

Technical Note – Planning Documents Review

Cromwell Weirs

Newark and Sherwood District Council

Project reference: Cromwell Weirs

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Quality information

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Table of Contents

| | | |
|----|--|----|
| 1. | Introduction..... | 5 |
| 2. | Ecological Reporting..... | 5 |
| | Fisheries Assessment – Fishtek Consulting..... | 5 |
| | Fish Passage | 5 |
| | Hydrology and geomorphology | 6 |
| | Habitat Regulations Assessment..... | 6 |
| | Suitability of report to support planning | 7 |
| | Ecological Appraisal and Protected Species | 7 |
| | Otter and Water Vole..... | 8 |
| | Bats..... | 8 |
| | Suitability of reports to support planning | 8 |
| | Potential Noise Impacts on Fish..... | 9 |
| 3. | Conclusions | 10 |

1. Introduction

- 1.1 This Technical Note has been prepared for Newark and Sherwood District Council in order to provide a review of the ecological reports supporting an application (19/01484/S73M) to vary condition 2, 5, 6, 9, 10, 12 and 15 attached to planning permission 18/01477/FULM. The current application is to amend the approved plans, reducing from three turbines to two and with a smaller development footprint for the proposed erection of a hydropower electricity generating station, supported by energy storage and fish passage in the area of land adjacent to Cromwell Weir, on the right bank of the River Trent near Collingham. This application has also been submitted to discharge all pre-commencement conditions on the existing consent 18/01477/FULM.
- 1.2 The scheme is an update of an earlier proposal submitted by Barn Energy that comprised three Kaplan turbines. The new proposals have been submitted by H2O Power and comprise of two turbines instead of three. The new scheme means there is a reduction in the maximum abstraction rate from 80m³/s to 54m³/s.
- 1.3 This report provides:
- a summary of the applicable legislative requirements and guidance, and whether this has been satisfactorily addressed in the supporting documents;
 - A critical technical review of the collective ecology work submitted in support of the application including commentary on adherence to both legislative and best practice guidance requirements and the robustness of the work carried out, including the reasonableness of any conclusions reached. This component will include the identification of gaps in the robustness of supporting documents, and recommendations for further work where this is considered appropriate; and
 - an overall review of the key issues presented in any previously submitted objections limited to the potential impact of the development on fish, other aquatic and riparian species, and their associated habitat.

2. Ecological Reporting

Fisheries Assessment – Fishtek Consulting

- 2.1 This report provides a detailed assessment of the potential impacts of the proposed Hydro Electric Power Plant (HEPP) at Cromwell Weir. The assessment includes analysis of flows, river substrate, fish passage, species-specific modelling, hydraulic and geomorphological modelling and proposes mitigation and enhancement measures in the form of a naturalised bypass channel linking Slough Dyke to the River Trent, a Larinier fish pass and an eel pass.

Fish Passage

- 2.2 H2O Power Ltd instructed Fishtek Consulting to update the 2017 Cromwell Weir HEPP Geomorphology and Fisheries Report to assess how the up to date scheme may affect the areas of concern as set out in pre-application response NPS/WR/022415. In terms of fish passage, there are no fundamental changes to the baseline scenario and no further fish surveys have been completed. It is considered that based on available information the report provides a thorough understanding of fish populations within the River Trent.
- 2.3 The River Trent supports a diverse range of fish species, including Atlantic salmon *Salmo salar*, sea trout *Salmo trutta trutta*, sea lamprey *Petromyzon marinus* and European eel *Anguilla anguilla*; however, the River Trent itself has no specific statutory or non-statutory designations at the location of the proposed development.
- 2.4 The site is located within 250 m of the Langford Lowfields RSPB Nature Reserve and Local Wildlife Site (LWS), designated in part for aquatic plant and invertebrate communities, and is connected to the Humber Estuary SSSI (2000480) and SAC (UK0030170) approximately 60 km downstream, for which sea and river lamprey (*Petromyzon marinus* and *Lampreta fluviatilis*) are qualifying features.

- 2.5 The proposed Larinier fish pass would significantly improve upstream fish passage at the weir, particularly for migratory salmonid species, namely Atlantic salmon and sea trout.
- 2.6 The proposed naturalised bypass channel has been designed to allow passage for lamprey and eel, however, Fishtek still recommend a separate eel and lamprey pass to be installed on the opposite bank to the HEPP, either in place of or alongside the existing pool and traverse pass. The combined pass should comprise a channel lined with both eel and lamprey crawling media, as detailed in the outline design. This would further reduce the risk of entrainment and impingement at the intake. Recent studies on the efficacy of lamprey tiles have found mixed success during in-situ trials and research is on-going. Fishtek have therefore recommended that it would be beneficial if any lamprey substrate could be easily removed and replaced with an alternative at a later date, subject to the findings of on-going research.
- 2.7 It is considered that the report provides robust evidence that the proposals will improve fish passage at Cromwell Weir. The baffle height was selected by the developer to best meet the requirements for migratory salmonids and coarse fish and is based on discussions they had with EA fisheries. At present the weir provides a barrier to fish migration and the existing pool and traverse fish pass does not currently meet best practice guidelines and is unlikely to provide effective upstream passage for coarse fish and brown trout. Large head drops and high velocities means that the fish pass is not passable for 95% of the year, making it unfit for purpose.
- 2.8 Fishtek have also stated that given the reduction in scheme size there is a potential to reduce the size of the fish pass, providing minimum discharge limits can be met as well as the hydraulic conditions required for coarse fish and salmonid migration.

Hydrology and geomorphology

- 2.9 Results from the hydraulic and geomorphological modelling predict changes in flow velocities and geomorphology in the downstream channel, which translate into variations in fish spawning habitat quality.
- 2.10 The largest impact will be on brown trout habitat, for which the model predicts a large increase in near-optimal adult habitat and a slight reduction in juvenile and spawning habitat. The model also predicts gains in near-optimal juvenile barbel, adult roach and spawning roach habitat, as well as a slight reduction in the availability of near optimal adult barbel, adult chub and spawning chub habitat. Impacts to optimal habitat are less significant mainly due to the low availability of such habitat under the pre-installation scenario. The results are largely similar to those found in the previous report for an 80 m³/s abstraction.
- 2.11 The modelled effect of the abstraction regime on channel velocities does not seem to vary significantly between the current proposal of 54 m³/s abstraction, and the previous proposal of 80 m³/s abstraction. One observation is that under the reduced abstraction regime the course taken by the higher velocity turbine discharge shifts from the centre of the channel and towards the true right bank sooner. This can likely be explained by the fact that the hydro turbines will be drowned out sooner and therefore, there will be more flow discharging over the weir.
- 2.12 The maximum abstraction rate of the proposed scheme is 54 m³/s and the minimum residual flow is 7.54 m³/s to be divided between the weir and fish pass. Whilst the maximum abstraction is lower than the previous proposal, the residual flow has not changed.
- 2.13 The report is supported by Environment Agency (EA) correspondence, which confirmed that the EA do not believe that the development will significantly impact upon fish species present.

Habitat Regulations Assessment

- 2.14 During the licensing determination the applicant considered lamprey and consulted Natural England as the competent authority for the Humber SAC. The EA completed a Stage 1 Habitat Regulations Assessment and submitted this to Natural England for comment. Natural England responded and '*agree with the Environment Agency that the proposal will have no Likely Significant Effect on the integrity of the Humber lamprey population*'.
- 2.15 A Shadow Habitats Regulations Assessment has been completed by Barn Energy and updated to provide Appropriate Assessment of the SAC and impacts on the associated aquatic species. Additional mitigation measures to ensure no detrimental impacts on sea and river lamprey, and European eels, have been included and are detailed below:

- The 6mm fish screen has been augmented with a 3mm section at the base so as to specifically protect against the impingement of juvenile eels, river lamprey and sea lamprey. The detail of the screen design is contained in the Abstraction Licence.
- Biosecurity measures, including rigorous implementation of Check-Clean-Dry, will be implemented on site to stop the spread of waterborne diseases and INNS.
- Fish passage will be maintained during construction works by constructing the adjustable weir section-by-section, and part of the channel will have flow over the weir crest at all times.
- Pollution prevention measures will be implemented during construction of the HEPP.
- The risk of harming fish species during de-watering will be mitigated by using fish friendly pumps.
- Contractors will ensure that suitably qualified Ecologists are on site to undertake a fish rescue should any fish remain trapped in the dry-working area.

