COMPLETE HOME WATER QUALITY HANDBOOK

TESTING, TREATMENT AND MAINTENANCE GUIDE

WATERFILTERGEEK

Complete Home Water Quality Handbook

Understand, Test, and Improve Your Home's Water

by WaterFilterGeek.com

Table of Contents

Introduction: Why Water Quality Matters

Water is the most essential substance for human life. The average person drinks 2-3 liters per day, and uses 80-100 gallons for cooking, cleaning, and bathing. Yet most homeowners know very little about what's actually flowing from their taps.

The quality of your home's water affects:

- **Your health:** Contaminants like lead, PFAS, and bacteria can cause serious health issues
- **Your home:** Hard water damages appliances, plumbing, and water heaters
- **Your wallet:** Poor water quality leads to higher energy bills, appliance repairs, and bottled water costs
- **Your comfort:** Chlorine odors, metallic taste, and mineral buildup affect daily life

This handbook provides the knowledge you need to understand, test, and improve your home's water quality. Whether you're dealing with hard water, concerned about contaminants, or simply want peace of mind, you'll find practical guidance for making informed decisions about water treatment.

What This Handbook Covers:

- Understanding where your water comes from and what might be in it
- How to test your water and interpret the results
- The science behind different filtration technologies
- How to match filtration systems to your specific water issues
- Maintaining your water treatment systems for long-term performance

What This Handbook Doesn't Cover:

This is an educational guide, not a product catalog. For specific product recommendations, reviews, and affiliate links to purchase equipment, visit **WaterFilterGeek.com**.

Chapter 1: Understanding Your Water

Before you can improve your water quality, you need to understand where your water comes from and what contaminants are likely present.

Municipal vs. Well Water

Municipal Water

Municipal Water comes from your city or county water utility. It's treated at a central facility before distribution through underground pipes to your home.

Advantages:

- Professionally treated and monitored
- Required to meet EPA standards
- Regular testing and public reporting
- Consistent supply

Common Issues:

- Chlorine/chloramine disinfectant taste and odor
- Lead from aging pipes
- Trihalomethanes (THMs) from chlorine treatment
- Hard water minerals (depending on source)
- Occasional main breaks or boil advisories

Well Water

Well Water comes from a private well on your property. You're responsible for all testing and treatment.

Advantages:

- No water bill for usage
- Independent supply
- Often naturally soft in some regions

Common Issues:

- No regulatory oversight (testing is your responsibility)
- Bacteria and microorganisms
- Iron, manganese, and sulfur (rotten egg smell)
- Arsenic, uranium, radon (geological contaminants)
- Agricultural runoff (nitrates, pesticides)
- Hard water minerals

Common Contaminants and Health Impacts

Heavy Metals

Lead

Lead enters water from corroded pipes, solder, and fixtures. No safe level exists. Health effects include:

- Developmental delays in children
- Learning difficulties
- Reduced IQ
- Kidney and brain damage

Copper

Copper leaches from pipes, especially in acidic water. Excessive copper causes:

- Gastrointestinal distress
- Liver damage at very high levels

Arsenic

Arsenic occurs naturally in bedrock in certain regions. Long-term exposure increases risk of:

- Bladder, lung, and skin cancer
- Cardiovascular disease
- Diabetes

Chemical Contaminants

PFAS (Per- and Polyfluoroalkyl Substances)

PFAS are "forever chemicals" used in non-stick coatings, firefighting foam, and industrial processes. They don't break down naturally and accumulate in the body. Health concerns include:

- Cancer (kidney, testicular)
- Liver damage
- Immune system effects
- Developmental issues in children

Chlorine and Chloramines

Chlorine and chloramines are disinfectants added by water utilities. While they kill bacteria, they can:

- Create unpleasant taste and odor
- Form trihalomethanes (THMs) when reacting with organic matter
- Dry out skin and hair
- Irritate respiratory conditions

Pesticides and Herbicides

Pesticides and herbicides enter water from agricultural runoff. Atrazine, glyphosate, and others may:

- Disrupt hormone function
- Increase cancer risk
- Affect reproductive health

Microbiological Contaminants

Bacteria

Bacteria (E. coli, coliform) indicate fecal contamination. They cause:

- Gastrointestinal illness
- Severe infection in vulnerable populations

Viruses

Viruses (norovirus, hepatitis A) spread through contaminated water. They cause:

- Acute illness
- Potentially serious complications

Parasites

Parasites (Giardia, Cryptosporidium) resist chlorine treatment. They cause:

- Severe diarrhea
- Dehydration
- Long-lasting symptoms

Water Hardness

Hard water contains high levels of dissolved calcium and magnesium. While not a health hazard, it causes:

- Scale buildup in pipes and appliances
- Reduced water heater efficiency (10-30% energy waste)
- Soap scum and reduced cleaning effectiveness
- Dry skin and hair
- Spots on dishes and fixtures

Understanding Your Risk Profile

Your contamination risk depends on:

1. **Water Source:** Municipal or well
2. **Geographic Location:** Some regions have naturally occurring arsenic, uranium, or radon
3. **Age of Infrastructure:** Older homes and cities have lead pipes and solder
4. **Local Industry:** Manufacturing, agriculture, and military bases can contaminate groundwater
5. **Recent Events:** Floods, droughts, and nearby spills increase contamination risk

Action Step: Before choosing any filtration system, you need to know what's in YOUR water. That's covered in Chapter 2.

Chapter 2: Testing Your Water

You can't treat what you haven't tested. This chapter covers when to test, what to test for, and how to interpret your results.

When to Test Your Water

Municipal Water Users

Municipal water users should test:

- When moving into a new home
- If you have lead pipes or fixtures (built before 1986)
- If you notice changes in taste, odor, or appearance
- If there's a boil water advisory in your area
- Every 1-2 years as a baseline

Well Water Users

Well water users must test:

- Annually for bacteria, nitrates, and pH (minimum)
- Every 3-5 years for broader contaminant panel
- After any flooding or nearby land use changes
- When you notice changes in water quality
- Before installing any treatment system

DIY Test Kits vs. Laboratory Testing

DIY Test Kits

Best For:

- Quick screening
- Monitoring treatment system performance
- Testing for a few specific parameters

Limitations:

- Less accurate than lab testing
- