Test Surface Water Licence 11/42/18.16/54 Stage 0.1 Drought Order 2025

2.2_Environmental Monitoring, Mitigation and Compensation Plan

July 2025

Contents

1 Introduction

1.1 Purpose of this Plan

This Environmental Monitoring, Mitigation and Compensation Plan has been prepared to support Southern Water Services' (SWS) application for a River Test surface water abstraction Stage 0.1 Drought Order under Section 79(A) of the Water Resources Act 1991:- The Test Surface Water Drought Order.

This Stage 0.1 Drought Order Environmental Monitoring, Mitigation and Compensation Plan (DO MMCP) has been prepared in line with UK Government guidance[1] in relation to drought permits and drought orders.

1.2 Background

In March 2018, the Itchen Licences were the subject of the Hampshire Sustainable Abstraction Public Inquiry ("the Hampshire Inquiry"). The conditions of the Itchen Licences were amended to reduce the impact of abstraction on the River Itchen, a European Designated Site under the the Habitats Regulations.

As a direct consequence of changes to the Itchen Licences (along with other licences), SWS lost circa 166 Ml/d of deployable output in its Western Area, as detailed in their Water Resource Management Plan 2019. This was with a reduction of 105 Ml/d at Test Surface Water and 61 Ml/d in the Itchen. This created a significant risk for SWS to meet its supply duties under Section 37 Water Industry Act 1991("WIA") during drought.

An agreement was reached under Section 20 of the Water Resources Act 1991 (WRA), between SWS and the EA ("the Section 20 Agreement"). The Section 20 Agreement recognised the supply risk and put in place an interim abstraction scheme reliant on drought permits and orders while long-term alternative supply infrastructure was put in place. The Section 20 Agreement outlines how the requirements of both the Habitats Regulations (and also the Water Environment (Water Framework Directive)(England and Wales) Regulations 2017 (WFD Regulations)) will still be met under conditions such as drought, through an agreed derogation process in the event that a drought application is required. The derogation for the drought interventions recognises the lack of available alternative options and the public supply duty as an imperative reason of overriding public interest (IROPI). NE, a supporting regulator in this process, were involved in the agreement of a package of environmental compensation measures, and are involved in the oversight of the mitigation/compensation and monitoring packages.

The mitigation/compensation packages defined for Itchen and Test related drought options were defined based on an understanding of the status of the River Itchen SAC interest features at the time and thus it was agreed that delivery of the mitigation/compensation defined in the packages would be sufficient to avoid adverse effects on the SAC related to the expected drought applications.

However, since the S20 Agreement was signed, genetic analysis has indicated the salmon population in the Itchen is part of a metapopulation with those in the Test and Meon, and the status of the salmon population has changed to 'at risk' such that the Section 20 mitigation/compensation packages in respect of potential effects on the Itchen and Test are not now deemed to be sufficient by the Environment Agency (EA) and NE.

[1] https://www.gov.uk/guidance/drought-plans-environmental-assessment-and-monitoring#write-your-environmental-monitoring-plans

1.3 The Stage 0.1 Drought Order

Under conditions where the available mitigation measures are deemed to fully off-set the potential effects of the Test Surface Water Drought Permit with the relaxation of the hands-off flow (HoF) of 355,000 cubic meters per day (355 Ml/d) or Test Surface Water Drought Order with the relaxation of the HoF of 265,000 cubic meters per day (265 Ml/d), SWS would apply to the EA for a Drought Permit as detailed under the Section 20 Agreement.

However, the Stage 2 assessment presented for the River Itchen SAC in the Habitats Regulation Assessment (HRA), concludes that it is not possible to conclude there will be no adverse effect on site integrity for the River Itchen SAC even with mitigation in place. Therefore a Stage 3 Assessment of Alternative Solutions was undertaken, which concluded that the only feasible alternative, given the conclusion in respect of the River Itchen SAC, was to apply for a Drought Order.

In this case, this is being referred to as a Stage 0.1 Drought Order, as it is applying for the same relaxation of the HoF (355,000 cubic meters per day (355 Ml/d)) as would otherwise have been allowed for in the Drought Permit .

1.4 This Plan

As a result of the Stage 2 assessment, and it not possible to conclude there will be no adverse effect on site integrity for the River Itchen SAC, SWS has been working on an enhanced list of mitigation and compensation measures for this Stage 0.1 Drought Order that will be implemented to offset the potential effects. These are detailed in this plan.

Also included in this plan are the details of the important environmental monitoring, that is used to inform gaps in conceptual understanding, and future Environmental Assessment Reports (EAR). The monitoring details are presented in three parts :

- Pre-drought baseline monitoring; and
- Monitoring during the Stage 0.1 Drought Order; and
- Post-drought monitoring.

The Stage 0.1 Drought Order Emergency Measures that would be implemented if required are presented.

2 Pre-drought Baseline Monitoring

2.1 Land Access for Monitoring and Mitigation Deployment

The implementation of the Test Surface Water Stage 0.1 Drought Order is the same relaxation of the HoF (355,000 cubic meters per day (355 Ml/d)) as would otherwise have been allowed for the Drought Permit ., permitting continued abstraction from the Test Surface Water intake on the Great Test.

The hydrology of the Lower Test is complicated by the number of carrier channels and diversions. Those carriers that are important to consider in relation to potential impacts from the operation of the Test Surface Water abstraction to the designated sites are those downstream of the abstraction intake on the Great Test, the Little Test and Wirehouse Streams.

These are located south of the M27, and within the Land owned by Barker Mill Estate (BME). The fishing rights are leased by BME to Little River Management (LRM).

The baseline monitoring and enhanced list of mitigation measures specific to this Stage 0.1 Drought order are all located within the land owned by BME

Since the Public Inquiry of March 2018, SWS, BME and LRM have negotiated terms under which annual baseline monitoring and implementation of mitigation measures, if agreed, may be able to proceed routinely (to an agreed protocol).

From 2019, a series of one-off agreements, and later from 2022 annual agreements, were made to allow Lower Test monitoring work to proceed on a series of ‘access days’ each year. There were a total of 17 access days in 2023, 30 (of which 2 were for EA bridge repairs) in 2024 and 18 anticipated in 2025. The EA, NE, Hampshire and Isle of Wight Wildlife Trust (HIWWT) and SWS make use of access on these days to undertake macroinvertebrate, macrophyte, fish and water vole monitoring, habitat walkovers, flow control structure surveys, hydrometric monitoring and water quality sampling.

SWS understands that any Test Surface Water Stage 0.1 Drought Ordert granted will not confer rights of access, and will also need assent from NE, as required.

A protocol for agreeing access for baseline monitoring has now been established with LRM since 2022 however, the drought monitoring will be dependent on additional access being agreed and arranged. Therefore the monitoring, emergency measures and enhanced list of mitigation measures for this Stage 0.1 Drought Order are caveated as ‘subject to agreed access’.

2.2 Access Day Programme

BME and LRM granted access for monitoring on a series of ‘access days’ in 2019-2020 and 2023-2025 to undertake monitoring activities as outlined in Table 2-1.

Table 2-1 Monitoring access days and activities

Date	Monitoring activity undertaken
03/04/2019	General habitat condition 'walkover' surveys; In-river invertebrate kick-sampling; and Reconnaissance for future work
17/06/2019	Aquatic macrophyte survey; and Sea lamprey spawning survey.
28/08/2019 to 31/08/2019	Invertebrate sampling; Macrophyte survey; · Fish survey; River habitat (including INNS mapping) and surface features surveys; Water vole survey; Water quality sampling; and Flow control structure survey
04/10/2019 and 07/10/2019	Fish survey (including electro fishing); and River habitat (including INNS mapping) and surface features surveys; Wintering bird surveys
11/03/2020	Salmonid Redd counting; River habitat survey; and Tree and scrub clearance and cattle poaching mitigation reconnaissance.
16/06/2020	Sea lamprey spawning survey; and Himalayan Balsam volunteer removal day
16/01/2023	WQ station and sampling work Reconnaissance for later River restoration strategy survey Drought permit preparation work General habitat survey Topographic survey
15/02/2023	As per 16/01/2023 Salmonid Redd counting
14/03/2023	As per 16/01/2023
18/04/2023	As per 16/01/2023 In-river Invertebrate sampling
10/05/2023	As per 16/01/2023
14/06/2023	As per 16/01/2023 Sea Lamprey Redd counting
18/07/2023 and 19/07/23	As per 16/01/2023 In-river Invertebrate sampling In-river macrophyte survey
22/08/2023 and 23/08/2023 29/08/2023 to 31/08/2023	As per 16/01/2023 Eel trapping Baited remote undewater video Fish surveys Electro fishing Water Vole surveys
04/10/2023 and 17/10/2023	As per 16/01/2023 In-river Invertebrate sampling
13/11/2023	As per 16/01/2023
11/12/2023	As per 16/01/2023
08/01/2024 to 12/01/2024	WQ stations and sampling work Aerial and hydrographic survey
15/01/2024 to 19/01/2024	WQ stations and sampling work Aerial and hydrographic survey

25/01/2024 and 26/01/2024	Otter surveys
14/02/2024	WQ stations and sampling work Salmonid Redd counting
13/03/2024	WQ stations and sampling work
16/04/2024	WQ stations and sampling work In-river Invert
08/05/2024	WQ stations and sampling work
12/06/2024	WQ stations and sampling work Sea Lamprey Redd counting
16/07/2024 and 17/07/2024	WQ stations and sampling work In-river Invertebrate sampling In-river macrophyte survey
20/08/2024 and 21/08/2024 27/08/2024 to 29/08/2024	WQ stations and sampling work Eel trapping Baited remote underwater video Fish surveys Electro fishing Water Vole surveys
30/08/2024 and 31/08/2024	EA bridge repairs - no monitoring
03/10/2024	WQ stations and sampling work In-river Invertebrate sampling
15/10/2024	WQ stations and sampling work In-river Invertebrate sampling
11/11/2024	WQ stations and sampling work
09/12/2024	WQ stations and sampling work
16/01/2025 and 17/01/2025	WQ stations (Meteor) Gauge board installation (APEM)
12/02/2025	WQ stations (Meteor) Walkover (EA)
12/03/2025	WQ stations (Meteor)
16/04/2025	WQ stations (Meteor) Invertebrate sampling (EA) Walkover and Water Vole survey (HIWWT)
08/05/2025	WQ stations (Meteor)
11/06/2025	WQ stations (Meteor) Walkover (EA)

Upcoming planned visits to end of 2025

Date	Monitoring activity undertaken
15/07/2025 and 16/07/2025	WQ stations (Meteor) Invertebrate sampling (EA)
12/08/2025, 13/08/2025, 19/08/2025, 20/08/2025, and 28/08/2025	WQ stations (Meteor) EA surveys: 12th: Combined salmon parr & lamprey surveys at Ghillies Run & Nursling Mill. 13th: 2 x Wirehouse fish surveys & combined salmon parr / lamprey surveys at Navvies Shovel & Conegar. 19th, 20th & 28th: BRUV & catch up any remaining electric fishing surveys. Water Vole survey (HIWWT)

18/09/2025	WQ stations (Meteor) Invertebrate sampling (EA)
14/10/2025	WQ stations (Meteor)
10/11/2025	WQ stations (Meteor)
08/12/2025	WQ stations (Meteor)

2.3 Baseline Water Quality Monitoring

Southern Water's S20 programme also included the implementation of permanent multi-parameter water quality meters ('sondes'). A total of 16 sites have been established on the River Test to date, providing real-time water quality data for baseline monitoring and to act as a trigger for emergency measures.

Baseline water quality data provides an understanding of the condition of the River Test under 'normal' flows, along with establishing the sensitivity of the receptors to changes in flow, notably any especially sensitive ecological features of interest. The completion of baseline monitoring also allows comparison of baseline conditions with those in the run up to, during and after a drought event.

2.3.1 Automatic Water Quality Monitoring Data

Since 2021, SWS has deployed 16 multi-parameter water quality meters ('sondes') to gather high frequency (30 minute) measurements at key locations in the fluvial and tidal sections of the lower River Test. To make use of this data, SWS has subsequently commissioned specialists to undertake the following, currently in-progress, tasks:

- Monitor real time water quality data streamed directly to specialist consultants;
- quality-check the data (using bespoke, semi-automated, data cleaning algorithms);
- summarise the location, frequency, timing and severity of any ecologically important water quality events;
- undertake a detailed analysis of inter-relationships between parameters and upstream-downstream changes; and
- investigate how abstraction (flow), weather and tidal conditions interact to influence water quality at key locations.

The currently ongoing work is focussing on data collected up to October 2024. The reporting of this detailed analysis once complete, will be reported to the EA and NE for discussion.

The multi-parameter water quality meters ('sondes') water quality data is a primary data source for the drought monitoring, and emergency measures. Parameters measured by the Sondes are:-

- Water level; temperature; pH; turbidity; conductivity; dissolved oxygen (mg/l and %); and, Ammonia (as mg/l.NH3 and as UIA).

The relative locations of the 16 no. River Test water quality monitoring stations are shown diagrammatically in Figure 2-1. The exact locations of the sondes are not provided in this plan due to the risks of vandalism (which has been experienced at multiple sites on multiple occiasions since installation). Location information can be provided on request subject to a confidentiality agreement.

