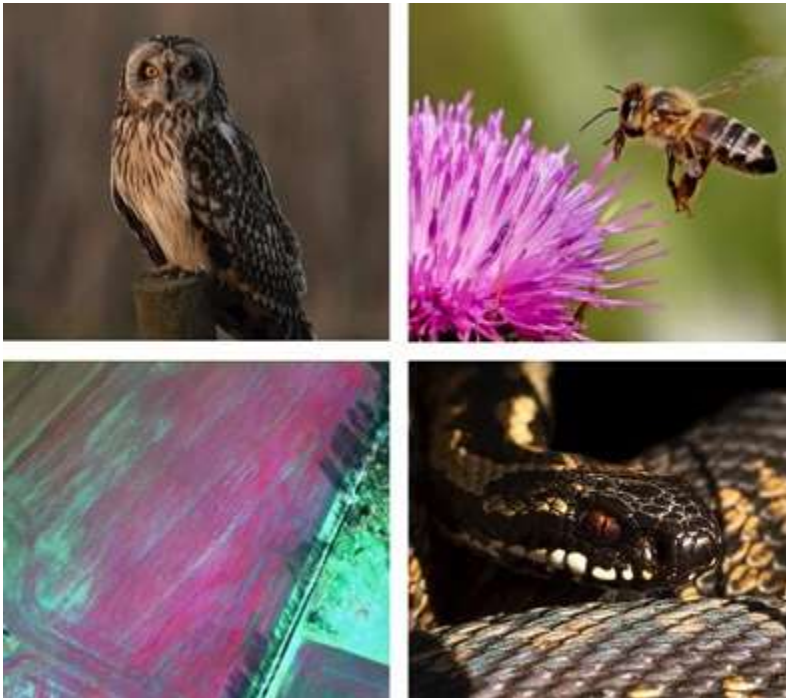


Afon Claerwen Hydro Scheme

Tree Survey



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Table of Contents

1. Introduction	3
1.1. Development Description	3
1.2. Habitats and Trees	3
2. Tree Survey Results.....	4
2.1. Presence of Tree Preservation Orders (TPO) or Conservation Area Designation	4
2.2. Existing Tree Description.....	4
3. Arboricultural Impact Assessment.....	5
3.1. Tree Protection and Root Protection Area	5
3.2. Incompatibilities between the layout and the trees proposed for retention.....	6
4. Tree Protection Plan	8
4.1. Construction Exclusion Zone	8
4.2. Modified RPAs.....	8
4.3. Responsibilities	10
Appendix A – Tree Schedule	12
Appendix B – Tree Survey	22
Appendix C – Tree Protection Plan.....	23



1. Introduction

Environment Systems was commissioned to complete a tree survey and prepare data and a report with regard to the development design, planning submission and consenting for a hydro-electric scheme operating on the Afon Claerwen in the Elan Valley. The tree survey has been prepared in following guidance from BS5837:2012 Trees in Relation to design, demolition and construction – recommendations.

1.1. Development Description

The development is located approximately 10 km southwest of Rhayader (National Grid Reference SN 89553 61784) between the Claerwen and Caban-coch reservoirs. The development is a run-of-river hydro-electric scheme with a capacity of 1.1 MW. Electricity will be generated by abstracting water from a location approximately 1.7 km downstream of the Claerwen Dam. A proportion of the flow (which has already been agreed and licenced by Natural Resources Wales) will be abstracted from the river and fed through either a pipe approximately 1.8 m in diameter or twin smaller (1.2 m) pipes. The pipe(s) will be laid underground and the alignment will broadly follow the southern side of the unmade track for approximately 2 km at which point it will return to the river via a hydro-electric turbine.

The turbine will be housed in a small building with dimensions of approximately 10 m x 8 m. In addition to the turbine house there will be a second building and compound containing electrical switchgear and transformer allowing connection to the Distribution Network Operator's (DNO) substation. Both buildings will be clad in appropriate local materials. Power will be exported along an underground cable to be owned and operated by the local DNO. There will be no requirement for overhead lines. The power house and DNO substation will be located in an improved grassland field. Access to this location will be made available by making improvements to an existing track (including some realignment) which falls from the public highway road. The existing track is well used by off-road vehicles. This access route will remain after the construction work is complete to allow future vehicle access to the turbine house and transformer compound.

Construction works are intended to take place during the spring and summer period and are expected to extend to between six and nine months. Plant and machinery used will include small numbers of excavators, concrete mixers and standard HGVs. During the laying of the pipeline an excavation corridor of approximately 200 m in length would be operation at any one time. The average depth of the excavation is likely to be 2.8 or 2.2 m (maximum diameter of single or twin pipes plus 1 m cover) subject to the ground contours. Temporary French drains will be provided to divert surface water away from the excavation. The total construction corridor, including the areas identified for the temporary deposition of spoil and turves, could be up to approximately 40 m in width.

1.2. Habitats and Trees

The hydro-electric scheme is located in an upland area of predominantly acid grassland, bracken, improved grassland and marshy grassland with some flush and heath. Being an on the fringe of the upland zone there are a number scattered trees throughout. These mainly occur at the location of the proposed outfall and in a wet marshy grassland corridor near the center of the pipeline route. Several more trees are located within the 40m zone surrounding the pipeline route.

A disused mine is present along the rout which provides a difficult design consideration for laying the pipeline. To move the pipeline north at this location would be over a very steep bank of the river and



through a group of trees. To move it south would result in the pipeline forming an incline alongside the existing tack which is not compatible with a gravity system. The pipeline needs therefore to pass close by to the remaining features of the mine including three mature trees and exposed bedrock.

2. Tree Survey Results

2.1. Presence of Tree Preservation Orders (TPO) or Conservation Area Designation

There are no Tree Preservation Orders in place on any of the trees within the proposed development site at the time of writing this report. The proposed development site does not fall within a Conservation Area.

2.2. Existing Tree Description

In total 55 trees were identified and mapped during the survey. The Tree Schedule (Appendix A) and Figures 1-7 (Appendix B) present the location and category of trees in relation to the layout of the hydro scheme.

The Tree Schedule was produced following specification of BS5837:2012 and includes the tree height, stem diameter, crown extent, remaining contribution and condition category. Where the measurements could not be taken as required by the standard this is stated. The height and direction of the lowest significant branch was recorded for each tree.

The trees on site can be split in to several distinct sections or areas related to differing aspects of the development and there are also a number of individual scattered trees. Section 1 at the most northerly point of the development is the intake weir which follows a route south before turning eastwards approximately 550m along the pipeline. Section 1 is exposed open upland with three trees (T49 rowan, T51 hawthorn and T52 sycamore) present. All three trees are sufficient distance from the pipeline, intake weir and associated structures that they will not be affected by the development and can be retained. The trees in Section 1 are all mature and due to their location on steep rocky terrain with little soil depth they are unlikely to grow much beyond their present height. These scattered trees have amenable and habitat value in the open upland.

Section 2 is located in and around the old ruins and a ford for the existing Byway Open to All Traffic (BOAT). This BOAT was observed to be used by off-road recreational vehicles as well as the local farmer during the survey. Section 2 includes 27 trees (T26-T56, exclusive of T49, T51 & T52). A mixture of species is present but dominant is downy birch and goat willow with frequent hawthorn, sycamore and beech. Ash, horse chestnut, crab apple, rowan and larch are also present. Of particular interest is T43 horse chestnut is a very large mature/over-mature specimen that has a hazard beam with some decay in places. The adjacent T44 beech and T45 sycamore are also very large examples of these species and have clearly been present for a long time and may be associated with the ruined cottages. A number of other trees T6 hawthorn, T47 rowan and T48 crab apple are similar to those in Section 1 in that they are short, stumped in response to shallower soils in slightly more open upland habitat. In other words, this is a transition point between open upland and more sheltered riverine valley associated with the stream and Afon Claerwen. There are two larch trees (T36 & T37) present which appear to have been planted at some time immediately adjacent to the BOAT. Although they are good specimens in their own right they appear out of sync with the other trees and habitat present. The remaining trees are all mature or over-mature with a range of quality and features typical of this valley location



Section 3 can be described as open ground rather than open upland which becomes more marshy grassland and improved grassland associated with livestock farming. This is likely due to the more protected nature of the land from the elevation and topography to the southwest which may enable grazing throughout more of the year. Section 3 also becomes enclosed with a number of stone walls and post and wire fenced fields readily identifiable. Trees included in Section 3 are T10-T24. Three trees (T12 downy birch, T18 downy birch and T23 hawthorn) are in poor condition and have been given a U classification. A number of other trees (T20, T21 and T22 all hawthorn) are over-mature with some remaining life contribution left in them but in deteriorating condition. However, they are typical of this habitat as scattered trees and have been given a C3 category rating. T15 sycamore, T16 ash, T17 ash and T19 downy birch are all located on/adjacent to old wall and mine adit top. These trees are mature but are starting to signs of being located on shallow and unsteady ground with rotting and peeling bark, rotten base and visible root damage.

Section 4 is at the powerhouse and tailrace end of the development and is inclusive of T1-T9. Section 4 is located along the edge of the riverbank where the trees are growing. The adjacent land is improved grassland used for livestock grazing with hedgerow and post and wire fencing around. The dominant species is goat willow with two downy birch, one alder and one sessile oak. One tree, T6 downy birch, was classified as U with T3 goat willow, T4 downy birch, T5 goat willow and T9 goat willow all categorised as C1 as they are typically poor specimens. The trees in Section 4 are part of the wooded river corridor and as such are part of a wider ecosystem.

