National Testing Laboratories, Ltd.

The National Testing Laboratories, Ltd. Network shall be a leading provider of quality laboratory services in support of environmental health and safety issues, recognized worldwide for it's commitment to customer service.

We sincerely hope you find this booklet to be helpful in guiding you to understand the importance of not only identifying potential water problems in your area, but also the importance of taking precautions to protect one of our most valuable resources from further decline.

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National Testing Laboratories, Ltd. has been serving the water industry with quality water analysis for informational and compliance testing requirements for over 15 years. The corporate office is located in Cleveland, Ohio with laboratory facilities located in Michigan, Virginia and Florida. For more information, please contact National Testing Laboratories, Ltd. at (800) 458-3330, extension: 4.

Extensive research and time have been dedicated to publishing this book to ensure its accuracy and to make it useful to the reader. The bibliography located in the back includes a listing of source materials and additional relevant material on these subjects. This information is included to allow the reader to check the accuracy of our statements or conduct further research.

Our goal is to educate the public about the current conditions of the country's drinking water. People need to recognize that drinking water contamination is a serious problem. It is a problem that is constantly being addressed by government officials, public interest groups and the scientific community. Since the problem is complex and multi-faceted, it will take years before it may be truly resolved.

In the meantime, contaminated water supplies can be dealt with if the following is understood:

What is contamination?
Where does it come from?
Does it present a health hazard?
How can it be removed from the drinking water supply?

This book is a guide designed to help the reader understand the issues surrounding water quality and what can be done if contamination is suspected in a water supply. It will demonstrate how to determine the quality of a drinking water supply and what can be done to correct or remove contaminants, if present. It will also take a look at the equipment and services that may be required to make the necessary corrections.

What is Contamination?

Pure water (H2O) consists of 11.188% hydrogen and 88.812% oxygen by weight. The term "pure water" is often used; however, it is virtually a "non-existent" liquid.

Water is often referred to as a "universal solvent" because of its ability to dissolve almost anything it may contact. It is common for minerals such as calcium, magnesium, iron and manganese to be present in well water. This is a result of water coming in contact with rock formations containing these minerals. In addition, water is known to dissolve metals from pipes and fixtures, gases and dusts from the atmosphere and any other water-soluble compounds with which it comes in contact. The superior solvent action of water allows it to be easily contaminated by water-soluble waste or materials.

Water is considered "contaminated" when it contains harmful or objectionable substances, whether these substances are dissolved, suspended or biological.

Where did this problem originate and why now?

Water pollution and contamination are issues that have been attracting attention since the beginning of America's industrial revolution. The Industrial Revolution prompted a rise in the manufacturing of goods, leading to the creation of new synthetic materials. The U.S. chemical industry produced 11 trillion pounds of synthetic organic chemicals between 1945 and 1991, most of which has ended up in the environment: soil, air or water.

In efforts to improve the quality of life, chemical manufacturers are developing different chemicals to protect and preserve the food supply. There have also been a variety of sprays created for personal hygiene, pet, automobile and home use. Over a thousand new chemicals are designed each year to meet growing demands in the marketplace.

In the past, these chemicals were developed and released into the environment with little thought given to the potential dangers they could present. Environmental activists have forced the government and industry to become more conscious of waste disposal and its impact on the environment. Traditionally, hazardous waste has been disposed of in deep-well injections, surface impoundments and landfills. Current regulations for deep-well injections do not require long-term monitoring of sites. This allows waste to contaminate soils and water long after the monitoring period ends. Surface impoundments include pits, ponds and lagoons. According to the EPA, approximately 70% of surface impoundments are used for hazardous waste and do not have liners. As many as 90% of impoundments may threaten groundwater. The Office of Technology Assessment has determined that eventually even the best designed and secured landfills will leak hazardous waste into nearby surface and groundwater. Past hazardous waste management practices have allowed thousands of chemical compounds to find their way into the drinking water supplies.

When is a contaminant considered harmful?

In 1974, Congress passed the Safe Drinking Water Act that authorized the U.S. Environmental Protection Agency (EPA) to establish safety levels for certain contaminants in public water supplies. These safety levels, referred to as Maximum Contaminant Levels (MCLs), are the maximum allowable amounts of contaminants in drinking water.

The original list of inorganic and organic contaminants with established MCLs has grown from 18 in 1975 to 94 in 1999. Additional contaminants are constantly considered for future regulations.

The current EPA standards and MCLs for these contaminants are listed on page 18 of this booklet.

