Scottish Forestry
Coilltearachd na h-Alba

Managing forestry operations to protect private water supplies

Scottish Forestry is the Scottish Government agency responsible for forestry policy, support and regulation.
S e Coilltearachd na h-Alba a' bhuidheann-ghnìomha aig Riaghaltas na h-Alba a tha an urra ri poileasaidh, taic agus riaghladh do choilltearachd.

Scottish Government
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Scottish Forestry is the Scottish Government agency responsible for forestry policy, support and regulation. We are committed to promoting sustainable forest management across Scotland through policy, advice, regulation and grant aid in accordance with the UK Forestry Standard (UKFS).

The UKFS is the reference standard for sustainable forest management in the UK. It outlines the context for forestry, sets out the approach of the UK governments to sustainable forest management, defines standards and requirements and provides a basis for regulation and monitoring.

In order to comply with the UKFS, forestry planning and operations need to carefully consider and reduce potential environmental risks, including those associated with private water supplies. This guidance outlines due diligence measures at the planning, operations and post-operations stages of forestry activities to safeguard private water supplies.

Version history

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Version 1	May 2025	First publication.

Contents

Introduction

Well-planned, designed and managed forests can benefit the water environment. These benefits include alleviating flood risk; protecting aquatic habitats and species; preventing soil loss and erosion; reducing water temperatures; and reducing water treatment costs for water supplies. In contrast, poor forest management can diminish or reverse these benefits, including in certain circumstances, reducing the volume of water supplies.

This guidance provides information on how to incorporate safeguarding measures for private water supplies into forestry proposals, forest planning, during operations and post-operations. Following this guidance will help to protect water quality, quantity and private water supply infrastructure. Separate guidance applies to the protection of public water supplies; refer to Forestry activities around Scottish Water assets.

The guidance compliments the UK Forestry Standard (UKFS) and associated UKFS Practice Guides (Annex 1), bringing the requirements into a Scottish context. It does not detail the legislative framework that underpins forestry, private water supply and the water environment.

Who is this guidance for?

This guidance is aimed at forest managers, practitioners, planners and supervisors such as: Landowners/Forest Managers, Forest Works Managers and Contractors/Sub-contractors. It outlines steps to be taken before, during and after operational activities in areas containing private water supplies.

What are private water supplies?

Operational considerations differ between public and private water supplies. Public water supplies are provided by the water authority, Scottish Water. Private water supplies are drinking water supplies that are not the responsibility of Scottish Water but of their owners and users.

In Scotland, private water supplies fall into one of two categories:

i. **Regulated supplies (formerly known as Type A supplies)**: those which (a) supply 50 or more people and provide 10 cubic metres (m^3) or more of water per day or (b) are supplying premises that are part of a commercial or public activity, regardless of the number of people served or the volume supplied. Regulated supplies serve a variety of premises, for example: private/residential lets, holiday lets, B&Bs, hotels, caravan parks/campsites, schools, community halls and a range of other facilities.
ii. **Type B supplies**: are all other domestic private water supplies, many of which serve single properties.

Private water supply infrastructure

Private water supply infrastructure can consist of numerous components, which may not always be visible and the condition of these may vary. The infrastructure could be relatively new or a legacy asset for which there is not much information on. All private water supply infrastructure can be vulnerable to physical damage from forestry operations. Types of private water supply infrastructure include:

- A small dam (photo A) and/or collection chamber (photo B);
- Blue water supply pipes;
- Associated pipework;
- Collection tanks; and
- Storage tanks (photo A).

See the *Damage to private water supply infrastructure* section for photographic examples of private water supply infrastructure.

A typical surface water abstraction point involving a small dam to impound water plus associated pipework connecting to settlement and/or storage tanks serving a local property. Photo by Tom Nisbet.

Collection chambers can be simple structures that can become weak or brittle with age. Photo by Tom Nisbet.

Types of private water supplies

Most private water supplies are located in rural areas but can also exist in close proximity to urban areas. No private water supply is the same as they vary in size, layout and nature. Similarly, water sources for private water supplies can greatly differ in size and nature, which can range from groundwater sources like springs, flushes and aquifers to direct surface water sources like rivers, streams and lochans. They can serve single households to whole communities and vary in their relative vulnerability to environmental and land use changes. Surface water and shallow groundwater sources are particularly vulnerable to land use change and management.

Direct surface water abstraction (lochans and streams)

Many private water supplies in Scotland come directly from surface water sources such as a stream or lochan. They are highly vulnerable to land use change and management due to the water being on the ground surface and easily disturbed. Once damaged, they can be difficult and expensive to restore. Great care is required in the design and management of woodland to ensure surface water supplies are protected from disturbance.

Springs and flushes

Springs and flushes are where groundwater flows onto the surface. Their vulnerability depends on the source of the groundwater, particularly its depth and extent. Shallow sources of groundwater flowing through the soil and subsoil, or draining shallow wetlands, are highly vulnerable to soil disturbance, while the opposite is generally the case for deeper sources draining permeable bedrock. However, regardless of the depth of the groundwater source, the locations where the groundwater emerges as springs and flushes are extremely vulnerable to disturbance and need protection.

Borehole or well

Boreholes typically access deeper groundwater (30-100 m depth) that is less vulnerable to land use change and management. They can be expensive to install but can provide a reliable source of drinking water, depending on the permeability of the bedrock. Poor construction and lack of maintenance can make them more vulnerable to disturbance. The groundwater often needs to be pumped to the surface and may require treatment to remove natural contaminants such as dissolved metals. Wells tend to be shallower and wider features and should be considered highly vulnerable to disturbance when less than 5 m deep.

Why protect private water supplies?

Households and commercial activities rely on private supplies for clean water and any disruption can cause serious problems. It is an offence to pollute the water environment[1] and to cause deterioration of the quality of a private water supply[2]. Private water supplies are often served by water draining from relatively small areas of upslope or upstream land. This makes them easily polluted or disrupted by local land management disturbing the soil or introducing contaminants. Consequently, it is important that forest managers and contractors follow the good practice in this guidance to ensure adequate safeguards are in place to protect supplies.

Water yield

Woodland creation and some forestry operations can reduce the available water yield for private water supplies[3]. As a consequence, households or businesses reliant on private water supplies can run out of water or find flow reduced to a level which is not fit for purpose. Woodland creation, especially involving conifer planting, is likely to increase evaporation and thereby add a competing demand for water. Forest roads, ground excavation, soil damage and drainage work can divert water flows and reduce or prevent rainwater from reaching private supplies. Climate change is also having an impact on water availability in catchments. A combination of prolonged dry weather and competing water demands in catchments can lead to water shortages.

