

How to identify a suitable site for borewell?

Vertical Electrical Sounding is one of the very common geophysical methods used for domestic borewell exploration. However, sufficient open area around the location is needed for conducting the survey. Geologists charge around Rs.1,500 to 5,000/- for identifying a borewell site. Other methods of geophysical survey are used in special cases and they are quite expensive.

Local well diviners who use wooden sticks or magnetic blocks are also to some extent successful in identifying borewell sites. But this method may not be always reliable, especially in areas where the geological formation is critical.

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Is there a best suited time for drilling a borewell?

As such there is no prescribed season for drilling a borewell if the location of site has adequate ground water potential. However, identifying a suitable site and drilling the borewell in summer months would give the worst possible scenario in the location at the point of time. Therefore, summer months are usually preferred by some experts as the best suited period for drilling a new borewell. Also, as most agricultural sites can be accessed by drilling rigs only during summer months, they are usually available in these periods.

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What are the common methods adopted for drilling borewells?

Methods of drilling to be adopted depends on factors like suitability of a method for a particular type of geological formation (i.e. such as alluvial, bouldery and hard rock), cost factors, diameter and depth of borewell and the purpose intended.

Most commonly used types of drilling methods are;

- Water Jetting - Shallow bores in alluvial formations
- Augur Drilling - Shallow bores in alluvial formations
- Calyx Drilling - Shallow borewells in both hard rock and alluvial formation
- Percussion Drilling – Deep bores in bouldery formation
- Rotary Drilling - Most common method used for drilling large and deep bores in alluvial formations.

- Down the Hole Hammering (DTH) Drilling – Most common method for drilling large and deep borewells in hard rock formations.

What is the standard diameter of borewells drilled for domestic purposes?

For domestic purposes, 4.5 and 6 inches dia borewells are usually drilled. While 4.5 inch is most commonly drilled borewells for domestic purposes, 6 inch borewells are drilled when higher yield is required for large apartments or buildings and also for agricultural purposes. Initially larger diameter bits are used to place the casing pipes up to the hard rock zone prior to drilling specified size of the borewell.

How charges for drilling a borewell are usually calculated?

Charges for drilling a specified size of borewell include

- (i) drilling cost per feet,
- (ii) cost of casing pipe per feet,
- (iii) cost of drilling and installation charge for casing pipe per feet,
- (iv) flushing charges per hour for flushing the borewell after drilling and
- (v) transportation charges of the rig to the site from nearest town per km.

Drilling rates are sometimes charged in slabs for specified ranges especially when deep borewells are drilled. As drilling rates usually vary depending on the availability of rigs, local demand and site conditions, it is better to cross check with few drillers to get a competitive quote.

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What are the types of casing pipes used in borewells?

Currently, PVC pipes are very widely used as casing pipe. GI/Mild steel casing pipes which were used earlier are not being recommended due to the problem of corrosion. PVC casing pipes installed in borewells must confirm to IS 12818: 1992 that governs the specification for unplasticized PVC screen and casing pipes for borewell of the Bureau of Indian standard. This standard covers the requirements of ribbed screen, plain screen and plain casing pipes of nominal diameter 40 to 400 mm produced from unplasticized polyvinyl chloride for borewell for water supply.

Slotted PVC casing pipes are used if aquifer yields through sandy zones to protect collapse of borewell side walls and to prevent entry of fine sand into the borewell which might clog the borewell. This requires detailed study by Geologists to decide slot size and at what depths these have to be provided along with gravel packing around the casing pipe.

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What is well development?

- **Flushing and Over Pumping**

Well development is the process by which a borewell is cleaned and the permeability of the borewell is increased by removing fine materials like sand, clay deposits and rock cuttings accumulated in borewells and gravel packing provided around well screens. Usually it is done by over pumping water in the borewell or flushing the borewell with adequate air pressure.

In hard rock areas, flushing is done after the drilling process for at least 2-3 hours by using compressed air before drilling is stopped. Most of the drillers avoid this as it is an additional task. This is an important process that must be finally performed before completion of the drilling process at any given site.

