Environment Agency
Water Resources
Devon, Cornwall and the Isles of Scilly

Restoring Sustainable Abstraction
Options Identification, Appraisal and Agreement Stage Plan
Old Walls (Licence no 14/46/004/0685)

Approved By:

For EA:

Name: Emma Townsend

Signature: E. Townsend.

Date: 08/10/25

Revision History Form

Version Number	Description of Change	Author	Approved by	Date Approved	Issue Date
V1.0	Final Version	Hester Jackson	Emma Townsend	06/02/2020	
V2.0	Draft version created to update the OA for 2025	Debbie Peareth			
V3.0	Draft created following peer review comments by SM/ET.	Debbie Peareth			
V4.0	Final Version	Debbie Peareth	Emma Townsend	08/10/2025	08/10/2025

Old Walls Hydro-Electric Power Scheme (HEP)
Abstraction Licence number 14/46/004/0685

Options identification appraisal and agreement plan – this is an updated version of the 2020 report written in August 2025.

1. Introduction

1.1 Document purpose

This is the options identification, appraisal and agreement plan for the Old Walls Hydro-electric scheme.

Environmental scheme summary

Licence no 14/46/004/0685 allows the holder to take water from the West Webburn River for Power Generation. Water is abstracted by gravity to a sluiced concrete lined leat. This has the potential to leave a deprived reach of approximately 600m in the main channel. The current licence requires the licence holder to ensure the flow through the notch at Jordan weir is not less than 0.025m^3/s.

The aims of the Restoring Sustainable Abstraction (RSA) scheme are to amend the conditions of the abstraction licence so that it is in accordance with the current guidance for licensing run-of river hydropower development, and fish screening best practice.

We seek to improve the following elements of the existing licensed abstraction:

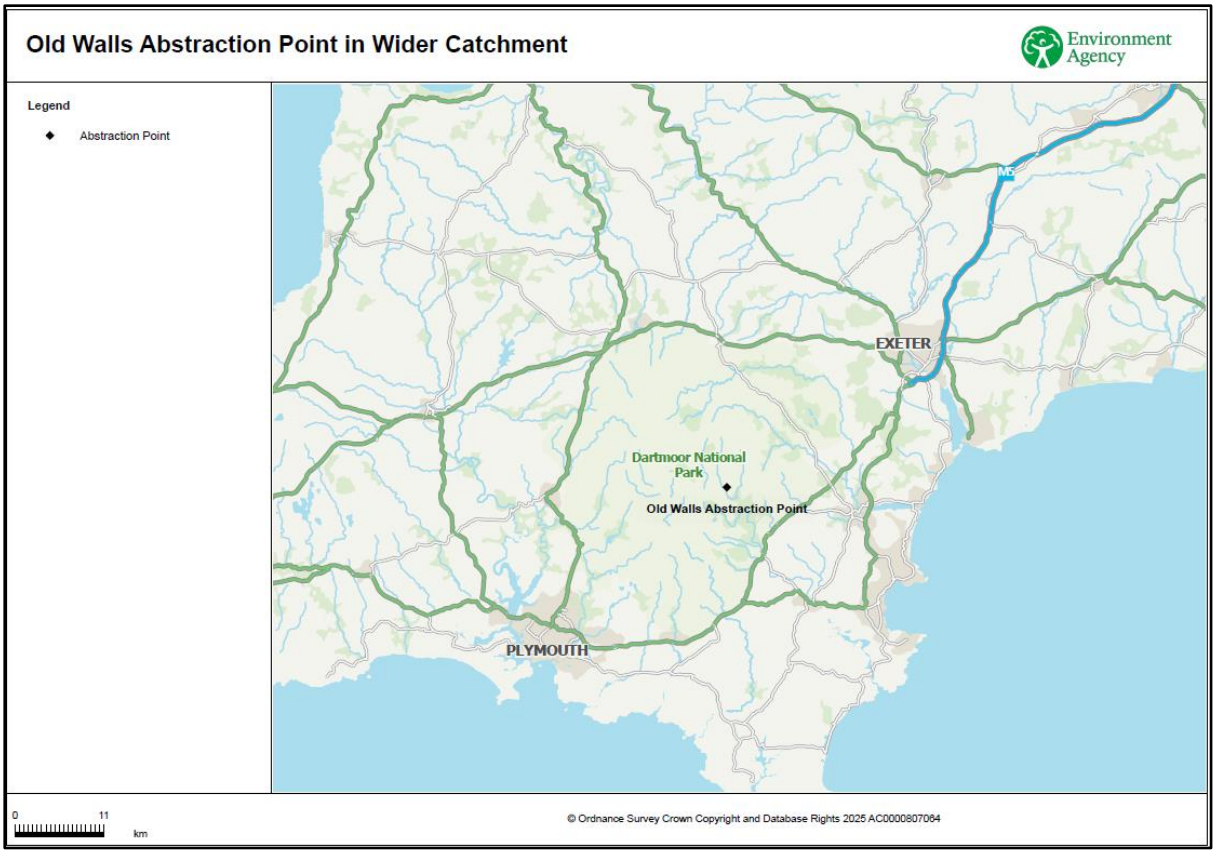
- The extremely low 'Hands Off Flow' (HoF) of 0.025m^3/s (lower than natural extreme low flows of Q99.9)
- The relatively high maximum instantaneous abstraction volume of 0.80m^3/s (equivalent to natural Q35). When this is modelled in combination with the extremely low HoF, there is only excess flow to pass over the weir and down the deprived reach for 35% of an average year (127 days).
- No provision to adjust the instantaneous volume abstracted according to the flow in the river which removes any variability of flow when flows are between the HoF and the maximum instantaneous volume. Variability only occurs when flows are higher than Q35 and there is excess water available.
- Fish screen requirements do not comply with current best practice.
- Location of the screen at the turbine does not comply with current best practice.
- Tail race screening at the discharge point to be included on the licence.
- Control of the abstraction at the head of leat from the West Webburn River.
- Measurement of the abstraction to be moved to the head of leat.
- Prevent water being lost down the overflow, which currently protects the site from flooding in the absence of flow controls at the head of the leat.