Suitability of report to support planning

- 2.16 The proposed 6 mm intake screening deviates from best practice guidelines; however, the Shadow HRA states that the 6 mm fish screen has been augmented with a 3 mm section at the base to specifically safeguard against the impingement of eel, river lamprey and sea lamprey. The detail of the screen design is contained in the Abstraction Licence. Environment Agency best practice guidance states that mesh size for glass eel and elvers should be 1-2 mm; however, given the location of the weir approximately 60 km from the Humber Estuary, elvers and glass eels of such a small size are unlikely to be present. There is still a risk that this deviation from best practice may form the basis of objection to the planning application, and therefore it is recommended that the design of the intake screen is revisited if possible.
- 2.17 Fishtek recommend that 150 mm high baffles on the Larinier fish pass could be considered in place of the 125 mm baffles currently proposed to prevent the fish pass from becoming overcharged for migratory species at high flows. However, even with higher baffles the fish pass would be slightly overcharged with the newly proposed lower abstraction regime. A more detailed hydraulic design that better meets best practice guidelines should be produced if possible for approval by the Environment Agency's National Fish Pass Panel.
- 2.18 Fishtek still recommend a separate eel and lamprey pass to be installed on the opposite bank to the HEPP, either in place of or alongside the existing pool and traverse pass. The combined pass should comprise a channel lined with both eel and lamprey crawling media, as detailed in the outline design. This would further reduce the risk of entrainment and impingement at the intake. Although this is a nice to have, it is considered that for planning purposes, the proposed naturalised bypass channel designed for eel and lamprey migration should be considered appropriate.
- 2.19 The construction of the fish passage must be completed by a competent engineer to ensure gradients and flows are sufficient to provide attractant flows and passage for all species.
- 2.20 A maintenance regime must be agreed to ensure that the bypass channel remains passable for all fish species and does not become blocked with silt or debris.

Ecological Appraisal and Protected Species

- 2.21 An Ecological Appraisal was completed in 2016 and updated in 2018. The 2018 update concluded that there was no significant change in the assessment in the intervening time.
- 2.22 The Ecological Appraisal Report covered the main development area and the proposed access track and included recommendations for mitigation in relation to vegetation clearance throughout the site.
- 2.23 An amended Ecological Appraisal has not been completed to accompany this new application and the previous reports are considered sufficient to support this application. As per the recommendations in the Ecological Appraisal, a Habitat Creation Scheme incorporating an Ecological Management Plan has been completed by MRB Ecology and Environment in September 2019, and has been submitted as supporting information.

Otter and Water Vole

- 2.24 It is agreed that the Slough Dyke provides an important route for riparian mammals, such as otter, to pass between the River Trent and the adjacent Langford Lowfields Reserve. This wildlife corridor should be retained and enhanced, where possible, through appropriate design of the diversion channel, to incorporate suitable bank profiles and wide berms which will support a greater diversity of marginal vegetation than is currently present on the Dyke.
- 2.25 No water vole were found in the baseline surveys, however, as detailed in the Habitat Creation Scheme, suitable bank profiles will be incorporated into the bypass channel design to offer burrowing habitat for water vole in the event that they are present within the wider area. A double line of native hedge species along the northern bank of Slough Dyke will also be provided to provide cover for otter.