Pollution

Cultivation, drainage, road construction (photo C) and harvesting can cause siltation and pollution of private water supplies. This is especially true when the ground is saturated or prone to erosion. Siltation (photo D) can block water intakes and pipes, which makes it more difficult and expensive to treat water to make it suitable for drinking. Increased turbidity can also reduce the effectiveness of water treatment and makes it more expensive (photo E). Ground disturbance can increase bacterial and pathogen loading. The limited infrastructure and technology available to the owners of private water supplies means that it is often not possible to treat polluted water, making it unsafe to drink. Chemicals, fuel oils and lubricants can also pollute water supplies. Natural contaminants in the environment can also exist (photo F).

[1] The Water Environment and Water Services (Scotland) Act 2003 and The Water Environment (Controlled Activities) (Scotland) Regulations 2011
[2] The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017
[3] Refer to the Information Note on Water Use By Trees by Forest Research to learn more about forestry and water yields.

Log bridge for timber extraction placed too close to water supply abstraction point. Photo by Tom Nisbet.

Excessive siltation from harvesting operations can block water intakes and storage tanks, disrupting private water supplies. Photo by Tom Nisbet.

High levels of turbidity such as in this example will block water filters and interfere with water treatment. Photo by Tom Nisbet.

Natural contaminants can be present in some private water supplies, such as high levels of dissolved iron. This can result from reducing conditions in anaerobic soils, evidenced in this example by the presence of iron ochre and a surface film. Photo by Tom Nisbet.

Damage to private water supply infrastructure

Private water supply infrastructure usually consists of an impoundment or collection chamber, pipework and one or more settlement and storage tanks. Collection chambers, boreholes and wells are likely to be covered and may have an inspection lid that can become overgrown with soil and vegetation. Surface water intake pipes (Photo G) may be situated within a natural pooled section of a stream channel, buried in a stoney or gravelled area on the streambed or placed behind or in the wall of a small dam (Photo G).

Chambers collecting groundwater from springs and flushes may be served by one or more buried inflow pipes that extend for an unknown distance upslope or to an adjacent wetland or field drainage system. Pipework issuing from abstraction points may extend for long distances downslope or downstream to the properties that they serve, sometimes crossing watercourses and other services. Pipes are often buried but may be relatively shallow, making them very vulnerable to disturbance. A mix of cast iron, and concrete pipework or new polyethylene pipes may be present, with older pipes more susceptible to breakage. Abstraction points may be fenced off (photo H) The images below provide examples of the types of infrastructure that you may find serving a private water supply.

Damage to infrastructure prevents households and businesses from receiving a wholesome supply of water. It can be costly to fix and can significantly delay forestry operations. Machinery and vehicles can easily cause physical damage, especially when crossing fragile pipework.

G

A larger stream impoundment and intake pipe serving several properties. Photo by Tom Nisbet.

H

Private water supply abstraction points are often fenced off to reduce the risk of direct disturbance. Photo by Tom Nisbet.

Roles and responsibilities

A combination of Scottish Forestry, local authorities and Scottish Environment Protection Agency (SEPA) regulatory roles and responsibilities protect private water supplies from forestry activities (Figure 1).

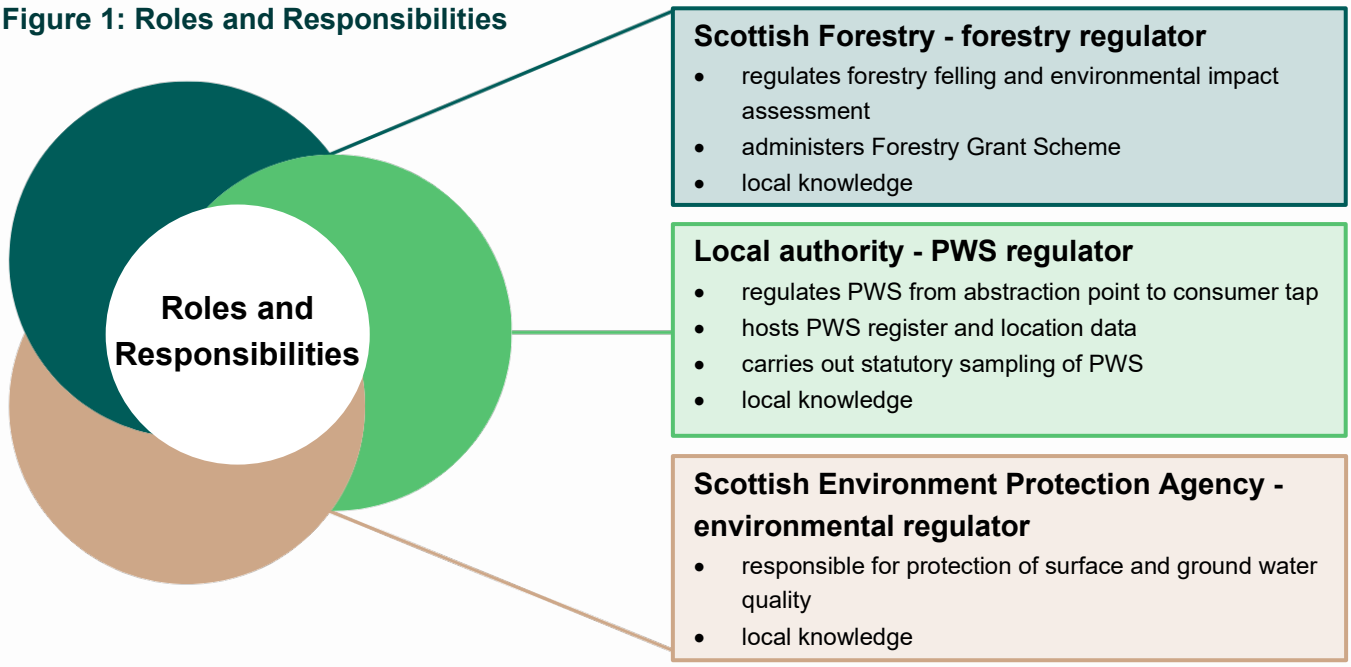
The **forestry sector** plays a vital role in safeguarding private water supplies by prioritising them during planning and operational phases. This role begins with identifying private water supplies at the planning stage. If there is likely to be a private water supply, engaging with private water supply users (e.g. property residents and local land occupiers), Scottish Forestry, the local authority and SEPA is central to well informed forest planning and avoiding impacts at an early stage.