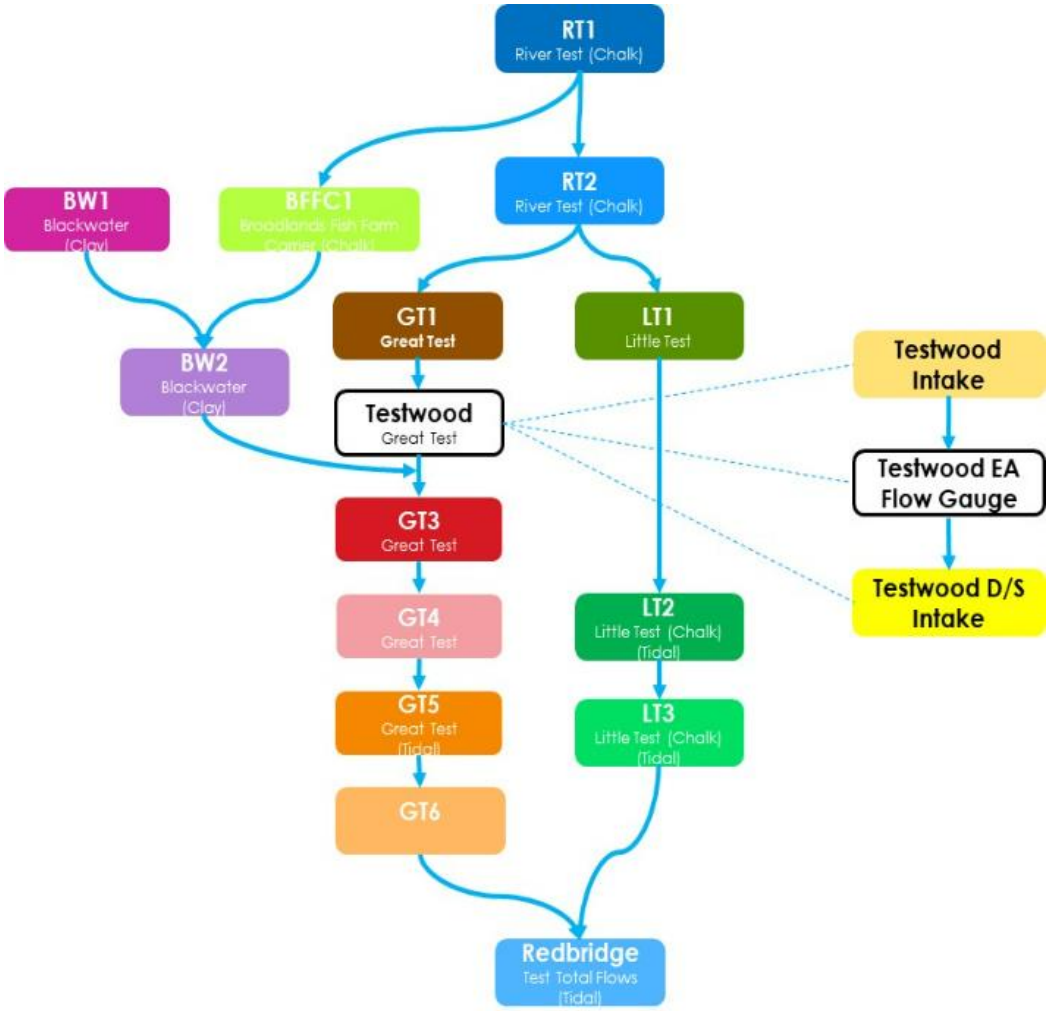

Figure 2-1 - WQ monitoring locations from upstream to downstream

2.3.2 Spot Analytical Water Quality Monitoring Data

Monthly water quality sampling has been undertaken at up to 33 sites (Figure 2-2) since 2019 coinciding with the ebbing tide across the survey area. At each monitoring site, *in-situ* water quality monitoring data is collected using a multi-parameter water quality meter. Parameters measured will be as follows: dissolved oxygen (DO mg/l and % saturation), temperature, specific conductivity, pH and salinity.

During each survey analytical water samples are collected by hand in accordance with best practice sampling methodology, and subsequently delivered within 24 hours to an analytical laboratory in a chilled cool-box under full chain-of-custody documentation. Laboratory analysis is undertaken according to limits of detection for comparison with relevant standards. Calcium and dissolved organic carbon (DOC) are included as these are required to calculate the bioavailable fraction of some metals for comparison with Water Framework Directive Environmental Quality Standards (WFD EQS). The list of parameters analysed are shown in Table 2-2.

In addition to the historical water quality analysis, testing of perfluoroalkyl and polyfluoroalkyl substances (PFAS) in the River Test and River Blackwater was added in 2025 (Table 2-3).

At each sampling site photographs and notes of possible influencing factors, such as weather conditions, ambient air temperature, the presence of oil slicks, growth of algae, any unusual sights or smells, sewage litter or fungus were recorded as these may have a bearing on the water quality results.

Table 2-2 - Lab determinands measured during monthly sampling

Determinand	Units	Limits of Detection	Accreditation
Biochemical Oxygen Demand (BOD) – 5 day	mg/l	1	ISO17025
Ammoniacal Nitrogen as N	µg/l	15	ISO17025
Nitrite (as N)	µg/l	1	ISO17025
Total Oxidised Nitrogen (TON)	mg/l	0.02	-
Orthophosphate (as P)	µg/l	20	ISO17025
Suspended Solids	mg/l	2	ISO17025
Arsenic (dissolved)	µg/l	0.15	ISO17025
Cadmium (dissolved)	µg/l	0.02	ISO17025
Chromium (dissolved)	µg/l	0.2	ISO17025
Copper (dissolved)	µg/l	0.5	ISO17025
Lead (dissolved)	µg/l	0.2	ISO17025
Zinc (dissolved)	µg/l	0.5	ISO17025
Mercury (dissolved)	µg/l	0.05	ISO17025
Iron (dissolved)	mg/l	0.004	ISO17025
Nitrate (as N)	mg/l	0.01	ISO17025
Total Inorganic Nitrogen	mg/l	0.3	-
Total Organic Nitrogen	mg/l	0.1	-
Dissolved Inorganic Nitrogen	mg/l	0.15	-
Calcium (dissolved)	mg/l	0.012	ISO17025
Dissolved Organic Carbon (DOC)	mg/l	0.1	ISO17025
PAH – Speciated (EPA 16) including total	µg/l	0.01	ISO17025
Phosphorus (Total)	µg/l	20	ISO17025
BTEX	µg/l	1	ISO17025

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Table 2-3 PFAS determinands measured during monthly sampling

Determinand	Units	Limits of Detection	Accreditation
Perfluorobutanoic acid (PFBA)	µg/l	0.05	-
Perfluorobutane sulphonate (PFBS)	µg/l	0.05	-
Perfluoropentonic acid (PFPeA)	µg/l	0.05	-
Perfluoropentane sulphonate (PFPeS)	µg/l	0.05	-
Perfluorohexanoic acid (PFHxA)	µg/l	0.05	-
Perfluorohexane sulphonate (PFHxS)	µg/l	0.05	-
Perfluoroheptanoic acid (PFHpA)	µg/l	0.05	-
Perfluoroheptane sulphonate (PFHpS)	µg/l	0.05	-
Perfluorooctanoic acid (PFOA)	µg/l	0.05	-
Perfluorooctane sulphonate (PFOS)	µg/l	0.05	-
Perfluorononanoic acid (PFNA)	µg/l	0.05	-
Perfluorononane sulphonate (PFNS)	µg/l	0.05	-
Perfluorodecanoic acid (PFDA)	µg/l	0.05	-
Perfluorodecane sulphonate (PFDS)	µg/l	0.05	-
Perfluoroundecanoic acid (PFUdA)	µg/l	0.05	-
Perfluoroundecane sulphonate (PFUdS)	µg/l	0.05	-
Perfluorododecane sulphonate (PFDoS)	µg/l	0.05	-
Perfluorododecanoic acid (PFDoA)	µg/l	0.05	-
FOSA (C8 Sulphonamides) - Semiquantitative	µg/l	0.1	-
NMeFOSA (C9 Sulphonamides)	µg/l	0.1	-
NEtFOSA (C10 Sulphonamides) - Semiquantitative	µg/l	0.1	-
6:2FTA (C8 Telomer acids) - Semiquantitative	µg/l	0.1	-
8:2FTA (C10 Telomer acids) - Semiquantitative	µg/l	0.1	-
10:2FTA (C12 Telomer acids) - Semiquantitative	µg/l	0.1	-
6:2FTUA (C8 Telomer unsaturated acids) - Semiquantitative	µg/l	0.1	-
8:2FTUA (C10 Telomer unsaturated acids) - Semiquantitative	µg/l	0.1	-

10:2FTUA (C12 Telomer unsaturated acids) - Semiquantitative	µg/l	0.1	-
4:2FTS (C6 Telomer Sulphonates)	µg/l	0.1	-
6:2FTS (C8 Telomer Sulphonates)	µg/l	0.1	-
8:2FTS (C10 Telomer Sulphonates)	µg/l	0.1	-

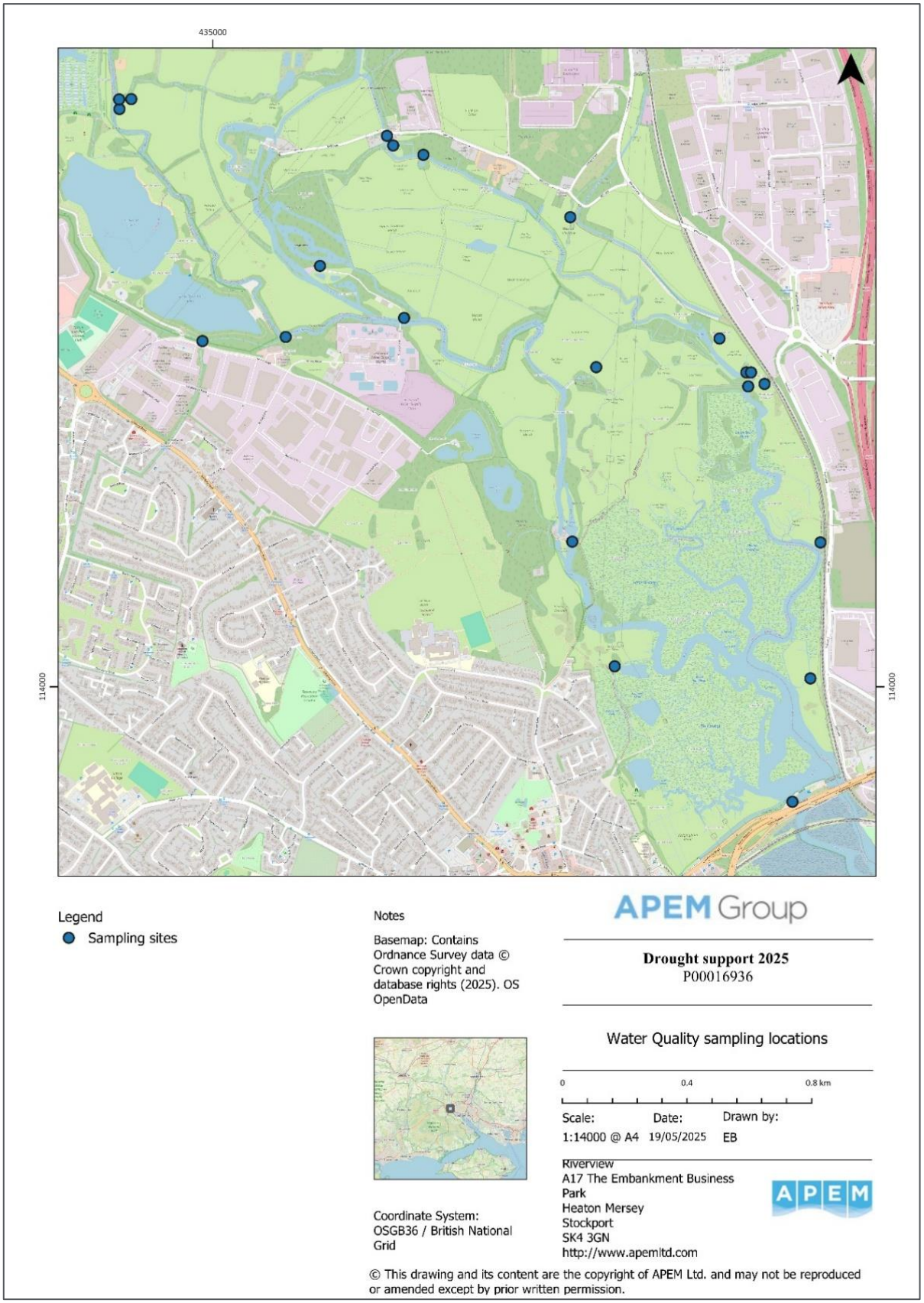


Figure 2-2 River Test & Lower Blackwater Water Quality sampling sites 2019-2025

2.3.3 River Blackwater Pollution Monitoring

The River Blackwater is a tributary of the River Test, and a key source of nursery habitat for salmonids, notably sea trout. In 2020, specialist surveyors undertook targeted walkover surveys in reaches of the River Blackwater which identified priority reaches for salmonid recruitment (spawning and nursery habitat) and notable areas of diffuse pollution. In 2023/2024, surveyors completed work to validate those findings and by working with a local farm adviser, engaged with key landholders to produce Farm Information Packs (FIPs) and Farm Action Plans (FAPs) at 4 holdings identified as priorities for pollution intervention. In 2025 this work was extended in the catchment and focused water quality monitoring undertaken.

