Well Facts And Frequently Asked Questions

Part of a series of documents created by Tim Guishard Enterprises discussing relevant subjects in the groundwater industry.

This document discusses many facts not readily transmitted to the public before they sign a contract with a driller to construct a water well.

Well Facts, And Frequently Asked Questions

Q: Do wells "dry up"?

A: Wells rarely completely "dry up". There are cases where the well no longer has water, due to a lowered water table, because the well is not deep enough to intercept the water bearing formation. This typically happens during periods of drought, or increased building development. Drilling deeper might return your wells production.

Please note: Every well drilled into the ground is like a straw placed into a glass. If the glass is only being filled by a drip from a faucet, then the glass will go dry for a period of time. If the faucet is turned on fully, all the straws will have more water. The same is true of wells. If everyone in the neighborhood is pumping their well, and there is very little recharge of the formation, eventually the shallow wells will dry up. When the rains recharge the formation, the wells will have water again.

More frequently, wells have a problem with "reduced production" as a result of: inaccurate testing in the first place, chemical plugging, bacterial growth, and improperly sized or worn out pumps.

Most well testing typically conducted during drilling, is for a short period of time and there are very few accurate water level measurements made. Proper drawdown and recovery testing can verify if a well can sustain production at a given flow rate for a period of time. During this type of testing the water levels and flow rates are measured at specific timed intervals. This data is then charted out, and a pattern emerges. With careful analysis, a trained person can determine if the well can sustain pumping the desired quantity of water for a specific time. There are limitations to this testing, as it cannot account for extended drought, or other outside factors such as: your neighbor drilling a well in the near vicinity. This analysis can also give a numeric expression of the Specific Capacity (SC) of the well, in Gallons Per Minute (GPM) per foot of draw down. (Example: SC=.5GPM/FT or ½ GPM per foot of draw down.) In this example the well may have 50' of total draw down, and produce 25 GPM. As the well ages, plugs up, and the pump wears this number will change. By analyzing the SC of a well over time you can predict if you need to replace or reconstruct or chemically/mechanically treat the well.

Certain naturally occurring chemicals, at a certain pH, can quite literally plug up the well. Refer to the action of calcification of a showerhead. When new, the shower sprays nicely. However with time the showerhead plugs up, and the water spray is erratic, or reduced. The same thing happens to the fractures or screens in the well.

Another common problem is Iron-reducing bacteria. These bacteria form a slime that plugs the formation, well screens, pumps, and drop pipe. The higher the water velocity, the greater the slime buildup. A new well may not seem to have a problem, but with time the problem can be exacerbated, due to the plugging thus increased velocities and increased bacterial slime production.

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Q: How much does it cost to test a well?

A: That depends on what type of test you want. Are you testing the capacity of the well, or the water quality? There are many types of tests for both. Generally, the more money you spend, the greater information that can be attained.

Capacity tests: Can cost a few hundred dollars for a 2 hour test completed by your local licensed well contractor, to over $5,000.00 for an extended 72 hour test by a licensed hydrogeologist.

Water Quality Tests: The costs range from less than $ 100.00 to test for bacteria and nitrates, to in excess of $3000.00 to test for all the contaminates listed by the EPA for drinking water systems.

Q: Why does my well water stink, and stain everything?

A: You probably have some type of iron, or sulfur reducing bacteria in the well.
Iron (IRB), sulfur (SRB), and manganese (MRB) reducing bacteria are typically found together is some wells. These reducing bacteria feed on naturally occurring iron, sulfur, and manganese found in the formation, and on metal components in the well, including the steel drop pipe, and steel well casing. Iron and manganese will cause staining from light red to dark brown.

Sulfur reducing bacteria can feed on the Iron and Manganese reducing bacteria also, and leaves the water smelling like rotten eggs while staining everything black. Wells that are drilled with too deep of a reservoir below the pump promote the growth of anaerobic bacteria like SRB. When a well is drilled, if you do not get water 50' past the last producing fracture, the well should be backfilled and sealed up to within 50' of the last fracture. I know that people say I just paid to get the well drilled, so why would I also want to pay to fill it partially back in? And the answer is to reduce problems associated with anaerobic bacteria.

Tannins (tannic acid) are another compound that can stain things light brown. Tannins are a byproduct of the decomposition of organic matter. They take a special filtration process to remove them from the water before removing many other contaminants.

