Hampshire Water Transfer and Water Recycling Project

Environmental Statement – Appendix 9.2 Migratory fish surveys

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1 Introduction

1.1 Overview

1.1.1 This technical report has been prepared in relation to the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as the 'Proposed Development') and supports the marine ecological assessment which is presented within Environmental Statement (ES) Chapter 9 Marine biodiversity, Volume I (Document reference 6.1, DCO Volume 6). Details of the Proposed Development are described in ES Chapter 3 Description of the Proposed Development, Volume I (Document reference 6.1, DCO Volume 6) and have informed the scope of this study.

1.1.2 This report details the baseline data for migratory fish collected between 20 June 2022 and 1 June 2023 and is produced to inform the marine ecological assessment presented within ES Chapter 9 Marine biodiversity, Volume I (Document reference 6.1, DCO Volume 6). The survey scoping and methodology used for establishing the ecological baseline for migratory fish is provided in section 2.2 and sections 2.6 to 2.9 respectively of this report.

1.2 Objectives

1.2.1 The Environmental Impact Assessment (EIA) Scoping Report for the Proposed Development identified potential effects on migratory fish.

1.2.2 To inform the assessment of likely effects on migratory fish the following objectives were set:

1. Undertake a desk study to identify any records of migratory fish within the study areas (refer to ES Figure 9.1 Marine ecology study areas 1 and 2, Volume III (Document reference 6.3, DCO Volume 6)).
2. Undertake a fish habitat walkover survey of the study areas (refer to ES Figure 9.1 Marine ecology study areas 1 and 2, Volume III (Document reference 6.3, DCO Volume 6)) to inform their suitability for migratory fish.
3. Conduct fish baseline surveys within Hermitage Stream and Langstone Harbour to identify the migratory fish assemblage.

1.3 Migratory fish ecology

1.3.1 Fish species migrate between different habitats at various stages of their life cycle for reasons including spawning, foraging, residence, and seeking refuge. Some species undertake more localised migrations. Anthropogenic structures can prevent such movements by fish, either due to a physical blockage, creating a hydrological barrier or by creating artificial conditions that act as behavioural barriers. Barriers can result in significant delays to (or complete inhibition of) migrations, physiological stress, increased predation, and physical damage to fish. These restrictions to fish accessing important habitat (e.g. for spawning) can therefore limit the recruitment potential for fish populations. Migratory fish species may also be impacted by underwater noise and vibration which can create barriers to migration, cause permanent or temporary injury, or induce behavioural changes.

All these factors will impact commercially and recreationally exploited anadromous fish species.

1.4 Legal context

1.4.1 Langstone Harbour is a designated Site of Special Scientific Interest (SSSI) under Section 28 of the Wildlife and Countryside Act 1981 (as amended). Langstone Harbour is also classified as a Special Protection Area (SPA) under Article 4.2 of the EU Directive (79/409/EEC), Ramsar site under the Convention on Wetlands of International Importance (Ramsar Convention) and forms part of the Solent Maritime Special Area of Conservation (SAC) designated under the Habitats Directive (92/43/EEC).

1.4.2 Hermitage Stream is regarded as a Freshwater Fish Waters Protected Area under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.

1.4.3 These regulations set out requirements to prevent the deterioration of aquatic ecosystems; protect, enhance and restore water bodies to 'good' status; and achieve compliance with standards and objectives for protected areas. Local planning authorities must, in exercising their functions, have regard to River Basin Management Plans (RBMP). These plans contain the main issues for the water environment and the actions needed to tackle them.

1.4.4 The key provisions of the regulations relate to River Basin Districts and Water Bodies; Protected Areas; Monitoring; Environmental Objectives and Programs of Measures; RBMPs; General Provisions; and Ongoing Management.

2 Methodology

2.1 Background

2.1.1 As part of the Proposed Development, a desk study and habitat walkover survey were commissioned to assess the migratory fish species within the study area (see ES Figure 9.1 Marine ecology study areas 1 and 2, Volume III (Document reference 6.3, DCO Volume 6)).

2.1.2 The desk study was undertaken to identify any migratory fish records available from public databases. The habitat walkover survey was undertaken to assess the suitability for migratory fish and map any spawning and juvenile habitat for migratory fish species. Both were completed by APEM Limited.

2.2 Survey guidance

2.2.1 The following guidance documents were used to inform the framework for undertaking the migratory fish surveys:

1. Electric fishing operations: equipment and working practices [1]
2. BS EN 14011:2003, BS 6068-5.32:2003 Water quality – Sampling of fish with electricity [2]
3. BS EN 14962:2006, BS 6068-5.40:2006 Water quality – Guidance on the scope and selection of fish sampling methods [3]
4. Restoration of Riverine Salmon Habitats: A Guidance Manual [4]
5. Key to the Marine and Freshwater Fishes of Britain and Ireland [5]
6. UKTAG Transitional Water Assessment Method – Fish fauna [6]
7. WFD111 (2a) Coarse resolution rapid-assessment methodology to assess obstacles to fish migration [7]

2.3 Zone of Influence

2.3.1 The geographical scope of the assessment has been informed by:

1. The Order Limits which include sufficient permanent and temporary land required for construction, operation, maintenance and decommissioning activities.
2. The likely effects of the Proposed Development on ecological features within the 'Zone of Influence' (ZoI).

2.3.2 The ZoI is the area over which ecological features may receive impacts from a development. It covers the Order Limits, and the wider landscape where pathways of connectivity (ecological or hydrological links) exist for the transfer of impacts away from the works area. The ZoI for each ecological feature varies in size depending on the nature of the effects and the sensitivity of the ecological features to those effects.

2.3.3 Each ZoI has been determined by:

1. Consideration of the activities during construction and operation associated with the Proposed Development.
2. The scale, duration and timing of the works.
3. Ecological data, including aerial photography and Ordnance Survey mapping, biological records of protected and notable species and baseline data collected from field survey.

2.3.4 Based on the scale and duration of the Proposed Development it is considered that construction activities within the Order Limits will typically produce temporary and localised impacts. Different desk study areas have been applied for each category of ecological feature, as appropriate, to enable effective assessment of potential effects on each ecological receptor.

2.3.5 The ZoI, desk study area and field survey area for migratory fish are detailed below in Table 2-1.

Table 2-1 Migratory fish Zone of Influence, desk study area and field survey area

Ecological Receptor	ZoI	Desk study area	Field survey area
Migratory fish	Marine ecology ZoI for all designated marine sites: 2km Marine ecology ZoI for hydrologically connected statutory designated sites: 10km	Study area 1: The entirety of Langstone Harbour, including the tidal extent of Hermitage Stream. Study area 2: 10km from the Eastney Long Sea Outfall (LSO) within the Solent (refer to ES Figure 9.1 Marine ecology study areas 1 and 2, Volume III (Document reference 6.3, DCO Volume 6))	The northern extremity of Langstone Harbour where the Hermitage Stream outputs into the Brockhampton Mill Lake watercourse. The survey area extends approximately 1km southwards towards the North Binness Island and Long Island whilst spans approximately 3km from Chalkdock Lake to the edge of Bridge Lake

2.4 Location of field survey area

Hermitage stream

2.4.1 Hermitage Stream runs for approximately 4km rising to the west of the A3(M) in Cowplain, Hampshire, flowing through Havant before discharging into the north of Langstone Harbour. The catchment area and majority of riparian watercourse length is heavily urbanised and the stream contains numerous weirs and modifications (Graphic 2-1). This has led to Hermitage Stream being classified as heavily modified under the Water Framework Directive (WFD; waterbody ID: GB107042016370). Under Cycle 3 (2019) of the WFD[1], fish element was classified as 'Poor' with the reason for not achieving good (RNAG) status being attributed to barriers causing ecological discontinuity.

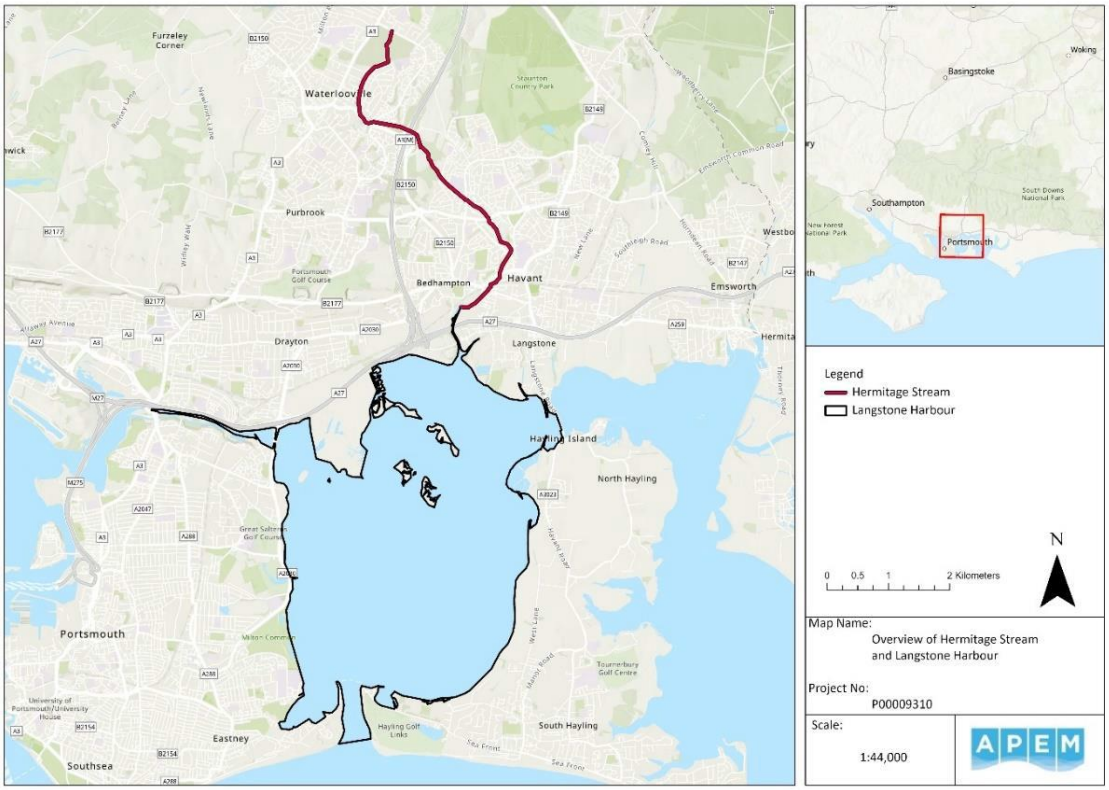
[1] Information from EA available at https://environment.data.gov.uk/catchment-planning/WaterBody/GB107042016370 (accessed on 11/01/2024).

Langstone harbour

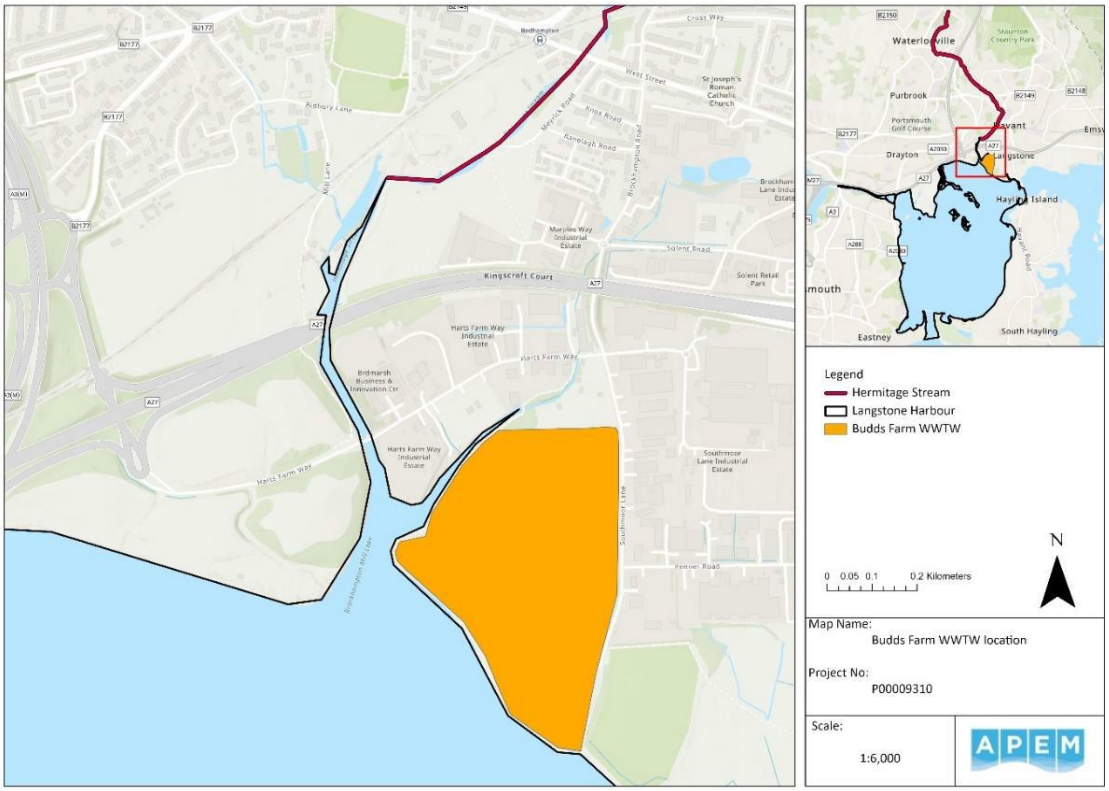
2.4.2 Langstone Harbour is a tidal basin with a surface area of approximately 19km^2. At high water the basin resembles an almost land locked lake, while during low water extensive mud flats are exposed (Graphic 2-1). Langstone Harbour has been recognised as an important ecological area, containing one of the largest areas of mixed saltmarsh on the south coast, which supports a number of protected species. Subsequently, Langstone Harbour has been granted several statutory site designations as described in section 1.4 above.

2.4.3 Langstone Harbour is drained by three main channels which combine to make a single, narrow exit to the sea. As with Hermitage Stream, it is classified as a heavily modified under the WFD (Waterbody ID: GB580705130000). However, fish have never been assessed as a Biological Quality Element within Langstone Harbour under any WFD cycle and therefore limited fish data exists.

Graphic 2-1 Overview of the Water Framework Directive extents of Hermitage Stream (GB107042016370; red line) and Langstone Harbour (GB580705130000; black boundary)



Graphic 2-2 Location of Budds Farm Wastewater Treatment Works (orange) in relation to Hermitage Stream (red) and Langstone Harbour (black outline)



2.5 Desk study

2.5.1 A desk study was completed by APEM Limited to identify any migratory fish records available from public databases. These consisted of:

1. The Environment Agency (EA) National Fish Population Database (NFPD) for both freshwater and Transitional and Coastal (TraC) water fish surveys.
2. The National Biodiversity Network (NBN) Atlas using appropriately licenced data for commercial use.

2.5.2 These databases were filtered spatially using the following methods:

1. All NFPD migratory fish records within Hermitage Stream and its respective tributaries were filtered by its respective WFD Water Body (Water Body ID: GB107042016370).
2. All NFPD TraC fish records recorded within Langstone Harbour were filtered by its respective WFD Water Body (Water Body ID: GB580705130000).
3. All NBN database was filtered by drawing a polygon around the study area using the spatial search function.

2.5.3 All records of migratory fish from the respective databases were collated to provide a holistic summary of existing data on the migratory fish assemblages of Langstone Harbour and Hermitage Stream.

2.5.4 To adequately assess migratory fish species, both spatial (fresh and transitional water) and temporal (seasonal – spring and autumn) factors need to be addressed within the survey plan to account for changing life histories and to provide a holistic assessment of migratory fish. Both Hermitage Stream (freshwater) and Langstone Harbour (tidal reach of Hermitage Stream) required surveys in spring (May – June) and autumn (September – October) to adequately capture migratory species variability (Table 2-2). For European smelt and lamprey, although their adult migrations are not captured during the survey period, any presence of juveniles or fry during the survey will be indicative that adults of these species have successfully migrated prior to the survey period. As such, the below outlines the methodological approaches utilised by APEM Limited at these two sites.

Table 2-2 Timings of potential migratory fish species within proximity to the Proposed Development (potential occurrence indicated in green)

Ecological receptor	Life stage	J	F	M	A	M	J	J	A	S	O	N	D
European eel (*Anguilla anguilla*)	Glass eel migration				O	O	O						
	Siler eel migration									O	O	O	
European smelt (*Osmerus eperlanus*)	Larval/juvenile migration				O	O	O	O					
	Adult migration	O	O	O									
Atlantic salmon (*Salmo salar*)	Smolt migration			O	O	O							
	Adult migration									O	O	O	
Sea trout (*Salmo trutta*)	Smolt migration			O	O	O							
	Adult migration						O	O	O	O	O		
River lamprey (*Lampetra fluviatilis*)	Transformer migration	O	O	O									
	Adult migration									O	O	O	
Sea lamprey (*Petromyzon marinus*)	Transformer migration										O	O	O
	Adult migration				O	O	O						
Twaite shad (*Alosa fallax*)	Juvenile migration						O	O	O				
	Adult migration				O	O	O						
Allis shad (*Alosa alosa*)	Juvenile migration						O	O	O				
	Adult migration				O	O	O						

2.6 Habitat walkover survey

2.6.1 Given the relatively short length of Hermitage Stream and the level of potential fragmentation within, an initial habitat walkover survey was carried out in June 2022 where Public Rights of Way (PRoW) allowed access to assess the suitability of the river for migratory fish.

2.6.2 These walkovers were completed over two days, primarily covering 2.5km of Hermitage Stream. The stretch of the river surveyed extended from the A27 road bridge (SU 70311 05918) upstream to Fitzwygram Way (SU 69820 08857).

2.6.3 Mapping of spawning and juvenile habitat for targeted migratory fish species was undertaken in the survey. This was a ground-based walkover habitat survey technique using the methodology outlined in salmonid habitat classification criteria (Hendry and Cragg-Hine, 1997). Although this method primarily looks to identify salmonid habitat, the results are still applicable to other target species. The survey data has been plotted on to map exports, to provide a clear and quantifiable assessment of the surveyed reach, alongside numerical quantification of the

habitat areas for subsequent analysis. Habitat type definitions are presented in Table 2-3.

Table 2-3 Habitat types and definitions used for walkover (adapted from Hendry and Cragg- Hine, 1997)

Habitat type	Habitat definition
Fish habitat	
Run	Deep water habitat. Run habitat can vary in appearance depending on depth and velocity.
Riffle	Lithophilic spawning/gravel substrate. Riffles flow characteristic (> 0.5metre per second (m/s)).
Glide	Deep water habitat. Glide flow is characterised by an unbroken, smooth 'glassy' perceptible downstream movement of water.
Pool	Deep water habitat, typically associated with riffle-pool sequences. Slow flowing (< 0.1 m/s).
Weir Pool	Deep water habitat, typically formed by scour downstream of a weir structure.
Eddy	Vortexing water.
Torrent	Violent or forceful flow. Fast flowing stream of water.
Impounded	Deep water habitat. No flow/very low perceptible flow velocity typically found upstream of weir and other impounding structures.
Juvenile habitat	
Fry habitat	Shallow slow flowing water.
Suitable Salmonid Spawning	Average flow velocity of 0.35 m/s to 0.65 m/s.
Bankside features	
Tree complexity	Continuous/semi continuous stand of riparian trees that provide bank face structural complexity e.g. underwater tree roots, undercut banks, exposed bankside roots.
Artificial complexity	Continuous/semi continuous manmade marginal feature that provides bank face structural complexity e.g. tipped stone, willow spiling, gabion baskets.
Obstructions	
Major Obstruction	Structure normally man-made cause obstructing to all fish, even during high flow events.
Moderate Obstruction	Structure, natural/manmade causing obstruction to migratory fish, commonly passable during high flow events.
Minor Obstruction	Structure, often natural (e.g. cascade) causing obstruction to fish at low flows only.
Depositional features	

Habitat type	Habitat definition
Mid-channel bar	Depositional feature in the middle of the river (flow surrounds both sides).
Side bar	Depositional feature along the side of one bank – straight section.
Point bar	Depositional feature on the inside of a meander bend attached to the bank.
Island	An established island within river channel.
Overhanging trees	Low trees overhanging the channel.
Large wood	Accumulations of large wood in the channel Fallen trees, tree limbs and large branches.
Gravel bar	Transitional gravel deposit which does not contain any rooted macrophytes.
Other features	
No Access	No Access to river for mapping.

2.6.4 The walkover survey assessed the quantity of hydromorphological features such as riffles, cascades, pools, and glides within the target reach, and the spatial distribution of the quality and quantity of functional habitats, notably those pertaining to migratory fish spawning and juvenile habitat, along with hydromorphological impacts such as barriers to fish movement.

2.6.5 The data from the field surveys was presented using Geographic Information System (GIS) software and exported maps. The digitised habitat maps display the spatial distribution of key habitats, along with any significant pressures/modifications, which may limit habitat quality and/or connectivity throughout the reach. The nature of this data format allowed for spatial analyses, including quantification of habitat area to be performed quickly and accurately. A total area calculation was made and presented for each of the habitat types available.

2.6.6 For the survey reach under this study the following outputs were produced:

1. River habitat maps of the survey reach
2. Habitat shapefiles (in .shp format)
3. A shapefile detailing the locations of natural and artificial obstacles to migration, classified as passable or impassable
4. A spreadsheet quantifying the surface area of each habitat type

2.6.7 The walkover surveys also identified suitable survey sites for the electric fishing surveys within Hermitage Stream and provided an assessment of the survey stations in Langstone Harbour to ensure they were suitable for netting under low tide (particularly in relation to ensuring fyke nets would be fully submerged).

2.7 Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) WFD111 assessment of obstacles to fish migration

2.7.1 the survey was assessed for passability following the SNIFFER WFD111 methodology. The SNIFFER methodology is a rapid assessment at a coarse level providing the likely passability of structures and is appropriate for the full range of structures and species encountered in the UK. It provides passability scores for a structure which are sub-divided into fish groups (species, family, and life-stage) to provide a holistic overview on the structures impact on the fish assemblage passability. The criteria used for determining passability scores are based on published data describing the swimming and leaping abilities of different fish species.

2.7.2 Passability values were assigned for each hydrological and physical aspect to the physiology of the fish under consideration (specifically burst swimming speed and leaping capability). The transversal section with the maximum passability score then determines the overall passability score estimate of the structure.

2.7.3 The estimated passability score is defined as:

"The proportion of fish that encounter an impediment and then successfully pass it (during either an upstream or downstream migration) without undue delay (i.e. the probability of reaching the final destination, e.g. spawning or feeding grounds, is not compromised due to increased energetic expense or predation risk)" [7].

2.7.4 A definition for each passability score is provided in Table 2-4. To aid in visually comparing passability scores, colour coding has also been assigned to each classification.

Table 2-4 WFD111 passability scores and classifications (as outlined by the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) guidelines)

Passability Score	Passability classification
1.0	No barrier: the obstacle does not represent a significant impediment to the target species/life-stage, or species guild, and the majority of the population will pass during the majority of the period of migration (movement). This does not mean that the obstacle poses no costs in terms of delay, e.g. increased energetics, or that all fish will be able to pass.
0.6	Partial barrier low impact: the obstacle represents a significant impediment to the target species/life-stage, or species guild, but most of the population (e.g. > two-thirds) will pass eventually; or the obstacle is impassable for a significant proportion of the time (e.g. < one- third).
0.3	Partial barrier high impact: the obstacle represents a significant impediment to the target species/life-stage, or species guild, but some of the population (e.g. < one-third) will pass eventually; or the obstacle is impassable for a significant proportion of the time (e.g. > two-thirds).
0.0	Complete barrier: the target species/life-stage, or species guild cannot pass the obstacle.

2.7.5 Often riverine constructions are complex in form, with several component parts that can each present challenges for fish passage. These components can occur

either transversally, where a single structure has different characteristics across its width, or longitudinally, where multiple obstacles are in a sequence along a section of the channel. Commonly, these result in changes to the physical structure and/or hydraulics across the structure which form distinct components for each structure. These varied structural components, termed transversal sections (TS), can provide alternative routes for fish passage and therefore must be assessed individually to provide a holistic passability score of a structure.

2.7.6 Given the high-level qualitative approach for these assessments, for each transversal section, measurements of the hydraulic characteristics (water depth and velocity) and physical characteristics (head loss, obstacle height, length of structure etc.) were approximated based on both in-situ observations and ex-situ analysis of high-quality photography, rather than direct in-stream measurements.

2.7.7 It must be noted that where multiple barriers are assessed, these are done so in isolation of each other as the model does not account for cumulative effects or the order in which the assessment is completed. Subsequently, a summary of holistic passage in the context of the study area will be provided following the amalgamation of results.

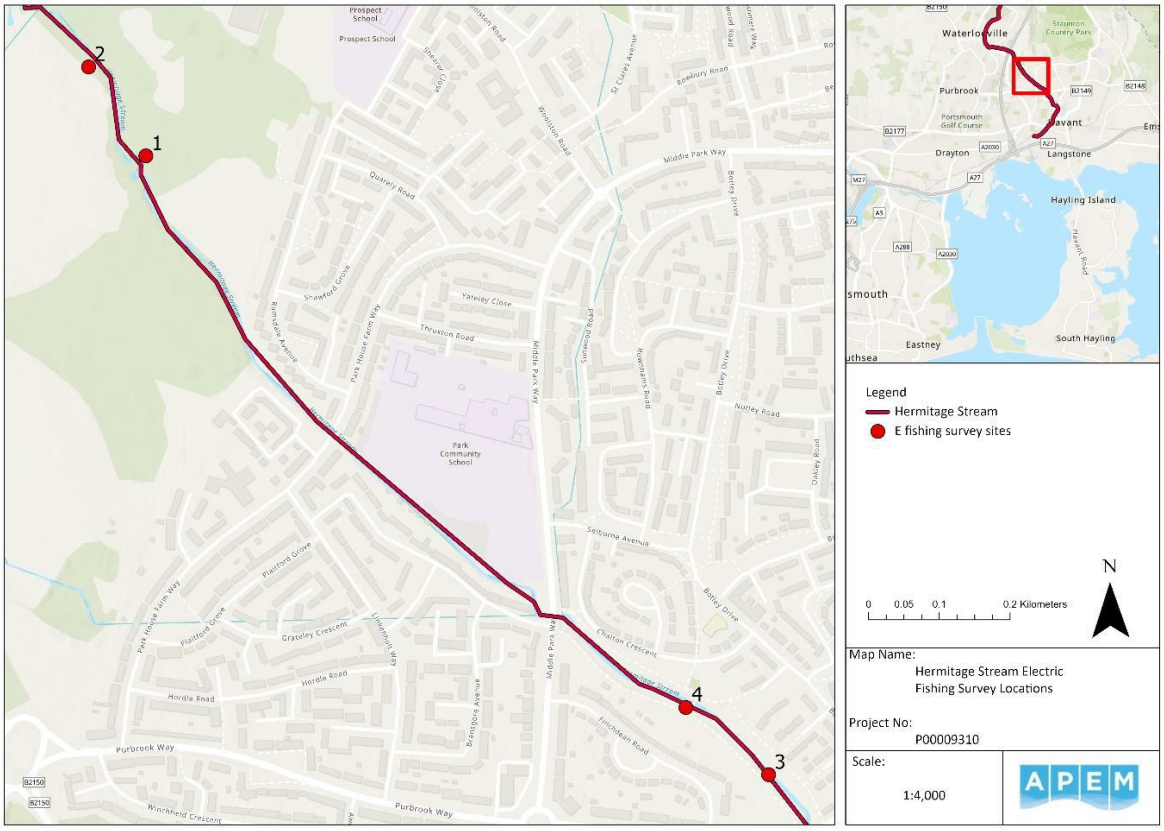
2.8 Hermitage stream electric fishing surveys

2.8.1 To inform the presence of migratory fish species within the non-tidal stretch of Hermitage Stream, electric fishing surveys were completed at four appropriate sites identified during the site walkover survey (Table 2-5 and Graphic 2-3). These surveys were completed following the EA best practice [1] and British/European Standards [2, 3] to ensure surveys were WFD compliant and to facilitate future ecological assessments. These surveys were completed in both spring and autumn of 2022.

Table 2-5 National Grid References (NGRs) for electric fishing survey sites on Hermitage Stream

Site Number	NGR
1	SU 69947 08631
2	SU 69866 08757
3	SU 70827 07757
4	SU 70710 07852

Graphic 2-3 Location of electric fishing sites at Hermitage Stream as part of the spring and autumn 2022 surveys



2.8.2 Surveys were carried out by a three-person team utilising a backpack or bankside electric fishing gear with a single anode. During these surveys, one of the team acted as the Officer in Charge (OIC) ensuring all survey requirements were met. For each survey site, a representative 100m stretch was isolated using upstream and downstream stop nets, to ensure no escapement from, or migration into the sampling area. The team completed a single run in an upstream direction between these stop nets. Immobilised fish were captured using hand nets and transferred to water-filled, aerated containers, prior to data collection. Any eels captured, were kept in a separate tank to all other fish species as they secrete mucus which can infest the gills of other fish. Dissolved oxygen levels were monitored and maintained at optimum levels by continuous infusion using an aeration unit.