2.2.1. Summary

None of the trees on site have special individual value (i.e. there are no fine arboricultural specimens, rare species or trees with particular historical significance). A total of 55 trees were recorded and measure during the survey, and notes made on tree groups, hedgerows and amenable and habitat value to support the categorisation. The details for each tree are provided in the Tree Schedule (Appendix A) and individual trees were assigned to BS5837 categories as shown in Table 1.

Table 1: Tree Categorisation

Category	Description	Number of trees
Category A	High quality with more than 40 years remaining life contribution	11
Category B	Moderate quality with more then 20 years remaining life contribution	20
Category C	Low quality with more than 10 years remaining life contribution	17
Category U	Poor condition, defective with less than 10 years remaining life contribution	7

3. Arboricultural Impact Assessment

Given that the construction will require the burying of a large diameter pipe it is not normally feasible to move living trees when they are much more mature and larger than sapling size. Although it is possible to move some mature trees, it is often of extremely high cost and success is limited. It is therefore often only worthwhile where trees of particularly high-value are found and all other possibilities are not an option.

3.1. Tree Protection and Root Protection Area

Each of the trees identified as category A, B or C have been plotted on the Tree Protection Plan and assessed against the proposed development layout. The final Tree Protection Plan is provided in Appendix C. The Root Protection Areas (RPA) have been applied from Appendix D of BS5837 which



provides for an equivalent to a radius of 12 times is the stem diameter. A number of the trees which are asymmetric and discussed in the following sections.

3.2. Incompatibilities between the layout and the trees proposed for retention

Fifteen trees require removal to facilitate construction of the pipeline. Fourteen of these trees are in suitable condition for retention (i.e. Category A, B or C) with only one tree (T33) that was identified as being over-mature and recommended for removal.

Eight trees are recommended to be retained if possible. It will be necessary to specify these trees when site marking is carried out. These trees are all outside of the site boundary or on the very edge of the construction area but work will be within the required RPA. In these circumstances there are specific tree protection measures described in Chapter 0 but on more detailed ground investigations, i.e. during the enabling works the RPA can be refined to the specific tree or the tree may require removal.

3.2.1. Section 1 Impacts

No trees were identified for removal in Section 1. T49 is on a steep slope, is asymmetrical and appears that the roots are localised. T49 is on the very edge of the site boundary but at distance from the pipeline route itself. The construction works including tracking of vehicles will be avoiding the area around T49 as far as possible due to the steepness of slope and associated health and safety risk.

3.2.2. Section 2 Impacts

Section 2 includes the required removal of seven trees (T33, T34, T35, T36, T37, T46 and T48) to facilitate the installation of the pipeline. A further four trees (T26, T38, T43 and T44) are all located on the very edge of the site boundary or outside of the site but within the required RPA.

T26 and T38 are on the top of a bank which sits above the BOAT. The root system appears to be more within the field (T26) and rising ground (T33) to the south of each tree. The bank itself follows the BOAT along this section and evidently was historically cut in this way to provide access to the ruins approximately 60m further west. Both T26 and T33 have grown on top/alongside the BOAT with exposed bedrock and so asphyxiation of roots is unlikely from vehicle tracking. It is therefore considered T26 and T38 can feasibly be retained with a restricted RPA along the top of the bank continuing to allow access along the BOAT.

3.2.3. Section 3 Impacts

Four trees require removal in Section 3 to facilitate development with three further trees that could be retained if construction is well managed. T22 is located immediately adjacent to the pipeline route and will be lost to the trench excavation.

Three of the trees (T15, T16 and T17) are located on top of a former stone wall and bedrock close to a former mine. At this location the pipeline options were developed to avoid the dis-used mine whilst retaining a route along suitable gradient. Immediately to the north of the wall and trees the land becomes steep and is a woodland leading down to the Afon Claerwen. This was considered unfeasible it will not be possible to access the slope safely or construct a safe pipeline route. To the south and on the opposite side of the BOAT the land rises and would result in the pipeline not being fit-for-purpose (i.e. the angle and slope would not allow water to flow). The resulting design of the pipeline therefore requires the excavation of a trench immediately adjacent to the wall and trees which will ultimately mean the trees need removing to facilitate construction.



T14 is a large Norway spruce south of the BOAT. The canopy does not overhang the BOAT and the BOAT provides a physical barrier to the roots of the tree. The tree is at the edge of a conifer group which stretches to the south and it appears susceptible to windthrow. If required this tree can be removed, but no action would help to retain the visual amenity of the conifer block in the landscape.

T18 is located on the steep slope at the top of a woodland section north of the site boundary. There is no canopy overhang over the site and the roots are likely constrained (i.e. asymmetrical) to the steep slope and near surface bedrock. T18 can be retained with a modified RPA.

T19 is located on top of the dis-used mine head and is behind the post and wire fence around the opening. Tracking of vehicles and excavation of the trench along this location will be within the RPA and as such will cause asphyxiation of roots as a minimum and likely severance of roots. This tree can be retained but may require coppicing and allowed to regenerate post-construction.

3.2.4. Section 4 Impacts

In Section 4, five trees require removal for construction of the tailrace and outfall. This includes T1 goat willow, T2 alder, T3 sessile oak, T4 downy birch and T5 goat willow. The river at this location is tree-lined and the work schedule to remove the trees will only remove the trees necessary to construct the outfall with the opposite bank of the river also tree-lined and trees either side of the proposed outfall. It is not considered that this will affect the overall amenity value of trees in the long-term at the powerhouse and outfall location.

3.2.5. Tree Pruning

Tree pruning is recommended for three trees (T31, 43 and T52) although only one of these trees (T43) may be affected by the development. All trees are realistically far enough away from the construction works not to be affected and pruning is for tree health purposes only.

Six further trees were recommended for removal regardless of the proposed development. Given the open nature of the habitat and landscape, it may be the most appropriate course of action to allow these trees to naturally decay.

A number of the retained trees especially those close to removed adjacent trees will be at risk of wind damage post-construction. Although, some damage is expected the BOAT provides public access and as such it is recommended that a Tree Hazard Assessment is completed on retained trees adjacent to the BOAT after the construction phase.

3.2.6. Hedgerows

Two hedgerows will be crossed within 250m of the powerhouse. Both of these hedgerows have recently (2017) been traditionally layed and so have some existing damage. In installing the pipeline at least, a 5m gap will be created in the hedgerows. Once the pipeline has been installed it will be possible to lay the hedge over and allow tall ruderal (i.e. rank grassy vegetation) to grow in the gaps.



4. Tree Protection Plan

The Tree Protection Plan (TPP) (Appendix C) identifies trees for removal and the RPA required. This should be read in conjunction with the Tree Schedule (Appendix A).

4.1. Construction Exclusion Zone

No works will be undertaken within any Construction Exclusion Zone. The Construction Exclusion Zones are to be afforded protection at all times and will be protected by fencing. A protective fence shall be erected prior to the commencement of any site works e.g. before any materials or machinery are brought on site, development or the stripping of soil commences. The fence shall have signs attached to it stating that this is a Construction Exclusion Zone and that **NO WORKS are Permitted** within the fence. The protected fence may only be removed following completion of all construction works.

The fence is required to be sited along the No Construction Zone and No-dig Construction Area shown in the Tree Protection Plan (Appendix C) and the fence must ideally be constructed as per Figure 1 in (BS 5837:2012) and be fit for the purpose of excluding any construction activity. Any other fence/barrier used must be fit for the purpose.

Please note that barrier tape, warning signs etc. are not sufficient to protect trees from development activity, although they may be used to supplement hard barrier protection where appropriate (e.g. to improve visibility to machine operators). They may also be used where terrain difficult terrain prevents the installation of hard barriers (as per Type A).

No storage of materials, lighting of fires will take place within any construction Exclusion Zone. No mixing or storage of materials will take place up a slope where they may leak into a Construction Exclusion Zone.

No notice boards, cables or other services will be attached to any tree.

Materials which may contaminate the soil will not be discharged within 10m of any tree stem. When undertaking the mixing of materials, it is essential that, any slope of the ground does not allow contaminants to run towards a tree root area.

4.2. Modified RPAs

Where barriers are set back for temporary access within RPAs, temporary ground protection is to be installed on this area prior to work starting on site. The type of ground protection may be varied according to the use.

For temporary pedestrian access, scaffold boards across a scaffold frame or suitable woodchip base is sufficient. For pedestrian-operated plant (up to 2 tonne), interlinked ground protection boards laid above 150mm of woodchip is recommended. Where woodchip is used as a foundation, it should be placed over a geotextile membrane.

For temporary access areas where small plant (up to 2 tonne) is to be used a no-dig construction area protecting the roots using a geo-grid or equivalent (i.e. geoweb) can be installed. The method for no-dig construction access is as follows and an example shown in Figure 2.



- Construct edging boards attached to pegs driven into the ground through the geogrid.
- The geogrid will be covered with a minimum of 100mm of type 1 road stone. This will be tipped from one end so that machinery moves on ground outside to the west of the RPA and not upon the geogrid.
- Compact the sub-base in geogrid using hand held vibrating tamper
- Lay gravel on compacted aggregate to desired level.

