APPENDIX 1

Method statement and emergency plan for in drought environmental monitoring of fish populations and implementation of emergency measures associated with the Test Surface Water Licence 11/42/18.16/54 Stage 0.1 Drought Order 2025

Revision and Amendment Register

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1. Introduction

This document is intended as a practical guide for implementing in-drought monitoring and emergency measures specific to fish populations outlined in the Southern Water Test Surface Water Licence 11/42/18.16/54 Stage 0.1 Drought Order 2025Environmental Monitoring, Mitigation and Compensation Plan.

The monitoring and emergency measures detailed here rely on an access agreement between the owners/lease owners of the Testwood and Nursling Fishery and Southern Water. The successful implementation of emergency measures requires close liaison between Southern Water (their consultants), fishery owners and river keepers, and the Environment Agency (EA) from the outset. In advance of a drought order (DO) being implemented, Southern Water's consultants will meet with the relevant fishery owners/staff on site to agree access arrangements such that the planned monitoring and mitigation can be deployed.

Any field-based emergency measures would be informed by detailed contemporary monitoring via continuous water quality monitoring and visual observations provided by this method statement.

The specific objectives of this document are to:

- Identify which reaches of the River Test are most likely to be affected by the DO, specifically with respect to designated fish populations identified in the Environmental Management Plan (EMP);
- Identify functional aquatic habitats for sensitive life stages of fish in the River Test within the reaches affected by the DO;
- Develop a monitoring program, at predefined locations in the priority reaches, to detect the development of conditions unsupportive of the fish communities in the river;
- Develop emergency measures for the fish communities in the river should a DO related reduction in flow result in loss of habitat or the development of poor water quality conditions; and
- Provide clear instructions to field staff on all aspects associated with fish monitoring and emergency measures, including preparation activity, field work and critical lines of communication.

The document is structured into four main sections;

- **Section 2 Logistics** – team contact details, licenses and access permission
- **Section 3 Monitoring** – pre-, during, and post- DO monitoring
- **Section 4 Emergency measures** – including decision-tree for implementation
- **Section 5 Reporting** – requirements for reporting field outputs

This handbook has been developed with reference to available Ordnance Survey maps and data collected from remote sensing and specialist walkover surveys conducted along the River Test between 2019 & 2024.

Figure 1 Lower Test area of interest

2. Logistics and preparation

2.1. Team and contact details

The APEM team required for the monitoring and potential implementation of emergency measures on the impacted reach will consist of six water quality and fisheries specialists, led by Peter Dennis, APEM Field Survey Divisional Director. Further contacts for the operation are shown in Table 1.

Table 1 Contact details for the operation team (TBC)

Role	Name	Contacts
APEM Team Leader		
EA Environment Monitoring Officer		
EA Consenting Officer		
EA Incident Helpline		
Southern Water Operational		
Southern Water Lead Ecologist		

2.2. Licensing and Consents

To ensure it is possible to implement all of the recommended emergency measures a number of licenses need to be in place, notably those related to capture / movement of fish stocks (Table 2). Fish capture and relocation is expected to be a last resort emergency measure in response to DO implementation when the impact are considered to be detrimental to fish health and welfare, and in this scenario a fish health check and/or CL23 are not required. All fish captured will be relocated elsewhere within the same water body (to a location with satisfactory conditions). The individual licenses can also be found in the appendix of this document.

Table 2 Licenses for River Test Drought Orderimplementation

Licence Type	License code	Date consented	Expiry date	License holder
Fish health check	Not required			
CL23	Not required			
Flood risk exemptions	Section 4.3			

2.3. Land access permission

Prior to undertaking the monitoring and emergency measures, land access permissions must be pre-agreed with local landowners and stakeholders. Specific landowners (listed in Table 3) should be contacted well in advance of any on-site presence. Where access cannot be agreed, surveyors will not access and will attempt to find alternate access.

Table 3 Landowners / tenants to be contacted (TBC)

Landowners	Contact Details	Date consented	Comments

2.4. Health and Safety

Prior to undertaking any monitoring and emergency measures, team leaders will conduct a Field Risk Assessment (FRA). This document will be added to a detailed method statement to form a Risk Assessment Method Statement (RAMS). Team leaders will be selected based on their experience in the relevant fields, and individuals selected for the work will have experience of conducting similar initial and dynamic field-based risk assessments for previous related projects.

The RAMS document will be reviewed by the Field Manager (FM) and Health and Safety Co-ordinator (HSC) and passed on to Southern Water in advance of any works. When the initial RAMS have been accepted by Southern Water the APEM team leader will brief the survey team. The FRA document will be read and signed by the survey team to demonstrate their understanding of the risks associated with the site. Once on site, the FRA will be reviewed to ensure its relevance as part of a dynamic on-site risk assessment which would also include any other potential hazards and H&S issues which may be encountered on a particular day.

3. Monitoring

3.1. Identification of sensitive fish habitats

This handbook provides a summary of key functional habitats of the expected fish populations in the potentially affected reaches of the River Test. The results were based on walkover surveys of the River Test which primarily followed the Hendry & Cragg-Hine[1] methodology. The summary should be referred to in conjunction with the monitoring requirements. Monitoring and emergency measures (and the emergency plan) relating to fish have been recommended based upon data from site surveys. The habitat assessments should be complemented by detailed calibration and field trials should land access throughout the reach be permitted.

The potentially flow sensitive fish habitats in each of the reaches have been identified and mapped using a combination of contemporary high-resolution aerial photography and walkover surveys, such that emergency measures and emergency response can be implemented should they be required (Figures 2-3 & Table 4). Fish species which are protected under the UK Post-2010 Biodiversity Framework as required under the Natural Environment and Rural Communities (NERC) Act 2006 are of particular importance and in the River Test include Atlantic salmon (*Salmo salar)*, brown trout (*Salmo trutta*), European eels

(*Anguilla anguilla*) and lamprey species. The key functional habitats pertaining to sensitive life stages of these species have been generally categorised into:

- Salmonid nursery habitats (including fry, parr and spawning grounds-)[1];
- Lamprey nursery beds[2]; and
- Marginal habitats with key functionality for eels (including migration) and other fish, notably juvenile life stages.

It is expected that marginal habitats downstream of the intake would be most prone to change under the DO, due to a reduction in wetter perimeter. However, any changes would be expected to be gradual with most fish capable of moving from marginal refuges to other cover. This is not necessarily the case for juvenile larval lamprey (ammocoetes) which can become stranded even if flow reduction is slow. As such optimal marginal lamprey habitat has been identified with particular focus on regions where habitats may become isolated from the main flow of the river (Figure 3).

Table 4 provisional location and type of priority sensitive habitats (Reach 1-3)

Feature	Habitat type	NGR
Ha1	Salmonid nursery	SU 35130 15782
Ha2	Salmonid nursery	SU 35110 15794
Ha3	Salmonid nursery & potential spawning habitat	SU 35039 15787
Ha4	Salmonid nursery & potential spawning habitat	SU 35042 15735
Ha5	Salmonid nursery	SU 35054 15677
Ha6	Salmonid nursery and marginal exposure	SU 35250 15367
Ha7	Juvenile lamprey nursery	SU 35903 15023
Ha8	Juvenile lamprey nursery and marginal isolation	SU 36008 15106
Ha9	Potential marginal exposure	SU 36111 14951
Ha10	Juvenile lamprey nursery	SU 36134 14794
Ha11	Potential marginal exposure	SU 36107 14673
Ha12	Juvenile lamprey nursery	SU 36118 14598
Ha13	Salmonid nursery (Wirehouse Stream)	SU 36224 15017
Ha14	Salmonid nursery & potential spawning habitat	SU 35145 15596

[1] Hendry K. & Cragg-Hine D. (1997). Restoration of Riverine Salmon Habitats; A Guidance Manual. Fisheries Technical Manual: Technical Report W144, Environment Agency, Bristol.

[2] Maitland P.S. (2003) Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5, English Nature, Peterborough

Figure 2 location and type of flow sensitive habitats (Reach 1)

