge, the HoL would be reached near the end of February 2023.

For comparison, using the recent actual average daily abstraction rates derived from the 2018-2022 data (Table 4.3) with both an average and a low winter recharge profile does not result in the HoL being reached before the end of April 2023. This is consistent with the fact that the level has not reached, or come close to, the HoL historically. In this scenario, 635 ML less is abstracted in total between December and April than the current fully licensed volume, and up to 1,121 ML less is abstracted than under the above scenarios using the abstraction rates in the proposed drought permit.

The drawdown of the lake in the above scenarios is presented in Figure 4.2, and the total volumes abstracted under each scenario are summarised in Table 4.4 below.

Table 4.4: Abstraction and recharge modelling scenario results

Modelling scenario	Modelled date that HoL is reached	Total modelled abstraction in Dec 22 – Apr 23 (ML)	Total permitted abstraction for Dec – Apr (ML)	Total abstracted as a % of maximum
14 ML/d abstraction Average winter recharge	13/03/2023	1694	2114	80%
14 ML/d abstraction Low winter recharge	27/02/2023	1372	2114	64%
Recent actual (2018-2022) average abstraction Average/low winter recharge	-	573	1208	47%

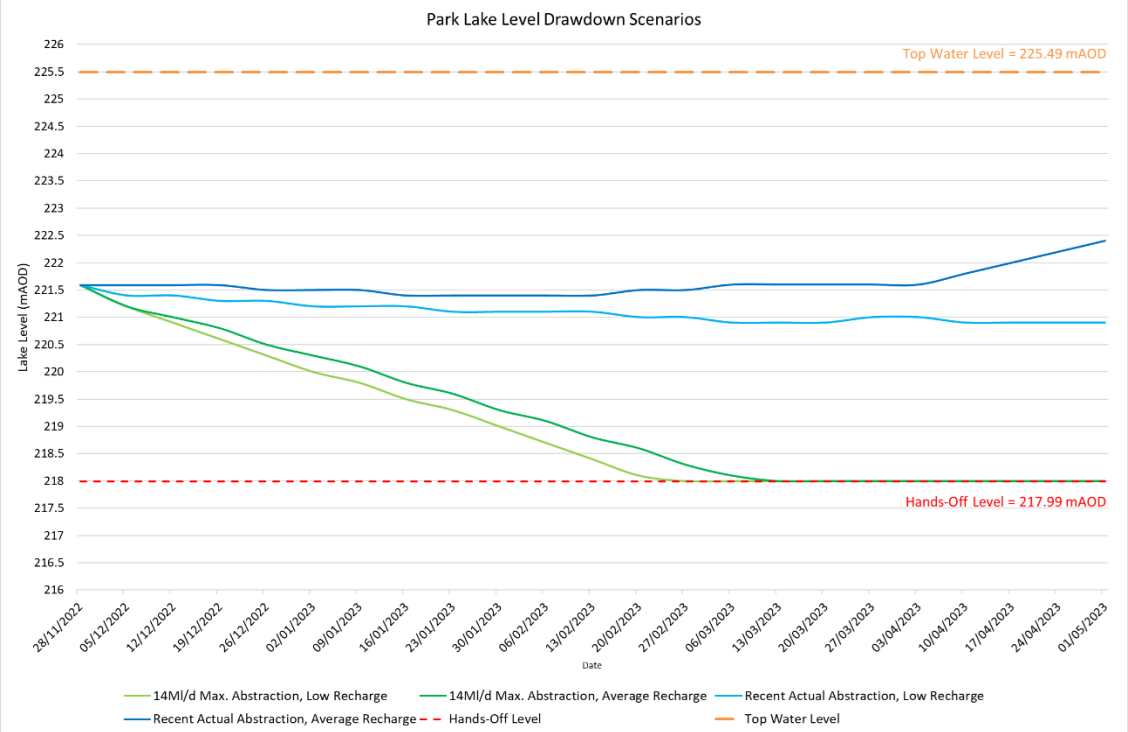

Figure 4.2: Park Lake Level Modelled Drawdown Scenarios

This analysis shows that the maximum abstraction rates proposed in the drought permit would not be able to be utilised continuously through to the end of April 2023, with the HoL becoming a constraining factor. Nevertheless, increasing the maximum daily abstraction rate to 14 ML/d would allow around 160 to 490 ML of additional water to be abstracted from Park Lake over the period than under the current licence conditions, depending on the rate of recharge to the lake this winter.

Abstracting from Park Lake at 14 ML/d will result in the lake level being held at the HoL for an extended period. Drawdown of the lake below 220.5 m AOD has not been experienced historically, therefore the impact of a further 2.5 m of drawdown, down to the

HoL, is unproven. The bathymetric survey of the lake shows that the lake bank gradient between 221 m AOD and 217 m AOD is comparable to that between TWL and 221 m AOD, therefore drawdown to the HoL would not be expected to expose sections of the bank with a significantly different stability to that of previous drawdowns.

Once the lake level reaches the HoL, SWW will be reliant on recharge increasing the lake level for any further abstraction availability. Recharge is historically slow in Park Lake and is dependent on direct rainfall due to the low permeability nature of the underlying clay and the capture and routing around the lake of the majority of surface drainage from the local catchment. For the winter of 2022/23 there is a slightly increased likelihood of dry weather (UK Centre for Ecology & Hydrology, 2022), therefore the recharge rate of the lake is expected to be average to below average.

The proposed activity in the drought permit produces uncertainty around the effects of the water level in Park Lake being drawn down further than it has been historically, at a faster rate than usual, and being held at or around the HoL for an extended period. However, the HoL is included in the existing abstraction licence as a protection measure, and therefore is expected to provide a considerable degree of mitigation to the risks associated with drawing down the water level in the lake. Additional monitoring and mitigation measures are recommended in Section 10.1.

4.2.2 Trenant Stream

The Trenant Stream is diverted in a man-made channel around Park Lake, which is situated at a slightly higher elevation than the lake itself.

Historically, flow within the Trenant Stream also included discharges from the Park Pit China Clay Works, before the stream was circumvented around Park Lake. Calculations of the scale of impact of the loss of discharges on flows in the Trenant Stream downstream of the lake were presented alongside the original Park Lake abstraction licence application. Any impact was shown to be quickly mitigated by stream flow from other tributaries down the catchment (SWW, 2022b).

4.2.2.1 Potential routes of impact

Investigations undertaken to support renewal of the Park Lake abstraction licence (SWW, 2017) showed that there was negligible hydrological connection between the Trenant Stream and water level in the lake, with flows in the stream responsive to rainfall rather than changes in lake level.

In addition to the above studies, Envireau Water analysed recent (2017-2022) daily monitoring data for the Park Lake level, flows in the Trenant Stream at the Park Lake outfall, and flows in the stream 2 km downstream to look at relationships between the lake level and stream flows. The assessments showed that there is not a statistically significant correlation between Park Lake level and flow in Trenant Stream at the Park Lake outfall (R^2 = 0.04) (Figure 4.3) and an even weaker correlation between lake level and flows downstream in the catchment (R^2 = 0.01). This analysis supports the conclusion that changes in the water level at Park Lake appear to have minimal impact on flow in the adjacent and downstream waterbodies.