Q: How to correct problems due to chemical or bacterial plugging?

A: Chemical and/or mechanical intervention. There are tools and chemicals specifically designed to correct or mitigate problems with chemical or bacteriological problems. Pumping the well to hard, and lowering the water levels, thus providing an environment for these problems to occur, exacerbates the problems. I cannot give justice to the entire question in this format. Contact your local licensed well contractor for details. There are a lot of good websites with more information: www.designwater.com, and www.agwt.org to name a couple.

Q: How do you locate a well?

A: Much depends on the type of groundwater formation (IE: alluvium or fractures rock). There are many different ways to locate wells. Well Drilling Contractors and hydrogeologists familiar with the area have the best knowledge as to the type of formation that you will encounter. There are some competent dowsers is some areas of the country that may be able to help you. In alluvial

formations, you have a greater chance of getting a good well, and at a known depth, than when a well is constructed in fractured rock.

In alluvial formations: As long as you drill deep enough you should hit water. You may want to seal off certain water bearing strata to mitigate issues with poor quality water. If you encounter multiple water qualities in various strata, it is best to seal out all but one, to protect from future contamination. Drilling the well larger in diameter will typically increase the yields. Frequently by looking at records for other wells in the vicinity, you can determine the depth and anticipated yield of the well. By hiring the services of a hydro-geologist to work with the driller, your chances of a high capacity well will increase.

In fractured rock formations: You have a 50% chance of hitting water just by setting up a rig and drilling. You never know exactly how deep you are going to drill, or what the capacity may be. You typically increase your odds to 55% or better by hiring a dowser, with local experience. You will increase your odds further (to about 70%) by hiring a contractor or hydro-geologist that uses satellite imagery (lineament) maps. Go another step and use a licensed hydro-geologist using sub surface imagery techniques, and you increase your odds to 80%+, and will have a target depth at which to stop drilling.

Q: How much does it cost to drill a well?

A: That depends on many factors. Generally, wells constructed in alluvial formations cost more per foot to construct, than wells constructed in most fractured rock formations. Of course, there are exceptions. The size of the well (inside diameter), whether the well is fully cased and screened also affect costs. Contact a Licensed Well Driller in your area for local drilling costs.

Remember: *Like a Ford and a Cadillac are both vehicles; there are also different classes of wells. Local conditions may require you to purchase a 4-WD vehicle that costs more than the 2-WD vehicle used elsewhere. Obviously the 2-WD Cadillac Escalade will cost more than a 4-WD Ford Explorer. You may be able to get by with a Ford Prius, or you may want a Mercedes 450 SEL, either way they are both cars. You may choose a driller that prefers Chevys than Fords, as they may last longer (or produce more/better water) in your area.*

Q: How much does it cost to operate a well?

A: That depends on many factors. A lot depends on the well construction. A poorly constructed well, will cost more to operate than a properly constructed well. A well that produces a lot of sand, or a pump that is set below the screened sections, will not last as long. In areas where there elevated water temperatures (>70^{o}F), there may be problems with submersible motor life, if the motor is not chosen correctly.

Smaller diameter motors cost more to operate than a larger diameter motors. It costs money to put multi horsepower (HP) motors in a smaller package. 3” pumps and motors are available up to 1.5 HP, but cost more to purchase and operate than a comparable 4” pump and motor. The smaller the pump, the more moving parts (and potentially higher operating speeds) thus the more parts to wear out. A 4” x 5 HP motor costs more than a 6” x 5 HP motor to purchase and operate. A typical 5-10

HP 4" motor is only 74% electrically efficient, while a 6" version can be 79% electrically efficient. The larger pumps are typically more hydraulically efficient. A typical submersible 50 GPM 4" pump is 60% hydraulically efficient, while the efficiency in a 6" model is 65%. The motor and pump efficiencies together can account for an increase in "Wire to Water" efficiency for the 6" pump/motor, nearly 10% higher than that of the 4" pump/motor. This difference is dollars, into, or out of, our pocket every month.

A 2 HP pump may be needed by your neighbor for his specific operating conditions, but that does not mean you need the same. Size every pump to the specific application. A smaller HP pump will typically cost less to install, operate, and last longer than a larger HP pump if it is sized properly. If three-phase power is available; the motor will be more efficient, cost less to operate, and typically last longer. Never run a pump on 120V unless it is the only thing available. BTW: Transformers are available to convert 120V to 230V, and may well be less expensive than buying the larger wire for the 120V motor.