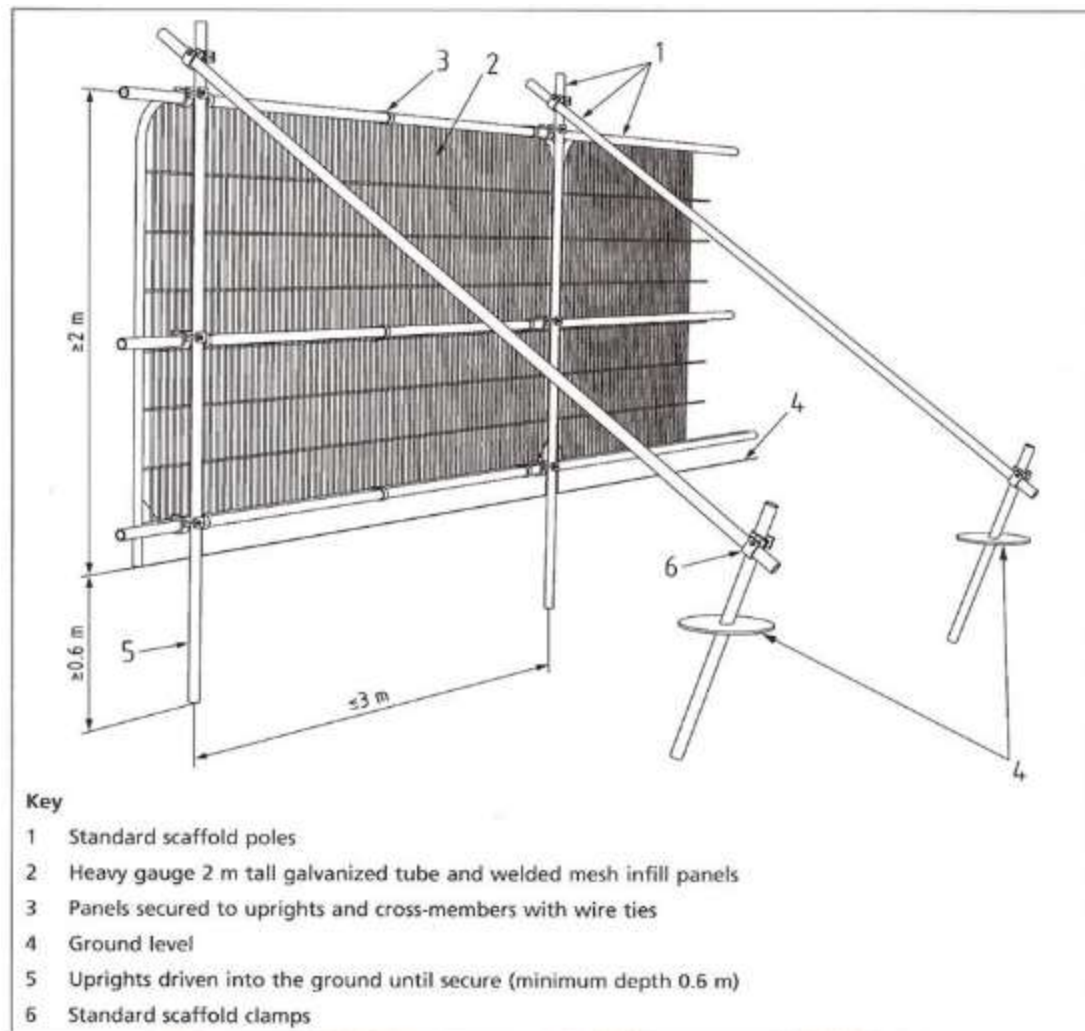


Figure 1: Default specification for protective barrier

Temporary access for running of heavy plant (greater than 2 tonne) within the defined RPAs is not recommended for this development; instead the removal of the trees is recommended, with suitable replanting after development.

Temporary movement of barriers to accommodate above-ground-level movement of machinery (e.g. manoeuvring of excavator booms etc.) is acceptable if no ground disturbance within the RPA is involved, providing (a) the physical protection barrier is retained in situ for the tree trunks, and (b) adequate care is taken to protect branches from damage. If necessary branches should be pruned back to Target Pruning points by a suitably qualified contractor before machinery uses the area. The barrier should be replaced at the RPA extent immediately work in the area is completed.

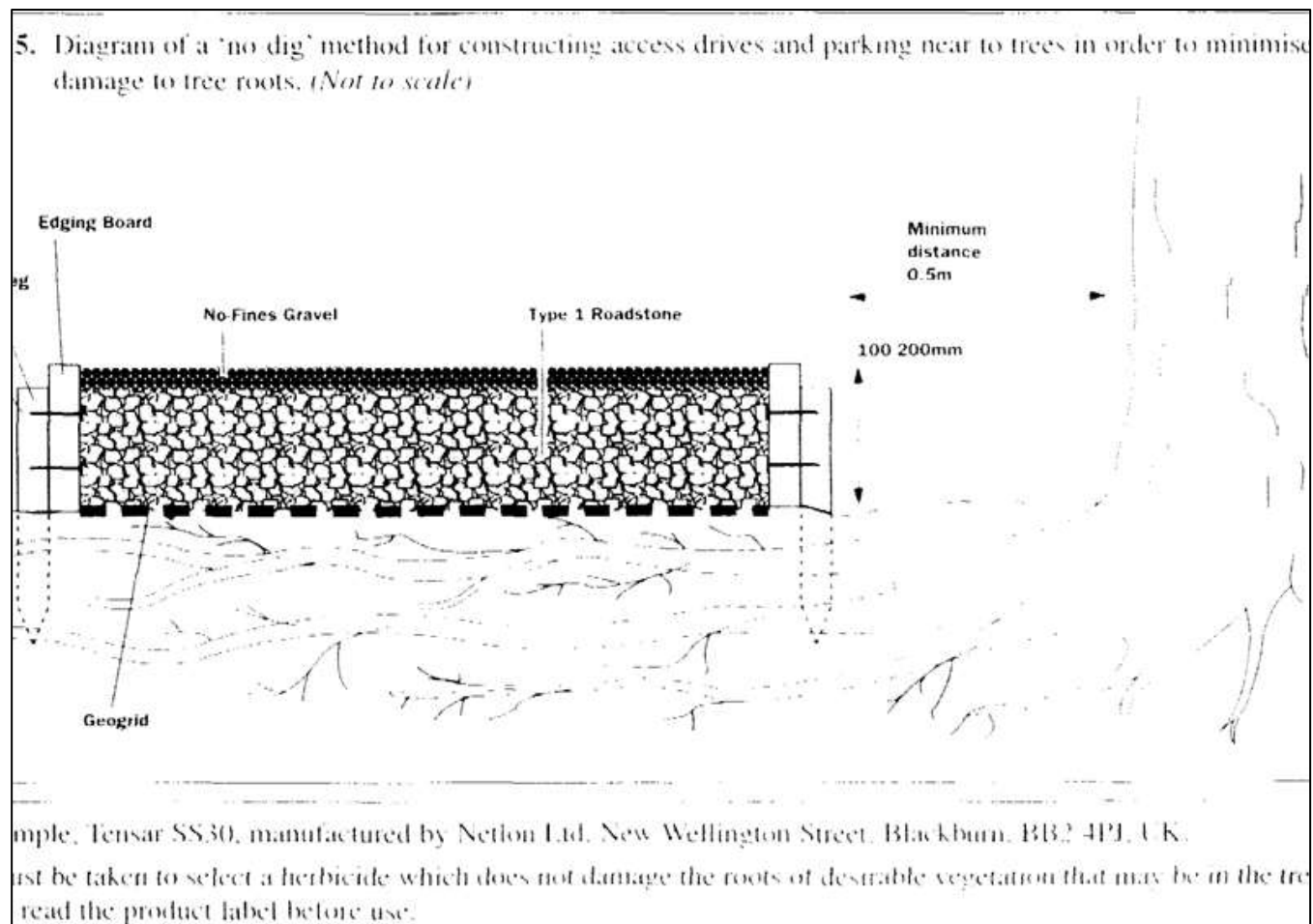


Figure 2: Diagram of a 'no-dig' method for constructing access drives and parking near to trees in order to minimise damage to tree roots

4.3. Responsibilities

It will be the responsibility of the main contractor to ensure that the planning conditions attached to planning consent are adhered to at all times and that a monitoring regime in regards to tree protection is adopted on site.

The main contractor will be responsible for contacting the Local Planning Authority at any time issues are raised related to the trees on site.

If at any time pruning works are required permission must be sought from the Local Planning Authority first and then carried out in accordance with BS 3998 Recommendations for Tree Works 2010.

The main contractor will ensure the build sequence is appropriate to ensure that no damage occurs to the trees during the construction processes. Protective fences will remain in position until completion of ALL construction works on the site.

The fencing and signs must be maintained in position at all times and checked on a regular basis by an on-site person designated that responsibility.

The main contractor will be responsible for ensuring sub-contractors do not carry out any process or operation that is likely to adversely impact upon any tree on site.



Appendix A – Tree Schedule

Tree ID on plans	Species	Height (m)	Crown spread (m)	Stem diameter @ 1.5m (mm)	Height of lowest branch (m) and direction of growth	Life stage	Remaining contribution	General observations P – Physiological condition S – Structural condition	Category of retention	Recommendation in relation to proposed scheme	Recommended RPA (m)
1	Goat willow	7.8	N - 7.5 E - 5.2 S - 6.4 W - 5.5	1,700	0.5 East	Mature	20+	P - Fair S - Fair Multi-stem, lower branch breaking off, some rot.	B1	<ul style="list-style-type: none"> None Requires removal for development 	15
2	Alder	10.1	N - 5 E - 4 S - 5.2 W - 2.7	1,000	1.4 North	Mature	40+	P – Fair S - Fair Smaller lower branches dying off	B1	<ul style="list-style-type: none"> None Requires removal for development 	12
3	Sessile oak	10.2	N - 1.3 E - 7.8 S - 7.4 W - 6.8	1,600	0.9 West	Mature	40+	P – Good S - Fair Conjoined with T4 at base	C1	<ul style="list-style-type: none"> None Requires removal for development 	15
4	Birch	15.9	N - 4.8 E - 6.4 S - 4.3 W - 6.3	1,200	1.3 West	Mature	40+	P – Good S – Fair Conjoined with T3 at base	C1	<ul style="list-style-type: none"> None Requires removal for development 	14
5	Goat willow	8.9	N - 1.2 E - 1.1 S - 4.3 W - 7.6	1,600	0.1 North	Over-mature	10+	P – Fair S - Poor DBH @ 0.7m; Multi-stem. Twist in lower stem	C1	<ul style="list-style-type: none"> None Requires removal for development 	15
6	Birch	5.7	N - 9 E - 6.1 S - 5.9 W - 5.3	2,200	0.2 North	Mature	40+	P – Poor S – Poor Twin-stem, multiple rot holes, root-collar extends over river bank and washed out.	U/C1	Retain if possible	15

Afon Claerwen Hydro Scheme
Tree Survey

7	Goat willow	7.8	N - 1.2 E - 3.6 S - 5.7 W - 5.9	1,000	0.6 North	Mature	20+	P - Fair S - Fair DBH @ 0.55m; Multi-stem from ground level; partly over riverbank	B1	None	12
8	Goat willow	6.0	N - 2.5 E - 2.5 S - 2.3 W - 3.7	700	1.6 West	Mature	40+	P - Good S - Good	A1	None	8
9	Goat willow	8.5	N - 9 E - 7.9 S - 7.4 W - 6.5	1,500	0.9 East	Over-mature	20+	P - Good S - Good Multi-stem	C1	None	15
10	Sessile oak	10.9	N - 5.5 E - 7.1 S - 6.1 W - 6.1	1,400	2.1 West	Young	40+	P - Good S - Good Some moss, good specimen	A1	None	15
11	Hawthorn	3.5	N - 3 E - 3.5 S - 3.1 W - 2.6	1,300	0.5 South	Over-mature	20+	P - Good S - Fair DBH @ 0.55m. Fungi growing at base	B2	None	15
12	Birch	4.3	N - 1.7 E - 3.5 S - 4 W - 3.5	800	1.8 South	Mature	40+	P - Good S - Fair Fungal growth on base	U/C1	Retain if possible	10
13	Norway spruce	21.4	N - 6.8 E - 7.5 S - 3 W - 1.7	1,100	1.9 South	Mature	10+	P - Fair S - Fair Group - Conifer plantation. Planted to close together and so at windthrow risk	C1	None	12
14	Norway spruce	21.4	N - 7.8 E - 0.5 S - 0.5 W - 6.7	1,800	1.9 North	Mature	10+	P - Fair S - Fair Group - Conifer plantation. Planted to close together and so at windthrow risk	C1	None	15



Afon Claerwen Hydro Scheme
Tree Survey

15	Sycamore	9.2	N - 6.6 E - 8.6 S - 7.9 W - 3	3,000	2.3 North	Mature	20+	P – Good S - Good Multi-stem, peeling bark. Conjoined T16	B1	<ul style="list-style-type: none"> • None • Requires removal for development 	15
16	Ash	5.7	N - 6.7 E - 0.5 S - 0.5 W - 1.9	1,300	1.7 West	Mature	20+	P – Fair S - Good Conjoined with T15. Twisted trunk. Some rot present, peeling bark	B1	<ul style="list-style-type: none"> • None • Requires removal for development 	15
17	Ash	7.2	N - 5.5 E - 6.2 S - 4.7 W - 5.2	1,600	1.7 North	Mature	40+	P – Good S – Good Some peeling bark. lichen.	A1	<ul style="list-style-type: none"> • None • Requires removal for development 	15
18	Birch	7.3	N - 3.7 E - 4.4 S - 3.4 W - 4.5	1,300	0.6 West	Over-mature	10+	P – Poor S – Poor Rotten at base. Cavity empty. Gall wasp affecting grow	U/C1	Retain if possible	15
19	Birch	7.9	N - 6.5 E - 4 S - 5.3 W - 5.7	500	1.9 South	Young	40+	P – Fair S - Poor Group. Over dis-used mine with root damage	C1	<ul style="list-style-type: none"> • None • Retain if possible 	6
20	Hawthorn	2.4	N - 2.5 E - 4 S - 3.9 W - 3.4	1,300	0.9 East	Over-mature	20+	P – Poor S - Fair DBH @ 0.7m; Multi-stem, rotten at base.	C3	None	15
21	Hawthorn	4.2	N - 4 E - 3.9 S - 3 W - 2.6	600	1.1 West	Over-mature	10+	P – Poor S – Poor Coppiced stool, rotten with hollowing stems	C3	None	8
22	Hawthorn	1.7	N - 3 E - 3.4 S - 2.5 W - 3	1,000	0.5 East	Over-mature	40+	P – Good S – Good DBH @ 0.5m; Split trunk with twist	C3	<ul style="list-style-type: none"> • None • Requires removal for development 	13



Afon Claerwen Hydro Scheme
Tree Survey

23	Hawthorn	4.7	N - 2.4 E - 5 S - 3 W - 2.1	400	0.6 East	Over- mature	<10	P – Poor S – Poor Rotten at base. Multi-stem.	U	Retain if possible	5
24	Ash	22.8	N - 6.6 E - 7.9 S - 7.9 W - 6.3	1,300	1 North	Over- mature	20+	P – Poor S – Fair Multi-stem; Canker throughout	U/C1	Remove	15
25	Ash	12.5	N - 6 E - 8.9 S - 8.4 W - 6.1	2,500	1.2 East	Mature	40+	P – Good S – Good	A1	None	15
26	Sycamore	10.8	N - 5.5 E - 6.9 S - 6.9 W - 6.7	1,900	1.6 South	Mature	40+	P – Good S – Good	A1	<ul style="list-style-type: none"> • None • Retain if possible 	15
27	Birch	10.8	N - 7.6 E - 9 S - 9.7 W - 6.7	2,500	1 West	Mature	40+	P – Good S – Good DBH @ 0.8m; Twin-stem	A1	None	15
28	Hawthorn	4.5	N - 4.1 E - 5.8 S - 3.5 W - 4.5	1,300	1 West	Over- mature	20+	P – Good S – Good DBH @ 0.66m	B1	None	15
29	Birch	13.0	N - 7 E - 6.5 S - 1 W - 6.7	2,200	1.7 West	Over- mature	20+	P – Good S – Good	B1	None	15
30	Goat willow	10.3	N - 6.5 E - 6.2 S - 8.2 W - 3.9	1,600	2.3 South	Over- mature	20+	P – Good S - Fair DBH @ 0.9m (where trunk split into fork)	B1	None	15
31	Birch	8.3	N - 4 E - 4.9 S - 7.1 W - 6.3	1,600	1.7 North	Over- mature	20+	P – Fair S – Fair DBH @ 1.2m (where multi-stem occurs). Some branch rot	B1	Remove dead and rotting branches	15



Afon Claerwen Hydro Scheme
Tree Survey

32	Birch	10.9	N - 3.8 E - 6 S - 6.5 W - 5.6	1,500	1.5 North	Mature	40+	P - Good S - Good	A1	None	15
33	Sycamore	10.0	N - 3.6 E - 3.7 S - 4.6 W - 5.4	1,600	2.1 South	Over- mature	<10	P - Poor S - Poor Dead in canopy top. Some young growth at split	U	<ul style="list-style-type: none"> • Remove • Requires removal for development 	15
34	Hawthorn	4.6	N - 2.9 E - 3 S - 2.3 W - 2.8	900	1 East	Over- mature	10+	P - Poor S - Poor Twin-stem; basal rot	C1	<ul style="list-style-type: none"> • None • Requires removal for development 	11
35	Beech	11.1	N - 6.3 E - 4.1 S - 5.7 W - 5.1	1,800	1.3 North	Mature	40+	P - Poor S - Poor DBH @ 1.2m; Multi-stem with trunk dead in places; lots of carpet moss	B1	<ul style="list-style-type: none"> • None • Requires removal for development 	15
36	Larch	21.2	N - 5.1 E - 8.2 S - 7.2 W - 4	1,600	5.5 West	Mature	20+	P - Good S - Good	C1	<ul style="list-style-type: none"> • None • Requires removal for development 	15
37	Larch	19.3	N - 4.1 E - 4.3 S - 5.3 W - 7	1,600	1.7 West	Mature	20+	P - Good S - Good	C1	<ul style="list-style-type: none"> • None • Requires removal for development 	15
38	Beech	11.7	N - 6.7 E - 5.5 S - 4.9 W - 5.8	2,100	1.4 South	Over- mature	10+	P - Fair S - Fair Some rot. Extensive bark peel	C1	<ul style="list-style-type: none"> • None • Retain if possible 	15
39	Ash	13.4	N - 6.1 E - 5.8 S - 6.3 W - 5.5	1,000	1.6 South	Mature	40+	P - Good S - Good Twin-stem	B1	None	13
40	Birch	11.1	N - 4.5 E - 3.8 S - 6.4 W - 5.8	1,300	1.9 North	Mature	40+	P - Good S - Good	A1	None	15