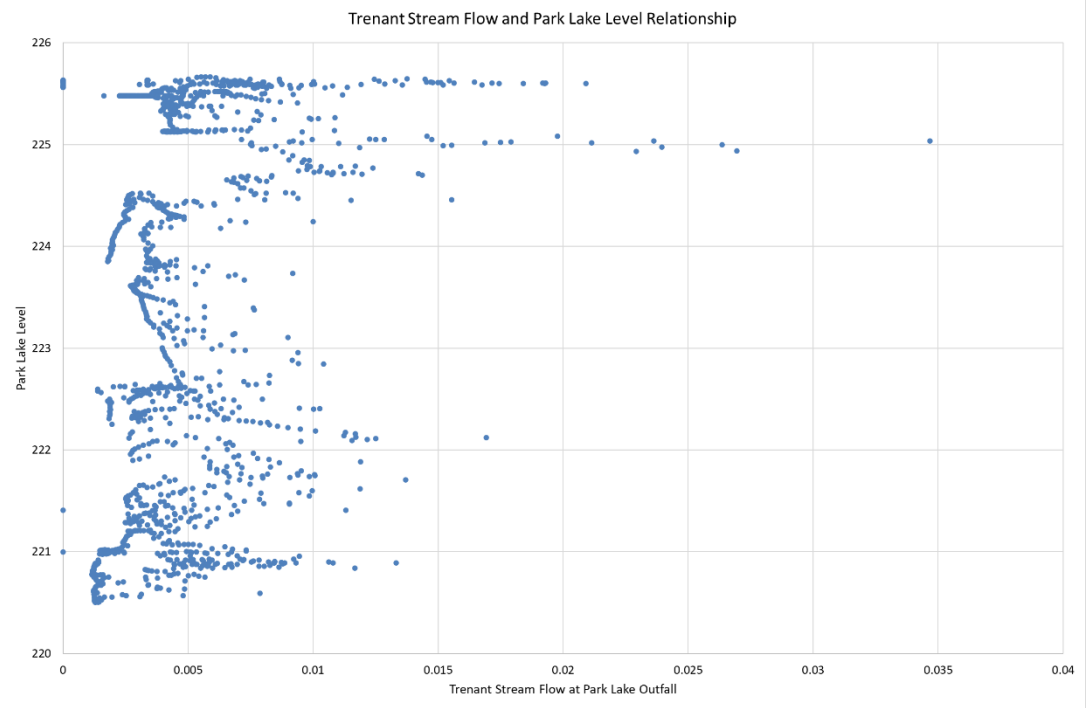

Figure 4.3: Trenant Stream Flow and Park Lake Level Relationship

4.2.2.2 Potential impact

The last 12 months have been severely dry in the Colliford WRZ, with cumulative rainfall between October 2021 and August 2022 categorised by the EAs 'exceptionally low'. As a result, flows in the lower River Fowey have been consistently below average since mid-March 2022, and were most recently reported at less than 50% of the long-term average flow for the time of year (EA, 2022b).

Park Lake level was almost 4 m below TWL at the end of October 2022, and historic monitoring data confirms that there have been long periods where level is persistently below the TWL, as shown in Figure 4.1.

Due to the lack of hydraulic continuity between Park Lake and the Trenant Stream implementation of this drought permit, and subsequent drawdown of level in Park Lake, will not exacerbate existing dry conditions in the wider catchment.

4.3 Groundwater Impacts

4.3.1.1 Potential routes of impact

SWW's 'Environmental Impact Review' report (SWW, 2022b) was reviewed to obtain the following information on groundwater monitoring and impacts in the vicinity of Park Lake.

Piezometers are deployed within 10 to 20 m of the edge of Park Lake to monitor groundwater levels. Analysis of piezometer data by SWW for the 2017 Park Lake Monitoring Report showed:

- The piezometer within the Whitebarrow Downs wetland showed responses typical of low permeability aquiclude material, consistent with the underlying mica spoil material that underlies the wetland.
- Despite being sited on land within 10 to 20 m of the lake edge, the deeper piezometers within areas of weathered granite showed some response to lake drawdown with a coupling ratio of 34%, consistent with limited hydraulic interconnectivity with the adjacent lake.
- Piezometers on land close to the lake in the areas where underlying bedrock granite may be unweathered or less weathered show close correlations with lake drawdown changes, with a high coupling ratio. This is consistent with local fissure interconnection between the lake and the granite in this location.

4.3.1.2 Potential impact

Following investigations to support recent renewals of the Park Lake abstraction licence, the understanding of the groundwater regime associated with this area is as follows.

Permeability of the granite is naturally low. The only mechanism for groundwater flow within the bedrock granite is within its fissure system. However, fissure density and width decrease rapidly with depth, and interconnectivity tends to be limited. This means that not only are fissure storativity and transmissivity properties generally low, but both can be expected to fall off rapidly with depth. This means that rates of lateral groundwater flow are likely to be very low, and recess rapidly to minimal rates as groundwater drains and water levels fall. This can be clearly seen away from valley areas where the limited fissure storativity means that groundwater heads can fluctuate rapidly; fissures refill quickly under winter recharge conditions, but rapidly recess again by a few metres as soon as soil drainage ceases. This drainage mechanism explains why overlying acidic upland soils can remain saturated in wet winters, but locally be freely draining after a few days with no rainfall.

The limited fissure interconnectivity and fall in fissure transmissivity and storativity with depth also explains why down-slope groundwater drainage falls back to minimal values in drier periods, and why emergent seepage areas can occur mid-slope, rather than all being concentrated towards valley bottoms. This in turn means that groundwater catchments of valley bottom areas may only extend a few tens or hundreds of metres up-slope, as groundwater from beneath higher slopes drains to local seepage areas where it emerges intermittently.

Given the above limitations to lateral flow, the undulating nature of the moorland topography in this area ensures that the groundwater flow regimes tend to be self-limiting in extent and restricted in the area. In areas with steeper slopes their effectiveness may be significantly smaller than the surface catchment might suggest. Rates of recession to stream systems from the granite groundwater regime will therefore be high. Where recession rates are somewhat gentler, it is likely that these have been mitigated by the buffering effects of higher local storage availability within local made ground or valley infill deposits.

5 WATER QUALITY

The in-situ quality of the water in the Lake reflects its geological and hydrological setting. It is soft and slightly acidic in nature. The Lake's nutrient load matches the quality generally found in headwater streams on the Bodmin granite upland such as the Trenant Steam or Colliford Reservoir (SWW, 2022b).

The similarity of the Lake's in-situ water quality with that within headwater streams on the Bodmin granite means that as before, when overflow occurs, its effect on the River Fowey system downstream can be considered benign.

Similarly given its geographic proximity to Colliford Reservoir the two sites share comparable water quality parameters. SWW has collected water quality monitoring data for Park Lake since 2009 and the results show it is of similar quality to the water in Colliford Reservoir (SWW, 2022b).

Water abstracted from Park Lake historically has been pumped into Colliford Reservoir as well as being blended with that from Colliford Reservoir in a raw water main prior to treatment as the water goes into supply. Water from Colliford Reservoir is also released from the dam to the River Fowey from which it is subsequently abstracted and treated at Restormel water treatment works (WTW). So, the mixing of waters from both sources and interaction with watercourses in the catchment is established and the WTW set up for this (SWW, 2022b).

5.1 Potential routes of impact

The SWW water quality monitoring data for Park Lake has shown no water quality issues with drawdown of the Lake to 222.50 m AOD (the lowest historic drawdown as seen in July 2019) (SWW, 2020b). The drought permit will potentially see the lake drawn down to the licensed HoL (217.99 m AOD, a further 4.5 m) which will expose sections of the bank usually submerged. It is possible that this could mobilise contaminants not previously exposed. This is considered unlikely however since monitoring has shown no problems associated with drawdown in the upper section (SWW, 2020b).

Park Lake is a deep excavation of <50 m at its deepest, meaning that there is a risk at depth of the presence of water with a low dissolved oxygen (DO) content. The HoL limits drawdown to the top 7.5 m of the water column meaning that there is no risk of abstracting low DO water from the bottom of the lake. The increased drawdown of 4.5 m to the HoL that may occur during the drought permit, over that which has occurred historically, does not stand to significantly reduce the DO content of the abstracted water and is also unlikely to induce mixing of the water column between the shallower and deeper sections of the lake.