Scottish Forestry is the regulator for forestry felling and environmental impact assessment (EIA). They promote sustainable forest management, administer the Forestry Grant Scheme and assess compliance with the UKFS, which is a prior condition for receiving grant support, permission to fell and EIA screening.

The **local authority** is the regulator for private water supplies (via Environmental Health Departments). They risk assess and sample private water supplies in line with regulations. It can be helpful to liaise with local authorities from the beginning as they may be able to provide some key information to support forestry managers in developing a good site plan (see *Planning and approving a forestry proposal*). They may also have experience in other cases where forestry and private water supplies interact.

SEPA is Scotland's environmental regulator responsible for protecting and improving Scotland's environment, including surface and groundwater quality.

Figure 1: Roles and Responsibilities



Planning and approving a forestry proposal

When developing a forestry proposal for approval by Scottish Forestry, private water supplies and associated infrastructure should be identified and considered in the design. In some cases, expert surveys and ground truthing will be needed. The level of detail required will depend on a number of factors:

- **Overlapping private water supply catchments:** may require more detail in terms of hydrological assessment of water yields due to combined water supply demands in the shared drainage area.
- **Type and characteristics of the private water supply:** small surface and shallow spring water supplies are likely to be the most vulnerable. The size of water demand in relation to the available supply is another important consideration, including previous water issues. Large-scale conifer planting within private water supply catchments is likely to pose the greatest issue and may require a detailed hydrological assessment to determine the level of threat to the supply.
- **Type and characteristics of the private water supply infrastructure:** the extent, age/condition and nature of construction materials, as well as the routeway, distance and depth below the surface of associated pipework.
- **Nature of the works planned:** extent of woodland creation or restocking, as well as the types of forest operation (e.g. forest roads, ground prep or felling).
- **Local environment:** the sensitivity of the terrain to woodland creation and management, including site wetness, runoff pathways, soil erodibility and slope gradient.
- **Local authority knowledge and data:** whether there is an existing risk assessment, water quality data and knowledge of water treatment. Note that the private water supply may not be registered and so the local authority may have no data to share.

The following steps in this section can apply to any submissions for review or approval from Scottish Forestry to capture potential changes to private water supplies and associated risks.

A forestry proposal is a generic term which applies to Land Management Plans, Long Term Forest Plans, Environmental Impact Assessments (for afforestation, deforestation, roads and quarries), felling permission application, Forestry Grant Scheme application and carrying out Statutory Plant Health Notice work.

Identify private water supply system and catchment

There are various approaches to identifying a private water supply. It is important to understand which houses or other buildings are connected to a private supply, where the water is likely abstracted from, and where infrastructure, such as pipework and collection tanks, are likely to be located. **The abstraction point location is crucial for determining the correct water source and catchment area.** Identifying all these features can be challenging and may require detailed investigation. A well-informed estimation of the likely location of abstraction points and infrastructure is an essential contingency following all other efforts to locate. This will enable appropriate forestry planning and reduce the risk of adverse impacts on private water supplies.

Three effective actions to build a reliable information base and demonstrate appropriate due diligence are: communication, desktop study and (where appropriate) a site walkover investigation. These actions are not mutually exclusive and each one plays a role in verifying the information being gathered. When considering private water supplies in a forestry proposal, a key aim is to use evidence to demonstrate the appropriate level of due diligence has taken place.

Communication

Effective open and consistent communication is a key first step in identifying private water supplies and throughout the planning process and operational practice. It is recommended a record of discussions and attempts to communicate are recorded as evidence of the process. The local authority holds a private water supply register, which may indicate the presence of any supplies within the vicinity of planned forestry operations. The register may also assist in locating the precise abstraction point and infrastructure. Not all properties will be identified on the register, but for those that are, together with any others discovered by a desktop study or site walkover, direct engagement can support data verification or provide missing data. It is important to engage early, often and effectively with local authorities, private water supply users and landowners.

Local authority engagement

Contact the local authority Environmental Health Department for specific information on the private water supply. Local authorities hold a private water supply register and, in some cases, may have carried out a risk assessment for the supply. Some information may be out of date but can provide a good starting point.

Allow up to 28 days for a response from Environmental Health Departments at local authorities and stipulate this expectation in your communication. A follow-up reminder email after 14 days is recommended. If a local authority is unable to respond, record the correspondence as evidence of due diligence on your part.

Possible private water supply information held by local authorities	
Private water supply register	Name and type of private water supply. Location of properties. Description and location of abstraction point.
Private water supply risk assessment	Description of source catchment. Suspected location of pipework and infrastructure. Mitigation measures in place. Recommended improvements.

Questions to ask local authorities

→ Are there any private water supplies in the area and how many are there?

→ Are you able to provide location details?

→ Do you have any information on abstraction points or source catchment?

→ Can you provide a history of the area? (for example - water scarcity issues)

→ Has a private water supply risk assessment been carried out in the last 5 years?

→ Are there any known water quality issues affecting the supply?

→ What is the level of water treatment and water demand?

Remember

- Local authorities and private water supply users may not know the locations of abstraction points and infrastructure.
- Local authorities may not have all the information you need and any information they do provide should be verified.
- Leave plenty of time for local authorities to respond.
- Not all private water supplies will have a risk assessment or be registered.

Engage with private water supply users and landowners

Communicating with private water supply users will provide another important layer of information to inform the design of a forestry proposal and help to establish a good relationship with residents. Early engagement is the most effective way to inform initial assessments. Some private water supply abstraction points will be located on land owned by a third party and in these cases, it is likely to be useful to also engage with the landowner. As a guide, it is advised

to engage with all properties within an appropriate ‘screening zone’ boundary downstream of the forestry proposal. However, discretion should be used here. For example, if there are properties just outside the screening zone boundary and likely to be on a private water supply, it is best practice to include these in the plan. Properties known to be on the public water supply can be excluded from any further assessment, although some properties may continue to use their private water supply for some purposes even when they are on a public supply.

Liaise with all the identified properties, including any not on the local authority register. Multiple attempts using different communication techniques such as a letter or in-person visit may be required to successfully contact local residents**.** Speaking in-person could be particularly beneficial and provide most of the data required. In person attempts to engage can also be carried out as part of a site visit.