Afon Claerwen Hydro Scheme
Tree Survey

41	Ash	11.5	N - 4.5 E - 5.4 S - 6.3 W - 4.9	1,400	1.9 North	Over- mature	20+	P - Fair S - Fair Fork in stem. One stem dead and rotting. Other healthy	B1	None	15
42	Goat willow	10.3	N - 8.1 E - 7.7 S - 5.1 W - 6.2	3,100	1.3 South	Over- mature	40+	P - Good S - Good DBH @ 1.0m; Pollard at lowest branch. Carpet moss	B1	None	15
43	Horse chestnut	16.5	N - 4.4 E - 1 S - 6 W - 4.6	3,200	3.6 East	Mature	40+	P - Fair S - Fair Some lower branch decay with one hazard beam	B1	<ul style="list-style-type: none"> Remove dead and decaying branches. Monitor hazard beam and remove if necessary Retain tree if possible 	15
44	Beech	19.5	N - 1.1 E - 7.5 S - 8.5 W - 1	3,500	3 South	Mature	40+	P - Good S - Good	A1	<ul style="list-style-type: none"> None Retain if possible 	15
45	Sycamore	24.6	N - 7.6 E - 5.7 S - 4.6 W - 2	2,600	1.7 East	Over- mature	10+	P - Poor S - Poor Multi-stem; One dead stem. Further branch dieback. Trunk rot	U/C1	Retain if possible	15
46	Hawthorn	6.1	N - 3.3 E - 2.3 S - 2.8 W - 4	800	1.6 West	Mature	20+	P - Good S - Good	B1	<ul style="list-style-type: none"> None Requires removal for development 	10
47	Rowan	4.3	N - 0.6 E - 3.3 S - 4.2 W - 4.3	900	1.4 South	Over- mature	<10	P - Poor S - Poor Trunk hollow, branch dieback extensive	U/C1	Retain if possible	11
48	Crab apple	3.5	N - 4.7 E - 3.2 S - 2.9 W - 5.3	1,800	0.5 North	Mature	20+	P - Fair S - Good DBH @ 0.4m; Twin-stem; Peeling bark and rust	B1	<ul style="list-style-type: none"> None Requires removal for development 	15

Afon Claerwen Hydro Scheme
Tree Survey

49	Rowan	3.5	N - 3.5 E - 5.6 S - 5.5 W - 3	1,600	0.7 North	Mature	20+	P – Fair S - Fair Fork at lowest branch; Rot hole and bark peel. Overhanging river; Roots likely asymmetrical and constrained to steep bank	C1	<ul style="list-style-type: none"> • None • Retain if possible 	15
51	Hawthorn	5.9	N - 2.3 E - 1.8 S - 2.9 W - 2.5	900	0.9 South	Mature	20+	P – Fair S - Good Some fungal decay and some new growth	A1	None	10
52	Sycamore	8.8	N - 4.1 E - 5.5 S - 6.3 W - 6.7	1,900	1.7 West	Mature	40+	P – Fair S - Good Minor deadwood in lower branches	A1	Remove dead branches	15
53	Birch	13.6	N - 7 E - 5.6 S - 5.8 W - 5.5	1,600	1.2 West	Mature	40+	P – Good S - Good DBH @ 0.9m; Split stem	B1	<ul style="list-style-type: none"> • None • Retain if possible 	15
54	Goat willow	8.9	N - 5.9 E - 4.5 S - 5.5 W - 7.3	900	0 West	Mature	40+	P – Good S - Good Multi-stem tree in flush	B1	None	11
55	Goat willow	8.4	N - 4.1 E - 5.5 S - 6.3 W - 6.7	1,900	1.6 West	Mature	40+	P – Good S - Good Multi-stem tree in flush	B1	<ul style="list-style-type: none"> • None • Retain if possible 	15
56	Goat willow	8.3	N - 5.2 E - 7.6 S - 8.3 W - 7.4	3,300	1.5 South	Over-mature	10+	P – Poor S – Poor Trunk largely rotted away and hollow; Split at top of trunk and reformed into stems inc. along ground. fresh growth.	C1	None	15



Key to Tree Schedule BS 5837 2012

Tree No.

Tree numbers applied to each tree are as per the Tree Survey Plan and subsequent drawings, where trees occur as a cohesive group these are suffixed with a G, they are assessed as such, with all size data being given as mean figures unless otherwise stated. Any trees on-site and off-site that are appropriate to be included but are omitted from the topographical survey supplied are included in the schedule, though their positions are shown only indicatively. The measurement conventions are as follows.

- height, crown spread and crown clearance are recorded to the nearest half metre (crown spread is rounded up) for dimensions up to 10 m and the nearest whole metre for dimensions over 10 m
- stem diameter is recorded in millimetres, rounded to the nearest 10 mm (0.01 m)
- estimated dimensions (e.g. for off-site or otherwise inaccessible trees where accurate data cannot be recovered) should be clearly identified as such (e.g. suffixed with a "#").

Height (m)

Tree height measured in metres

Stem Diameter (mm)

Stem diameter in millimetres measured at 1.5m above ground level. Where the stem is divided below 1.5m, measurement is taken as directed by BS 5837 Annex C.

Branch Spread (m)

Radial crown spread in metres, measured for each of the four cardinal points of the compass from the centre of the trunk.

Height of Lowest Branch (m) and direction of growth

Height above ground in metres of the lowest branch and use of the 4 cardinal points of the compass.

Life Stage

- NP Newly planted – a tree within 3 years after planting
- YM Young Mature – a tree within its first one third of life expectancy
- MA Middle-aged – a tree within its second third of life expectancy
- M Mature – a tree in its final one third of life expectancy
- OM Over Mature – a tree having reached its maximum life span and is declining in health and size due to old age
- V Veteran – a tree that is of interest biologically, aesthetically or culturally because of its age, size and condition



Physiological Condition

An assessment of the physiological condition (i.e. health/vitality) of the tree categorised into:

- GOOD a tree in a healthy condition with no significant problems
- FAIR a tree generally in good health with some problems that can be remediated
- POOR a tree in poor health with significant problems that can't be remediated
- DEAD a tree without sufficient live material to sustain life

Structural Condition

An assessment of the structural/safe condition of the tree categorised into:

- GOOD a tree in a safe condition with no significant defects
- FAIR a tree in a safe condition at present but with defects or with significant defects that can be remediated
- POOR a tree with significant defects that can't be remediated

Notes related to both physiological and structural condition follow the categorization in order support the statement and give greater detail on the true quality and value of the tree.

Recommendation

These may include further investigations for the presence or extent of decay or climbed inspections, ivy removal or pruning works when access is a non-moveable aspect etc (NB this is not intended to be a specification for tree work and further advice maybe required prior to implementation). Trees assessed as being in apparently immediately hazardous condition will be notified to the client separately as soon as practicable.

Estimated Remaining Life Contribution

An estimate of the remaining life contribution in years that the tree or group of trees is expected to have based on species, condition on the site in its current context. The following bands are used:

- <10 Tree is dead or dying and unlikely to contribute beyond 10 years
- 10+ Tree is assessed as being able to contribute to the site for 10+ years
- 20+ Tree is assessed as being able to contribute to the site for 20+ years
- 40+ Tree is assessed as being able to contribute to the site for 40+ years

Quality and Value Category Grade



Afon Claerwen Hydro Scheme
Tree Survey

Quality & Value grade classification according to BS5837:2012, Table 1 *Cascade chart for tree quality assessment*

- U Trees that cannot be realistically retained
- A Those trees of HIGH value quality to retain
- B Those trees of MODERATE quality to retain
- C Those trees of LOW quality to retain



Appendix B – Tree Survey



Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

! A1

! B1

! B2

! C1

! C3

! U

Canopy Spread (Circular)

! A1

! B1

! B2

! C1

! C3

! U

! Group - Coniferous

! Group - Deciduous

! Hedge

— Stream

0 50 Meters

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Scale: 1,250

Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

! A1

! B1

! B2

! C1

! C3

! U

Canopy Spread (Circular)

▨ A1

▨ B1

▨ B2

▨ C1

▨ C3

▨ U

▨ Group - Coniferous

▨ Group - Deciduous

▨ Hedge

— Stream

0 50 Meters

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Date: 06/03/2018

Scale: 1,250

Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

- ! A1
- ! B1
- ! B2
- ! C1
- ! C3
- ! U

Canopy Spread (Circular)