2.8.3 Following their capture, each fish was identified to species level and measured (fork-length to the nearest millimetre (mm)) and once recorded, all fish were returned to Hermitage Stream unharmed.

2.9 Langstone Harbour intertidal surveys

2.9.1 Given the dynamic nature of sampling transitional waters, multiple sampling methods were required to ensure a representative sample of fish were caught to enable the best chance of characterising the migratory fish present. The WFD sampling protocol within intertidal waters involves the use of beam trawls, otter trawls, fyke nets and seine nets [6]. However, given that these surveys were to specifically target migratory species and, that the data will not be used to compare

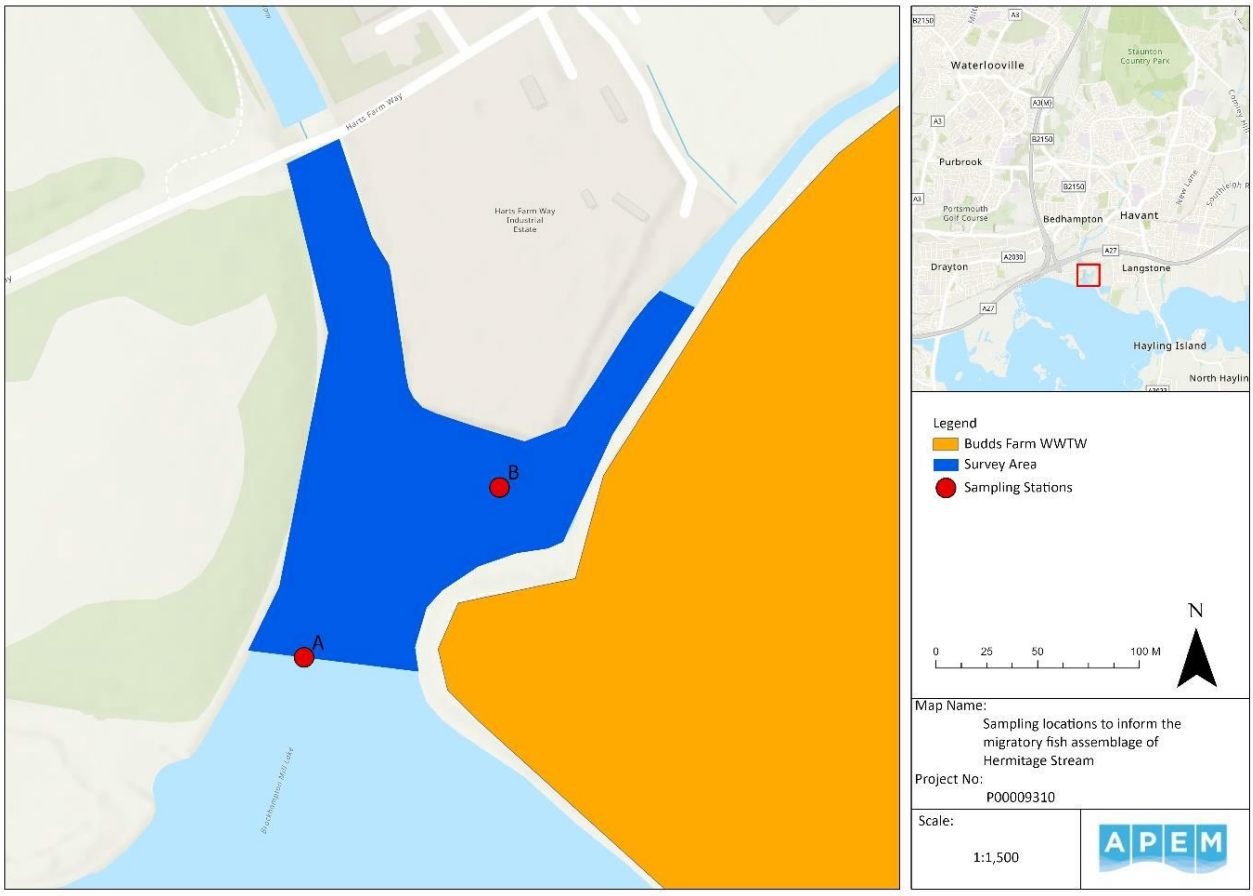
against the TraC data classification, the use of beam and otter trawls were removed from the sampling programme given they target benthic species.

2.9.2 Subsequently, to adequately assess the migratory fish species within Langstone Harbour, sampling was completed in spring and autumn using the combination of seine and fyke nets with WFD appropriate net patterns. Here, sampling was completed from two sampling stations within Langstone Harbour (Graphic 2-4) with a breakdown of sampling effort provided in Table 2-6.

Table 2-6 Summary of sampling effort per gear time in Langstone Harbour

Year and Season	Langstone Harbour		
	No. of sites	Seine	Fyke
2022 Autumn	2	10 per site	2 per site
2023 Spring	2	10 per site	2 per site
Total	2	40	8

Graphic 2-4 The sampling stations (red) and survey area (blue) of the intertidal surveys at Langstone Harbour to inform the migratory fish assemblage, showing location of Budds Farm Wastewater Treatment Works (orange)



Seine netting

2.9.3 Seine netting is an efficient way of sampling fish communities and has shown to be effective for sampling migratory species; however, the method and sample

locations are subject to the greater logistical challenges in terms of access and gear deployment.

2.9.4 The WFD estuary survey seine net (43m long and 4m deep with 6.5mm knotless mesh centre panel and 14mm knotless wings) was deployed from a vessel encircling an area of water from the shore to sample the marginal fish communities. The net was then hauled to shore and landed in an appropriate location. Fish were quickly transferred into holding containers for processing. The process was repeated to obtain ten replicates from each site.

Fyke netting

2.9.5 Fyke nets are conical nets with inscales and a circular or D-shaped opening held open by metal rings. There are a series of interconnecting nets with one-way entry to trap fish.

2.9.6 In transitional waters the Dutch 'D' type fyke net (14mm mesh, 100cm height, 2 x 5.3m long, 1m leader) is used for WFD monitoring. They are held in place via a 7kg anchor at each end.

2.9.7 For monitoring in transitional waters, fyke nets were set at low tide and fished over a full 12-hour tidal cycle. For example, low water to high water and back to low water. All fyke nets were fully submerged at low water and fitted with otter guards.

Catch sampling

2.9.8 For each survey, upon hauling the respective survey gear, the catch was emptied into a water filled, aerated bucket. All fish were identified to species level, and measured as Total Length (TL), in half cm length classes, to the nearest half cm. where the catch of a species was inherently large, then only the first 50 fish were measured with the rest being counted.

2.9.9 Fish identification was guided by the EA WFD fish key [5] and taxonomic QA was maintained by the survey lead throughout the monitoring programme. Where fish processing could not be completed immediately upon being hauled, all fish, regardless of method, were placed in oxygenated buckets filled with water until processing could begin.

Biosecurity measures

2.9.10 Before the initial survey, and after each subsequent survey, all equipment was disinfected with Virkon disinfectant to prevent the potential for spreading disease and aquatic non-native species.

2.10 Limitations

2.10.1 Limitation with access at the Hermitage Stream was encountered during the walkover survey. As such, species/habitats recorded in this region may be potentially limited or underrepresented.

3 Results

3.1 Desk study

3.1.1 The desk study was completed by interrogating the EA NFPD, EA TraC and NBN Atlas datasets for migratory fish records from Hermitage Stream and Langstone Harbour.

3.1.2 The EA NFPD identified records of one migratory species within Hermitage Stream, European eel (Table 3-1). This species has been identified on each of the three EA surveys within Hermitage Stream spanning over 14 years. This implies that European eel likely colonised Hermitage Stream annually and as such migrated through Langstone Harbour.

Table 3-1 Summary of the Environment Agency National Fish Population Database search results for migratory species within Hermitage Stream

Species identified	Environment Agency monitoring sites	Years recorded	Total number of individuals across all surveys
European eel	Barncroft Way (Site ID: 43142) Bentworth Close (Site ID: 28323) Ramsdale Avenue (Site ID: 131655)	2007, 2012 and 2021	51

3.1.3 European eel are protected under the following legislation:

1. The Eels Regulations 2009
2. Bonn Convention (Appendix II)
3. Section 41 species under Natural Environment and Rural Communities (NERC) Act
4. EC CITES (Appendix II)

3.1.4 The EA NFPD TraC database showed that no surveys have been completed within Langstone Harbour WFD waterbody and on additional interrogation it was found that no TraC surveys have been completed around Portsmouth. The closest areas to the site where data exists was Southampton Water (approximately 30km due east) and Adur (approximately 46km due west). As such, no information on the migratory fish assemblage in Langstone Harbour was available.

3.1.5 The interrogation of the NBN Atlas highlighted no records of migratory species within Hermitage Stream.

3.2 Habitat walkover surveys

3.2.1 Fish habitat mapping was completed along the length of Hermitage Stream. The river area was around 21,414 metres squared (m^2) in total, while around 15,178m^2 was surveyed (excluding areas of no access). Table 3-2 presents an overview of habitats recorded during the habitat walkover and section 4 for the digitised habitat maps.

Table 3-2 Percentage cover of fish habitat types within Hermitage Stream

Habitat type	River area (m^2)	Percentage of river occupied (%)
Glide	10418	48.7
Artificial	1898	8.9
Standing water	1211	5.7
Torrent	907	4.2
Fry habitat	218	1.0
Island	131	0.6
Riffle	119	0.6
Run	101	0.5
Salmonid spawning habitat	76	0.4
Moderate obstruction (grade 2)	44	0.2
Emergent macrophytes	24	0.1
Minor obstruction	23	0.1
Gravel bar	4	<0.1
Pool	4	<0.1
Habitat total	**15178**	**70.9**
No access	6236	29.1
Grand total	21414	100

3.2.2 The most dominant habitat type present throughout the margins of the survey stretch was habitat suitable for adult fish (54%), consisted of Glide (48.7%), Torrent (4.2%), Riffle (0.6%), Run (0.5%) Emergent macrophytes (0.1% - which can also be considered a juvenile habitat – providing shelter for fish of all ages) and Pool (less than 0.1%). Fry habitat totalled 1% of the survey area and Salmonid spawning habitat totalled 0.4%. There was also a gravel bar habitat (see Graphic 4-1) accounting for less than 0.1% of total habitat, although this habitat does not directly provide habitat for fish, they are depositional features that when submerged provide shelter for smaller juvenile fish and a spawning habitat for certain species of fish.

3.2.3 Potential barriers/obstructions to fish movement covered 0.3% of the area surveyed, consisting of Moderate obstructions (0.2%) (see Graphic 3-1 and Graphic 4-14), and minor obstructions (0.1%) (see Graphic 4-7). These obstructions represent barriers to fish at times of low flow and will likely be passable during periods of high flow/water level.

3.2.4 Standing water totalled 5.7%, presenting poor quality habitat as areas of standing water often become oxygen poor due to low circulation or no aeration by flow (Graphic 4-13, Graphic 4-14 and Graphic 4-15).

3.2.5 There was no access to 29.1% of the total surveyed area, meaning habitats within this area remain undocumented (examples in Graphic 4-2 and Graphic 4-3). Areas of coarse woody debris were seen throughout the survey area; however, these have not been reported in Table 3-2 due to overlaying other habitat types which would lead to errors in the quantification of habitat coverage. However, these have been annotated throughout the walkover maps in section 4.

3.3 Scotland and Northern Ireland Forum for Environmental Research WFD111 assessment of obstacles to fish migration

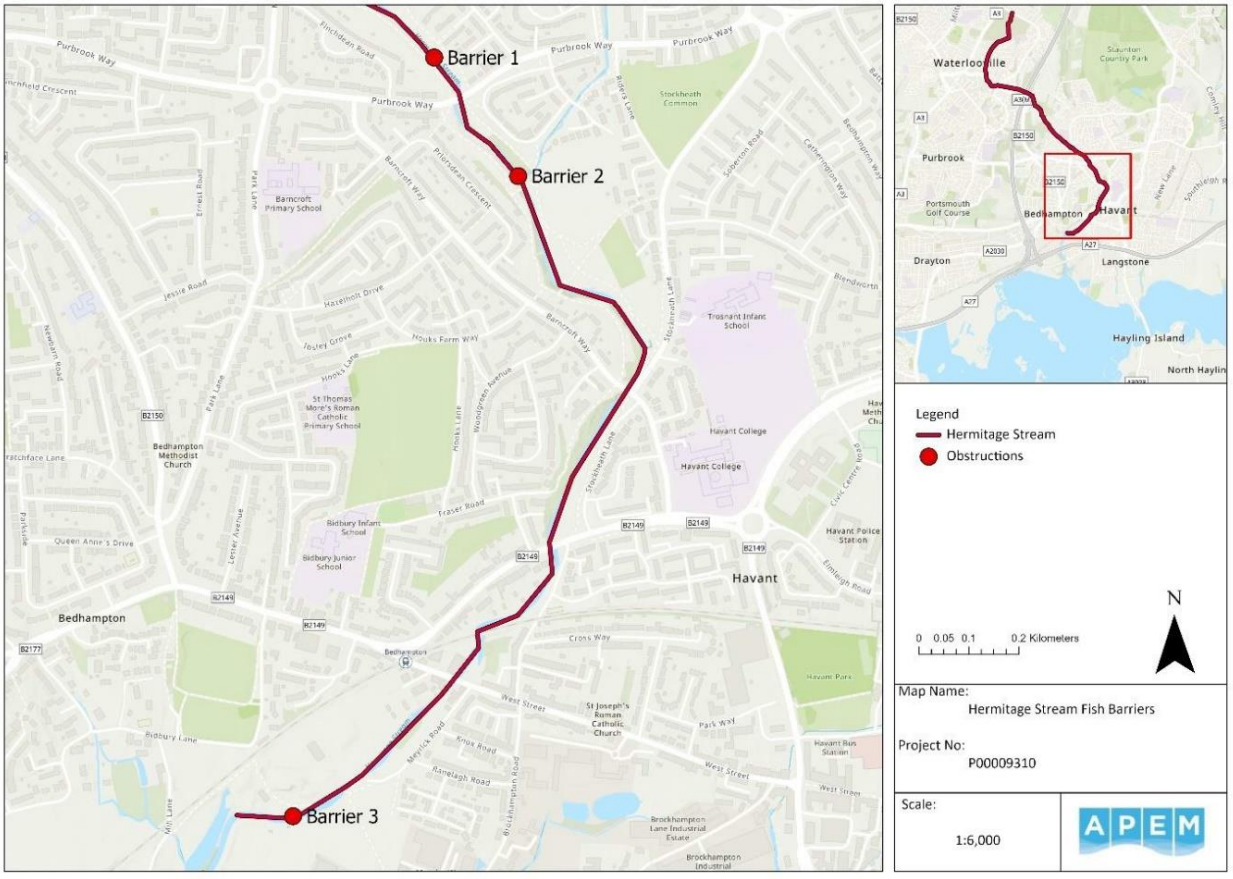
3.3.1 The habitat walkover surveys identified three barriers of varying complexities which were taken forward to be assessed for their fish passability. These barriers are located between the middle and lower reaches of Hermitage Stream (Graphic 3-1). However, it must be noted that due to the limitations with access during the walkover survey, this is not necessarily an exhaustive list of all the barriers within Hermitage Stream. For this assessment, the barriers are being assessed from upstream to downstream, see Table 3-3 for the exact locations of the barriers identified.

