

**WRH Supporting Documentation for
CRT234 Llangattock**

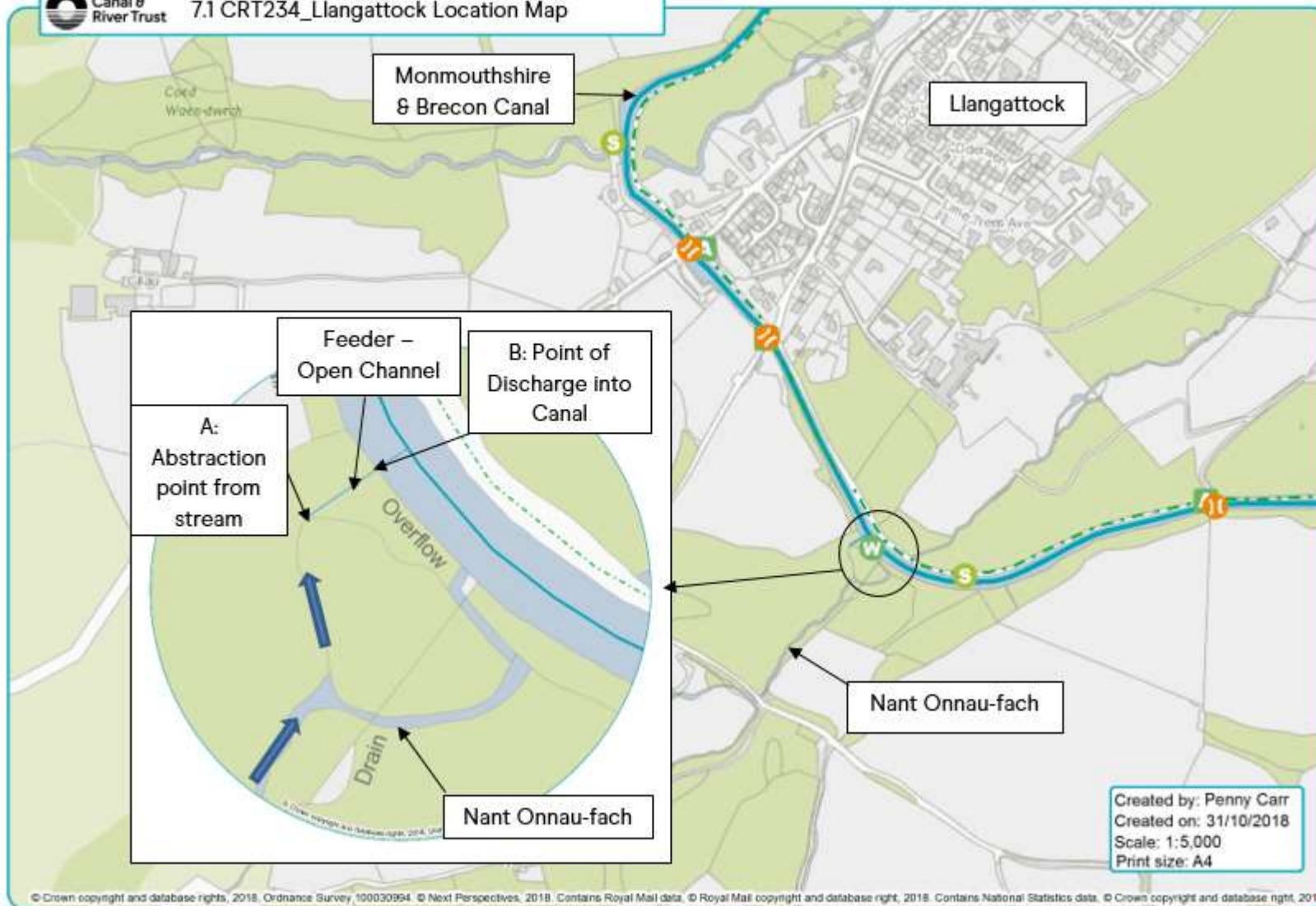
Documents included are:

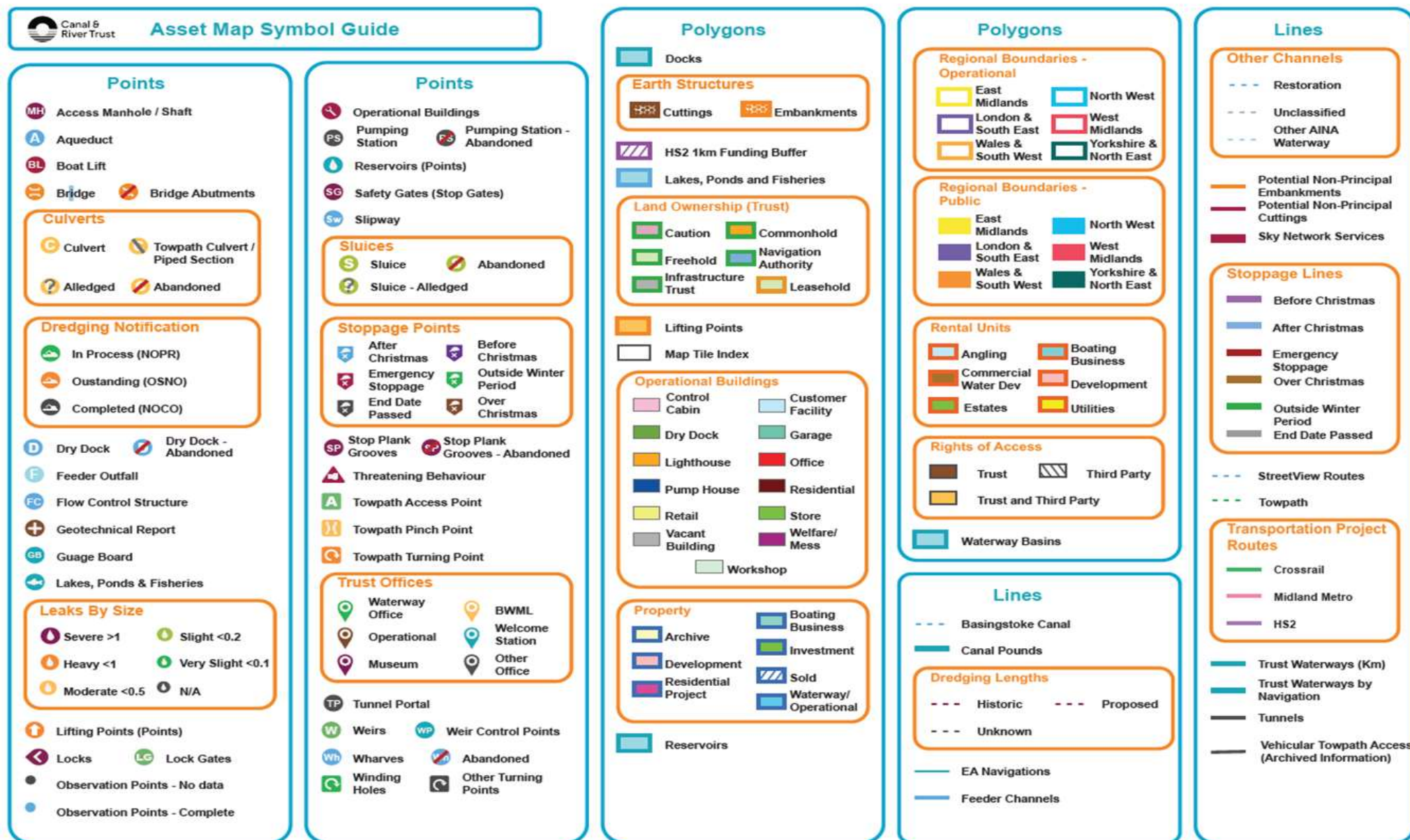
- 7.1 CRT234_Llangattock Location Map
- Canal & River Trust Generic Map Key
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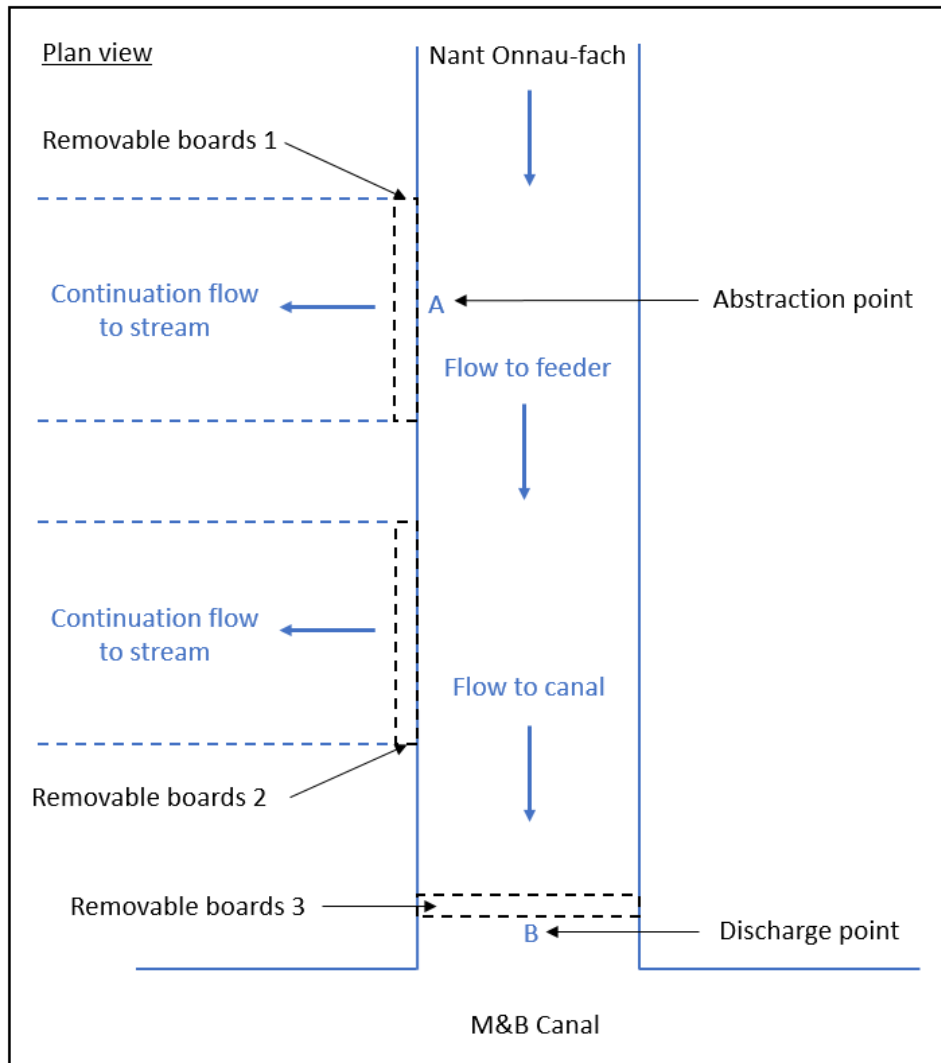