How small is one contaminant? – Very small!

The standard units for measuring contaminants include milligrams per liter (mg/L), parts per million (ppm) and parts per billion (ppb). The maximum contaminant levels are written in mg/L. The units mg/L and ppm are interchangeable. For an example of how small these measurements are, one part per million is equivalent to one minute in two years, one inch in sixteen miles or one penny in ten thousand dollars. Many contaminants are colorless, tasteless and odorless which leads people to believe they have safe drinking water. In small quantities, toxic contaminants usually do not cause immediate health problems, but if consumed over a long period of time they can cause serious and irreversible health complications.

What is the risk to us?

The effects of some toxic substances on human life have been understood for some time. Studies regarding arsenic have indicated that it is a potential carcinogen. In the early 1950's in Japan, the effects of mercury poisoning became apparent when thousands of people eating fish contaminated with mercury became crippled and some even died. There have been a significant number of studies conducted finding even small amounts of lead can have adverse health consequences, especially in infants and young children. According to the EPA, almost 1 in 5 Americans drink tap water containing excess levels of lead, including 7 million children.

Unfortunately, chemicals are introduced into the environment faster than the risks and benefits of each individual chemical can be estimated. There are currently in excess of 70,000 chemicals in commercial use. According to the National Academy of Sciences, only 10% of these chemicals have been tested for toxicity. Toxicity testing is done to determine the health risk of exposure to chemicals. The laboratory animals used in testing do not necessarily react to these chemicals the same way humans would. The little data available relating human health effects to contaminants in drinking water leaves scientists uncertain about the effects of ingesting small amounts of some substances over long periods of time.