2. Scheme justification

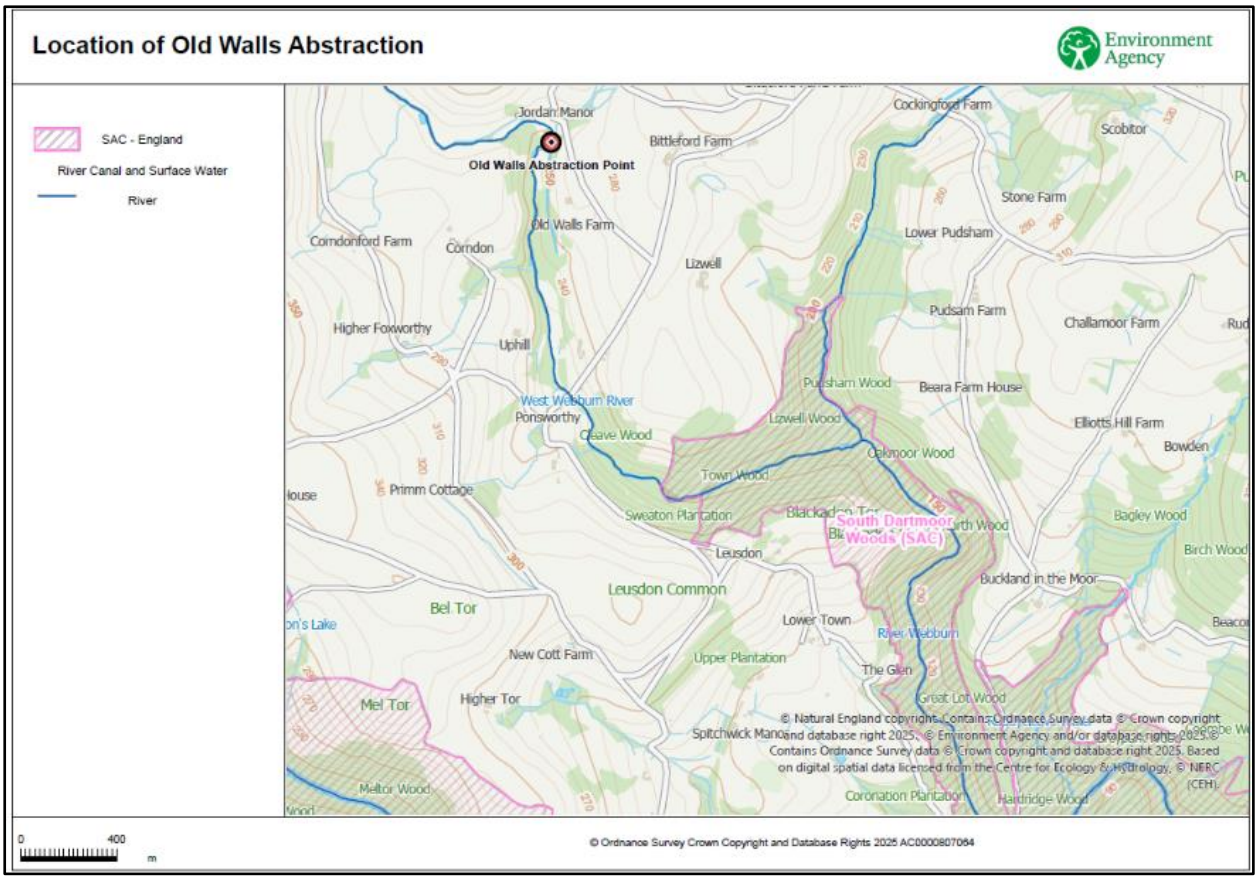
2.1 Site Classification

The RSA driver for this site is Local. This recognises the severity of the local impact which the non-consumptive abstraction, in line with its current licence conditions, causes in terms of the deprived reach created. We have site observations, flow monitoring and modelling which demonstrates this impact. We have also identified that the screening in place is not in line with our best practice guidance.

The West Webburn starts on the eastern side of Dartmoor, flows past Widecombe-in-the-Moor and joins the East Webburn River at Lizwell Meet in Oakmoor Wood. These rivers then feed into the River Dart near Buckland Bridge (South Dartmoor Woods SAC) and flows through Buckfastleigh and onto Totnes. The catchment is mainly agricultural and home to traditional Dartmoor farms. The Old Walls site sits near a geological transition zone, where granite meets metamorphic country rock – this boundary adds complexity to the local landscape and biodiversity.



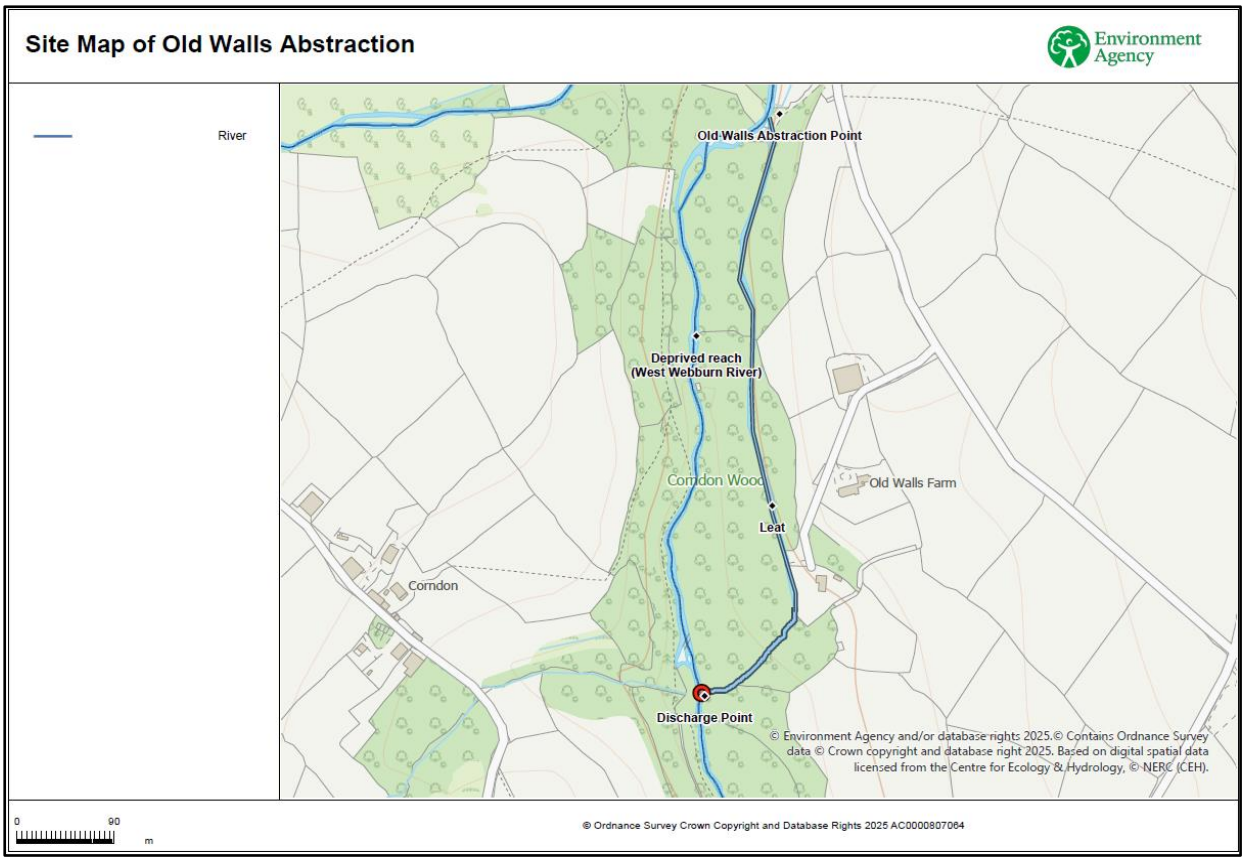
Map 1: Location of Old Walls Abstraction in wider context



Map 2: Location of Old Walls abstraction

2.2 Site situation

- The abstraction from the West Webburn River was regulated as a Licence of Entitlement (LoE) on 21 July 1992 following the introduction of the Water Act 1989. The legislation change brought previously exempt abstractions into licence restriction under Schedule 26, para 30 of this Act. These licences were granted to reflect their operation rather than including environmental requirements due to the constraints of the legislation.
- The licence allows the holder to abstract 0.8m^3/sec, 69,120m^3/day and 16,054,984m^3/year. The water is abstracted at NGR SX 700 749 and discharged back to the river at NGR SX 699 744 (see Map 3).
- At the time of the Licence of Entitlement determination, the water was abstracted via a 4m leat which fed a 250m pipeline to the turbine. 9kW of electricity was being generated for domestic use. The licence holder made an informal proposal to increase the length of the pipeline by 250m and move the turbine house and discharge point in order to provide a greater hydraulic head. Increasing the production of electricity generated from 9kW to 80kW.
- This increased the length of the deprived reach in the river at low flows. The licence holder stated that less water would be required to generate the same amount of electricity, therefore the proposal could be beneficial for river ecology.
- The Licence of Entitlement was determined on the original layout of the site.