8.4 CRT234 Llangattock Abstraction Details

General Description:

Mill Turn is a Scenario 2a feeder (as detailed in Navigation Scenario Workbook), with variable structures. The abstraction is from Nant Onnau-fach which is diverted into a feeder channel via two sets of removable boards. Please see schematic of abstraction arrangement.

Schematic of Abstraction Arrangement:



Details of the Structures:

Flow is diverted into the feeder channel via two sets of removable boards. Normal operation is for boards to be inserted at the two locations (shown in the schematic above as 1 and 2) parallel to the stream flow during the main boating season, April to October. Boards are generally inserted at the third location, adjacent to the canal (see location 3 above), and removed from locations 1 and 2, during the winter months, November to March. In exceptionally dry years e.g. 2011, flow may be diverted to the canal all year. The dimensions of the boards are as follows: location 1 - 1.51 x 0.15m; location 2 - 1.43 x 0.3m; and location 3 - 1.39 x 0.3m. Flow discharges via gravity to the M&B Canal approx. 0.02m downstream of abstraction point A. Please refer to photographic record in section 8.5 CRT234 Llangattock Evidence of Abstraction below for photographs of the abstraction arrangement.

Means of Measurement/Assessment of Abstraction Quantities Method:

The abstraction at this location is not monitored. Abstraction quantities were therefore estimated from derived inflows at Llangattock and the hydraulic capacities of the abstraction structures at this location.