- ! A1
- ! B1
- ! B2
- ! C1
- ! C3
- ! U

! Group - Coniferous

! Group - Deciduous

! Hedge

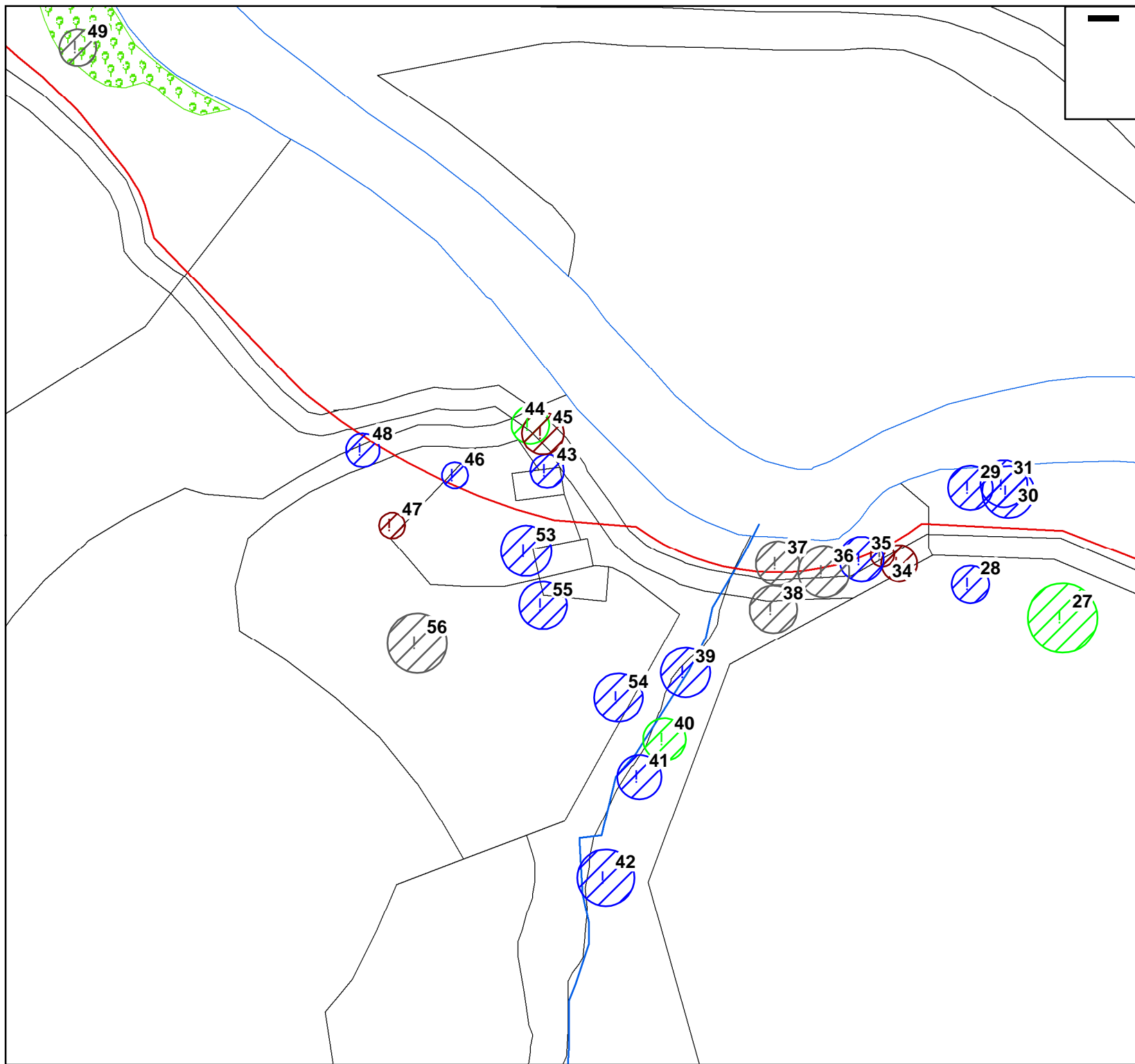
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Date: 06/03/2018

Scale: 1,250



Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

- ! A1
- ! B1
- ! B2
- ! C1
- ! C3
- ! U

Canopy Spread (Circular)

- A1
- B1
- B2
- C1
- C3
- U

Group - Coniferous

Group - Deciduous

Hedge

Stream

0 50 Meters

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Date: 06/03/2018

Scale: 1,250

Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

- ! A1
- ! B1
- ! B2
- ! C1
- ! C3
- ! U

Canopy Spread (Circular)

- [Green diagonal lines] A1
- [Blue diagonal lines] B1
- [Blue diagonal lines] B2
- [Grey diagonal lines] C1
- [Grey diagonal lines] C3
- [Red diagonal lines] U

[Green trees icon] Group - Coniferous

[Green trees icon] Group - Deciduous

[Green dashed line] Hedge

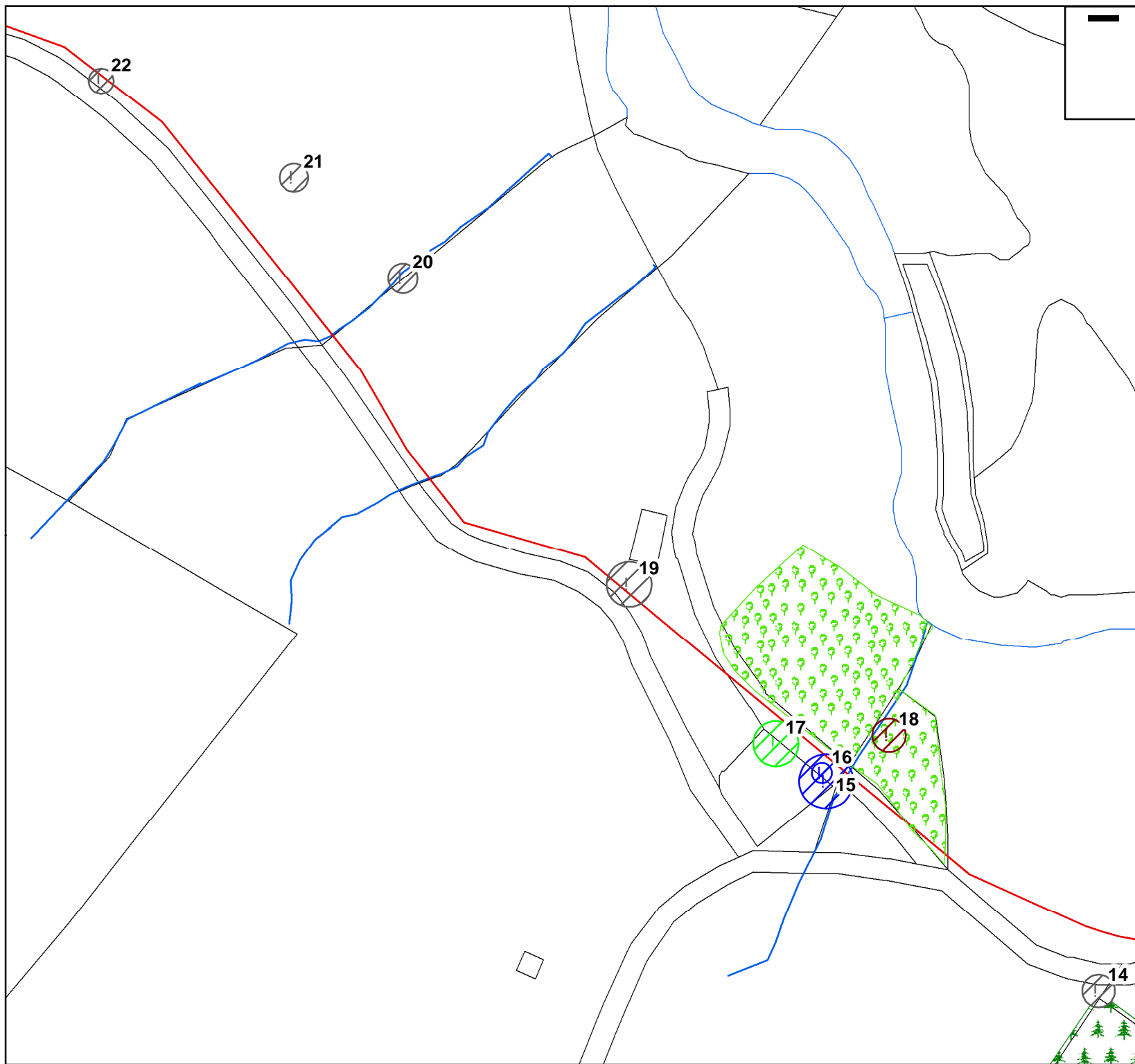
[Blue line] Stream

0 50 Meters

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Date: 06/03/2018

Scale: 1,250



Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

- ! A1
- ! B1
- ! B2
- ! C1
- ! C3
- ! U

Canopy Spread (Circular)

- [Green diagonal lines] A1
- [Blue diagonal lines] B1
- [Blue diagonal lines] B2
- [Grey diagonal lines] C1
- [Grey diagonal lines] C3
- [Red diagonal lines] U