A deeper well will cost more to operate, when compared to a shallow well, as will a lower pumping level. Deeper pump settings require more HP, and have more moving parts. The wire lengths are also longer in deeper pumps, which when improperly sized, can cause premature failure of the motor. Larger HP motors are more susceptible to power fluctuations. Generally, if 3-phase power is available (especially true at higher voltages), the pump system will be less expensive to install and maintain.

Q: Do wells need maintenance?

A: Yes, as do the pumps and ancillary equipment. Water, is known in chemistry, as a "universal solvent". Eventually it will break down any carbon-based product back into its original elemental state. That includes: plastic, metal, or anything that is carbon based including stainless steel.

The average residential well is only designed for a 20-year life (due to cost). Most casings are thinner in a residential well than in a commercial well and rust out faster. Chemical and bacterial plugging of a well may require attention every few years.

Residential submersible well pumps, on average, require replacement in 7-10 years. I have seen pumps last well over 20 years, and some less than 2 years. They typically come with a 1-3 year warranty and an extended 5-year material warranty policy (at additional cost) is typically available from most manufacturers. Most of the problems with short-lived pumps can be traced back to a improper well construction, or a improper pump selection.

Most pressure tanks have a 5-year warranty, and are designed to operate for 10 years. Extreme heat and cold can have a significant factor on the life of a pressure tank. Freezing will damage the bladder/diaphragm that is inside most tanks, when the water is either put in or drawn out of the tank. If the tank is empty during periods of extreme heat, the temperatures may also damage the diaphragm/bladder. Pressure tanks should be installed in a shelter to protect them from extreme elements. If the temperatures can drop below 35 ^{o}F or rise above 100 ^{o}F consider a building or shelter to protect them from the elements. Under sizing the tanks for the application will significantly

reduce the useful life of a pressure tank. Every time the pump cycles, the diaphragm must flex. With every flex the tank life is being used up. A pressure tank should be sized so that the pump will run a minimum of 1.5-2 minutes when filling.

Many above ground pumps (jet and centrifugal) can last for 15-20 years. Weather (rain, snow, freezing, dust, heat, etc.), and animals (lizards, earwigs, rodents, etc.), are the major causes of premature motor failure. While these motors are designed for certain conditions, no pump can withstand all. Freezing and improper selection of the pump for the application are major factors in pump end failure. Installing oversized/undersized pumps can lead to premature motor failures. Low temperatures can lead to motor failures, as the thermal overload devices may not trip in time. Pumps should be installed in a shelter to protect them from the elements encountered in your area. Water quality is another major factor in pump life (this goes back to selection).

Storage tanks need maintenance too. No tank will last forever. Anyone selling a lifetime warranty on any component in a water system is selling "snake oil". All tanks have a design life based on: the type of construction, and material selection, and water quality. Many tanks are available with specific maintenance requirements, to increase their useable life. Generally: The more expensive the tank, the longer the expected life.

Accessories such as: pressure relief valves, shut off valves, piping, pressure switches, etc., all need replacement on an as needed basis. Typically the pressure relief valve should be replaced when the pump or pressure tank is replaced.

Some things to remember: *As a well owner, you are the one that is responsible to maintain your water system. It is not the responsibility of the contractor you call to make repairs, or the local water company to properly maintain your water system. By performing PREVENTATIVE MAINTENANCE, you can reduce your "emergency repairs" and save money in the long run.*

- *Regularly cut and clean the weeds away from around the equipment.*
- *Look for and repair leaks as soon as they are noticed.*
- *Do not store toxic or flammable liquids around the wellhead or in a pump house.*
- *Maintain your pump houses to keep out rodents, rain, etc.*
- *Listen for unusual sounds from the equipment.*
- *Don't allow unlicensed contractors to work on your equipment "to save money".*

Q: How often should a well be tested for contaminates?

A: That depends on the type of contaminate, and the possible occurrence in the area. All drinking water wells should be tested for bacteria annually, whenever the pump is pulled for servicing, and at transfer or sale of the property. Samples should also be drawn and analyzed for nitrates annually and at transfer or sale of the property.

There are many chemicals/contaminates that may be present in the groundwater that may require testing on a regular basis, ask your Local Health Department for recommended testing in your area.