Bats

- 2.26 No evidence of potential bat roosts was found in the Ecological Appraisal. However, a mature ash tree (Target Note 5) was identified as having 'modest potential', although this tree is to be retained. Further bat roost surveys are recommended should there be any impacts proposed to this tree.
- 2.27 A small patch of immature scrub and scattered young willow trees on the river bank are to be removed, but these were noted as having no bat roost potential. However, these areas of vegetation do contribute to areas of optimal bat foraging habitat locally and should be replaced through compensatory planting where possible.
- 2.28 An Arboricultural Method Statement and Tree Protection Plan has been submitted with the new application and details the tree protection measures which should be adopted by site contractors throughout the works to minimise any risks and adverse impacts on the trees to be retained.
- 2.29 It is understood that trees will be planted along the east side of the main site, between the Slough Dyke river and the flood bank. 11 trees are proposed here, a mix of pedunculate oak (*Quercus robur*) and poplar (*Populus* sp.). These trees will form a row of taller trees between the development and the neighbouring nature reserve. As oak and poplar trees grow to larger sizes, they can provide good nesting and roosting habitat for birds and bats from both the river and the nature reserve.
- 2.30 As detailed in the Habitat Creation Scheme, an existing strip of scrub running parallel to the realigned Dyke corridor is a feature of the scheme and will be retained. The tree-lined edge of Slough Dyke is likely to be an important linking feature for any riparian animals (including bats) using the Langford Lowfields site and the riparian corridor of the nearby River Trent.

Suitability of reports to support planning

- 2.31 As an amended Ecological Appraisal Report has not been submitted, the comments from our previous review still stand and are detailed below for ease of reference.
- 2.32 In the Ecological Appraisal Report, trees were assessed for their suitability as bat roosts. Due to the lack of bat roost features identified further bat surveys were scoped out. However, it is considered that the justification for this is poor: '*trunks are not of sufficient girth*'. Roosts have been found in tree trunks with girth less than 10 cm and therefore further surveys are recommended to satisfactorily establish the likely absence of bat roosts in any scrub or trees to be removed. In the event that potential bat roosts were found in trees to be removed, it would be recommended that where possible these trees should be retained. Where removal of such trees was unavoidable, further investigation of potential bat roosts in the form of nocturnal bat emergence surveys may be required and a European Protected Species licence application submitted to Natural England to allow the removal of an active bat roost.
- 2.33 The report comments that habitats on the site have some potential to support reptiles such as grass snake, but no further recommendations are made. The new Habitat Creation Scheme document provides recommendations in relation to timing and methods of vegetation clearance in relation to reptiles and amphibians.
- 2.34 The Ecological Appraisal does not provide a list of relevant legislation or review the potential development in relation to these.

- 2.35 The report makes reference to known badger activity in the area, but no further assessment is made in relation to this protected species. In the event that vegetation clearance is required and considering the time elapsed since the extended Phase 1 Habitat Survey, it is considered that a pre-commencement check for the presence of badger in these areas of vegetation is required. Badger are not included in the Habitat Creation Scheme or Ecological Management Plan.

Construction Environmental Management Plan

- 2.36 A new Construction Environmental Management Plan has not been submitted and therefore our comments on the previous application still stand. These have been included below for ease of reference.
- 2.37 It is recommended that the Construction Environmental Management Plan be updated to provide more specific mitigation measures with regards to protection of the aquatic environment during the construction phase. Some examples are provided below.
- The site access track must provide a suitable buffer (i.e. 8-10 m) between the track and Slough Dyke to ensure that no suspended sediments and contaminants enter the waterbody.
 - Any crossing of the Slough Dyke will be completed in compliance with the local authority guidance, e.g. Land Drainage Consent requirements.
 - Storage of materials must be outside of the floodplain, if this is not possible materials should be stored securely to ensure run-off does not enter any surface waterbodies should a flood event occur.
 - Pollution Prevention Guidelines should be followed as best practice when undertaking construction works near water.
 - Incident response methodology should be provided should a pollution incident occur.