No overspill of water will occur from Park Lake into the River Fowey catchment during times of increased drawdown, removing any risk of direct release of any contaminants or lower DO water which might be present. There is however a mitigation option in the Drought Permit related to a potential need to provide an augmentation flow to the Trenant Stream if low flows are observed in the stream, which could be a potential route for mixing of water quality between the two waterbodies.

5.2 Potential impact

The drought permit is not expected to have any impact on water quality in either Park Lake or Colliford Reservoir or the River Fowey, with the existing licence HoL (217.99 m AOD) remaining in place and no overspill occurring into the River Fowey catchment during times of increased drawdown.

5.3 Water Framework Directive (WFD)

The Trenant Stream system lies within the catchment of the River Fowey and flows into the Upper Fowey. Stream flow will include any outflow from the overflow of Park Lake during extreme floods. Historically, it also included discharges from the Park China Clay Works site before the river was circumvented around Park Lake Pit (SWW, 2022b).

5.3.1 WFD classification

As part of the licence renewal in 2015 the following waterbodies were assessed (SWW, 2022b):

- Fowey (Warleggan to St Neot) WFD Ref: GB108048001420
- Lower River Fowey WFD Ref: GB108048007650
- Fowey (Upper) WFD Ref: GB108048001410

to consider ecological and chemical parameters. All three of the above waterbodies were assessed as 'Good' or 'High' status in the 2016 assessment (SWW, 2017).

For the 2019 assessment, the EA changed the monitoring and assessment of chemical status in surface water bodies to include new priority substances and stricter standards. The EA also now measure the presence of more persistent chemical substances and more accurately reflect the extent of these chemicals in the environment. As a result, the above waterbodies were classified as failing to meet good chemical status. The results for the Fowey (Upper) waterbody are presented in Table 5.1, alongside the 2016 assessment results. The introduction of these new standards has meant that no surface water bodies have met the criteria for achieving good chemical status (Environment Agency, 2022). It is therefore extremely unlikely that historic spill from Park Lake to the Fowey has contributed to the reported deterioration in status.

Table 5.1: 2016 & 2019 WFD Assessment Results for the Fowey (Upper) waterbody (Environment Agency, 2022)

Classification Item	2016 Assessment	2019 Assessment
Ecological	Good	Moderate
Biological Quality	High	Good
Physico-chemical Quality	High	Moderate
Hydromorphological Support	Supports Good	Supports Good
Chemical	Good	Fail
Priority Hazardous Substances	N/A	Fail
Priority Substances	N/A	Good

5.3.1.1 *Potential routes of impact*

Park Lake will only overflow into the Trenant Stream during extreme floods, which would be the only route of impact on the water quality related WFD objectives for the waterbody.

5.3.1.2 *Potential impact*

There is no evidence to suggest that Park Lake produces significant negative impacts on the status of the above parameters and hence the achievement of compliant WFD objectives for the River Fowey and its tributaries.

6 ECOLOGICAL ASSESSMENT

The assessment for the ecological receptors discussed below, considers the impacts on Park Lake only. Impacts on the nearby Trenant Stream (and the River Fowey downstream) were scoped out of the assessment owing to the limited extent of spill under baseline conditions and the general hydrological isolation of the lake (see Section 4.2.2 for further details regarding the hydrological isolation of Park Lake). It is understood however, under an existing drought permit issued in November 2022, the EA have specified an extensive environmental monitoring schedule for Trenant Stream. This includes a requirement to 'monitor for signs of environmental impacts that may be caused by or affected by a reduction in levels and overflows at the Park Lake Outflow, as a result of the increased abstraction from the Lake. As such, although impacts have not been assessed, the monitoring schedule stipulated by the EA has been included in Table 12.2 for completeness.

6.1 Macrophytes and phytobenthos

Site specific (historical or otherwise) macrophyte and phytobenthos survey data for Park Lake is not available for analysis, however several broad outline surveys have been undertaken at the site to inform baseline ecological conditions. These include a Phase 1 and UK Habitats Classification survey undertaken by Cornwall Environmental Consultants (CEC) in October 2022 (CEC4126, Oct. 2022) and an aquatic invasive non-native species (INNS) survey undertaken by RSK in November 2022 (RSK Biocensus, 2022). Broad assumptions as to the ecological value of the macrophyte species assemblage at the site can be drawn from these reports and generalisations made regarding likely impacts and mitigation, but the limitations of the data should be acknowledged.

The CEC report noted a small pond to the north of the site, colonised largely (60-75% coverage) by bulbous rush *Juncus bulbosus*. Soft rush *Juncus effusus*, water purslane *Lythrum portula* and the INNS New Zealand pygmy-weed *Crassula helmsii* was also present. In addition, a small lake to the south of the site was also surveyed. Notably dominant species included bottle sedge *Carex rostrata*, marsh St.John's-wort *Hypericum elodes*, branched bur-reed *Sparganium erectum,* broad-leaved pond weed *Potamogeton natans* and water-lily *Nymphaea* spp.

Park Lake itself was considered to be outside of the survey scope for the CEC report, however it was broadly assessed. The report describes a gently sloping beach along the southern shoreline of the lake, dominated by shoreweed *Littorella uniflora*, with frequent water purslane *Lythrum portula*, soft rush, creeping bent *Agrostis stolonifera* and bryophyte spp. The INNS New Zealand pygmy-weed was notably dominant along the western shore of the lake.

The survey undertaken by RSK in November 2022 focussed on the presence / absence of INNS, however other notable species were also recorded. Thick 'mats' of New Zealand pygmy-weed were recorded across the banks of the lake, in the drawdown zone and submerged on the western banks. The species was also notably dominant along the rocky north-western shoreline and in ruts along the track on the western shoreline. The species is listed under Schedule 9 of the Wildlife and Countryside Act 1981 (WCA 1981)

and is discussed further in Section 6.5. The native species shoreweed and Quillwort *Isoetes lacustris* were also notably dominant.

Phytobenthos data is not available for Park Lake, however the nearby Colliford Reservoir is classified as 'Moderate ecological status' under WFD Cycle 3 for macrophytes and phytobenthos. Agriculture/rural land management and internal nutrient load are listed as reasons for not achieving good status (RNAG). Given its geographic proximity to Colliford Reservoir, the two sites share comparable water quality parameters. SWW has collected water quality monitoring data for Park Lake since 2009 and the results confirm it is of similar quality to the water in Colliford Reservoir (SWW, 2022b). As such, it can be reasonably assumed that the phytobenthos community present in Park Lake is likely to be of a comparable ecological status, notwithstanding potentially subtle differences in species composition due to the greater groundwater contributions in Park Lake.

6.1.1 Potential routes of impact

Water level fluctuations are known to have a negative association with macrophyte species richness, altering species composition and diversity. Macrophytes and phytobenthos can be negatively impacted when abstraction regimes are altered through increased abstraction and subsequent reduction in the wetted perimeter of the lake. A reduction in the wetted perimeter of the lake may expose marginal emergent and submerged species in the littoral and photic zones, leading to desiccation. In addition, a reduction in the water depth of the lake may increase light penetration, which can lead to increased likelihood of algal blooms, such as filamentous, epilithic and epiphytic algae.

Following analysis of bathymetric data, Park Lake is determined to have a maximum water depth of c. <50 m, with notably precipitous banks, particularly along the north and north-eastern shoreline. As such, macrophyte growth across the lake is likely to be limited to the marginal shorelines, and therefore subject to increased likelihood of desiccation, following reservoir drawdown.

Park Lake is a relatively newly established (former China clay quarry), oligotrophic lake. Due to the dominance of New Zealand pygmyweed and low organic matter of the substrate, the lake is considered unlikely to support a diverse macrophyte assemblage beyond those species already recorded.

