

HOI and Flow Split Percentage Calculations for Nant Ffynnon-Wen watercourse (Main intake)

Coefficient	2.2
HOF Width (mm)	50
HOF Height (mm)	67
HOF (ls)	1.9
Abstraction %	70
Residual %	30
Peak Abstraction	12
TGV Reference	17-053 (Ma
Site Name	Pant Y Turnor

Site Name: Pant Y Turnor

TGV Reference: 17-053 (Main watercourse)

Blue boxes (below) show calculated flow rates at peak abstraction

Orange box indicates the proposed width and flows of the Residual Flow section of the weir design

Green Boxes (below) highlight the calculated actual residual flow split left in the watercourse immediately below the intake. In this instance there is always more left in the watercourse than the licenced agreed percentage (over HOF) reducing impact on the depleted reach below that of the nationally adopted Wales Hydropower Guidelines.

Natural Flow (based on WHS Lowflows)		
Table for reference only, does not correspond directly with adjacent table		
Q number	m/s	l/s
5%		0
10%		0
20%		0
30%		0
40%		0
50%		0
60%		0
70%		0
80%		0
90%		0
95%		0
99%		0

			Width of Residual Notch if basic (in addition to HOF notch)		HOF Height (mm) (D)	in the watercourse than the licenced agreed percentage (over HOF) reducing impact on the depleted reach below that of the nationally adopted Wales Hydropower Guidelines.						
			164		67							
			Proposed Width of Residual Flow notch (mm) (in addition to HOF notch) (B)		HOF Width (mm) (A)							
			Width of Screen (mm)		Residual Flow Calculations			Natural Flow Calculations				
			500	500	112	50	Correct Figure in accordance with licence (HOF + residual split)(%) (Is)	Proposed Figure based on design (Is)	% of Proposed residual (vs abstracted)	Total Natural Flow (without hydro scheme) (Is)	Remaining Natural Flow (after hydro abstraction) (Is)	Remaining Natural Flow (after hydro abstraction) (%)
Water Level above Weir Crest Height (mm) (C)	Flow over Broad-crest Screen Section (Is)	Quantity abstracted from screen section (Is)	Flow in Residual section		Flow in Hof Section (Includes section above & below weir height) mm (Is)							
			If HOF not causing hydrological interference (Is, pure %)	Proposed quantity in residual flow section (Is) (B)	A		A + B					
0	0.00	0.00	0.00	0.00	1.91	1.9	1.91	100.00%	1.9	1.9	100.0%	
10	1.10	1.10	0.47	0.25	2.35	2.37	2.60	38.78%	3.70	2.60	70.2%	
20	3.11	3.11	1.33	0.70	2.82	3.23	3.52	34.24%	6.63	3.52	53.1%	
30	5.72	5.72	2.45	1.28	3.32	4.35	4.60	32.11%	10.32	4.60	44.6%	
40	8.80	8.80	3.77	1.97	3.85	5.67	5.82	30.82%	14.62	5.82	39.8%	
49.2	12.00	12.00	5.14	2.69	4.36	7.04	7.05	30.01%	19.05	7.05	37.0%	
50	12.30	12.00	5.27	2.75	4.40	7.17	7.16	30.46%	19.46	7.46	38.3%	
60	16.17	12.00	6.93	3.62	4.98	8.83	8.60	35.83%	24.77	12.77	51.5%	
70	20.37	12.00	8.73	4.56	5.58	10.63	10.14	40.72%	30.51	18.51	60.7%	
80	24.89	12.00	10.67	5.58	6.20	12.57	11.78	45.14%	36.67	24.67	67.3%	
90	29.70	12.00	12.73	6.65	6.84	14.63	13.50	49.14%	43.20	31.20	72.2%	
100	34.79	12.00	14.91	7.79	7.51	16.81	15.30	52.75%	50.08	38.08	76.0%	

Calculations use Broad-crested weir equation:	$H = (Q/c \cdot b)^{2/3}$
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HOF and Flow Split Percentage Calculations for un-named tributary of the Nant Ffynnon-Wen watercourse (Feeding intake)

HOF and Flow Split Percentage Calculations

Coefficient	2.2
HOF Width (mm)	50
HOF Height (mm)	101
HOF (ls)	3.5
Abstraction %	70
Residual %	30
Peak Abstraction	10
TGV Reference	17-053 (Feeding watercourse)
Site Name	Pant Y Turnor

Site Name: Pant Y Turnor TGV Reference: 17-053 (Feeding watercourse)

Green Boxes (below) highlight the calculated actual residual flow split left in the watercourse immediately below the intake. In this instance there is always more left in the watercourse than the licenced agreed percentage (over HOF) reducing impact on the depleted reach below that of the nationally adopted Wales Hydropower Guidelines.

