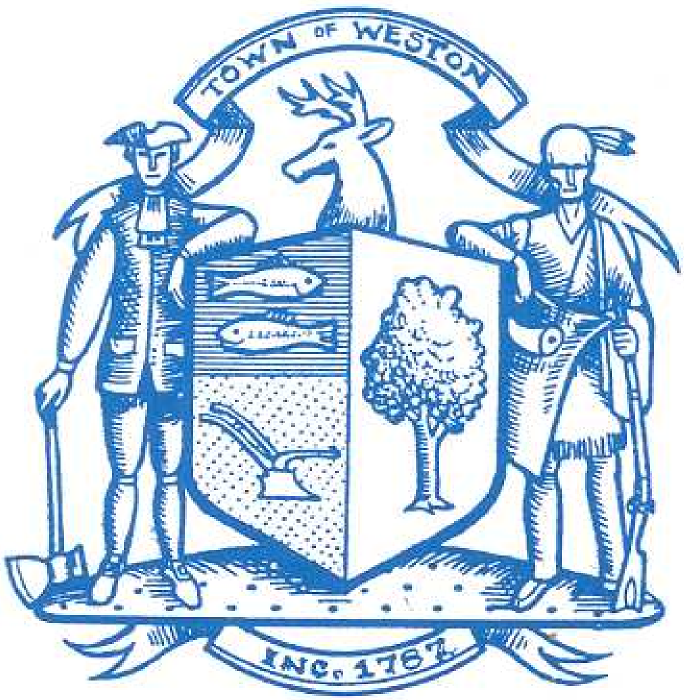
WESTON WATER RESOURCE GUIDE



WESTON, CONNECTICUT

Text Adopted June, 1993

ACKNOWLEDGMENTS

I wish to thank the members of the Weston Water Study Task Force both past and present for the long hours of hard work they personally put into making this study of Weston's drinking water a success.

In addition, we want to thank Dr. Jan Dunn, president of EML Laboratories and the many homeowners who participated in the testing program.

The task force held its first meeting in May, 1987 and was made up of citizens of the town both in and out of public office. During the first year the task force held a series of meetings with guest speakers to enhance their knowledge of groundwater and to establish a reasonable basis for the kinds of tests that would be needed to evaluate the town's drinking water supply.

None of this would have been possible without the support of town officials, our Selectmen, Board of Finance, Planning & Zoning & Conservation Commissions along with the Westport/Weston Health Department.

—Elbert Burr, Chairman

TOWN OF WESTON, CONNECTICUT

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Potable Water: A Right or a Privilege?

With over three-fourths of the earth's surface covered with water, did it ever seem possible that one day we would be faced with the reality that naturally fresh and potable drinking water might no longer be available from its normal sources? The water that exists in our lakes, rivers and deep beneath the ground, which we have always taken for granted, is slowly becoming polluted. This statement is nearer to the truth than you can imagine, and because of it the state of Connecticut and the Federal Government are working hard to correct the years of neglect and waste.

In 1985 the state of Connecticut mandated that local Planning and Zoning Commissions consider water supply protection. We are fortunate in Weston to have people who are concerned enough with the environment to approve the funding of a committee to study Weston's groundwater supply.

The Water Study Task Force was formed in May of 1987 to develop definitive boundaries for Weston's water sources through the year 2000 and beyond, to establish a working knowledge of water-related pollutants which might prevent Weston from continuing to use its aquifers, and to develop programs on surface and subsurface activities which will continue to protect the groundwater from careless misuse.

Weston is located in a region rich in natural rainfall and, while we have experienced several drought periods, none have had any major effect on the town's day-to-day activities due in large part to its sensible land use policies.

Drinking water, perceived as an inalienable right, that is to say without significant cost or supply restrictions, is now on its way to becoming a rationed resource, and for many a major expense. Much of the natural water we now drink requires treatment and filtration, and it still may become a health threat. This fact is highlighted by an April 20, 1993 article in *The New York Times* entitled, "The Outbreak of Disease in Milwaukee Undercuts Confidence in Water."

West Branch Saugatuck River north west end of town.
Al Smith, Elbert Burr and Andy from E.M.L.

To put a finger on the source of groundwater contamination is often difficult and very expensive. In many cases the contributing factors are numerous. There are over 700 contaminants for groundwater pollution on the

Environmental Protection Agency's current list. The big questions facing the state and the Federal Government when a major pollution problem arises is how to clean up, what to do with the by-product, and who should pay the bill.

The following are some of the difficult issues currently facing environmental review. Our farmers depend heavily on pesticides and herbicides. The auto industry is surrounded by hydrocarbon products and their by-products. Our local streets and highways are doused with sodium chloride each winter. Our lawns and gardens are sprayed with chemicals of all combinations. Our clothing is dry cleaned and our family collections of photographs are developed in toxic solutions. Our homes are covered with paints, varnishes, plastics and other petroleum by-products. When we are attacked by the gypsy moth, mosquitoes, black flies or other large infestations of insects, we spray the atmosphere with chemicals. In the end, all of these products wind up in the ground and eventually in water we drink.

Today more so than ever before a much greater effort is needed to educate ourselves in the proper use and care of this precious natural resource.

The state of Connecticut's groundwater protection goal is, wherever feasible, "to restore or maintain all groundwater to a quality consistent with its use for drinking without treatment" (CT's Water Quality Standards).

Connecticut is the third smallest, fourth most densely populated state in the nation, one of the most industrialized, and in which thirty-two per cent of its three million residents rely upon groundwater as a principal drinking water supply source. Weston is about ninety per cent reliant on groundwater.

Water is often taken for granted. People tend to forget how little is actually available in a form usable to humans. Of the three per cent of the planet's water that is not seawater or saltwater, two-thirds is frozen in the polar ice caps, leaving us with just one percent of the world's water for drinking and cooking, for fire fighting and manufacturing.

Groundwater nourishes and maintains many ecosystems valued for fish production, wildlife habitat and recreation opportunities. In periods of drought groundwater serves important ecological functions, providing fresh water for lakes, rivers, inland wetlands and bays.

It is clear from the research developed by the Task Force over the past six years that, while Weston currently has a good and reliable supply of drinking water, the fragile relationship we share with Mother Nature could change very quickly if we or any of our surrounding towns were to abuse to any extent current land use policies.

Water, being the most critical element in Weston's life support system, requires a commitment to environmental responsibility by all of Weston's residents.

In refining land use policy, Weston must be assured that an adequate supply of potable groundwater is available to serve all the community's needs.

We hope you will enjoy reading this resource guide and will find it useful to you and your families.

All the water that's in the world right now is all the water there will ever be.

Only 1% of the world's water is drinkable . . . the remaining 99% is either unusable seawater or ice.

There will never be more water or new water – just the same molecules, used or stored, evaporated or frozen, recirculated and reused by human and beast, for better or worse, forever.

Forging a Standard for the Future

By Dr. Jan Dunn

Vigilance is the cost of preserving society's most cherished possessions. Protection of Weston's private drinking water resources — an important factor in sustaining the life-style and ambience of this community—was the motivating force behind the Weston Water Study Task Force's five-year survey. This publication is the culmination of their multi-phase effort and embodies what may be offered as a blueprint for preserving the Town's drinking water resources—a key determinant in Weston's future development. Our firm, Environmental Monitoring Laboratory, Inc. (EML), is privileged to have taken part in this Project.

This Project incorporated leading-edge analytical protocols due to the breadth and sensitivity of the testing designed into the Study. It should be noted that one of the Task Force's early obstacles in initiating this project was the virtual vacuum regarding guidelines for private well water quality. The Group found no consensus at the Federal nor at the State Level as to what tests were appropriate for monitoring private water wells. Determined to apply the most up-to-date criteria for water purity, the Task Force consulted various experts and State regulators, in addition to obtaining local input from professionals and advisors, to forge a set of water quality standards custom-tailored for Weston's specific needs and concerns. The testing program was carefully crafted to be within the logistical and economic constraints of the Project while detailed enough to assure that problems would not be overlooked. As such, the final test battery included US EPA-compliant analytical protocols for microbiology, heavy metals, inorganic constituents, pesticides, herbicides and volatile organic chemicals. Analyses of Weston's samples utilized advanced instrumentation such as gas chromatography (GC), combined chromatography-mass spectrometry (GC/MS), high-performance liquid chromatography (HPLC), inductively-coupled plasma spectrophotometry (ICP) and graphite furnace atomic absorption spectrophotometry (GFAAS). These techniques represented the latest developments in analytical methods which, due to high costs, are not normally available to the average homeowner wanting his/her well water checked. The pie chart (Figure 1) gives a comparison of Weston's tests versus a traditional potability test.

Type of Analyses Conducted by Environmental Monitoring Laboratoy, Inc.

Per Each Site }
- Bacteria
- Physical Characteristics
- Conventional Chemistry
- Metals and Heavy Metals
- Pesticides
- Herbicides
- Volatile Solvents and Hydrocarbons

The bar graph (Figure 2) shows the aggregate results of the survey conducted from 1988 to 1991 which comprised 130 samples. The most frequently observed water quality problems were due to excessive levels of iron and manganese, keeping in mind that only secondary (non-health, esthetic quality) standards exist for these elements. Sodium and pH values were outside of the established limits in about a third of these samples. As the chart shows, other concerns were with metals, inorganics, bacteria and, surprisingly, with volatile organics. Overall, the percentage of samples exhibiting these constituents was small. For all of these unfavorable findings, specific corrective measures were implemented or recommended to remedy the observed problems.

That the design of the testing protocol "worked" in the case of volatile organics contamination was an issue that brought forth mixed emotions. On one hand, the hard work that went into constructing an appropriate battery of tests for this Project appeared to have been rewarded; on the other hand, discovery of these contaminants in drinking water was a sobering reminder of the often insidious nature of groundwater contamination. "Stealth pollutants" — such as volatile organic contaminants revealed in our survey — are undetectable to the human senses and do not leave tell-tale signs or symptoms; neither are they uncovered by the traditional test for well water potability. Moreover, any of these hidden contaminants have the potential for inflicting serious, adverse health consequences on the unwary consumer.

In summary, this multi-year, multi-phase study of private well water in Weston revealed a generally high quality of water supply in the community. In many respects, the water was typical of New England regional water quality (elevated levels of iron and maganese; low pH values). On the other hand, several localized sites were affected by unacceptable levels of a chlorinated solvent (tetrachloroethylene), bacteria (as total coliform) or lead. The reader is referred to the laboratory reports generated pursuant to this project for further details.

Vigilance, then, is only part of a systematic plan for preserving Weston's drinking water resources. Other key factors are public education, the dissemination of available information and continued focus by Town leaders on prevention practices which help keep contaminants from entering the drinking water in the first place.

The Task Force's work is unprecedented within our State. Whereas one-third of our States' population relies on private wells for drinking water, this Project sets a benchmark for a pro-active, community-based water evaluation effort for the rest of Connecticut. To demonstrate that this can be done, and to show how concerned citizens can make it happen, may be a legacy of this Project which transcends town boundaries.