6.1.2 Potential impact

Without further monitoring, it is not possible to assess the impact of the drought permit on macrophytes and phytobenthos with a high degree of confidence; however, based on available data the magnitude of the impact is judged to be 'Low'. The sensitivity of the receptor is judged to be 'Low', and significance of the impact is therefore judged to be 'Minor'. Based on the information available however, the confidence in this assessment is 'Medium'.

6.2 Macroinvertebrates

Baseline/historical aquatic macroinvertebrate data is not available for the site, however a survey of the aquatic macroinvertebrate assemblage at Park Lake was conducted as part of the INNS surveys undertaken in November 2022 (RSK Biocensus, 2022).

Macroinvertebrate sampling was undertaken at 10 locations across Park Lake. Where safe to access, surveyors used a combination of kick and sweep sampling for three minutes, in addition to a one minute hand search in accordance with EA guidelines. Care was taken to ensure that all habitat types and micro-habitats, both typical and atypical, were sampled, and species adhered to submerged stones and macrophytes were included to maximise the potential capture of INNS. A summary of the macroinvertebrate indices at each of the sites is provided below.

Table 6.1: Macroinvertebrate Indices across the 10 monitoring sites surveyed at Park Lake in November 2022 (RSK Biocensus, 2022).

Taxa name	Site									
	1	2	3	4	5	6	7	8	9	10
BMWP (TL1)	44	33	39	27	59	48	36	30	66	52
NTAXA (TL1)	12	7	11	8	13	11	10	9	14	12
ASPT (TL1)	3.67	4.71	3.55	3.38	4.54	4.36	3.60	3.33	4.71	4.33
CCI (TL5)	21.00	37.50	33.33	30.00	30.00	26.36	26.67	27.14	22.50	25.00
WHPT (TL2)	38.4	30.4	40.3	24.3	51.9	39.4	35.1	31.8	54.9	43.4
NTAXA (TL2)	12	8	12	8	14	12	11	10	15	13
ASPT (TL2)	3.20	3.80	3.36	3.04	3.71	3.28	3.19	3.18	3.66	3.34

The Biological Monitoring Working Party (BMWP) index scores range from 27 – 66 indicating poor – moderate bioassessment for water quality. The Average Score Per Taxon (ASPT) ranges from 3.33 – 4.71, indicating similarly poor – fair biological quality. In addition, Community Conservation Index (CCI) scores range from 21 – 37.5, indicating a species assemblage of 'Very High Conservation Value'. This is attributed largely to the presence of *Stictonectes lepidus*, a species of diving beetle, which was recorded at all sampling sites. *Stictonectes lepidus* is a Red Data Book 3 (RDB3) species, listed as 'Rare'.

Although baseline/historic macroinvertebrate data is not available for Park Lake, the nearby Colliford Reservoir is classified as 'Good ecological status' under WFD Cycle 3 for Chironomids (CPET). Given its geographic proximity to Colliford Reservoir, the two sites share comparable water quality parameters. SWW has collected water quality monitoring data for Park Lake since 2009 and the results confirm it is of similar quality to the water in Colliford Reservoir (SWW, 2022b). As such, it can be reasonably assumed that the macroinvertebrate community is likely to be of a comparable ecological status.

6.2.1 Potential routes of impact

Macroinvertebrate assemblages are associated with the amplitude of water level regulation, as is taxon richness which decreases with intensity of regulation. Invertebrates with long life cycles are particularly vulnerable to unnatural water level fluctuation. In addition, lakes where disturbance is frequent are known to have reduced species richness and diversity, particularly in the littoral zone (Bill, 2020).

Following analysis of the bathymetric data, a reduction in the wetted perimeter of the lake may lead to a loss of shallow marginal habitat (outside of areas characterised by a steep bank profile); particularly as the lake comprises shallow marginal habitat, before dropping off abruptly into deeper water. Reducing the water level will therefore result in the exposure of marginal sediments in these areas, leading to desiccation.

6.2.2 Potential impact

The impact has been assessed using expert judgement to inform decisions regarding the likely sensitivity of the macroinvertebrate community.

Macroinvertebrate communities are typically resilient to water level fluctuations, generally recovering rapidly from any negative impacts, as such the magnitude of the impact is judged to be 'Low'. The sensitivity of the receptor is judged to be 'Low', and significance of the impact is therefore judged to be 'Minor'. Based on the information available however, the confidence in this assessment is 'Medium'.

6.3 Fish

A review of historical data for fish on the EA Ecology and Fish Data Explorer has been undertaken to inform this environmental assessment. Monitoring for fish has been undertaken extensively within the Upper Fowey catchment, both upstream and downstream of Park Lake since 1977. A summary of available data for the nearby Trenant Stream is provided in Table 6.2. Species presence / absence at each of the monitoring sites is summarised in Table 6.3.

Table 6.2: EA fish data (1986 – 2015)

EA Site ID	Site Name	National Grid Reference	Years Sampled	Method
8415	Chapel	SX2101068190	1982, *1994, *1997, 2000, 2002 – *2015, 2017 – *2019	Catch depletion (3 runs) and single catch (marked *)
14306	Trengale Wood	SX2121568107	*1994, *1997, 2005	Catch depletion (3 runs) and single catch (marked *)
15906	Hulker	SX1988070410	1982, *1994, *1997, *2000, 2005, *2010-2012, *2018	Catch depletion (3 runs) and single catch (marked *)
16209	d/s Park Pit	SX1997670416	2005	Catch depletion (3 runs)
16210	Carpuan	SX2041469114	1982, 1994, 1997, 2000, 2005, 2011, 2012, 2014, 2016, 2018, 2021, 2022	Catch depletion (3 runs)
24382	Downs Ford	SX2027070490	19982, 1994, 1997, 2000	Catch depletion (3 runs)
24383	North Wood	SX2062069910	1982, *1994, *1997	Catch depletion (3 runs) and single catch (marked *)
36538	Park Pit	SX1964270284	2010, 2011	CPUE / Timed sample

Table 6.3: Summary of species presence at EA fish survey sites in the Porth Catchment

Species	Site Name							
	Chapel	Trengale Wood	Hulker	d/s Park Pit	Carpuan	Downs Ford	North Wood	Park Pit
Brown / sea trout (*Salmo trutta*)	Y	Y	Y	Y	Y	Y	Y	Y
Atlantic salmon (*Salmo salar*)	Y	Y	N	N	N	N	N	N
European eel (*Anguilla Anguilla*)	Y	Y	Y	N	Y	Y	Y	N
Bullhead (*Cottus gobio*)	N	Y	N	N	N	N	N	N
Minnow (*Phoxinus phoxinus*)	Y	N	N	N	N	N	N	N

Baseline / historical fish data is not available for Park Lake itself, however, a fish survey was conducted as part of the INNS surveys undertaken by RSK in November 2022. Eighteen locations around the lake were sampled using a 2.8 x 15 m micro mesh seine net hauled by hand. No fish were caught at any of the sites during these surveys, however this method is designed predominately to target marginal and juvenile species and given the time of year much of the fish population may be utilising the deeper areas of the lake. However, two large brown trout *Salmo trutta* were observed in the lake. Additional fish surveys were undertaken by Fishtek in 2017 as part of previous INNS surveys. No fish were captured at the site.

The WFD Cycle 3 status for fish in the Upper Fowey is classified as 'good' and known to support a number of species of conservation interest such as Atlantic salmon *Salmo salar*, brown trout, European eel *Anguilla anguilla* and bullhead *Cottus gobio*. Migratory salmonids are protected under the Salmon and Freshwater Fisheries Act 1975, whilst eels are afforded protection through The Eels (England and Wales) Regulations 2009.