Mitigating pollution during drought conditions is particularly important because reduced water flow can concentrate pollutants in rivers, exacerbating their harmful effects on water quality and aquatic ecosystems. Water quality monitoring at high-risk locations targeted before/after comparison of water quality, evidencing the efficacy and impact of interventions delivered via the FAPs on water quality (e.g. reductions in nutrients or suspended solids) (Figure 2-3).

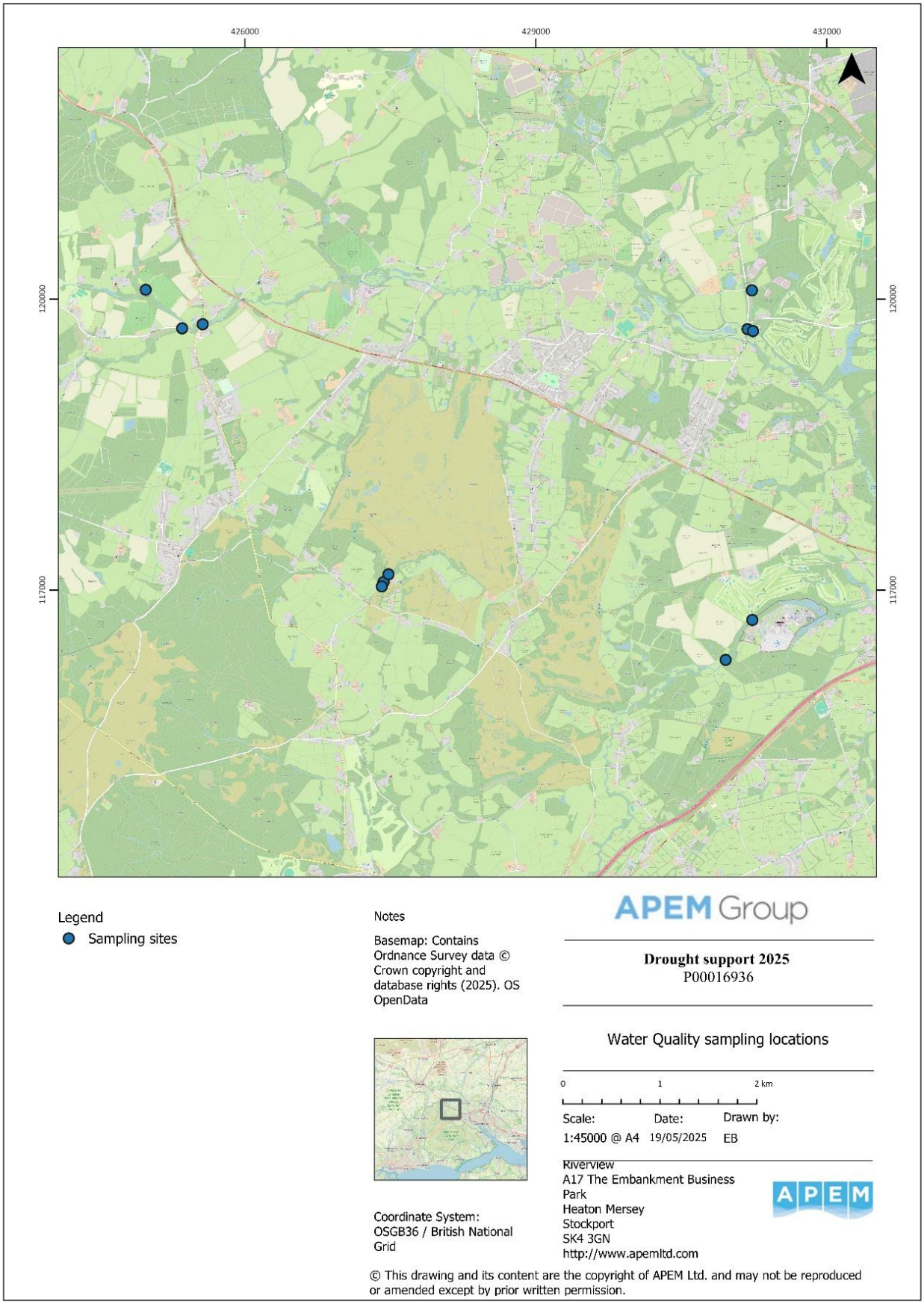


Figure 2-3 - Sampling locations on the River Blackwater

Analytical water quality samples were collected by hand in accordance with best practice sampling methodology and subsequently delivered within 24 hours to an analytical laboratory in a chilled cool-box under full chain-of-custody documentation. Analysis was completed as per Table 2-4, giving a detailed picture of key water quality and diffuse pollution indicators.

Table 2-4 Lab determinands measured during monthly sampling

Determinand	Units	Limits of Detection	Accreditation
Biochemical Oxygen Demand (BOD) – 5 day	mg/l	1	ISO17025
Ammoniacal Nitrogen as N	µg/l	15	ISO17025
Nitrite (as N)	µg/l	1	ISO17025
Nitrate (as N)	mg/l	0.01	ISO17025
Orthophosphate (as P)	µg/l	20	ISO17025
Phosphorus (Total)	µg/l	20	ISO17025
Suspended Solids	mg/l	2	ISO17025
Nitrogen - Total (Kjeldahl)	mg/l	0.1	-
Total Organic Carbon (TOC)	mg/l	0.1	ISO17025

Physico-chemical data was collected using a multi-parameter water quality meter including parameters such as dissolved oxygen (DO mg/l and % saturation), temperature, specific conductivity, pH and salinity.

At each site photographs and notes of possible influencing factors, such as weather conditions, ambient air temperature, the presence of oil slicks, growth of algae, any unusual sights or smells, sewage litter or fungus, and recent management of the watercourse/water body, were recorded.

2.3.4 Southampton Water Water Quality Monitoring

Southampton Water is a tidal estuary north of the Solent and the Isle of Wight in England. The city of Southampton lies at its most northerly point, where the estuaries of the River Test and River Itchen converge.

Salmonids, notably Atlantic salmon, are particularly sensitive to changes in water quality, with different life stages influenced by certain parameters such as dissolved oxygen concentration (DO), temperature, pH, conductivity and suspended solids. Poor water quality associated with a range of these parameters can influence productivity, fecundity and migratory behaviours.

As part of the baseline monitoring, developing a better conceptual understanding of river flows, associated water quality changes, in a number of zones of influence in Southampton Water, and how this in turn may affect migratory salmonid populations which use the estuary as a transitional area during their migration will be key to future assessment.

APEM have undertaken surveys from 2023-25 monitoring water quality at key locations across selected areas of the estuary (Figure 2-4) during a prolonged dry antecedent period, which if coinciding with high water temperatures has the potential to mimic conditions relating to typical drought conditions in the area. During these surveys APEM specialists completed in-situ water quality monitoring from a suitably accredited vessel collecting samples at sites covering a full tidal cycle. Data was collected from surface to bed levels, producing a full profile of water quality across this range.

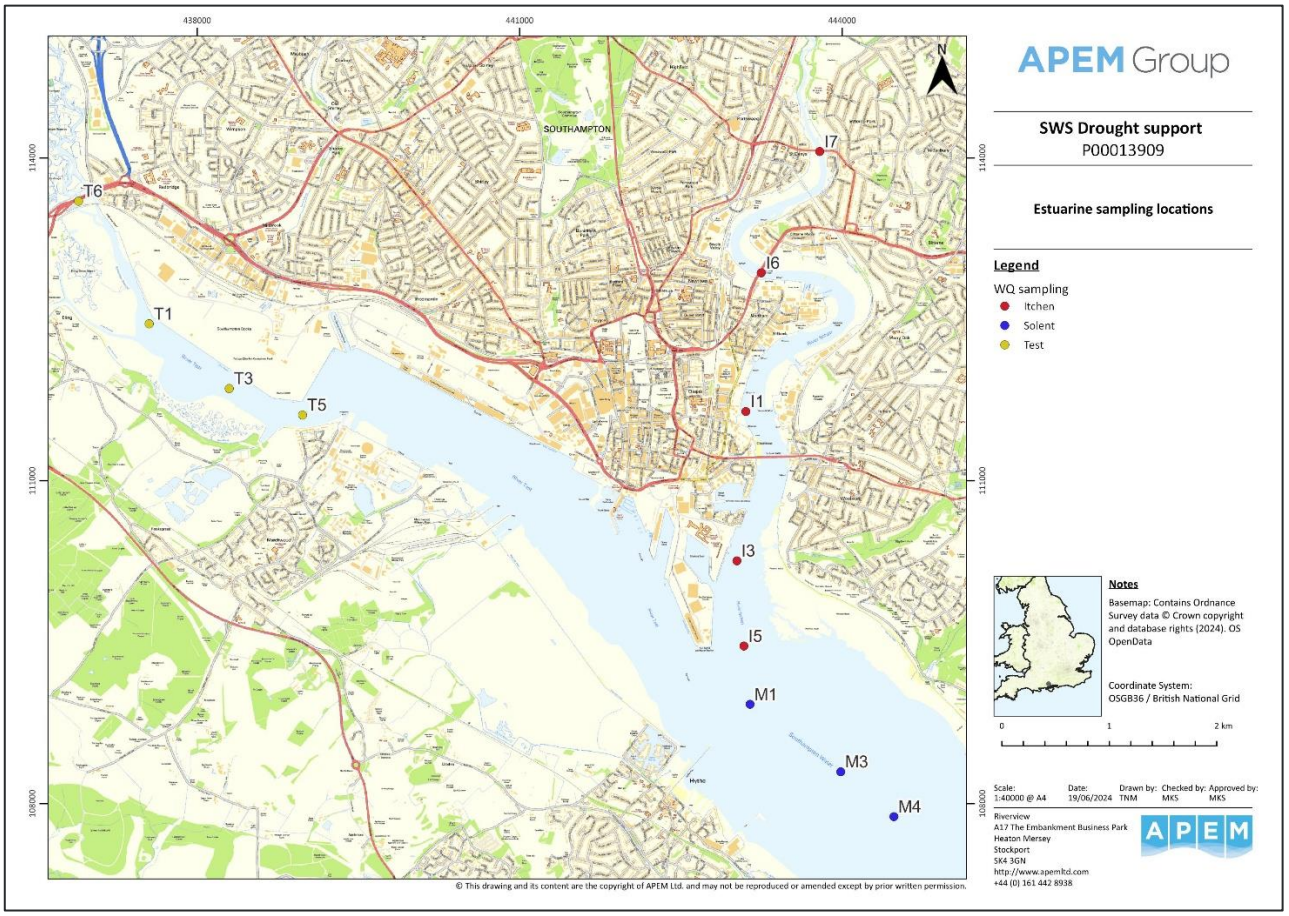


Figure 2-4 Water quality sampling locations on Southampton Water

2.4 Baseline Fish Habitat Monitoring

A specialist habitat survey was undertaken to characterise the current fish habitats of the lower reaches of the River Test, first using remote sensing in 2019 and then validated with on the ground walkovers in 2022. The survey targeted the main stem of the river from Nursling Mill (SU 35200 15800) to the estuary downstream of Testwood Mill (SU 36200 14200) and included a 600 m reach of the River Blackwater upstream of its confluence with the Test. A 1.5 km reach of the Little Test was also surveyed, including the connecting watercourses on Wirehouse Stream (upper and lower). These reaches were selected as important to consider in relation to defining potential impacts from the operation of the Test Surface Water abstraction to the designated sites downstream of the abstraction intake on the Great Test, the Little Test and Wirehouse Streams (Figure 2-5).

The habitat survey was undertaken during seasonally representative flows and during a period authorised by BME and LRM. The survey was undertaken during low tidal conditions in Southampton Water which is known to flood stretches of the Lower Test system to a varying degree.

The survey primarily followed the Hendry & Cragg-Hine[2] methodology, which was designed to determine the spatial distribution, quality and quantity of key functional habitats for Atlantic salmon (*Salmo salar*) and lamprey (*Lampetra* spp.*)* within the reaches surveyed (Figure 2-6). Habitats favoured by juvenile and adult salmonids, including those areas with gravel composition suitable for spawning, were recorded along with optimal juvenile lamprey (ammocoetes) habitats[3].

