

Title	Forge Washery Residential Development, Brynaman
Brief Description	Construction of 26 detached and 4 semidetached dwellings
Location	The old Forge Washery site, Brynaman
Coordinate	271503 213992
Maps	

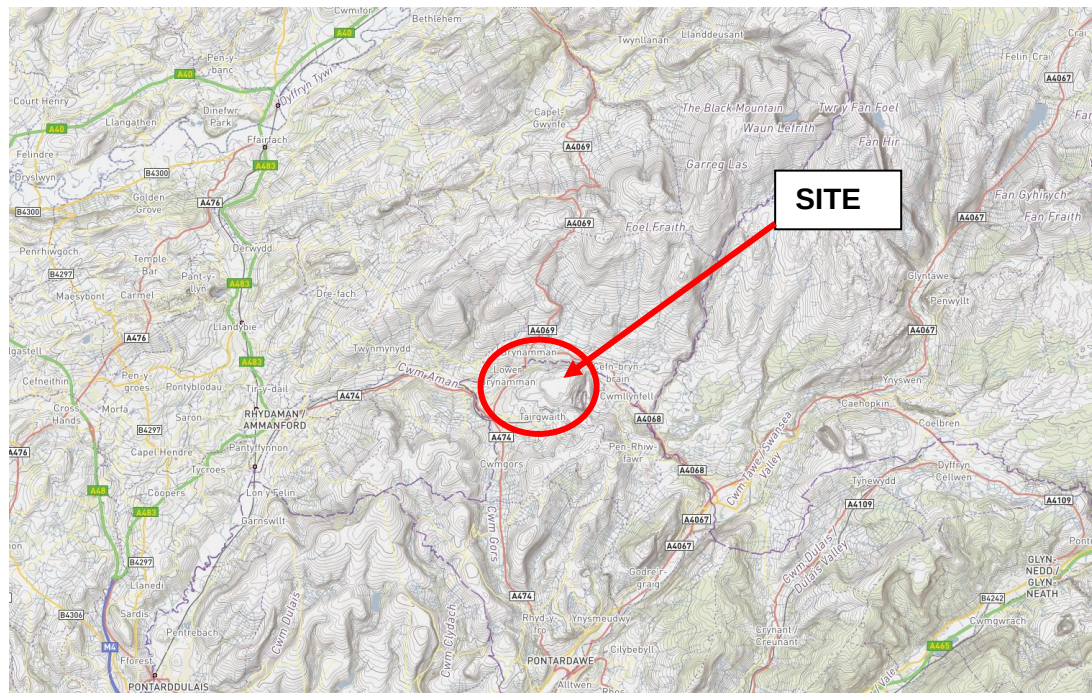


Figure 1 – Location Plan