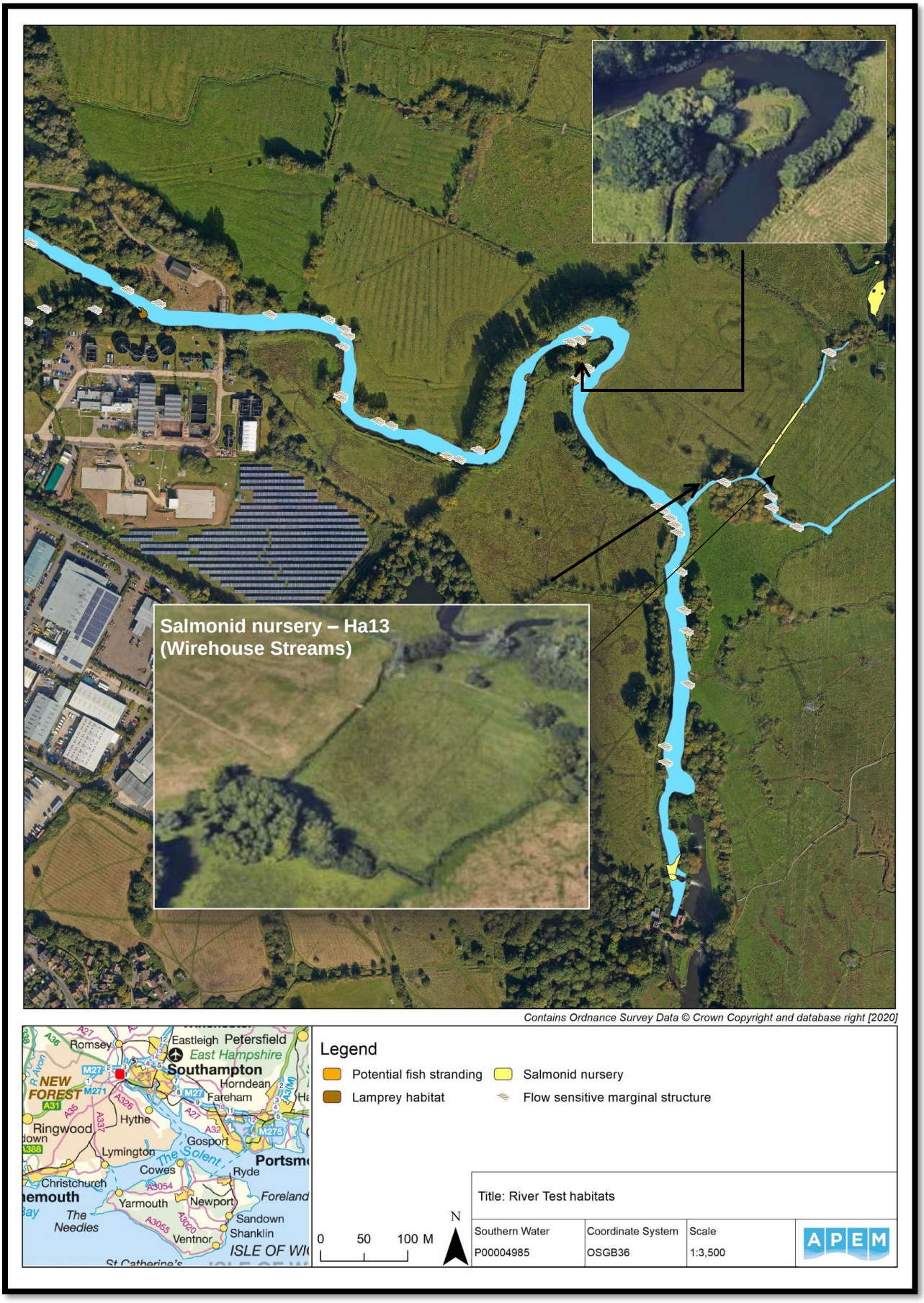

Figure 3 Location and type of flow sensitive habitats (Reach 2 & Wirehouse Stream)

3.2. Connectivity and passageway

The hydrology of the target reach of the River Test is complicated by the number of channels, distributaries and diversions[3]. To understand the operation and potential impact of the abstraction, the connectivity to each watercourse offering key functionality to fish should be assessed both prior and during implementation of the DO. A summary of the features / structures thought to be of most interest in safeguarding critical flows and passageway for migratory fish are shown in Table 5. These features would be visually assessed during inspection of the watercourse with the following recorded:

- Visual evidence of fish passage and general fish behaviour;
- Depth of flow over each structure;
- Length of each structure; and
- Velocity of flow across each structure.

Table 5 location and type of priority sensitive habitats (Reach 1-3)

Feature	Habitat type	NGR
Pa1	Discharge over the weir at Nursling Mill	SU 35199 15775
Pa2	Connectivity to the River Blackwater	SU 35497 15174
Pa3	Connectivity to nursling fish farm carrier (D/S)	SU 35912 15100
Pa4	Connectivity to Wirehouse Stream system	SU 36151 14979
Pa5	Connectivity between Wirehouse Streams (north & south)	SU 36210 14994
Pa6	Connectivity into freshwater system at Testwood Mill	SU 36154 14458

It is recommended that particular consideration should be afforded to the Wirehouse Stream (north and south) (Pa4) which are fed from an offtake from the River Test in Reach 2 (Figure 4). Flow to this distributary system is controlled by a sluice, which is understood to be kept locked open to provide a constant flow to the streams. It is understood that the stream performs a critical function as a salmonid nursery and should be assessed continuously to ensure connectivity to the River Test.

The obsolete fish farm at Nursling was licensed to abstract from the River Test with a return via the Nursling fish farm downstream of the Blackwater confluence (Pa3). The Environment Agency now holds the abstraction licence at this location and abstracts a small amount to support a local wetland. It is thought that the Test Back Carrier is poorly connected to the main River Test in Reach 1, such that there is little flow from the River Test and is thus discounted.

The weir structures at Testwood Mill (Pa6) afford critical passageway for migratory fish between the Test Estuary and the holding freshwater at Testwood Pool (primarily during high water). The connectivity between the waterbodies at all tidal states should be considered.

Further consideration should also be afforded to migratory passageway for salmonids in the Little Test which offers an increasingly important route during prolonged drought.[4]

[3] 5 Environment Agency, 2011. Lower Test Project

[4] Modelling of salmon migration response to rover flows in the Little Test. APEM 2018