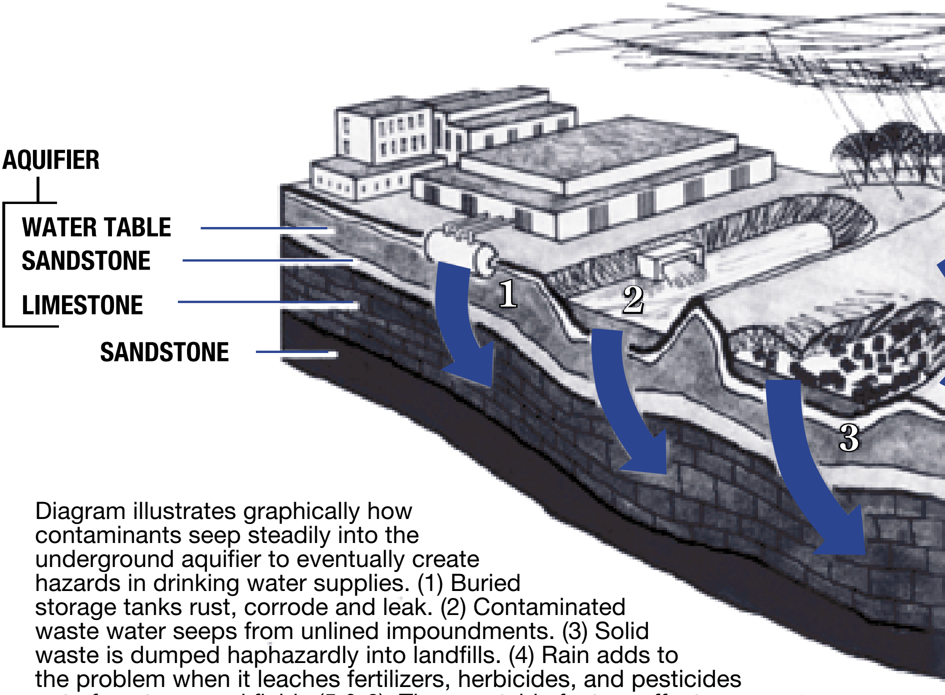


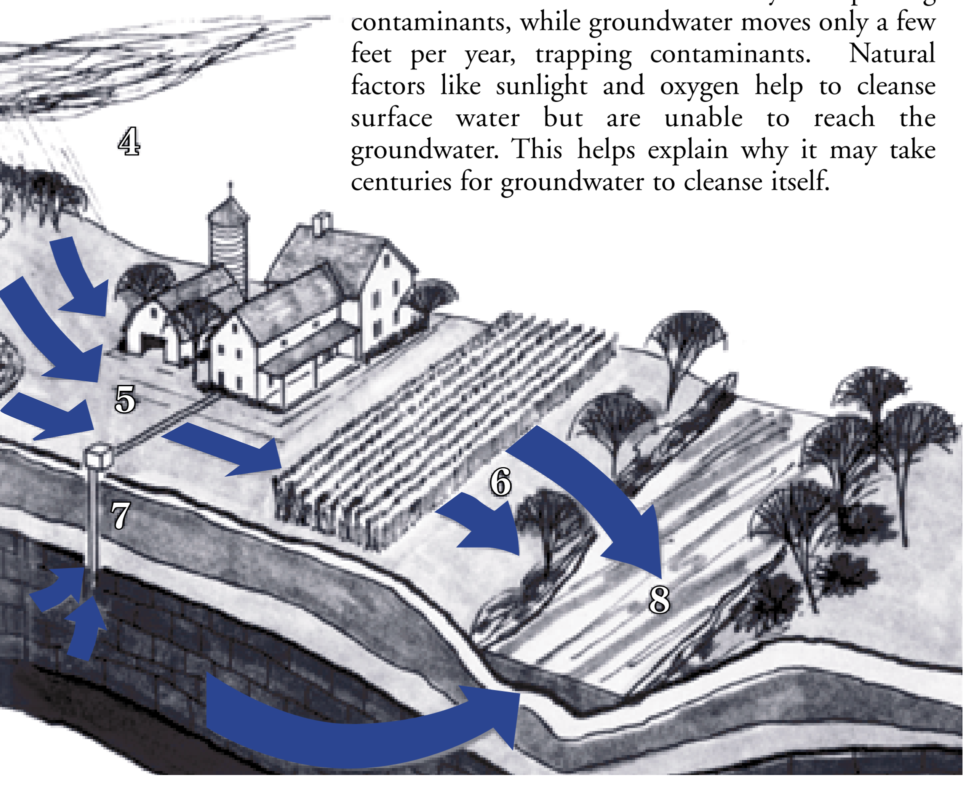
Diagram illustrates graphically how contaminants seep steadily into the underground aquifier to eventually create hazards in drinking water supplies. (1) Buried storage tanks rust, corrode and leak. (2) Contaminated waste water seeps from unlined impoundments. (3) Solid waste is dumped haphazardly into landfills. (4) Rain adds to the problem when it leaches fertilizers, herbicides, and pesticides out of pastures and fields (5 & 6). These outside factors affect groundwater well (7) as well as surface water (8).

How do regulators determine what should be regulated and at what level? President Clinton signed the Safe Drinking Water Act Amendment of 1996 into law on August 6, 1996. The Amendment established a procedure for the EPA to select and regulate contaminants that pose the greatest public health risks. This procedure involves risk assessments based on health advisories and toxicity studies, as well as cost/benefit analysis. This Amendment also states that the EPA must regulate 25 new contaminants every three years. The Amendment will allow the EPA to make decisions in the best interest of public health based on scientific studies rather than randomly picking contaminants.

A Real and Present Danger

About half our nation's drinking water comes from underground aquifers. These groundwater basins are located anywhere from 20 to 1,000 feet below the surface. Aquifers are defined as porous, water-saturated layers of sand, gravel or bedrock that can yield economically significant amounts of water.

Surface water moves swiftly dispersing contaminants, while groundwater moves only a few feet per year, trapping contaminants. Natural factors like sunlight and oxygen help to cleanse surface water but are unable to reach the groundwater. This helps explain why it may take centuries for groundwater to cleanse itself.



Can contaminated water be cleansed at all? The experts contend that the cost of cleaning contaminated water may well run into the billions of dollars and take decades to accomplish.

The government most likely will not be able to economically clean up the groundwater supplies for decades, if at all. Each individual will have to take initiative as far as drinking water quality is concerned and it would be a good idea to start right now.

HOW UNSAFE IS OUR DRINKING WATER?

Even the experts disagree as to the extent of groundwater and surface water contamination. Each drinking water supply is different and subjected to various sources and types of contamination. Drinking water's quality and it's potential for contamination needs to be determined.

THE THREAT IS REAL

To ignore the seriousness of this issue would be to ignore the following facts:

According to the National Water Quality Assessment Program (an ongoing study by the U.S. Geological Survey) about fifty percent (50%) of the wells sampled contained one or more pesticides. More than fifty percent (50%) of streams sampled contained five or more pesticides.

Experts for the Center for Disease Control estimate that one million people get sick each year from contaminated water, and nearly one thousand of these people even die. The 1993 Cryptosporidium outbreak in Milwaukee alone accounts for over 400,000 people becoming ill and over 100 people dying.