Derived inflows at Llangattock

Inflows at Llangattock were derived using gauged flows from the River Senni at Pont-Hen-Hafod which were scaled *pro rata* by catchment area. The River Senni at Pont-Hen-Hafod was found to be the most hydrologically similar

catchment based on review of catchment characteristics: SAAR; BFI Host; SPR Host; and URBEXT2000. Inflows were estimated using the following formula:

$$I = Q_i \times A_2/A_1$$

where I is the derived inflow in m^3/s , Q_i is the gauged catchment flow in m^3/s , A_1 is the gauged catchment area in km^2 and A_2 is the catchment area of the abstraction point at Llangattock in km^2 .

Hydraulics of the abstraction structures

Abstraction quantities to the canal were then estimated using the normal April to October and November to March board settings in all years, except 2011, which was exceptionally dry. Abstraction in 2011 was assumed to have taken place all year. The following standard equation for broad crested weirs (to represent the removable boards) was used to estimate the flows:

$$Q_w = Cd \times b \times (h^{3/2})$$

where Q_w is the flow over the weir in m^3/s , Cd is the coefficient of discharge, b is the breadth of the weir in m and h is the upstream head in m. See section 8.5 CRT234_Llangattock Evidence of Abstraction below for further details.

General principles of maintaining a level on Canal & River Trust Navigations:

The purpose of water control at the Canal & River Trust (the Trust) is to keep the water level within a Normal Operating Zone (NOZ) to minimise business risks. The business risks associated with high water levels include overtopping, which could lead to canal infrastructure damage ranging from towpath surfacing to catastrophic embankment failure or breach. Low levels can lead to damage to canal lining and in cases of rapid drawdown collapse of canal bank, in addition to insufficient navigable depth which can lead to disruption and inconvenience to our customers, damage to reputation, loss of income and/or environmental/ ecological damage such as algal blooms, fish distress, kills etc. and/or impact on water sales (hands off flows, commercial agreements, intake structures exposed).

Generally, canals operate within the NOZ (Figure 8.41 below), which is a zone of tolerance around a Normal Water Level (NWL); NWL is usually determined by refining a given level based on unobstructed passage for navigation and efficient use of available resources (water and manpower).

Across the Trust's canal network, NWL may or may not be the same as 'level', 'pound datum' or 'zero' and slight variations between NWL and 'level' exist across the network i.e. in some areas NWL is equivalent to 'level', whereas in other areas 'level' maybe the bywash cill and NWL is 25 to 50mm above this to maintain a flow and level throughout the lower pounds in the canal.

The lower limit of the NOZ is generally governed by the minimal navigable depth of the section of canal in question, below NWL. Assuming pound datum and NWL are the same, then typical values of the lower limit of NOZ are in the region of - 200mm from pound datum. Depending on location, this can vary between -450mm and -100mm.

The upper limit of the NOZ is generally governed by the available freeboard of the section of canal and then subtracting a 'margin' from this. The freeboard enables the canal to have a degree of passive control, by the waste and bywash weirs (and in some areas the top beam of the lock gates), before requiring active intervention/flood control activities to avoid overtopping of the canal. In some locations on the network, the upper limits of NOZ is governed by the air draft under a bridge, i.e. the point below NWL beyond which navigational issues occur due to restricted head room.