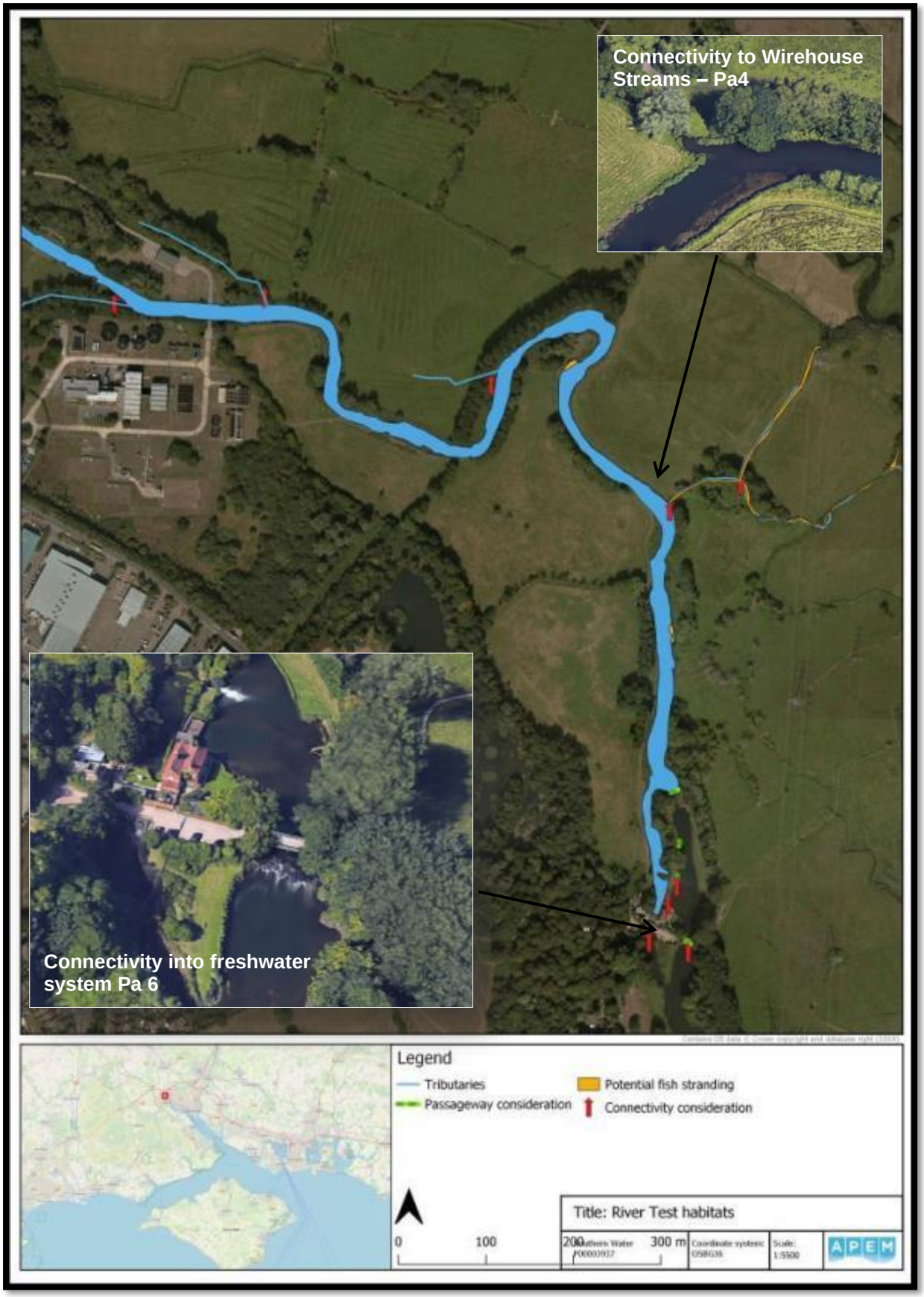

Figure 4 location and type of flow sensitive habitats (Reach 2 & Wirehouse Stream)

For the duration of the DO, locations detailed within this document will be observed for signs of fish in distress/stranding. These observations, combined with continuous water quality readings will provide the trigger for the implementation of flow control measures and strategic aeration measures outlined in Section 3.4, and for potential last-resort fish rescue and relocation (such measures would only be considered should other remediation measures be impracticable or ineffective).

3.3. Water quality monitoring

3.3.1 Where and when to monitor

As detailed in the Monitoring, Mitigation and Compensation Plan, water quality data will be collected from the automatic water quality sondes installed in the Lower Test with supplementary in-situ measurement of physico-chemical parameters collected as part of visual monitoring surveys.

An understanding of the typical fluctuations in DO concentration and % saturation in the river and the relationship between the various parameters is critical for the determination of realistic and robust trigger values for use during the DO. This will allow potential impacts to be assessed in the context of expected/normal conditions, allowing informed management and responses to be implemented. Baseline data will therefore be collated and reviewed prior to a DO. These data will be reviewed to verify that the proposed trigger levels are suitable. With regards DO concentration and % saturation it will be particularly important to understand the natural diurnal variations in levels so as to target aeration efforts at critical times e.g. early morning/dawn when naturally low levels occur.

The trigger value for DO% saturation is proposed as 75%. The trigger value represents the minimum threshold value that should ideally be maintained at all times. In the event that DO falls below this trigger value at any of the six telemetered sites the relevant response will be actioned. This trigger value has been selected to allow enough time for the relevant decision-making process and subsequent response. Similar trigger values can be agreed for other parameters if considered necessary e.g. turbidity.

Upon notification of a trigger breach the data from the sondes will be checked by an experienced member of the APEM water quality team. This will consider the following: have trigger values been breached for an extended period (>4 hours to allow for episodic low oxygen levels), does the data show the gradual development of poor conditions or are the breaches anomalous readings which may require sonde maintenance, how do the data compare to baseline conditions, what is the weather forecast? Depending on the data the responses will then consist of: continue to monitor the data via daily checks, arrange for additional on-site monitoring as soon as possible to verify sonde results and check for any signs of fish in distress or aeration response.