According to studies conducted by the Environmental Working Group, between 1994-1995 (the most recent federal data available) over 45 million Americans were supplied drinking water that violated federal health standards for fecal matter, parasites, disease causing microbes, radiation, toxic chemicals, lead and other pollutants.

Trihalomethanes, which are by-products of disinfecting with chlorine, are now being linked to urinary, bladder and rectal cancer at levels starting at 10,000 cases per year.

A Growing Concern

In an article, TOXINS ON TAP, published in Time Magazine November 15, 1993, Michael Lemonick commented, *"The water Americans drink may look clear and clean, but it often contains noxious chemicals and malicious microbes."*

Another publication, WATER, published by National Geographic in November 1993, the editor, William Graves, stated: *"The problem is not the supply of water; earth has virtually the same amount today as it did when dinosaurs roamed the planets. The problem is simply people – our increasing numbers and our flagrant abuse of one of our most precious and limited resources."*

The conclusion of the report, *Think Before You Drink*, by the Natural Resources Defense Council is encouraging in some respects but there is still evidence that drinking water in the United States is not safe for everyone to drink. In fact, the U.S. EPA has advised anyone with a compromised immune system to consult a physician before drinking tap water. The American Water Works Association has taken it a step further by advising all individuals with the HIV Virus to boil tap water before drinking it.

Major sources of contamination

- There are approximately 5 to 7 million underground storage tanks in the United States. The U.S. EPA estimates that over 11 million gallons of gasoline per year are lost due to leaking underground storage tanks.
- According to a 1994 report issued by the National Wildlife Federation, farmers apply 600 million pounds of pesticides and herbicides annually that eventually end up in the groundwater table.
- The Environmental News Network estimates that 154 million tons of garbage are generated each year within the United States. Improper disposal of garbage can leach harmful contaminants into groundwater.
- Lead has been used in service connections, goosenecks, water meters, solder and brass fixtures. Corrosion in older municipal distribution systems allows lead to leach into our drinking water supplies.
- Chlorine used in municipal supplies to protect us against microbiological contamination is known to form by-products called trihalomethanes, which are suspected carcinogens.
- There are approximately 250,000 solid waste disposal facilities in the United States. Each contains various chemicals that have the potential to threaten groundwater supplies.

These are just some of the numerous sources of water contamination. The total list is endless, as is the list of contaminants which come from these sources.

The following quotation from a lengthy report issued in 1993 by the National Resources Defense Council sums it all up: *"…despite the existence of the 1974 Safe Drinking Water Act and it's 1986 strengthening amendments, the nation's drinking water is still at risk."*

Contaminants: Where do they come from?

→ *CHLOROFORM:* One of the trihalomethane group of chemicals (THMs) which are formed when chlorine reacts with harmless organic materials already present in the water. They are found in almost all water supplies that use chlorine as a means of disinfection. Other THMs include bromoform, bromodichloromethane and dibromochloromethane.

→ *LEAD, COPPER AND ZINC:* These are metals which can be leached from distribution pipes and household plumbing fixtures.

- → *TRICHLOROETHENE:* A solvent typically found in degreasing formulas used to clean grime from machinery and automobiles.
- → *BENZENE AND MTBE (Methyl-Tertiary-Butyl-Ether):* These are both components that may come from gasoline.
- → *TETRACHLOROETHENE:* A chemical found in dry cleaning fluids.
- → *NITRATE AND NITRITE:* Found in fertilizers and rich soils from farming. May also be indicators of septic contamination.
- → *ALACHLOR AND ATRAZINE:* Chemical herbicides used in corn and soybean growing areas.

Given the impact of these and other published findings, it would appear that periodic testing of drinking water, especially water from private and community wells, would be a wise precaution for any homeowner.

The EPA is constantly studying synthetic organic chemical compounds that have been found in groundwater supplies. As reliable data is developed, compounds that are found to be toxic will have maximum contaminant levels (MCL) established.

GOVERNMENT REGULATIONS AND LIMITATIONS

Tragically, we have been burying all kinds of waste in landfills and discharging it into rivers and lakes for decades. Only recently has anyone begun to worry about these practices.

In 1972, the U.S. Congress passed the Federal Water Pollution Act also known as the Clean Water Act. This Act requires that a permit be obtained before any discharge of waste into surface water occurs. The Act does not eliminate the discharge of waste into the water supplies but only limits the amounts of contaminants that are to be discharged. Also, the emphasis of the Act was on surface water, for example lakes, rivers and streams and does not address groundwater sources.