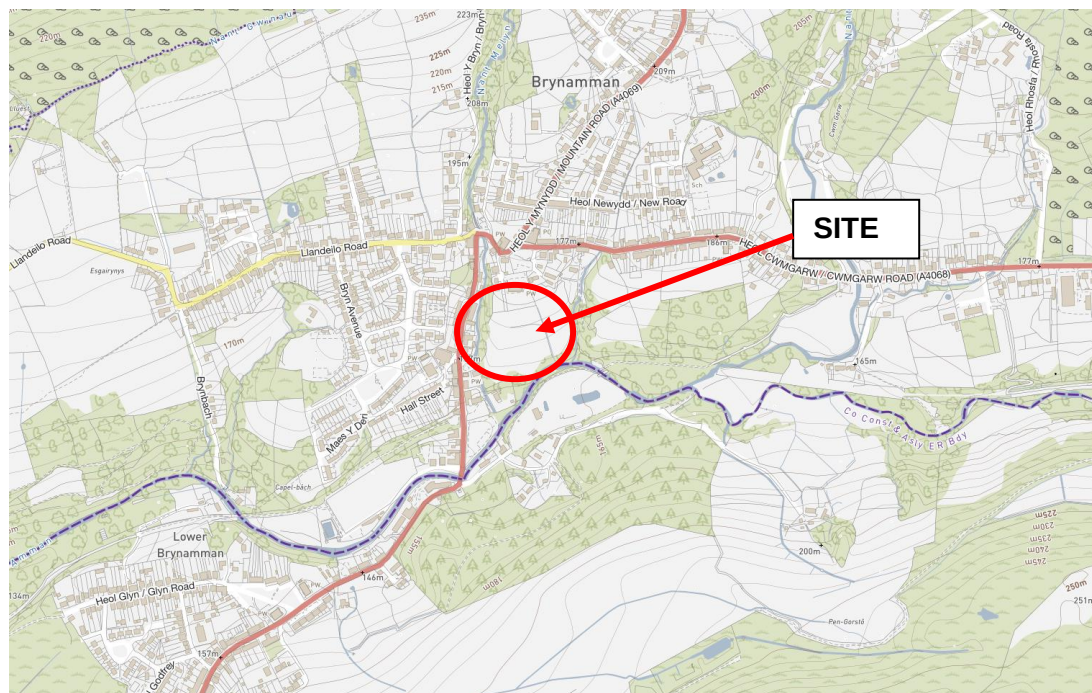


Figure 2 – Plan of Area

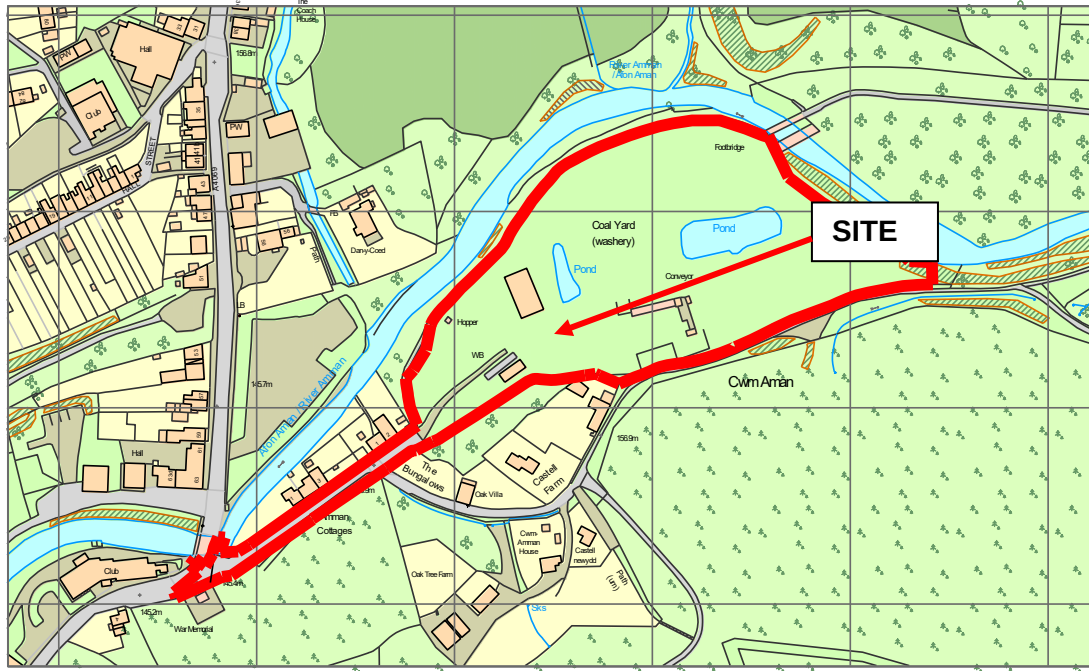


Figure 3 – Plan of Street

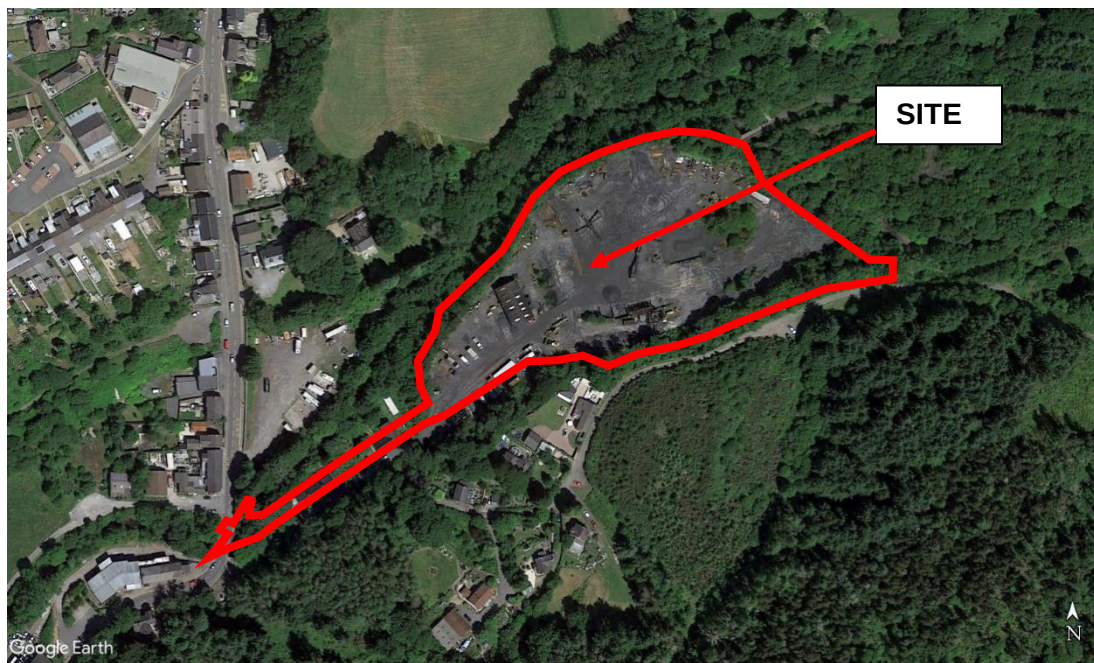
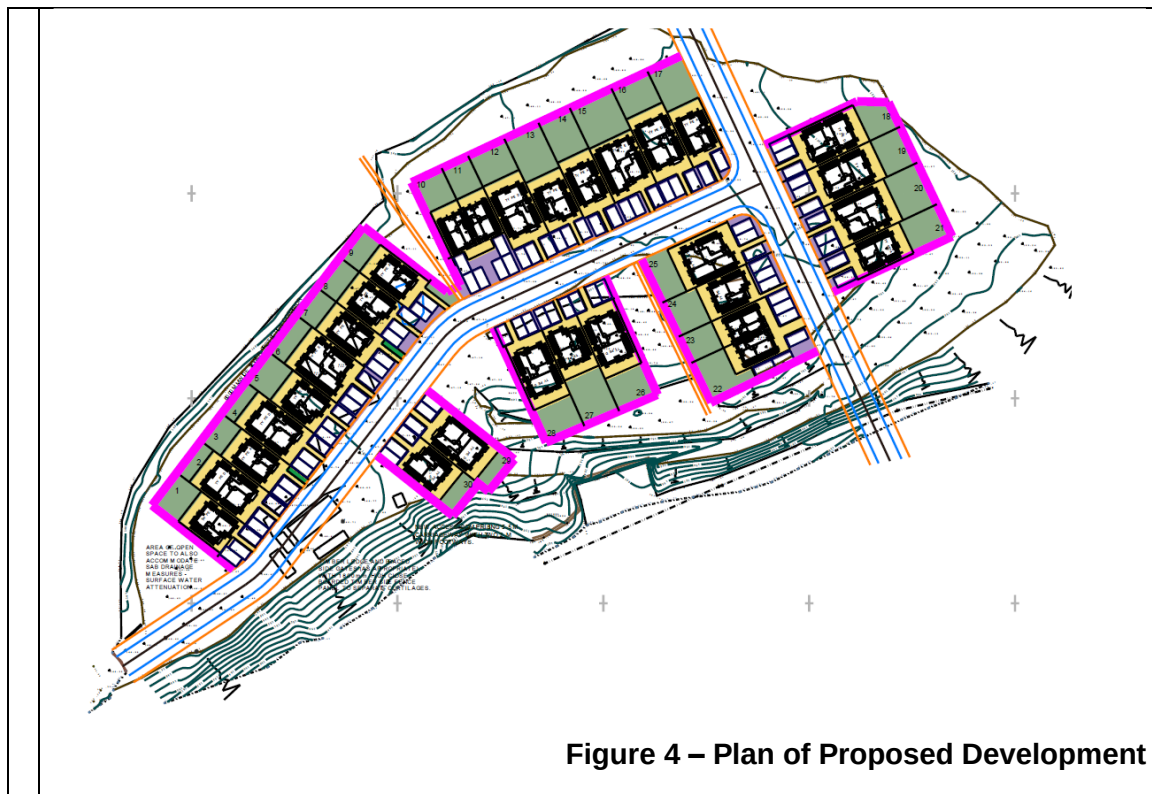


Plate 1 – Aerial Photograph of Site