Map 3: Site map of Old Walls abstraction

- The licence included a condition that once the proposed pipeline extension was completed, the existing prescribed flow of 0.005m^3/s would be increased to 0.025m^3/s.
- In 1992, after discussions with a National Rivers Authority Water Resources Licensing Officer, it was agreed that the Licence Holder could place the fish screen at the turbine rather than at the leat intake. The reasoning behind this was that the Licence Holder at the time (current Licence Holder's father) was elderly and removing the stones and grit was proving difficult. Whilst the NRA felt that this was understandable at the time, it is no longer considered acceptable under current operational and environmental standards.
- In 1994 the Licence Holder applied to Dartmoor National Park to construct a leat, rather than a pipeline as the National Rivers Authority had expressed concern over the impacts of a pipeline or closed culvert on fish ecology. A smooth concrete lined leat was the Licence Holder's preferred option to minimise frictional losses. It was constructed in 1995 and the prescribed flow was increased to 0.025m^3/s at this time, by means of a notch in the weir.
- Complaints of low flows at Jordan Weir were received in 1997 whilst the Licence Holder was waiting for flow gauging to be done by the Environment Agency. A site visit by a regulatory officer found site to be in compliance with the licence.
- In order to obtain a relationship between the turbine opening and the volume abstracted, a flow rating table was produced in 1999 which allowed the Licence Holder to provide abstraction returns to the Environment Agency.
- The Licence Holder, Mr Fursdon, stated in 1999 that he would be happy to consider putting more water than the prescribed flow down the river in summer in exchange for being able to take more water in winter (Telephone conversation

with Ann Riley, EA Senior Engineer, 23/04/1999, Letter from Mr Fursdon to the Environment Agency 02/06/2000). This would have required a formal variation to be applied for and paid for by the licence holder and an application was not submitted.

- A rotating drum screen was added to the tail race in 2006. It is operated seasonally in autumn/winter to prevent the ingress of migrating fish moving upstream into the attraction flow of the tail race. This is still operated voluntarily by the licence holder and is not a requirement of the current licence.
- Concerns were raised by the Dart Fisheries Association in 2015 over the impact of the abstraction on the ecology of the West Webburn River, particularly the impact on migratory fish.
- There is no record of weir ownership. The National Rivers Authority provided the resources for the weir to be rebuilt in 1979 and Mr Fursdon Senior agreed to take responsibility for maintenance of the weir.

Image 1: Looking downstream to the leat, sluice gate and weir (May 2018)

Image 2: Looking upstream to the weir on the main river (May 2018)

Image 3: by wash channel returning to the main river (May 2018)

Image 4: Deprived reach (May 2018)

2.3 Site Characteristics (Hydrology)

The Environment Agency uses the guidance for run-of-river hydropower development (December 2017) to determine licences for hydro-power developments.

Table A sets out our starting point for flow management for hydropower schemes. We will start with these flow allocations for all schemes. However, we may also need to set a more protective flow if:

- the scheme could affect a weir pool that is highly important to the status of the water body or wider catchment.
- reducing flow is likely to have an impact on fish passage.

TABLE A DESIGN FLOWS FOR HYDROPOWER SCHEMES						
	High sensitivity ASB3		**Medium sensitivity ASB2**		**Low sensitivity ASB1**	
River type Q95 / Qmean value	Low/med base flow Below 0.2	High base flow 0.2 & above	Low/med base flow Below 0.2	High base flow 0.2 & above	Low/med base flow Below 0.2	High base flow 0.2 & above
HOF	Q95	Q97	Q95	Q97	Q95	Q97
Maximum abstraction	1.3 x Qmean	Qmean	1.3 x Qmean		1.3 x Qmean	
% take above HOF	35%		40%		45%	

Table 1: Table A from Environment Agency Guidance for run-of-river hydropower development

This guidance details how the best available evidence is used to assess how abstraction, impoundment, flow modifications and flow diversions will affect river-based habitats and the associated ecology.

Each water body in England is assigned to an Abstraction Sensitivity Band (ASB); High (ASB3); Medium (ASB2) and Low (ASB1). Abstractions in lower sensitivity bands are typically allowed to abstract more water, than in highly sensitive areas.

The West Webburn River is assigned ASB3.

Table 2 provides the site-specific character of the West Webburn River and therefore the HoF, maximum abstraction and percentage abstraction according to Table A.

Old Walls Hydrological Flow Characteristics	
ASB	3
Q95: Qmean ratio	0.160
River type	Low/med baseflow
HoF	Q95 = 0.146 m^3/s
Max abstraction	1.3*mean = 1.3*0.908 = 1.181 m^3/s
% Take	35%

