

## **Baseline Surveys**

### **Teddington Weir Pool Hydro-Electric Scheme Ecological Monitoring Programme**

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**Client:** Ham Hydro Community Interest Company  
**For the attention of:** Alex Beckett  
**Document Number:** 559R0103  
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**Commercial in Confidence**



Upstream view of Teddington Weir Pool on the River Thames

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## 559: Teddington HEP, Baseline Surveys

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## **EXECUTIVE SUMMARY**

Ham Hydro Community Interest Company (Ham Hydro C.I.C.) proposes to develop a hydro-electric power (HEP) scheme across Teddington Weir, a low-head weir on the River Thames in South-West London. The scheme proposes to install three, four-metre-diameter, Archimedean screw turbines with a total generating capacity of approximately 490kW. THA has provided a programme of baseline ecological monitoring that will enable the Environment Agency to assess potential impacts of the proposed HEP scheme on fish and wildlife.

The aim of this report is to present the results from the ecological surveys of the pre-construction year (2012) of the Teddington Weir hydro-electric power scheme, including fisheries, Phase 1 habitat survey, macrophytes, macroinvertebrates and aquatic habitat.

A Phase 1 habitat survey was conducted in August 2012, combined with a desk study for the area within a 1km radius of Teddington weir pool, to provide a description of existing ecologically valuable habitats and potential presence of protected species. The details of site access and proposed works were considered with regard to their potential for impact on habitats and species using the weir pool, wider river and adjacent river banks. The river, island and right bank of the Thames in the vicinity of Teddington Weir were occupied by large, naturalised areas of broadleaved woodland, semi-improved grassland and flowing water, with smaller patches of marginal vegetation and dense scrub. The left bank was dominated by amenity grassland, bare-surfaced hard-standing and buildings.

Protected species scoping revealed potential habitat for some species groups. The details of site access and proposed works were considered with regard to their potential for impact on habitats and species using the weir pool, wider river and adjacent river banks. Barge-based access should restrict disturbance to adjacent, riparian habitats. Works at the Lensbury Club site should be preceded by a walkover check from the ecological clerk of works. Species surveys are recommended if access is needed from the right bank. Invasive plant species, Himalayan balsam and orange balsam, are present in the riparian area surrounding Teddington weir pool. If any bankside vegetation may be disturbed during works, a method statement for removal of Himalayan balsam should be prepared.

The construction of low-head, hydro-electric schemes on rivers may result in modifications to the flow regime downstream of the impounding weir. Boat-based surveys were undertaken with regard to the potential impact that the scheme may have on spawning, juvenile and adult fish populations. A literature search of the published, preferred habitat criteria for key species and life stages expected to be found in Teddington informed an assessment of the quality of fish spawning habitat, juvenile nursery habitat and adult habitat within the weir pool. Spawning habitat for phytophilic species of fish was limited. However, the heterogeneity of the pool, in conjunction with the presence of numerous anthropogenic structures, makes it moderately suitable to a number of species. The presence of gravels within the weir pool at the left bank of the lock island affords potential spawning habitat for lithophilic cyprinid spawning. However, the tidal nature of the weir pool may result in low egg viability, due to risk of

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desiccation at mid-water. The area between the pontoon and the lock island was found to be most suitable for young of the year (YOY) fishes, primarily due to their preference for slow-moving currents. Significant areas of boulders could provide cover for adult perch, by braking up velocities and are likely to also offer cover to large piscivorous fish, such as pike and zander (*Sander lucioperca*). Salmonids are unlikely to utilise the pool to spawn, given its tidal nature and location within the catchment. Maps are provided that represent suitable spawning areas based on velocities and spawning substratum.