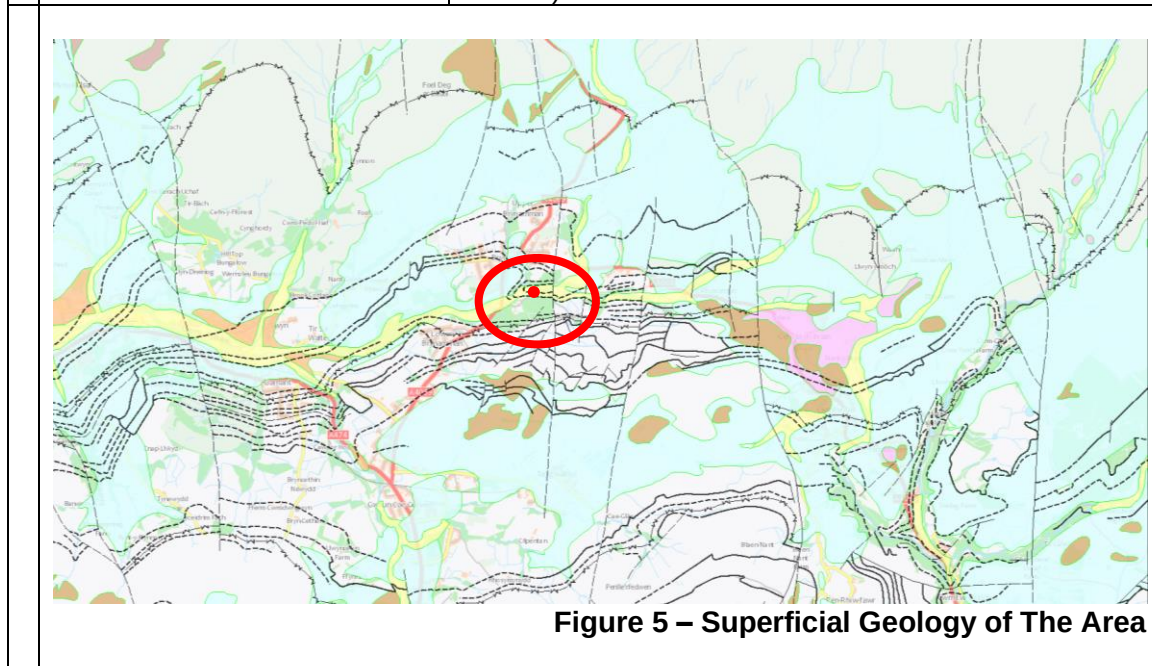
Site Area	22815m ²
Development	It is proposed to construct 26 detached houses and four semidetached houses along with an access road off an existing lane (see Figure 4). The development will have a total surface footprint as indicated in Table1.