3.4. Fish Distress Visual monitoring

3.4.1 Where and when to monitor

Observational monitoring should be undertaken at seven locations (Vm 1– 7) covering reaches in the vicinity of the water quality telemetry units (as required by the EMP). The reaches have been selected as representative for the watercourse in its lower reach. These may potentially be affected by DO-related activities as defined by the baseline walkover survey (Figure 5).

Visual monitoring, as with water quality monitoring, will extend downstream of the freshwater river at access points into the tidal reaches, to as far as safe public or agreed bankside access allows. That is, mainly the river reach highlighted yellow on figure 1, including to Redbridge but, also including accessible points downstream of Redbridge as far as the confluence with the River Itchen

Observational monitoring would be supplemented by data collected from water quality monitoring points outside of the target area (upstream on the Blackwater and Test). An initial baseline assessment at each of these recommended reaches should be undertaken prior to the implementation of the DO. Changes in fish habitat can be discreet and subtle as discharge reduces. Baseline maps (and images) are available in each survey reach such that changes can be detected and reported back to the Operations Team.

Subsequent visual monitoring would then be implemented when the river flow falls below 355 Ml/d with the order in place, with visual monitoring (including fish distress and passageway assessment) undertaken at the recommended locations **twice** a week.

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);
- Dead or dying fish (record number and species); and
- Signs of pollution.

If fish distress is observed, **the Team Leader should be informed immediately** who will liaise with Southern Water and the EA as appropriate. To facilitate this, the following signs of distress should be recorded:

- Approximate number of dead fish;
- Signs of damage or disease;
- Approximate number of fish in distress (e.g. gasping at the surface or leaping out of the water);
- Approximate number of stranded, or trapped fish;
- Approximate size of fish; and
- Species affected.

In addition, the following supplementary information should be recorded:

- The location of the site of environmental problems observed (12 figure NGR);
- Date and time;
- Evidence of hydromorphological change (e.g. erosion or bank slippage);
- Water quality parameters;
- Photographs;
- Visual signs of pollution (e.g. discolouration or odours); and
- Weather conditions.