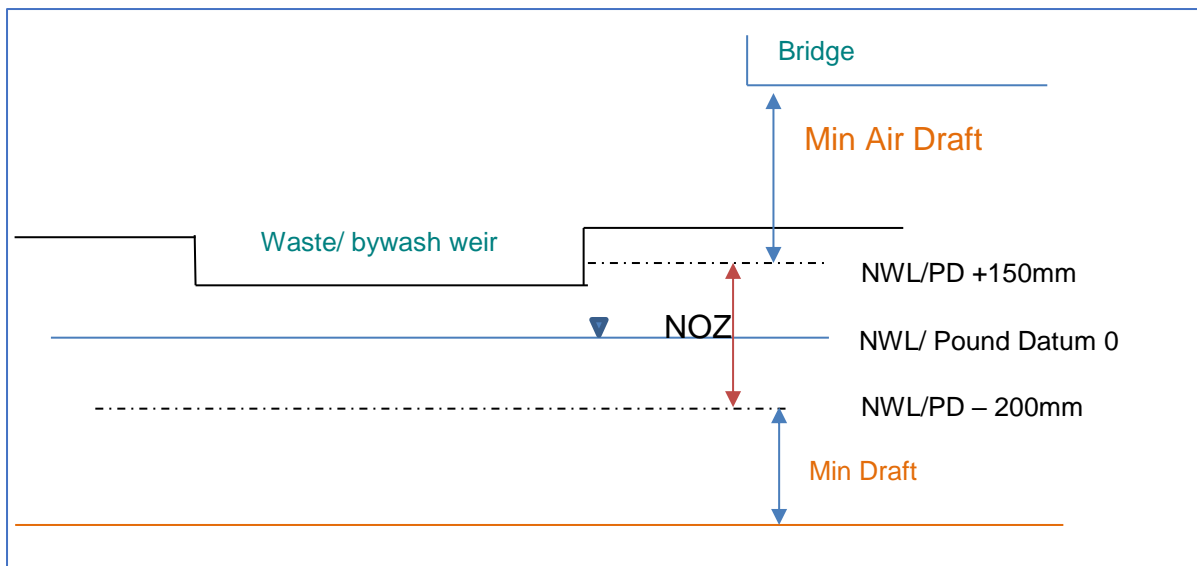


Figure 8.41: Example of Normal Operating Level on Canal & River Trust Navigations

8.5 CRT234 Llangattock Evidence of Abstraction

Estimated Abstraction Quantities:

The abstraction at this location is not monitored. Abstraction quantities were therefore estimated from derived inflows at Llangattock and the hydraulic capacities of the abstraction structures at this location. Figure 8.51 below shows the estimated daily mean abstraction quantities for the period 2011-2017 inclusive.