Figure 1

Weston's Testing Program vs. Standard Well Tests

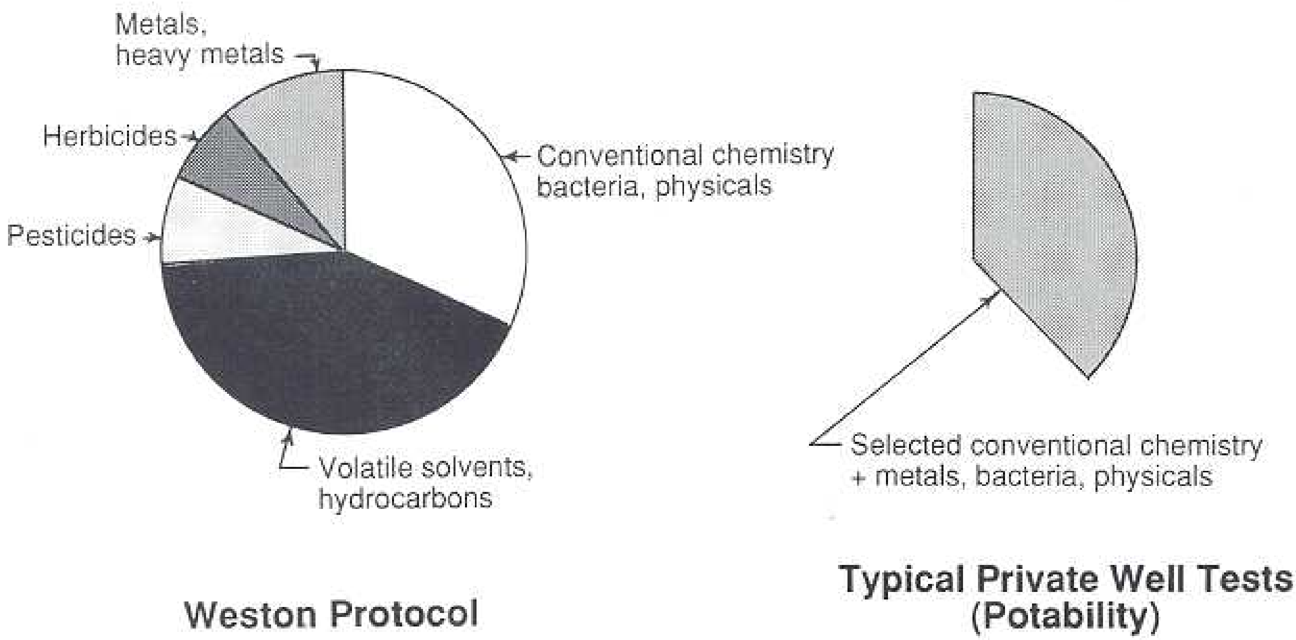
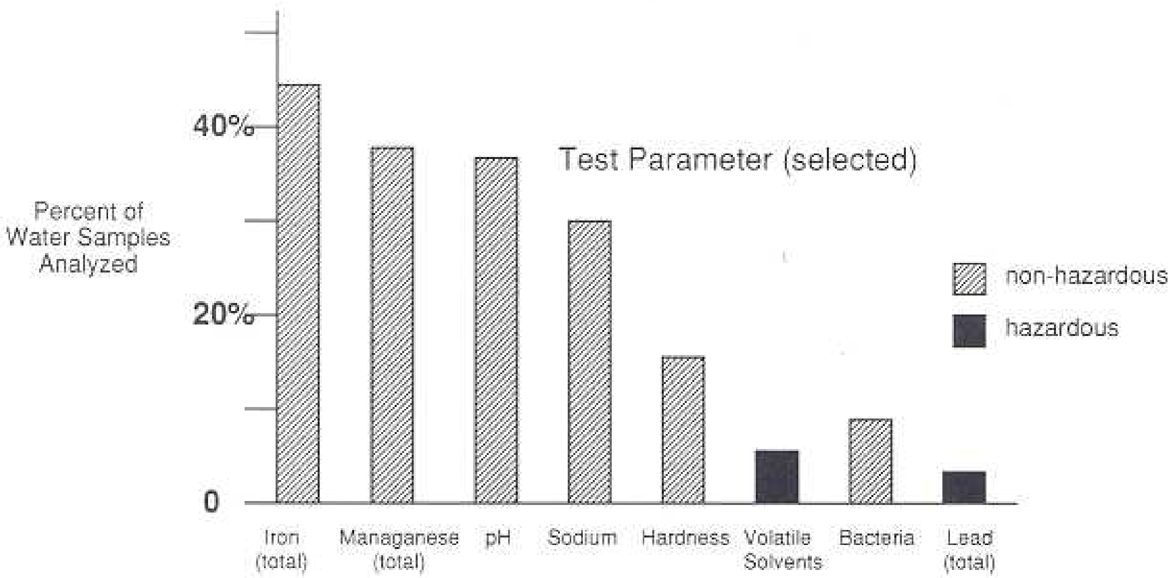


Figure 2

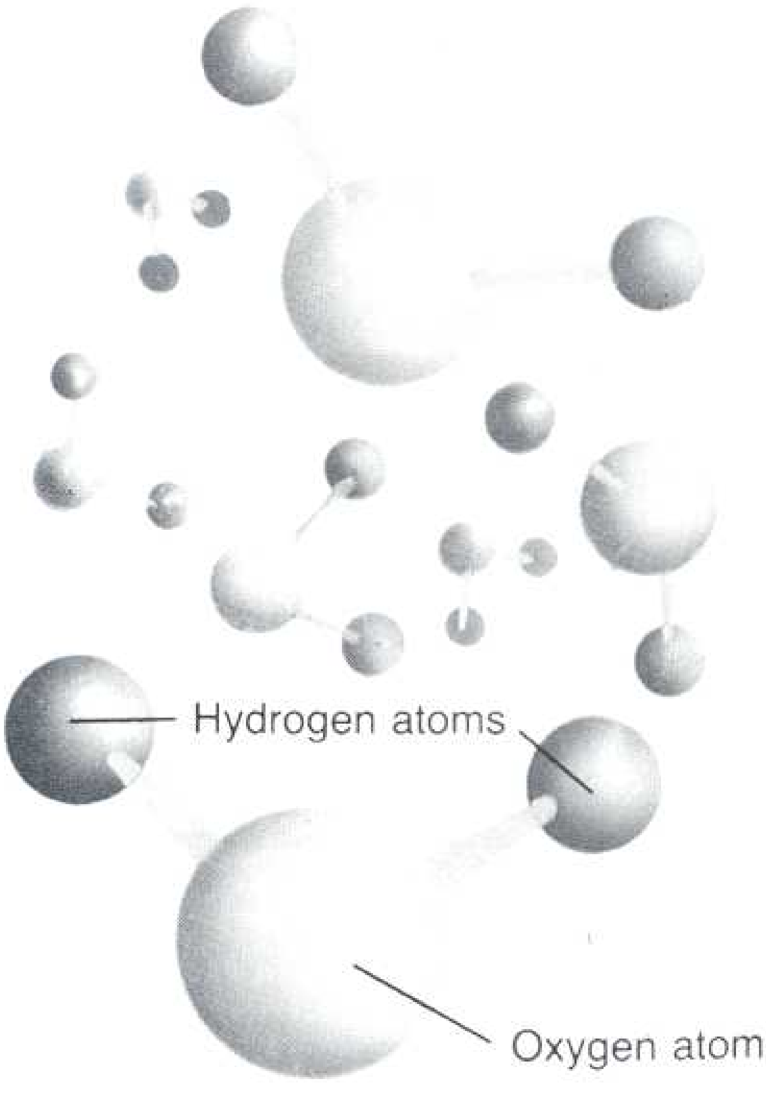
Frequency of Samples Exceeding Standards*



*U.S. EPA & CT Dept. of Health Services limits

Source: Environmental Monitoring Laboratory, Inc.

On average, a person takes in about 20,000 gallons (76,000 liters) of water during a lifetime.



A single molecule of water has two atoms of hydrogen and one atom of oxygen

Weston's Household Water Supply

Water is just like the air we breathe, we can't live without it. Living creatures other than human beings depend upon their natural habitat to obtain their water. Humans also depend upon their environment to obtain pure water, however, they need to construct systems in order to make access more convenient. Cities in our modern society rely on large-scale systems such as reservoirs, dams, pumping and filtering and chemical systems whereas some small communities such as Weston depend almost entirely upon private wells that access water from underground.

Groundwater does not flow in subterranean rivers or lakes as a legend would have us believe. Groundwater is simply water that fills the spaces between grains of soil or fractures in bedrock. Well water is drawn from groundwater. Most of our 3,500 homes in Weston, housing approximately 8,500 residents, depend upon private wells to tap the groundwater. Only a few homes on the southern edge of town are supplied by the Bridgeport Hydraulic Company. Also, Weston operates two small municipal systems which are supplied by community wells. One system serves the schools, Town Hall, the Library and the Town Garage. The other system serves the Weston Gun Club-Ravenwood area. Private wells are the responsibility of the homeowners.

Aquifers

Aquifers are geologic formations capable of yielding significant amounts of groundwater to a well. Some formations yield only a few gallons per minute, while others may yield hundreds of gallons per minute. There are two basic types of aquifers. First, those that are found in unconsolidated sediment of sand and gravel that were deposited when the last glaciers melted about 15,000 years ago along rivers and stream valleys. The two main Stratfield Drift Aquifers, which contain the most significant groundwater reservoirs in Weston, are 10–20 feet in depth along the Saugatuck River and 10–30 feet or more along the West Branch Saugatuck River. (see maps centerfold) These aquifers were almost fully developed early in Weston's history because of relatively flat topography. These aquifers are potential sources of high-yield wells for nearby homes.

The second type of aquifer is found in bedrock. Bedrock aquifers underlie the town and most wells in Weston are drilled into the bedrock. Weston's bedrock was formed under great heat and pressure and is of a hard, crystalline nature which is almost impervious to water. Therefore, wells completed in bedrock derive their yield by intersecting water-bearing joints and fractures in the rock. In general, the yield of a well is "chance" since it is directly proportional to the number of fractures encountered by the well borehole. That randomness of water makes it difficult to predict the yield. Further, it makes it difficult to predict whether two wells cause drawdown interference with one another. The further apart, the less likely the occurrence of significant drawdown.

Types of Wells

There are four basic types of wells for different water-bearing strata. The names are derived from the method of construction.

1. Dug Wells — The first wells were dug by hand or later by power tool. A dug well is simply an excavated hole lined with rocks, bricks or concrete. They have the greatest diameter and measure up to 50 feet deep. This type of well can be constructed only if the water table is near the ground's surface. Because they are shallow, they are very susceptible to surface pollution and are apt to fail in drought. The top of the well should extend above ground level and should be protected by a sloping collar and an impervious lid. A few homes in Weston are still supplied from dug wells.