Well development is also carried out to borewells which are facing reduction in water yield over a period of time to increase its yield. The reduction in yield can be due to clogging of pores spaces by silt and mineral deposits. Flushing using air pressure or over pumping the borewell are the methods normally employed to improve the yield of such borewells.

- **Bore Blasting**

Bore blasting is a technique which is used for opening up of fracture zones of borewells located in hard rock areas. Around 14 to 230kg explosives are used depending upon the depth at which the blast is to

www.indiawaterportal.org be carried out. It is usually carried out when a drilled borewell is dry and there is a potential to obtain water by opening up fissures in the rock at the specific site. This method could also affect very existence of the borewell therefore taking professional help is must for choosing this method.

- **Hydro-fracturing**

As the term suggests, it is applying water under high pressure for the creation, propagation and cleaning of fractures and fissures deep in the rocky layer of the earth. Creation or extension of the fractures is done using very high pressure water pumped into the bore well with pressures reaching as high as 3000 PSI (pounds per square inch). Hydrofracturing is one way of cleaning the blockage in the fissure and releasing water back into the bore wells. Hydro-fracturing can also open up the bore well to new fissures in the immediate vicinity not previously tapped by the bore well. A borewell camera is used to identify the fracture zones inside the borewell prior to the process.

Hydro-fracturing is an expensive process which is normally adopted by Government Water Supply Departments. Recently, in Bangalore a

private agency is involved in providing such services. They can be contacted at;

Mr. P.Ganesh,
Managing Director, Fractech Equipments { p} Ltd,
2, Parvatha Industrial complex, Ganganna circle, Jalahalli,
Bangalore -560 013.
Ph 28384732, Subramaniam- 9443150582
E-mail- fractech@vsnl.net, trivenimachine@yahoo.co.in

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How to determine yield of a borewell while drilling?

Usually V-Notches (a metal plate/wooden board with V shaped slot on top) are used by borewell drillers for determining yield of a borewell during the borewell drilling process. To measure the flow, water coming out of the borewell during drilling process is allowed to flow through an earthen barrier created around the site is fixed with a V-notch temporarily.

Drillers won't be inclined to do so as this is an additional task they have to do. Based on their experience, they tell the rough yield which may not

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be always correct. Yield of a borewell is usually referred in inches (i.e. depth of water flowing over the notch). Refer the website

<http://www.lmnoeng.com/Weirs/vweir.htm> to calculate water yield for various types of weirs and the depths of water measured over them (your computer should have java to support the program).

How yield of an existing borewell can be determined?

Yield of a borewell can be determined by conducting a step drawdown test, in which water is pumped at different rates (that is, so many litres per hour) by keeping the submersible pump at different depths to know the actual quantum of water that could be safely pumped and the resulting lowering of water level or drawdown. The test helps to know whether the borewell can meet the water requirements.

Usually, reputed pump dealers can conduct such tests at a fee before deciding to purchase a pump. Such tests are necessary for large settlements like apartments to arrive at very suitable pumps which can provide huge quantities of water needed.

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How to measure depth of water and total depth of a borewell?

We can find the water level in a borewell from the ground by time calculating the time taken for a very small stone (0.5 inch) to strike the water surface. All you need is a watch and a very small stone. Drop the stone and note the time taken for it to strike the water surface.

Multiplying with 9.8 (i.e. an object free falling near the earth surface would travel 9m/sec due to gravity) to the time taken for the stone to strike the water surface measured in seconds, we can get the water level depth in meters (Ex: for a 10 seconds time, depth to water is – $9.8 \times 10 = 98$ meters) . Repeat the exercise few times to get the correct depth.

A thin nylon rope longer than the depth of borewell firmly attached to a small sized stone (2 inches) or metal ring (a small automobile bearing is ideal for this purpose) in one end is used for finding both the water level and total depth of the borewell. While leaving the stone/metal block

attached to the rope into the borewell, when reduction in the weight of the stone is felt due to buoyancy of water after it strikes water surface, mark the point on the rope and remove the entire portion of rope let inside the borewell to measure for the water level from the ground.