3.3.2 The SNIFFER assessment models the passability values for a range of fish species and groups, including those which are non-diadromous i.e. cyprinids and grayling. Given the focus of this study on migratory species, the non-diadromous species and groups have been screened out for assessment.

Table 3-3 Co-ordinates of the barriers identified during habitat walkover surveys

Barrier	British National Grid Reference
Barrier 1	SU 70832 07754
Barrier 2	SU 71001 07517
Barrier 3	SU 70550 06233

Graphic 3-1 Overview of the barriers identified during habitat walkover surveys



Barrier 1 – Sloping weir with masonry face followed by a vertical weir with smooth concrete crest

3.3.3 The most upstream weir identified within Hermitage Stream was a vertical weir with smooth concrete crest spanning the width of the channel, followed by a sloping weir with masonry face (Graphic 3-2). The official purpose of these weirs is unknown, but it is believed to help regulate the upstream water levels in relation to the surrounding topography.

3.3.4 The barrier assessment of the vertical weir with smooth concrete crest showed that upstream passability was possible for all fish species at various degrees of impact, with European eel being the only species for which it was deemed no barrier (Table 3-4). The main limiting factors for impacted species was the hydraulic head of the weir and the Pool depth/Hydraulic head relationship, which impacts leaping abilities of adult salmonids. In contrast, downstream passability was assessed as no barrier to all species, apart from adult salmon, where it was classified as a partial barrier with high impact due to the water depth limiting their swimming capabilities (Table 3-4).

3.3.5 The barrier assessment of the sloping weir with masonry face shown is a significant structure representing a complete barrier to the up and downstream migration of adult salmonids (Table 3-5). This is solely due to water depth impeding fish swimming abilities to ascend the full length of the slope. In contrast, adult lamprey, juvenile eel, and juvenile salmonid were shown to be able to pass this structure albeit with varying degrees of impact. This again is limited by water depth, but due to the body forms of these fish groups (i.e. being physically smaller organisms) their swimming abilities are less impacted (Table 3-5).

3.3.6 With both the sloping weir with masonry face and the vertical weir with smooth concrete crest, it is likely that under high flow conditions, these barriers will become passable to all species.

Graphic 3-2 An upstream view of the sloping weir with masonry face followed by a vertical weir with smooth concrete crest within Hermitage Stream

Table 3-4 WFD111 passability assessment result of 'Barrier 1 - vertical weir with smooth concrete crest' within Hermitage Stream

Fish species/groups	Upstream	Downstream	Issues
Adult salmon	0.3	0.3	Pool depth/Hydraulic head
Adult trout	0.3	1	Pool depth/Hydraulic head
Adult lamprey	0.6	N/A	Vertical hydraulic head
Juvenile eel	1	N/A	N/A
Juvenile salmonid	0.6	1	Vertical hydraulic head
Juvenile lamprey	N/A	1	N/A
Adult eel	N/A	1	N/A

Table 3-5 WFD111 passability assessment result of 'Barrier 1 – sloping weir with masonry face' within Hermitage Stream

Fish species/groups	Upstream	Downstream	Issues
Adult salmon	0	0	Water depth
Adult trout	0	0	Water depth
Adult lamprey	0.3	N/A	Water depth
Juvenile eel	0.6	N/A	N/A
Juvenile salmonid	0.3	0.3	Water depth
Juvenile lamprey	N/A	1	N/A
Adult eel	N/A	0.3	N/A

Barrier 2 – Sequence of step weirs

3.3.7 The next downstream barrier in Hermitage Stream is a sequence of four concrete weirs in a step orientation (Graphic 3-3 and Graphic 3-4). All four span the width of the channel and appear uniform in construction. As with the first barrier, its purpose is unknown, but it is believed to regulate both water levels and flow given the significant head drop between the most upstream and downstream weirs.

3.3.8 Unfortunately, due to access constraints, only the most upstream weir could be assessed and a view of the downstream faces of the three subsequent structures could not be captured. Therefore, due to the apparent uniformity of the weirs, this assessment has used the upper most weir as a proxy to inform the passage of all the structures seen downstream.

Graphic 3-3 The most upstream of the sequence of step weirs within Hermitage Stream (photo taken looking upstream)

Graphic 3-4 Sequence of three step weirs within Hermitage Stream (photo taken looking downstream)

3.3.9 The passability assessment of these barriers has shown that both upstream and downstream migration amongst almost all species is not possible, primarily due to the lack of water over the face of the weir preventing swimming, and the vertical head for non-leaping species (Table 3-6 and Graphic 3-3). That said, upstream passage for eels is not impeded owing to the presence of climbing substrate as seen by the algal growth covering the face of the weir towards the left-hand bank (Graphic 3-3). In addition, the downstream migration of juvenile lamprey is also possible, albeit still classified as a high impact, due to their narrow body form.

3.3.10 It is likely that under high water level conditions, these weirs will remain unpassable due to the velocity of water moving through this constrained section of Hermitage Stream impeding the swimming ability of fish. Conversely, this will permit the downstream migration of all species.

Table 3-6 WFD111 passability assessment result of 'Barrier 2 – sequence of step weirs' within Hermitage Stream

Fish species/groups	Upstream	Downstream	Issues
Adult salmon	0	0	Water depth
Adult trout	0	0	Water depth
Adult lamprey	0	N/A	Water depth/Vertical hydraulic head
Juvenile eel	1	N/A	N/A
Juvenile salmonid	0	0	Water depth/Vertical hydraulic head
Juvenile lamprey	N/A	0.3	Water depth
Adult eel	N/A	0	Water depth

Barrier 3 – Single vertical face weir

3.3.11 The final barrier identified from the walkover survey is a single vertical faced weir located at the tidal limit of Hermitage Stream. It is believed to be constructed of concrete but due to high algal growth this could not be confirmed at the time of the survey. As with the other barriers, its purpose is unknown, but given its location at the mapped tidal limit, it is believed that this weir is designed to prevent saline ingress under normal tidal conditions.

Graphic 3-5 Single vertical faced weir within Hermitage Stream

3.3.12 The passability assessment has shown that the single vertical faced weir within Hermitage Stream was passable to adult salmon and trout at vary degrees of impact, whilst eels were shown to be able to pass freely due to the climbing substrate (filamentous algae over the face of the weir; Table 3-7). All other species of migratory fish (adult lamprey and juvenile salmonids) were shown to be unable to pass due to the height of the vertical head preventing their ascent. In comparison, downstream migration was shown to be passable to all fish species apart from adult salmon where water depth would limit their ability to descend over the crest.

3.3.13 It is likely that under high water level conditions and/or high tidal states, this weir will likely become passable and enable passage into the non-tidal stretch of Hermitage Stream. Likewise, higher water conditions will permit the downstream migration of all species.

Table 3-7 WFD111 passability assessment result of 'Barrier 3 – Single vertical faced weir' within Hermitage Stream

Fish species/groups	Upstream	Downstream	Issues
Adult salmon	0.3	0.3	Water depth
Adult trout	0.6	1	Vertical hydraulic head
Adult lamprey	0	N/A	Vertical hydraulic head
Juvenile eel	1	N/A	N/A
Juvenile salmonid	0	1	Vertical hydraulic head
Juvenile lamprey	N/A	1	N/A
Adult eel	N/A	1	N/A

Cumulative passability

3.3.14 The cumulative upstream passability assessment has shown that only eels are able to ascend all the barriers to migrate into the wider catchment of Hermitage Stream (Table 3-8). All other species would not be able to ascend past either the initial barrier 3 (adult lamprey and juvenile salmonids) or barrier 2 (adult salmon and trout). This would mean that it is likely that most fish groups will likely be limited to the tidal limit and lower reaches of Hermitage Stream under normal flow conditions.

3.3.15 It is possible under higher flow conditions that the passability of these structures may improve. However, given the constrained nature of the channel (particularly with barrier 2) the resultant velocities could prevent fish migration in isolation.

Table 3-8 Summary of upstream passability going from downstream (barrier 3) to upstream (barrier 1)

Fish species/groups	Barrier 1 – vertical weir with smooth concrete crest	Barrier 1 – sloping weir with masonry face	Barrier 2 – sequence of step weirs	Barrier 3 – Single vertical faced weir
Adult salmon	0.3	0	0	0.3
Adult trout	0.3	0	0	0.6
Adult lamprey	0.6	0.3	0	0
Juvenile eel	1	0.6	1	1
Juvenile salmonid	0.6	0.3	0	0
Juvenile lamprey	N/A	N/A	N/A	N/A
Adult eel	N/A	N/A	N/A	N/A

3.3.16 The cumulative downstream passability assessment has shown that only juvenile lamprey can descend all the barriers to migrate into Langstone Harbour (Table 3-9). That said, given that this assessment has shown that adult lamprey (river and sea lamprey), were unable to migrate upstream and thus complete their life cycle to spawn, it is unlikely that juveniles of these species exist in Hermitage Stream.

In this instance, this result will only be reflective of the non-diadromous species brook lamprey *Lampetra planeri* should a relic population be present within the catchment.

3.3.17 It must be noted that under higher flow conditions, all these structures will become passable so it is likely that the downstream migration of migratory species could be delayed until higher flow events are experienced.

Table 3-9 Summary of downstream passability going from upstream (barrier 1) to downstream (barrier 3)

Fish species/groups	Barrier 1 – vertical weir with smooth concrete crest	Barrier 1 – sloping weir with masonry face	Barrier 2 – sequence of step weirs	Barrier 3 – Single vertical faced weir
Adult salmon	0.3	0	0	0.3
Adult trout	1	0	0	1
Adult lamprey	N/A	N/A	N/A	N/A
Juvenile eel	N/A	N/A	N/A	N/A
Juvenile salmonid	1	0.3	0	1
Juvenile lamprey	1	1	0.3	1
Adult eel	1	0.3	0	1

3.4 Hermitage stream electric fishing surveys

Spring 2022 surveys

3.4.1 Electric fishing surveys of Hermitage Stream were successfully completed on 20 June 2022 by APEM's field team. A total of 84 fish were captured across four sites, representing a species richness of three (Table 3-10). Of these, bullhead (freshwater species) were the most dominant species (n = 54) followed by three spined stickleback (freshwater/brackish species; n = 16), and European eel (migratory species; n = 14). Note that bullhead is a protected freshwater species listed under Annex II of the Habitats Directive and European eel is protected species as outlined above in section 3.1.

3.4.2 The recorded fish lengths indicate that multiple age classes of European eel were present within Hermitage Stream, this implies that the Hermitage Stream is subject to annual colonisation from juvenile European eel and is suitable for juvenile development. In addition, multiple age classes were present in the freshwater species three-spined stickleback and bullhead, this highlights that suitable spawning habitat must be available for these species within Hermitage Stream.

3.4.3 European eel were the only diadromous species captured and therefore the only species of concern to this study.

3.4.4 The physical and water quality characteristics recorded at each site on the day of the surveys are presented in Table 3-11.

Table 3-10 Fish species composition and lengths from the spring electric fishing surveys completed in Hermitage Stream, 2022

Species	Site 1	Site 2	Site 3	Site 4	Total number	Minimum length (mm)	Maximum length (mm)	Mean length (mm)
Three-spined stickleback	5	8	1	2	16	20	55	37.5
Bullhead	24	13	16	1	54	15	85	50
European eel	4	0	7	3	14	70	550	310

Note: Sites are not sequentially located along Hermitage Stream, see Graphic 2.3 for order of locations

Table 3-11 Site parameters during the 2022 Spring electric fishing surveys in Hermitage Stream

		Site 1	Site 2	Site 3	Site 4
	Date	20th June 2022	20th June 2022	20th June 2022	20th June 2022
Physical parameters	**Site length**	--	--	85	70
	Average width (m)	2	2	3	3
	Max depth (m)	40	0.6	35	0.3
	Average depth (m)	10	0.3	15	0.1
	Riparian vegetation LHB	Low plants, shrubs	Trees, low plants, shrubs	Trees, low plants	Low plants, trees
	Riparian vegetation RHB	Bare ground	Trees, low plants, shrubs	Trees, low plants	Low plants, trees
	Flow conditions	Low	Low	Low - medium	Low
	% Riffle	0	0	0	0
	% Run	20	10	5	30
	% Glide	60	70	85	60
	% Pool	20	20	10	10
Bed substrate (%)	**Sand and silt**	10	20	10	20
	Gravel	10	30	20	20
	Cobble	40	40	70	60
	Pebble	40	10	0	0
	Boulder	0	0	0	0
	Bed rock	0	0	0	0
	Artificial	0	0	0	0
Water qualit	**Conductivity SPC (µs)**	784	792	759	740

		Site 1	Site 2	Site 3	Site 4
	Conductivity (µs/cm)	617	622	674	660
	PH	8.77	8.8	8.85	8.88
	Dissolved O_2 (mg/L)	7.06	6.92	4.14	6.63
	Dissolved O_2 (%)	68.7	67	44.8	73.1
	Temperature (°C)	13.9	13.8	19.1	19.4
	Salinity	0.39	0.39	0.37	0.35

Note: Sites are not sequentially located along Hermitage Stream, see Graphic 2.3 for order of locations

3.4.5 It should be noted that site 3 demonstrates poor dissolved oxygen (%) concentrations (shown in Table 3-11), although similar results in the quantity of fish were obtained.