When the excavation was abandoned and allowed to fill to form the lake, an outfall was engineered at its southern end so that when full, in flood conditions overflow can occur into the Trenant Stream. The lake is therefore effectively isolated from the adjacent stream system, except under extreme weather conditions. It is understood that the lake has only overspilled four times in the last thirteen years (see Figure 4.1) and that the current abstraction licence does not require a compensation flow from the lake into the Trenant Stream. As such, the output of this assessment suggest Park Lake produces no significant negative impacts on the WFD status for the River Fowey and its tributaries. In addition, taking the aforementioned hydrological isolation into account and the presence of a coarse screen on the outfall (preventing the upstream migration of fish), any fish within Park Lake are therefore considered to be resident species, which may have either been stocked or arrived during flood conditions.

In December 2022, Fishtek consulting were commissioned by SWW to complete a baseline survey of habitat and water quality along three sections of Trenant stream downstream of Park Lake. The report captures the preliminary result from a walk over survey and captures baseline conditions that future surveys can refer to when monitoring any changes in river conditions and fish habitat.

6.3.1 Potential routes of impact

As discussed in Section 4, Park Lake is effectively hydrologically isolated from the nearby Trenant Stream and River Fowey, only overspilling under extreme wet weather conditions.

The main potential effects of the proposed drought permit are reduced water levels within Park Lake, leading to a reduction in available marginal habitat and a potential reduction in marginal spawning habitat. Fish may also be impacted by changes in water quality, however, the lake itself is c. 50 m deep when full, and the abstraction licence states a Hands-off Level if the water is measured to be less than 217.99 m AOD, which is just 7.5 m below the outfalls invert level. As such, due to the size and nature of the lake the impact of the scheme on water quality within the lake is deemed to be 'Negligible'.

Furthermore, as discussed in section 2.3, a 2 mm eel screen will be installed on the lake pumps to prevent entrainment of eels and other fish. As such, the likelihood of any impacts through entrainment are considered to be 'Negligible'.

Based on the habitat survey (Fishtek 2022) the middle reaches of the Trenant stream provide habitat suitable for salmonid spawning and the upper reaches provide the best habitat for lamprey ammocoetes.

6.3.2 Potential impact

Based on available data and using expert judgement to inform decisions regarding the likely sensitivity of the fish community, Park Lake is considered to support a limited population of fish species. Possibly limited to brown trout, however the presence of European eel cannot be ruled out and there are anecdotal accounts of eel being present. Although brown trout are present within the lake, it is considered unlikely the population is self-sustaining (i.e., fish are unlikely to be spawning in the lake).

Taking into account the HoL, the size and nature of the lake and the limited population of fish within the lake, the magnitude of the impact is judged to be 'Negligible', and the sensitivity of the receptor is judged to be 'Low'. The significance of the impact is therefore judged to be 'Negligible'. Based on the information available, the confidence in this assessment is 'High'.

Trenant stream is considered to be hydrologically isolated from Park lake with any impact judged to be 'Negligible', and the sensitivity of the receptor is judged to be 'Low'. The significance of the impact is therefore judged to be 'Negligible'. Based on the information available, the confidence in this assessment is 'High'.

6.4 Terrestrial ecology

In September 2022 CEC were commissioned by SWW to undertake a habitat condition assessment of the site, which included Phase 1 and UK Habitat Classification methodologies (CEC4126, Oct 2022).

This report highlights the important habitats on site as:

- wet heath;
- dry heath;
- purple moor grass and rush pasture;
- mire; and
- wet woodland.

The report also states there are a number of notable plant species which includes S41 marsh clubmoss and faunal species including bats, nesting birds, marsh fritillary butterfly, Odonata, reptiles and amphibians.

Protected species surveys have not been included in CEC4126, however it is noted that the site has habitat that could support otter, badger, additional breeding birds (such as nightjar and willow tit) and invertebrates.

RSK Biocensus recorded Jersey cudweed *Gnaphalium luteoalbum* on the northern banks of the reservoir, a protected species under Schedule 8 of the WCA 1981.

6.4.1 Potential routes of impact

Potential routes of impact are limited to water dependent habitats with an active hydrological connection to the lake. As noted in Section 4.1, the lake itself is effectively isolated as a high-level leat system has been developed across the higher slopes of surrounding land to the north and east of the lake to intercept down-slope drainage and lead this into the Trenant Stream downstream of the lake. The lake itself only becomes connected to the adjacent leat system under extreme wet weather conditions and previous investigations have demonstrated that flows in the Trenant Stream are not influenced by draw down in lake water level.

The proposed maximum abstraction rates in the drought permit are not anticipated to have any impacts on the terrestrial habitats on site. However, changes in water levels may impact how otter use the site, although the steep sided nature of the bank sides reduces the potential of the site being used by otter for holts. Instead, otter may use the lake as a valuable foraging site.

6.4.2 Potential impact

The impact has been assessed using expert judgement to inform decisions regarding the likely sensitivity of the receptor.

The magnitude of the impact is judged to be ‘Negligible’. The sensitivity of the receptor is judged to be ‘Not Sensitive’, and significance of the impact is therefore judged to be ‘Negligible’. Based on the information available however, the confidence in this assessment is ‘Medium’.

6.5 Invasive Non-native Species

The Park Lake site was subject of an INNS walkover survey completed by CEC Ltd. in June 2015. The survey identified three plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981. These are:

- New Zealand pygmyweed (*Crasssula helmsii*);
- montbretia (*Crocosmia x crocosmiiflora*); and
- rhododendron (*Rhododendron x supercontinua*).

The report also noted the presence of spiraea sp., bamboo sp. and ragwort *Senecio jacobaea*.

In addition to the survey completed by CEC Ltd. in 2015, RSK Biocensus was commissioned by SWW to carry out an aquatic INNS survey in October 2022 (RSK Biocensus, 2022). RSK's primary focus was crayfish, shrimps, bivalves, and terrestrial / aquatic plants. The survey included seine netting for fish species, setting crayfish traps, kick and sweep sampling for macroinvertebrates, visual observations, a walkover of the perimeter of the lake and the use of a grapnel to sample deeper areas.

No INNS of fish, crayfish or shrimps were recorded during the survey, however, the non-native flatworm *Girardia tigrine*, New Zealand mud snail *Potamopyrgus antipodarum* and bladder snail *Physella acuta* were present. No invasive bivalves were recorded during the surveillance surveys.

As in the survey in 2015, the INNS New Zealand pygmyweed *Crassula helmsii* was recorded throughout the lake forming thick mats in the drawdown zone and underwater on the leeward western side, as well as in sheltered bays around the lake's perimeter. It was present along the rocky north western shore in scattered patches and growing among the rocks. It was also present in ruts on the track on the western shore. Additional investigations seeking to identify the presence of INNS fish species were undertaken at Park Lake in 2017 (Fishtek Consulting, 2017), utilising a combination of minnow traps and electrofishing of shallow marginal areas. No fish species (invasive or otherwise) were recorded during the surveys.

6.5.1 Potential routes of impact

The proposed maximum abstraction rates in the drought permit are not anticipated to have any impacts on the terrestrial habitats on site and therefore no impact on presence or extent of any of the terrestrial INNS species recorded on site.

The abstraction does however represent a significant pathway to the spread of the INNS New Zealand pygmyweed, whereby fragments may be easily transferred in the process. New Zealand pygmyweed is known to be present at Colliford Reservoir[1], however the abstraction under the drought permit has potential to exacerbate the spread of the species at the site.

Water abstracted from Park Lake historically has been pumped into Colliford Reservoir as well as being blended with that from Colliford Reservoir in a raw water main prior to treatment as the water goes into supply. Water from Colliford Reservoir is also released from the dam to the River Fowey from which it is subsequently abstracted and treated at

[1] https://nbnatlas.org/

Restormel water treatment works (WTW). So, the mixing of waters from both sources and interaction with watercourses in the catchment is established and the WTW set up for this (SWW, 2022b). As such, there is considered to be an existing route by which potential transfer of INNS species between the two water bodies may occur.