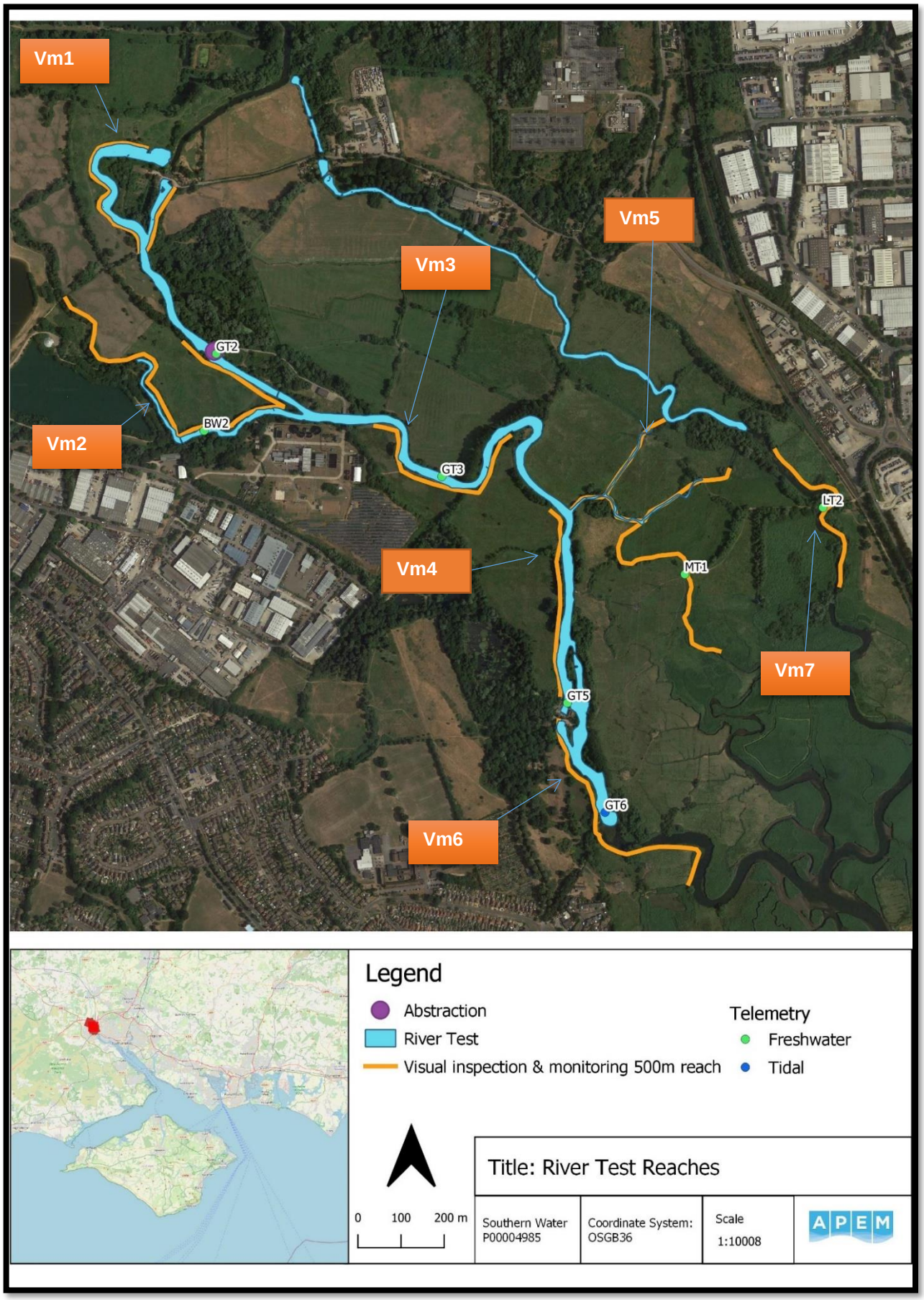

Figure 5 Visual monitoring reaches associated with the River Test Drought Order

3.4.2 How and what to record during visual monitoring

The visual monitoring surveys will be captured by annotated walkover maps and completion of a '*River Conditions Observation Form - Low Flows*' (Appendix 1).

4. Emergency Measures

If during the visual and physico-chemical monitoring there are signs of adverse conditions for fish, then the emergency response plan may be initiated. These options are outlined below and would primarily be implemented at perceived 'high risk' locations. Emergency measures may however be required at other locations in the affected reach and the response should therefore remain flexible although access constraints should be considered.

4.1. Aeration of watercourse

Aeration is proposed as a temporary measure to be implemented should adverse water quality conditions (specifically DO levels) be identified via the proposed monitoring (Section 3.3). The deployment of aeration is considered a responsible emergency measure, with few alternatives.

Effective aeration systems are reliant on a) introducing oxygen directly into solution from a source of compressed air; and/or b) enhancing mixing to promote increased rates of oxygen diffusion at the air:water interface. Under emergency conditions a system that is able to optimise mechanism 'a' above is preferable to maximise the rate of oxygen transfer. As such, aeration products with the smallest bubble size possible would be deployed (e.g. bubble pore size of, or c.1 micron). This small bubble size will maximise the contact time (of bubbles with the water column) facilitating optimum oxygen transfer from bubble to water. Although in this deployment scenario it is secondary, the action of a concentration of bubbles moving in concert towards the surface can induce vertical mixing and promote increased rates of surface oxygen transfer.

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 with proposed aeration type is based on APEM's trials on the River Test in 2022 & 2024 which trialled a range of system designs and installation locations.

If required, aeration would be focussed on areas prone to low dissolved oxygen conditions or specific fish refuge areas. Aeration may also be considered in reaches that are prone to chronic pollution issues however locations will be informed principally by the results of the monitoring surveys. Where possible, deeper water sections will be targeted for specific diffuser deployment, to maximise oxygen transfer, and to maximise the primary mixing radius (and potential for surface diffusion) from each diffuser unit.

If required, aeration units would be deployed at the access bridge to the SWS water treatment works, and at up to 10 additional locations where access platforms have been recently restored upstream of Testwood Mill (Figure 6).

It is noted that multiple diffuser units may be deployed within a single installation i.e. to maximise the effectiveness of each install. The number of diffuser units (within a single installation) will be dependent on e.g. consideration of optimum diffuser airflow requirements, water depth (back pressure) etc. The design of each diffuser deployment will also have consideration for the specific deployment environment; for example, diffuser heads will likely be mounted to plastic trays, or alternatively on short flexible hosetails to avoid bed scour and disturbance of silts. The use of fine pore diffusers (as opposed to coarse bubble diffusers used specifically for water column mixing) will also reduce lateral flow of water at the bed (and therefore bed scour).

Aeration units would be run continuously during the night when diurnal dissolved oxygen sags are expected and would be supplemented by monitoring in the immediate vicinity (upstream versus downstream) to help evaluate the effectiveness of the deployment. Teams of field operatives would be deployed to setup and maintain the diffuser systems.

Figure 6 Potential locations for aeration deployment

4.2. Fish capture, holding and relocation

4.3.1 Fish capture

Fish health and welfare is of paramount importance, and should conditions dictate it (see detail provided above) a team of fisheries experts would be mobilised to participate in aeration implementation. Should fish be reported to be showing signs of distress or isolation from the main river channel, the team would implement a fish capture and relocation procedure upon discussion with the Southern Water Team Leader, their consultants and EA Fisheries staff. This would be considered a final option, and all other options should have become ineffective prior to fish rescue being considered.

If required, fish rescues and relocations will take place as early in the day as possible to target lower water temperatures. 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 fish collection method chosen should be effective at capturing the species and life stage present in the river during the fish rescue, causing the least stress to fish. 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. Furthermore, site characteristics will also influence the chosen collection method and its efficiency of fish capture.

Electric fishing would be the most applicable method to capture juvenile fish in this instance, with manual searches (notably in marginal structures etc.) using hand nets to capture fish also applied. 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 from conditions brought on by the DO activities. Substrate type, instream structure and accessibility all may limit the team's ability to capture fish.

All electric fishing should 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.