[Green trees icon] Group - Coniferous

[Green trees icon] Group - Deciduous

[Green dashed line] Hedge

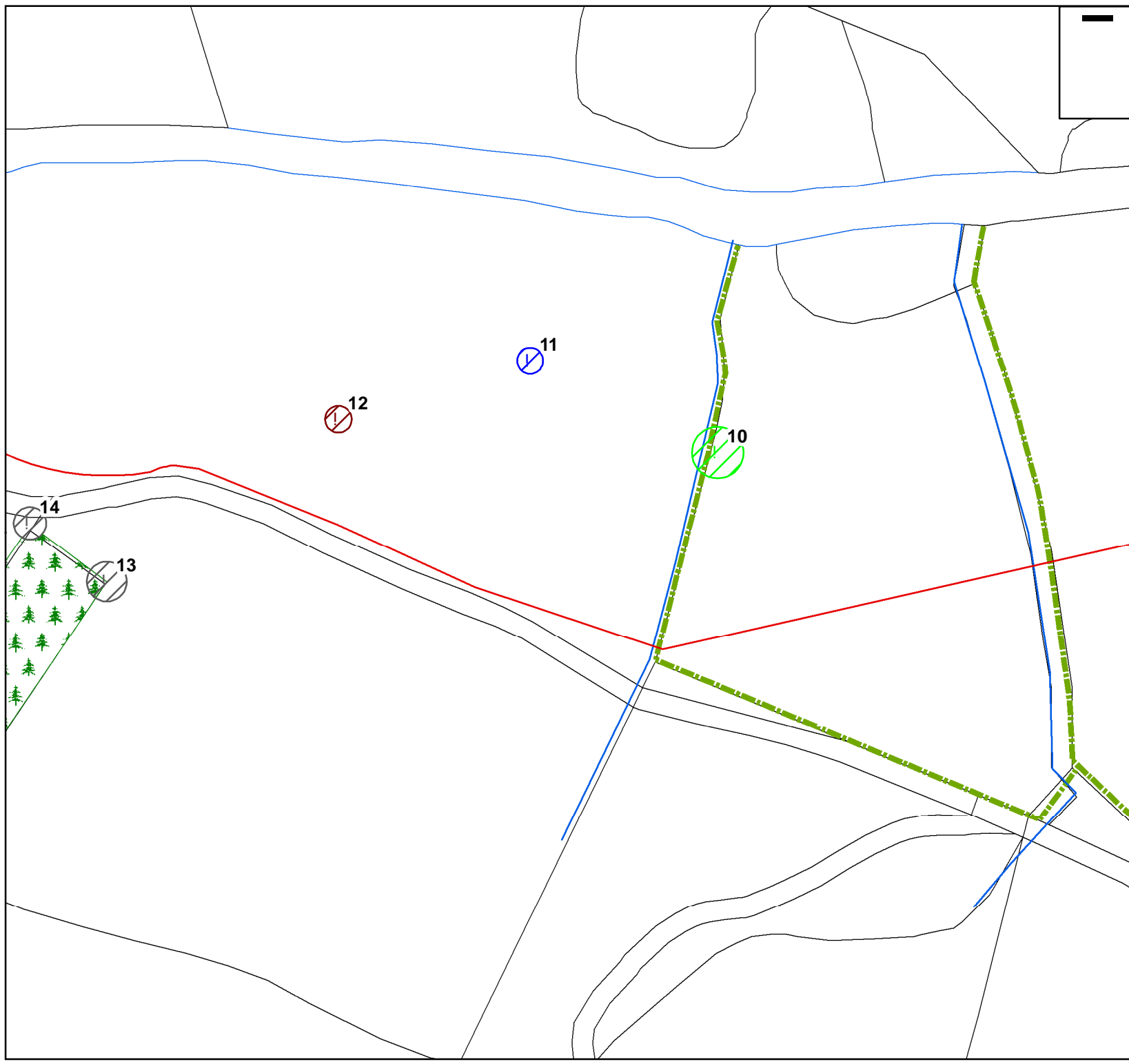
[Blue line] Stream

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Date: 06/03/2018

Scale: 1,250



Afon Claewen Hydro Scheme

BS5837:2012 TREE SURVEY

Key:

— Layout

Tree Category

- ! A1
- ! B1
- ! B2
- ! C1
- ! C3
- ! U

Canopy Spread (Circular)

- A1
- B1
- B2
- C1
- C3
- U

Group - Coniferous

Group - Deciduous

Hedge

Stream

0 50 Meters

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Date: 06/03/2018

Scale: 1,250

Appendix C – Tree Protection Plan



Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

— Layout

▭ Site boundary

Tree Retention Category

! Remove

! Retain

! Retain if possible

▭ Root protection area

— Hedge

— Stream

0 50 Meters

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Date: 06/03/2018

Scale: 1,250

Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

— Layout

□ Site boundary

Tree Retention Category

! Remove

! Retain

! Retain if possible

□ Root protection area

— Hedge

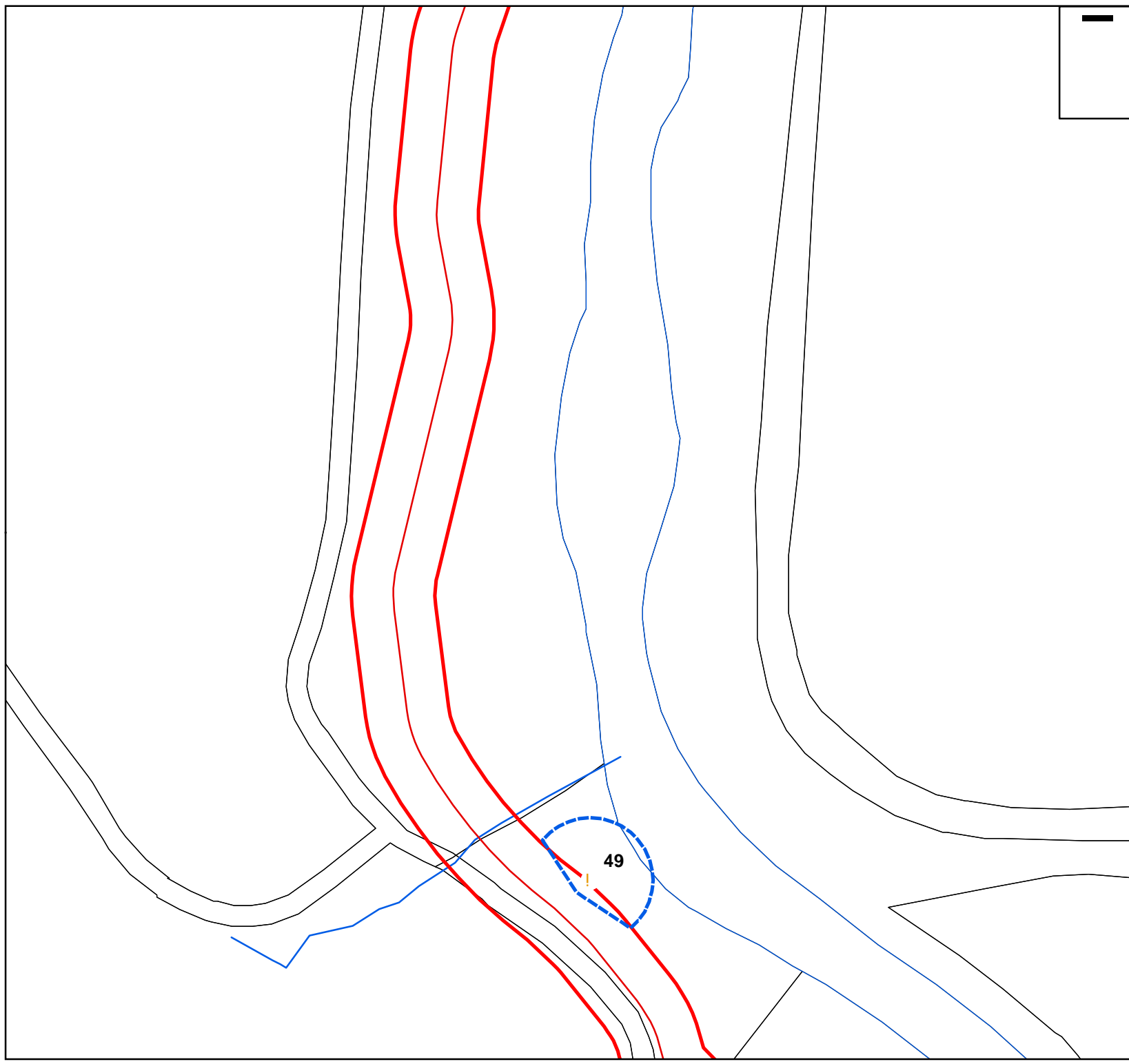
— Stream

0 50 Meters

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Date: 06/03/2018









Scale: 1,250

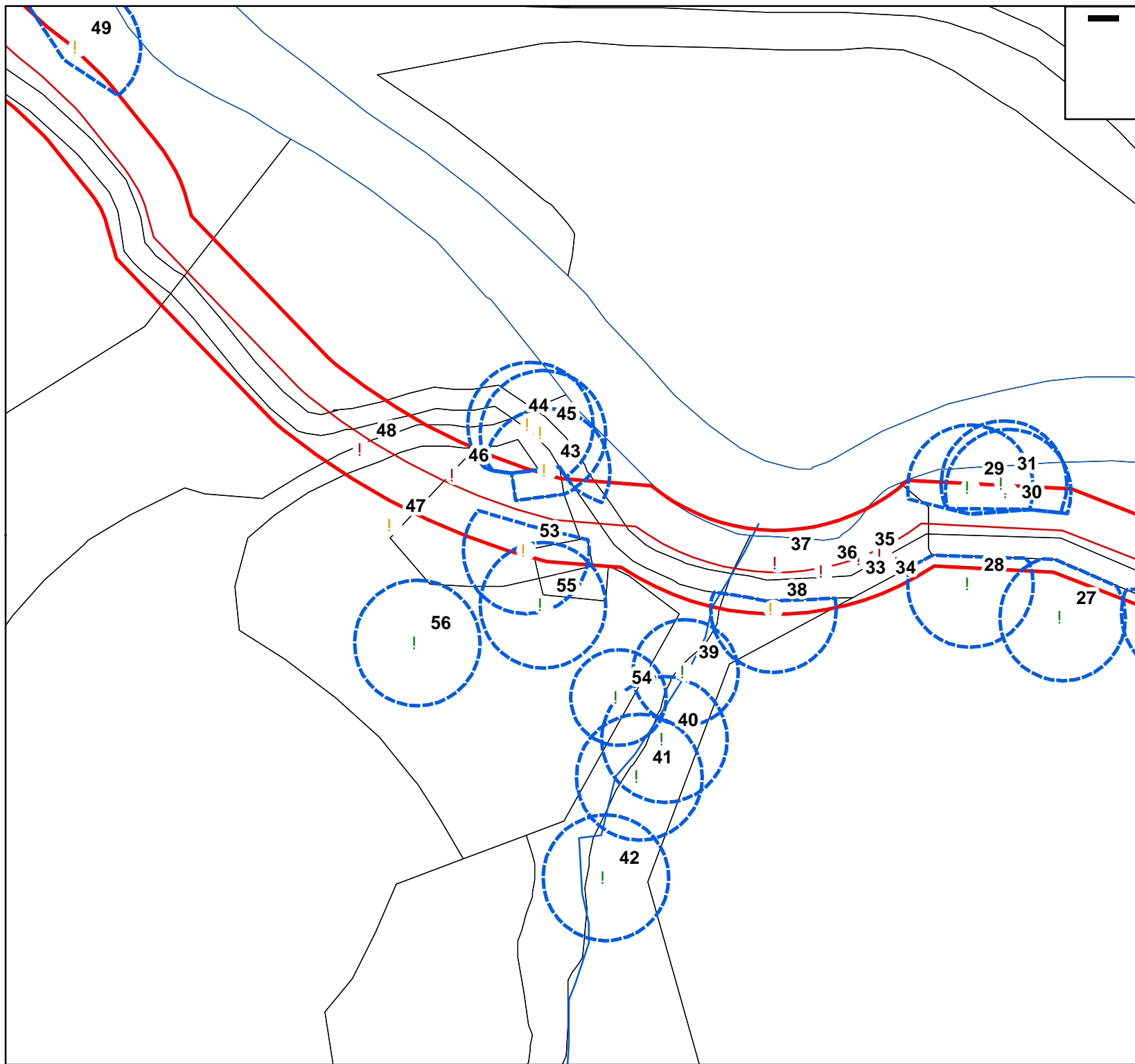


Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

-  Layout
-  Site boundary
- Tree Retention Category**
 -  Remove
 -  Retain
 -  Retain if possible
-  Root protection area
-  Hedge
-  Stream