Table 2: Hydrological flow characteristics of Old Walls

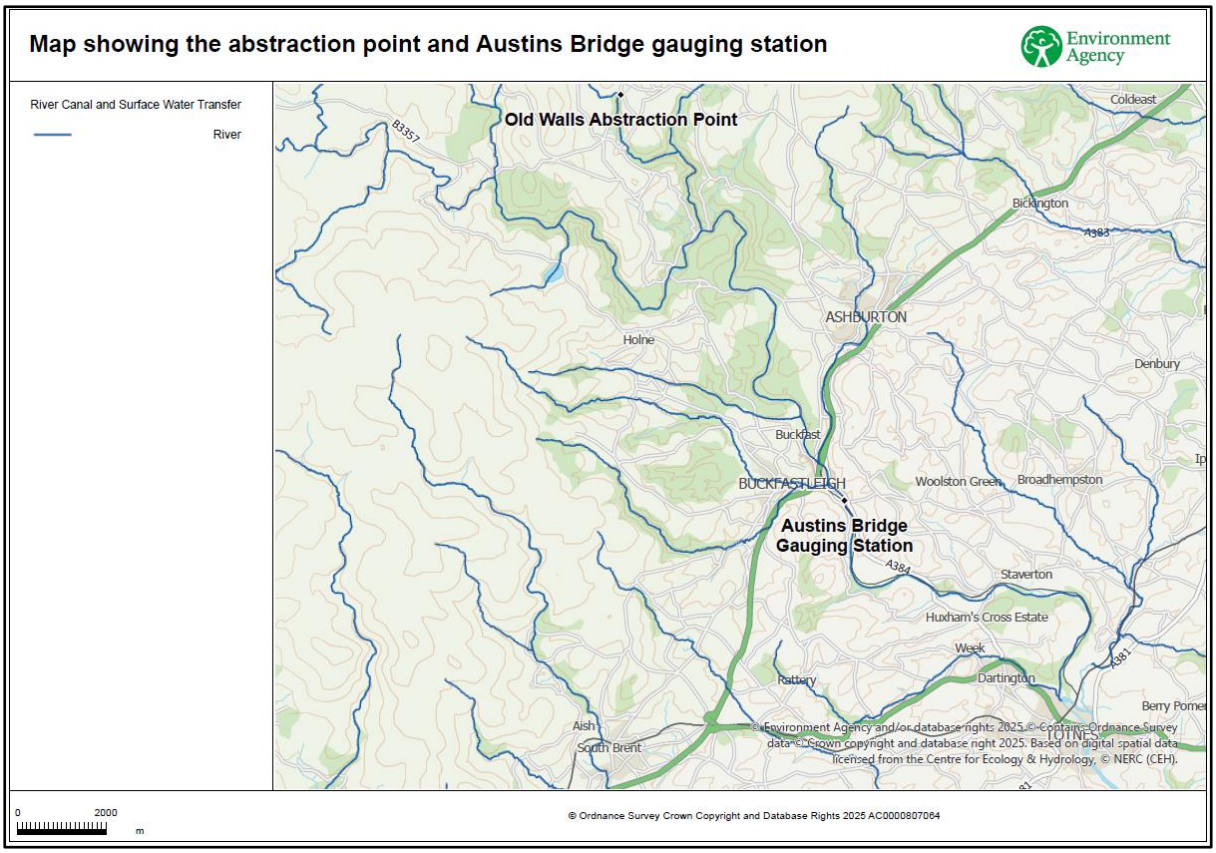
Licence conditions

The Old Walls abstraction licence (14/46/004/0685) authorises abstraction by gravity for power generation. Authorised quantities are given below:

- Daily licence quantity: 69,120m^3/d
- Annual licence quantity: 16,054,984m^3/y
- Max instantaneous rate: 0.80m^3/s
- Authorised months: All year

Additionally, the licence includes a prescribed flow of 0.025m^3/s which is ensured by the ‘flow over the notch of the Jordan Weir at NGR SX 700 749’. This Hands off Flow (HoF) is less than the natural Q99.9 flow. Although this prevents abstraction of the entire river flow, the fully licensed abstraction causes the flow in the deprived reach to flatline at 0.025m^3/s for long periods of time.

In order to model the natural flow in the West Webburn River at the point of abstraction, flow values have been transposed from Austins Bridge gauging station further down the catchment on the Dart (see Map 4) and validated with spot gaugings on the West Webburn River (full methodology can be found in the Hydrology Report 2025, Appendix 2)



Map 4: Map showing the abstraction point (top left) and Austins Bridge gauging station on the River Dart (bottom right).

Hydrographs showing estimated natural flows and spot gaugings for the West Webburn River are available in the Hydrology Full Report June 2025.
It can be seen from the graphs that the modelled flows are a good fit to the spot flow measurements. This means the modelled natural flow data is a good representation of the flow at the abstraction point and is suitable for use in the assessment.

The impact of the abstraction on flow in the West Webburn River downstream of the abstraction point has been modelled for a 'fully licensed' scenario, which assumes that abstraction is compliant with the licence conditions listed above and maximum abstraction is equal to the instantaneous, daily and annual volumes stated on the licence.

The flow that remains in the river downstream of the abstraction, between the intake and the discharge point, is known as the 'residual' flow.

Weekly abstraction returns have been submitted by the licence holder in line with their current licence conditions. These have been used to calculate monthly average abstraction rates over the period 2016-2021 for comparison with the water available under the current and proposed licence scenarios.

Flow targets

The Environment Agency uses the Environmental Flow Indicator (EFI) to assess where abstraction pressures may start to cause an undesirable effect on river habitats and species.

Allowable abstraction as a percentage of flow is as follow:

- 10% of natural at Q95
- 17% of natural at Q70
- 25% of natural at Q50
- 23% of natural at Q30

The average impact of abstraction at a range of flows under the current licence is shown in Table 3, along with the allowable abstraction to protect EFI.

Flow	Percentile	Allowable abstraction as % of natural flow (to protect EFI)	Abstraction as % of natural flow (Current licence)
High	30	23	84
Moderate to high	50	25	95
Low to moderate	70	17	93
Low	95	10	83
Very Low	99	13	77

Table 3: Maximum licensed abstraction under the current licence and allowable abstraction to protect the EFI, as a percent of natural flow. The percentiles 95, 70, 50 and 30 are the standard percentiles at which compliance with the EFI is reported. Q99 is included to demonstrate impact on very low (drought) flows.

Table 3 shows that:

- Abstraction under the current licence is a very large proportion of flow at all flows.
- Abstraction at the current licence is much higher than allowable abstraction to protect EFI at all flows.
- The biggest impact on flow is at Q50.

Residual flows are below the EFI (green line) between the middle of March and start of September and for shorter periods at times of low flow throughout the autumn and winter.

The current ‘fully licensed’ scenario has a significant effect on reducing flow in the ‘deprived reach’ that would be below the EFI target flow for 336 days a year (on average over 1991-2020), equivalent to 92.0% of the time and for 339 days in a dry year (2022), equivalent to 92.8%.

Results

Modelled residual flows under the fully licensed scenario described above, along with the ‘natural’ flow (the flow in the absence of abstraction) and the EFI target flow, are shown on the hydrograph in Figure 1 below. It can be seen that residual flows (red line) flatline below the EFI for long periods during 2022, which has been chosen as a recent dry year, at times of low flow. There is no variability in flow during this time.

