Staverton
742

Archimedean Screw Hydropower scheme at Staverton

Summary of proposed scheme

with photographs of site

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Summary of proposed scheme

A hydropower scheme is proposed on Staverton Leat at Staverton Town Mills on the River Dart, Devon. The scheme will abstract water at the existing leat intake sluices and convey it along the existing leat to a new Archimedean screw hydropower system at the tail end of the leat where it emerges to the river. Control philosophy and design are predicated on maintaining compliance with the scheme environmental conditions. Fish passage at the weir is to be improved as part of the scheme.

This document is a summary only, giving key parameters of the scheme, along with photographs of the site. All aspects are detailed in depth in the submitted document set.

Prior discussion:

EA:	This submission has taken account of a formal pre-app response received from Alice Coles – Alice.Coles@environment-agency.gov.uk (licensing reference SW/046/0004/015)
Planning permission:	South Hams District Council – pending
Right of access:	Applicant has written right of access from landowner

Site parameters:

Site name:	Staverton Leat Hydropower Scheme
Watercourse:	River Dart
Point of abstraction:	SX7897263860 (Intake “A” on plan)
Point of use:	SX7940283660 (Turbine “B” on plan)
Point of discharge:	SX7940863653 (Discharge “C” on plan)
Existing impoundment:	Upstream of and adjacent to SX7897263860 – Staverton Weir
Proposed impoundment:	EA may consider that the new works constitute an impoundment: licensing Form D is submitted for this eventuality.
Impounded levels:	Negligible increase at weir after repairing damaged areas of the crest to default 7.6 mAOD. Leat levels allowed to rise within existing banks
Description of scheme:	Gravity abstraction at sluices via existing leat to an Archimedean screw hydropower system.
Length of depleted reach:	660m

Archimedean screw system parameters:

Number of screws: 1	Maximum system power: 100kW
Maximum flow: 6.00 m3/s	Screw diameter: 3.60m
Net head: 2.40m	Screw length: ~8m (flights ~6m)
Number of blades: 4	Covering: non-enclosed (open mesh)
Maximum rotation speed: <=26 RPM	Tip speed of screw blades: <=4.90 m/s

Control method: variable-speed inverter control (all screw chambers always fully filled)

Protections: fail-safe stop on loss-of-signal from, or thresholds met at, level sensors

Predicted average annual energy output: 360,000 kWh

Predicted average annual CO_2 emissions saved: 155 t/CO_2

Key flow parameters for licensing (from site hydrology and machine parameters):

maximum design flow	6000	l/s
maximum hourly quantity	21600	m3/hour
maximum daily quantity	518400	m3/day
maximum annual quantity (if 220 days)	114048000	m3/year
minimum start-up flow	300	l/s

Hydrology

Flows AT SITE, calculated by different methods (see report) - for licensing:

Q%	*1958-2017 Gauged Flow m3/s*	*INFERRED 1958-2017 Naturalised Flow m3/s*	*1990-2016 Gauged Flow m3/s*	*1990-2016 Naturalised Flow m3/s*
97	**1.43**	**1.59**	**1.62**	**1.80**
95	**1.68**	**1.86**	**1.83**	**2.02**
90	**2.16**	**2.34**	**2.24**	**2.43**
80	**3.18**	**3.40**	**3.29**	**3.51**
50	**7.26**	**7.56**	**7.33**	**7.64**
40	**9.34**	**9.64**	**9.49**	**9.79**
10	**26.59**	**27.01**	**28.57**	**29.02**
Mean	**11.76**	**12.05**	**12.31**	**12.62**
BFIV	*0.143*	*0.154*	*0.148*	*0.160*

Sensitivity **ASB3**

Abstraction regime proposed

Q95 minimum residual flow (1.68 m3/s), thereafter 50/50 flow split with natural channel.

Indicative design flows:

with respect to EA default guidance	**"Table A"**	**proposed**	
Hands-off flow	1.68	1.68	m3/s
maximum abstraction	15.28	6.00	m3/s
Percentage take above HOF	35	50	%

Fish exclusion screening proposed

Intake: None (100mm-spaced vertical bar debris screen: comment below)

Outfall: None

In line with guidance? Yes

Bywash? N/A

Fish passage

Main channel: No net detriment due to proposed flow regime. Project recognises potential that the EA may see benefit in improving the existing fish easement and agreeing addition of some form of eel or lamprey substrate at Staverton Weir. Agreement and design of measures are subject to EA opinion. Conventionally, fish passage improvements are conditioned in outline in the licence, and final approval of a technical pass is not a prerequisite to the EA licensing timeline.

Leat and turbine: The proposed screw is compliant with latest EA guidance and will be fitted with standard compressible bumpers. On the basis of EA national precedent of no exclusion screening and the balance of evidence of risk to fish from Archimedean screws, no exclusion screening is proposed at the intake to the leat or the screw.