Questions to ask private water supply users and landowners

→ Where does your property get its drinking water from?

→ Do you know the location of the abstraction point?

→ Do you know the catchment area of the abstraction point?

→ Do you know where your private water supply infrastructure (pipe work and tanks) is located?

→ Have you suffered any supply issues in the past?

→ Do you know the volume of any storage tanks?

Remember

- Private water supply users do not always know where their water comes from.
- Try to corroborate and verify information from private water supply users and local authorities where applicable.
- Early engagement with landowners and properties is valuable for everyone.

Desktop study

A desktop study can provide important information early in the planning process. Alongside information from local authorities, a desk study forms the basis for initiating communication with private water supply users, although remains an iterative process as information is gathered.

Identify properties with private water supplies

Aim to identify all addresses with a private water supply to support effective engagement and subsequent planning. Use an appropriate size of screening zone downstream or downslope of

the planned forestry activities to help identify properties at risk. This is a good starting point for planning engagement.

Identify sources of private water supplies

Use information acquired through engagement with private water supply users, landowners and the local authority to determine the source 'type' (borehole/well, spring/flush or surface/stream water) and location. This will inform design and protection measures e.g. the size and shape of required buffer areas.

Determine the catchment area draining to private water supply source

If the abstraction point is known or estimated, catchment boundaries can be approximated. This is **not required for boreholes or wells >5 m depth,** although these sources still require a protective buffer to be applied at design and operation stages. Identify catchment boundaries for every abstraction point present and note where these overlap. There will be increased water supply needs from the areas of overlapping private water supply catchments.

The way the desktop study is conducted will depend on access to data and spatial analyst tools. Data may be freely available via open data licencing whereas others come at a cost for licencing (see Table 1) or to initiate your own data collection. Access to Geographical Information Systems (GIS) mapping software can be a useful tool for spatial analysis at the desktop study phase and beyond.

Traditional desktop study techniques can be used to identify relevant topographical features such as watercourses and springs, as well as local water impoundments and surface pipelines. Elevation data such as contour lines are needed to define catchment boundaries. Spring and flush sources will often be distinguishable on aerial photographs, Google satellite images, higher resolution Ordnance Survey (OS) maps, and possibly on habitat maps. British Geological Survey maps of bedrock geology, drift deposits and registered boreholes are essential to understand the nature of spring, well and borehole private water supplies, as well as estimating their catchment areas.

GIS are especially useful for defining the catchment boundary (also known as 'catchment delineation'), particularly for surface and/or shallow spring or flush water supplies, drawing on a range of open access topographic data (e.g. contour maps, light detection and ranging (LiDAR), Digital Terrain Models (DTM) and Digital Elevation Models (DEM). Once the catchment area likely to be contributing water to the private water supply is known, spatial analysis tools can be used. These can assess the extent of land use change for determining the risk posed, as well as identify suitable buffer areas for protecting water abstraction points and infrastructure. In the absence of GIS, catchment boundaries can be drawn by hand using aerial photographs, Google satellite images and physical OS maps.

LiDAR and DTM data are valuable for defining catchments in GIS and need to be at the appropriate resolution for the catchment size.

Suggested mapping methods

A. Manually

Manual annotations on an OS base map and aerial photograph or Google satellite image are a good starting point for understanding private water supplies, including identifying users/properties and the location of infrastructure and abstraction points. They are also helpful for recording site observations, including adjustments to catchment boundaries due to any local features deflecting flows, such as drains, ground preparation and tracks. The following points draw on Appendix 2 of the UKFS Practice Guide on Designing and managing forests and woodlands to reduce flood risk, which recommends the approach for identifying catchment boundaries and assessing the scale of land use change and management potentially impacting on private water supplies:

- Identify the area of planned forestry activities and draw a polygon shape around this on the map.
- Create an appropriately sized screening zone around each forestry activities polygon.
- Look for and mark all properties (See Table 1 for suggested property data) within, and nearby, the screening zone downslope or downstream of the forestry activity. Exclude any properties known to be connected to a public water supply.
- For each identified property, engage with residents to check whether their water supply is public or private. If the supply is private, **determine the location of the abstraction point and include on the map**. Only properties with a private water supply (and associated infrastructure) that can potentially be impacted by the upslope or upstream forestry activities should be factored into a forestry proposal. **Identify the catchment area of the abstraction point on the map** (see the final bullet point for guidance on how to do this manually).
- Where the abstraction point is unknown, use local OS map features to indicate the potential source e.g. a well (blue ‘W’ symbol), spring (blue ‘Spr’ or ‘Sprs’ symbol), ‘issues’ or ‘sink’, or stream. Identifying potential sources can narrow the search area for an abstraction point. Finding the abstraction point may take time but is important.
- Aerial photography or satellite imagery (free on Google maps or Google earth) can be useful to identify features associated with private water supplies such as fenced enclosures, stream impoundments, water tanks and pipelines, and wet flushes and springs. These can often be used to help locate abstraction points.
- **Aim to verify or estimate the abstraction point on foot** during a site visit and where possible walk the catchment boundary and record any amendments to previous estimates. Record features like the layout and condition of the private water supply infrastructure,

where pipework is buried, and estimate the likely path between any water tanks and property.

- Following the identification and verification (e.g. from a site walkover) of the abstraction point location, re-draw the catchment boundary around the land draining to this point.
    - Start by drawing a line upslope from the abstraction point, perpendicular to the next contour.
    - Continue drawing the two lines upslope (either side of the abstraction point) until the highest points are reached. Then proceed to link consecutive highest points around the edge of the natural catchment until the two lines meet.
    - Manual editing can be quick and effective in smaller catchments where a DTM or DEM are of insufficient resolution to accurately reflect the microtopography or presence of existing drains.

It may not be possible to determine exact locations. Detailed assessment is essential to provide a general understanding and likelihood of where the water is flowing is essential.

B. Digitally using GIS software

Providing step-by-step guidance on how to use GIS is not within the scope of this guidance. Nevertheless, this section signposts useful resources and highlights factors to consider. GIS, and where available, integrated spatial analysis tools can be used to quickly delineate and characterise catchments, including calculating areas draining to abstraction points, the extent of land use change and management practices, and identifying local soils, geology, registered boreholes and dominant surface water flow paths.

GIS relies on spatial data, common sources of which are outlined in Table 1. It is important to consider the resolution of the available data, noting that high resolution spatial data will improve the accuracy of defining catchment boundaries and calculating areas. This is particularly important for smaller catchments. Coarser 50 m DTM data is generally only suitable for delineating larger catchments.