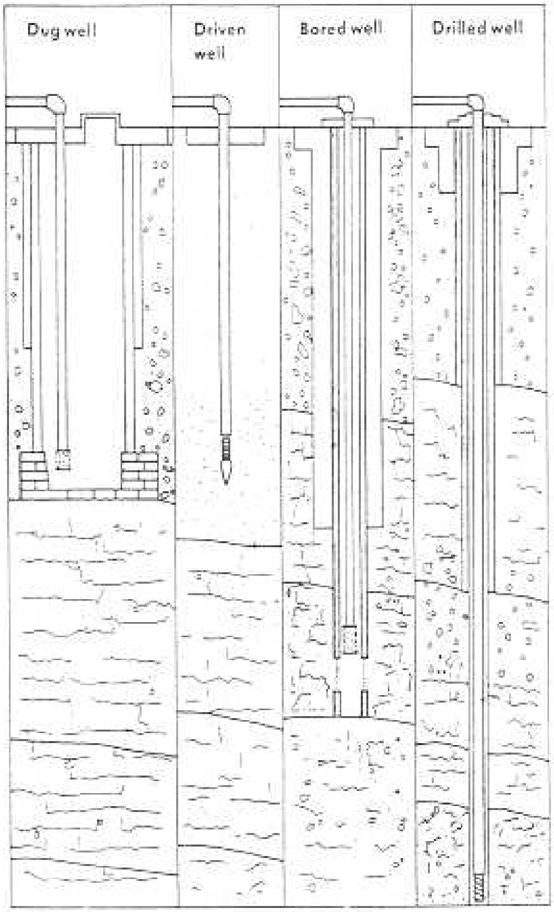
2. Bored Wells — These wells can extend deeper into water-bearing formations, however, they still require a high water table. They are constructed using large cork-screw-shaped bits called earth augers. These wells consist of a hole lined with encased pipe. The casing must be properly sealed to prevent contamination.

3. Driven Wells — These are made by driving a series of pipe lengths into the ground with a "drive point" to depths up to 60 feet. They are shallow wells with a small diameter. The most suitable location for driven wells are areas containing alluvial deposits of high permeability. Most of Weston is not suited to this method of construction.

4. Drilled Wells — Most of Weston's homes are built in the thin glacial till soils on uplands and require wells drilled deep into bedrock for water. Bedrock wells are between 100 and 400 feet in depth. The two methods of drilling wells are the "percussion" (cable tool) method and "rotary hydraulic" method.

A. Cable Tool or Percussion Method — A machine called a drilling rig alternately lifts and drops a heavy chisel-shaped steel bit which crushes pieces of rock. Crevices of soft streaks are often water-bearing in hard formations. After drilling a short distance, the bit is lowered into the hole to pick up the crushed rock.

B. Rotary Method — A steel bit is fastened to a pipe that is rotated by machine. As the bit turns, it works its way into the earth, water or air is forced down the drill pipe, out through the holes in the bit, and up outside the drill pipe. If water is used it can be thickened with special materials to make a mud that plasters the sides of the hole and carries the drill cuttings to the surface. When air is used, it is kept under high pressure to achieve this affect.



Drilled wells are one of the most common types of private wells in Weston.

Well Casings

In all drilling methods, the hole is lined with a cast iron or plastic pipe called the well casing. The casing serves two purposes — it keeps the well from caving in and when it is properly cemented in place, it protects the groundwater from being polluted by surface water that seeps downward. If the well is drilled in loose sand or gravel, the entire length of the well is lined with casing. A screen is put on the end to let water in but keep out sand and other loose material. In wells drilled into rock, the casing goes from the surface to the top of the hard-rock layer. No screen is needed.

Regardless of the type of well, improper installation is a major cause of pollution. Wells must be adequately flushed and disinfected before use because digging stirs up sediments, bacteria and organic matter. Wells can become contaminated through improperly sealed joints and casings, faulty well covers or broken pipes.

The Westport/Weston Health District has maintained records of all Weston household wells since 1967. Well location is determined by the State of Connecticut Public Health Code regulations. The State of Connecticut and its agent, the Westport/Weston Health District have standards for locations of wells with respect to septic systems or other sources of pollution. A well is located where contamination of the well field can be prevented. Wells should be sited uphill and as far from potential sources of pollution as possible.

Pump Selection

To get water out of a well, the water must be pumped to the surface. Pumping depresses the water table in the vicinity and causes more water to flow toward the well from all directions (its "zone of influence"). A pump is selected by the installer on the basis of well-log information. The type of rock formation or soil deposits in which the well is located must be taken into consideration. In essence, the type of pump is determined by the yield of the well which is determined by the geology of the area. A large pump does not necessarily supply more water. The two basic types of pumps on private wells are Jet-Pump which is located inside the dwelling or a submersible pump located in the well, suspended by pipe.

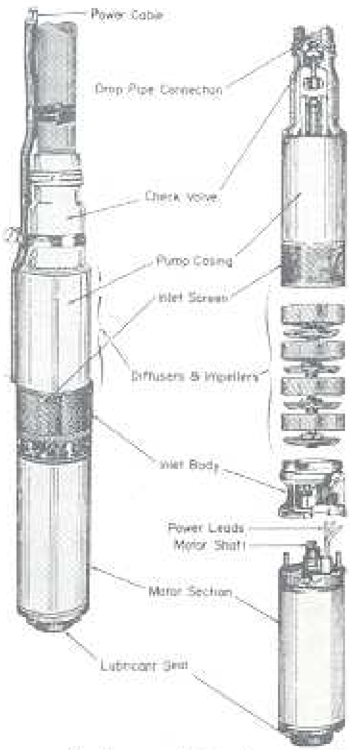


Diagram of submersible deep well pump

Water Quality/Testing/Treatment

The quality of the water drawn from a well can change over a period of time, and owners of private wells are advised to have their drinking water tested periodically. Water quality should also be tested whenever the pump or plumbing in the well has been replaced or if the taste or other physical characteristics of the water have changed.

Weston residents may request information about independent water-testing services from the Town Engineer, in Weston Town Hall, or the Westport/Weston Health District, at 180 Bayberry Lane, Westport.

Choosing A Water-Testing Laboratory

The following guidelines should be considered when selecting a water-testing laboratory:

1. The lab should be a professional, licensed laboratory, certified by the Connecticut Department of Health Services.
2. To ensure that the water analysis is objective, the lab should be a water-testing facility only and not in the business of selling filters or other treatment systems.
3. To prevent degradation of water samples due to mail delays, a mail-order lab should not be used.
4. Generally, results should be available within two to five business days; 24-hour emergency services are sometimes available, as well.
5. The lab report should indicate the state's acceptable public water standards along with the results of the well water sample tested, so a comparison can be made. For questions contact the Health District.

Accurate sampling is extremely important. Use only the sterile containers provided by the lab to collect the water sample, and submit it to the lab promptly. The sample should be collected from the kitchen tap and should be unsoftened, untreated water. Failure to carefully follow the lab's instructions could result in an inaccurate report.

Testing For Contaminants

Well water can be tested for simple potability, for a broad range of contaminants, or for the presence of a single chemical. When having well water tested, homeowners must be aware that their well water may appear, smell, and taste good; but it could still have unacceptable levels of certain contaminants. To be sure well water is uncontaminated, a lab test in necessary. (Sources of contamination are discussed in Chapter 5).

New wells in Connecticut are required by state health regulations to have the local Health Department or Health District review and approve or disapprove the results of the test. This test is a conventional analysis of about twenty items, including total coliform bacteria count,

physical properties, and sanitary chemistry. A simple potability test will cost about $30. (1993).

Water from *existing or older wells*, which have not been tested for several years, should be analyzed on a broader basis and tested for some synthetic solvents in addition to the items included in the "certificate of occupancy" potability test mentioned above. This type of broad-based water test may cost about $100 (1989). It is recommended that water taken from existing or older wells be tested *periodically* for the presence of the chemicals shown on the following list. (Where maximum levels permitted by the Connecticut Health Department are established, they are shown.)

Water Sample Tests

Recommended For Existing or Older Wells

Physical/ Coliform Bacteria/ pH Examinations	Limits*
Color, Apparent	15
Odor	2
Turbidity (NTU)	5.0
Total Coliform (cfu/100 mL)	0
pH (standard units)	6.4 to 8.5

Standard Chemical Analysis (mg/L)

Chloride	250
Nitrite Nitrogen	1
Nitrate Nitrogen	10
Sulfate	250**
Sodium	28
Copper	1
Iron	0.3**
Manganese	0.05**
Calcium	none
Magnesium	none
Lead	0.05
Ammonia-N	?
Alkalinity	none
Detergents ABS	0.5
Hardness	200**

Synthetic Solvents (ug/L)

1,2 -Dichloroethane	1
Benzene	1
Toluene	1,000
1,1,1-Tricholoroethane	200
Methylene chloride	25
Chloroform	100
Xylenes	(600)
Trichloroethyele (TCE)	25
Chlorobenzene	none
Tetrachloroethylene (PCE)	5
Dichlorobenzenes	none
Tetrachloroethane	none
1,1-Dichloroethane	none
Vorlex 10	10**

* Maximum levels permitted by CT Dept. of Health Services

** Suggested limits which may be exceeded on occasion. Contact the Westport/Weston Health District for details.

Testing For A Single Contaminant

Testing for a single chemical may be indicated. Examples of situations when such a test might be indicated are:

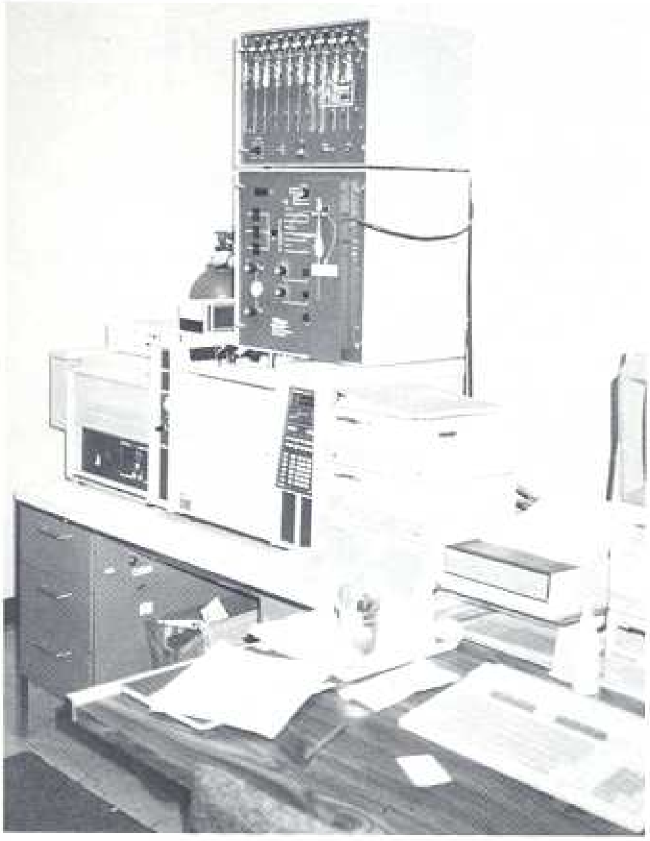
- A physician might recommend testing for sodium in a patient's drinking water.
- If there are lead pipes in the house or, more likely, lead-soldered pipe joints and the well water possesses the "aggressive" quality of dissolving lead, lead could be leaching from the plumbing into the drinking water; a test for lead only could be made.
- A test for copper could be made if fixtures are staining blue, or for iron or manganese, if reddish-brown.
- During flooding and high water table conditions, wells with caps located several feet below ground level can become contaminated with surface or shallow groundwater; if this is suspected, a coliform bacteria test should be made.
- Finance institutions often require a minimum bacteria test before approving mortgages on homes with private wells.