The fish community within Teddington weir pool was examined through a summer and autumn survey programme conducted in 2012, combined with a desk study using historical records from Environment Agency surveys and the Francis Francis Angling Club. The fish community appears representative of a moderately impacted lowland river, dominated by freshwater species (roach, perch and dace made up almost 90% of catches in summer, while roach and dace were the second and third most numerous species in autumn, respectively) with some estuarine residents (the majority of fish caught in autumn surveys were goby species), marine juvenile taxa (e.g. bass) and diadromous species (e.g. European eel). Published data indicated that cyprinid species dominated the fish population at Teddington, with influxes of transient species, such as gobies, at certain times of year. Densities of up to seven fish per square metre were recorded during autumnal baseline surveys, with juveniles (0+) forming the bulk of the catches. There is some limited scope for spawning of some lithophilic and phytolithophilic fish; this is discussed in greater detail in Chapter 2: Aquatic Habitat Survey. The lentic areas in the littoral zone of the pool area provide nursery habitats for juvenile fish. The greatest proportion of fish was captured in seine nets along the beach, which may reflect the comparative efficiency of the method. Electric fishing is less efficient in deeper and faster flowing water and results may therefore not give a balanced view of distribution of fish across the pool. Predation on fish is most likely to be from piscivorous fish (e.g. pike and zander), although a number of piscivorous birds are present within this stretch of river. Recreational fishing within the weir pool is of regional importance, with the main target species being bream, roach, perch, chub and pike.

The macroinvertebrate community structure at Teddington weir pool was characterised by analysing richness, abundance and dominant species. This was carried out using the Biological Monitoring Working Party, Average Score per Taxon and Community Conservation Index systems. Teddington's scores differed between seasons and sampling areas and score fluctuations were also seen in historical records from the Environment Agency. The macro-invertebrate community consisted mainly of common and widespread species. Many of the taxa associated with the fast-flowing, well-oxygenated water of riffles were absent. However, the range of Ephemeroptera recorded is a sign of a healthy river.

The diversity and coverage of aquatic macrophytes within Teddington weir pool is poor and the in-channel macrophyte community is considered to be impoverished, which is typical of the Upper Thames Tideway. Spawning, foraging and refuge may be afforded by fishes amongst the marginal vegetation on the left bank of the lock island over high water on spring tides, when the vegetation on the upper beach becomes partially submerged. Eggs deposited on the marginal plants at high water will become stranded for most of the tidal cycle and are likely to become desiccated during this period.

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## 1. INTRODUCTION

### 1.1. Scope of Works

Ham Hydro Community Interest Company (Ham Hydro C.I.C.) proposes to develop a hydro-electric power (HEP) scheme across Teddington Weir (TQ 16998 71363), a low-head weir on the River Thames in South-West London. The weir marks the extent of tidal influence within the River Thames. The scheme proposes to install three, four-metre-diameter, Archimedean screw turbines with a total generating capacity of approximately 490kW.

Mitigation engineered into the scheme includes a head- and tail-race screen, fish bypass/flood protection channel and a fish pass. A super-active, bottom baffle fish pass adjacent to the right bank and the turbines is currently being proposed.

Ham Hydro C.I.C. are following a gateway process for the project as set out by the Environment Agency and working with Environment Agency approved contractors. The Environment Agency has previously outlined a programme of ecological monitoring (Clifton-Dey 2010) that it perceives will be required prior to the construction of the proposed scheme. This will enable the Environment Agency to discharge its duty in its role of statutory consultee and regulator, with regard to determination of planning permission, abstraction and impoundment licence, and in its role as the Appropriate Authority to undertake a compliance assessment, as required by the Water Framework Directive.

Turnpenny Horsfield Associates Ltd (hereafter, THA), have been commissioned by Ham Hydro C.I.C. to undertake a suite of baseline ecological surveys that will enable the Environment Agency to undertake an evidence-based assessment of the likely impact of the proposed HEP scheme on fish and wildlife.

The completed hydropower plant will be operated in accordance with a protocol agreed with the Environment Agency covering both operation of the hydropower plant by Ham Hydro C.I.C. and management of flows through the weir by the Environment Agency.

### 1.2. Delivery

Surveys within channel were hampered throughout the year by high flows and this led to delays in programme delivery. Figure 1 below describes flow levels recorded at Teddington during 2011 and 2012.