Table 1 - Proposed Surface Area for New Development

Plot	Area	Dwelling	Paths	Parking	Impermeable
1	295	57.7	27.84	59.1	144.64
2	289	83.25	32.32	54.9	170.47
3	247	55.8	26.88	47.2	129.88
4	280	83.25	32.32	57.2	172.77
5	261	57.7	27.84	51.2	136.74
6	310	94.39	34.72	63.4	192.51
7	223	55.8	26.88	44.0	126.68
8	228	57.7	27.84	69.8	155.34
9	218	55.8	26.88	46.5	129.18
10	252	51.0	17.68	54.6	123.28
11	221	51.0	17.68	51.3	119.98
12	303	83.25	32.32	54.6	170.17
13	287	57.7	27.84	48.5	134.04
14	263	55.8	26.88	48.5	131.18
15	252	94.39	34.72	66.6	195.71
16	306	83.25	32.32	55.4	170.97
17	272	55.8	26.88	50.6	133.28
18	307	83.25	32.32	62.2	177.77
19	307	83.25	32.32	61.4	176.97
20	356	94.39	34.72	70.9	200.01
21	275	55.8	26.88	56.7	139.38
22	258	51.0	17.68	54.2	122.88
23	259	51.0	17.68	51.2	119.88
24	275	57.7	27.84	58.7	144.24
25	338	94.39	34.72	70.5	199.61
26	321	83.25	32.32	61.3	176.87
27	287	57.7	27.84	53.1	138.64
28	319	83.25	32.32	57.5	173.07
29	233	83.25	32.32	55.2	170.77
30	199	57.7	27.84	52.7	138.24
Access	2477				
	10718	2069.51	856.64	1689	4615.15
Potential Total Impermeable Area					4615.15
Permeable Area					1328



Geology	The development site has a superficial geology of Alluvium over a bedrock of Mudstone, Siltstone and Sandstone the South Wales Lower Coal Measures Formation (see Figure 5 and 6).
---------	--



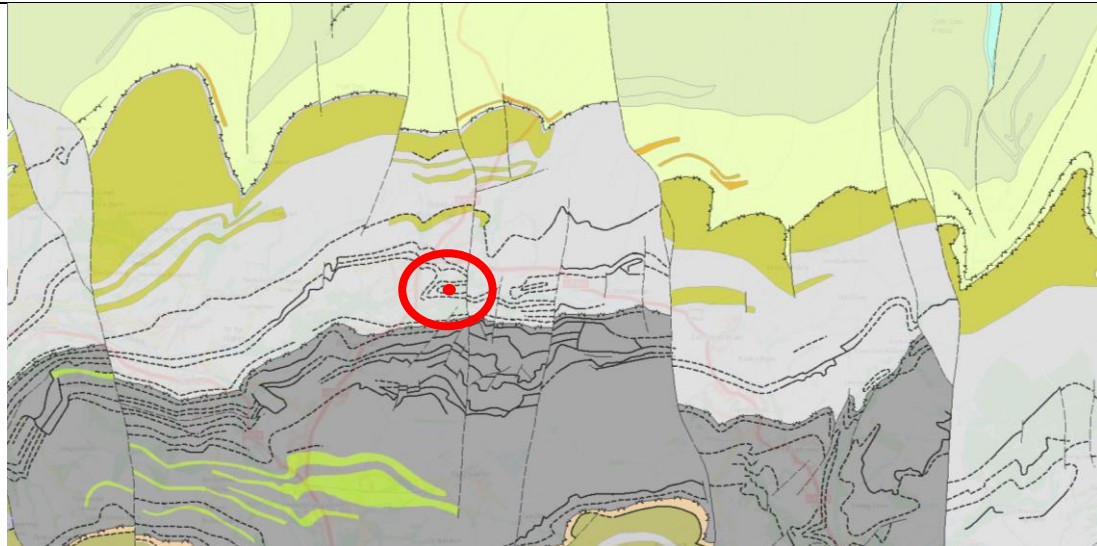


Figure 6 – Solid Geology of The Area

Topography

A Topographic survey shows the site levels ranges between 146.13m AOD to 153.24m AOD with the site generally falling from east to west but with the land to the south rising sharply. The afon Aman lies to the north with a berm between the site and the river (see Figure 2.7).