Two years later, in response to persistent reports of contaminated water supplies being piped into the nation's homes, Congress passed the Federal Safe Drinking Water Act (SDWA). This empowered the EPA to establish and enforce maximum contaminant levels (MCLs) which are permissible levels for contaminants that could safely be allowed in our drinking water.

The SDWA requires all public water supply systems to monitor their water for these contaminants and to ensure that they do not exceed the established MCLs. Now there are criteria by which to judge the quality of drinking water. Periodically, the EPA sets MCLs for other compounds and adds them to the list.

Greater efforts in recent years have been made to enhance the quality of our Public Water Systems. Municipal and community water systems are now mandated to take corrective measures if they do not meet the current quality regulations. There is; however, a serious under-funding of the EPA's drinking water enforcement efforts.

For smaller water suppliers, compliance in testing and treatment is far from perfect. As EPA drinking water standards expand, regulations become more stringent and money sources diminish, the outlook for testing compliance seems discouraging.

WHAT NOW?

If an aquifer were receiving toxins from any source, it has been determined that it would need to cleanse itself. Developing an economically acceptable treatment system to assist the cleansing process could take generations to achieve. The aquifer cannot start the cleansing process until we stop the pollution process.

The EPA has been concentrating its efforts in pollution prevention and the agency has come a long way in stopping the dumping of toxic wastes; however, this is just a start. The cleanup of past sins is moving very slowly, mired in federal and state politics and fiscal policies.

The total cost of cleanup has been estimated to be in the billions of dollars. Spending funds of that magnitude will have an impact on many social programs. It simply becomes a matter of priorities that are difficult to establish.

It is not the purpose of this booklet to pass judgement on the effectiveness of federal, state or local government regulations. As stated at the onset, water pollution is a very complex, expensive and wide-ranging national problem affecting all segments of our society.

In addition to municipal water systems, there are millions of groundwater wells. How are customers served by well water guaranteed safe drinking water for their families? As there are no regulations or policies set forth for owners of their own well supplies, it is simply up to each individual to determine if they are receiving quality drinking water. The only way to ensure the quality of well water is for the home/well owner to perform a drinking water analysis through a qualified, independent testing laboratory.

The Advice Is Simple and Straightforward

- **Know the water supply is safe to drink. Have it analyzed by an independent certified testing laboratory and compare the results to the limits established by the Safe Drinking Water Act.**
- **If the analysis shows a problem, seek the help of a reputable water treatment specialist. A list of water treatment specialists in the local area can be obtained by contacting the Water Quality Association at 1-800-749-0234 or visit www.wqa.org**
- **Follow the specialist's advice and maintain the treatment equipment according to the manufacturers suggested maintenance schedule and instructions.**
- **Have the drinking water retested after installation to be sure the equipment is performing as advertised.**
- **Have a regular "check-up" analysis performed on the drinking water. Testing is recommended either twice a year or annually to maintain a record of the quality of the water and to make sure no significant changes are occurring.**

Know the Problem and Choose the Cure

When an individual feels ill, a physician is consulted, the problem is diagnosed and the appropriate treatment is administered. A mechanic is contacted when an automobile is not functioning properly. In any case, if a problem arises, it must be identified correctly before it can be fixed. Due to the vital importance of the home drinking water supply, it should be no different.

Some contaminants may make themselves known in obvious and unpleasant ways. For example, iron in water may cause staining, bad odor and taste problems and hard water may cause unsightly build-up and may cause spotting on dishes. Unfortunately, a majority of health threatening chemicals and bacteria that can contaminate drinking water supplies do not always make themselves known in obvious ways. Many of these dangerous and toxic items in the water can only be uncovered by performing a comprehensive and sophisticated series of analyses on the water.

ANY PROBLEM CAN BE CORRECTED

Practically any problem that arises in drinking water can be corrected through the application of one or more water treatment systems. The cost of making the corrections will depend on the type and scope of the problem. Considering the kind of contaminants detected in the water, there may also be other alternatives to installing treatment equipment. For example, bottled water may be purchased to use for drinking and cooking. If the problems in the supply are significant and difficult to treat, another water source that is not contaminated may also need to be considered and located.

There are important choices to be made and options to consider, but good safe drinking water can be achieved.

DOES ALL OF THE WATER IN THE HOUSEHOLD NEED TREATED?