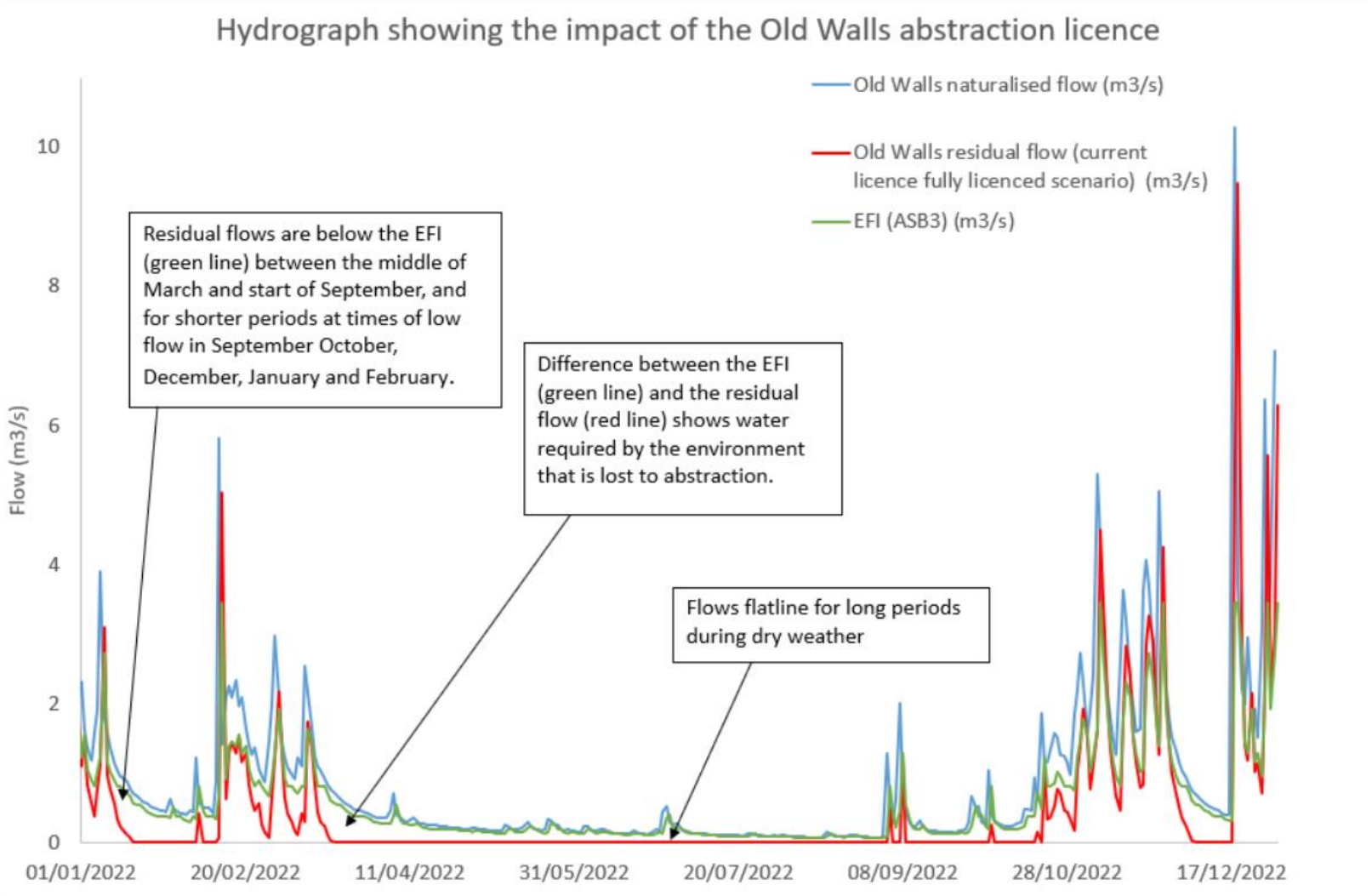


Figure 1: Hydrograph showing the impact of the current Old Walls abstraction licence.

2.4 Conservation/water resource impacts and site condition assessment

It is the expert opinion of the EA's Fisheries Technical Specialists, that the scheme has a local impact on fish migration and improvements to fish screening are required. Salmonid fish (migratory sea trout and Atlantic salmon, resident brown trout) and European eel will all migrate through this watercourse. Current screening at the intake of the turbine and ad hoc deployment of the tail race screen allows fish to enter the leat with no safe exit. This together with an inadequate bypass channel puts all life stages of fish at risk of harm.

If the abstraction licence was operated to maximum authorised quantities the following impacts would be observed:

- Reduction of juvenile production of salmonids (Atlantic salmon and brown/sea trout) in the deprived reach (approximately 600m) due to a reduction in flow which results in decreased available habitat area and, hence carrying capacity. Reduced flow also increases accretion of fine sediments which degrades viable spawning gravels and increase the likelihood of egg and juvenile mortality in salmonids.
- Impediment of upstream and downstream movement of migratory salmonids over the existing weir which is required to feed the leat offtake. In addition, the deprived reach would become impassable under certain flow conditions due to reduced water depth.
- Entrainment of Atlantic salmon, European eel and brown/sea trout parr and smolt into the leat with potential for delay, damage and/or loss within the leat and bywash.

Abstraction at the licensed maximum poses unacceptable risk to salmonid and European eel populations in the West Webburn, given current stock status and life stage vulnerabilities. Our data show that the Atlantic salmon population in the West Webburn, once an important spawning tributary, has been in decline for a number of years and this is symptomatic of the wider River Dart population which is currently assessed as "At Risk" of failing conservation targets. This data has been taken from the Salmon Stocks and Fisheries in England and Wales in 2023 report.

The status of the Dart salmon population is currently highly vulnerable to any additional pressures so the potential for loss or delay to salmon smolts in particular is of significant concern.

The West Webburn waterbody (GB108046008410) has been classified as Moderate for 2022 under the Water Environment (Water Framework Directive) Regulations 2017 (WFDR 2017). The failing element is Fish.

The 2025 interim WFDR 2017 classification indicates no change from the 2022 classification.

A bywash is present in the form of a 10" pipe from the head of turbine. The bywash is operated manually by the site operator when they consider it is required. The bywash design does not meet current best practice standards (Screening for intake

and outfalls: a best practice guide. Environment Agency. Science Group. Jacobs Babtie Aquatic, O'Keeffe, N: Turnpenny, A W H – Bristol: Environment Agency 2005). This pipe (when used) can by itself cause damage to smolts.

Downstream of the turbine there is a short tail race that returns flow to the river. This tail race is screened seasonally with a rotating drum screen (Image 3) to prevent the ingress of migrating fish. The screen is deployed voluntarily by the Licence Holder at their discretion during undefined high risk periods.

Image 3: Rotating drum screen sitting on the bank (June 2024)

2.4.1 Turbine

The turbine operated by the Licence Holder is a cross flow turbine.

Cross flow turbines, while compact and efficient, are known to have high mortality rates for fish due to:

- **Blade strike**: Fish can be hit multiple times as they pass through the rotor.
- **Shear forces and pressure changes**: These can cause internal injuries or disorientation.
- **Turbulence and cavitation***: Particularly harmful to smolts and eels during downstream migration.

Fish passing through turbines are at significant risk of injury or mortality, particularly where screening and bypass systems are inadequate. Although screening is currently in place at the site, it does not sufficiently mitigate the risk of harm to fish.

*Cavitation is where vapor bubbles form and collapse violently in a liquid in response to rapid changes in pressure – a bit like boiling but triggered by low pressure rather than high temperature.

2.5 Objectives

This scheme aims to achieve environmental improvements at the site through a variation of the current licence conditions.
An abstraction rate designed to protect the environment will be identified, including a more protective 'hands off flow' condition to protect low flows in the river.
Appropriate fish screening will be required to protect both resident and migratory fish species, as will flow measurement equipment to enable compliance monitoring of new licence conditions.

The RSA objectives for this site are:

- Flows protected by compliance with Table A in guidance for run-of-river hydropower development December 2017 for a ASB3 waterbody with low/moderate baseflow.
- Update HoF to Q95 and add 35% take above the Hands-off Flow to licence conditions
- Control structure and means of measuring abstraction at head of the leat.
- A small sweetening flow of 20l/s into the leat would protect habitat in the leat, once the flow in the river falls below 40l/s all abstraction must cease (including the sweetening flow). This prioritises flow in the deprived reach.
- Add the existing voluntary tail race screening to the licence conditions.
- Improve fish screening to meet current best practice. This will include installing an appropriately sized screen at the head of the leat.