Autumn 2022 surveys

3.4.6 Electric fishing surveys of Hermitage Stream were successfully completed on 23 September 2022 by APEM's field team. A total of 156 fish were captured across four sites, representing the same fish assemblage as previously identified in the spring surveys (Table 3-12). As with the spring surveys, bullhead was the most dominant (n = 117) followed by three-spined stickleback (n = 25) and finally European eel (n = 14). Additionally, a similar range of fish lengths were recorded as those from the spring surveys.

3.4.7 As with the spring surveys, European eel were the only diadromous species captured and therefore the only species of concern to this study.

The physical and water quality characteristics recorded at each site on the day of the surveys are presented in

3.4.8 Table 3-13.

Table 3-12 Fish species composition and lengths from the autumn electric fishing surveys completed in Hermitage Stream, 2022

Species	Site 1	Site 2	Site 3	Site 4	Total number	Minimum length (mm)	Maximum length (mm)	Mean length (mm)
Three-spined stickleback	1	6	4	14	25	14	50	28.44
Bullhead	34	3	23	57	117	20	80	42.3
European eel	1	2	4	7	14	25	550	180.77

Table 3-13 Site parameters during the 2022 Autumn electric fishing surveys in Hermitage Stream

		Site 1	Site 2	Site 3	Site 4
	Date	23rd September 2022	23rd September 2022	23rd September 2022	23rd September 2022
Physical parameters	**Site length**	100	60	100	100
	Average width (m)	2	2	2	2.5
	Max depth (m)	1.5	0.75	0.3	0.3
	Average depth (m)	0.5	0.5	0.2	0.2
	Riparian vegetation LHB	Low plants, shrubs	Low plants, shrubs	Low plants, shrubs	Low plants, shrubs
	Riparian vegetation RHB	Low plants	Low plants	Low plants	Low plants
	Flow conditions	Normal	Normal	Normal	Normal
	% Riffle	20	20	0	20
	% Run	0	0	20	20
	% Glide	70	60	80	60
	% Pool	10	20	0	0
Bed substrate (%)	**Sand and silt**	50	80	20	40
	Gravel	50	20	0	40
	Cobble	0	0	0	10
	Pebble	0	0	0	10
	Boulder	0	0	0	0
	Bed rock	0	0	0	0
	Artificial	0	0	80	0
Water quality	**Conductivity SPC (µs)**	377.8	307.3	423.2	505.9
	Conductivity (µs/cm)	310.6	255.3	512.3	415
	pH	7.95	8.53	7.91	7.9
	Dissolved O_2 (mg/L)	9.16	7.46	4.21	7.73
	Dissolved O_2 (%)	84	77.2	78.9	78
	Temperature (°C)	15.6	16	15.9	15.6
	Salinity (ppt)	0.18	0.15	0.25	0.25

3.5 Langstone Harbour intertidal surveys

Autumn 2022 surveys

3.5.1 Intertidal surveys of Langstone Harbour were successfully completed between 20 and 23 September 2022 by APEM's field team. A total of 1,912 fish were captured across two sites, representing a species richness of nine (Table 3-14). Of these, sea bass *Dicentrarchus labrax* were the most dominant species (n = 670) followed by goby sp. *Gobiidae* (n = 424), and sprat *Sprattus sprattus* (n = 357). The lengths of the fish captured highlighted a range of age classes present, representing that Langstone Harbour is used as both nursery grounds and for residency/feeding.

Table 3-14 Fish species composition and lengths from the autumn intertidal surveys completed in Langstone Harbour, 2022

Species	Site A seine	Site A fyke	Site B seine	Site B fyke	Total number	Minimum length (mm)	Maximum length (mm)	Mean length (mm)
Thin lipped grey mullet (*Liza ramada*)	81	4	24	24	133	45	180	89.88
Sea bass	409	109	105	47	670	35	270	83.99
Sprat	323	0	34	0	357	33	105	84.42
Sand goby (*Pomatoschistus minutus)*	1	0	7	0	8	25	45	36.13
Flounder (*Platichthys flesus)*	1	0	1	0	2	92	130	111
Goby sp.	204	0	220	0	424	9	90	40.80
Herring (*Clupea harengus)*	283	0	6	0	289	55	105	76.80
European smelt	25	0	0	0	25	50	95	61
Dover sole (*Solea solea)*	2	0	0	0	2	75	110	92.50

3.5.2 Of importance to the overall Proposed Development was the identification of several protected species during the intertidal surveys, these were: sand goby, herring, European smelt, and dover sole. All of these species are protected solely as Species of Principal Importance under Section 41 of the Natural Environment and Rural Communities Act 2006, apart from sand goby which is protected under Appendix III Bern Convention. Of these species, European smelt is anadromous, migrating into tidal and fresh waters to spawn within clean gravels. However, the European smelt cannot currently pass the existing barriers in place.

3.5.3 Water quality data at time of sampling was measured and are presented in Table 3-15.

Table 3-15 Water quality parameters during the 2022 Autumn intertidal surveys in Langstone Harbour

Parameters	Site A	Site B
Temperature (°C)	17.5	17.5
Dissolved O_2 (%)	111.1	115.0
Dissolved O_2 (mg/L)	8.99	8.94
Conductivity (µs/cm)	43323	43383
SPC (µs)	60466	50719
Salinity (ppt)	33.01	33.25
pH	7.51	7.68

Spring 2023 surveys

3.5.4 Spring intertidal surveys of Langstone Harbour were successfully completed between 30 May and 1 June 2023 by APEM's field team. A total of 1,102 fish were captured across two sites, representing a species richness of ten (Table 3-16). As with the autumn surveys, the three most abundant species were sea bass (n = 351), sprat (n = 289) and goby sp. (n = 198), and the length ranges of the fish captured displayed the use of the harbour is used as both nursery grounds and for residency/feeding.

Table 3-16 Fish species composition and lengths from the spring intertidal surveys completed in Langstone Harbour, 2023

Species	Site A seine	Site A fyke	Site B seine	Site B fyke	Total number	Minimum length (mm)	Maximum length (mm)	Mean length (mm)
Thin lipped grey mullet	0	0	1	0	1	69	69	69
Sea bass	50	9	226	66	351	70	885	109.03
Sprat	220	0	69	0	289	35	91	52.66
Flounder	88	0	62	0	150	4	65	33.97
Goby sp.	138	0	60	0	198	3	60	39.08
Herring	7	0	1	0	8	60	82	67.63
European smelt	19	1	35	0	55	41	165	87.76
Dover sole	9	0	1	0	10	35	63	49.71
Plaice (*Pleuronectes platessa*)	1	0	0	0	1	50	50	50
European eel	0	23	0	16	39	200	540	354.23

3.5.5 The Spring 2023 intertidal surveys highlighted two species which were not originally identified in the Autumn 2022 intertidal surveys, these were plaice and European eel with one and 39 individuals recorded respectively. Importantly to this

Proposed Development, both European eel and European smelt are migratory species.

3.5.6 Water quality data at time of sampling was measured and are presented in Table 3-17.

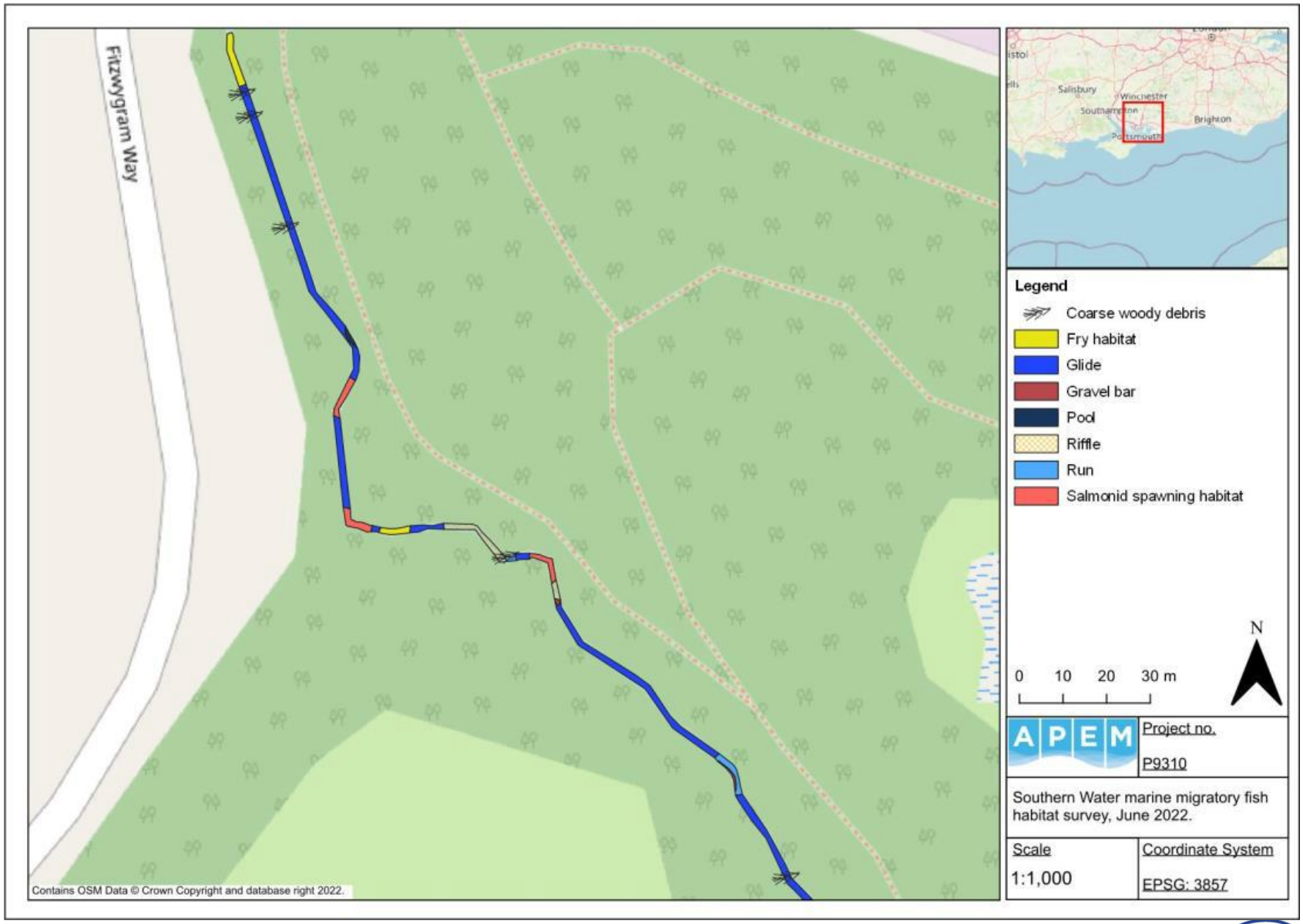
Table 3-17 Water quality parameters during the 2023 Spring intertidal surveys in Langstone Harbour

Parameters	Site A	Site B
Temperature (°C)	16.4	16.4
Dissolved O_2 (%)	105.7	109.6
Dissolved O_2 (mg/L)	8.57	8.89
Conductivity (µs/cm)	42095	39987
SPC (µs)	50418	47899
Salinity (ppt)	33.18	31.33
pH	7.79	7.98