Hardness, usually caused by dissolved calcium and magnesium salts in the water, can be determined alone.

- When there is reason to believe there has been some careless dumping of pesticides on or near the property or there has been heavy landscaping use of pesticides and fertilizer over a long period of time in the area, individual tests can be made for a considerable number of pesticides. Indication of heavy fertilizer usage would appear in a basic chemical analysis.
- Testing for these and other individual elements is done primarily on an as-needed or monitoring basis. Periodic testing might include the larger spectrum of physical qualities, coliform count, pH, metals and inorganic chemicals, and occasionally, synthetic solvents (volatile organic chemicals).

Treatment of Contaminated Water

Most water contamination can be corrected or treated; sometimes this can be accomplished simply and inexpensively by the homeowner, without hiring an "expert." For instance, if a high coliform count is found (an indicator of disease-carrying germs in the water) and it is determined that the contaminant has entered from the surface in a single incident (such as flooding mentioned above), the homeowner can disinfect his/her own well with household chlorine bleach. Simple instructions on how to accomplish this treatment are as follows. After the flood waters have receeded, appropriate action should be



taken to disinfect the well. The first step is to inspect the well to determine if the physical integrity has been damaged, *e.g.* casing damage or wash out. Any damage, including damage which existed before the flood, should be repaired before disinfection. Wells should then be freed of debris and pumped clean before the solution of disinfectant is added. Approximately one gallon of Clorox bleach or a product of equal chlorine concentration (5 1/4%) should be added to the well. The well water should be recycled to provide good mixing and contact. The recycling can be accomplished by using an outside faucet with a hose to return the chlorinated water to the well and allowing the system to run until the mixing is complete. A chlorine odor should be detected in each faucet in the home. The disinfectant must remain in the water supply system a minimum of 12 hours with 24 hours preferred. To flush the well allow the water to run until the chlorine odor is no longer detectable at any of the faucets. The chlorinated water from the well can be discharged into the waste system or on the ground surface away from shrubbery or grass which might be damaged. A properly collected sample then can be collected and submitted to the State Health Department Laboratory as outlined below.

If lead is suspected due to old plumbing or found when the water is tested, the homeowner can reduce the level of lead in the water by the following actions:

1. After several hours of nonuse, such as overnight or all day, let the water run for several minutes before using it for drinking or cooking. This will flush out the water that has been in contact with the lead pipe or solder for a long time and will significantly reduce exposure.

2. Because hot water dissolves lead more easily than cold, always use cold water for drinking and cooking.

3. Replace the lead pipes or fittings as soon as practical. Lead-free plumbing materials are required in new construction.

4. Monitor the amount of lead with tests; if levels remain unacceptable, install a lead-treatment system.

An individual homeowner with a private well in Weston is not likely to have multiple contamination problems; but if a problem should arise, a variety of commercial home-treatment systems are available. Two important things should be kept in mind, however. Home water-treatment systems should be:

(1) chosen carefully and according to specific pollutants found in the water; and

(2) very carefully maintained.

As considerable as the technology is for removing contaminants, there is no single solution to solve all water pollution problems. Activated carbon filters are especially effective for removing organic contaminants, as are reverse osmosis systems. Distillers remove minerals (some of which are, in fact, desirable), bacteria, inorganics, and organic chemicals. Different systems can be combined for greater effectiveness and to treat an array of contaminants.

Before a homeowner pays or makes final payment for a treatment system, the water should be re-tested by a certified laboratory independent of the company selling the system, to objectively evaluate the adequacy of the system relative to the specific problem. Currently, home treatment devices are not regulated by the government, nor are they monitored for proper maintenance. However, the State Department of Health Services regulations prohibit backwashing of water treatment units into the septic systems. One of the reasons for this is the backwash chemicals can effect the life of the concrete holding tank. It is up to the homeowner, then, to make sure the right system is installed, that it works properly and that it is maintained sufficiently.

Groundwater Use and Conservation

Many of us do not realize the part we play in Weston's life support system. Water is the most critical element in this system. It is tapped from private bedrock wells, used to fulfill household needs, discharged as wastewater to a septic system where it is treated and returned to the groundwater as a potential source of supply for our own or neighbor's well. The information provided in this chapter explains this life-supporting hydrologic system we all depend on as well as the role and responsibility we all share for its maintenance.

Weston's Water Supply

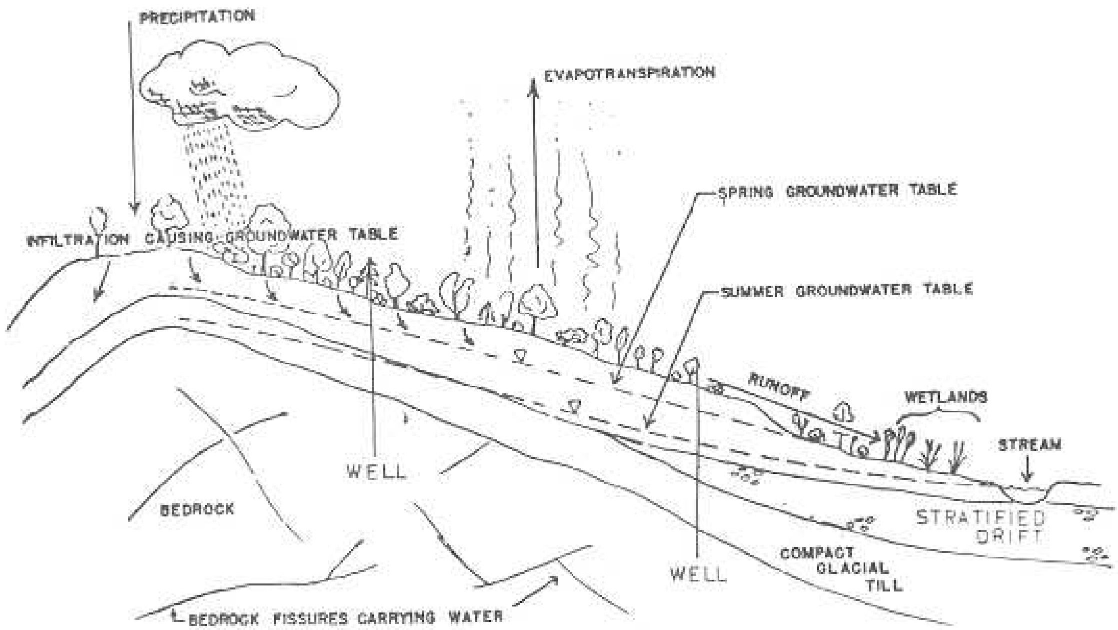
We too often take for granted the water that comes out of the tap. We assume and behave as if there is an infinite supply of water. There are, however, physical limitations to the quantity of water that is available to support the population of Weston. To get a better understanding of these physical limitations, let's review the *water cycle* and its role in Weston's life support system.

annual precipitation by a third or to 31 inches of precipitation.

The second physical limitation is the amount of precipitation that actually percolates under the influence of gravity into the soil and underlying strata to become subsurface or groundwater. For example, of the total average annual precipitation, approximately 13.4 inches (29 per cent) runs off immediately to appear in streams as storm or flood flow; it therefore cannot contribute to Weston's water supplies. Another portion of the precipitation enters the soil where it is taken up by the plants to be transpired through their leaves, evaporated directly, or is held by the soil through capillary and molecular action. These phenomena are known as *evapotranspiration* and account for an estimated 23.1 inches (50 per cent) of total annual precipitation that also cannot contribute to Weston's water supplies.

The final portion of precipitation that also enters the soil is called *infiltration*. Infiltration passes downward under the influence of gravity until it reaches an impervious stratum. It then begins to move in a more lateral but

Cross section of a typical Weston watershed

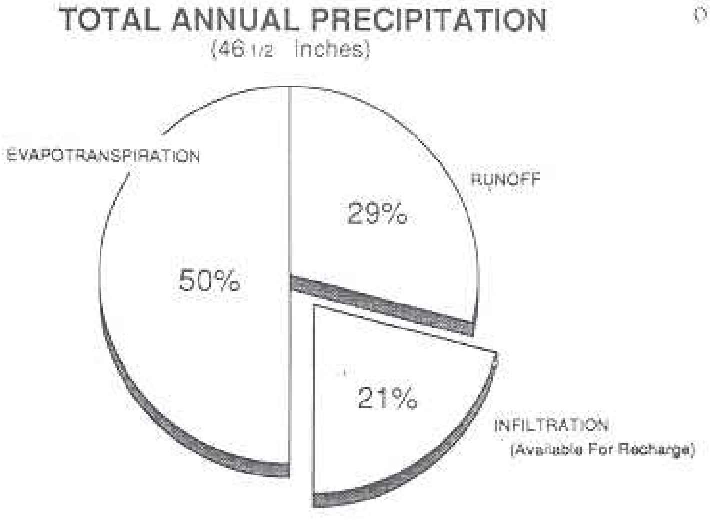


The first of these physical limitations is the amount of water that falls upon Weston's numerous watersheds as rain, snow, hail and sleet. Bridgeport Hydraulic Precipitation Data for the period 1894 through 1971 indicates that the total mean annual precipitation is 46 1/2 inches. However, this amount can vary significantly from year to year. For example, a drought having a 1 in 30 year probability of occurrence is expected to reduce the total

downslope direction toward some outlet such as a pond, spring or wetland area. The portion of the earth through which this lateral movement takes place is known as the *zone of saturation*, and its water is called *groundwater*. Geological formations that store and transmit groundwater are called aquifers.

The upper edge of the zone of saturation is called the *water table*. Here in Connecticut, the level of the water table is likely to fluctuate considerably—7 to 9 feet on average— primarily as a result of differing rates of evapotranspiration between summer and winter. Infiltration is estimated to account for 10.0 inches (21 per cent) of the total average annual precipitation and is considered to be the amount of precipitation potentially available to be tapped by homeowners' wells. The following chart summarizes these runoff, evapotranspiration and infiltration rates for the Town of Weston.

Only 21 per cent of the annual precipitation actually recharges our groundwater supply.



Source: BHC, CT DEP & Dominski/Oakrock Assoc.

The third physical limitation to the quantity of water that is available to support the population of Weston is our local geology and its influence on bearing and yielding water to wells. Some people are very fortunate; they live directly over sand and gravel deposits left by the last ice age. These deposits, called *unconsolidated stratified drift*, have large interconnected open spaces to store and transmit groundwater and are thought to be capable of yielding greater than 50 gpm to individual wells. These potential high-yield aquifers have been found along the stream valleys of the Saugatuck and West Branch rivers here in Weston.

Unfortunately for the rest of us, most of Weston is underlain by a nearly impervious strata of granite, schist, and gneiss which makes it extremely difficult to collect water in a well. In most cases, we are fully dependent on the bedrock fissures containing groundwater intercepted by our wells to yield an adequate supply of water. It is not unusual to find wells here in Weston 300 to 600 feet deep producing less than 1 gpm.

