



Appendix 4

Water Survey

Report on water requirements for the Lammas Project, Pont y gafel Farm, Dyfed .

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This report was prepared following a visit to the farm on 22nd April 2006 and updated in December 2007 following further information supplied and details of the proposed development.

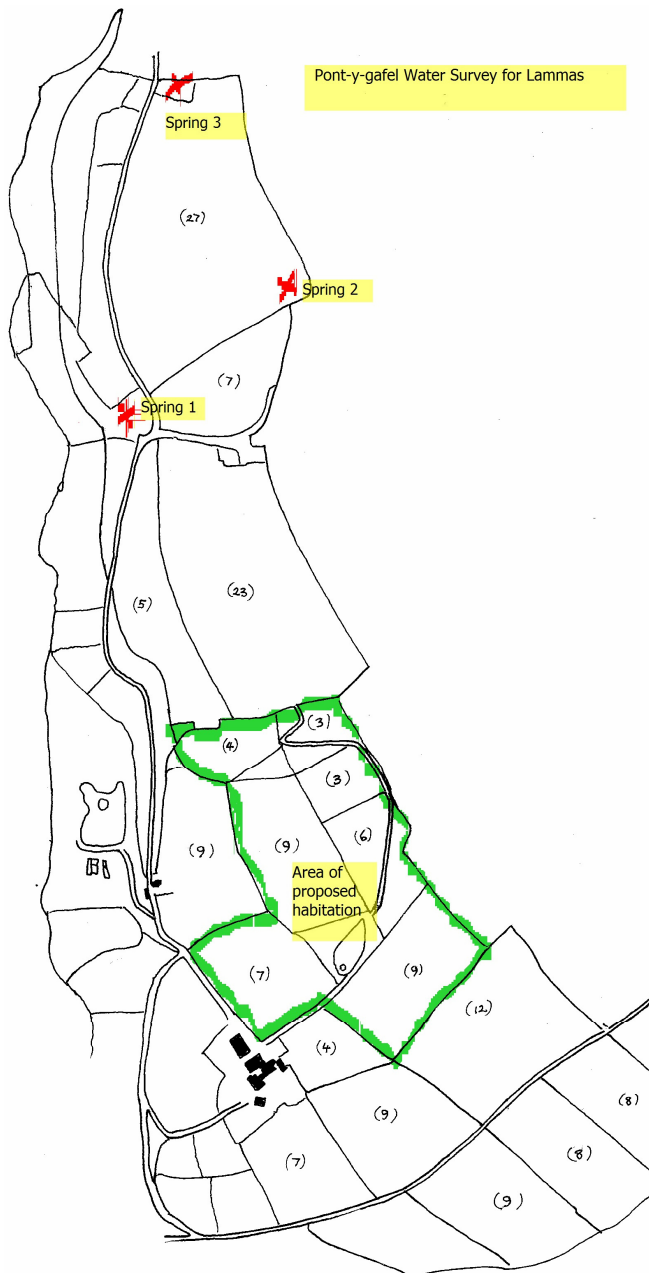
Sources

There are 3 springs on site which are identified on the map below and labelled as follows:

Spring 1: The current spring feeding the farm and bottling plant issuing inside a collection chamber inside a sealed building and with an immediately protected catchment.

Spring 2: Further up the hill from spring 1, with no collection chamber near to the crest of the hill.

Spring 3: The spring near the northern boundary of the farm. It issues about halfway down the hill but flow seems reabsorbed into the ground when visited and no flowing water below was visible.



Uses for the sources:

Spring 1 is collected inside a sealed building roughly halfway down the hill and therefore consistent with a spring from groundwater. The area around is not cultivated and animals are kept away. Ground and vegetation is clean. The source has been used for drinking and bottling by the farm for many years and the supply has apparently been tested. This source seems eminently suitable for drinking water.

Spring 2 does not have a clear issuing point and emerges near to the crest of the ridge at the edge of the farm. The field adjacent has sheep, which are not part of the Lammas farm, and which congregate near the wall and trees beside the issuing area. There could be a risk of contamination from the sheep and the location of the spring area near the crest could indicate that the water is surface water rather than deeper groundwater. This is therefore likely to be of doubtful quality and of variable flow depending upon rainfall rather than a reservoir within the aquifer. I would not recommend using this source for drinking water without further work to check the quality, isolate the catchment, remove the sheep to a distance and provide a hygienic collection chamber. As a source of water for irrigation of plants etc it should be suitable. If this water is to be used for horticulture for salad crops etc then it would still be worth protecting the catchment as much as possible and providing a collection chamber. Sheep are able to contaminate water supplies, for example by cryptosporidia, which is very robust and could be transferred on to salad crops by irrigation.