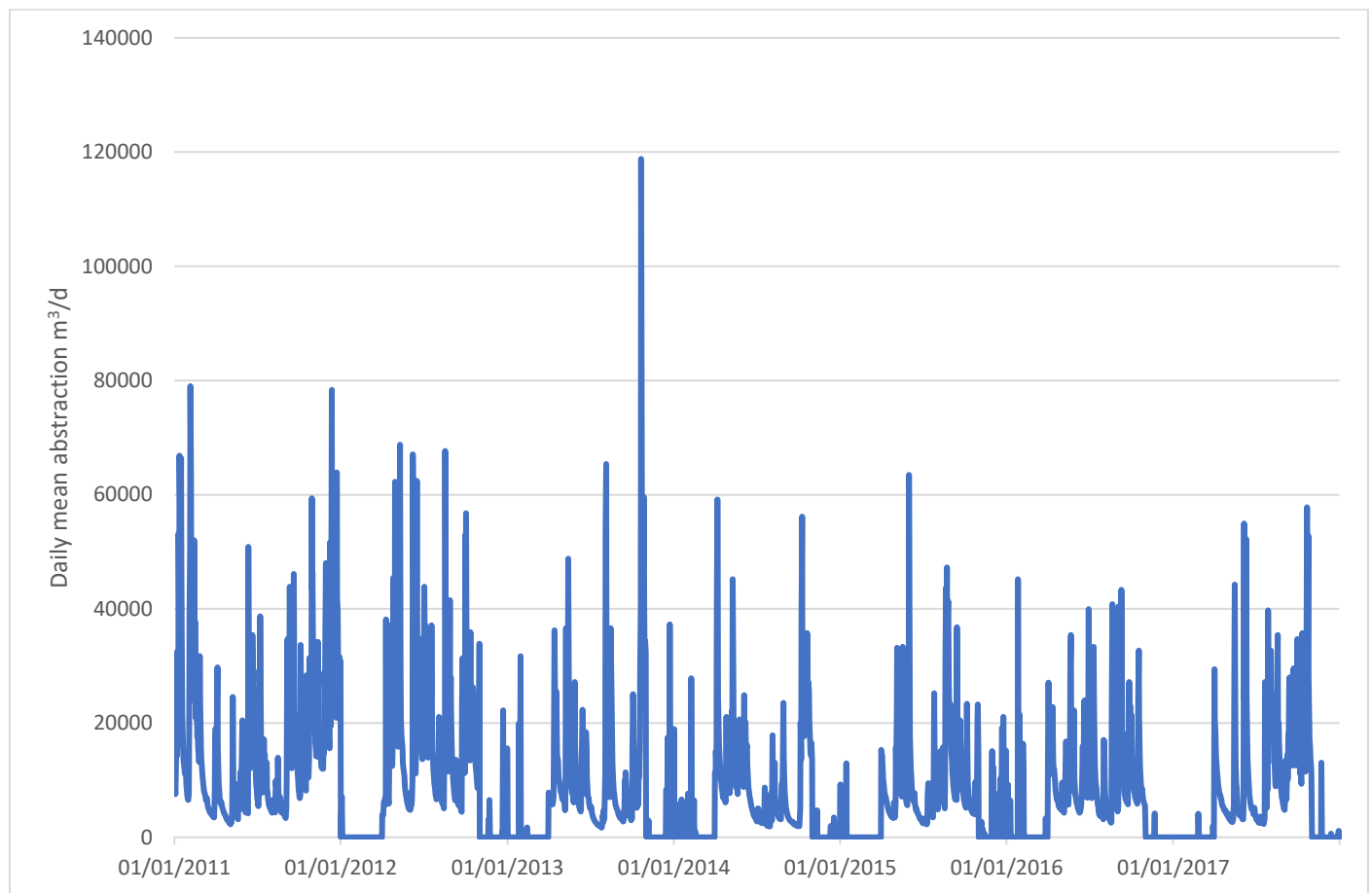


Figure 8.51 Estimated daily mean abstraction 2011-2017

Photographic Record:

Photo 1: Abstraction point A at removable board location 1, looking upstream. Flow diverted to canal 17/08/11