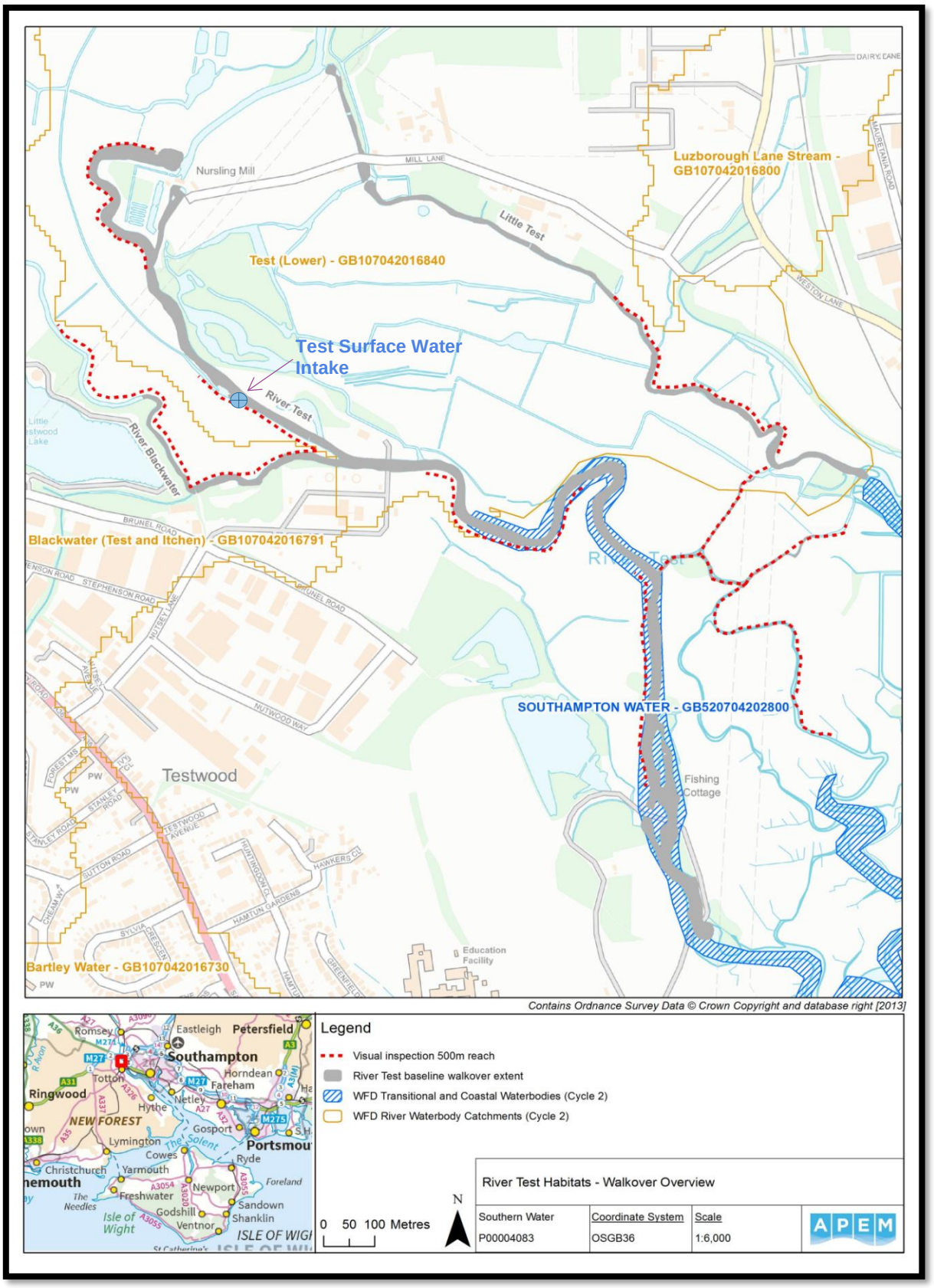
Other hydromorphological features were recorded, including runs and glides which provide suitable migratory passageway for fish, and pools which offer suitable resting and pre-spawning congregational areas for salmonids. These were assessed using standard River Habitat Survey methods[4].

Key functional habitats for other fish species of conservation value e.g. bullhead (*Cottus gobio*) and European eel (*Anguilla anguilla*) were also identified using standard methods where available during the walkover survey[5].

Further observations which were noted during the walkover included areas of excessive erosion which could cause siltation of nursery habitat, and anthropogenic alterations to the channel which could affect fish migration. Additional prominent features (e.g. woody debris/macrophyte cover/depositional bars) were also recorded with all salient observations throughout the walkover recorded with a unique GPS reference, and photographs.

To ensure good coverage in restricted access areas in the target area the ground survey was augmented by ultra-high resolution aerial survey imagery, which was processed into 20mm resolution, providing a continuous mosaic of habitat across the lower catchment.

[2] Environment Agency National R&D Project W2/i584 – EA R&D Technical report W44.
[3] Maitland PS (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.
[4]River Habitat Survey in Britain and Ireland: River Habitat Survey Manual: 2003 version, Environment Agency
[5] Tomlinson ML & Perrow MR (2003). Ecology of the Bullhead. Conserving Natura 2000 Rivers Ecology Series No. 4. English Nature, Peterborough.



Contains Ordnance Survey data © Crown copyright and database right 2019

Figure 2-5 Survey reaches on the Lower Test.

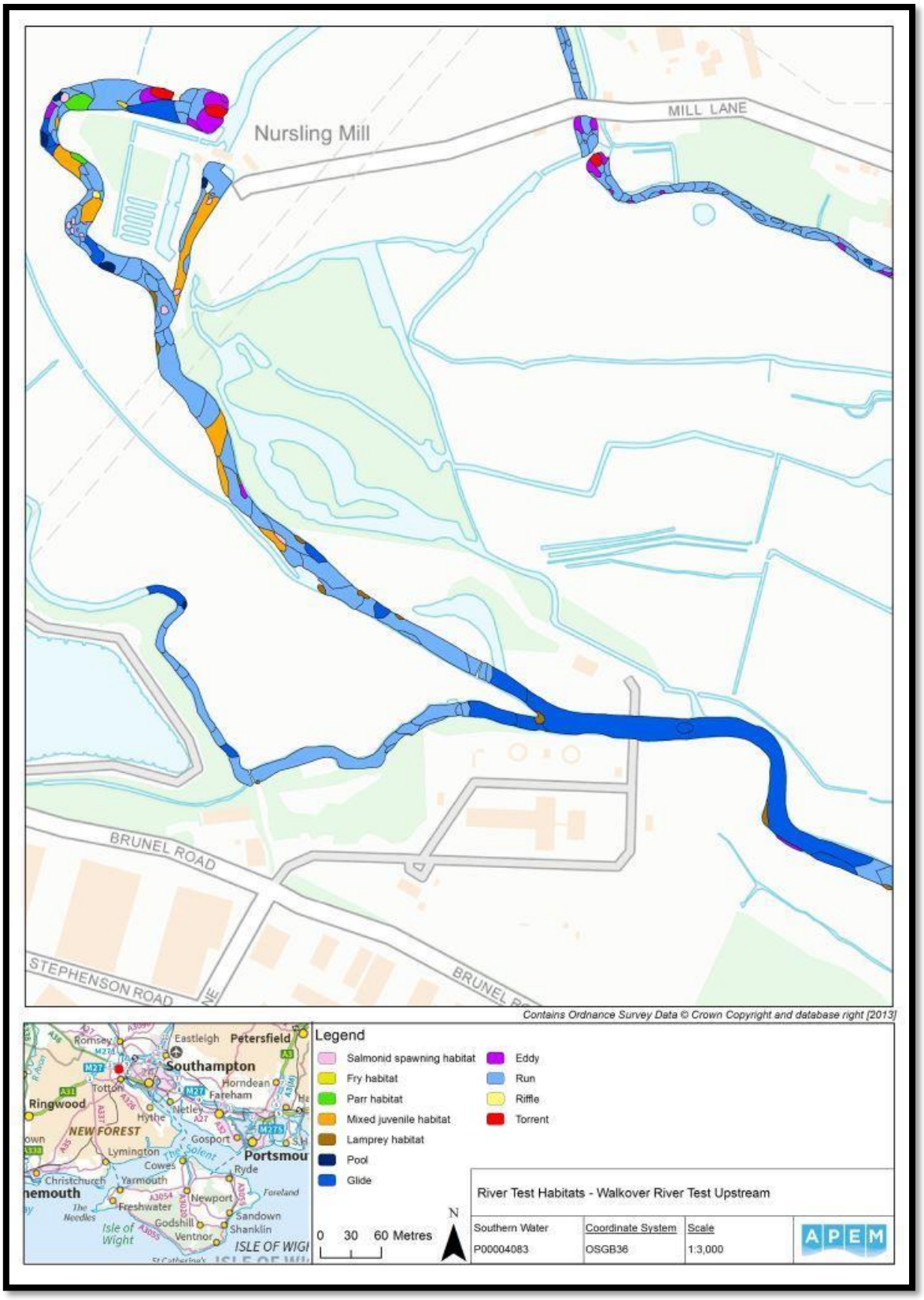


Figure 2-6 Example output of the fish habitat survey of the lower River Test.

2.5 Aerial Survey Monitoring & Interpretation 2019 - 2025

In 2019, 2023 and 2024 APEM were commissioned by SWS to create a 3D model of the intertidal and lower reaches of the River Test. This was undertaken using a survey grade, photogrammetric, Phase One airborne digital aerial photographic system mounted on a PAV80 gyro-stabilised mount. These surveys covered 5.7km^2 of the lower River Test and when used in combination with survey data gathered from land, have provided an extremely valuable tool for quantitative environmental monitoring, detailed habitat assessments, visualisation purposes, stakeholder engagement, ecosystem value studies and change detection.

The highly detailed imagery showing features such as intertidal habitats, riverbanks and salt marsh vegetation in more detail than the overhead data alone. This data is becoming increasingly important during considerations of the Lower Test Restoration Plan. The model can also be hosted online, allowing multiple users to zoom, pan and fly around the surveyed site, providing a unique perspective on the surveyed areas of interest. The models have also helped to minimise the need for expensive ground surveys and reduce health and safety risks on site as multiple users can view different aspects of the study area remotely.

The imagery from the remote sensing capture has been used to create habitat maps of intertidal areas, instream and terrestrial habitats. Most recently, comparisons between salt marsh and/or intertidal reed bed extents in different years have been calculated, with the changes accurately quantified. The imagery has also been used to detect potential pollution sources in the local landscape, aiding in developing potential mitigation measures, aiming to improve water quality across the entire lower River Test and River Blackwater catchment (Figure 2-7).

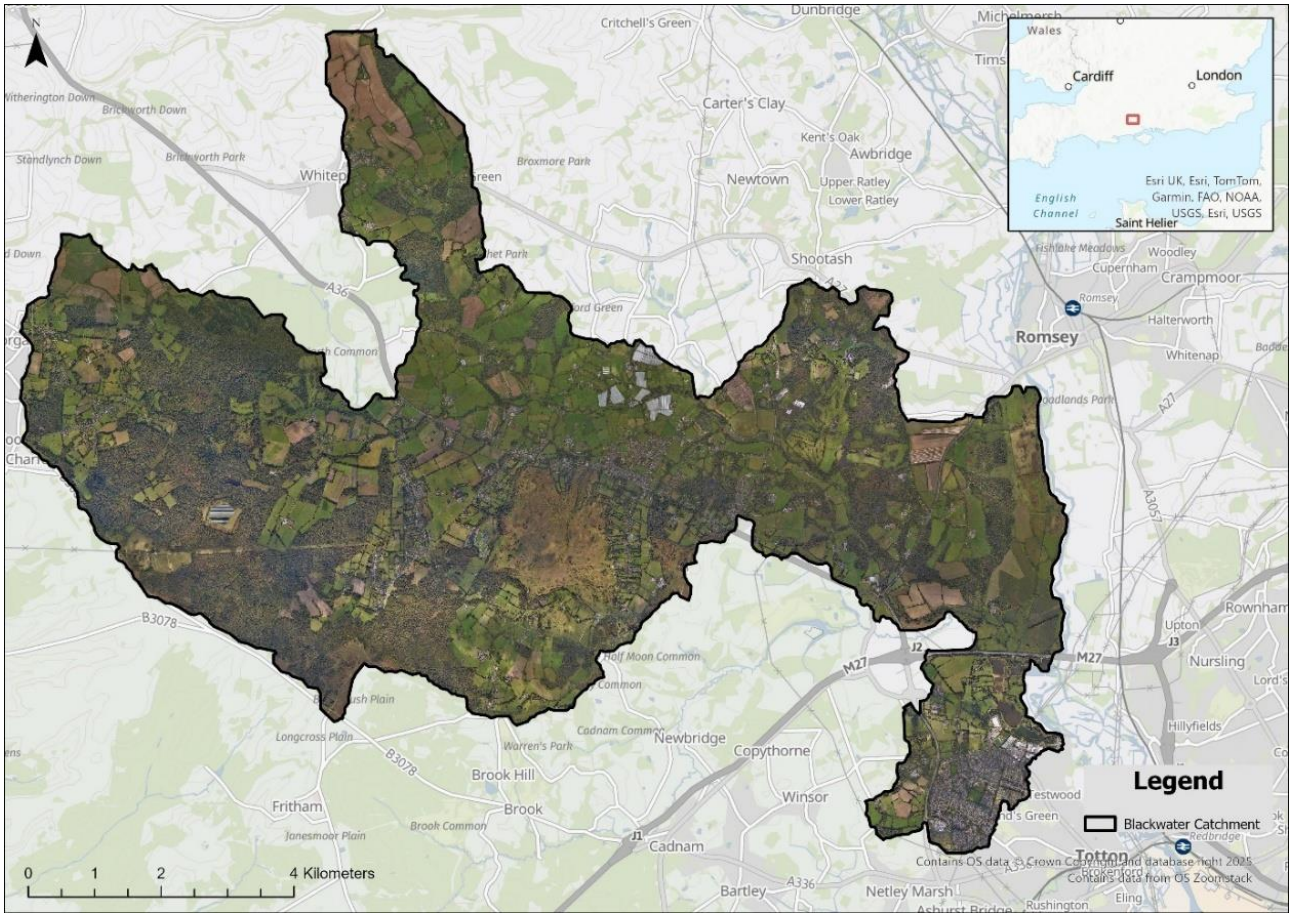


Figure 2-7 High resolution imagery coverage from the River Blackwater catchment

2.6 Baseline Hydrometric Monitoring

Gauge boards were installed at four locations in 2024 (including three stations where level loggers where installed for high-frequency measurement) (Figure 2-8):

- Site 1: opposite Lock Hatches on right bank (with level logger).
- Site 2: downstream of Lock Hatches on left bank.
- Site 3: upstream of Nursling Hatches on left bank (with level logger).
- Site 4: upstream from Testwood Mill House on timber fishing platform upstream of weed boom to Storm Hatches (with level logger).