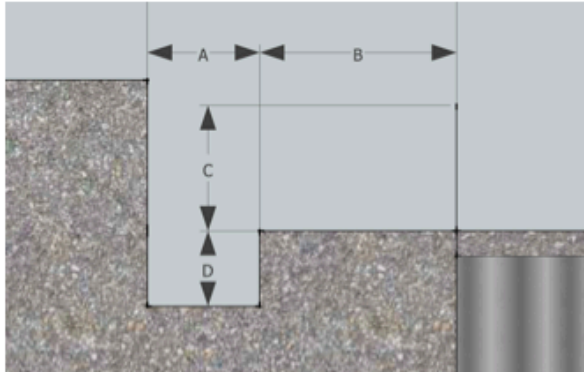
Blue boxes (below) show calculated flow rates at peak abstraction														
Orange box indicates the proposed width and flows of the Residual Flow section of the weir design														
			Width of Residual Notch if basic (in addition to HOF notch)		HOF Height (mm) (D)									
			207		101									
			Width of Screen (mm)		Proposed Width of Residual Flow notch (mm) (in addition to HOF notch) (B)		HOF Width (mm) (A)							
			600	600	124	50	Residual Flow Calculations				Natural Flow Calculations			
Natural Flow (based on WHS Lowflows)			Water Level above Weir Crest Height (mm) (C)	Flow over Broad-crest Screen Section (ls)	Quantity abstracted from screen section (ls)	Flow in Residual section	Flow in Hof Section (includes section above & below weir height) mm (ls)	Correct Figure in accordance with licence (HOF + residual split%) (ls)	Proposed Figure based on design (ls)	% of Proposed residual (vs abstracted)	Total Natural Flow (without hydro scheme) (ls)	Remaining Natural Flow (after hydro abstraction) (ls)	Remaining Natural Flow (after hydro abstraction) (%)	
Table for reference only, does not correspond directly with adjacent table						If HOF not causing hydrological interference (ls, pure %)	Proposed quantity in residual flow section (ls) (B)	A	A + B					
Q number	m/s	l/s												
5%		0												
10%		0												
20%		0												
30%		0												
40%		0												
50%		0												
60%		0												
70%		0												
80%		0												
90%		0												
95%		0												
99%		0												
			0	0.00	0.00	0.00	0.00	3.53	3.5	3.53	100.00%	3.5	3.5	100.0%
			10	1.32	1.32	0.57	0.27	4.07	4.07	4.34	38.91%	5.66	4.34	76.7%
			20	3.73	3.73	1.60	0.77	4.63	5.10	5.40	33.74%	9.14	5.40	59.1%
			30	6.86	6.86	2.94	1.42	5.22	6.44	6.63	31.36%	13.49	6.63	49.2%
			38.57	10.00	10.00	4.29	2.07	5.74	7.79	7.80	30.08%	17.80	7.80	43.8%
			50	14.76	10.00	6.32	3.05	6.45	9.82	9.50	37.52%	24.26	14.26	58.8%
			60	19.40	10.00	8.31	4.01	7.11	11.81	11.12	43.23%	30.52	20.52	67.2%
			40.6	10.80	10.00	4.63	2.23	5.86	8.13	8.09	31.47%	18.89	8.89	47.1%
			70	24.45	10.00	10.48	5.05	7.78	13.98	12.83	48.27%	37.28	27.28	73.2%
			80	29.87	10.00	12.80	6.17	8.47	16.30	14.64	52.70%	44.51	34.51	77.5%
			90	35.64	10.00	15.27	7.37	9.18	18.77	16.55	56.61%	52.19	42.19	80.8%
			100	41.74	10.00	17.89	8.63	9.91	21.39	18.54	60.06%	60.28	50.28	83.4%

Calculations use Broad-crested weir equation:

$H = (Q/c*b)^{2/3}$

Green Boxes (below) highlight the calculated actual residual flow split left in the watercourse immediately below the intake. In this instance there is always more left in the watercourse than the licenced agreed percentage (over HOF) reducing impact on the depleted reach below that of the nationally adopted Wales Hydropower Guidelines.