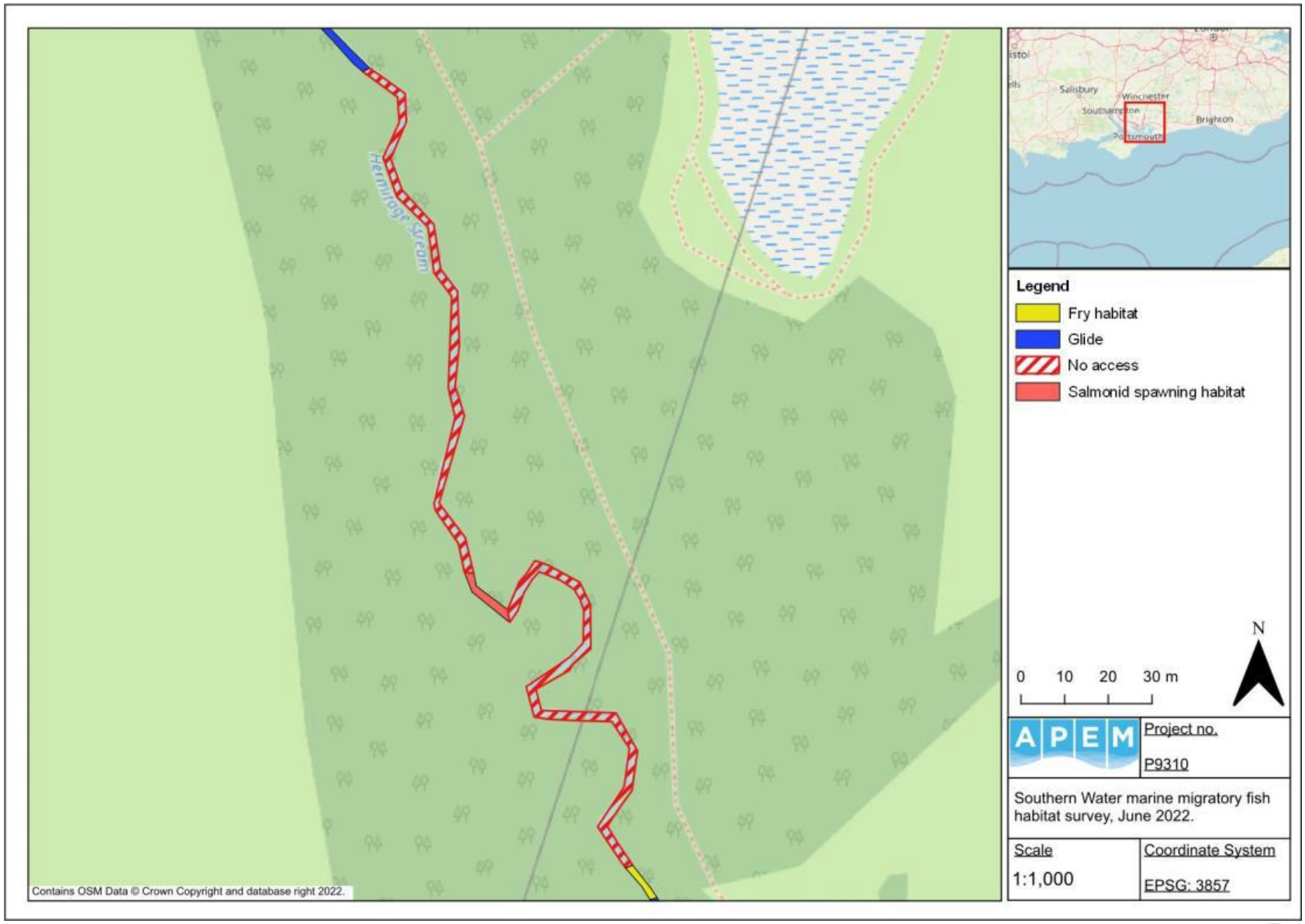
4 Digitised habitat maps

4.1.1 This section shows the results of the of the habitat walkover as maps below.

Graphic 4-1 Hermitage Stream walkover map 1

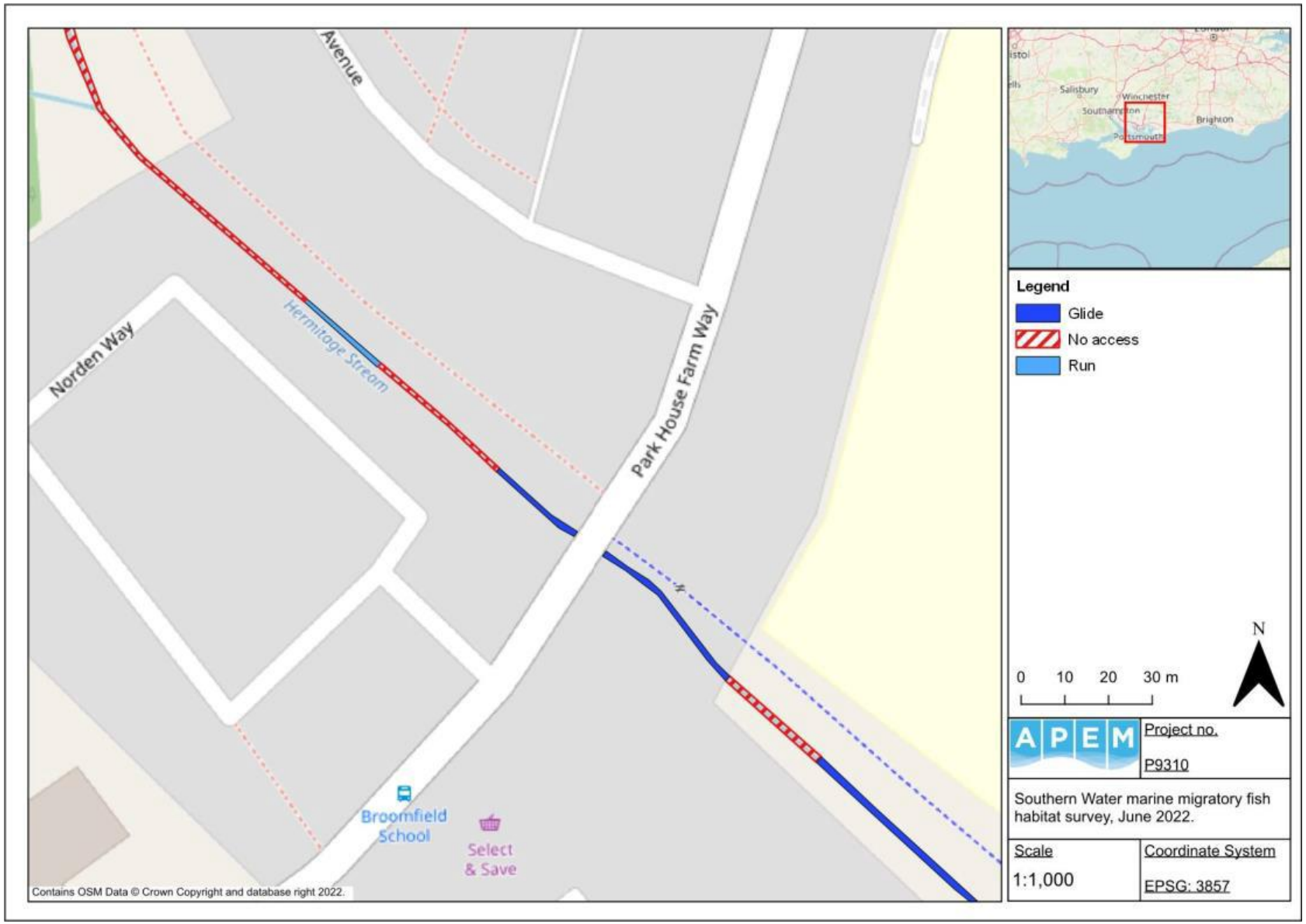


Graphic 4-2 Hermitage Stream walkover map 2

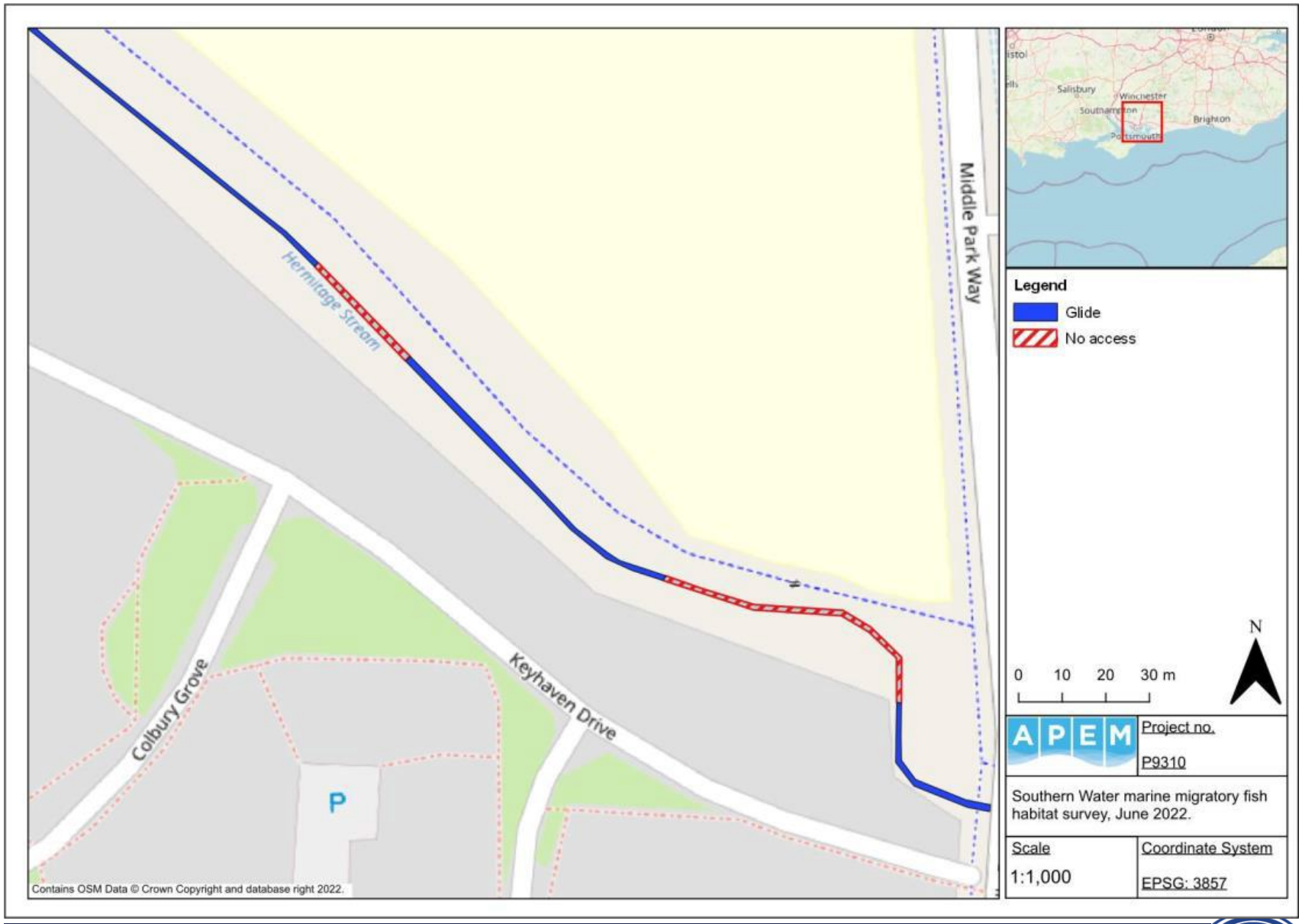


Graphic 4-3 Hermitage Stream walkover map 3

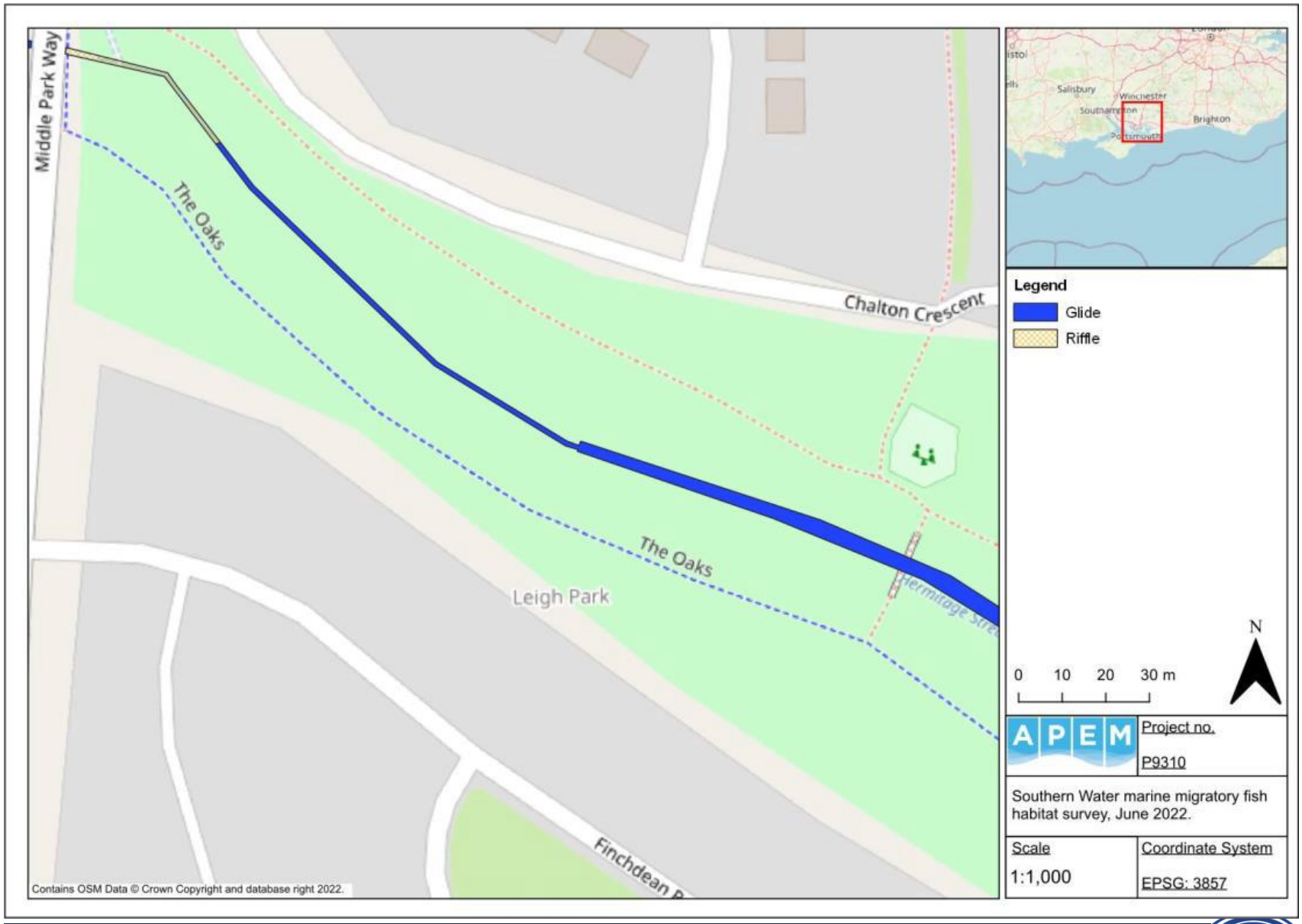
Graphic 4-4 Hermitage Stream walkover map 4



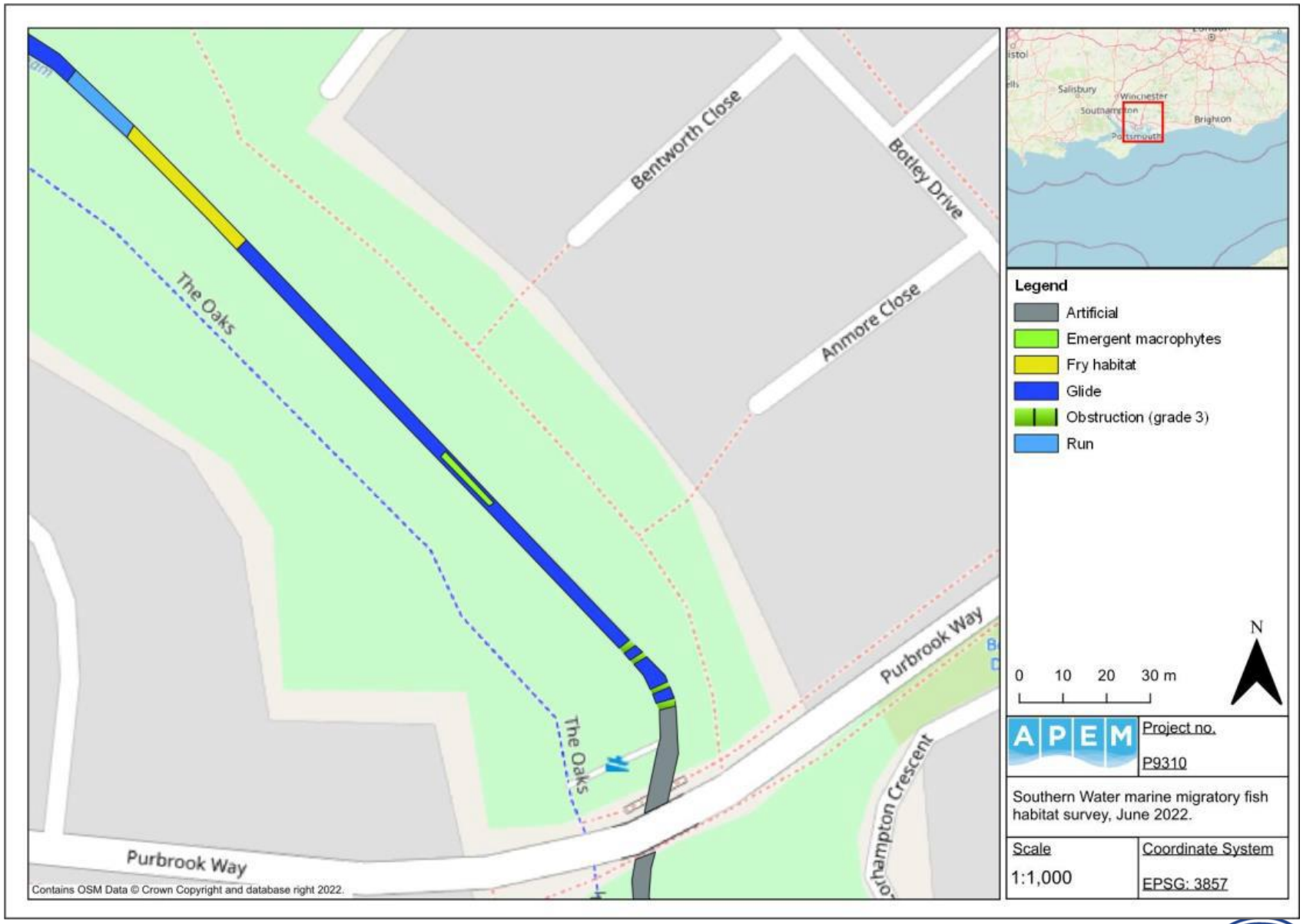
Graphic 4-5 Hermitage Stream walkover map 5