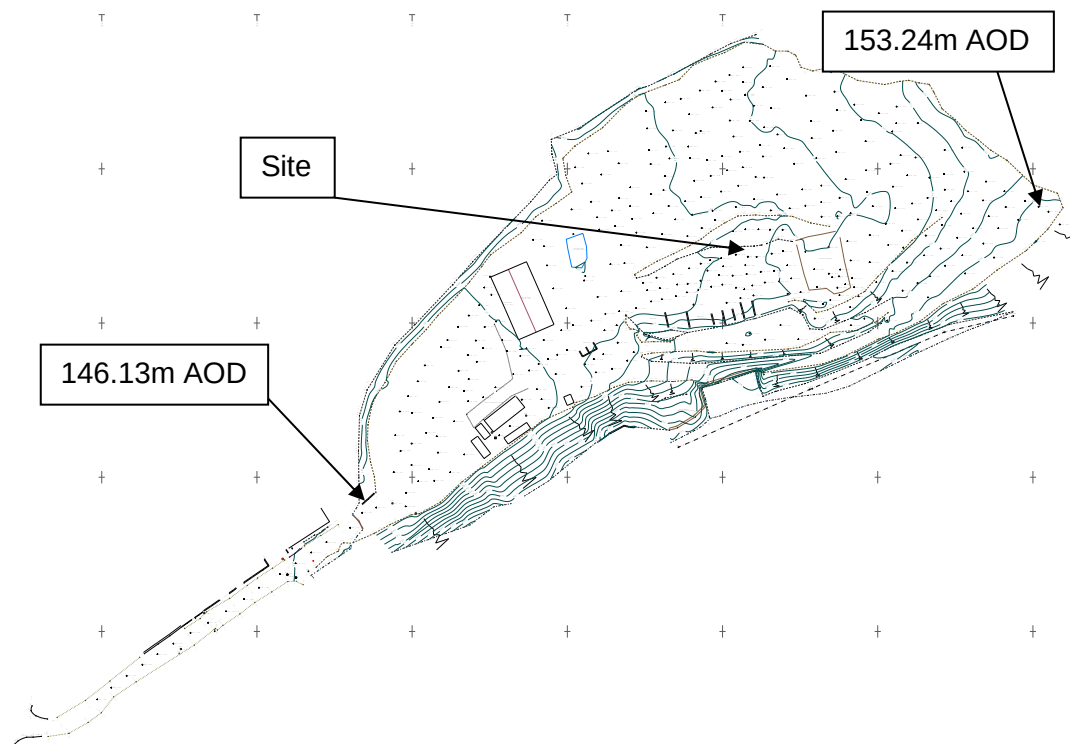


Figure 7 – Topographic Survey

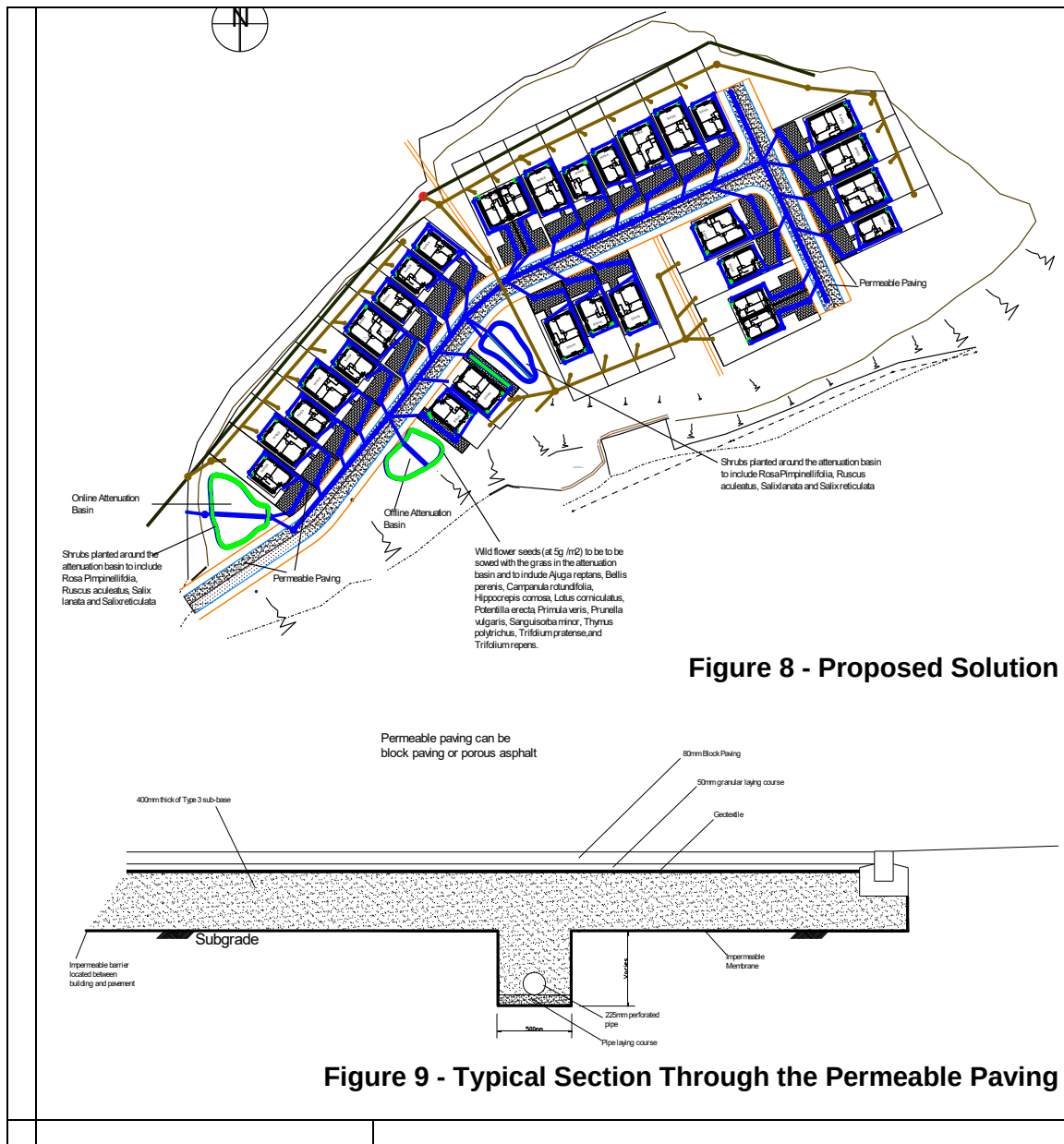
Wallingford online tool

SAAR	1687
M5-60	20
r ratio	0.2
SOIL	0.47

Using the procedure identified in the Institute of Hydrology Report 124 “Flood Estimation for Small Catchments” $Q_{BARrural} = 0.00108AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$																																																																																																																																																																																																																							
Region (for growth rate)			9																																																																																																																																																																																																																				
<table><tr><th colspan="6">Table 2 – Greenfield Runoff For Each Plot</th></tr><tr><th></th><th>Area</th><th>Q1</th><th>Q2.3</th><th>Q30</th><th>Q100</th></tr><tr><td>1</td><td>0.0295</td><td>0.339</td><td>0.399</td><td>0.698</td><td>0.869</td></tr><tr><td>2</td><td>0.0289</td><td>0.332</td><td>0.390</td><td>0.683</td><td>0.851</td></tr><tr><td>3</td><td>0.0247</td><td>0.284</td><td>0.334</td><td>0.584</td><td>0.728</td></tr><tr><td>4</td><td>0.028</td><td>0.322</td><td>0.378</td><td>0.662</td><td>0.825</td></tr><tr><td>5</td><td>0.0261</td><td>0.300</td><td>0.353</td><td>0.617</td><td>0.769</td></tr><tr><td>6</td><td>0.031</td><td>0.356</td><td>0.419</td><td>0.733</td><td>0.913</td></tr><tr><td>7</td><td>0.0223</td><td>0.256</td><td>0.301</td><td>0.527</td><td>0.657</td></tr><tr><td>8</td><td>0.0228</td><td>0.262</td><td>0.308</td><td>0.539</td><td>0.672</td></tr><tr><td>9</td><td>0.0218</td><td>0.250</td><td>0.295</td><td>0.515</td><td>0.642</td></tr><tr><td>10</td><td>0.0252</td><td>0.289</td><td>0.340</td><td>0.596</td><td>0.742</td></tr><tr><td>11</td><td>0.0221</td><td>0.254</td><td>0.299</td><td>0.523</td><td>0.651</td></tr><tr><td>12</td><td>0.0303</td><td>0.348</td><td>0.409</td><td>0.716</td><td>0.893</td></tr><tr><td>13</td><td>0.0287</td><td>0.330</td><td>0.388</td><td>0.679</td><td>0.845</td></tr><tr><td>14</td><td>0.0263</td><td>0.302</td><td>0.355</td><td>0.622</td><td>0.775</td></tr><tr><td>15</td><td>0.0252</td><td>0.289</td><td>0.340</td><td>0.596</td><td>0.742</td></tr><tr><td>16</td><td>0.0306</td><td>0.351</td><td>0.413</td><td>0.724</td><td>0.901</td></tr><tr><td>17</td><td>0.0272</td><td>0.312</td><td>0.368</td><td>0.643</td><td>0.801</td></tr><tr><td>18</td><td>0.0307</td><td>0.353</td><td>0.415</td><td>0.726</td><td>0.904</td></tr><tr><td>19</td><td>0.0307</td><td>0.353</td><td>0.415</td><td>0.726</td><td>0.904</td></tr><tr><td>20</td><td>0.0356</td><td>0.409</td><td>0.481</td><td>0.842</td><td>1.049</td></tr><tr><td>21</td><td>0.0275</td><td>0.316</td><td>0.372</td><td>0.650</td><td>0.810</td></tr><tr><td>22</td><td>0.0258</td><td>0.296</td><td>0.349</td><td>0.610</td><td>0.760</td></tr><tr><td>23</td><td>0.0259</td><td>0.297</td><td>0.350</td><td>0.612</td><td>0.763</td></tr><tr><td>24</td><td>0.0275</td><td>0.316</td><td>0.372</td><td>0.650</td><td>0.810</td></tr><tr><td>25</td><td>0.0338</td><td>0.388</td><td>0.457</td><td>0.799</td><td>0.996</td></tr><tr><td>26</td><td>0.0321</td><td>0.369</td><td>0.434</td><td>0.759</td><td>0.946</td></tr><tr><td>27</td><td>0.0287</td><td>0.330</td><td>0.388</td><td>0.679</td><td>0.845</td></tr><tr><td>28</td><td>0.0319</td><td>0.366</td><td>0.431</td><td>0.754</td><td>0.940</td></tr><tr><td>29</td><td>0.0233</td><td>0.268</td><td>0.315</td><td>0.551</td><td>0.686</td></tr><tr><td>30</td><td>0.0199</td><td>0.229</td><td>0.269</td><td>0.471</td><td>0.586</td></tr><tr><td>Access</td><td>0.2477</td><td>2.845</td><td>3.347</td><td>5.857</td><td>7.296</td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td>1.0718</td><td>12.310</td><td>14.482</td><td>25.343</td><td>31.571</td></tr></table>						Table 2 – Greenfield Runoff For Each Plot							Area	Q1	Q2.3	Q30	Q100	1	0.0295	0.339	0.399	0.698	0.869	2	0.0289	0.332	0.390	0.683	0.851	3	0.0247	0.284	0.334	0.584	0.728	4	0.028	0.322	0.378	0.662	0.825	5	0.0261	0.300	0.353	0.617	0.769	6	0.031	0.356	0.419	0.733	0.913	7	0.0223	0.256	0.301	0.527	0.657	8	0.0228	0.262	0.308	0.539	0.672	9	0.0218	0.250	0.295	0.515	0.642	10	0.0252	0.289	0.340	0.596	0.742	11	0.0221	0.254	0.299	0.523	0.651	12	0.0303	0.348	0.409	0.716	0.893	13	0.0287	0.330	0.388	0.679	0.845	14	0.0263	0.302	0.355	0.622	0.775	15	0.0252	0.289	0.340	0.596	0.742	16	0.0306	0.351	0.413	0.724	0.901	17	0.0272	0.312	0.368	0.643	0.801	18	0.0307	0.353	0.415	0.726	0.904	19	0.0307	0.353	0.415	0.726	0.904	20	0.0356	0.409	0.481	0.842	1.049	21	0.0275	0.316	0.372	0.650	0.810	22	0.0258	0.296	0.349	0.610	0.760	23	0.0259	0.297	0.350	0.612	0.763	24	0.0275	0.316	0.372	0.650	0.810	25	0.0338	0.388	0.457	0.799	0.996	26	0.0321	0.369	0.434	0.759	0.946	27	0.0287	0.330	0.388	0.679	0.845	28	0.0319	0.366	0.431	0.754	0.940	29	0.0233	0.268	0.315	0.551	0.686	30	0.0199	0.229	0.269	0.471	0.586	Access	0.2477	2.845	3.347	5.857	7.296								1.0718	12.310	14.482	25.343	31.571