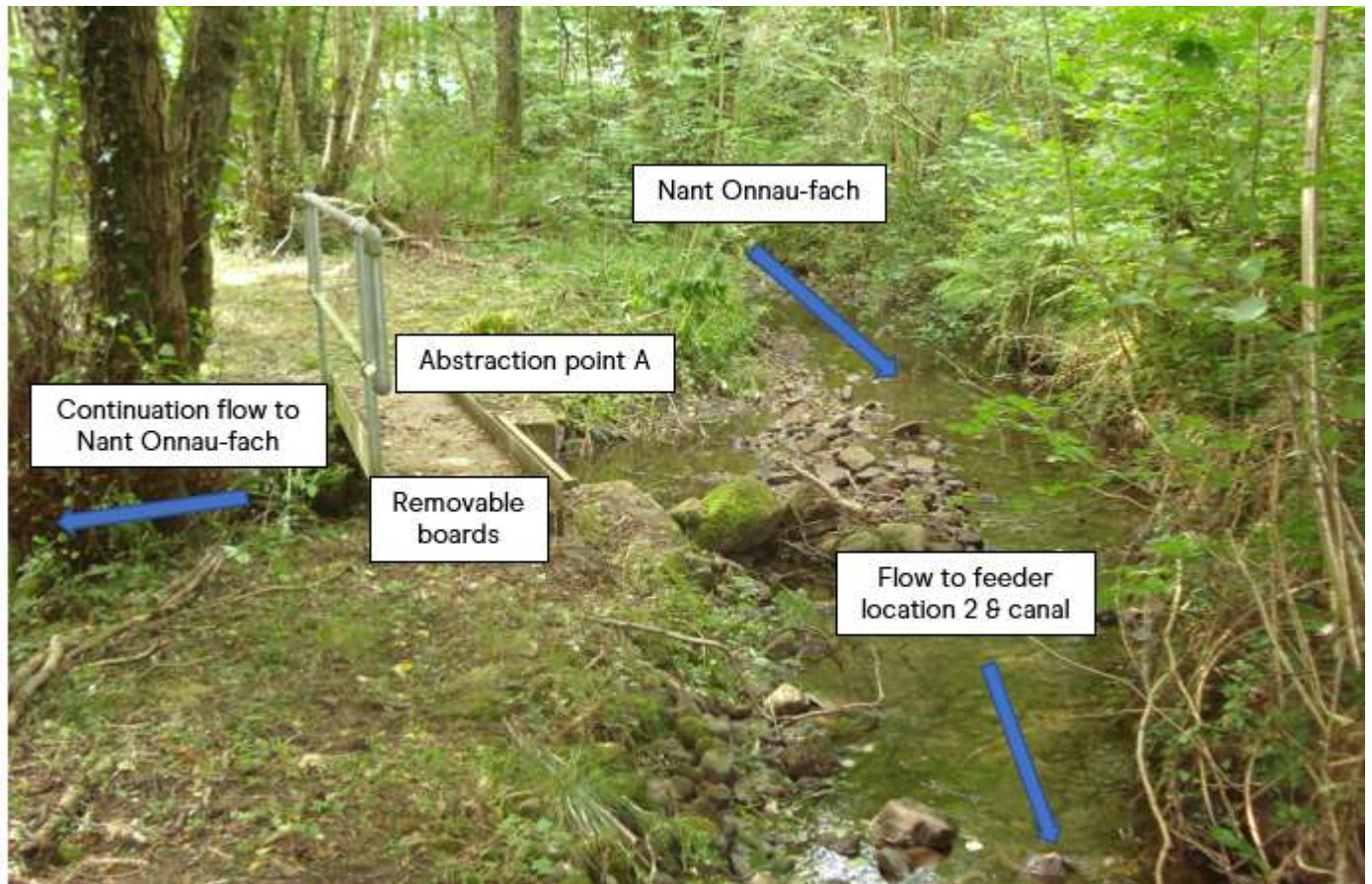


Photo 2: Abstraction point A at removable board location 1. Flow diverted to canal 17/08/11



Photo 3: Abstraction point A at removable board location 1, looking downstream. Flow diverted to canal 25/07/18



Photo 4: Removable boards location 2, looking upstream. Flow diverted to canal 25/07/18