The volume of water from spring 2 was not measured but is probably of the order of 10 l/min. It could be worth checking this using a v-notch or timing the filling of a suitable container. Given that the visit was in spring (albeit not the wettest) this is probably the highest flow likely and could be expected to decline in the summer. If irrigation of crops is required in a dry summer I would expect that this spring could reduce to almost nothing, although observation and local knowledge could provide useful information here. Even at the current flow it would not be sufficient to irrigate a large area in a dry period.

Spring 3 was a small pond in a collection of trees. From the location halfway down the hill it looks as though it could be groundwater but below the muddy area and the small pond I could see no flowing surface water. This could indicate that the flows are very small or that the flow returns underground. It could be worth cleaning the area and trying to identify the source and building a collection chamber but at present I would suggest that any water from spring 3 should be considered a bonus rather than be relied upon.

Drinking water requirements for the Lammas project

Domestic demand

There are plans for 9 households on the project. Water supply for a conventional housing project is normally based upon 0.5 m³/day/property (500 litres/day). The water requirements for an eco-village may be less since there are unlikely to be widespread dishwashers and washing machines, for example. I would consider that 500 l/property/day should be very generous for domestic needs here.

The total domestic water requirements are therefore for the total Lammas development is likely to about 4,500 litres/day.

Supply available from Spring 1

The farm owner reports yields from the well at an average of 30 l/min dropping to 20 l/min in dry periods of late summer. The spring never runs dry.

The arrangement is that the Lammas residents will have the use of this water for 12 hours per day which is therefore a minimum of 14,400 litres per day, about three times the estimated daily requirement.

There is therefore no problem with the quantity of water available for domestic use for the Lammas residents.

Water distribution arrangements

Due to the topography of the farm, the supply from spring 1 should be able to feed the households using a gravity supply. A small reservoir or storage tank is required to store water at night and provide water to each resident during the day. I would suggest that a tank of about 5 -6 m³ below spring 1 should be ample, or alternatively each household could use a small storage tank fed from a small 'header tank' at the spring. From a quality point of view the water should be stored for as short a period as reasonable (and in a rainproof, insect-proof container in as cool and dark conditions as possible). The reservoir and distribution system must be kept clean and some form of filter should be

incorporated between the spring and the reservoir/header tank to remove any debris that could find its way into the spring chamber.

Water Quality Regulations

Water supplies for a small-scale private supply fall under regulations to protect the public. Although the spring has been used by the farm for some time it would be worthwhile to ask the local authority to check the water quality, if for no other reason than to demonstrate that a responsible approach is being taken. Details and sensible advice can be obtained from the Drinking Water Inspectorate website. See for example www.dwi.gov.uk/pubs/private/index.htm#1

The regulations can be found on www.dwi.gov.uk/regs/si2790/2790.htm

Sanitation systems to avoid groundwater contamination

The areas of habitation as currently projected are far from the springs and at a lower elevation. The density of occupation is also very low. Under these circumstances it is extremely unlikely that any activity in the inhabited areas will effect the quality of the spring flows.

To protect all other groundwaters however I would suggest that reasonable precautions should be taken. . To avoid any ambiguity or risk therefore the following guidelines are advised:

1. the reed beds and composting toilets should not be sited at a lower elevation than any of the springs or within 100m of the springs.
2. The composting toilets must be sited to avoid rainwater entry or flooding and not used for any other liquid disposal.
3. The reed beds should be lined with puddle clay or a protected membrane.

Conclusions:

1. The quantity and quality of water from spring 1 is suitable to meet the drinking and domestic water requirements for the proposed project.
2. The households proposed should all be able to receive water by gravity possibly using a small reservoir/tank near spring 1.
3. Spring 2 is not recommended for drinking water and should be isolated from sheep if used to irrigate salad-type crops.
4. Spring 3 seems to have a low yield but should be suitable for irrigation
5. There is very little risk of groundwater contamination for the size of development proposed and the location relative to the springs. If the recommended guidelines on construction and siting of reed beds and composting toilets are followed then the proposals are more than adequate..

PNW 07 December 2007