Table 2 – Greenfield Runoff For Each Plot																																																																																																																																																																																																																							
	Area	Q1	Q2.3	Q30	Q100																																																																																																																																																																																																																		
1	0.0295	0.339	0.399	0.698	0.869																																																																																																																																																																																																																		
2	0.0289	0.332	0.390	0.683	0.851																																																																																																																																																																																																																		
3	0.0247	0.284	0.334	0.584	0.728																																																																																																																																																																																																																		
4	0.028	0.322	0.378	0.662	0.825																																																																																																																																																																																																																		
5	0.0261	0.300	0.353	0.617	0.769																																																																																																																																																																																																																		
6	0.031	0.356	0.419	0.733	0.913																																																																																																																																																																																																																		
7	0.0223	0.256	0.301	0.527	0.657																																																																																																																																																																																																																		
8	0.0228	0.262	0.308	0.539	0.672																																																																																																																																																																																																																		
9	0.0218	0.250	0.295	0.515	0.642																																																																																																																																																																																																																		
10	0.0252	0.289	0.340	0.596	0.742																																																																																																																																																																																																																		
11	0.0221	0.254	0.299	0.523	0.651																																																																																																																																																																																																																		
12	0.0303	0.348	0.409	0.716	0.893																																																																																																																																																																																																																		
13	0.0287	0.330	0.388	0.679	0.845																																																																																																																																																																																																																		
14	0.0263	0.302	0.355	0.622	0.775																																																																																																																																																																																																																		
15	0.0252	0.289	0.340	0.596	0.742																																																																																																																																																																																																																		