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Q: My well service person, said my "static water level was at 50 feet, and my pump is set 300', why don't I have any water after running the pump for 20 minutes?

A: There are several answers to this question.

1. It is possibly due to bacterial or chemical plugging of the well/pump.
2. The pump is oversized for the formation and pumping more than the well is capable of producing. It is also possible that the pump is:
3. Worn out.
4. Set deeper than it is designed for.
5. There is a hole/crack in the drop pipe.
6. In the case of a deep well jet pump, the pressure control valve is set to low.

Ask your well contractor to conduct a short draw down and recovery test to verify the Specific Capacity (SC) of the well. Compare the static water levels and SP to the original conditions when the well was drilled.

Q: My realtor has asked for a "Well Certification". What is it? And who completes it?

A: These are loaded questions. Many realtors ask for a "well certification" during a property transaction, like they are asking for a termite inspection. They have been taught to use this terminology in an attempt to keep them out of court. When there is a problem with the well, they simply state that the well was "certified" by XYZ Company on a specific date.

No competent contractor will "certify" that a well will produce a specific; water quantity, or quality. They will only inspect the well to ensure that the equipment is operating properly. They may draw water samples for lab analysis and report the findings.

The inspection typically includes an inspection of the mechanical aspects of the equipment to ensure that it is working properly. Better inspections include; a short draw down test of the well with water level measurements, and a water sample that is drawn and analyzed for bacteria, nitrates, or other contaminates as required by Local Governmental Regulations.

Who does the testing, is typically governed by local region. It may be a: well/pump contractor, or a licensed Hydro-geologist that draws the sample, with the water analysis completed by a: State Certified laboratory, of the Local Public Health laboratory.

Q: Will save money using my own well, instead of city water?

A: In most cases, NO!!! Water districts have a large number of customers to spread out the costs. All wells consume electricity, and need maintenance. Typically, the well-related portion of your electrical bill will rise by 25-30% of that of your water bill. (Example: If your water bill is currently $100.00 per month, expect the electric bill to increase by $ 25.00-30.00 per month for the well consumption.) If your average annual water bill is $ 2400.00 per year, your electrical bill will increase by about $ 650.00, making the savings of only $ 1750.00 per year. If the well costs $ 8000.00 to construct and connect to your water piping and electrical, it will take 4.5 years to make an initial payback. As you will need maintenance in about 7 years, the payback is extended to over

10 years. If you have water quality issues, the pump and other components of the water system may need frequent repairs, or you may need to install and maintain filtration equipment. As most residential wells are only designed to last 20 years, before major reconstruction, the payback is rarely ever there.

Usually if your average annual water bill is in excess of $ 6000.00 per year, and the average well depth is less than 500' does it make sense to drill a well. If the local water company has drought restrictions preventing you from watering your landscape, it may make sense to drill a well no matter what the water bill might be.

Q: Is there any Preventative Maintenance that I perform on my equipment?

A: Yes. All pumps and wells systems require preventative maintenance to obtain the longest life. The most overlooked PM is general housekeeping of the area around the equipment. Keep the weeds cut away from all wells and related equipment. Keeping an eye on leaks, and having them repaired ASAP, is another PM item frequently overlooked by people. If you see rust or corrosion on anything related to your well, repair it if you are comfortable with the task or have it repaired by a Licensed Contractor.

Look for rust inside your water storage tank annually. If your tank has an internal epoxy coating and you see any rust, have it repaired immediately. If your tank was shipped without an epoxy coating, ask the manufacturer if they can apply a coating in the field. Every 5-10 years storage tanks should be completely drained and cleaned.

Measure the water level in the well annually. Also check the pumps flow rate, motor current, and have the wire to the motor tested with a "megohm meter". These items can alert you of potential problems before you are out of water. Most Licensed contractors can provide this service at a minimal cost. If this is a water well supplying water to a home, also draw samples and have them analyzed for Bacteria and Nitrates.

If you have a question, that you think others may be interested in, you may E-mail me at: guishard@ sbcglobal.net, and I will try to get the answer placed on this site, at my earliest convenience. It may take some time, as I may need to research the answer, and I need to make money. (I sometimes think I should open a 900 # to answer peoples questions!) Please note that I will only answer questions, that I think will be of value to others visiting this site.

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