6.5.2 Potential impact

The magnitude of the impact on INNS is judged to be 'Medium'. The sensitivity of the receptor is judged to be 'Low' (due to existing INNS presence in Colliford Reservoir) and significance of the impact is therefore judged to be 'Minor'. Based on the information available however, the confidence in this assessment is 'High'.

7 DESIGNATED SITES

Statutory Designated Sites

- The entirety of Park Lake and its surroundings are located within one of the 12 sections of the Cornwall AONB. In May 2022 a management plan for the AONB was adopted by Cornwall Council and this will run until 2027.
- The Upper Fowey Valley SSSI is located approximately 2km to the northwest.
- Draynes Wood SSSI lies approximately 2.4km to the southwest. This woodland also forms part of a National Nature Reserve (NNR).
- Dozmary Pool SSSI lies approximately 2.4km to the north.
- Cabilla Manor Woods SSSI lies approximately 3.6km to the west.
- North Bodmin Moor SSSI lies approximately 3.7km to the north.

Non-statutory Designated Sites

- In addition to the AONB, in 2012 the site including the lake and its environs became fully designated as a County Wildlife Site (CWS).
- Browngelly Downs County Wildlife Site (CWS).
- The site lies 400 m to the southwest of Colliford Lake which is Cornwall's largest inland water body and provides a drinking water resource. Park Lake is therefore entirely within drinking water protected and drinking water safeguard zones.
- Bowden Wood lies approximately 1.5km to the south and is an area of Ancient and semi-natural woodland identified as Priority habitat – Deciduous woodland.

7.1 Potential impact

The proposed maximum abstraction rates in the drought permit are not anticipated to have any impacts on designated sites. The magnitude of the impact is therefore judged to be 'Negligible'. The sensitivity of the receptor is judged to be 'Not Sensitive', and significance of the impact is therefore judged to be 'Negligible'. Based on the information available, the confidence in this assessment is 'High'.

8 ASSESSMENT OF OTHER ENVIRONMENTAL CONSIDERATIONS

8.1 Archaeology and cultural heritage

Historically, Park Lake was located within the former Parson's Park Downs, between Redhill Downs, Whitebarrow Downs and Northwood Downs. The area has a particularly rich archaeological heritage, with evidence of prehistoric funerary activity and settlement, and later medieval agriculture and settlement.

Historic mapping indicates that during the 19th century the site was located in an area of post-medieval enclosed fields and upland rough grazing, with a single farmstead 'Hulker' situated towards the south-eastern end of the site. Mineral extraction had commenced to the southeast of the site in the 19th century, the disused 'Northwood China Clay Works' visible on OS mapping in 1905/1906.

The area of Park Lake itself was developed in the 20th century as a second and much larger operation for the extraction of China Clay. In the 1960s the extraction area was concentrated in the eastern portion of the site, with spoil tips to the east, and throughout the second half of the 20th century the works grew to encompass the full extent of the site with an extensive linear zone of spoil tipping and earthworks extending to the northeast.

There are no listed buildings in proximity to the site. Two scheduled monuments are present in the surrounding area, comprising a medieval homestead and fields on Redhill Downs and a hut circle village 330 yds (300 m) west of West Northwood Farm.

The Cornwall and Scilly Historic Environment Record identifies one non-designated heritage asset within the site, comprising a record of the modern Park China Clay Works. A former prehistoric hut circle is recorded to the east of Park Lake, depicted on the 1880 OS mapping, however the site has since been removed by the clay extraction and spoil tipping activities. The 19th century settlement of Parson's Park is also recorded to the north of the lake, first depicted on the 1st Edition 6" OS map of 1888, but has been overwhelmed by the China Clay works spoil heap. The site of the now-demolished farmstead 'Hulker' is located to the south of Park Lake.

The recorded heritage assets in proximity to the site are summarised in Table 8.1 below. Of these assets, only Park Lake itself has the potential to be affected by the proposed works, the others having either been removed or demolished by previous activities or are located at a substantial distance from the site.

Table 8.1: Heritage assets in proximity to Park Lake

NHLE/HER Reference	Name	Type	NGR	Distance from Park Lake
1003074	Medieval homestead and fields on Redhill Downs	Scheduled Monument	220576, 70667	561 m to east
1004662	Hut circle village 330yds (300m) W of West Northwood Farm	Scheduled Monument	219729, 69533	603 m to south
MCO23836	PARK - Modern China Clay Works	Non Designated Heritage Asset	219612, 70854	0 m
MCO19983	PARSONS PARK - Prehistoric hut circle	Non Designated Heritage Asset	219649, 71070	46 m to east
MCO16013	PARSONS PARK - Post Medieval settlement	Non Designated Heritage Asset	219578, 71206	117 m to north

8.1.1 Potential routes of impact

There would be no intrusive groundworks required as part of the proposals to abstract from Park Lake, therefore no direct physical impacts on known archaeological remains are anticipated.

The variation in water levels would in theory have the potential to cause indirect impacts on the condition of any archaeological remains surrounding the lake through changes in moisture levels. However, the lake is confined to an area of former China Clay extraction which has already removed any potential archaeological remains within its footprint and therefore the potential for this type of impact is nil.

There are no impacts anticipated on the setting of heritage assets in the surrounding area due to changes in water level or upgrade to existing pumping facilities.

8.1.2 Potential impact

The only asset identified with the potential to be affected by the proposals is Park Lake itself, a flooded quarry dating to the latter half of the 20th century. This asset is recorded on the Cornwall and Scilly HER and is deemed to be a non-designated heritage asset. The sensitivity of this asset is assessed as being 'Not Sensitive'. The magnitude of impact arising from fluctuating water levels in the former pit would be 'Negligible', resulting in a 'Negligible' significance of impact.

8.2 Landscape and visual

Park Lake and Colliford Reservoir are both located within the Bodmin Moor section of the Cornwall AONB. Colliford Reservoir is one of three reservoirs which, while in scale with the surrounding landscape, are not considered to be in keeping with the wild landscape of the moor in character terms. In addition, there are numerous smaller pools found

across the moor some of which are natural and some, such as Park Lake, are a result of mineral extraction.

Colliford Reservoir is visible from the local road network, public rights of way and common land within the locality. It is also used recreationally for fishing and by visitors to Colliford Reservoir Tavern and Holiday Park that borders it to the north. Colliford Reservoir is a man-made reservoir and as a result the level of the lake would be expected to vary dependant on longer term rainfall and usage trends. By contract, Park Lake is not publicly accessible with the local topography largely restricting views towards it from any publicly accessible locations in the surrounding landscape. The lake was created through mineral extraction and has then subsequently filled with water. Water would currently either exit the lake through the existing overflow route into the river system or be extracted through the existing infrastructure to St Cleer Water Treatment Works.

8.2.1 Potential routes of impact

The proposed extraction from Park Lake would upgrade existing pumping infrastructure. As such any potential landscape and visual impact would be restricted to the changing levels of both lakes. This potential impact would be on the surrounding moorland environment; users of the local road and footpath networks; and recreational users of Colliford Reservoir. The potential impact on the special qualities of Bodmin Moor AONB should also be considered.

8.2.2 Potential impact

The landscape surrounding the lakes has a high sensitivity due to its AONB status. The lakes are both man-made structures within a wild landscape and as such would appear at their most naturalistic (and in keeping) when full. As the effect of the abstraction will differ between the lakes, they have been considered separately before assigning an overall impact. When compared with a baseline of no abstraction from Park Lake, the water level of Colliford reservoir would recover at a faster rate. The exact extent of this difference is unable to be quantified due to the variables involved. This faster recovery would be positive in nature.