In Dominski/Oakrock Associates' 1976 report to Weston's Planning and Zoning Commission, it was estimated that about half of the infiltration or groundwater recharge might be available to bedrock wells. This translates to around 300–400 gallons per acre per day, or that the typical two-acre lot in Weston can support a single dwelling requiring 600 to 800 gallons of water per day. This, however, is a town-wide average and should only be used for long-range planning. If we focus on specific areas around Weston, we soon see that there are numerous factors that control the amount of precipitation that actually reaches the zone of saturation to become groundwater. The most important of these factors are: watershed characteristics, soil cover, and soil characteristics. Each of these factors are briefly described below.

- Watershed Characteristics include: the topography of the drainage area, its degree of slope and roughness; geology of the watershed; solar radiation and its variation.
- Soil Cover or vegetation protects the soil from compaction by rain and provides detention on the surface thereby increasing the opportunity for infiltration. The degree of detention depends upon the density of cover; natural forest cover is the most effective, followed by hay meadows. Lawn cover has a significantly lower absorption rate than either forest or meadow. Obviously covering the soil with impervious areas such as paved driveways, patios, buildings and tennis courts increases direct run-off and can reduce the amount of precipitation entering the soil.
- Soil Characteristics such as pore size, mixture of large and small particles and soil type can affect infiltration. For example, some soils contain colloidal clay which swells on wetting and reduces infiltration regardless of the degree of detention.

An example of these factors — topography, soil cover and soil characteristics — is provided by a recent subdivision filing in which infilitaration rates varied from 5.5 to 15 inches per year across areas within the 80+ acre subdivision for normal precipitation and 3.7 to 10 inches for drought conditions.

Water Use

At this point you are probably asking yourself whether a water supply of 600 to 800 gallons per day for a two-acre lot is adequate for your household. Generally speaking it is, for two reasons. The first reason is that daily water consumption has been estimated by various agencies to be in the 90 to 125 gallon per day per capita range for similar communities. For a family of four, this translates to 360 to 500 gallons of daily water consumption, leaving a margin of 300 to 400 gallons on average.

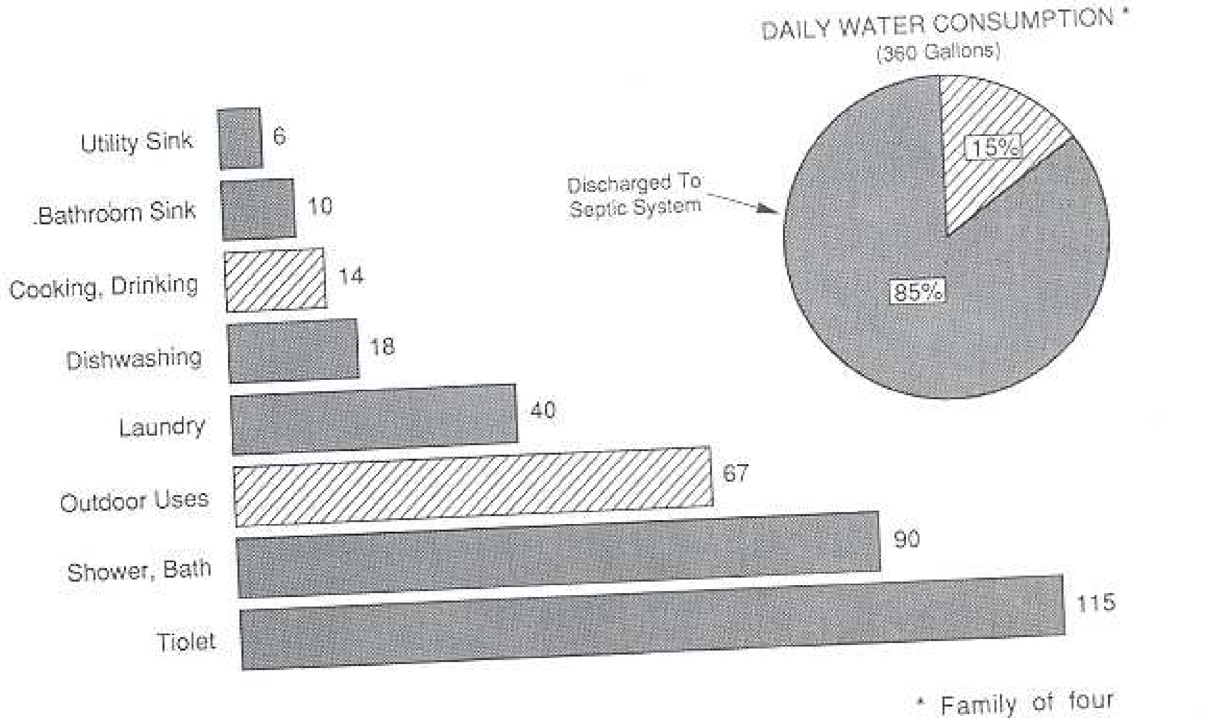
The second reason has to do with the continuation and completion of the water cycle. All of us have on-site septic systems that receive a significant daily flow of household waste water from the toilet, dishwasher, sinks, tub and washing machine. Our septic systems clean and recycle this used water back into the ground where it is potentially available to our well and our neighbors. The mechanics of a septic system and what we can do to assure its effective operation is the subject of the next chapter.

Looking at the daily water use by a family of four we see that approximately 85 per cent of the total daily water consumption is discharged to the septic system.

Another area where water can easily be conserve with the use of water saver shower heads and fa aerators. These widely available devices limit flow 2 1/2 gallons per minute and do not reduce the qualit the flow. Proper maintenance of plumbing fixtures also save significant amounts of water. For examp dripping faucet can result in a water loss of 15 gallo more per day.

Outdoor use can be significantly curbed by redu the need and avoiding waste. For example, landsca with plants that require little water, watering your

Approximately 85% of our daily home water consumption is discharged to the septic system



SOURCE: CT DEP

We can also see what the major water uses are, with the toilet being the largest single user followed by the shower and bath, and outdoor uses such as lawn and garden irrigation and car washing. These are the areas that should be addressed first. For example, most toilets use between four and seven gallons of water per flush, yet studies have shown that it actually takes only 3 1/2 gallons to work effectively. Tank inserts such as plastic bottles or flush dams can be used to reduce the amount of water your conventional toilet uses for each flush.

only when it needs it, washing your car from a soapy water and reusing water wherever poss State of Connecticut Department of Health Se two excellent booklets that provide ideas an conserving water: "The ABC's of Water Cons and "Wise Water Use Outdoors." To obtain co write the Water Supplies Section at 150 W Street, Hartford, CT 06106.

Protecting Our Supply

In reviewing the water cycle we have seen that there are physical limitations to the quantity of water available to Weston households. Each one of us plays a part in this life support system and shares in the responsibility for its maintenance. The Town of Weston has taken a very pro-active approach to protecting this supply through various land use and development policies such as:

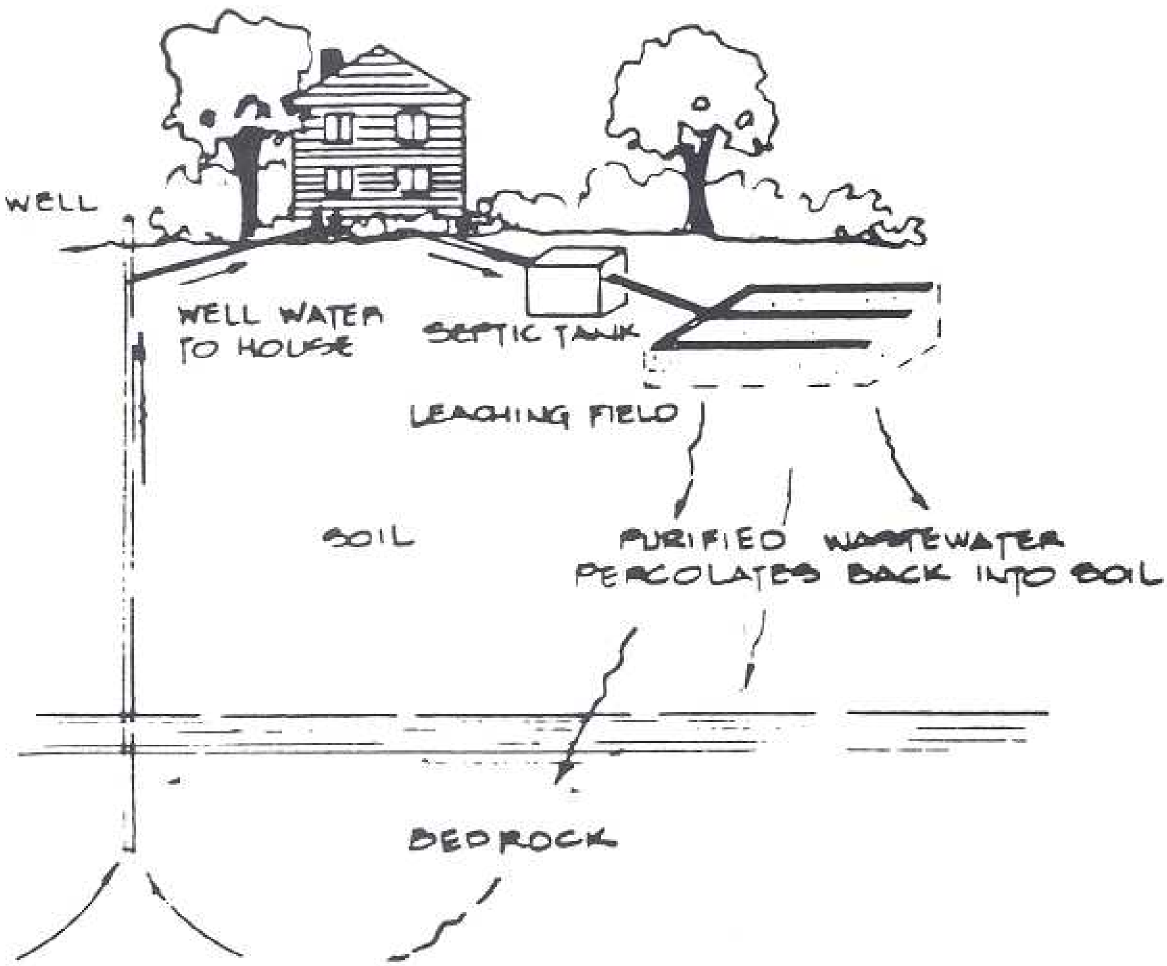
- Preserving wetlands
- Acquiring open space
- Requiring minimum two-acre residential zoning
- Requiring 10 per cent open space for new subdivisions over 10 acres
- Retaining the incremental increase in runoff from developed land
- Minimizing lot coverage by impervious surfaces
- Requiring use of drywells to recharge surface runoff on individual lots
- Requiring underground fuel tanks to be made of fiberglass

Our role as individual homeowners is equally, if not more, important. The most effective way we can protect our water supply is to avoid over-pumping by adopting conservation measures. And, the most effective way we protect the quality of our water supply is to:

1. Prevent pollution in the water we use within the house and discharge to our septic system, and

2. Prevent pollution from the use of hazardous products such as fertilizers, pesticides, motor oil and anti-freeze outside the home.

Please join your neighbors in protecting Weston's life-support system. The quality of life we have all come to expect depends on each of us doing our part.



The water we use is recycled to be used again.