In addition, two existing gauge boards were cleaned and cleared so accurate monitoring of level could be undertaken:

- Site 8: at Nursling Hatches
- Site 9: at Mill House

The gauge boards were installed onto a wooden board and set, flush with the stream bed. Where a structure was already in place the board was secured to these where possible to limit intrusion to the bed and bank however, where no structure was is in place, metal stakes were driven into the bank and attached to the wooden board to secure the gauge board in place. The installation of these structures required Flood Risk Activity Permits (FRAPS), which were compiled and issued to the EA.

The key objective of installing gauge boards at a series of targeted sites was to understand the stage regime of the River Test, including the tidal reaches prior to, during and following drought conditions and in advance of any potential drought permit or order application.

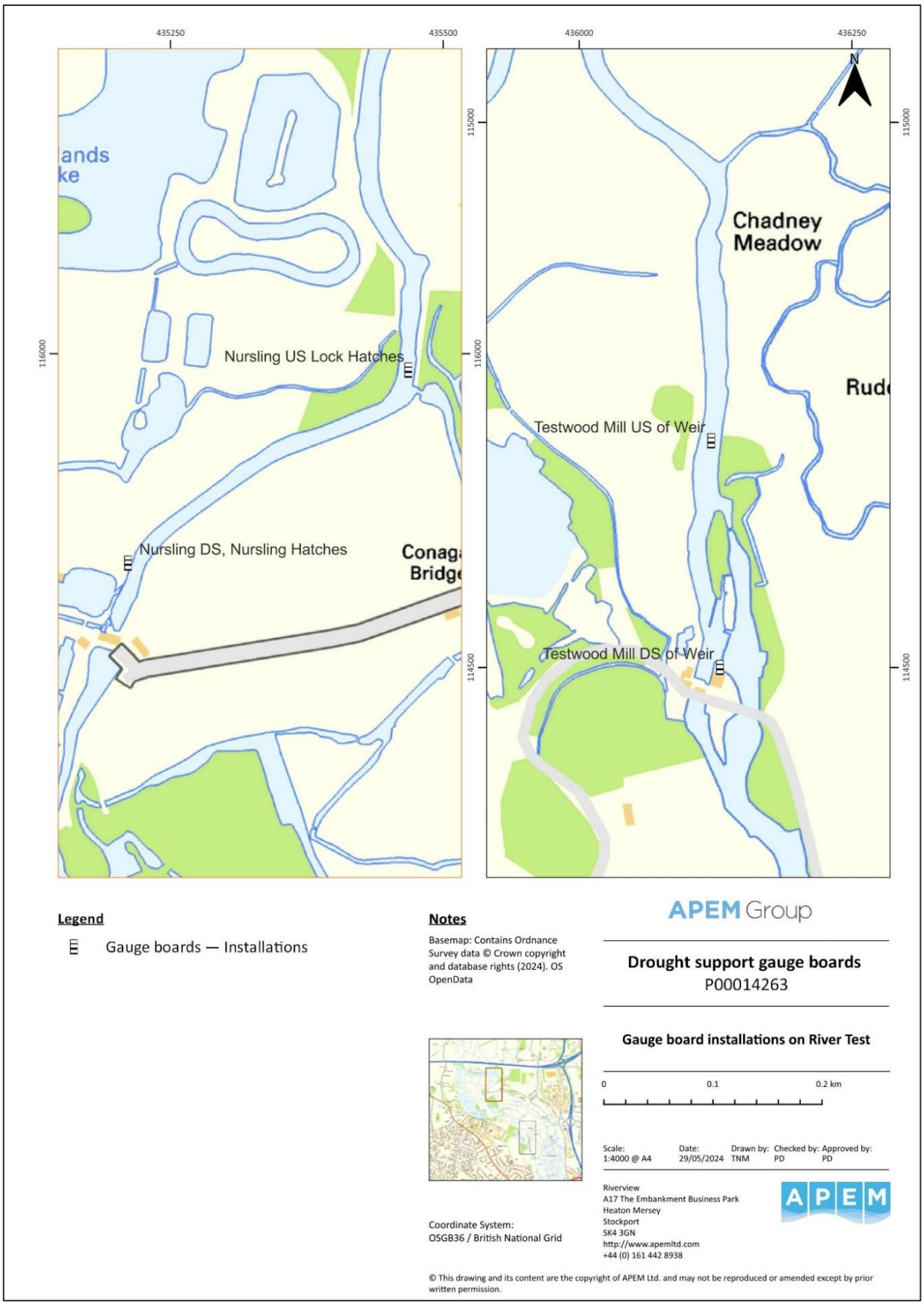


Figure 2-8 Gauge board installations on the Lower Test

2.7 Lower Test Barrier Monitoring

The lower River Test river system features numerous weirs, barriers, hatches and sluices, used to manage water levels and flows in its lower reaches. Although some structures feature fish passes, many of these structures pose a barrier to the free passage of the fish species in the river.

Specialist surveyors will be undertaking surveys in August 2025 to assess the degree to which these various structures will impede fish passage, with a focus on low flow and drought conditions (i.e. Q95 flows[6] and below). This assessment considers the full range of fish species in the River Test, ranging from stronger swimming and migratory salmonids (salmon, trout and migratory trout) to weaker swimming species (coarse fish, eels and lamprey). It is acknowledged that migratory species (salmonids, eels and lamprey) will be of key importance during low flows, due to the environmental designations associated with the River Test river system.

There are several physical structures, carrier channels and diversions within the Lower River Test area. These are normally passible for fish, however there is a risk that they may become barriers to fish movement during drought. The structures at Testwood Mill and at the confluence of the Wirehouse stream are downstream of the Test Surface Water intake and risks may be increased under low flow conditions. However, the risks at structures is also likely to be closely related to how the structures are operated. (For example, there are opportunities to alter penstock settings so as to be most advantageous to fish movement and or flow aeration).

The list of structures to be assessed in the lower Test, some of which may potentially have multiple passage routes or channels are as follows:

- Lock Hatches (Greater River Test)
- Nursling Mill Hatches (Greater River Test)
- Conniger Hatches (Lesser River Test)
- Wirehouse River Hatches (Wirehouse Stream)
- EA Storm Hatches (near Testwood Millhouse)
- Millhouse Salmon Pass (near Testwood Millhouse)
- Three Kings Hatches (near Testwood Millhouse)
- Eel Rack Hatches (near Testwood Millhouse)
- Garden Hatches (near Testwood Millhouse)

The site-based assessment of structure passability will follow the principles outlined in the WFD111 'SNIFFER' guidance[7]. This methodology uses field-based assessments to score barrier passability, giving consideration to the barrier's geometry, construction and key features, as well as measured flow velocities and water depths.. The WFD method can then be used to score barrier passability. Crucially, this score reflects passability in the flow conditions on the day of the survey, with passability likely to vary in different flows (and, in the case of this highly managed river system, due to the operation of sluices and structures). Passability is considered in both the upstream and downstream direction, with due consideration to the passage needs for different life-stages of the species present (e.g. downstream passage is essential for salmon smolts and silver eels).

[6] Q95 is the flowrate in a river that is equalled or exceeded 95% of the time.
[7] WFD111 (2a) Coarse Resolution Rapid Assessment Methodology to Assess Obstacles to Fish Migration.

2.8 River Aeration Trials

Aeration of river water is proposed as a temporary emergency measure to be implemented should adverse water quality conditions (specifically significantly reduced DO concentrations) be identified during the Stage 0.1 Drought Order implementation. It is recognised that reactive/emergency aeration has multiple associated challenges, particularly in a large, uncontained river system when water temperature will limit oxygen solubility, however it remains a responsible mitigation measure with few alternatives.

A series of aeration trials were conducted by APEM in 2022 and 2024 to determine the efficacy of a range of equipment used to aerate water. These trials were undertaken at several stations on the lower river and at the Test Surface Water Water Supply Works (WSW) (Figure 5-1).

The desk-top work and subsequent field trials undertaken by APEM identified appropriate aeration equipment capable of having a positive change on dissolved oxygen concentrations in river water. The stored compressed gas system with the selected configuration of diffusers and compressed air source are scalable, cost effective and could be deployed during the night without supervision.

3 Drought Onset and During Drought Monitoring

The scope of environmental monitoring during and post the Stage 0.1 Drought Order is set out in this section. This monitoring supplements the baseline monitoring in the S.20 Agreement.

3.1 Water Quality and Hydrological Conditions

3.1.1 Automatic Water Quality Monitoring data

Southern Water's automatic real-time (30 minute timestep) water quality data, as well as providing long-term baseline data (Section 2.3.1), is a primary data source for the Stage 0.1 Drought Order and informing emergency measure actions. Parameters measured by the Sondes are:-

- Water level; temperature; pH; turbidity; conductivity; dissolved oxygen (mg/l and %); and, Ammonia (as mg/l.NH3 and as UIA).

Weather, including temperature forecast data, will be kept under review alongside WQ data.

The relative location of the River Test water quality monitoring stations are shown diagrammatically in Figure 2-1. The exact locations of the sondes are not provided in this plan due to the risks of vandalism (which has been experienced at multiple sites on multiple occiasions since installation). Location information can be provided on request subject to a confidentiality agreement.

The water quality data acquired to date from the River Test stations is summarised in an Excel Workbook that will be made available to the EA and updated weekly during the process of this River Test Stage 0.1 Drought Order.

The EA has access to the data in real time and will also be sent 'alarms' by email if parameter thresholds (listed below, Table 3-1) are breached.

Southern Water intends to use the sonde data immediately downstream of the river intake (the "Test Surface Water U/S discharge" station as a primary data source relative to alarms and implementing emergency measures. Other nearby station data will be used to corroborate the primary station data, to guard against it providing false alarms and action triggers. Should the primary data source fail, we intend to use the downstream of discharge sonde as the source of primary data and, if that fails, the measurement at the intake itself. (N.B. the Test Surface Water Intake sondes does not record DO (mg/l) therefore, if the primary and secondary sondes fail, we would rely on the DO (%) data at the Intake).

3.1.2 Supplementary Spot Water Quality Measurement

Supplementary in-situ measurement of physico-chemical parameters will be undertaken on a weekly basis as part of the visual montitoring surveys.

3.1.3 WQ triggers

The WFD UK Technical Advisory Group (UKTAG) has defined the following EQS for dissolved oxygen (DO) and DIN concentration for transitional and coastal waters.

DO (5th percentile):

- High: >7 mg/l
- Good: 5-7 mg/l
- Moderate: 3-5 mg/l
- Poor: 2-3 mg/l
- Bad: <2 mg/l

DIN (transitional waters):

- High – Good boundary: 20 µmol/l
- Good – Moderate boundary: 30 µmol/l

We have also considered guidance provided by the EA (April 2020 papers from Dom Longley, Fisheries Team Leader) concerning protection for priority fish species in relation to water quality triggers and responses.

We intend to use DO (mg/l) thresholds as listed in Table 3-1 below as the primary real-time data triggers for emergency measures, with real-time alarms also set relative to the other parameters in the Table. We intend all parameters alarms to be based on at least 2.5 hours (five 30-minute timesteps) of exceedance of the thresholds as in Table 3-1.

Table 3-1 - Parameter thresholds for alarms at installed monitoring sites

Parameter	Upper Limit	Lower Limit	Comments
Thresholds activating mitigation measures			
Dissolved Oxygen (mg/l)		7.5; 6.5	Primary site is Test Surface Water, secondary site is Test Surface Water D/S
Thresholds for information only			
Dissolved Oxygen (%)		75; 65	If the primary and secondary thresholds fail then DO (%) at Test Surface Water will be the tertiary threshold to activate mitigation
Temperature (°C)	19		Measured at 09:00 each day in accordance with the level at which fishing activity is stopped on the River Test
pH	9	6	
Turbidity	250		
Un-ionised Ammonia (UIA, mg/l)	0.018		

7.5 mg/l dissolved oxygen is used as a level where persistence below which, fish behaviour is likely to start becoming distressed and, 6 mg/l dissolved oxygen as level where persistence below which, negative impacts on fish are more likely to occur.

The alarm levels are set as below, including durations below the thresholds so as not to trigger alarms from un-influential short duration dips in the data and, to avoid routine alarms occurring relative to normal within day patterns of variation of dissolved oxygen:-

(i) a dissolved oxygen level of less than 7.5mg/l occurring for more than 5 consecutive 30 minute periods;
(ii) a dissolved oxygen level of less than 6 mg/l occurring for more than 5 consecutive 30 minute periods.

The 7.5mg/l threshold is expected to be triggered for less than 20% of data, and the 6 mg/l threshold for less than 5% of data according to data available to date for analysis from the installed stations. However, during lower river flows the threshold could be reached to a greater extent. Therefore, these thresholds are considered appropriate.