Park Lake would have a reduced water level, but one that is confined by a maximum reduction of 7.5 m due to the inclusion of a HoL within the abstraction licence. This is an existing restriction and one that applies to the existing abstraction from Park Lake to the St Cleer WTW. As such, while the abstraction would occur at a faster rate than at present; and be more likely to result in a reduced level over the timeframe of the permit; it would not exceed the maximum drop in level currently permitted. Furthermore, the lake is not accessible by the public and is largely obscured in views from the surrounding landscape.

While the sensitivity of the landscape is considered to be ‘High’, the extent and nature of any impacts fall within the existing parameters of water level variance on both lakes. The magnitude of impact is therefore assessed as ‘Negligible’ resulting in a ‘Minor’ significance. Confidence in these conclusions is ‘High/Medium’.

8.3 Tourism and recreation

Park Lake and Colliford Reservoir are located in Bodmin Moor, a granite moorland designated as an AONB. Colliford Reservoir provides good access for walking and fishing, whereas Park Lake is not accessible to the public.

8.3.1 Potential routes of impact

Colliford Reservoir hosts car parking, picnic areas and lakeside walks, as well as a nature reserve in the northernmost section of the East Arm. Fly fishing for brown trout is also available either via a season permit or a day permit during the season, from 15th March to 22nd October inclusive (SW Lakes, 2022). As well as the footpaths accessible from the lakeside car parking spaces, there are also several public rights of way in the vicinity of the East Arm of Colliford Reservoir (FPM, n.d.), as well as Registered Common Land to the West and Countryside and Rights of Ways surrounding the lake (MAGIC, 2022). However, there are no National Trails or National Cycle Routes adjacent to the lake (MAGIC, 2022). Colliford Reservoir Tavern and Holiday Park is situated approximately 50m north of the lake, providing hotel rooms, self-catering accommodation, glamping pods and a campsite and caravan pitches (Colliford Tavern and Holiday Park, 2022).

8.3.2 Potential impact

Park Lake is not accessible to the public. There is a small section of Countryside and Rights of Way to the South of the lake (MAGIC, 2022), and there are no footpaths, National Trails, or National Cycle Routes in the vicinity (FPM, n.d.; MAGIC, 2022). The impact of the abstraction on tourism is therefore determined to be minimal.

The sensitivity of the tourism and recreation in the area is determined to be ‘Low’, and the impact to be ‘Minor’. Confidence in these conclusions is ‘High/Medium’.

9 SUMMARY

Table 9.1 below illustrates the summary of impacts on the different environmental aspects in relation to Park Lake and Colliford Reservoir. The table sets out the sensitivity of the receptor, along with the magnitude of impact on the pathway (initials) and the significance of the impact on the receptor (colour).

Note: the proposed implementation of the drought permit will be from November 2022 to April 2023.

Table 9.1: Summary of impacts

		Sensitivity of receptor	J	F	M	A	M	J	J	A	S	O	N	D	Level of Confidence
Pathways	**Hydrology**														
	Park Lake	High	M	M	M	M	NA	NA	NA	NA	NA	NA	M	M	Medium/High
	Habitat and geomorphology														
	Park Lake	Medium	M	M	M	M	NA	NA	NA	NA	NA	NA	M	M	Low
	Water Quality														
	Park Lake	Low	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	Medium/High
	Fowey Upper Water Body	Medium	M	M	M	M	NA	NA	NA	NA	NA	NA	M	M	Medium/High
Receptors	**Phytobenthos and macrophytes**														
	Park Lake	Low	L	L	L	L	NA	NA	NA	NA	NA	NA	L	L	Medium
	Macroinvertebrates														
	Park Lake	Low	L	L	L	L	NA	NA	NA	NA	NA	NA	L	L	Medium
	Fish														
	Park Lake														
	Brown trout (juvenile and adults)	Low	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	High
	Eel (freshwater resident life stages)	Low	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	High
	Protected species (birds, otters, water voles and great crested newts)														
	Park Lake	Not Sensitive	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	Medium
	Non-native species														
	Park Lake	Low	M	M	M	M	NA	NA	NA	NA	NA	NA	M	M	High
	Socio-economics, tourism and recreation														
	Park study area	Low	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	Medium/High
	Aesthetics and landscape														
	Park study area	High	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	Medium/High

		Sensitivity of receptor	J	F	M	A	M	J	J	A	S	O	N	D	Level of Confidence
	Archaeology and cultural heritage														
	Park study area	Not Sensitive	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	Medium/High
	Designated sites														
	All water bodies	Not Sensitive	N	N	N	N	NA	NA	NA	NA	NA	NA	N	N	High

Key

Magnitude of impact on pathway		Significance of impact on receptor	
H	High		Major
M	Medium		Moderate
L	Low		Minor
N	Negligible		Negligible
U	Uncertain		Uncertain
NA	Not assessed	NA	Not assessed

10 MITIGATION MEASURES

10.1 Hydrology

To mitigate the impact of this drought permit on the hydrology of Park Lake and Trenant Stream, SWW will:

- Maintain the existing licence condition to cease abstraction from Park Lake when the water level is at the HoL (217.99 m AOD) and not reinstate abstraction until the water level has recharged above the HoL.
- If a marked decrease in flows in the Trenant Stream is observed, abstraction shall return to the maximum rate currently permitted in the abstraction licence whilst SWW seek advice from the EA. Abstraction will not be reinstated at the higher rate until the EA are satisfied that abstraction from Park Lake is not the driver behind declining flows in the Trenant Stream.

10.2 Water Quality

No impacts on water quality in Park Lake, Colliford Reservoir, or the River Fowey catchment downstream of Park Lake are anticipated as a result of the drought permit operation therefore, no mitigation is proposed.

10.3 Ecology

No significant negative impacts to ecology were identified through the environmental assessment process. Significant negative impacts, for the purposes of this report are defined as those of at least moderate significance. As such, no mitigation is proposed for Park Lake, when considered in isolation at this stage. The confidence in the assessment is however medium/low due to fragmented or poorly corroborated data. Further monitoring is therefore proposed, as detailed in Section 11.3.

Although no negative impacts were identified for Park Lake when considered in isolation, the EA have highlighted concerns of environmental impacts to Trenant Stream that may be caused by or affected by a reduction in levels and overflows at the Park Lake Outflow, as a result of the increased abstraction from the Lake. As such, the following mitigation measures may be appropriate if evidence of ecological distress is observed:

- releasing additional flows from Park Lake to Trenant Stream via temporary pumps (an eel screen with maximum 9 millimetre aperture size and approach velocity not exceeding 20 centimetres per second shall be installed on the pump(s) installed for this purpose);
- deployment of localised aeration;
- installation of fish refugia in spatially limited areas;
- fish rescue and relocation if no other suitable alternative is available; and
- funding of appropriate reasonable measures (e.g., habitat restoration) could be made in mitigation of ecological damage occurring in reaches affected by reduced flows in the longer term.

Implementation of the above aforementioned mitigation measures may not be required if significant negative impacts are not observed through on-going monitoring. Should mitigation be required however, the suitability and feasibility of any methods proposed will discussed and agreed with SWW, the EA and other key stakeholders, prior to implementation.

10.4 Designated sites

No significant negative impacts to designated sites were identified through the environmental assessment process, and the impact on nearby designated sites was judged to be negligible. As such, no mitigation is proposed.

10.5 Other environmental considerations

No mitigation measures are required for Landscape, Archaeology and Cultural Heritage, or Tourism and Recreation environmental considerations.