Photo 5: Removable board location 2. Flow diverted to canal 17/08/11



Photo 6: Removable board locations 2 and 3. Flow diverted to canal 17/08/11

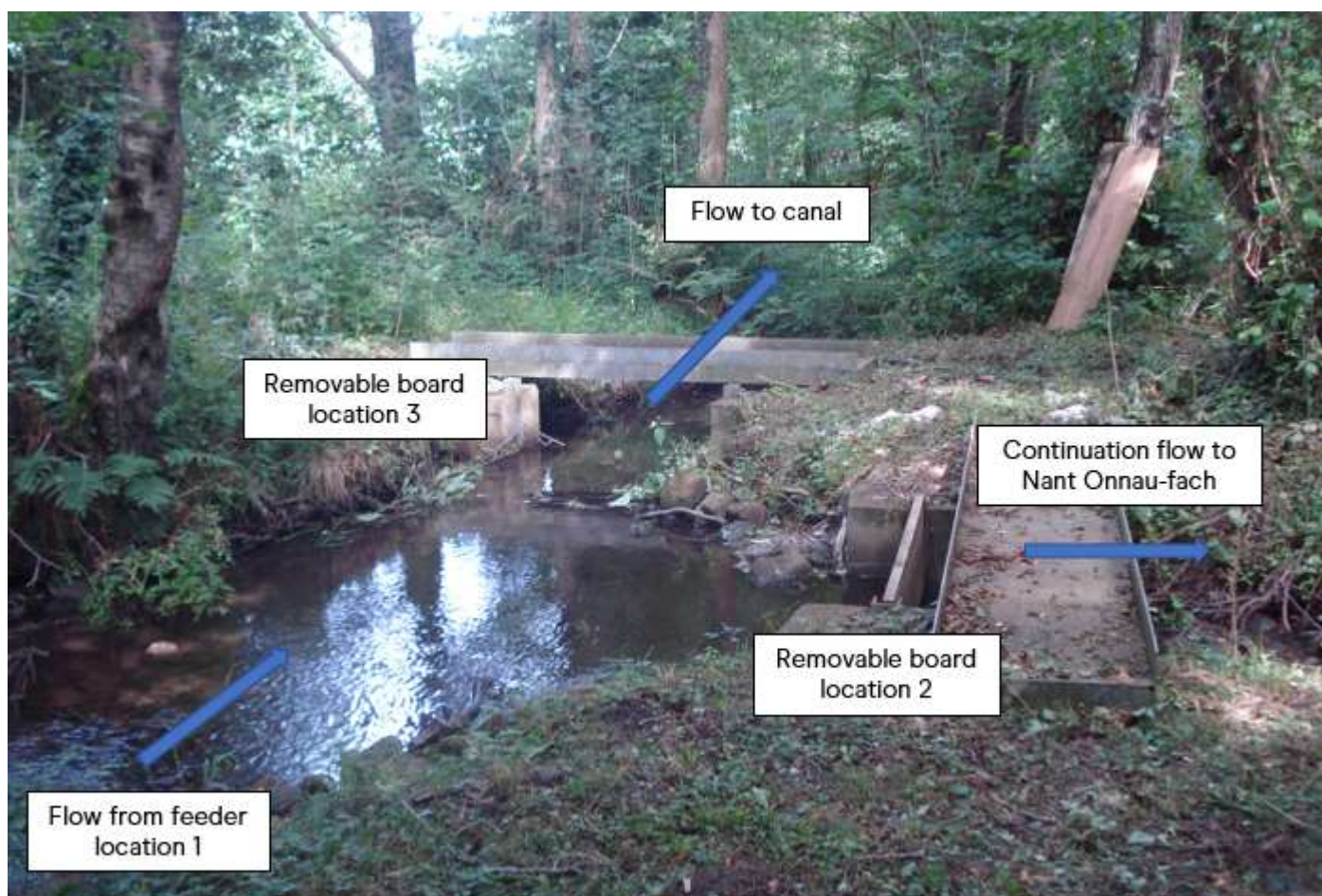


Photo 7: Discharge point B to M&B Canal: 17/08/11



13.1 CRT234 Llangattock - Other Abstractions

Table 13.1 – Details of any other abstraction(s) (licensed or exempt) that are associated with this application					
National Grid Reference (12 digit) of where you abstract water	Source name and type	Purpose of abstraction	Where do you use the water?	When do you abstract the water	Is this a pending application, or already licensed? Please provide the application or licence number as appropriate
SO 29207 11704	Tributary of River Usk – Single point	Transfer from one source of supply to another	Monmouthshire & Brecon Canal	All year	Pending application CRT_61 Castle Turn
SO 14327 19473	Afon Crawnon – Single point	Transfer from one source of supply to another	Monmouthshire & Brecon Canal	All year	Pending application CRT91_Cwm Crawnon
SO 30500 07288	Nant Rhyd-y-Meirch – Single point	Transfer from one source of supply to another	Monmouthshire & Brecon Canal	All year	Pending application CRT263_Mill Turn Feeder
SO 29704 09116	Tributary of Ochram Brook – Single point	Transfer from one source of supply to another	Monmouthshire & Brecon Canal	All year	Pending application CRT276_Ochran Turn
SO 03975 28882	River Usk – Single point	Transfer from one source of supply to another	Monmouthshire & Brecon Canal	All year	Pending application CRT327_River Usk at Brecon
SO 28609 00570	Trosnant Brook – Single point	Transfer from one source of supply to another	Monmouthshire & Brecon Canal	All year	Pending application CRT438_Trosnant Spring

Llangattock is one of seven feeders to the M&B Canal. There are six additional feeders that support navigation on the canal. These are shown in Table 13.1 above and separate applications have been submitted for each.

The River Usk and its tributaries are designated a Special Area of Conservation (SAC) under the Habitats Directive. To comply with this directive, Natural Resources Wales (NRW) have indicated that for each of these feeders, conditions will need to be applied to licences. This will most likely result in a reduction in supply to the canal, once these licences are determined and lead to the canal being closed for significant periods every year.

The Trust has therefore been working with Natural Resources Wales, together with Dwr Cymru Welsh Water and the Wye & Usk Foundation as part of the UWAG (Usk & Wye Abstraction Group), to come up with an agreed solution to secure the long-term resources to the canal. In addition to improvements to existing feeders, this solution may also include abandoning some and establishing new, alternative sources of supply.

Please note however, that this work is still ongoing and an agreed and funded solution has not yet been reached. Separate applications have therefore been submitted for each existing feeder to the M&B Canal.