16	0.0306	0.351	0.413	0.724	0.901																																																																																																																																																																																																																		
17	0.0272	0.312	0.368	0.643	0.801																																																																																																																																																																																																																		
18	0.0307	0.353	0.415	0.726	0.904																																																																																																																																																																																																																		
19	0.0307	0.353	0.415	0.726	0.904																																																																																																																																																																																																																		
20	0.0356	0.409	0.481	0.842	1.049																																																																																																																																																																																																																		
21	0.0275	0.316	0.372	0.650	0.810																																																																																																																																																																																																																		
22	0.0258	0.296	0.349	0.610	0.760																																																																																																																																																																																																																		
23	0.0259	0.297	0.350	0.612	0.763																																																																																																																																																																																																																		
24	0.0275	0.316	0.372	0.650	0.810																																																																																																																																																																																																																		
25	0.0338	0.388	0.457	0.799	0.996																																																																																																																																																																																																																		
26	0.0321	0.369	0.434	0.759	0.946																																																																																																																																																																																																																		
27	0.0287	0.330	0.388	0.679	0.845																																																																																																																																																																																																																		
28	0.0319	0.366	0.431	0.754	0.940																																																																																																																																																																																																																		
29	0.0233	0.268	0.315	0.551	0.686																																																																																																																																																																																																																		
30	0.0199	0.229	0.269	0.471	0.586																																																																																																																																																																																																																		
Access	0.2477	2.845	3.347	5.857	7.296																																																																																																																																																																																																																		
	1.0718	12.310	14.482	25.343	31.571																																																																																																																																																																																																																		
Standard 1																																																																																																																																																																																																																							
Priority Level 1 Surface water runoff is collected for use:		Water Butts																																																																																																																																																																																																																					