Septic Systems: Their Use and Maintenance

Private septic systems are designed to receive and decompose the household waste discharged from drains, washing machines and toilets. When correctly sited and installed, properly designed systems will efficiently renovate domestic wastewater and sewage and return good quality water to the watershed. When operating incorrectly, private septic systems can allow pollutants to enter the groundwater.

Along with proper installation and maintenance, soil condition is of particular importance for a properly functioning septic system. Soils with slow percolation - absorption rates, shallow soils, and those over bedrock are inappropriate for sewage-disposal systems.

A septic system too small for the house it serves, a leaching system placed in unsuitable soil, or a poorly constructed system may lead to early failure.

How It Works

A septic system generally consists of a tank where sewage is received and treated through bacterial action before being discharged to one or more leaching systems beyond. The four most common types of leaching systems are trenches, galleries and leaching pits.

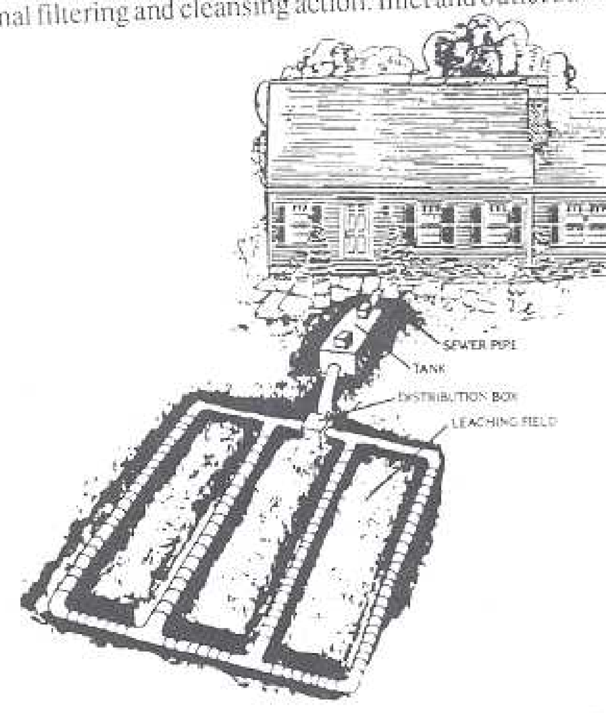
Organic household waste materials are flushed through waste pipes to the septic tank, an underground watertight structure (usually made of concrete or fiberglass) connected to a leaching system. Organic solids from the kitchen, laundry, and bathroom are decomposed in the tank through natural bacterial action. Bacteria thrive in the tank's oxygen-free environment by digesting the solids, thereby reducing their volume.

Inorganic or inert solids and the by-products of bacterial digestion settle into a layer of *sludge* on the bottom of the tank. Sludge is not biodegradable and will not decompose. If the septic tank is not pumped out regularly, sludge will accumulate, reducing the bacterial action.

Grease and lighter organic material float to the surface of the tank, creating a layer of *scum*. Most of the scum layer is gradually decomposed and converted to liquid by the primary anaerobic bacteria present in the tank, although some solids from the scum layer also settle to the bottom. Normal household waste will provide enough bacteria to digest the solid material, unless harmful chemicals are introduced to the system.

The clear liquid sewage that forms between the sludge and scum layers is called *effluent*, polluted water that flows out of the tank and into the leaching area for purification. It is the only material which should flow into the leaching area; solid material overflowing into the soil-absorption area will clog soil pores.

Partially treated effluent still contains a large numb[e]
of disease-causing bacteria and organic matter. Fo[u]
odors and health hazards will develop if effluent
allowed to rise to the surface of the ground befo[re]
traveling through the leaching system and subsoil f[or]
final filtering and cleansing action. Inlet and outlet baffl[es]



in the septic tank extended downward below the l[iquid] level in the tank to prevent newly received sewage flowing directly through to the outlet pipe and in[to] leaching fields.

The leaching system disperses the polluted ef[fluent] from the middle layer of the septic tank into surrou[nding] soil (the leaching area) without polluting the grou[ndwa]ter that supplies well water to the owner's home and neighborhood. Disease-producing bacteria which the soil gradually die off as they are exposed to ai[r in] porous soil or attacked by soil bacteria. Rain and g[round] water further dilute the effluent.

A leaching system generally consists of either a [leach]*ing field*, a network of perforated plastic pipes gravel-lined trenches, or a *leaching pit*, a precast [perfo]rated concrete chamber, with an open bottom an[d holes] in the sides, placed in a hole lined with stones.

The size of the holding tank and leaching sy[stem is] determined by the number of bedrooms, large w[ater] fixtures, and the absorption ability of the surro[unding] soil. Clay and mud soils have slow drainage cha[racteris]tics and require large leaching areas; sand or gra[vel soils] drain more quickly and are ideal locations.

Leaching areas should be located downhill from the septic tank. They should be at least 75 feet from a well or spring, 50 feet from a pond or stream, 25 feet from an in-ground pool, and 10 feet from the property line.

The leaching area should be located at least 18 inches above the maximum high-water table. Otherwise, during wet seasons the water table can rise into the leaching area, forcing sewage upward to the surface. Groundwater curtain drains installed around the leaching area may help lower the water table.

Maintenance

A septic system will give a home healthy, odor-free service for an average life of 20–25 years, but only if it is properly designed, installed and adequately maintained. A well maintained septic system may serve satisfactorily even longer. A neglected system will become a nuisance and a burdensome expense. To repair or replace the septic tank, the leaching area, or both, a portion of the yard must be dug up, and the system replaced or extended, costing thousands of dollars. A failed system also presents a serious environmental health hazard, since the escape of raw sewage can contaminate the ground and surface water in the area.

It is prudent for a new homeowner to inspect the septic system with a licensed septic pumper, determine whether it needs pumping, and establish an appropriate interval for routine inspection and cleaning. As a rule, septic tanks should be pumped out *every two to three years*. In situations involving heavy use or small capacity tanks, more frequent pumping may be required. Routine yearly inspection of the tank and baffles by the homeowner or a trusted service person is advisable to protect the life of the system.

It is important to pump out sludge and scum before they accumulate to a point where they interfere with the effective settling function of the tank. When either the sludge or scum layer approaches the vicinity of the outlet baffle, which prevents floating scum and sludge from discharging into the leaching field, the tank should be pumped out completely and the sludge removed from the bottom. To remove the sludge, the pumper will open the access manhole cover(s) and insert a hose; the sludge is stirred and pumped into a tank truck for proper disposal.

Your septic tank may have a single manhole cover over a mid-tank baffle or two manhole covers, both of which must be removed for proper cleaning. Septic tanks installed after January 1, 1991, have two compartments, and both should be pumped.

If sludge or scum escape into the leaching system, the soil will become clogged and form a barrier to further penetration by effluent. And when partially treated effluent from the septic tank cannot soak into the soil, sewage may back up and overflow into the house or puddle on the surface of the ground.

It is particularly important to inspect the condition of the baffles each time the tank is pumped.

It is not advisable to disinfect the tank after pumping. Some residual bacteria are necessary for successful start up.

Care

Proper care of your septic system is essential for your own health and that of your neighbors and the surrounding environment. The following guidelines will minimize cleaning and maintenance costs and extend the life of your septic system:

The surface area above the entire septic system should be kept clear, unpaved, and unencumbered by anything which could damage the structure or interfere with evaporation. To permit maximum evaporation, the ground above the leaching fields should be kept mowed and raked and no trees or shrubbery should be planted over the area; roots could infiltrate and damage the leaching structures. Heavy weights (such as automobiles, trucks, or other heavy equipment and materials) should not pass over or be placed above the septic tank or leaching system, for they could damage pipe connections and render the entire system inoperable.

Runoff from precipitation should be diverted away from the septic area to prevent its impending evaporation from the leaching area. Roof and foundation drains, sump pumps, and water-softener discharges should not be piped into the septic tank, since such large volumes of water will stir up the contents of the tank and carry some of the solids into the outlet line and hydraulically overloading the leaching system.

Be mindful of what goes down your household drain. Excessive amounts of water, toxic materials, and certain products (even those that are biodegradable) can overload or destroy your system.

Avoid discharging too much water into your system. Install water-saving shower heads. Place a brick or closed plastic bottle of water in the toilet tank to decrease the amount of water used in flushing. New toilet fixtures work more efficiently, using 1.6 to 2.5 gallons of water per flush (compared to 4.7 gallons for some older models). Backwash from household or swimming pool water-filtering and water-softening systems may not be discharged into any subsurface disposal system.

Use discretion even when disposing of biodegradable products. Plain white toilet tissue can be decomposed by the bacteria in the tank; colored paper cannot, and it adds to the sludge layer. Garbage disposals put an excessive organic burden on the tank and should not be installed. Some items decompose very slowly (paper towels, feminine hygiene products, and coffee grounds, for example) and should never be put down the drain.

Know Your System

Know the location of your septic system, and record all repair and cleaning dates. If you have recently purchased your home and do not have this information, you must locate your tank before it can be inspected, cleaned, and properly maintained.

If you do not know where your tank is, you may be able to obtain a copy of the final sketch of the plan for original installation of the system (the "as-built") from the Westport/Weston Health District or from the previous owner, septic pumper, or builder. "As-builts" for systems installed in Weston from 1966 to the present time are on file, and homeowners may request a file search for such records at the Health District office. "As-builts" should indicate whether your tank has one or two access manholes. Keep a copy of your "as-built" and any subsequently approved applications for repair to your system in your household files.

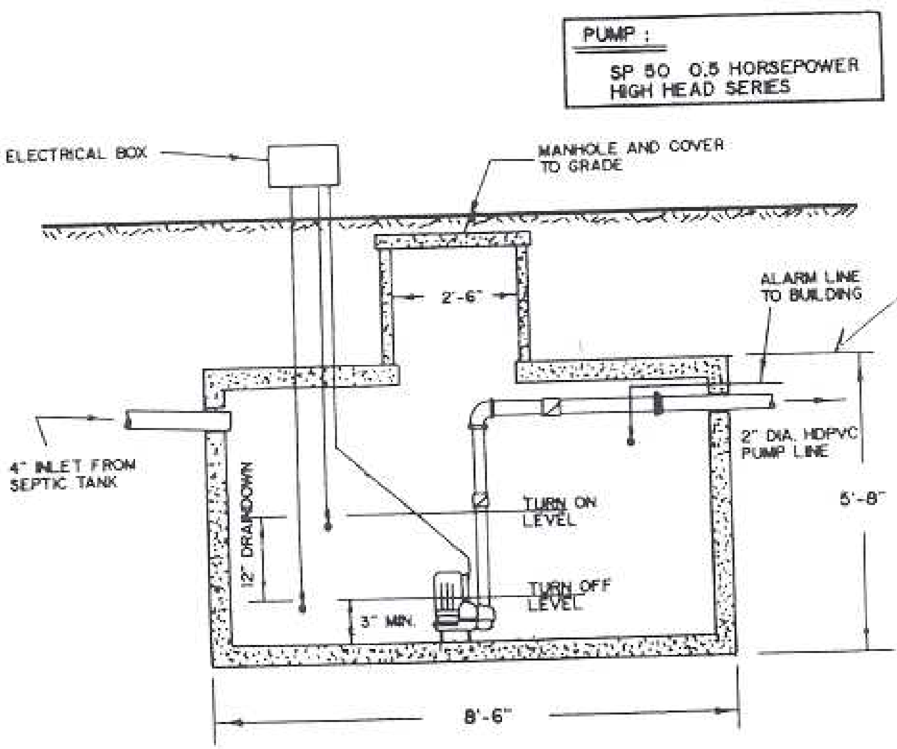
Most dwellings are served by a single septic tank. In some instances, however, the tank is followed by another chamber, containing a pump, which lifts the settled sewage to the leaching area. Homeowners with a pump system should be aware of the location of the pump chamber, the type of pump, and where the pump can be serviced should it fail. It is recommended that this information be posted next to the alarm that indicates when the pump has failed.