Although approximately 100 gallons of water are used per person per day, each person actually consumes less than 5 quarts for drinking and cooking. When it comes to improving the quality of a *drinking* water supply, there is a choice to be made: to correct all the water in the home by the use of a "whole house" or "point of entry" (POE) system or to correct only water used for drinking and cooking, "point of use" (POU).

Aesthetic problems such as hardness, iron and hydrogen sulfide usually require "whole house" treatment; whereas, other metals and minerals that may cause health concerns, such as lead would be best treated by a system directly attached to the drinking water supply or POU. Some contaminants that cause health concerns, such as volatile organic chemicals and radon in water, because of their nature (rapidly volatizing into the air) also need to be treated as the water enters the home by a POE system to avoid any exposure to the inhabitants.

THE CURES

The following information may provide some solutions to the treatment of different types of water problems. Please note that water treatment systems are not necessarily "simple" in nature and sometimes, depending on the water chemistry or composition, more than one system may be needed to correct the issues that are faced in the water supply. There are no "miracle systems" that will treat all existing or potential problems.

Primary contaminants are those which may affect health

The EPA, in the Safe Drinking Water Act, identifies two major groups of contaminants – primary contaminants and secondary contaminants. Primary contaminants are those which may directly affect an individuals health. Secondary contaminants are those which are primarily associated with aesthetic affects.

Maximum Contaminant Levels (MCLs) or safety levels have been established for more than eighty different primary contaminants and the EPA requires that public water systems test for each of these periodically. If a system should find one of the primary contaminants present above the MCL, that system must take immediate remedial action and notify all households on the system that a health threat may exist.

It makes sense that homeowners served by their own wells should do no less. Unfortunately, homeowners served by wells are on their own to make sure that none of these primary contaminants are in their water by performing their own testing. The EPA actually suggests that well water be tested thoroughly every six months to a year.

Primary contaminants fall into the following groupings:

(a complete list is provided in the appendix on page 18.)

1. *Inorganic Chemicals:*
   Inorganic chemicals include metals such as:
   Lead, mercury, metalloids such as arsenic and selenium, as well as non-metals such as nitrate, nitrite and fluoride.

Most of these items can be removed or reduced to safe levels through the application of POU systems such as Reverse Osmosis or Distillation. Lead may also be effectively removed by specially treated activated carbon filtration systems installed at the point of use.

2. *Volatile Organic Chemicals:*

This group includes petroleum based products, chemicals and industrial solvents and all have the potential to be dangerous to health. Most are considered carcinogenic or probable carcinogens. Benzene, ethylbenzene and methyl-tertiary-butyl-ether (MtBE) are products of gasoline and other fuels. TCE and PCE are used in dry cleaning solvents and cleansers. Trihalomethanes are the by-products of chlorine used in public water supplies to kill bacteria.

A whole house POE activated carbon system or an aeration system are best to treat these contaminants as they do rapidly evaporate into the air and exposure occurs not only while drinking but also while bathing and washing clothes or dishes. A system used for treating volatile organic compounds should be rated or certified for their removal. *(Contact the National Sanitation Foundation at 1-800-673-6275 or the Water Quality Association at 1-800-749-0234 for more information regarding the certification of water treatment devices.)*

3. Pesticides and Herbicides:

These are probably the most misunderstood and over publicized group of chemical contaminants as well as being the most diverse. There are thousands upon thousands of different pesticides and herbicides that are listed and registered in the United States alone and many have a long environmental life span. Testing for the great variety being used today is generally costly. If possible, it is best to identify the types of pesticides/herbicides that are more likely to threaten the water supply prior to purchasing a test.

A POE activated carbon filtration system is usually effective in removing these compounds once they are detected.

4. Biological Quality:

This group is concerned with coliform bacteria, giardia cysts, cryptosporidium and some viruses. Chlorination of the household water is effective in controlling coliform and most viruses, but micro-filtration must be used for the cysts and cryptosporidium. With the exception of coliform, this group of organisms are *usually* only found in surface water supplies. Coliform may also be found in groundwater supplies.

It is recommended to consult the local health department before choosing any treatment method for this group.

5. Physical Quality:

This includes Turbidity and Radioactivity. Turbidity is best controlled through the use of cartridge or media filters.

Radon is best controlled through the use of a good household aeration and ventilation system. Other types may be removed by ion exchange or carbon.

Secondary (aesthetic) contaminants:

1. Hardness in the form of dissolved calcium and magnesium can shorten the life span of appliances such as dishwashers, washing machines and water heaters. It also increases the amount of cleanser and soap/detergent needed for normal cleaning tasks.