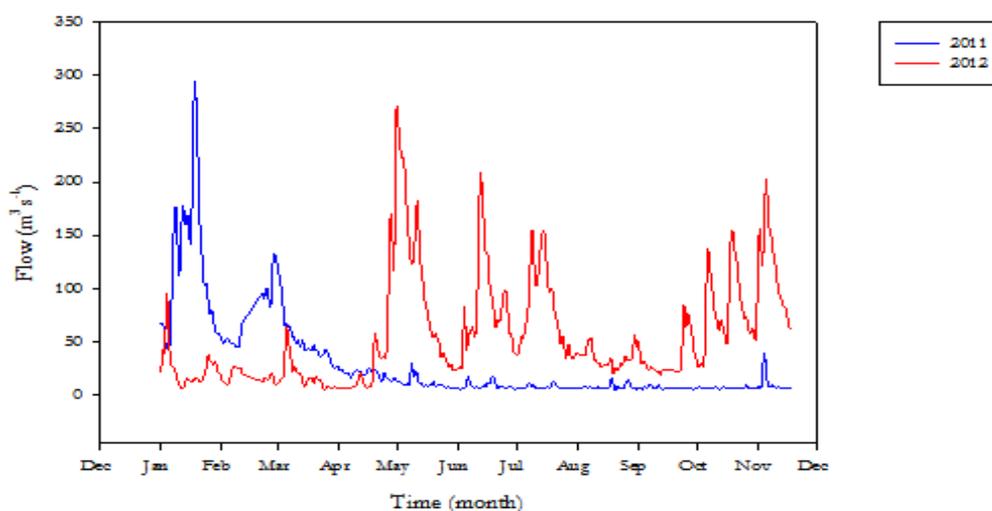


Figure 1 Teddington gauged flow ( $\text{m}^3\text{s}^{-1}$ ) between January and November in 2011 and 2012.

Boat-based surveys were undertaken within the weir pool over the low water stand, a period of the tidal cycle that provides a constant water level for approximately four hours either side of low water. Surveys were undertaken when river flows were less than  $Q_{50}$  (the natural river *flow* that is exceeded 50% of the time), as measured at the Environment Agency gauging station at Kingston (Site Ref. 39001). Given the high rainfall experienced throughout 2012 and especially during the summer months, safe access to the river was inhibited and surveys were frequently postponed, as flow levels became dangerously high. It was agreed with O. Rodin of the Environment Agency that contact would be made prior to the embarking upon of any fieldwork in order to check flow levels. Fieldwork only proceeded once the Environment Agency could indicate that water had reached a safe level for working.

Consent was received from the Environment Agency for authorisation to fish within Teddington Weir Pool using instruments (other than rod and line) under section 27A of the Salmon and Freshwater Fisheries Act for the period 01 June to 01 December 2012 (Authorisation reference number B/SP/16052012/1E1).

Discussions on the methodologies used for surveys were entered into by Ham Hydro C.I.C., THA and the Environment Agency at each step of the way to ensure that a safe and reliable approach was taken at all times.

### 1.3. Site Details

Teddington Weir (Figure 2) defines the tidal limit of the River Thames at the borders of London boroughs, Richmond-upon-Thames and Royal-Kingston-upon-Thames (grid reference: TQ 16998 71363, postal code area: TW10 7). To the north lies the village of Ham and to the south, Teddington. The borough of Richmond is characterised by vast areas of green space including Richmond Park (national nature reserve and special area of conservation), Royal Botanic Gardens Kew (a world heritage site), Hampton Court Park and six local nature

reserves (London Borough of Richmond upon Thames Civic Centre 2010). Royal Kingston is a more urbanised area with smaller patches of green space that provide important connectivity of habitat for urban wildlife.