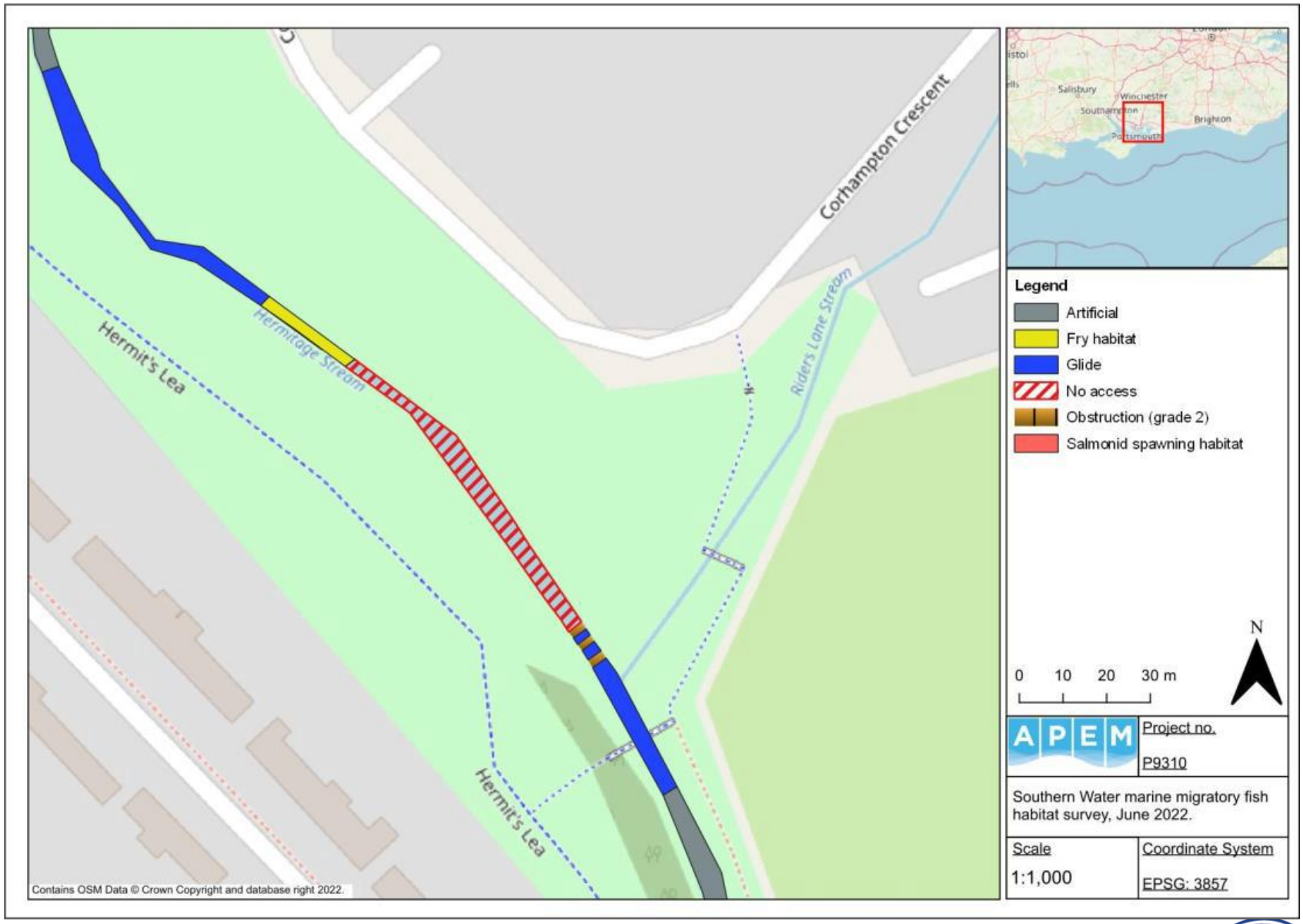
Graphic 4-6 Hermitage Stream walkover map 6



Graphic 4-7 Hermitage Stream walkover map 7

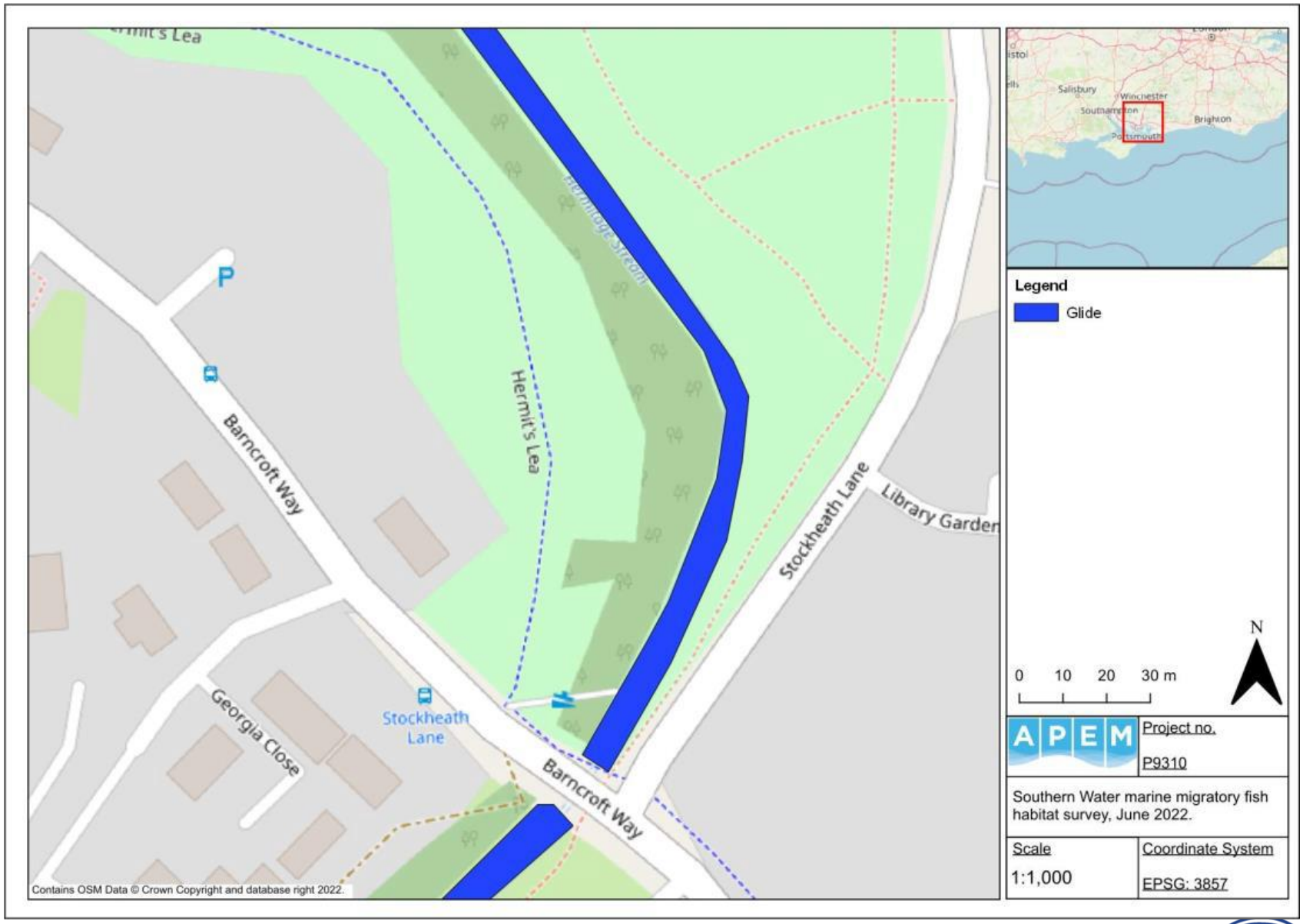


Graphic 4-8 Hermitage Stream walkover map 8



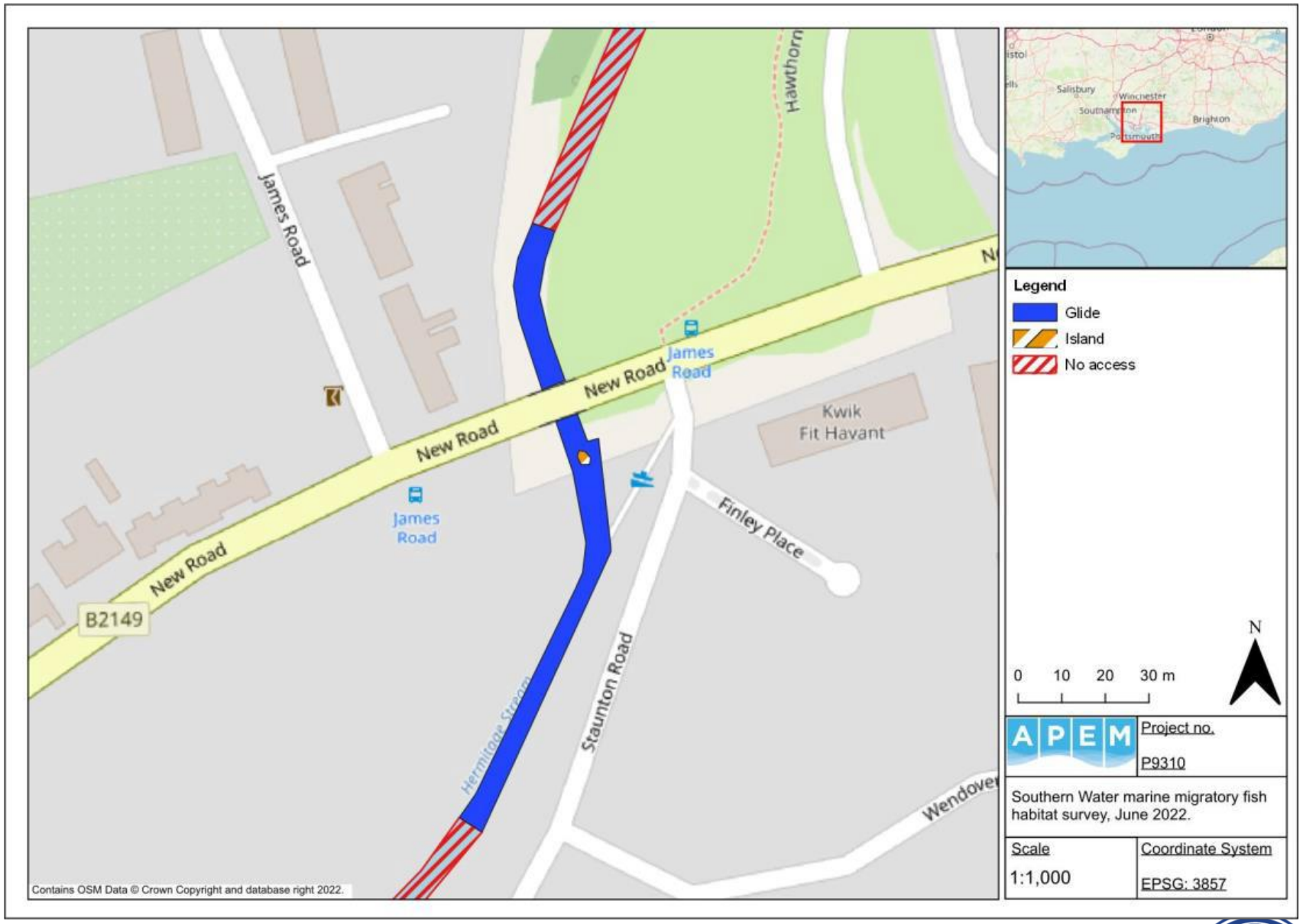
Graphic 4-9 Hermitage Stream walkover map 9