Septic tanks installed after January 1, 1990, have two compartments, both of which should be pumped out regularly.

If your system was built prior to 1967 and you are unsuccessful finding information about the location of your tank from the above-mentioned possible sources, a licensed septic pumper can help you locate your tank. Once you have located it, prepare a sketch of its location and keep a copy in your household files. Also, send a copy to the Westport/Weston Health District for future reference.

Warning Signs of a Septic System Problem

Inside:	Poor drainage Plumbing backup Gurgling sound in pipes and drains
Outside:	Unpleasant odor Mushy ground or stagnant water Greener grass in leaching area



1000 GALLON PUMP CHAMBER
NOT TO SCALE

Groundwater Contamination

Solid Waste is defined as any garbage, refuse, sludge, or other discarded material.

Hazardous waste is any solid waste that may present specified properties (such as ignitability, corrosivity, reactivity, or toxicity) of waste listed by EPA that poses harm to human health and the environment.

The list of exotic chemicals, both organic and inorganic, available in the marketplace is extensive. Farmers depend on pesticides and herbicides to grow our food. Automobiles spew hydrocarbon particles into our air. Streets and highways are de-iced with sodium chloride each winter. Our lawns and gardens are sprayed with chemicals in myriad combinations. We dry-clean our clothing with deadly chemicals, and our family photographs are developed in highly toxic solutions. Our homes are covered with paints, varnishes, plastics, and other petroleum products. When threatened by insects, we spray with pesticides. And in the end, all these toxins return to the ground and, eventually, reach the water we drink.

Many of these products have been tested and proven carcinogenic; others have yet to be categorized. Our ability to develop new chemicals precedes our understanding of their long-term effects on the environment, putting into question whether the government should approve the sale of any chemicals before we know how to dispose of them safely.

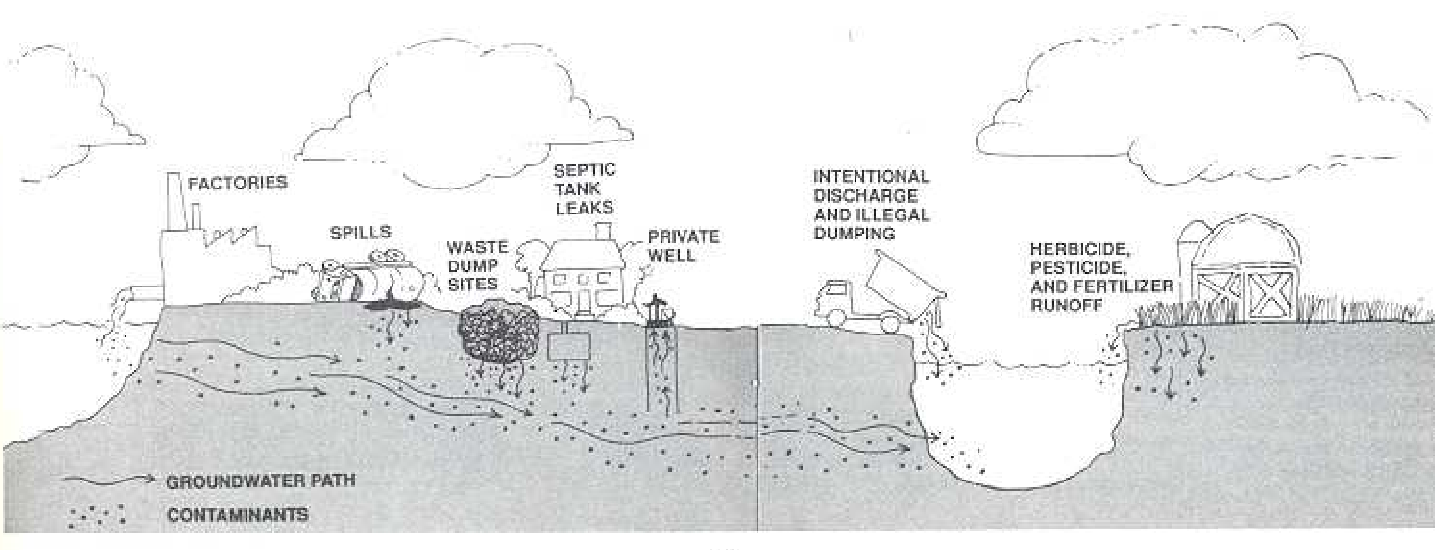
Our nation is just more than 200 years old, and only about half of those years has been as an industrialized nation. Yet, we have mired ourselves in hazardous waste. Of one thousand public water-supply wells tested nationwide by the EPA, 29 per cent were found to be contaminated to some degree. American industry has had little concern with the quantity of toxic materials spewed out of its factories over the years.

On the other hand, there are encouraging signs of action being taken. A few industries now seem to be taking a real stand in looking for solutions. Elizabeth Ryan Sullivan reports in *Manufacturing Weekly*, for example: "The paper industry, within a week of discovering dioxin in the sludge of paper-producing plants, pulled together a group of industry leaders to start developing testing methods."

Groundwater contamination, or pollution, is most often the result of contaminants being dumped or spilled on or into the ground. Soil is an effective treatment system for some of the most common possible groundwater contaminants, such as sewage waste from a properly functioning septic system, for many harmful contaminants are removed as water moves through the soil. Some other contaminants, such as synthetic organic chemicals, are not broken down as they pass through the soil and will travel unaltered into aquifers.

Contaminants that make their way to an aquifer have the potential to endure for a very long time. Unlike the fast-moving flow of surface water, groundwater moves through an aquifer at a slow rate and, therefore, cleanses itself slowly. And the lack of turbulence in an aquifer causes very little mixing to take place. A plume of pollution that reaches an aquifer will move slowly along the groundwater flow path to where the water is either pumped from a well or discharged to a body of surface water (lake, pond, river, stream, or ocean).

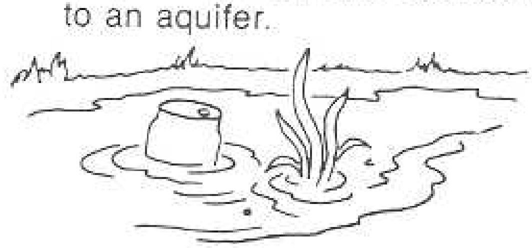
Everyone living in Weston must take responsibility for the safety of the groundwater which feeds our wells. Polluted *well water* can usually be treated sufficiently to



make it safe and potable; however, it is almost impossible to reverse contamination of the *groundwater* itself. The following sources of groundwater contamination are the most prevalent causes found in small, rural/suburban, nonindustrial, and nonagricultural town like Weston.

POLLUTED SURFACE WATER

Polluted water can sometimes seep from a surface source into an aquifer.



Hazardous Household Products

Storage, use, and disposal of hazardous household materials has become an enormous problem, because so many activities involve their use. For example, following is a list of toxic household materials commonly found in the home; all these materials should be used with great care and directions carefully followed.

Cleaners. Disinfectants, bleaches, ammonia and ammonia-based cleaners, window cleaners, drain cleaners, household lye, oven cleaners, all-purpose cleaners, rug and upholstery cleaners, furniture polishes, floor waxes, brass and silver polishes, spot cleaners/removers, toilet-bowl cleaners, solvent-based septic tank cleaners, aerosal cans (empty), and air fresheners.

Paints and Preservatives. Paints, paint removers, solvents and thinners, turpentine, varnish, shellac, stains, strippers, and wood preservatives and driers (illegal for home use).

Automotive Products. Waxes and polishes, antifreeze, gasoline/kerosene, engine degreasers, rust removers, motor oil, and car batteries. (Motor oil and car batteries should be taken to the Weston Transfer Station, on Godfrey Road East, for recycling).

Pesticides. Mothballs, rodent poisons, ant/wasp/roach sprays, slug baits, flea powders/sprays, insect repellants, insecticides, fungicides, and herbicides.

Medicines and Cosmetics. Nail polish remover, hair dyes, hair sprays, and medicines.

Miscellaneous. Photographic developing chemicals (unmixed), chemistry sets, swimming pool chemicals, lighter fluid, artists' paints, shoe polishes, and smoke detectors.

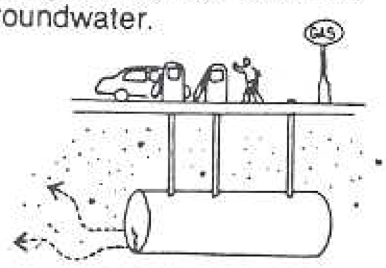
Many people carelessly or unwittingly dispose of household hazardous waste down a toilet or sink drain connected to a septic system. Septic systems are not designed to degrade these chemicals, so the untreated toxins exit from the system as contaminants and make their way through the soil to the water table and, eventually, to the groundwater supply. The introduction into a septic system of toxic chemicals such as the above can also destroy the microorganisms necessary for an effective septic system.

Consumers should buy only as much of these toxic materials as needed, to be used properly and as completely as possible, so only minimum amounts remain for disposal. Any amount that is not used (or shared with a neighbor) should be stored in a safe place, in its original container and sealed tightly, until Weston's Household Hazardous Waste Collection Day.

If the material cannot be stored until the collection day, do not discard it with the normal trash and do not dump it on the ground somewhere "out-of-sight." Nowhere is "out-of-sight" to groundwater! Dumping toxic chemicals onto the ground can contaminate your own well or that of neighboring homeowners. Such toxic household waste should be carefully packaged for special trash pickup by a licensed hazardous-waste hauler (list available from Connecticut Department of Environmental Protection).

UNDERGROUND STORAGE TANKS

For example, gasoline in faulty storage tanks can leak into groundwater.



Underground Fuel Storage Tanks (Residential)

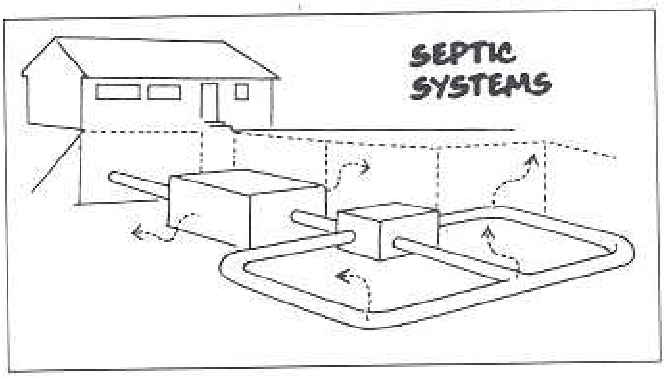
Leaking underground fuel-storage tanks and supply lines are not uncommon and pose a major threat to groundwater. *Bar-steel or unprotected* tanks which have been in the ground for fifteen or more years may be seriously corroded and leaking fuel oil.