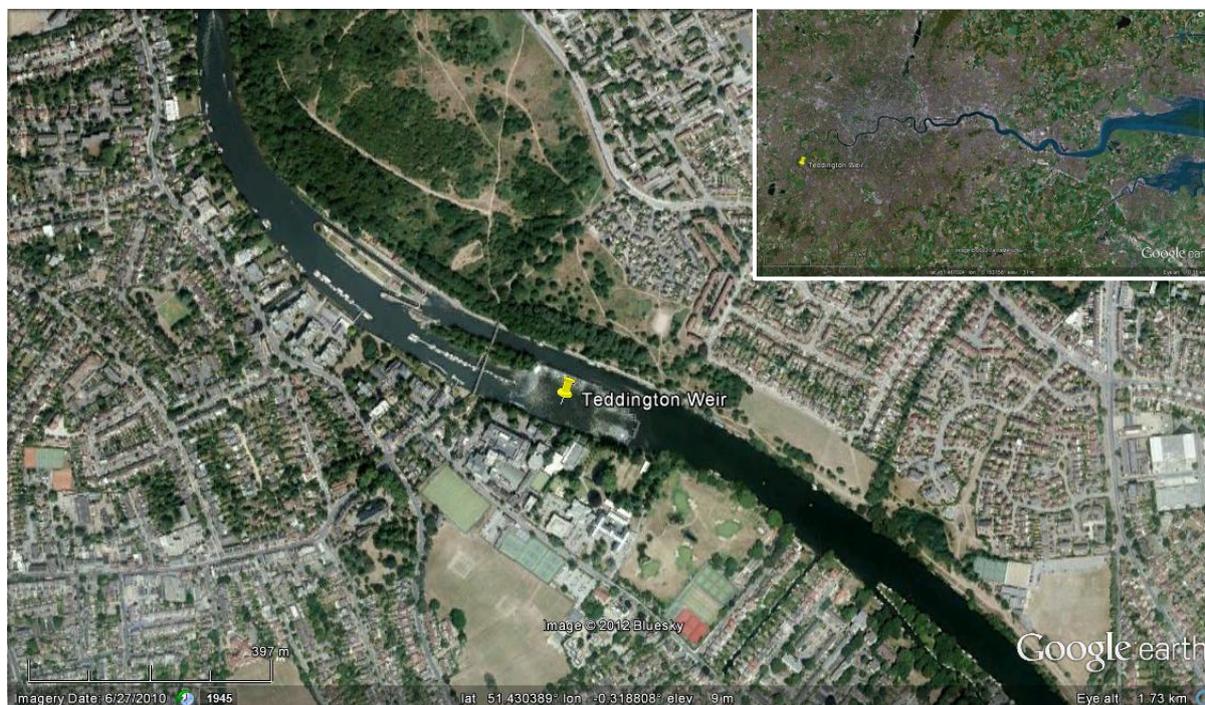


Figure 2 Aerial photographs of Teddington Weir and (inset) its position in South-West London, on the Upper Thames reaches (Google Inc. 2012).

#### 1.4. Development Proposals

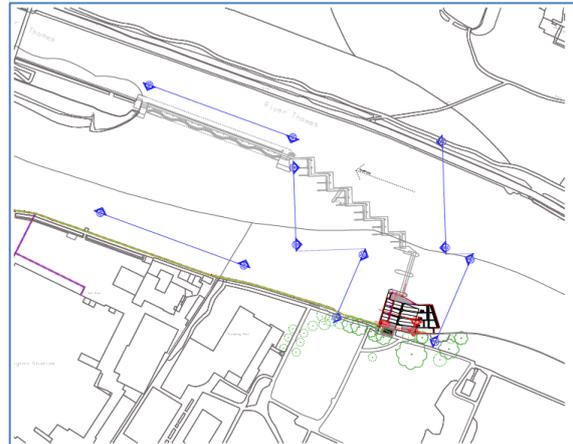
The proposed development consists of the installation of turbines adjacent to the existing roller sluices at Teddington Weir (Figure 3). It is proposed to employ mainly waterborne construction techniques, operating from floating pontoons and barges deployed both up and downstream of the weir. Construction workers will be ferried to the site with all materials shipped from Commercial Wharf. There will also be some development of a parcel of land at the Lensbury Club on the left bank, with a further contingency access route on the right bank, upstream of the weir pool, leaving the road at the corner of Burnell and Dysart Avenues. Ham Hydro C.I.C. have been liaising with the Lensbury Club regarding the need to obtain access to the site.

Welfare facilities will also be provided at a floating pontoon station beside the weir. The construction sequence will involve mobilisation of a working, floating pontoon, from which to install a temporary coffer dam creating dry working conditions. The construction phase will involve in-channel pile driving and a temporary fish pass will be installed on No. 1 gate during construction works. The existing weir structure will be demolished and the new structure cast *in-situ*. Ready-mixed concrete will likely be delivered via pump and pipe line from the adjacent bank;

dry materials will be delivered by barge. Archimedean screw turbines will be delivered by barge and installed within channel (through weir). Similarly electrical housing and walkways will be constructed from floating platforms. After a dry run, the temporary structures will be removed.