Graphic 4-10 Hermitage Stream walkover map 10

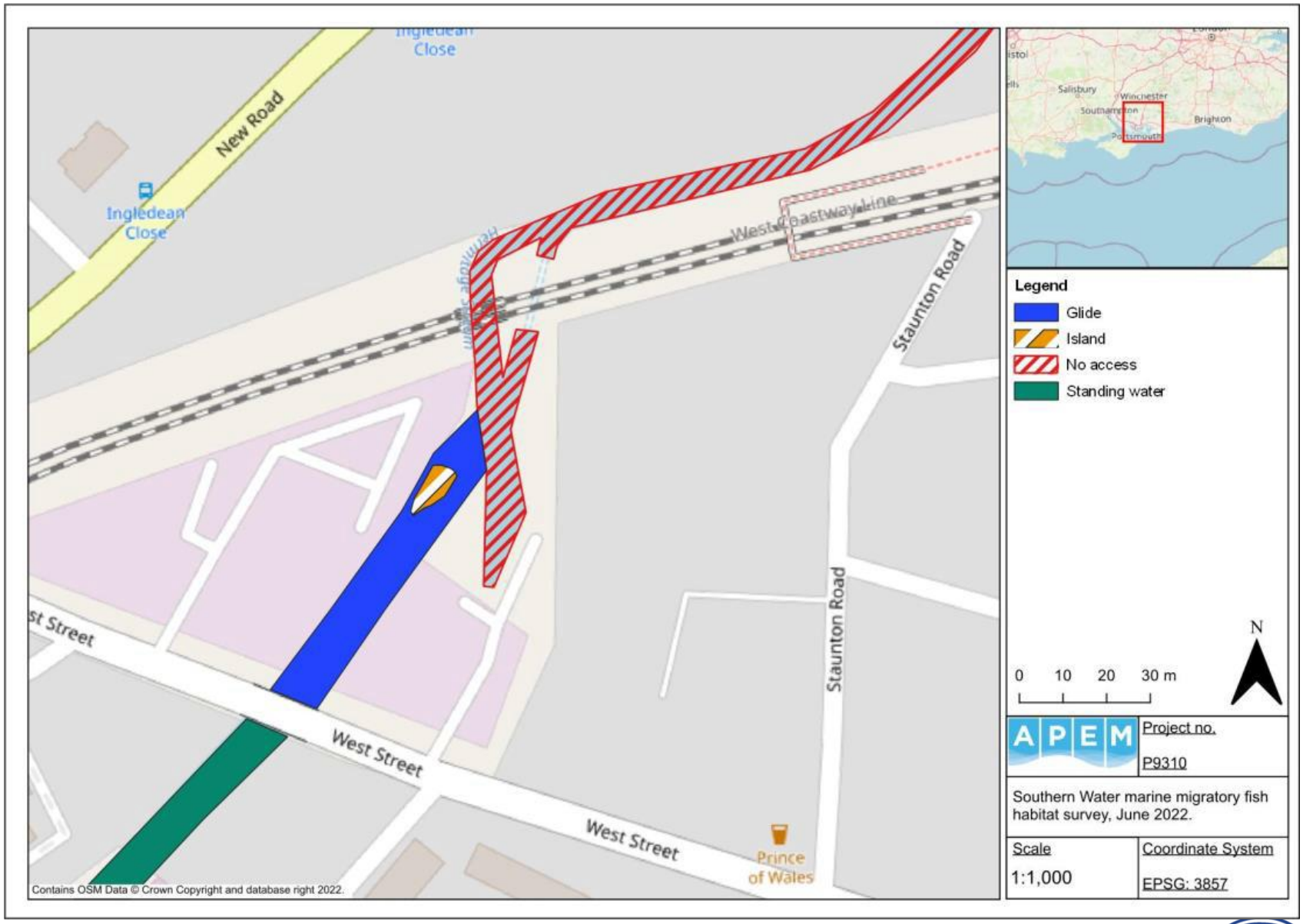


Graphic 4-11 Hermitage Stream walkover map 11

Graphic 4-12 Hermitage Stream walkover map 12

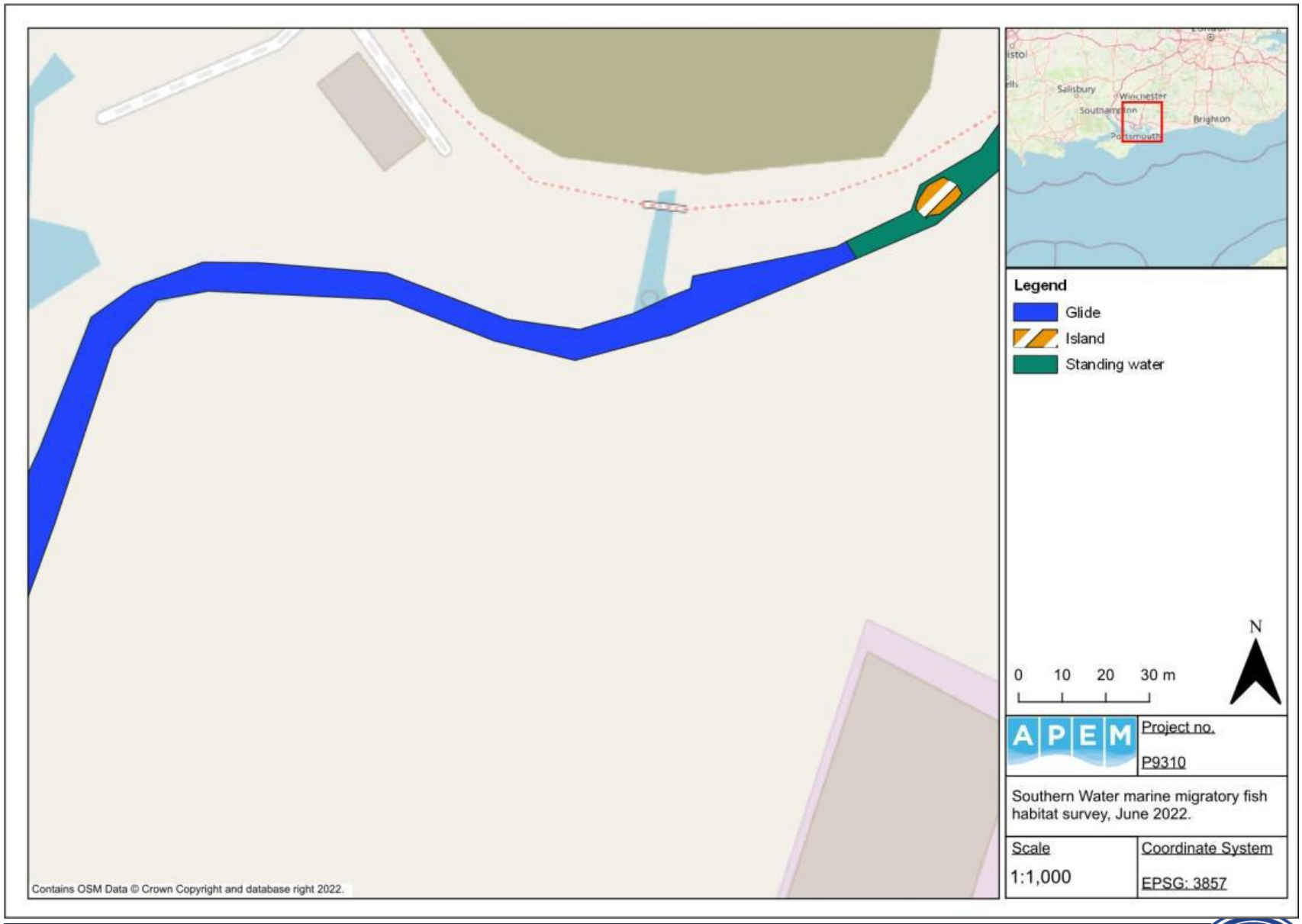


Graphic 4-13 Hermitage Stream walkover map 13

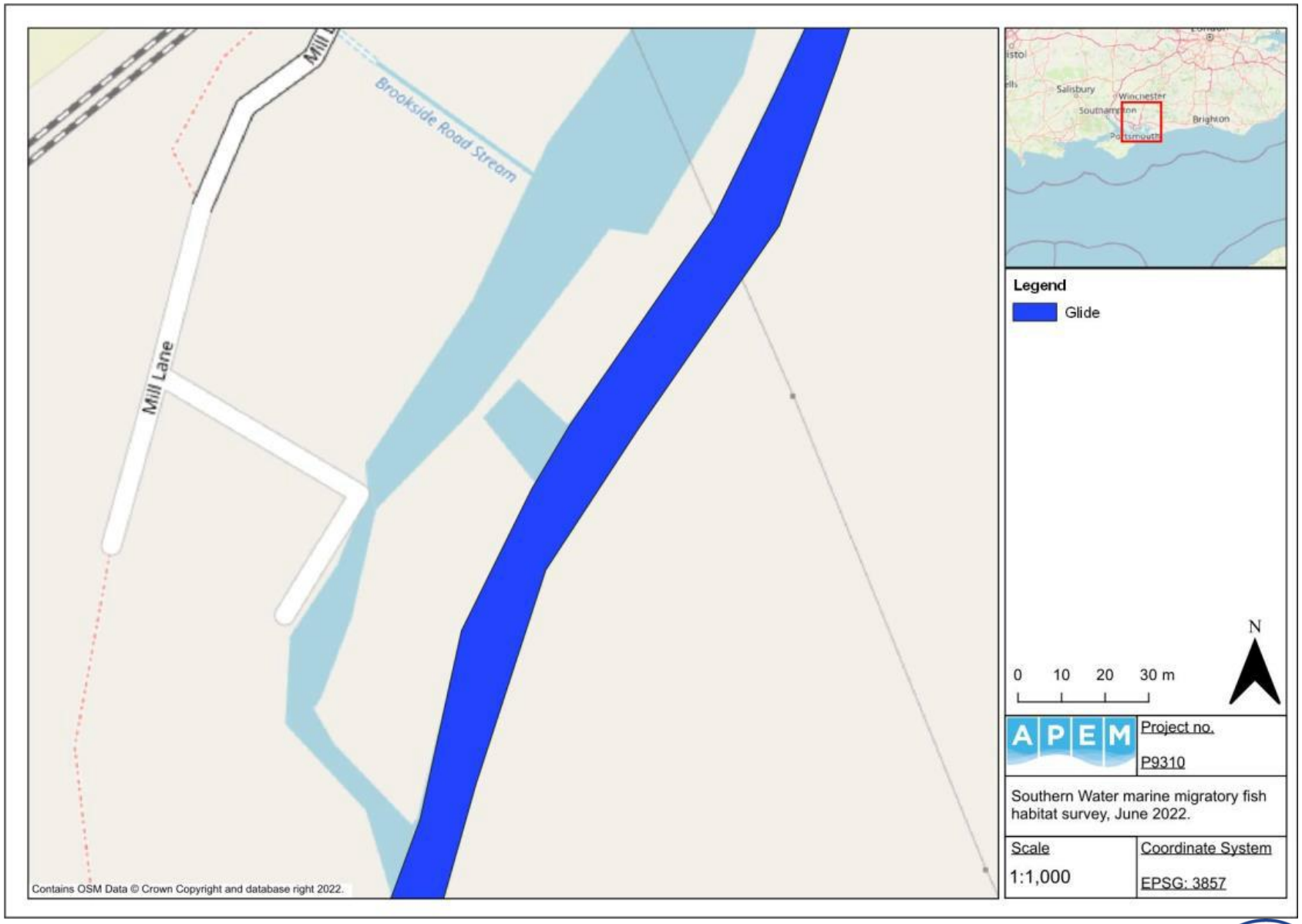


Graphic 4-14 Hermitage Stream walkover map 14

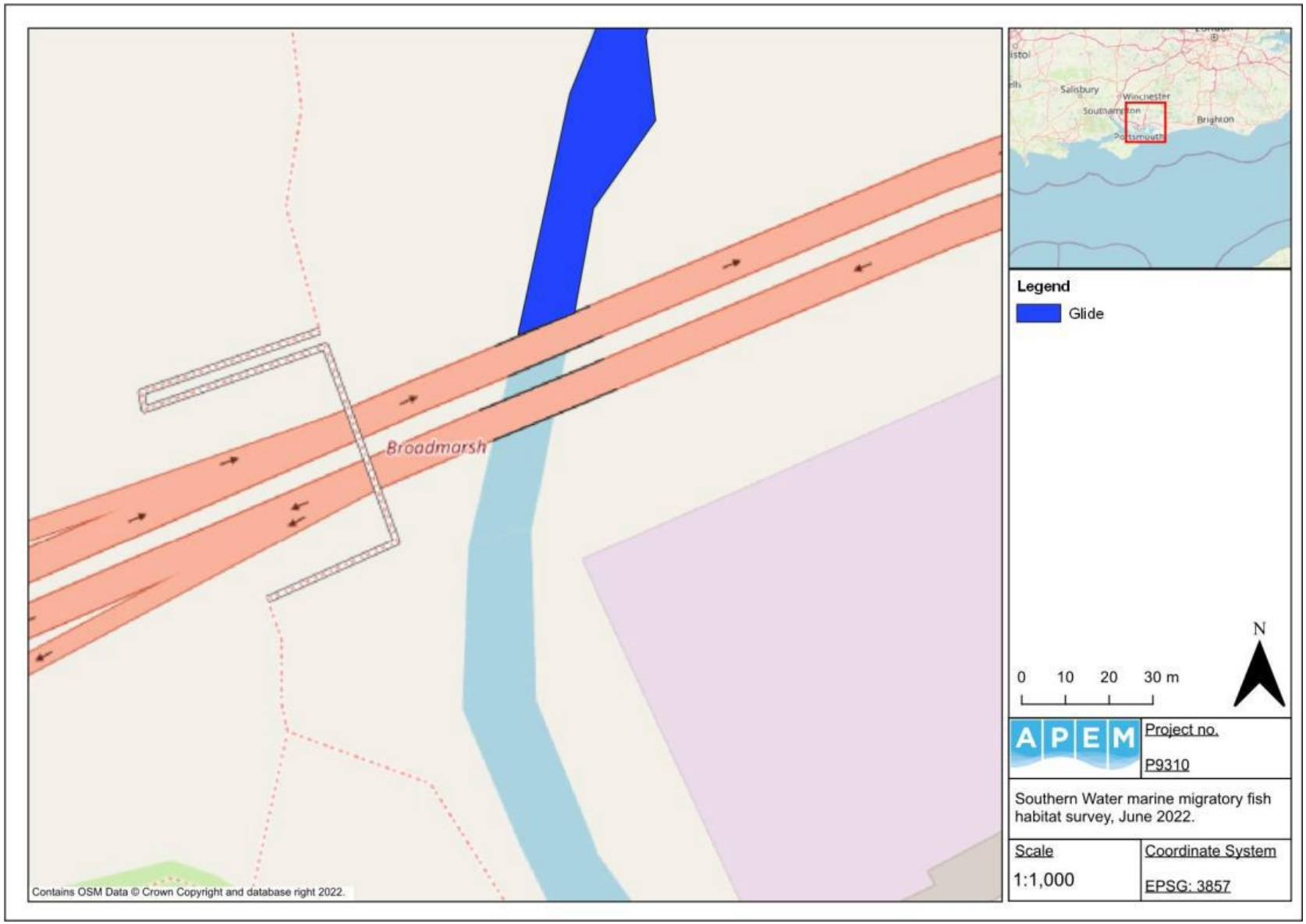
Graphic 4-15 Hermitage Stream walkover map 15



Graphic 4-16 Hermitage Stream walkover map 16



Graphic 4-17 Hermitage Stream walkover map 17



5 Summary

5.1.1 A series of surveys and a desk study were undertaken to assess the potential of migratory fish in Langstone Harbour and Hermitage stream.

5.1.2 The desk study results showed that the only recorded migratory fish in the area was European eel.

5.1.3 The surveys undertaken showed the area upstream was mainly suitable for adult fish and that the barriers in place are only suitable for European eels to overcome.

5.1.4 In the electric fishing survey, the only migratory fish species to be caught was European eel.

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