0 50 Meters

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Date: 06/03/2018

Scale: 1,250

Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

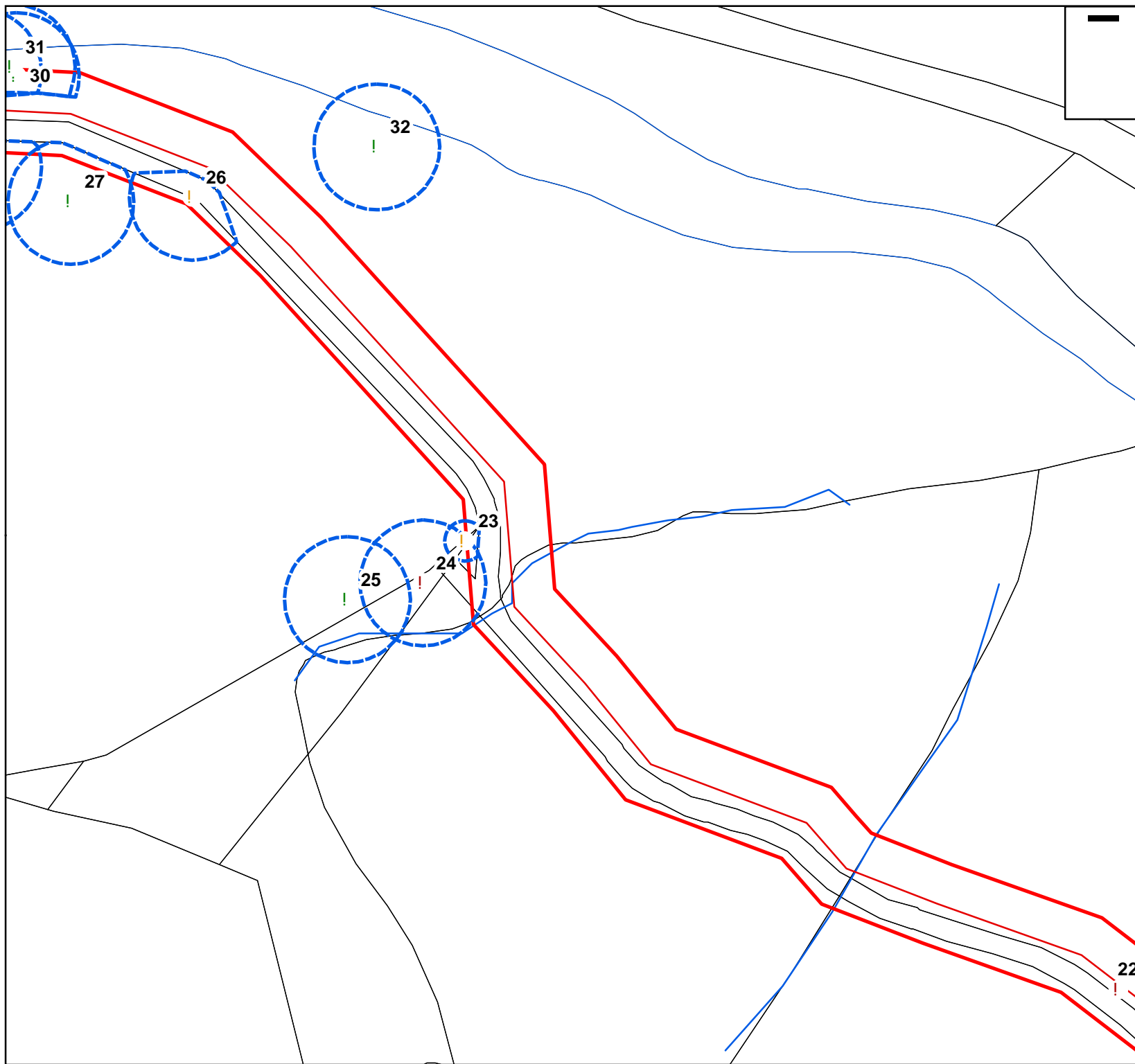
-  Layout
-  Site boundary
- Tree Retention Category**
 -  Remove
 -  Retain
 -  Retain if possible
-  Root protection area
-  Hedge
-  Stream



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Date: 06/03/2018









Scale: 1,250



Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

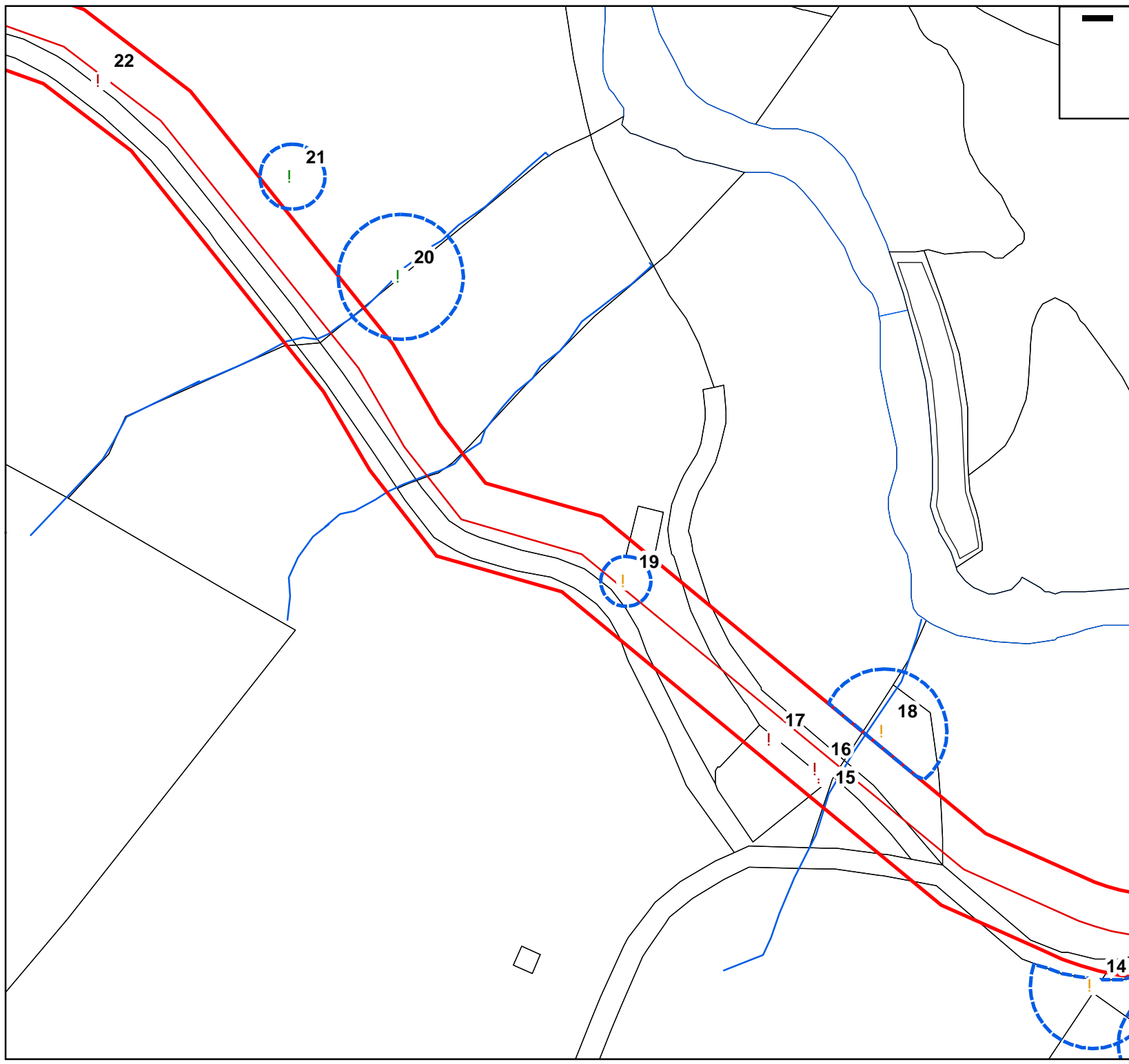
-  Layout
-  Site boundary
- Tree Retention Category**
-  Remove
-  Retain
-  Retain if possible
-  Root protection area
-  Hedge
-  Stream

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Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

— Layout

□ Site boundary

Tree Retention Category

! Remove

! Retain

! Retain if possible

□ Root protection area

— Hedge

— Stream

0 50 Meters

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Afon Claewen Hydro Scheme

Tree Protection Plan

Key:

— Layout

□ Site boundary

Tree Retention Category

! Remove

! Retain

! Retain if possible

□ Root protection area

— Hedge

— Stream

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Date: 06/03/2018

Scale: 1,250