Table 1. Common sources of spatial data for GIS applications to identify private water supplies.

Data type	Dataset name, source and information
Property data	**Free -** Ordnance Survey Open Unique Property Reference Number (UPRN).
River network	**Free** - Ordnance Survey Open Rivers.
Topography	**At cost** - Commission or obtain existing LiDAR, DTM* or DEM* data. **Free** - Check Scottish Government Remote Sensing Portal for existing LiDAR*. **Note: LiDAR, digital terrain (DTM) or digital elevation models (DEM) need to be at high resolution (e.g. 5 m or better) to determine small private water supply catchments.*
Catchment boundary	**At cost** – Catchment boundaries can be obtained from Centre of Ecology and Hydrology's Flood Estimation Handbook Web Service. **Free** – Create your own catchment boundary using similar GIS software.
Aerial / Satellite Imagery	**Free** – Use Google Maps or Google Earth.
Geology	**Free and at cost** – British Geological Survey maps.
Soils	**Free** – James Hutton Institute (JHI) soils maps and land cover maps.
Land cover	**Free and at cost** – UK Centre for Ecology and Hydrology (UKCEH) Land cover maps.
Vegetation / habitats	**Free** – NatureScot Habitat Map of Scotland.

Site walkover

One of the most effective ways of identifying a private water supply is on foot. Carrying out a site walkover, ideally with the user(s), to 'ground truth' the area proposed for forestry operations helps to visualise where water supplies and forestry interact. Walk the site to identify, verify and map the relevant features. Things to look for during a site walkover:

- Any evidence of infrastructure such as black water tanks, concrete chambers, metal or wooden covers, borehole caps or stream impoundments/dams, and consider how these might be connected. Note that a water tank is unlikely to form the abstraction point.
- Check for pipes entering buildings and local streams for blue pipes.
- Look upslope or upstream to find the actual source.

Although time consuming, a site visit is strongly advised, even when the location of the source and infrastructure are known; it is always helpful to check and document the precise location and condition of these. Knowing the location of the abstraction point is required to calculate the catchment area.

Protection buffers

Private water supply features such as abstraction points and infrastructure must be protected from the possible direct impacts of forestry activities. Protection buffers are a good forestry practice requirement specified by the UKFS. Minimum buffer widths are stipulated with scope to widen to increase protection for the more vulnerable or sensitive water supplies.

At the forestry proposal stage, it is important to identify and map appropriate widths of protection buffers for the various water features and infrastructure present. Buffer widths can be extended in light of any new information arising at the operational planning stage.

Table 2. Minimum buffer widths for protecting private water supplies.

Private water supply type	Buffer	Identify catchment boundary on map?	Useful information
Borehole or well (Groundwater)	Apply UKFS ≥ 50 m circular buffer centred on the borehole or well.	If > 5 m deep = No If < 5 m deep = Yes	Shallower wells (<5 m depth) are more vulnerable and therefore should be managed as springs. Boreholes are very unlikely to be <5 m deep.
Surface water supply (Stream, river or lochan)	Apply UKFS min 50 m semi-circular buffer centred on abstraction point and only for the land upstream of an abstraction point. The 50 m buffer should transition to the standard minimum 10 m or 20 m wide buffer required along all permanent watercourses, depending on channel width (see Table 4).	Yes	Usually involve small (<10 ha) or medium (<100 ha) sized catchments but occasionally large (hundreds of hectares).
Springs or flushes (Groundwater, surface water or both)	Apply UKFS min 50 m semi-circular buffer centred on feature and extending upslope. Extend buffer to incorporate any associated upslope wetland flushes. Applying an additional 20 m wide buffer around the edges.	Yes	Usually, these catchments are very small in size (only a few hectares) and rarely more than 5 - 10 ha.
All types - Private water supply infrastructure	Apply 5 m buffer around storage tanks. Apply 5 m buffer either side of water transfer pipes linking the abstraction point to the storage tanks and properties.	Catchment boundary not applicable.	Where possible, map the location and routing of all associated water pipes and tanks.

Forestry proposal map and approval

Once all the relevant data and evidence has been gathered it should be detailed on a forestry proposal map, incorporated into your application and submitted as part of the approval process. Following approval, notify all private water supply users of the timeline for planned operational activities.

Mapping checklist
✓ Location and area of planned forestry activities.
✓ Establish screening zone(s) around forestry activities in a downstream direction.
✓ Identify properties likely to have a private water supply within the screening zone.
✓ Mark all known or estimated private water supply abstraction points and infrastructure..
✓ Mark catchment boundaries for each abstraction point.
✓ Establish buffer zones of required width to protect all known or estimated abstraction points, associated streams and wetland flushes, plus water supply infrastructure.

Operational planning

Use the information within the forestry proposal to develop a site-specific operational plan. Operational activity upslope or upstream of private water supplies has the potential to impact on the quality and quantity of a private water supply. To avoid damage, apply appropriate measures as per the UKFS and other relevant guidance (Annex 1) and incorporate within the site-specific operational plan.

Gathering information

Always start by referring to the forestry proposal, assuming one is in place. Check the spatial coverage of the plan and whether it is up to date. If it was written over 5 years ago (or there is no evidence that private water supplies have been considered), the private water supply information should be reviewed (refer back to *Planning and approving a forestry proposal*). If no forestry proposal is yet in place, follow the process outlined in the previous section for which key tasks are summarised in Table 3.

Table 3. Summary of information gathering tasks for planning and approving a forestry proposal in the context of operational planning.

Knowledge and understanding	Site specific	Communication
→ Gather information about the vulnerability of private water supply and communicate this to managers and contractors. → Ensure managers appointed to commission the forestry works on the site (for example, a Forest Works Manager[4]) have an appropriate professional level of knowledge and understanding, including: o Environmental legislation. o Protection measures for the operational works; and Relevant requirements and guidance outlined in Annex 1.	→ Ensure relevant licences, consents and permits are valid and respected. → Ensure all relevant private water supply information is clearly displayed on the site map including: the catchment area (measured or calculated), contributing streams or wetland flushes, abstractions point(s), and location of private water supply infrastructure. → Identify and agree all measures required to protect the private water supply and mark out defined buffer areas. → Coordinate forest activities and adjust scale and timing to match site conditions, sensitivity and health and safety, for example avoiding wet weather working. → Ensure contingency plan is in place in case of accidents and disruption to private water supply.	→ Seek specialist advice where necessary. → Pre-operations, notify all private water supply users of planned activities and timing, and arrange to take a water sample(s) (e.g. for turbidity test, see section on monitoring). → As work progresses, have regular updates with operational teams (managers, contractors and sub-contractors) and check-in with private water supply users as to whether they have had any issues.