Note, the River Test is designated as a salmonid fishery under the Freshwater Fish Directive (78/659/EEC). Note, failure of Nitrite guidelines occurs under baseline conditions and therefore has not been used as a trigger level.

Emergency mitigaton measures intended in response to the water quality triggers are set in Section 3.2.2 below.

3.1.4 Rainfall, Groundwater Level, River Flow , and Weather monitoring

SWS uses data from the EA river flow gauging stations, and rainfall gauges to inform real time conditions of the lower River Test, in combination with the other monitoring..

SWS is able to get river flow data from the EA's national 'API' data provision system. However, it should be noted that there are someimes issues in respect of that system not always updating frequently enough. Consequently it is possible during the operation of this Stage 0.1 Drought Order, that key flow information might not be easily available, and reliant on email correspondence with the EA on the Total Test Flow estimation.

SWS recommends that a flow monitoring group is established to include key local stakeholders during the operation of the Stage 0.1 Drought Order, especially those who may have cause to alter control structures that affect river flows and water levels. Any such operations should be governed by the EA in respect of overall river management, consistent with the drought order.

3.2 Fish Distress Visual Monitoring

3.2.1 When and where to monitor

Fish observational behaviour monitoring will be undertaken at the survey locations detailed and shown in Appendix 1 and Figure 3-1.

When the river flow falls below 355 Ml/d with the Stage 0.1 Drought Order in place, fish distress monitoring will take place *weekly.* A selection of potentially flow sensitive fish habitats in each of the reaches have been identified and mapped.

SWS intends this work will be undertaken by a specialist contractor to be agreed in advance with the EA or, by the EA themselves.

SWS will also liaise with LRM for daily updates on fish behaviour.

3.2.2 Monitoring for and reaction to WQ deterioration

The real-time multi-parameter water quality meters ('sondes') data will be monitored in case of water deterioration and, the intended reactive monitoring actions are set out below in respect of falling dissolved oxygen thresholds at the primary monitoring station. (See Section 4 for emergency measures):-

Reduction of DO by 1mg/l in a 6hr period

- Increase observations of data and assess how DO levels are recovering across all stations.

Reduction in DO by 1mg/l in a 12hr period

- Review of long-term hot weather forecast and notification of aeration contractor to be on stand-by during any specific periods where hot weather is anticipated.

Reduction of DO by 1mg/l over a 24hr period

- As above as well as supplementary spot sampling will occur with field tests to include ammonia and nitrite as well as DO.

7.5mg/l alarm raised

- As above and review of ammonia and nitrite levels (any levels above agreed amount[8] will demonstrate a trend towards toxic conditions for fish) and, ready aeration for operation (See Section 4).

6mg/l alarm raised.

- As above and implement aeration (with EA / NE / Fishery permission) until recovery of DO above 7.5mg/l.

Reduction of DO further below 6mg/l

- As above.
- Continue aeration for as long as required until recovery of DO above 7.5mg/l.

SWS will notify the EA on 0800 80 70 60 and by email to the EA's nominated contacts in the event of WQ trends deteriorating to unfavourable conditions, as stated above. Implementation of aeration will only be actioned if the EA, NE and LRM Fishery agree to it.

3.2.3 How and what to record during monitoring

Observations from the weekly visual monitoring (Section 3.2.1) will be captured by annotated walkover maps and completion of a 'River Conditions Observation Form - Low Flows'. Surveys will be completed by specialist contractor.All observational monitoring will occur at dawn, first light.

As stated in Appendix 1, signs of distress that will be monitored for will include:

- Exposure of key functional habitats;
- Concentration of fish in restricted areas/pools (try to ascertain number & species);
- Stranding of fish in marginal areas;
- Fish in distress (e.g. gasping at the surface, gathering in large shoals in deeper pools);
- Dead or dying fish (record number and species); and
- Signs of pollution.

If fish distress is observed, SWS shall notify the EA on 0800 807060 at the location of the observed distress with the following information:

- Approximate number of dead fish;
- Signs of damage or disease;
- Approximate number of fish in distress;
- Approximate number of stranded, or trapped fish;
- Approximate size of fish;
- Species affected;
- Visual signs of pollution; and
- Weather conditions.

Subsequent emergency measures will be coordinated and agreed with the EA following notification and extent of fish distress. The intended fish rescue, relocation and aeration methodology is provided in Appendix 1.

[8] Ammonia 0.018mg/l Nitrite 0.01mg/l (0.003mg/l nitrite as N).

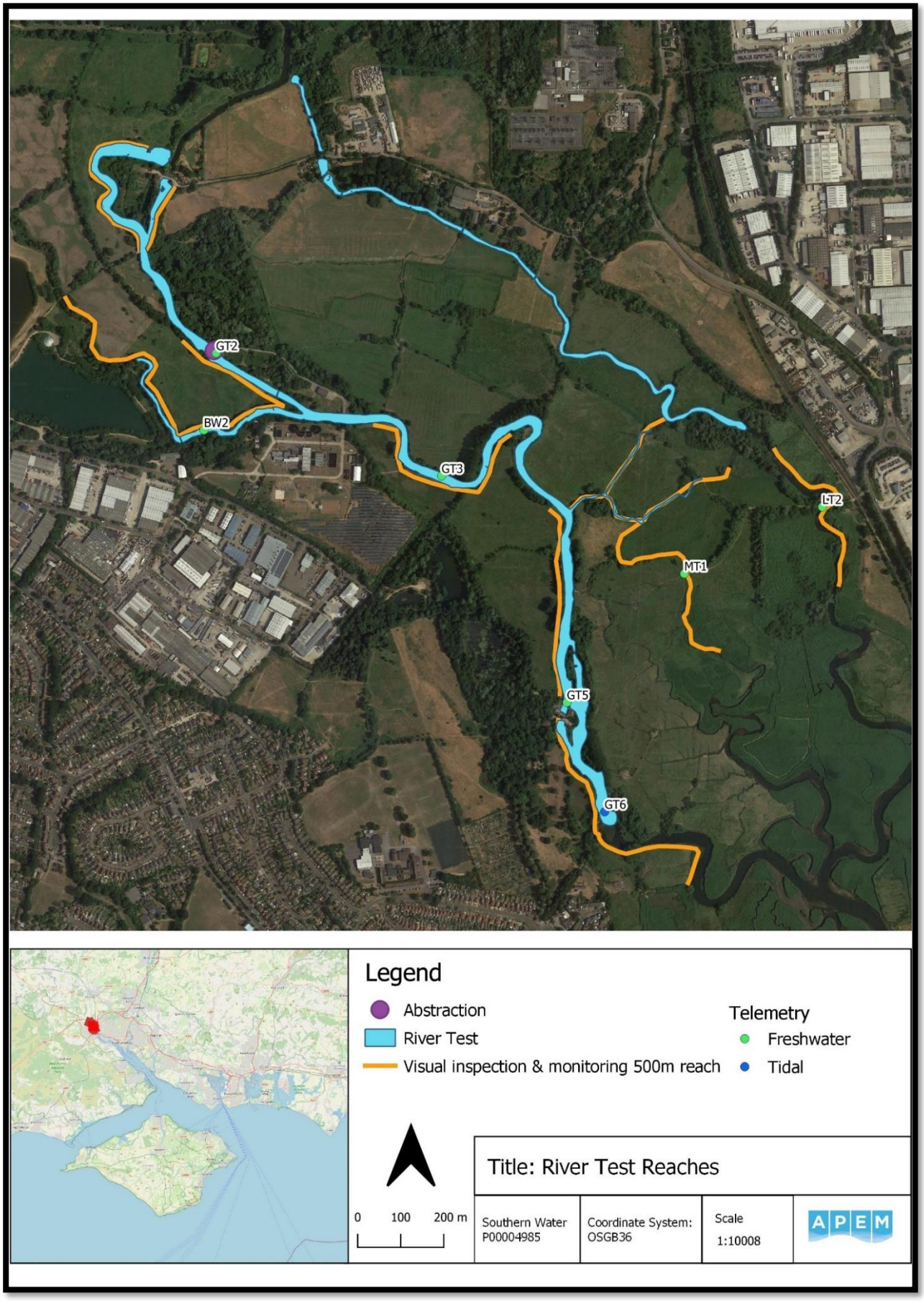


Figure 3-1 - Fish distress visual monitoring reaches

3.3 Abstraction Intake Fish Monitoring

A new eel screen has been installed at SWS' River Test abstraction intake, satisfying the Eels Regulations 2009.

A specialist fish screen monitoring programme was devised and deployed in 2023 by a specialist fisheries team to target species and life stages of fish, notably those anadromous species passing through the estuary and lower reaches of the River Test.

Due to the complexities of the Test Surface Water site, an initial site visit was undertaken to assess the intake and screen setup. A subsequent design to monitor the most effective way of sampling fish impingement and entrainment at the intake was delivered to SWS and permits applied for with the EA with the the survey then undertaken by APEM in 2024.

Resultant data allows SWS to understand the potential impact of a DP on the entrainment of fish while abstraction continues below the standard HOF level.

3.3.1 Elver and Lamprey Impingement Sampling

During operation of the Stage 0.1 Drought Order we will carry out regular checks of the intake to ensure screen blinding is less than the design allowance and so, eels (including elvers) will not be impinged on the screen by the abstraction velocity through the screen. We will undertake impingement sampling, which will include the monitoring of the debris return shute with a suitable capture net, this monitoring will be covered by the extended FR2 permit, in place between April and September, to capture fish for methods other than rod and line. All fish impinged, if any, will be identified to species level.

3.4 Invasive Non-Native Species Monitoring

3.4.1 Monitoring

During surveys in 2019 the presence and distribution of INNS were recorded in the Lower section of the River Test. Only one species was recorded, Himalayan balsam. Himalayan balsam is abundant along the riverbanks of the Lower Test. Whilst there may be a small risk that a reduction in water level (during drought) may lead to additional spread of stands of Himalayan Balsam we do not propose any special actions associated with this small risk.

Appropriate biosecurity measures (following check-clean-dry protocol) for all drought order monitoring and mitigation will be used to ensure invasive species are not spread between sites by the activities associated with the drought permit.

3.5 Monitoring of Physical Barriers Downstream of Intake

In addition to the baseline barrier surveys outlined in Section 2.7 as part of weekly visual monitoring surveys (Section 3.2) and subject to agreed access, observations of each structure will be undertaken by a SWS contractor (or by EA, if agreed or, possibly, if agreed by SWS, the EA and the Fishery). Note, access to the Wirehouse Stream will be agreed with HIWWT as leaseholder of the adjacent land.

Observations will record the following:

- Photographic record;
- Visual evidence of fish passage and general fish behaviour around the structure
- Best-endeavour noting of depth, width and velocity of flow over / through each structure;

These observations will be used long term by all stakeholders, to help inform long term river enhancement improvements of the Lower Test.

3.6 Other Users of the Test

SWS will consult with key stakeholders regarding navigation, recreation, amenity and heritage throughout the Test Surface Water Drought Order process, and where required hold face to face meetings. If necessary SWS will erect signage informing users of the River Test of the situation, including any specific safety warnings for navigation and recreation. This will be undertaken in liaison with the EA and other relevant organisations.

4 Drought Order Mitigation

Mitigation measures available to SWS for a 2025 Stage 0.1 Drought Order application are discussed below with locations shown on Figure 4-1.