Water softening or an ion exchange system is best for removing or reducing the hardness minerals. As many softening systems exchange the hardness minerals for sodium ions, people on low sodium diets may want to also consider a reverse osmosis system at the tap to reduce the sodium from the drinking water.

2. Metals such as iron and manganese are often unpleasant to have in the water as they may cause staining to fixtures and laundry. Manganese may also often contribute to an unpleasant odor and taste in the water.

The ion exchange process is a recommended treatment option except in very severe cases. If concentrations are extreme, an oxidation (or chlorination) system may need to be applied followed by filtration.

3. Hydrogen sulfide gas, readily identified by a strong sulphurous odor can be controlled through oxidation and aeration.

4. A POU reverse osmosis or distillation system can remove chlorides, sulfates, nitrates, sodium and other dissolved solids.

5. pH, the measurement of acidity in the water is considered within normal range by the EPA when it measures from 6.5 to 8.5. Waters with levels measured outside of those limits can be corrected by using a chemical feeder.

6. Color can be treated according to the cause of the discoloration. Tannins for example usually discolor the water with a yellow to brown color and may be treated with ion exchange or activated carbon. Copper plumbing that is leaching often causes a bluish-green discoloration and would be treated POU by Distillation or Reverse Osmosis or at the POE by a chemical feeder to reduce the corrosivity of the water.

Over the years, National Testing Laboratories, Ltd.
has tested thousands of drinking water samples
from all parts of the United States.
The following is a listing of those contaminants
we have found to be the most commonly occurring.
The full list of U.S.E.P.A. regulated contaminants
and the dangerous levels of each are shown on
page 18 of this booklet.

National Testing Laboratories, Ltd. specializes in the analysis of drinking water for chemical and microbiological contamination. Drinking water analysis has been offered at the laboratory facilities for more than fifteen years. Testing services are available for both residential and commercial customers for informational/screening purposes or to meet regulatory compliance requirements under the Safe Drinking Water Act. National Testing Laboratories, Ltd. strives to be a leading provider of laboratory services in the support of environmental health and safety issues, recognized worldwide for commitment to quality and customer service.

To obtain more information regarding National Testing Laboratories, Ltd. and the drinking water analysis services provided, please contact the Corporate Headquarters at 1-800-458-3330.

For more information regarding drinking water contaminants and their health and safety issues, please contact the EPA Safe Drinking Water Hotline at 1-800-426-4791 or the local Department of Public Health.

The Watercheck with Pesticides test kit offers homeowners
a comprehensive informational analysis of their water for
more than ninety-five potential contaminants.

INORGANIC CHEMICALS	POSSIBLE HEALTH EFFECTS
Aluminum	Some studies indicate Alzheimer like health affects may be associated with ingestion of large amounts.
Arsenic	Malignant tumors on skin and in lungs. Adverse effects to nervous system. May cause disorientation.
Lead	Damage to nervous system, kidneys and reproductive systems.
Mercury	Kidney impairment and adverse affects to nervous system.
Selenium	Possible carcinogen may cause irritation to mucous membrane, dermatitis. Nervous system affects.
Nitrate / Nitrite	Potential poisoning in infants, elderly and the immunocompromised.

ORGANIC CHEMICALS	POSSIBLE HEALTH EFFECTS
Trihalomethanes *(ex: Bromoform and Chloroform)*	May affect central nervous system, muscles and reproductive systems. Potential carcinogen.
Benzene	Associated with cancer, leukemia and anemia.
Ethylbenzene	Effects to eyes, upper respiratory system, skin, central nervous system, liver and kidneys.
Toluene	Narcosis, irritation to eyes and respiratory system, affects nervous system, liver and kidneys.
Methyl Tertiary Butyl Ether	Probable carcinogen, new studies are ongoing. Irritant to respiratory system and mucous membranes.
Xylene	Mucous membrane irritant, lung congestion, affects liver and kidneys.
Trichloroethylene (TCE)	Central nervous system effects, and confirmed animal carcinogen.
Tetrachloroethylene (PCE)	Central nervous system affects and loss of coordination. Probable carcinogen.
Atrazine	Affects nervous, respiratory systems, heart and liver. Possible carcinogen.