Developing a site operational plan

Operational plans should be informed by the UKFS and relevant UKFS Practice Guides (Annex 1) and include: a method statement, site operational risk assessments and a contingency plan. The plan should clearly set out any special working instructions to protect the private water supply, including use of appropriate widths of buffer area. Depending on site conditions and vulnerability of the private water supply, additional measures and monitoring may be required.

Protective buffer areas

Creating a buffer area between the forest edge and a watercourse, waterbody or abstraction point is essential to protect private water supplies. Buffer areas are subject to legal protections with additional restrictions and special measures outlined in forestry guidance for forest planning

[4] As defined by Confor.

and operations. The size of a buffer area depends on local climate, slope, soil type and topography, as well as the type of private water supply, the source area and infrastructure. Table 4 outlines **minimum** buffer sizes and the operations permitted within the buffer areas.

Table 4. Minimum buffer widths for forestry activities around private water supplies[5].

Minimum Buffer width	Situation	Operations
5 metres	Either side of water pipes linking the abstraction point to storage tanks and properties.	No forestry activities or tree planting.
10 metres	Along both sides of all permanent water courses with a channel less than 2 m wide‡.	Forestry activities allowable within buffer areas are: • hinge mounding. • inverted mounding. • direct planting of native trees and shrubs and other ecologically appropriate broadleaved trees to create riparian woodland. Machine mounding must stop within 2 m of watercourses and within 5 m of abstraction points for water supply.
20 metres	Along both sides of watercourses with a channel more than 2 m wide and along the edge of lakes, reservoirs, large ponds and wetlands.	
50 metres	Around abstraction points for private water supplies, such as springs†, wells*, boreholes* and surface water† intakes. **Circular buffer area.* *†A semi-circular buffer area upstream/upslope of abstraction point.*	

‡ UKFS stipulates "Narrower widths of buffer area [e.g. <10 m] might be appropriate along minor watercourses with a channel less than 1 m wide, especially on steep ground". This is highly unlikely to be appropriate for watercourses within a private water supply catchment and any evidence presented to justify smaller buffers will be assessed on a case by case basis by Scottish Forestry.

Works within buffer areas

Effective planning of operations can minimise the need to enter buffer areas. **Works within buffer areas should only occur if absolutely necessary and should be carefully planned.** In some cases, one-off activities may be required within the buffer area to address legacy issues (e.g. felling of conifer stands and extraction of timber to improve future protection of private water supply). In such cases, minimising ground disturbance is paramount, requiring additional protection measures to be detailed in the risk assessment methods statement (RAMS). Photographing the site conditions before and after works is recommended to keep a record and support any subsequent queries. Undertake the following tasks if it is not possible to avoid non-permitted activities within buffer areas:

[5] Reflects UKFS (2023) stipulations.

Working within buffer zone checklist

- ✓ Remove existing non-native conifer trees and replace with native species, preferably at a low density within buffer areas around abstraction points; tree cover within buffer areas should be managed as protective and not productive woodland.
- ✓ Avoid the use of heavy machinery and where possible, adopt manual extraction methods.
- ✓ Where the use of machinery is unavoidable, consider using broad low-pressure tyres and/or brash mats, removing material once complete.
- ✓ If material being removed is from wind blow, assess the risks and consider whether the material could be left (safely) to minimise disturbance to the buffer area.
- ✓ Where possible, carry out the work in drier weather and avoid wet weather periods.

Monitoring

Monitoring the water quality of a private water supply is recommended to guide forestry operations and check that protection measures are effective. This is especially the case where the scale and type of operation potentially poses a significant risk (e.g. large-scale timber harvesting), site conditions are vulnerable to ground disturbance (e.g. wet and/or erosion prone soils) and the private water supply is very sensitive to water degradation (e.g. surface and shallow water supplies with limited water storage and simple water treatment, or old and weak infrastructure).

Establishing baseline data prior to operational activity provides an important reference for determining the degree and significance of any changes during and after operations. The focus of monitoring and sampling before, during and after operations is on the 'raw' water in the environment, which is feeding the abstraction point, rather than at the tap. Most registered private water supplies will have been occasionally sampled, providing data to characterise water quality, identify any existing water issues and to inform the required level of water treatment. These data should be held by the property owner and Local Authority and can provide useful information on baseline conditions. **Data on 'raw' (pre-treatment) water quality is the most useful.** Every site and situation will be different. The need for any water monitoring will require careful consideration, as will the nature of it, and the outcome should be recorded in the RAMS.

The Managing forest operations to protect the water environment Practice Guide provides guidance on monitoring the water environment by taking water samples at appropriate intervals. The guide highlights the important role of turbidity monitoring to identify early signs of declining water quality so that corrective action can be quickly taken to protect the water supply. In most cases monitoring of turbidity should suffice but where private water supplies are impacted, the collection of additional water samples for a more complete water analysis by a chemical laboratory may be required.

Turbidity is one of the most sensitive characteristics of water quality, representing the degree of cloudiness in the water. It is a good indicator of suspended fine sediment derived from soil disturbance and can help to trace the source of any pollution. Water turbidity is relatively cheap and easy to monitor and thus well suited for managing the potential impacts of forestry operations on private water supplies. The Managing forest operations to protect the water environment Practice Guide describes a simple method for measuring turbidity in stream water samples, which has been summarised here and applies to monitoring the raw water quality. If private water supply users have concern about the water quality at their tap, the users can request an assessment to be carried out by the local authority. **On sensitive sites, monitoring of water turbidity may be necessary multiple times per day.**

How to monitor turbidity:

Fill a clear-sided and clean bottle with water from the private water supply abstraction point, either directly from the stream, spring or flush, or the overflow from a collection chamber. Take care not to touch the bottom of the channel (watercourse sample) to avoid disturbing any deposits of sediment, which can give a high reading.

Place the sample bottle against an appropriately coloured background and assess the clarity.

Record the turbidity measurement taken at each site visit by noting the location, date and time. Include a photograph of the bottle with the same-coloured background on each visit.