Calculations for the Residual Flow Section Width (factoring in the impact of the HOF Notch)



Calculations use Broad-crested weir equation:

$$H = (Q/c*b)^{2/3}$$

Calculations show how the increase in height of water over the weir crest (-C-) increase disproportionately the quantity of water travelling through section A. Consequently the width of the residual flow channel (B) is reduced so that when the scheme is abstracting at Q_{mean} the amount left in the watercourse is HOF + the correct percentage of residual flow. Calculations show how 2 different broad-crested notch equations are calculated for each section (A+B). Between A and B there will be a vertical stainless steel plate separating the two different flows.

fx = $=(5E58*(5L517/1000)^{1/3}*(G28+5L515)/1000)^{(3/2))*1000$

HOF and Flow Split Percentage Calculations

Site Name: Llichweddystrad TGV Reference: 11-055

Blue boxes (below) show calculated flow rates at peak abstraction
Orange box indicates the proposed width and flows of the Residual Flow section of the weir design

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Water Level above Weir Crest Height (mm) (C)	Flow over Broad-crested Screen Section (ls) (A)	Quantity abstracted from screen section (ls) (B)	Flow in Residual section (ls) (D)	Flow in HOF Section (includes section above & below weir height) mm (ls) (E)	Correct Figure in accordance with licence (HOF + residual opt%) (ls) (F)	Propo Figure 1 on design (ls) (G)
0	0.00	0.00	0.00	0.00	3.92	4
10	2.04	2.04	0.88	0.52	4.73	5.2
20	5.78	5.78	2.48	1.48	5.39	7.0
30	10.63	10.63	4.55	2.73	6.49	9.2
40	16.36	16.36	7.01	4.20	7.44	11.8
50	22.86	22.86	9.80	5.87	8.43	14.8
60	30.05	30.05	12.88	7.71	9.47	18.1
70	37.87	37.87	16.23	9.72	10.54	21.7
70.65	38.40	38.40	16.23	9.72	10.54	21.7
80	46.27	46.27	19.83	11.88	11.65	25.3

Water Level above Weir Crest Height (mm) (C)

Flow over Broad-crested Screen Section (ls) (A)

Quantity abstracted from screen section (ls) (B)

Flow in Residual section (ls) (D)

Flow in HOF Section (includes section above & below weir height) mm (ls) (E)

Correct Figure in accordance with licence (HOF + residual opt%) (ls) (F)

Propo Figure 1 on design (ls) (G)

Site Name: Llichweddystrad

Site for reference only, does not depend directly with adjacent table

der m/s l/s

0.14230 142.3

0.09500 95

0.05500 55

0.04100 41

0.03000 30

0.02290 22.9

0.01700 17

0.01200 12

0.00990 8.9

0.00570 5.7

0.00410 4.1

fx = $=(5E58*(5L517/1000)^{1/3}*(G28/1000)^{(3/2))*1000$

HOF and Flow Split Percentage Calculations

Site Name: Llichweddystrad TGV Reference: 11-055

Blue boxes (below) show calculated flow rates at peak abstraction
Orange box indicates the proposed width and flows of the Residual Flow section of the weir design

Water Level above Weir Crest Height (mm) (C)	Flow over Broad-crested Screen Section (ls) (A)	Quantity abstracted from screen section (ls) (B)	Flow in Residual section (ls) (D)	Flow in HOF Section (includes section above & below weir height) mm (ls) (E)	Correct Figure in accordance with licence (HOF + residual opt%) (ls) (F)	Propo Figure 1 on design (ls) (G)
0	0.00	0.00	0.00	0.00	3.92	4
10	2.04	2.04	0.88	0.52	4.73	5.2
20	5.78	5.78	2.48	1.48	5.39	7.0
30	10.63	10.63	4.55	2.73	6.49	9.2
40	16.36	16.36	7.01	4.20	7.44	11.8
50	22.86	22.86	9.80	5.87	8.43	14.8
60	30.05	30.05	12.88	7.71	9.47	18.1
70	37.87	37.87	16.23	9.72	10.54	21.7
70.65	38.40	38.40	16.23	9.72	10.54	21.7
80	46.27	46.27	19.83	11.88	11.65	25.3
90	55.21	55.21	23.66	14.17	12.79	29.3
100	64.66	64.66	27.71	16.60	14.97	33.3

Water Level above Weir Crest Height (mm) (C)

Flow over Broad-crested Screen Section (ls) (A)

Quantity abstracted from screen section (ls) (B)

Flow in Residual section (ls) (D)

Flow in HOF Section (includes section above & below weir height) mm (ls) (E)

Correct Figure in accordance with licence (HOF + residual opt%) (ls) (F)

Propo Figure 1 on design (ls) (G)

Site Name: Llichweddystrad

Site for reference only, does not depend directly with adjacent table

der m/s l/s

0.14230 142.3

0.09500 95

0.05500 55

0.04100 41

0.03000 30

0.02290 22.9

0.01700 17

0.01200 12

0.00990 8.9

0.00570 5.7

0.00410 4.1