2.6 Scope

The RSA Programme was adopted by the Environment Agency in 1999 to ensure the sustainability of abstractions and impoundments by undertaking changes to licence conditions that do not meet current standards of environmental protection.

Compliance with existing licence conditions is outside the scope of the RSA programme. Licence holders are expected to comply with the terms of their existing licences. Only licence conditions/changes requested as part of this review should be considered within the scope of the RSA programme. Licence holders will not be eligible for compensation for complying with existing/current licence conditions.

3. Options identification, appraisal and agreement

3.1 Available information

Old Walls Hydrology Full Report June 2025

Other Option Scenarios (see Appendix 1)

Old Walls Screen Agreement letter

Guidance for run-of-river hydropower development. Environment Agency December 2017

Screening for intake and outfalls: a best practice guide. Environment Agency. Science Group. Jacobs Babtie Aquatic, O'Keeffe, N; Turnpenny, A W H – Bristol: Environment Agency 2005
https://www.gov.uk/government/publications/screening-for-intake-and-outfalls-a-best-practice-guide

Salmon Stocks and Fisheries in England and Wales in 2023 report
Salmon Stocks and Fisheries in England and Wales 2023

3.2 RSA Technical Team

Internal Consultees	Role
Steve Marks	EPE Manager and RSA Sponsor
Emma Townsend	IEP WR Senior Tech Spec and RSA Project Executive
Carole Brennan	IEP WR Tech Spec
Debbie Peareth	IEP WR Officer
Jen Shears	IEP WQ Tech Spec
Dave Bartlett	F&B Tech Spec
Chris Lawson	Fisheries Enforcement
Harriet Ames	Hydrology Tech Spec
Michael Thomas	A&R Officer
Graham Melhuish	NPS Permitting Tech Spec
Tony Arden	L&W WR Tech Spec
Karen Gowlett	Operational Catchment Services

External Consultees
None, external consultation not appropriate as the site does not fall within a designated area and commercial confidentiality precludes external consultation at this stage in the process

3.3 Options Identified and Appraised

1) No change to licence
2) Revoke licence
3) Environment Flow Indicator (EFI) target for support of Good Environmental Status (GES)
4) Requirement in line with Table A in guidance for run-of-river hydropower development December 2017

The preferred option is **Requirement in line with Table A in guidance for run-of-river hydropower development December 2017.**
Appendix 1 contains details of the appraisal for each of the alternative options and explains the rationale for the selection of this as the preferred option.

As this is an existing HEP operation, the Licence Holder was invited to provide an alternative site-specific proposal to achieve a more sustainable option than the current abstraction licence.

This included a site visit by Steve Marks and Carole Brennan on 17 April 2025.

Particular effort was made to encourage the Licence Holder to consider making their own proposal to meet the RSA objectives.
It was emphasised that this would be considered even if it was not completely in accordance with the EA preferred option.

The Licence Holder did not submit their own proposal; however, the Licence Holder has expressed a preference for our preferred screening option (head of leat 6mm screening) rather than the alternative option (set back screening).

Preferred Option

Based on the EA Guidance for run-of-river hydropower development, the EA have proposed licence conditions to ensure river flows are sufficient to support the ecology of the West Webburn river in the deprived reach.

These conditions include:

- Daily licence quantity: 69,120m^3/d (unchanged)
- Annual licence quantity: 10,502,497m^3/y (reduced)*
- Instantaneous rate: 0.80m^3/s (unchanged)
- Authorised months: All year (unchanged)
- HOF: 0.146m^3/s (increased)
- Percentage take: 35% (new)
- Sweetening flow 20l/s: (new). If flow in the river drops below 40l/s then abstraction into the leat for the purpose of sweetening flow must cease.

* This has been reduced to 10,502,497m^3/year. River flows restrict the abstraction.

The hydrograph in Figure 2 (below) shows that residual flows in the proposed licence scenario (orange line) are generally very similar to the EFI. There are times where the residual flow is marginally below the EFI, but residual flows are still higher than in the current licence scenario.

The new 35% take condition ensures flow variability is maintained at all flows.

The difference between the proposed licence scenario (orange line) and the current licence scenario (red line) is the water that the environment will gain by introduction of the proposed licence conditions.

The average impact of abstraction on a range of flows under the proposed licence is compared to the impact under the current licence and the allowable impact to protect EFI in Table 4.

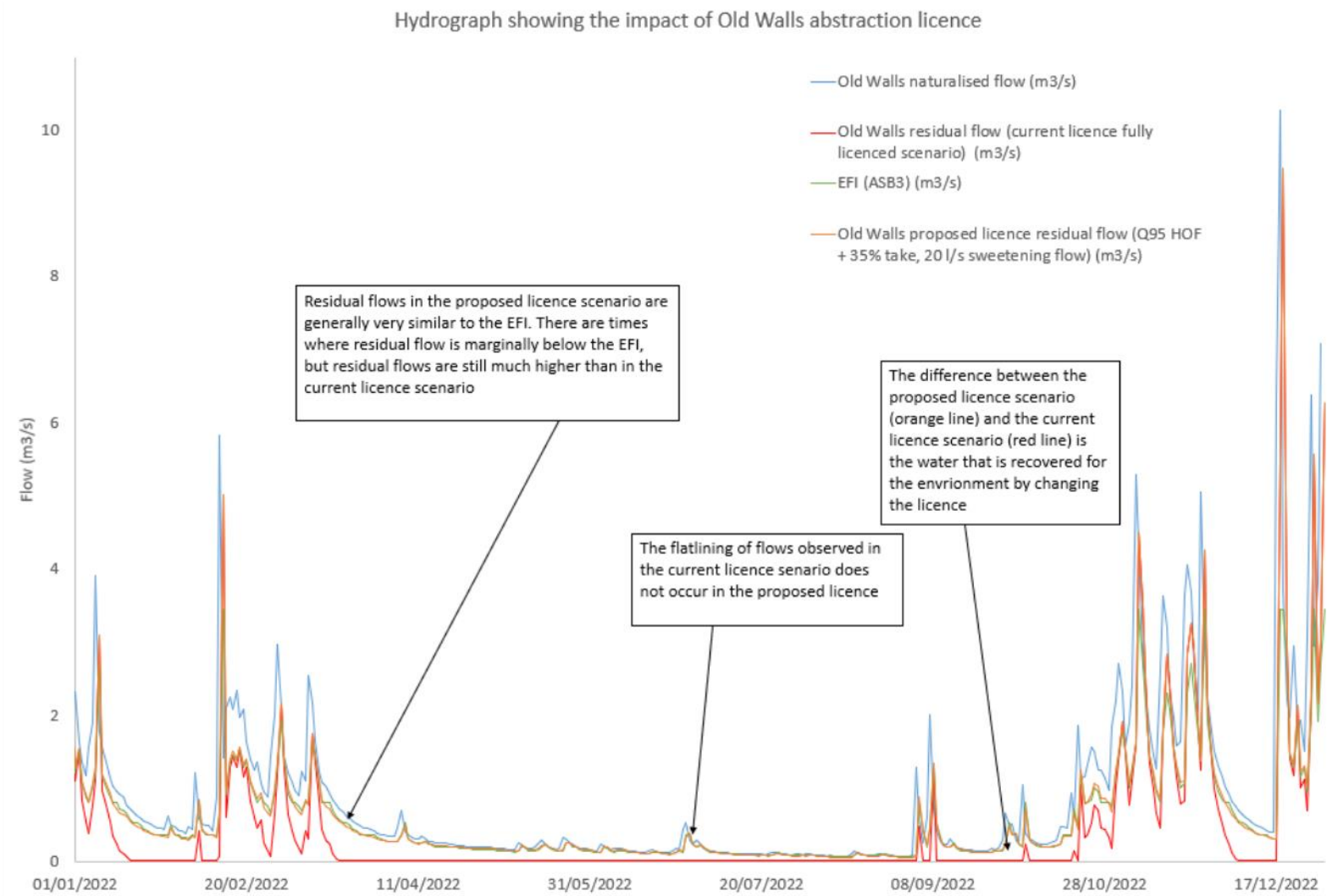


Figure 2 – hydrograph showing natural flow, EFI flow target and modelled scenario flows for Old walls abstraction in 2022