Flood risk

FRA has been submitted as part of an application for EA Environmental Permits.

Planning

In progress.

EIA

Not required for this scheme.

Contaminated land

Map regression shows continuous prior use as farmland and mill leat. Low risk.

Staverton Weir – view from intake sluice

Staverton Weir – view upstream from intake sluice

Staverton Weir – intake sluice controls

Staverton Leat – indicative view of bed near intake sluice

Staverton Leat – view upstream from railway bridge, showing overhanging trees

Staverton Leat – view upstream to railway bridge

Staverton Leat – view upstream from footbridge to railway bridge

Staverton Leat – view downstream from railway bridge to footbridge

Staverton Leat – view upstream from mill to footbridge

Staverton Leat – view downstream to mill, old turbine channel to left

Staverton Mill – leat passing through old turbine pit, left of mill, view downstream

Staverton Mill – old turbine channel, true left of mill, view upstream

Staverton Mill – obstructed channel, true right of mill, view upstream

Staverton Mill – obstructed channel, true right of mill, view downstream from mill

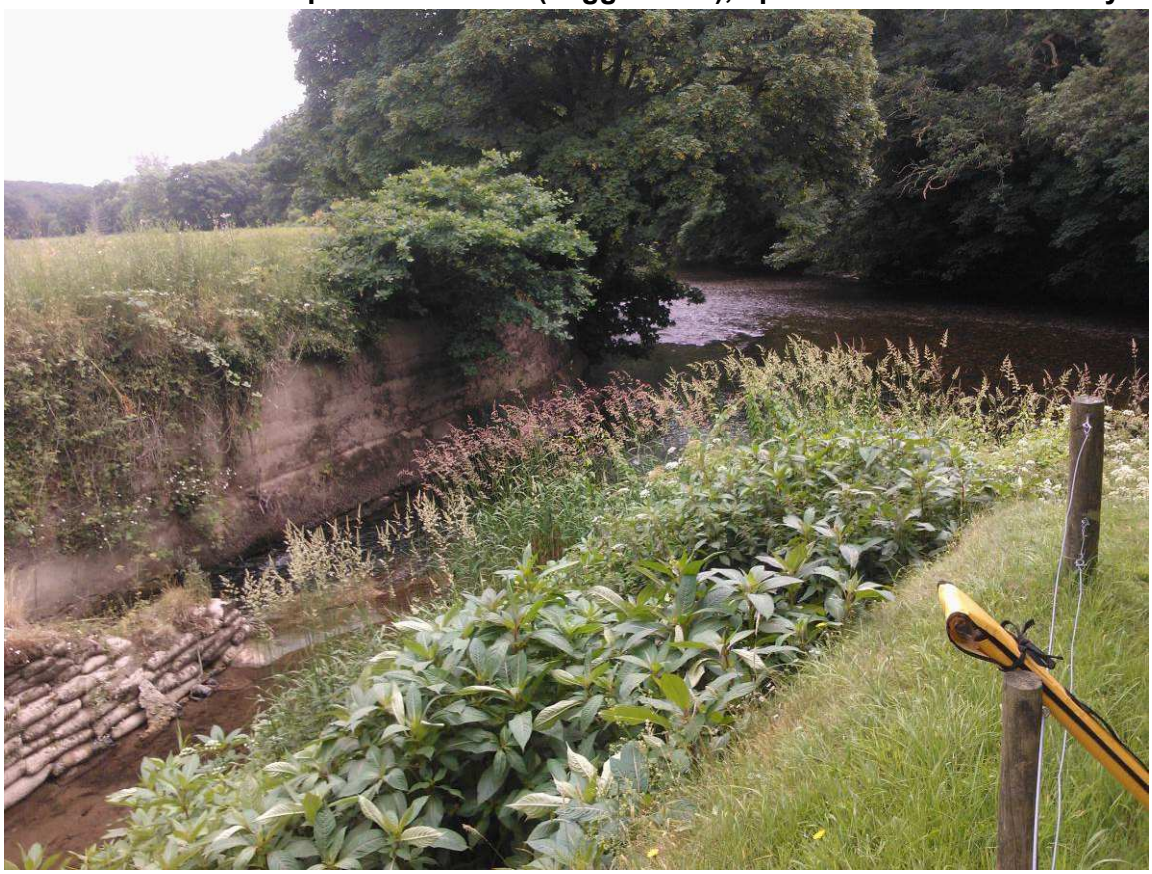
Staverton Mill – view upstream to mill

Staverton Mill – view upstream to mill from toe of island downstream

Staverton Mill – downstream view to L-shaped obstruction, with open channel to left

Staverton Mill – existing obstruction, upstream view - proposed screw site

Staverton Mill – L-shaped obstruction (bagged wall), open left-hand channel beyond



Staverton Mill – toe of existing obstruction (left), confluence of leat with river (right)