4.3.2 Fish holding

Fish will be held at a low stock density in large, dark containers holding aerator river water to reduce stressors such as temperature increase, light and shadows. Holding tanks should only be filled with river water within the same catchment, where water quality is good and not directly impacted from the drought implementation. Holding time can vary between species and site location, but where possible, holding time will be reduced and balanced against the risk of additional stress to a species of fish. Stress associated with capture, holding and release, in addition to the handling of fish within these stages can result in cumulative and lethal effects. APEM have a refined approach at each of these stages to provide stress free conditions for fish, such as reducing fish handling and disturbance during the holding stages.

The water quality within the holding tanks will be monitored throughout using a handheld device. Should any European eels be caught, these will 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, should any river or sea lamprey be caught, these will also be held in a

separate holding tank as they can increase ammonia to levels which can be toxic to other fish species. Where these species are caught, the water quality will be monitored following the same approach outlined above. Holding densities of fish will be dependent on the number of individuals caught during each survey. However, where many individuals are caught, these will be shared across numerous holding tanks to keep densities levels as low as possible.

4.3.3 Transportation and release

Fish will be transported in large, dark transporter containers containing aerated river water. To reduce stress, fish will be transported the shortest and smoothest route between sites. Fish will be released in a relatively slow flowing section of the river and in proximity to any key functional habitats.

It is suggested that a suitable relocation site for fish captured in Reach 1 and 2 would be the pools downstream of Nursling Mill in the upper reaches NGR: SU 36157 14456 (Figure 7). Any juvenile lamprey would be relocated to suitable optimal habitats and spread across as much habitat as possible so as not to overload existing refuge.

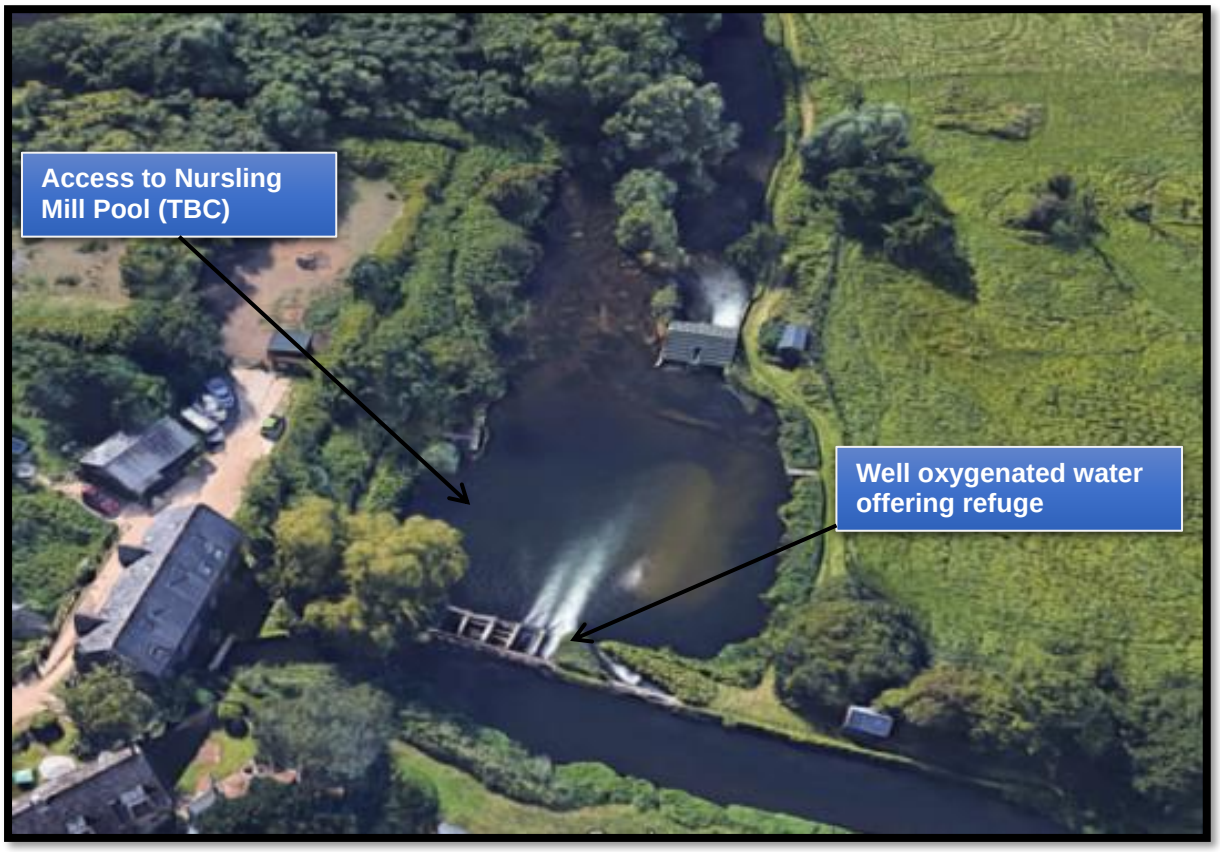

Figure 7 Suggested recipient area for fish in Reach 1 & 2.