Flow	Percentile	Allowable abstraction as % of flow (to protect EFI)	Abstraction as % of flow (Current licence)	Abstraction as % of flow (Proposed licence)
High	30	23	84	30
Mod to high	50	25	95	26
Low to mod	70	17	93	20
Low	95	10	83	14
Very low	99	13	77	18

Table 4 – maximum licensed abstraction as a percent of natural flow (current and proposed licence).

Table 4 shows that:

- Abstraction is a much smaller proportion of flow at low flows under the proposed licence compared to abstraction under the current licence.
- Abstraction under the proposed licence is marginally higher than allowable abstraction to achieve EFI, at all flows.
- The biggest impact on flow under the proposed licence is at Q50 but it is lower than under the current licence
- Under the proposed licence the percentage impact is lower at Q95 than at Q99. This reflects the fact that the sweetening flow is a larger proportion of the flow at very low flows.

RSA Site: Old Walls HEP

Scenario 4

		Preferred Option *(e.g. 1=Best option, 2=Next best, etc)* ** either/or these options, not both*
Hydrology Scenario	**Requirement in line with Table A in guidance for run-of-river hydropower development.**	1 2 3
River flow Measurement Options	Link to River Dart Austins Bridge gauging station. Not appropriate for abstraction operation or compliance due to location.	
	Automated flow monitoring of river upstream of weir using level sensor and rating curve, or flow measurement equipment such as ADCP (Acoustic Doppler Current Profiler)	✓
	Manual/visual monitoring of river level upstream of weir using stage board (suitably calibrated so that level-flow relationship is known). May need additional stage board in leat.	✓
		1 2 3
HoF compliance Options	Hard engineering solution to ensure compliance with HoF, percentage take, max take and sweetening flow.	✓*
	Automated flow monitoring of river upstream of weir plus automatic sluice	✓*
	Automated flow monitoring of river upstream of weir plus daily checks to alter sluice	✓
	Manual monitoring of river level upstream of weir plus daily checks to alter sluice	✓

	Screening Requirements		Bywash	Other specifications
Location:	***Smolts***	***Kelts***		e.g. Fish pass, weir repairs
Point of Abstraction at head of leat	Permanent screen needed –6mm at head of leat to protect juvenile salmonids as well as smolts.	Additional screening unnecessary if 6mm head of leat in place.	Bywash only required if forebay structure constructed and screen is not flush with bankside.	Fish pass easement existing on weir is poor. Concurrent improvements to match to the increased HoF would be the best option.
u/s of turbine	Existing set back 10mm screen in place. Would need upgrade to 6mm if head of leat screen not feasible. Bywash in place but falls short of Best Practice standards.		Existing bywash is managed by the site operative. Needs improving if screening remains at this location.	Screening at the turbine would be unnecessary if there is a 6mm screen at the head of the leat.
Tail race discharge point	Rotating tail race screen installed by local agreement. This should be added to the licence as a regulatory requirement.			

<u>Justification</u>

Screening:

Old Walls has a crossflow turbine. Our screening guidance (EA guidance for run-of-river hydropower development) suggests that this type of turbine is likely to cause a high mortality rate were fish to enter it. Therefore, year-round screening is required. Within the guidance the suggested screen mesh spacing for sites where juvenile salmonids are present is 6mm.

The best practice location for screening this site would be to screen at the intake. This is the screening location defined on the existing licence, but the licence holder placed the screen near the turbine in 1992.

A National Rivers Authority (EA predecessor) Water Resources Licensing officer agreed at the time that the screening at this location would be satisfactory. An automated 6mm screen at the head of leat is likely to be the most practical option – a manual screen would need additional space to account for partial blinding*.

It is believed that the existing screen was moved due to the licence holder at the time being elderly (current licence holders' father) and unable to easily move the large amount of debris being caught at the head of leat location. Whilst the EA felt that this was understandable at the time, it is no longer considered acceptable under current operational and environmental standards.

If the screen is truly at head of leat then no bywash is needed as fish can migrate downstream using the main river channel. If the screen is situated in the forebay area, then a bywash will be required to return fish to the river and would form part of the licensed abstraction quantity. This would not be additional water.

A 6mm screen will cover both smolt and kelt requirements. Keeping more fish out of the leat will also influence sweetening flow decisions – an open leat has greater requirement for sweetening flow.

The alternative option is to screen at the head of turbine. This relies on a bywash to return fish to the river. There is a bywash at the site, but it does not meet our best practice guidance. It is a small, corrugated pipe which is likely to fall short on required flow rate, it also lacks a deep plunge pool which increases the physical trauma of fish, including scale loss, fin damage and shock or disorientation. The bywash is also operated by local agreement whereby the operator opens it when they feel it is needed. A bywash with a consistent flow requirement stipulated on the licence would be preferable, as with the bywash for the forebay area, this would use water from the licensed abstraction quantity. The design of the bywash would also need to be improved. Trials of the existing bywash using smolts have previously taken place, however no reports are available to assess the robustness or success of the study.

The site currently has a rotating tail race screen. It is installed at the site operator's discretion. The tail race only has a short dead end, but fish may attempt to ascend this to the turbine. Conditioning the screen on the licence would need to be formalised, rather than the current voluntary arrangement. September – November are the highest risk months; however, fish may also migrate upstream on summer spates.

The preferred option is a 6mm head of leat screen.

*Partial blinding in the context of fish screens, especially those with fine meshes required to protect small fish and eels, refer to clogging up of the mesh with sediment, vegetation and other organic matter. This blockage, or 'blinding' reduces the screens effectiveness allowing fish to become entrained or impinged and negatively affects the flow through.