Similarly, when you feel that the rope is not freely moving downwards from your hand once the stone strikes bottom of the borewell, mark the point and measure for the total depth of the borewell after removing the rope.

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What should be the water quality in the drinking water borewells?

Water Quality is an important measure to be analysed in borewells. The IS Code 10500:1991 governs the water quality standards for drinking water. Chemical and bacteriological parameters of the water in a borewell can be analysed by taking the water samples to a water quality labs. Government water supply and geological departments have such labs in every district and city. Reputed private labs also conduct such tests at a fee. India Water Portal has a section which provides a [comprehensive list of water quality labs in India](#) as well.

Usually borewells constructed in hard rock areas are free from bacteriological contamination if due precautions like proper installation of casing pipes and avoiding stagnation of water around borewells is taken care off. If any strong smell or heavy froth forms in the borewell water, it could be due to entry of sewage/contaminated water. Chemical parameters such as iron, fluoride, TDS, arsenic and nitrate are some very important parameters to be normally analysed as they occur in ground water depending upon the geological formations. Other

parameters such as pesticides, cadmium, etc., can be assessed on specific cases where such contamination is suspected (for details, go through the links given in reference).

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Which types of pumps are suitable for borewells?

Jet, compressor and submersible pumps are the widely used pumps for domestic purposes in India. Jet pumps which are installed above the ground level over or near the borewell are suitable for depths upto 150 feet. If the ground water is at lower depths submersible or compressor pumps are used. Compressor pumps are suitable for low yielding borewells and also they are easy to install and maintain as they are installed at ground level. However, they are noisy and may also require frequent repairs. As submersible pumps of 4" dia which can work in single phase electricity connection are available in the market now, these have become a preferred choice for domestic borewells. They can be installed for meeting higher water requirements. However, submersible pumps will be prone to frequent repairs if they are installed in the borewells containing heavy silt particles.

How to choose a right type and capacity of pump for a borewell?

Capacity of the pump to be chosen depends on the depth at which the pump/foot valve is to be installed and the desired discharge. Based on the total depth of the borewell, the depth at which the pump is to be installed (usually 10-25 feet above total depth of pumps) is decided. The total head is determined using the depth of pump, over head tank level and friction loss expected in the suction and delivery pipes. Using the total head and the discharge desired, from the pump rating curves for each models of pump manufactured by various companies, the right HP of the pump suitable can be selected.

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Can borewells be drilled inside an existing well?

Dry wells can be brought to use by drilling borewells inside them. It is mostly done in large wells used for irrigation purposes. Flexible rigs which have separate tripod and drilling head, can be used for drilled a borewell inside an existing well if it is above 3m x 3m size to accommodate size of the rig and working space. These rigs are capable of drilling up to a depth of around 300 feet.

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What is the safe distance between a borewell and septic tank/soak pit?

Maintaining sufficient distance between a borewell and septic tank is always recommended as there are chances of contamination. If the situation warrants location of them in close proximity, it is advisable to properly grout the borewell casing pipe with cement slurry till hard rock formation. In shallow aquifer zones, it is not advisable to locate borewells used for drinking purposes and the septic tank in close proximity. It is better to take professional assistance in such cases to take preventive steps around the borewell as well as the septic tank.

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Can borewells be drilled in locations with narrow roads in urban areas or houses where the rigs can't reach the site?

Portable flexible rigs which function even when their compressor unit is parked at a distance can be used for drilling in such locations. These rigs are only capable of drilling up to a depth of around 300 feet which may be a limitation in sites where deeper borewells are to be drilled.

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Can an existing borewell be deepened to increase the yield?

Deepening an existing bore well to a greater depth is undoubtedly cheaper than constructing a new bore well as there will be saving on the installation of casing pipe and lesser depth of drilling. However, drilling companies may be reluctant to deepen existing bore wells and therefore it is necessary to identify the one willing to take up such a work. Exact saving that can be achieved in developing an existing well over drilling a new well can be known by obtaining quotations from the drilling company for the two works. However, it is better to consult a Geologist to know the feasibility of finding adequate quantity of groundwater in the location deciding upon deepening the borewell.