Remember

- This monitoring method is mostly suited to measuring potential impacts on surface waters and shallow groundwater (springs and flushes).
- Collect samples in advance of any operations to establish reference conditions, preferably during peak flows. Collection may be required at short notice following rainfall events.
- Collect samples immediately upstream of the abstraction point or the nearest accessible point in the system below the abstraction point, before any water storage or treatment.
- Unless you have permission, do not remove lids/covers of private water supply collection chambers or tanks for observation or water sampling.
- Record the location, date and time of samples, as well as weather conditions. Note that heavy rainfall is likely to generate increased water colour in peaty catchments, which will affect the assessment of water turbidity.

Contingency planning

Despite all planning and preventative measures, extreme weather events or accidents can result in unforeseen problems impacting on private water supplies. It is important to plan how to respond to minimise impacts if such occasions arise. Discussing and communicating contingency plans with landowners and private water supply users can demonstrate due diligence and provide reassurance.

Be clear within the RAMS on what actions will be taken, in the short-term and long-term, if a private water supply is impacted. Consider whether there is scope to move to another water supply, provide a temporary water bowser or to arrange for bottled water. Consider whether connection to the public supply is an option for a contingency measure. Obtain advice from Scottish Water about anything related to *public* water supply. Consider liaising with the local authority Environmental Health Department on options for an emergency plan.

Selecting a competent contractor

Selecting a contractor who is professionally competent to conduct forestry works is important to ensure environmental protection measures are implemented. Managers should ensure the contractor understands their legal obligations and the relevant guidance for protecting water supplies (Annex 1). Ensure managers communicate the following to contractors:

- The site-specific details of the private water supplies: the catchment area, abstraction point(s), and location of private water supply infrastructure.
- Location and extent of required buffer areas around abstraction points, contributing watercourses and wetland flushes, and private water supply infrastructure.
- Special protection and monitoring measures.
- Maps containing the above information.
- Contingency plan.

Pre-commencement of operations

Prior to the pre-commencement meeting, managers should mark out the site to ensure contractor compliance with the design and protection measures. Some features can be GPS recorded and have visible markers in place. The site marking can include:

- Buffer areas (aligned to UKFS stipulations).
- Boundary (known or estimated) of private water supply catchment.
- Stocks of materials and equipment to tackle accidental pollution incidents.
- Abstraction points.
- Private water supply infrastructure (pipework and storage tanks).
- Access routes.
- Fuelling and servicing points, which should be located outside of private water supply catchments.
- Monitoring points.

At the pre-commencement meeting, **ensure the contractor and everyone on site is aware** of, and understands:

- The details of the site's private water supplies and any associated issues.
- The catchment area of the private water supply and the site plan, including site specific rules and maps.
- What protection measures have been determined in the operational plan (e.g. buffer areas and machinery exclusion zones) and the resources available to implement them (e.g. appropriate machinery).
- The regulatory roles and responsibilities for private water supplies and forestry.
- The relevant guidance documents (Annex 1).
- What to do and who to contact if an incident occurs.

In-operations

It is expected the steps, information and precautions outlined in this guidance have been followed prior to any operational activity. This section is not intended to repeat UKFS and Practice Guides (Annex 1), instead it summarises key points from existing guidance with some additional elements, which apply in the Scottish context.

Engagement and clear communication

- Engage with landowners and private water supply users to notify them of the commencement of activities and check permissions for access to obtain any water samples. Ensure they are aware of emergency contact details for any incidents.

- Clear communication with contractors and sub-contractors on the details of the operational plan, responsibilities and frequency of monitoring requirements. Incorporate regular site visits to confirm compliance.
- Effectively manage, and provide regular site briefings to employees, contractors and sub-contractors to ensure continued awareness of: the private water supply and its associated infrastructure; temporary protection measures and zones; and compliance with good environmental practices, the operations plan and RAMS.
- Ensure everyone on site has access to site maps clearly showing protection buffers.

Monitoring and supervision

- Monitor environmental protection on site and for any developing issues such as:
  - Marking of protected zones becoming obscured, lost or disturbed.
  - Changes in the condition of surface waters indicative of diffuse pollution issues within the private water supply catchment during any forestry operations.
- Complete regular site visits to monitor whether operational activities and protection measures outlined in the operational plan are being complied with by contractors and sub-contractors. Check the existing environmental protection measures remain sufficient as the forestry operations progress across the site.
- Monitor the weather and adapt operational activities to suit conditions. Suspend operations if weather and ground conditions become unsuitable and result in ground damage and sediment starting to enter watercourses.
- Ensure the water monitoring regime outlined in the operational plan and RAMS is being carried out as planned and recorded.

Water sampling

- Follow the steps outlined in the monitoring section.
- Where there is a pre-existing water quality issue and concern that it could be exacerbated by forestry operations, consider collecting water samples (in addition to monitoring water turbidity) for laboratory analysis to check water quality and to monitor the impact of forestry operations.
- Consider collecting a water sample upstream of the operations from an undisturbed site to allow an assessment of any background changes in water quality unrelated to the forestry operations (e.g. unusual weather changes).
- In addition to recording the date, time and location of water samples, also record the type and extent of operations at the time (e.g. harvesting close to a stream).

Operational precautions and protection measures

- Implement, mark out and observe all buffer areas and associated working restrictions outlined in Table 2 and Table 4, the operational plan and RAMS.
- Where possible, avoid storing and handling chemicals, fuel oils and lubricants within private water supply catchments.
- Avoid the use of heavy machinery within buffers unless absolutely necessary. If the use of machinery is unavoidable (e.g. removal of wind blow), consider using low pressure tyres

and/or brash mats, removing brash once complete, and monitor regularly to assess and manage any impacts.

- Where possible, carry out higher risk work in drier weather and avoid wet weather periods.
- Do not ford streams or rivers within private water supply catchments, even where there is an existing purpose-built ford, unless there is no alternative access or using this would present a greater risk of ground damage and water pollution.
- Minimise the use of stream crossings and where these are unavoidable, use well-built log bridges and remove these after use.
- Keep streams and buffer areas clear of brash as far as practical and avoid locating large brash heaps within private water supply catchments.
- Where possible, avoid constructing tracks, roads and borrow pits within small (<10 ha) private water supply catchments, especially upslope of shallow spring supplies.
- Forest operations must not result in marked increases in sediment or discolouration impacting on private water supplies; water quality should be monitored and action taken if conditions start to deteriorate.
- Avoid machinery crossing buried water pipes. If this is unavoidable, minimise the number of crossing points and use suitable ground protection methods to protect the infrastructure.
- Ensure any cultivation channels or drains do not discharge directly into streams, springs or flushes; these need to stop at the edge of the associated buffer area.
- Seek advice before blocking or cutting off any existing drains within abstraction point buffer areas as such action could reduce water yield.