Zoomed in view of turbines



Panoramic view of turbines



Figure 3 3D visualisations of the HEP scheme in Teddington Weir Pool, as designed by HLM Architects ©2011, accessible from the council's planning website (London Borough of Richmond upon Thames Civic Centre 2012).

### 1.5. Aim of This Report

The aim of this report is to present the results from the baseline ecological surveys of Teddington weir pool undertaken during 2012. The suite of surveys is presented in Chapters 1 to 5, which explore: Phase 1 Habitat Survey; Aquatic Habitat; Fish; Macro-invertebrates; and Macrophytes.

Figure 4 is a map provided by the Environment Agency. The red line denotes the limit of Teddington weir pool, within which surveys should be carried out.

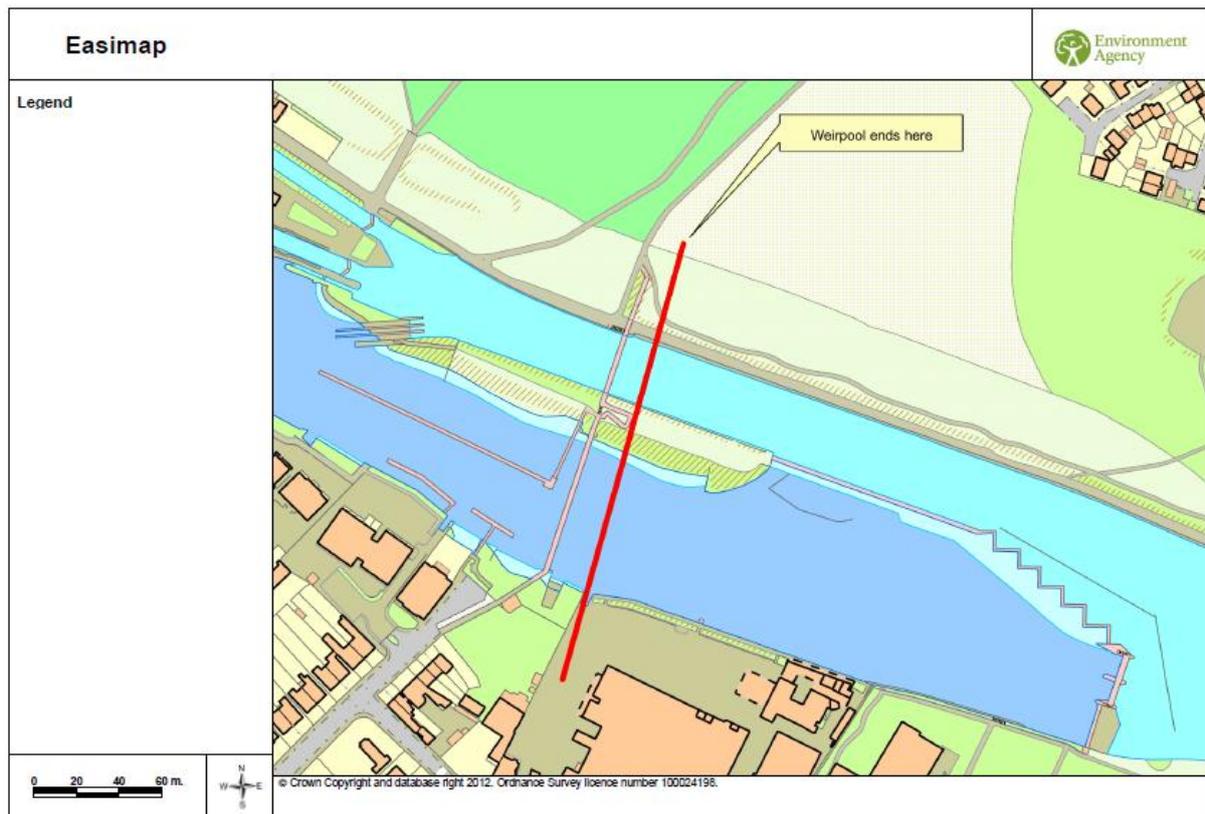


Figure 4 Map of Teddington weir pool with a red line denoting the limit of the weir pool (source: Environment Agency).

## 2. REFERENCES

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