Potential Noise Impacts on Fish

- 2.38 According to the updated Cromwell Weir Planning Statement Addendum Noise Assessment (dated 8 August 2019), the fact that the two proposed Kaplan Type turbines are buried will result in little or no noise disruption – certainly much lower aggregate noise levels than arises from the weir currently. *Any noise from the turbines will be generator noise, and as they are in the semi-buried turbine gallery, are not expected to create significant ambient noise above background levels.*
- 2.39 It has become increasingly apparent that human-generated sound has the potential to affect the health and wellbeing of animals as well as humans. There are still many gaps in the knowledge of fish bioacoustics, including questions on ear function. According to Popper et al., (2003), high sound levels are anything above 80dB, however, Lumsden (2016) demonstrated that the base flow of rivers can be anything from 95 – 106dB, and peak flows generating noise levels from 107 -123dB. Therefore, such noise levels are unlikely to have any adverse effects on fish.
- 2.40 The typical noise of a Kaplan turbine is 83 – 86dB (based on measurements from existing sites). However, the noise associated with the system will be predominantly generated within the turbine house, which will be buried to minimise acoustic leakage. The noise within the powerhouse is not expected to be more than 86dB, which will be significantly reduced in the aquatic environment based on the building design with dense concrete block and associated cladding, which will suppress noise. Additionally, the close proximity of the turbine and powerhouse to the weir, will mean that it is unlikely that the noise produced from the proposed HEPP will be heard over the baseline noise of the weir cascade. The background noise from the weir for similar schemes is typically 65 – 75dB, and it is considered that due to the attenuation of turbine noise, the predominant noise on the site will be that from the weir and fish pass. Therefore, there is not expected to be any influence on fish populations from the noise produced by the HEPP system.

3. Conclusions

- 3.1 This report provides a critical technical review of the collective ecology work submitted in support of the application, including commentary on adherence to both legislative and best practice guidance requirements and the robustness of the work carried out. This includes an evaluation of the reasonableness of any conclusions reached to support the planning application 19/01484/S73M. This application has also been submitted to discharge all pre-commencement conditions on the existing consent 18/01477/FULM.
- 3.2 The ecology reports provided meet the requirements to discharge the pre-commencement conditions. The Shadow HRA addresses the original objection '*the defendant failed in its obligation under the Habitats Directive to consider the impact on protected species*'. An Appropriate Assessment has now been completed to determine impacts on protected aquatic species, including those in the Humber Estuary SAC approximately 60 km downstream.
- 3.3 Detailed design of Slough Dyke has been submitted and takes water vole, otter, eel and lamprey habitat into account as well as the planting and protection of trees, which is further supported by the Arboricultural Method Statement and Tree Protection Plan.
- 3.4 The only outstanding concern is that Fishtek recommend 150 mm high baffles should be considered in place of the 125 mm baffles currently proposed to prevent the fish pass from becoming overcharged for migratory species at high flows. However, even with higher baffles the fish pass would be slightly overcharged with the newly proposed lower abstraction regime. It is recommended that a more detailed hydraulic design that better meet best practice guidelines is produced to satisfy the requirements of the National Fish Pass Panel.
- 3.5 Although a reduction in screen size from 6 mm to 3 mm is a vast improvement to protect eels and lamprey, there is still a risk that the Environment Agency will push for a 2 mm screen at the intake to account for glass eels and elvers as per their best practice guidance. However, screening requirements can be decided on a site by site basis, informed by local monitoring data. This will generally require input from local area Environment Agency officers. Where data does not exist, it may be possible to agree with the EA that the slot-width is based on appropriately designed surveys conducted during the glass eel/elver migratory window.
- 3.6 Fishtek also recommend that a combined eel and lamprey pass should be installed on the opposite bank to the HEPP alongside the existing pool and traverse pass. The pass should comprise a channel lined with eel and lamprey tiles that runs from the downstream bed to upstream of the weir. Although this would be a nice to have, it is considered that the proposed naturalised bypass channel is sufficient mitigation for lamprey and eel.
- 3.7 The Ecological Appraisal makes reference to known badger activity in the area, but no further assessment of this protected species is made. In the event that vegetation clearance is required and considering the time elapsed since the extended Phase 1 Habitat Survey, it is considered that a pre-commencement check for the presence of badger in these areas of vegetation is required. Badger are also not included in the Habitat Creation Scheme or Ecological Management Plan.
- 3.8 Due to the location of the proposed turbines below ground and the incorporation of additional noise attenuation measures, it is considered that the predominant background noise will be that from the existing weir and proposed fish pass. Therefore, it is considered that there will be no adverse effects on fish due to noise from the turbines.