It is suggested that should fish need to be relocated from Wirehouse Stream system that they are moved to the Little Test (or at a location TBC) and delivered at the small footbridge - NGR: SU 36356 15163 (Figure 8), where the habitats are likely to be most closely mirrored. Any juvenile lamprey would be relocated to suitable optimal habitats and spread across as much habitat as possible so as not to overload existing refuge.

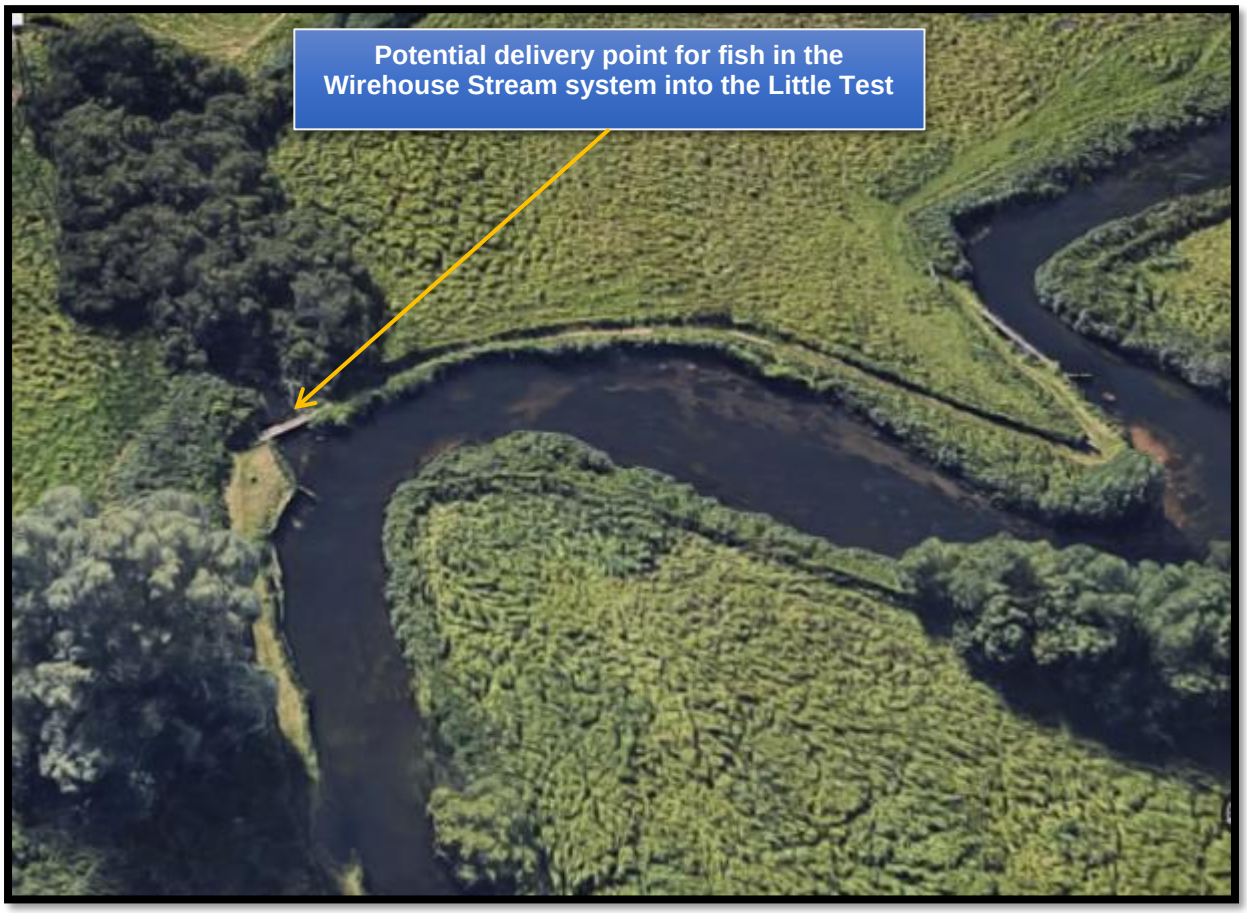

Figure 8 Suggested recipient area for fish in the Wirehouse Stream system

4.3. Biosecurity

APEM considers biosecurity issues at the earliest stage when planning any field work to determine potential risks and the level of biosecurity required for each area. It is recognised that Invasive Non-Native Species (INNS) are a major contributor to biodiversity loss and steps must be taken to prevent the spread of such species into non-affected areas. APEM has an operational responsibility to have a rigorous biosecurity routine in place.

As a precautionary measure, to minimise the risk of spreading non-native species, it is recommended that a strict procedure must be adhered to. APEM scientists routinely work in accordance with standard good practice biosecurity measures to avoid the spread of invasive and non-native species (INNS). Codes of practise for disinfection were set up by DEFRA, CEFAS, Natural England and Forestry Commission guidelines, and it is on these that APEM's biosecurity protocols are based.

5. Reporting

Southern Water shall provide the Environment Agency a report within one week of surveys being undertaken, detailing:

- Inventory of walkover surveys undertaken: dates, locations and findings
- Summary of water quality measurements, where taken
- Completed '*River Conditions Observation Form - Low Flows'* from surveillance walkover surveys of habitat quality and ecological stress
- Summary of fish captured and relocated