THE SAFE DRINKING WATER ACT

Current Drinking Water Standards (At time of print – March, 2001)

PRIMARY CONTAMINANTS	Maximum Contaminant Level (MCL)
INORGANIC CHEMICALS:	
Asbestos	7 mill. fibers/liter
Antimony	0.006 mg/l
Arsenic	0.05 mg/l
Barium	2.00 mg/l
Beryllium	0.004 mg/l
Cadmium	0.005 mg/l
Chromium (total)	0.10 mg/l
Lead	0.015 mg/l
Inorganic Mercury	0.002 mg/l
Nickel	0.10 mg/l
Selenium	0.05 mg/l
Fluoride	4.0 mg/l
Thallium	0.002 mg/l
Copper	1.3 mg/l
Cyanide (as free cyanide)	0.2 mg/l
Nitrate (measured as Nitrogen)	10 mg/l
Nitrite (measured as Nitrogen)	1.0 mg/l
ORGANIC CHEMICALS:	
Benzo(a)pyrene	0.0002 mg/l
Total Trihalomethanes	0.080 mg/l
Benzene	0.005 mg/l
Carbon Tetrachloride	0.005 mg/l
Chlorobenzene	0.1 mg/l
1,2-Dichlorobenzene	0.6 mg/l
1,2-Dichloroethane	0.005 mg/l
1,1-Dichloroethene	0.007 mg/l
cis-1,2-Dichloroethene	0.07 mg/l
Trans-1,2-Dichloroethene	0.1 mg/l
1,2-Dichloropropane	0.005 mg/l
Ethylbenzene	0.7 mg/l
Dichloromethane	0.005 mg/l
Styrene	0.10 mg/l
Tetrachloroethene	0.005 mg/l
Toluene	1.0 mg/l
1,2,4,-Trichlorobenzene	0.07 mg/l
1,1,1-Trichloroethane	0.2 mg/l
1,1,2-Trichloroethane	0.005 mg/l
Trichloroethene	0.005 mg/l
Vinyl Chloride	0.002 mg/l
Xylenes (total)	10 mg/l
Diquat	0.02 mg/l
DBCP (1,2-Dibromo-3-chloropropane)	0.0002 mg/l
EDB (1,2-Dibromoethane)	0.00005 mg/l
Di(2-ethylhexyl)adipate	0.4 mg/l
Di(2-ethylhexyl)phthalate	0.006 mg/l
Endothall	0.1 mg/l
Glyphosate	0.7 mg/l
Oxamyl (Vydate)	0.2 mg/l

*mg/l = milligrams per liter = parts per million = ppm

PRIMARY CONTAMINANTS	Maximum Contaminant Level (MCL)
ORGANIC-CHEMICALS: – (cont'd)	
Simazine	0.004 mg/l
Endrin	0.002 mg/l
Lindane	0.0002 mg/l
Methoxychlor	0.04 mg/l
PCB's	0.0005 mg/l
Toxaphene	0.003 mg/l
Silvex 2,4,5-TP	0.05 mg/l
2,4-D	0.07 mg/l
Alachlor	0.002 mg/l
Atrazine	0.003 mg/l
Chlordane	0.002 mg/l
Dalapon	0.2 mg/l
Dinoseb	0.007 mg/l
Heptachlor	0.0004 mg/l
Heptachlor Epoxide	0.0002 mg/l
Hexachlorobenzene	0.001 mg/l
Hexachlorocyclopentadiene	0.05 mg/l
Picloram	0.5 mg/l
Dioxin (2,3,7,8-TCDD)	0.00000003 mg/l
Carbofuran	0.04 mg/l
Pentachlorophenol	0.001 mg/l
1,4-Dichlorobenzene	0.075 mg/l
RADIONUCLIDES:	
Beta Particles & photon emitters	4 mrem/yr
Gross Alpha particle activity	15 pCi/L
Radium 226 & Radium 228 (combined)	5 pCi/L
MICROBIOLOGY:	
Coliform Bacteria	0 per 100ml

(additional items may be required if water is surface water or under the direct influence of surface water)

SECONDARY CONTAMINANTS	**Maximum Contaminant Level (MCL)**
Aluminum	0.2 mg/l
Copper	1.0 mg/l
Iron	0.30 mg/l
Manganese	0.05 mg/l
Zinc	5.00 mg/l
Silver	0.10 mg/l
Chloride	250 mg/l
Sulfate	250 mg/l
Total Dissolved Solids	500 mg/l
Fluoride	2.0 mg/l
Color	c 15 (color units)
Corrosivity	noncorrosive
Foaming Agents	0.5 mg/l
Odor Threshold	3 Ton
pH (Standard Units)	6.5-8.5

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Additional Information was obtained from various locations on the following websites:
www.wqa.org
www.nsf.org
www.epa.gov/OGWDW/wot/appa.html