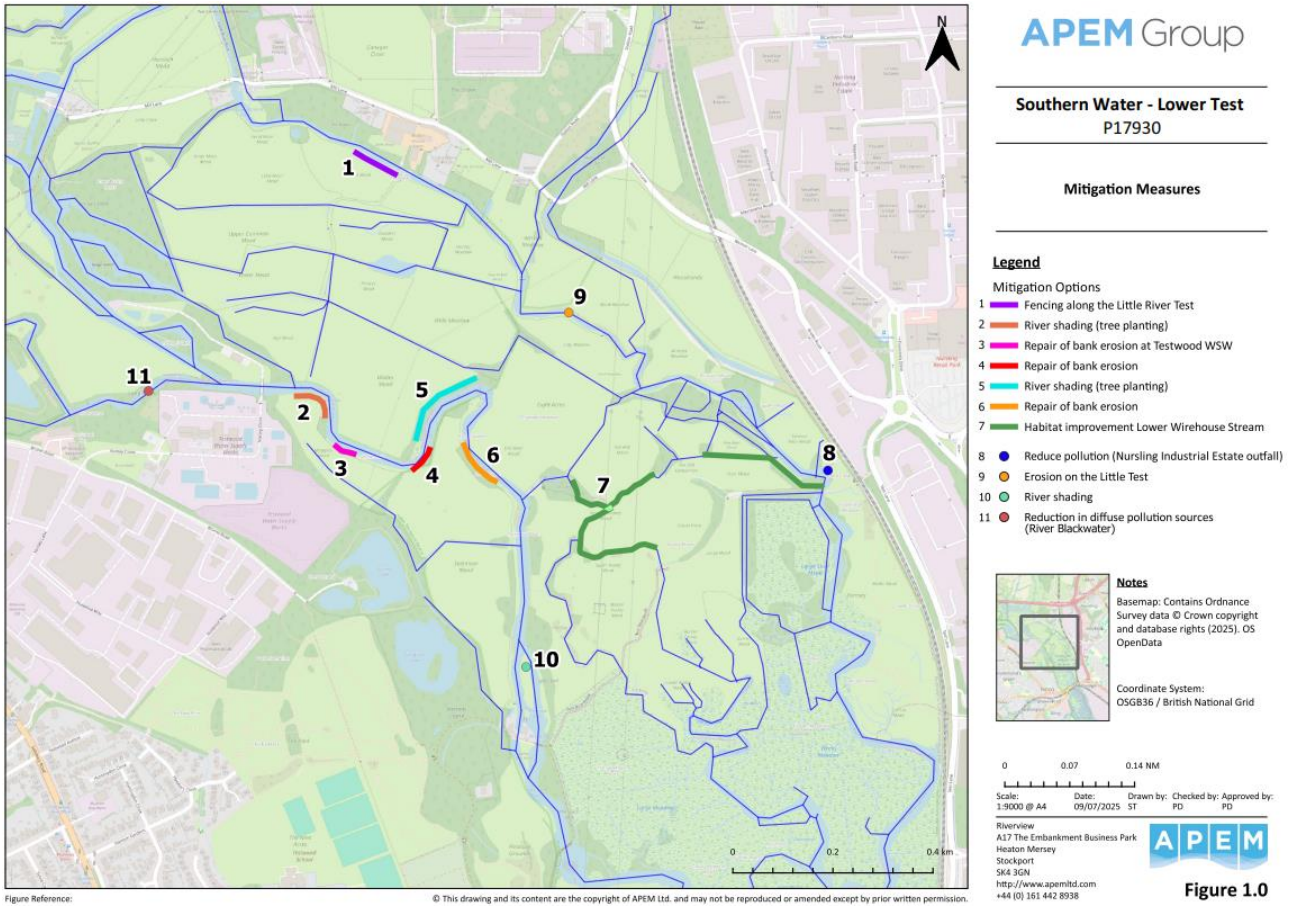


Figure 4-1 - Locations of mitigations and emergency measures

4.1 In channel Habitat enhancement – River Test (Test Surface Water downstream)

SWS has identified five small scale channel enhancement schemes that can be put in place in 2025. These are summarised below:

- Habitat Improvements to Lower Wirehouse Stream, which will improve local conditions for the salmon population over approximately 700m of channel. The principle measure will be improvements to the heavily dredged channel, to improve its overall habitat. This will include the addition of gravel to the channel, as well as creating deflectors and berms.
- Fencing along the Little River Test to exclude large grazing animals from the river bank which will improve flow conditions (eliminate unwanted channel widening) and also minimise potential for diffuse pollution (sediment) release. The extent of this will be approximately 100m.
- There is existing bank erosion at Test Surface Water WSW which will be repaired which will improve flow conditions (eliminate unwanted channel widening) and also minimise potential for diffuse pollution (sediment) release. The extent of this will be approximately 50m.
- Repair of two further areas of bank erosion (one also affected by ash dieback increasing erosion, whilst the other is eroding behind existing bank protection) which will improve flow conditions

(eliminate unwanted channel widening) and also minimise potential for diffuse pollution (sediment) release. The extent of this will be approximately 175m combined.

4.2 In channel Habitat enhancement - Blackwater

SWS is actively working to enhance the channel conditions, in terms of habitat provided and also reduction in diffuse pollution (specifically targeting salmonid - Sea Trout are understood to favour the Blackwater spawning habitat, and further aiming to improve habitat for salmonids), along an extensive reach of the River Blackwater. A focused fish habitat walkover survey covering >20km in the catchment was undertaken. The following measures are proposed or being implemented currently:

- Reduction in diffuse pollution sources with 250 potential water pollution sites identified along more than 20km of channel inspected, including 15 priority locations. To start to address this five farm action plans have already been delivered and a further five are being delivered in 2025.

4.3 Pollution reduction

Since the summer of 2022, SWS has assessed the pollution concerns for the Little Test from the Nursling Industrial Estate outfall and has developed and is implementing a three-phase action plan to reduce the pollution risk.

- Phase 1 involves routine regular inspection and change-out of the booms at the outfall; CCTV survey, sampling and jetting of 3.3 km of sewers and manholes / catchpits on the Industrial Estate. Phase 2 includes full clean out of the outfall and, weir and baffle upgrades (converting from wooden to steel); detailed clean and jet for 3 pipes of the Marshalls Mercedes Yard; Dewatering support and non-storm treatment management, including by oils separation. Phase 3 will be concurrent with phase 2 and follows up on phase 1 with a more detailed further investigation, aiming to identify further control and management options. This includes a unit-by-unit inspection for hydrocarbon sources within the contributing site.
- Effectiveness of this mitigation approach is assessed through the monitoring detailed below (recognising that this is not mitigation itself). As part of the ongoing drought and wider lower Test catchment monitoring programme, analytical sampling for hydrocarbons from select accessible outfalls and locations through the Lower Test catchment has been implemented. This is to identify wider diffuse pollution pressures, and these feeding into the development of the long term Lower Test Restoration Strategy.
- SWS, with the permission of the Lower Test Fishery, Lower River Management (LRM), has also installed two real time water quality monitoring stations in the Little Test; one (“LT2”) immediately downstream of the outfall and another (“LT3”) a further 200m downstream. These record and transmit measurement of turbidity; dissolved oxygen; temperature; conductivity, ammonium; and water level. They provide alarm messaging when low dissolved oxygen thresholds are passed and, overall, provide much improved knowledge of events and trends and means to trigger reactive response during Stage 0.1 drought order conditions.
  - It is believed the measures already implemented within the three-phase plan have reduced the risk, with further aspects of the plan to follow.
  - The real time water quality monitoring in the river is in place and provides information and alarms for reactive response during drought.

4.4 River Shading

SWS has completed (to end 2024) tree planting for river (fish) shade along two sections of the Test, in agreement with LRM, HIWWT, EA and NE, using a mixture of native trees and shrubs typical of the local area. Two further areas will be planted by SWS in 2025, subject to LRM, HIWWT, EA and NE agreement. Additional shading will be provided in the interim until the trees reach sufficient size, via shading hung over the river or river surface floated, subject to LRM agreement.

- Floating shading can be deployed quickly, subject to agreements with EA and LRM. Hung shading may take a little longer to 'design', procure and implement, notably to cover holding water downstream of the storm hatches at Testwood Mill.
- Shading reduces water temperature and so can improve dissolved oxygen conditions. It also provides lower stress locations for fish to rest in.

5 Drought Order Emergency Measures

5.1 Aeration

Aeration of river water is proposed as a reactive and temporary emergency measure which can implemented should adverse water quality conditions (specifically significantly reduced dissolved oxygen concentrations) be identified during Stage 0.1 drought order implementation. It can be implemented subject to access and environmental permissions but during drought situations SWS will be working to heightened communication with the EA, NE, LRM and others to ensure agreed deployment.

To optimise such operations, aeration would likely occur during night-time periods, when dissolved oxygen levels potentially sag below predetermined thresholds. However, it is expected that all parties will endorse the implementation during daytime as well should dissolved oxygen and/or river temperature indicate stress conditions for downstream fish that the aeration operation may reduce or relieve stress on fish, notably salmonids.

SWS have trialled and can install specialist aeration diffuser equipment at several locations in the depleted zone, and at Testwood Bridge (within the Test Surface Water WSW plant) and can operate it to agreement with the EA. In addition, SWS, in 2024, restored nine access platforms in the Lower Test, from which aeration equipment can be deployed. Exact locations and deployment types are to be determined based on-site conditions. This option could extend to provision of equipment to the Fishery Keepers, who with training could help deploy it. Deployment locations and timing should be flexible and directed by water quality data and observations of fish or other ecological stress. Proposed deployment locations are shown in Figure 5-1.

Aeration will mitigate physico-chemical (especially dissolved oxygen) quality and potentially temperature. The benefits are potentially 20% to 50% improvement in dissolved oxygen, depending on initial saturation level and proximity of deployment. The specific rate of oxygen transfer (i.e. effectiveness of the aeration system) is highly dependent on a range of site specific and temporal factors and is thus not possible to predict with certainty. However, the proposed aeration approach is based on specialist experience of undertaking multiple aeration system designs and installations across a range of water body types (rivers, lakes, estuaries, reservoirs, balancing ponds) at a range of locations (across the UK and the Netherlands). In addition, a series of aeration trials were conducted by APEM in 2022 and 2024 to determine the efficacy of the equipment on the River Test. These trials were undertaken at several stations on the lower river and at the Test Surface Water WSW under the authorisation of NE, EA and the Fishery.

If required, aeration would be focussed on areas prone to low dissolved oxygen conditions or specific fish refuge areas. At these locations equipment would be deployed via recently refurbished platforms in the deeper water sections upstream of Testwood Mill, to maximise oxygen transfer, and to maximise the primary mixing radius (and potential for surface diffusion) from each diffuser unit. Aeration may also be considered in reaches that are prone to chronic pollution issues (notably in the lower reaches of the River Blackwater) however deployment locations will be informed principally by the results of the ‘in-drought’ monitoring surveys.

SWS will follow the action set relative to water quality trends as described in Section 3.2.2 to determine when aeration will be actioned, with ample lead time to arrange land access and deploy and set up the equipment. We will also pay particular attention to visual signs, including fish in distress at the surface of the water to determine when to deploy the aerators. The length of time that aeration will be deployed will be entirely dependent on the reaction of water quality downstream of deployment and the duration of undesirable conditions. Water quality will be monitored downstream using both hand-held sondes and continuous water quality monitors to understand how the environment recovers from aeration.

Any proposed deployment of aeration equipment would first be discussed with the EA for agreement and will also be authorised with LRM. It may be that less intrusive methods will be used instead in the first instance of need.

SWS proposes two reaches for aeration deployment (Figure 5-1):

- Downstream of the SWS intake, with equipment deployed from Testwood Bridge within the SWS WSW compound.
- At several stations in the lower river where safe access is available via refurbished platforms from Warnford Corner to Testwood Mill.

SWS will consider other locations if suggested by the EA, NE or by other third parties but, access, security and public safety must be primary considerations.

Figure 5-1 Location of proposed aeration deployment & trials

5.2 Fish rescue

Fish rescue will be undertaken in extreme conditions should it become obvious that fish are stranded and in distress in the river. Although considered unlikely to be required, as only potentially needed in very extreme conditions, this can be implemented if required.

In the event that fish relocation is necessary, SWS will ensure that the correct statutory and land access permissions are in place in advance of the flow falling below 355 Ml/d. This action would be considered a final option with all other mitigation options exhausted prior to fish rescue being considered.

If required, fish rescue and relocation would take place as early in the day as possible targeting lower water temperatures helping to reduce the overall stress on target fish populations. Fish rescues will only be completed outside of these times in exceptional circumstances whereby the risk to fish remaining in the water body is deemed higher than that of completing the fish rescue and relocation i.e. where it is believed that fish will die without intervention.

The relocation method applied would selectively capture the fish species and life stages showing signs of distress or isolation. Fish rescue would initially focus on juvenile life stages and those sedentary species such as lamprey in their larval life stage which occupy marginal habitat which may become exposed as river levels drops.

In general, electric fishing would be the most applicable method to capture fish in this instance, with additional manual searches (notably in marginal structures etc.) using hand nets. It should be noted that these methods cannot guarantee all fish will be captured and moved to a safe location though every effort would be made to capture all fish at risk. All electric fishing would be undertaken by fully trained fisheries scientists following standard electric fishing practice for operators and equipment, as developed by the European Standards Committee and detailed in the Environment Agency Code of Practice and Electric Fishing Equipment Annex A and B, Issue II regulations.

If removed from the river fish would be held at a low stock density in large, dark containers contained aerated river water to reduce stresses during the relocation procedure. Holding time would vary between species and site location, but where possible, holding time will be reduced and balanced against the risk of additional stress to fish.

The water quality within the holding tanks would be monitored throughout using a handheld meter and any European eels be caught, would be kept in a separate holding tank as they secrete mucus which can invest the gills of other fish species reducing their respiratory function. Likewise, any river or sea lamprey would held in a separate holding tank as they can increase ammonia to levels which can be toxic to other fish species.

Fish would be released in well oxygenated reaches of the river upstream of the Test Surface Water intake and in proximity to any key functional habitats. It is suggested that a suitable relocation site for fish captured on the Great Test would be the pools downstream of Nursling Mill (SU 36157 14456). Any juvenile lamprey would be relocated to suitable optimal habitats and spread across as much habitat as possible so as not to overload existing populations. Should fish need to be rescued from the Wirehouse Stream system (upper and lower) it is suggested that they are moved to the Little Test and delivered at the small footbridge (SU 36356 15163). Any juvenile lamprey would be relocated to suitable optimal habitats in the Little Test and spread across as much habitat as possible so as not to overload existing populations.

In the unlikely event that fish removal is necessary, SWS will ensure that the correct permissions are in place (i.e. a Fish Removal 2 Form), and that a suitable location where they will be moved to has been identified and agreed in advance of the flow falling below 355 Ml/d. These locations will need to be continuously revisited to ensure landowners are always ‘on board’ if such emergency measures are required. Fish

removal will be coordinated and undertaken by the specialist fisheries contractor, see Appendix 1 for further details.

It may be necessary to introduce in-stream structures at sites to create functional refuges to support displaced fish stocks. The River Test is considered to be a main river and as such, installations will require a Flood Risk Activity Permit.