Forestry operations must not lead to harmful or polluting substances contaminating private water supplies

Report and rectify incidents

- Report any environmental concerns or incidents immediately to managers e.g. unplanned or accidental disturbance to buffer areas or watercourses, or damage to private water supply infrastructure.
- In the event of pollution or accidental damage to a private water supply abstraction point or any associated infrastructure:
    - Notify the private water supply user(s) immediately.
    - Report any damage to the private water supply to the local authority.
    - Follow contingency plan and provide supplementary water supply where needed.
    - Report any pollution incident immediately to SEPA and contact Scottish Forestry.
    - Repair and restore as soon as possible in line with the contingency plan.

Report pollution incidents to SEPA immediately on 0800 80 70 60

Post-operations

Following any operations, and especially if there have been any reported incidents (either from contractors or private water supply users), it is important to check that measures taken have addressed the issue and the quality of the water supply has been restored.

It is recommended to continue monitoring of water turbidity for a short period once operations have ceased, including after heavy rainfall. Any pollution control measures should be removed once no longer required.

Annex 1: Relevant guidance

UK Forestry Standard - version 5 (2023)
UK Forestry Standard Practice Guide: Managing forest operations to protect the water environment
UK Forestry Standard Practice Guide: Designing and managing forests and woodlands to minimise flood risk

Annex 2: Checklist - Planning and approving a forestry proposal

The table below is a checklist summarising the content in the planning and approving section to support those using this guidance (See *Who is this guidance for?*) in planning a forestry proposal being submitted for approval to Scottish Forestry.

Planning and approving a forestry proposal				Done
Identify private water supply system and catchment	Communication [1]	Local authority Environmental Health	Is there an existing private water supply (PWS) risk assessment?	
			Is the PWS registered?	
			Is there any supporting information on the PWS?	
		PWS users and landowners - confirm details	Confirm which properties are using PWS.	
			Do they know the abstraction point?	
			Do they know the PWS type/source?	
			Do they know the location of the PWS infrastructure?	
			Are they aware of any supply issues?	
			Do they know the catchment area?	
	Desktop study [1]	Identify PWS properties, source(s) and catchment area. Mapping of PWS.	Identify likely PWS properties using a screening zone.	
			Identify PWS type/source.	
			Identify PWS abstraction point.	
			Determine the catchment/drainage area of the abstraction point.	
			Apply relevant buffers to all PWS infrastructure and abstraction point.	
			Make relevant amendments following verification from communication and site walker phases.	
	Site walkover	Verify information gathered during desk study and communication.	Locate or identify evidence of PWS infrastructure.	
			Check for pipes (e.g. blue pipes in streams).	
			Verify the PWS source and abstraction point.	
			Verify relevant details from the desktop study.	
	Forestry proposal map and approval	Mapping checklist	Location and area of planned forestry activities.	
			PWS properties.	
			PWS abstraction type/source.	
			PWS infrastructure e.g. pipes, tanks and abstraction point.	
			Drainage catchment of each PWS abstraction point.	
			Buffer areas for each PWS feature as per guidance.	
		Miscellaneous	Who has been contacted (as per communication section), in what format(s), how often and have they responded.	

[1] Communication and desktop study elements share similarities as both may occur at the same time.

Annex 3: Checklist - Planning for operations

Planning for a forest operation where there are private water supplies (PWS)				Done
Planning for a forest operation (post-approval stage)	Review and/or gather information	Review any changes to information obtained in *Identify PWS system and catchment* checklist.		
		Environmental assessment of the impact of specific operations on PWS: Add necessary control measures for each operation.		
		Communication	Relay PWS information to managers and contractors.	
			Notify PWS users of work plans and protection measures.	
		Set buffers	Set buffer areas.	
			Determine limitations and temporary protection zones for each operation.	
		Working in PWS catchments	Monitor before, during and after any operations.	
			Restrict operations to dry weather.	
			All protection measures are clear (e.g. machinery exclusion zones and buffers).	
			Inform PWS user of upcoming works.	
	Monitoring	Water turbidity sampling	Sample before operations begin, preferable during peak flows and if required, several times a day.	
			Sample immediately upstream of abstraction point.	
			Record sample location, date, weather conditions.	
	Contingency planning	RAMS	Short-term actions & long-term actions.	
			Provide PWS users with emergency contact if an incident occurs.	
	Select a competent contractor.			

Glossary

Borehole	A narrow discrete hole drilled (bore) into the ground to obtain a groundwater source and can vary in depth. It is generally (but not always) deeper than a well.
Catchment	The area of land from which precipitation drains to a defined point in a river system, or to a lake, reservoir or spring (UKFS definition). The defined point for the catchment of a private water is the abstraction point. Sometimes referred to informally as the 'recharge zone'.
Flush	Area of wetland formed by groundwater seepage.
Forestry activities	A generic term to cover all forestry works including but not limited to: ground preparation, planting, track and road construction, felling and extraction.
Forestry proposal	A generic term which applies to Land Management Plans, Long Term Forest Plans, Environmental Impact Assessments (for afforestation, deforestation, roads and quarries), felling permission application, Forestry Grant Scheme application and carrying out Statutory Plant Health Notice work.
Lochan	A small body of standing water, larger than a pond but smaller than a loch.
Overlapping catchments	Where catchments overlap and share some of the same drainage area e.g. as a result of several abstraction points along the same stream.
Private water supply	A source of drinking water that is not provided by a water company. The source can come from surface water (e.g. lochans and streams) or groundwater (e.g. springs and flushes, or borehole and well).
PWS abstraction point	The precise point where the water for the private water supply is abstracted, such as the water intake pipe in a stream or dam, or the groundwater inflow from a spring, flush or the bedrock into a collection chamber, borehole or well.
Spring	The point where groundwater emerges at the land surface to form surface flow.
Water yield	All of the precipitation that drains from a catchment to a defined point within a given time period, typically a year, representing the annual water yield.
Well	A hole excavated or drilled into the ground to access the groundwater table in the bedrock for water supply, which is often wider and shallower than a borehole.

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