11 MONITORING PLAN

11.1 Hydrology

The following monitoring of Park Lake and Trenant Stream will be undertaken in relation to implementation of this drought permit:

- SWW will maintain the existing monitoring requirements in accordance with the current Park Lake abstraction licence. The licence conditions require data to be provided to the EA within 28 days of the 31 March each year, or within 28 days of a request by the EA. For the duration of the drought permit implementation, all data will be provided to the EA on a weekly basis. SWW will monitor:
    - Daily abstraction rate via installed meters
    - Continuous level in Park Lake
    - Continuous streamflow in the Trenant Stream at the Park Lake outfall
- SWW will undertake pre-implementation readings, and subsequently collect weekly readings for the duration of the drought permit implementation, from groundwater piezometers at existing installations.
- SWW will undertake daily visual inspections of Park Lake bankside stability for the duration of the drought permit implementation.

11.2 Water Quality

No impacts on water quality in Park Lake, Colliford Reservoir, or the River Fowey catchment downstream of Park Lake are anticipated as a result of the drought permit operation however:

- SWW historic water quality monitoring data will be supplemented by SWW with additional sampling from Park Lake and the Trenant Stream below the Park Lake outflow prior to abstraction commencing.
- Samples of the water abstracted from Park Lake will then be taken monthly until the drawdown reaches the historic maximum of 220.50 m AOD below which the sampling will increase to weekly until the HoL stops abstraction.
- Once abstraction under the drought permit ceases then sampling can return to the SWW baseline.

11.3 Ecology

RSK have designed a robust Environmental Monitoring Plan (EMP) which considers the requirements for baseline monitoring, in-drought monitoring and post-drought monitoring, in support of the drought permit application at Park Lake.

The proposed EMP for the various ecological receptors identified for monitoring are summarised in Table 12.2 below. The impact assessment was lacking complete / robust ecological baseline data to allow for a high degree of confidence in the assessment; as such, further monitoring has been proposed to ensure a robust record/understanding of any potential impact on ecological receptors.

11.3.1 Monitoring

A monitoring regime should be established at Park Lake and Tenant Stream to ensure that any changes in hydrological regime are reported before negative impacts on terrestrial and/or aquatic habitats occur. Regular monitoring will help inform the sensitivity of the site to medium- and long-term changes in water level, beyond those of a natural occurrence. Robust monitoring will also improve the level of confidence in the initial impact assessment.

11.4 Other environmental considerations

No monitoring is required for Landscape, Archaeology and Cultural Heritage, and for Tourism and Recreation environmental considerations.

12 CONCLUSION

Table 12.1: Environmental assessment and mitigation table

Feature of Interest	Sensitivity	Summary of likely impact (incl. if short, medium, or long term)	Category of impact	Confidence level	Proposed mitigation measure
Hydrology	High	Short term increased drawdown in lake level in response to abstraction	Moderate	Medium/High	Hands Off Level already in place
Water Quality – Park Lake	Low	Short term impact from increased draw down.	Negligible	Medium/High	N/A
Water Quality – Fowey Upper Water Body	Medium	Short term impact from increased draw down.	Minor	Medium/High	N/A
Ecology	Medium	Short term impact from increased draw down.	Minor	Medium	N/A
Designated Sites	Not Sensitive	Short term visual impact from increased draw down.	Negligible	High	N/A
Heritage	Not Sensitive	Short term impact from increased draw down.	Negligible	H	N/A
Landscape and Visual	High	Short term visual impact from increased draw down.	Minor	H	N/A
Tourism and Recreation	Not Sensitive	Short term impact from increased draw down.	Minor	M	N/A

Table 12.2: Environmental monitoring plan table

Feature of interest	**Location**	**Control or impact**	**Method**	**Baseline** (frequency, timing, responsibility)	**In-drought** (frequency, timing, responsibility)	**Post-drought (recovery)** (frequency, timing, responsibility)
Hydrology	Abstraction point (and outflow if spilling)	Impact	Water quality sampling		Monthly at water levels > 220.50 m AOD then weekly	Back to SWW baseline
Hydrology	Outflow	Control	Level monitoring via installed gauge post	Continuous monitoring by SWW	Continuous monitoring by SWW	Continuous monitoring by SWW
Macroinvertebrates	Park Lake – lake surface	Impact	UKTAG Lake Assessment Methods for Benthic Invertebrate Fauna (CPET)	N/A	Four samples from April until October. If required, to inform changing conditions at the site.	As per in-drought.
Macroinvertebrates	Park Lake – lake margins	Impact	UKTAG Lake Assessment Methods for Benthic Invertebrate Fauna (LAMM)	N/A	Sample from March-May. If required, to inform changing conditions at the site.	As per in-drought.
Aquatic Habitat	Trenant Stream - from the outfall of Park Lake to the confluence of the Fowey, or reach, or reaches of this watercourse.	Impact	Bespoke methodology incorporating elements of Hendry K & Cragg-Hine D (2003)	Completed by Fish Tek Dec 2022	'Habitat impact assessment walkovers': First survey on the first day on which the Water Company abstract above 8,000 cubic metres per day for the purpose of public water supply, then weekly thereafter for the	N/A

					duration of the drought permit. 'Redd counting and mapping': First survey on the first day on which the Water Company abstract above 8,000 cubic metres per day for the purpose of public water supply, then weekly for the period 1 November 2022 to 31 January 2023.	
Protected Species (Birds, otters, water voles and great crested newts)	Park Lake - perimeter	Impact	Otter survey – to follow guidance detailed in Chanin (2000)	Spring 2023 – single otter survey to inform baseline data.	N/A	N/A

13 REFERENCES

APEM. (2022). *Upper Tamar Lake Drought Permit Environmental Assessment Report.* APEM. Unpublished.

Cornwall Environmental Consultants (2022). *Park Lake Habitat Condition Assessment*. CEC4126. Unpublished.

Colliford Tavern and Holiday Park. (2022). *About Us.* Colliford Tavern and Holiday Park. [Online]. Available at https://www.colliford.com/about-us.html [Accessed: 18/10/2022]

EA and Defra. (2019). *Drought Permits and Drought Orders*. EA and DEFRA. Publish May 2019.

EA. (2020). *Environmental assessment for water company drought planning supplementary guidance*. Environment Agency. Published July 2020.

EA. (2022a). *Catchment Data Explorer*. [Online]. Available at https://environment.data.gov.uk/catchment-planning/ [Accessed: November 2022].

EA. (2022b). *Water situation: area monthly reports for England 2022*. [Online]. Available at https://www.gov.uk/government/publications/water-situation-local-area-reports [Accessed: November 2022].

FPM. (n.d.). *Foot Path Map.* FPM. [Online]. Available at https://footpathmap.co.uk/map/?zoom=14.2&lng=-4.57763&lat=50.52854 [Accessed: 18/10/2022].

Fishtek Consulting (2022) Park Pit Drought Permit Monitoring Baseline Survey Rev 01

MAGIC. (2022). *MAGIC Maps*. MAGIC. [Online]. Available at https://magic.defra.gov.uk/magicmap.aspx [Accessed: 18/10/2022].

NRW. (2017). *Water Company Drought Plan Technical Guideline.* Natural Resources Wales. Published December 2017.

RSK Biocensus. (2022). *Park Reservoir invasive non-native species surveys*. 2484678. Unpublished.

SW Lakes. (2022). *A guide to fishing Colliford Reservoir.* SW Lakes. [Online]. Available at https://www.swlakestrust.org.uk/news/a-guide-to-fishing-colliford-lake [Accessed: 18/10/2022].

SWW (2017). *Park Lake Monitoring Report.* South West Water. Unpublished.

SWW. (2022a). *South West Water and Bournemouth Final Drought Plan*. South West Water. Published September 2022.

SWW. (2022b). *3.0 Environmental Impact Review*. South West Water. Published November 2022.

UK Centre for Ecology & Hydrology. (2022). *UK Hydrological Outlook*. [Online]. Available at https://hydoutuk.net/ [Accessed: November 2022].