	Priority Level 2 Surface water runoff is infiltrated to ground;	The site has poor percolation properties with potential contamination in the ground. As such infiltration solutions are not considered appropriate			
	Infiltration value	Taken as 0.0m/hr			
	Priority Level 3 Surface water runoff is discharged to a surface water body;	Afon Aman flows along the site's northern boundary			
	Priority Level 4 Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;	A highway drain is situated west of the site but discharge, even at greenfield runoff rate, could potentially cause issues.			
	Priority Level 5 Surface water runoff is discharged to a combined sewer.	This is not necessary in this instance.			
	Standard S2	By interception solutions would ensure that there will be no discharge from the site for events of less than 5mm. The solution will also need to be designed to accommodate the 1 in 100 year event plus climate change.			
	Standard S3	Considering the nature of the development the pollution hazard level, in accordance with the Welsh Government Standards, can be considered to be very low to low and a simple index approach to design will be sufficient. A permeable paving solution for the parking area and access road would provide interception and will reduce the risk of pollution, meeting the requirements of S3. The use of water butts and having a catchpit will also help.			
	Table 2 - Simple Index				
	Land use	Pollution hazard level	Total Suspended Solids	Metals	Hydrocarbons
	Roof	Very Low	0.2	0.2	0.05
	Infiltration	Mitigation	0.7	0.6	0.7
	Trench and permeable paving				
	Residual		-0.4	-0.4	-0.65
	Carpark and access road	Low	0.5	0.4	0.4
	Permeable Paving	Mitigation	0.7	0.6	0.7
	Residual		-0.2	-0.2	-0.3
	Standard S4	As well as the housing the permeable paving can provide an aesthetically pleasing solution. In addition, the proposed attenuation basins, surrounded by planting, will also provide amenity to the residents.			
	Standard S5	Shrubs can be planted around the attenuation basins, constructed as part of the drainage system, enhancing the potential for biodiversity. The shrubs should include Rosa Pimpinellifolia, Ruscus aculeatus, Salix lanata and Salix reticulata. Wild flower seeds (at 5g /m2) to be sowed with the grass, in the basins, and to include Aiuqa reptans. Bellis			

		perenis, Campanula rotundifolia, Hippocrepis comosa, Lotus corniculatus, Potentilla erecta, Primula veris, Prunella vulgaris, Sanguisorba minor, Thymus polytrichus, Trifolium pratense, and Trifolium repens. The gravel in the attenuation basins can provide breeding grounds for insects and amphibians.
	Standard S6	Permeable paving can provide a cost-effective solution and is expected to have low maintenance requirements with the permeable paving being swept annually using high water pressure vacuum sweeper. The attenuation basins, , would also provide a low maintenance solution. Should the system fail then the water can be directed harmlessly towards the river causing but a minor inconvenience. The system should be designed with a safety factor to account for this.
	Potential Solution	The rear roof of the proposed dwellings will initially be drained into water butts which will meet level 1 of the of the hierarchy provided in the Welsh Government Standard S1. Consideration could also be given to installing a rainwater harvesting system, although it would be difficult to justify this economically. The overflow from the water butts along with the rainfall from the remainder of the roof areas and surface water draining from the paths surrounding the house could be drained into a Type C permeable paving forming the parking area (see Figure 8, 9, dwg 2103/301 and Appendix A). The access road will also be constructed using a permeable paving solution with three large attenuation basins (two off line and one on line). This solution would meet the requirements of the Welsh Government Standards with planting around the sunken garden providing an opportunity to enhance biodiversity and amenity.



Appendix A – Flow Calculations