5.3 Section 20 Mitigation

A mitigation package which, if implemented in full would be considered sufficient to mitigate for the effects of a Stage 0.1 Drought Order at the Test Surface Water abstraction, based on the status of the Itchen SAC features at the time, was agreed in 2018 under Section 20. This though was to outline design for most measures, with future funding to implement to be confirmed. The measures included comprised:

- Measure 1: River restoration to improve chalk stream habitat in the River Test
- Measure 2: River restoration in the Test to improve conditions for the fish community.
- Measure 3: Increasing shading in the River Test downstream of the lower boundary of the Watercress & Winterbournes HLF Project - Hampshire's Chalk River Headwaters Landscape Partnership Scheme – to the boundary of the M27.
- Measure 4: Significant increase in support to the Watercress & Winterbournes Project - Hampshire's Chalk River Headwaters Landscape Partnership Scheme.
- Measure 5: Support to the Test & Itchen Catchment Partnership (TICP).

SWS can confirm that no significant progress has been made in respect of measures 1-3 but that measures 4 and 5 have been really successful in catchment engagement, and measures being delivered more widely – the premise being that environmental improvements throughout the catchment will benefit habitat conditions lower down the valley where salmon occur. Funding for all of these measures remains committed to 2030 and implementation is on-going

5.4 SWS Ecological Resilience Fund

SWS has established an Ecological Resilience Fund (which incorporates the previous Drought Resilience Fund), to enable wider catchment stakeholders to undertake environmental improvement projects, that will provide benefit to the wider River Itchen and River Test catchments. To ensure projects provide that important benefit, a governing steering group has been established, with the EA and NE key members, where all project scopes are reviewed, before funding is approved.

6 Compensation

6.1 Overview

The conclusion of Stages 1 (screening) and 2 (appropriate assessment (AA)) of the *Information to support an assessment under Regulation 63 of the Conservation of Habitats and Species Regulations* in respect of Test Surface Water Stage 0.1 Drought Order is that an adverse effect on the integrity of the River Itchen SAC site and the River Meon Compensatory SAC Habitat cannot be discounted. This conclusion is reached due to the potential effect of the reduction of flows in the River Test below the licensed Hands of Flow on the River Itchen SAC salmon population and the salmon population of the River Meon Compensatory SAC Habitat.

SWS has demonstrated, in the preceding sections, that there are 'no alternative solutions' (Stage 3) to the Stage 0.1 Drought Order with the need to continue supplying water to customers, and that there are 'imperative reasons of overriding public interest' for (Stage 4) for the Stage 0.1 Drought Order application in line with the requirements of the Habitats Regulations.

6.2 Summary of HRA Stage 2 conclusions

The Stage 2 assessment for the River Itchen SAC concluded that, prior to mitigation, given the poor state of the Itchen SAC salmon population, i.e. recent historically low numbers of returning adult salmon, even the potential for loss of a probable small number of salmon as a result of implementation of the Stage 0.1 Drought Order would be considered to represent a failure against the relevant site Conservation Objectives in respect of salmon. Additionally, channel conditions have been described that could alter the distribution of the species, potentially preventing them from entering the river and being lost to the spawning population entirely.

Mitigation measures available to SWS that are implemented for this application are relatively limited in number and, with the exception of the Blackwater which is used more by sea trout than salmon, likely to have a local benefit only. Given the difficulty in quantifying the effects of the Stage 0.1 Drought Order on the physical environment and hence then on the salmon population, taking the precautionary approach it is not possible to conclude beyond reasonable scientific doubt that these measures will fully mitigate the potential for effect on the salmon population.

The same conclusion has been drawn in respect of the salmon population of the River Meon Compensatory SAC Habitat however it should be highlighted that this is a highly uncertain and highly precautionary conclusion in respect of this site.

Therefore, it is necessary to develop compensatory measures that benefit the Itchen salmon population. The measures also need to benefit the salmon of the River Meon Compensatory SAC Habitat. However the highly uncertain and precautionary assessment conclusion makes it a challenge to define the extent of compensation needed, but given the uncertainty and because of the metapopualtion nature of the salmon population, it has been assumed that the compensation defined in respect of the Itchen SAC is sufficent in respect of both the SAC and Compensatory SAC Habitat.

6.3 Proposed Compensatory Habitat

There are many existing pressures on the local salmon populations, which affect the population in all three rivers, whilst it is recognised that the physical effects of the Stage 0.1 Drought Order are restricted to the River Test.

SWS has therefore proposed compensatory measures on the River Itchen. This has the key feature of maximising benefit to the River Itchen salmon population itself, but which will also likely benefit the salmon population across the 3 rivers through increased resilience and sustainability.

6.3.1 Woodmill Activity Centre

Woodmill Activity Centre is used here to describe Woodmill Salmon Pool and connection to Monks Brook and the River Itchen and land in between.

Woodmill sluice is located at Woodmill Activity Centre (approximate National Grid Reference SU4396015235) and connects Woodmill Salmon Pool to the River Itchen. The sluice is known to be a significant issue for salmon trying to enter the River Itchen:

- The large sluice gate and the old fish pass represent one of the first barriers that salmon and sea trout are required to negotiate when moving from the estuary into the lower river;
- The pool is fished and any fish held up here are vulnerable to increased exploitation through angling pressure or predation; and
- The in channel conditions for salmon in the pool below the sluice are sub-optimal, with no shade available to limit warming of the water by direct sunlight and no refuge areas.

Woodmill Activity Centre (Figure 6-1) has recently been put up for sale by Southampton City Council and SWS has been informed by the Council that their bid, which is jointly made with the Scouts, is the preferred bid, and will be going to cabinet for the final approval in July 2025.
As part of their bid SWS put forward the following proposals:

- Improve fish passage between Woodmill Salmon Pool and the River Itchen, with the known current issues of the sluice structures and current fish pass
- Alter management of Salmon angling on the pool and areas controlled by SWS; and
- Improve in channel conditions for salmon in the pool by, for example, increasing shade provision to reduce the warming effects of the sun on the pool.

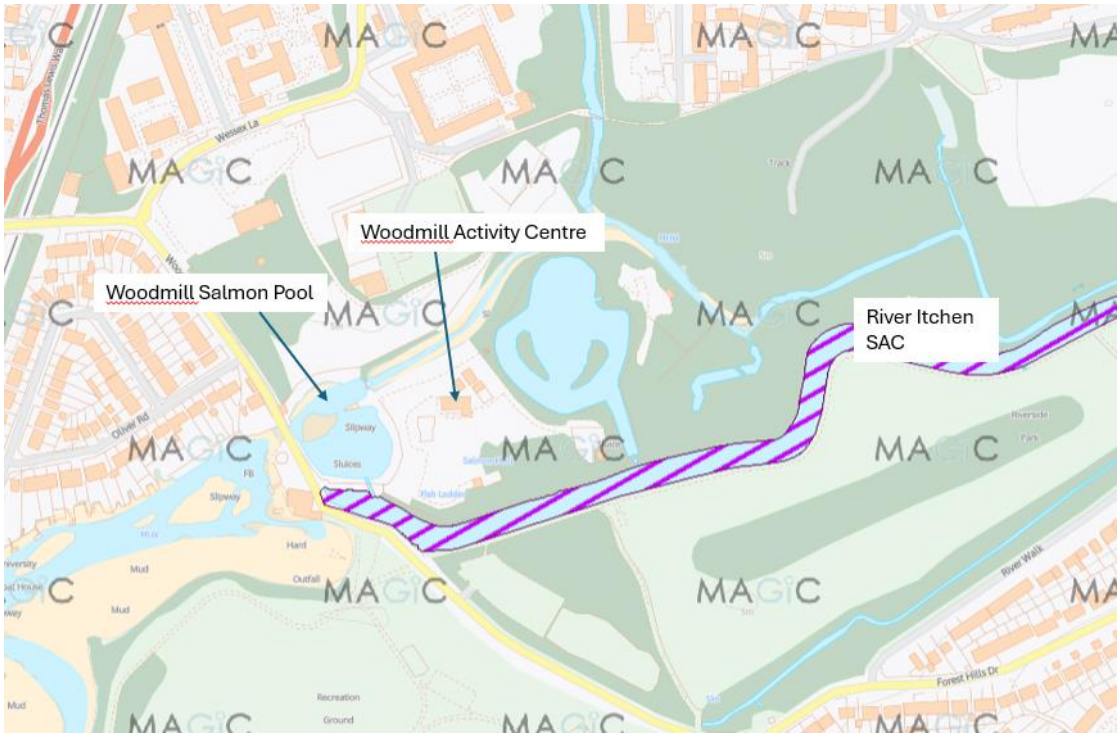


Figure 6-1 - Location of Woodmill Activity Centre and Salmon Pool (© Magic.gov.uk)

The proposed measures are located outside, immediately downstream of, and bordering, the River Itchen SAC (Figure 6-1). Whilst it is possible that some of the planned enhancement work will be required on the bank of the river in the designated reach, the measures will result in significant enhancement of fish passage, improved habitat conditions for salmon when refuge within the pool is required and reduced stress for fish related to angling that will significantly outweigh any potential for very localised disturbance of the bank.

Alongside the development of detailed proposals, SWS will develop and implement a monitoring plan in consultation with the EA and NE, which will include both pre- and post-scheme monitoring.

The principles of the proposals have been discussed with the EA and NE during the bidding process for the purchase, and have been agreed as significantly beneficial to the salmon population on the River Itchen.

Once the purchase is complete there will be a staged approach to implementation of the proposed measures:

- The management of salmon angling will be altered, most likely reduced in intensity, almost immediately. This will be undertaken in collaboration with the fishery
- In respect of improvements to fish passage and introduction of shading and fish refuge areas in Woodmill Salmon Pool, there will be a feasibility and design stage (expected to be completed 2027) followed by an implementation programme, with implementation expected in 3 years time (expected to start in 2028), subject to planning, permitting and public engagement.

SWS proposals at Woodmill Activity Centre will make a significant contribution towards achieving the objectives of the recently launched Itchen Salmon Delivery Plan, which is '*a collaborative initiative uniting conservation groups, fisheries experts, and environmental organisations in a concerted effort to save this endangered population. Through habitat restoration, improved fish passage, water quality initiatives, water resources management, and community engagement, the ISDP is taking a holistic approach to tackling the challenges salmon face*' (https://www.hiwwt.org.uk/save-our-salmon).
The benefits realised by the proposals in respect of the salmon population will include:

- Reduced losses of salmon to predation when they are held up at Woodmill sluice;
- Reduced losses due to post-capture stress. Although anglers return all salmon to the river following capture, only 80% of these may survive to spawn and there is also a reported further sublethal loss of reproductive success from the stress of capture and release which can be a further 30% (see the Salmon Note in the Appendix B). Where rod exploitation is high, such as on the Test and Itchen this is very important. Restriction of angling pressure at Woodmill Salmon Pool will result in fewer salmon being captured, and hence more surviving to spawn. Whilst it is recognised they will still be susceptible to capture further upriver, SWS will have done what it can to reduce that pressure.
- Increased rate of salmon passage up river by improving passage, thereby providing improved access to the whole SAC upstream.
- Enhancing passage can be also expected to benefit salmon through reduced energy expenditure and metabolic stress, reduce exposure to thermal stress, improved migration success and improved spawning success. As for post-capture stress above, whilst it is recognised that there are other structures on the Itchen that slow salmon passage, SWS will have done all it can at Woodmill Salmon Pool to reduce physical stresses on salmon entering the SAC.

6.4 Conclusions

Based on professional judgement, and having taken advice from the EA and NE during two meetings, these benefits are considered to exceed the residual adverse effects of the Drought Order that remained after mitigation has been taken into account. Moreover, these proposals are considered to meet criteria required for them to be considered as compensation as:

- SWS will imminently become owners of Woodmill Activity Centre. Therefore, these proposals can be considered to be secured, as required by the Habitats Regulations.
- The proposed measures will result in significant enhancement of fish passage, improved habitat conditions for salmon when refuge within the pool is required and reduced stress for fish related to angling.

Furthermore, in respect of the key considerations for compensation detailed on the .GOV.UK website the following points are important:

- Feasibility: The measures will be technically feasible as they will undergo feasibility and design optioneering stages prior to implementation. The measures proposed are expected to be effective in respect of the benefits discussed:
- Financial viability: SWS is confident that the measures are financially viable. Having purchased Woodmill Activity Centre, SWS is committed to delivery of the measures discussed;
- Delivery of measures: SWS is committed to the delivery of the measures, managed by an in-house team supported by external experts on the design, implementation, management and monitoring as required.
- Distance from the SAC: The proposals are for enhancements immediately adjacent to, but downstream of, the River Itchen SAC and hence will benefit all salmon returning to the River Itchen (this is not within the impacted reaches / ZoI).
- Time to become effective: Restriction of angling and improved fish passage will be effective compensation almost as soon as they are implemented. Habitat enhancements in/around Woodmill Salmon Pool may take longer to establish given the time for trees to grow and for refuge areas to be established.

Overall SWS is committed to making rapid progress on these proposals for compensatory measures that will be significantly beneficial to the River Itchen salmon population and off-set the residual potential effects of the Test Surface Water Drought Order.

7 Post Drought Order Monitoring

On cessation of the drought order, monitoring will revert to continuation of the pre-drought baseline monitoring programme as outlined in Section 2.

Appendix 1: APEM – Fish monitoring and mitigation handbook.