Nonresidential underground storage facilities are regulated under Connecticut and federal laws, but residential tanks are not. For several years, however, the Weston Planning and Zoning Commission has been making subdivision approval conditional upon the installation on building lots of either above-ground tanks or fiberglass buried tanks.

Homeowners with buried tanks should monitor their oil usage, for an unusual increase in usage can sometimes indicate a leak in the tank or supply line. If a leak is suspected, or if the tank is unprotected steel and more than fifteen years old, or if a petroleum odor or other evidence is detected, the tank and transmission lines should be inspected immediately by your fuel oil dealer.

All new or replacement tanks should be installed above ground, in the basement; or, if buried, they should be made of noncorrosive fiberglass. Fuel lines from the tank to the furnace should not be buried either; but if burying is necessary (*i.e.*, from a buried tank) there should be double-wall construction for the piping components.

Replacing an old or leaking oil tank and its transmission lines is an unwanted expense, but a major clean-up effort would be several times more costly. Very small quantities of hydrocarbons can pollute groundwater with toxic and carcenogenic chemicals; so to maintain the quality of a home's drinking water, the timely investment in a secure oil tank is certainly a worthwhile expense.



Septic Systems

The most common source of potential bacteria and viral contamination in groundwater is a malfunctioning septic system, one that fails to allow for the percolation of sewage wastes through a minimum amount of unsaturated soil. A properly designed, installed and maintained septic system will remove these pathogenic organisms. (See Chapter 4).

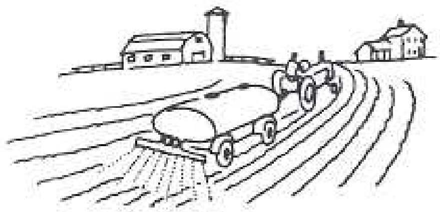
Chemical Fertilizers and Pesticides

Excess use of chemical fertilizers and pesticides on farmland and golf courses and for residential landscaping contributes high levels of nitrates and other contaminants to groundwater when the chemicals leach through the soil to the water table. Such pollution is almost impossible to reverse after it has occurred. Soil can absorb only a limited amount of any contaminant; the excess ends up in the groundwater. Any pesticide that does not leach into the groundwater may instead run off into surface water.

In Weston, where we are dependent on private well water, should try to eliminate or reduce the use of pesticides. Explore alternatives to toxic chemicals for controlling insects, plant disease, and weeds in lawns and gardens.

AGRICULTURAL CHEMICALS AND WASTES

These include pesticides and fertilizers. Animal wastes can also pollute groundwater.



Water Softeners

Many Weston residents are unaware that it is illegal in the state of Connecticut to discharge water softener brining effluent into septic tanks. This backwash discharge can produce salty groundwater contamination, which is difficult and expensive to treat. It can hamper the "digestion" of sludge in septic tanks.

Abandoned or Improperly Sealed Wells

Abandoned or improperly sealed wells can act as conduits for pollutants to enter groundwater from the surface. Sometimes, people even pour wastes down an abandoned well shaft, not realizing the harm it will do. Connecticut statutes require the proper abandonment of wells.

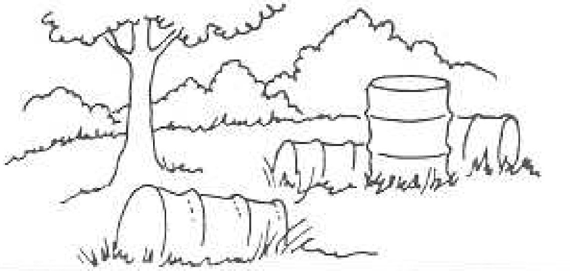
Nonresidential Use of Hazardous Materials

Home Occupations. Operators of small, in-house businesses may, inadvertently, store, use, or dispose of hazardous materials improperly. Those home occupations typically using hazardous materials include: photography developing, hairdressing, furniture refinishing, landscaping/tree care, printing and medical/dental/veterinary offices.

Riding Stables or Academies. Horse facilities are allowed by special permit. Owners and operators of stables and riding academies should avoid large manure piles that can introduce large amounts of nitrate into the groundwater.

INDUSTRIAL WASTES

Chemicals that are handled or disposed of improperly can pollute groundwater.



Commercial Activities. The few businesses operating in Weston which are known to use hazardous materials (two auto repair/gasoline stations and a dry cleaner), all of which existed prior to zoning, are now regulated and monitored.

LANDFILLS

Water seeping through wastes can pick up pollution and carry it down to groundwater.

Municipal Activities

Landfill. Landfills can contaminate groundwater supplies when rainwater or melting snow filters through the solid waste and forms a liquid called "leachate." The highly complex composition of landfill leachate reflects the variety of soluble materials contained in trash.

Weston's landfill was closed in 1980 in accord with Connecticut Department of Environmental Protection procedures. The Landfill site is now a Transfer Station for trash and the beginning of a recycling facility.

Road Salt. Sodium chloride (road salt), a highly soluble compound that does not degrade, is added to sand for de-icing town roads. When dissolved in surface runoff, road salt remains in the soil and will percolate into the groundwater. Very high concentrations of salt in drinking water can corrode pipes, pump, and fixtures, causing serious damage and can dissolve toxic metal ions in the water running through the pipes. A high concentration of salt in drinking water also constitutes a threat to human health.

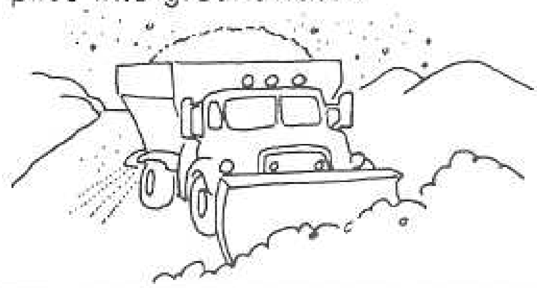
Weston closely monitors its use of road salt.

Underground Fuel Storage Tanks. Nonresidential underground fuel-storage tanks are monitored and replaced in accordance with regulations of the Connecticut Department of Environmental Protection.

Schools. A variety of hazardous materials used in Weston's schools found in industrial arts, science labs, the photography darkroom, and art classes are carefully monitored.

ROAD SALT

Rain or melting snow can carry salt from roads or salt piles into groundwater.



Transportation Accidents

Groundwater quality is threatened when traffic accidents occur involving vehicles that transport hazardous materials. Such accidental spills can happen anywhere, but they are more common on major highways than on Weston's Routes 57 and 53. In any case, groundwater protection relies on quick clean-up response. The federal government recently passed legislation requiring states to develop and implement plans for such emergencies, and regional planning in Connecticut is underway.

You can see that there is no single source of groundwater contamination. More than 400 contaminants are currently listed by the Federal Environmental Protection Agency as contributing to groundwater pollution. The improper disposal of hazardous materials puts pressure on nature's fragile water-recharging system. And in the end, these materials will reach the water we drink.

Implementation

The purpose of the Weston Water Study Task Force is to develop working knowledge of Weston's groundwater. Aquifers are studied concerning location, volume of water and quality. Water samples were gathered from all sections of Town including wells and tested for chemical and bacteriological residues. Samples were also taken at the northern section of the Town in the Saugatuck River and in Crystal Lake at the southern section of Town to take into consideration regional and up-stream activities of our neighbors.

Future concerns of the Weston Water Study task force concerning groundwater quality will be in the areas of leaching contaminants from septic systems, fuel oil storage tanks, general discharge of household products, lawn care contaminants and Weston Shopping Center discharge.

The actions and recommendations which follow are intended by the Water Study task force to implement findings of the study to future land use policy. The implementation programs for each specific subject are correlated with the respective objectives.

NATURAL RESOURCES

Action/Recommendation	Implementation Agent
1. Household water supply and aquifer protection	Planning & Zoning & Conservation Commission
2. Water Quality testing & treatment recommendations	Westport/Weston Health District
3. *Groundwater Conservation	Planning & Zoning
4. *Groundwater Contamination	Planning & Zoning & Conservation Commission, Westport/Weston Health District
5. *Study private water treatment systems and disposal of discharges	State & Town Government Agencies
6. *Seek "approved as safe" chemicals for household exterior use	State & Federal Government Agencies

COMMUNITY FACILITIES

Action/Recommendation	Implementation Agent
1. Maintain existing limited municipally operated water supplies	Dept. of Public Works
2. Make safe household hazardous waste disposal a priority	Selectmen
3. *Sponsor tank pumping drives with help in locating septic tanks for individual homeowners	Selectmen & Westport/Weston Health District
4. *Avoid use of heavy road salts to protect our groundwater supplies	Dept. of Public Works
5. *Limit the use of fertilizers and pesticides on home lawns and gardens	Selectmen

RESIDENTIAL DEVELOPMENT

Action/Recommendation	Implementation Agent
1. Continue Selected Ground Water Studies	Planning & Zoning with Water Consultants
2. Review Septic Suitability as it relates to water supply	Planning & Zoning, Westport/Weston Health District
3. Evaluate Ground Water Study vs. Dominski/Oakrock Study	Planning & Zoning
4. Monitor existing policies for future residential development	Planning & Zoning
5. Protection of natural sites and inland wetlands & water courses	Conservation Commission
6. *Regulate use of in-ground and above-ground fuel oil tanks	Selectmen

** Denotes action/recommendation items which are in addition to those in the Town Plan of Development.*

Guest Speakers

Roland La Pierre
Director of Land Development for the Bridgeport Hydraulic Company
Addressed the Task Force on the subject of BHC's land holdings in Weston and their use of ground and surface water.

Frank Schaub
Supervising Sanitary Engineer, Department of Health Services
Specializing in on-site sewage disposal systems.

James Murphy
Principal Environmental Analyst
Department of Environmental Protection, Water Compliance Unit
Mr. Murphy's contributions helped steer Weston into its current groundwater testing program.

Mark Johnson
BHC Engineer
Spoke to the group on testing procedures currently used by Bridgeport Hydraulic to meet drinking water standards.

John Sima Jr.
Head of the State Well Drillers' Association
Spoke on deep well drilling procedures.

Video Presentation
In a three-part series on video, the task force viewed "The Legal Issues of Groundwater Protection" produced by the American Law Institute and the American Bar Association.

Richard Winokur
President of Culligan, and a Weston Resident
Spoke on water softening systems and the latest technology in the field of water filtration.

David Thompson
Soil Scientist for Fairfield County and Government Consultant
Spoke on fire ponds and their construction.

Ray Jarema
Cheif Engineer Water Supply section Department of Health Services
Reported on current state and federal regulations dealing with water compliance.

Paul Schur
Director of Environmental Health Services, State of Connecticut
Reported on guidelines for private drinking water supply quality and testing.

Jan Dunn, Ph.D.
Environmental Monitoring Laboratory, DVC Wallingford, CT

Judith Nelson
Director Health, Westport/Weston Health District
Spoke on radon.

These presentations, along with a wealth of printed matter, set the platform from which the Water Study Committee launched Phase I of its water study program —deep well water testing. Our goals here were quite clear. Water quality was our first priority.

Weston Water Week

Proclamation By Selectman
November 12, 1990