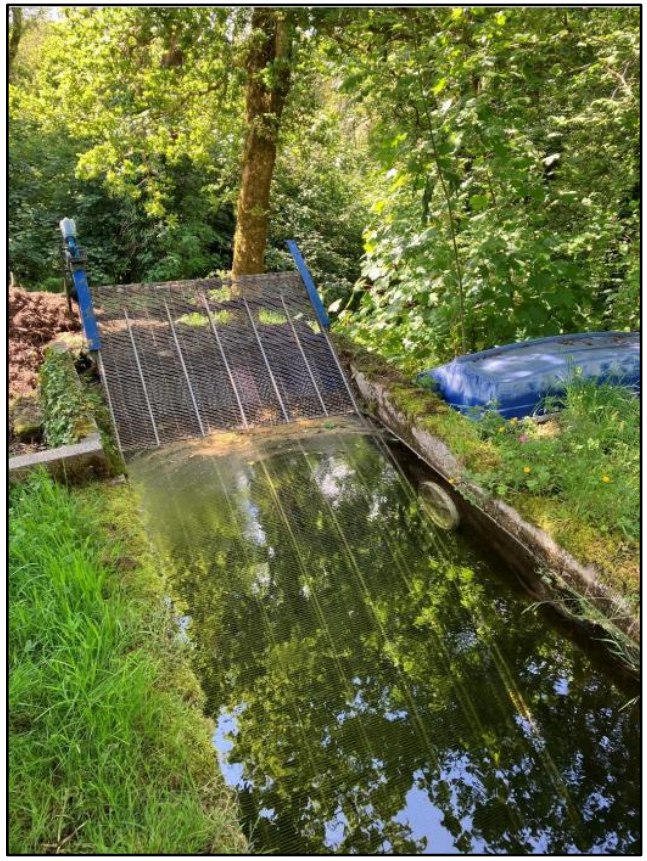


Image 4 - Existing Screen and bywash entrance (at low leat flows) June 2024

Sweetening Flow:

A sweetening flow of 20l/s will protect aquatic life and habitats within the leat once HoF is reached. At extreme low flows, the river should be prioritised. Therefore, if the river reaches flows as low as 40l/s, all flow should be directed to the river. This assumes a head of leat screen is in place and the majority of aquatic life is excluded from the leat.

Image 5: Overflow structure shortly downstream of offtake.

Overflow Structure: The site has an overflow structure near to the head of leat. It was flowing during a high flow winter visit to the site. Water leaving the leat via this route is not currently recorded in the abstraction quantities measured via the turbine, however it does divert around the weir further impacting fish passage. The controls on the abstraction should be maintained at the weir and head of the leat. All flow removed from the river will need to be part of the abstraction volumes measured.

Preferred Option Summary

FLOW

	Preferred Option	Notes
Hands off Flow	Q95 HoF of 0.146m^3/s	This is an increase from 0.025m^3/s
Maximum quantity	Maintain instantaneous flow at 0.8m^3/s Annual maximum abstraction quantity of 10,502,497m^3/year*	Annual maximum abstraction quantity has been reduced to 10,502,497m^3 annually. River flows restrict the abstraction.
Proportional take	35% Abstraction above HoF	The mid-range flows are protected because the Licence Holder has to leave 65% of water in the river at all times when flows are below the maximum instantaneous value.
Sweetening flow to leat (NGR SX 700 749)	Sweetening flow of 20l/s.	This takes effect when the flow upstream of the weir is below the HoF and so abstraction for HEP has ceased

When the flow upstream of the weir is below 40l/s, then abstraction into the leat for the purpose of sweetening flow must cease. At extreme low flows, the river should be prioritised. This is unlikely to happen based on current hydrograph.

SCREENING

	Preferred Option	Alternate Option	Notes
Intake Screening	6mm permanent screen at head of leat (to protect juvenile salmonids as well as smolts).	6mm permanent screen at head of turbine (This relies on an improved bywash to return fish to the river, current bywash does not meet best practice).	
Tail Race Discharge Point	Rotating Tail Race screening (currently installed by local agreement)		This should form part of the licence conditions.

3.4 Appraising options process

The following workshops and groups were undertaken to ensure the thorough application of the Environment Agency RSA process.

- 6 December 2018 –Objectives and evidence review workshop
- 7 March 2019 – Options identification workshop
- 3rd and 24 July 2019 – Options agreement workshop

Update for 2025

- 09 January 2025 – Task and Finish Group
- 06 February 2025 – Task and Finish Group
- 13 March 2025 – Task and Finish Group
- 10 April 2025 - Task and Finish Group
- 13 May 2025 - Task and Finish Group
- 20 May 2025 – Old Walls Sub-Group

4. Conclusions and Recommendations

Through the collaborative work of the RSA Technical team, we are confident that the preferred option for changing abstraction licence **14/46/004/0685** for Old Walls will meet the objectives for the environment.

Our preferred licence change is based on current guidance in the absence of any alternative proposals from the Licence Holder that would have been considered.

Licence Change

1. A hands-off flow of (HoF) of 0.146m^3/s (Q95) added to the licence.
2. A 35% take condition above HoF added to the licence.
3. Maximum instantaneous abstraction remains at 0.80m^3/s.
4. When the flow upstream of the weir is below the HoF of 0.146m^3/s, abstraction is restricted to a sweetening flow of 20l/s.
5. When the flow upstream of the weir is < 40l/s, all flow should be directed to the river.
6. Means of controlling and measuring the abstraction at the head of the leat.
7. 6mm permanent screen at head of leat condition added.
8. Tail race screen (max 25mm bar spacing) to be added as a licence condition.

RSA Site: Old Walls HEP

Scenario 1

		Choice *(1=Best 2=Next best)*	**Justification:**
Hydrology Scenario	**Do Nothing**	Discounted	This option does not lead to any improvements in the river and does not represent a valid way forward. **Option discounted** after appraisal.
River flow Measurement Options	N/A		
HoF compliance Options	N/A		

FBG Options	***Location:***	***Screening:***	***Bywash:***	Other specifications…
	N/A	N/A	N/A	

Abstraction Licence Statistics

HoF: 0.025 m^3/s

Max Abstraction: 0.8 m^3/s

Percent take: none

Other flow conditions: none

RSA Site: Old Walls HEP

Scenario 2

		Choice *(1=Best 2=Next best)*	**Justification:**
Hydrology Scenario	**Revoke the Licence** Best Scenario for the river		Option would return the depleted reach to a natural state. However, the business would close if there were no alternative source of supply. We consider we can mitigate sufficiently via the new conditions in the abstraction licence and so revocation is not required. This option would have the most benefits.
River flow Measurement Options	N/A		
HoF compliance Options	N/A		

	Location:	***Screening:***	***Bywash:***	Other specifications…
FBG Options	N/A	N/A	N/A	

Abstraction Licence Statistics

HoF: N/A

Max Abstraction: N/A

Percent take: N/A

Other flow conditions: N/A

RSA Site: Old Walls HEP

Scenario 3

		Choice *(1=Best 2=Next best)*	**Justification:**
Hydrology Scenario	**EFI target for support of GES**	Not relevant	This option was discounted on the basis that, although Table A of the run-of-river hydropower guidance permits the licence holder to abstract a greater volume of water—resulting in an increased number of days where flows fall below the Environmental Flow Indicator (EFI)—the deviation from the EFI is considered marginal. As such, it was concluded that the potential ecological impact does not justify pursuing this option.
River flow Measurement Options	N/A		
HoF compliance Options	N/A		

FBG Options	**Location**	***Screening***	***Bywash***	Other specifications
	N/A	N/A	N/A	e.g. Fish pass, weir repairs

Abstraction Licence Statistics

HoF: N/A

Max Abstraction: N/A

Percent take: N/A

Other flow conditions: N/A