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Is it safe to drill a borewell very close to the house?

A Borewell can be drilled close to a house if the house is built upon normal foundations that are usually recommended for house

construction. Shock waves generated during drilling will be dissipated through soil and rock layers. However, if you are planning to drill a borewell closer to a massive building which carries heavy loads, it would be better to check for the foundation stability.

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Is it possible to remove pump/pipes struck in a borewell?

Submersible pump or pipe assembly struck in a borewell can be removed in most cases using various types of fishing tools. After determining the position of the objects struck in the well, water is poured into the borewell to loosen the earth covering the pump or pipe struck inside the borewell before using fishing tools. Borewell rehabilitation agencies or mechanics usually develop special fishing tools that can be attached to the grounded pumps or pipes in a borewell based on their experience. Usually, this may be a time consuming and expensive attempt which may not be always successful. The entire operation may some time be a catastrophe that can lead to complete damage of the borewell; therefore adequate caution must be taken before deciding upon such an exercise.

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If pump or pipe struck in a borewell, should it be abandoned from use?

If there is sufficient water depth and yield of water in remaining portion of the borewell above the location where the pump/pipe is stuck, the borewell can be used by installing new pump/pipe assembly. However, it is better to check that the incident has not caused damages to side walls of the borewell which might cause yield of muddy water. It is also disinfect the borewell before it is used for drinking purposes as the process would have led to falling of external contaminants into the borewell.

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Is it necessary to obtain legal permission for drilling a new borewell?

Some states have implemented groundwater legislation acts which prevent drilling of borewells without the permission of Government Bodies in water scarce regions. However, some states allow only drilling of drinking water borewells without the need for obtaining permission. Therefore, it is advisable to explore the details of it before drilling a

borewell.

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How to seal unused or defunct borewells?

Sealing defunct or unused borewells is essential to prevent contamination of ground water. If left open, unused borewells can lead to rapid contamination of the ground water as they allow contaminants directly into the aquifers. Good quality clay materials can be used to seal the borewell using different methods after removing the casing pipe (details in the reference given at the end).

In case it is not possible to take such measures, cover the borewell properly using a well cap or provide adequate earthen cover over a concrete or stone slab kept on the borewell. Ensure not to allow entry of waste water or any external material inside an unused borewell.

Alternatively, unused or defunct borewells can be used as rainwater recharge wells after providing proper filter arrangements and intake arrangements around the well.

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Can an existing borewell be recharged for increasing its yield?

It is preferable to take up recharge measures such as recharge wells/borewells around the site of a borewell used for drinking purposes rather than putting rainwater directly into it. To maximise the benefit, it is always advisable that the entire neighbourhood is encouraged to take up recharge measures to benefit all the wells in the area. In case the borewell itself is being used for recharging, proper filtering arrangements for removing silt particles and also proper piping system for allowing the only rainwater water from clean roof catchments inside the well without damaging the side walls is essential.

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Can the treated sewage/grey water for recharging ground water through recharge borewells?

It is not advisable to use the treated water from STP or any other treatment process derived from sewage/grey water for recharging using recharge borewells or wells as it may still contain impurities. The impurities present in the treated water can easily enter the aquifer through recharge wells and contaminate the ground water. Only rainwater caught from roof catchments and uncontaminated surfaces should be allowed for recharging the ground water through recharge

Frequently Asked Questions – Borewells

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wells.

However, it is advisable to use the treated water for gardening purposes. The excess water may be allowed to soak through the ground by making soak pits which are up to 10feet deep.

For more,

[Discussion 32](#)

References:

- [India Water Portal – Ask a Question \(Borewells section\)](#)
- Hand Book on Borewell – BIS , GoI
- Guidelines For Sealing Groundwater Wells – WRMD, GNFL
- Water Quality Implementation Manual – Dept. of Drinking Water Supply , Government of India
- Water Well Manual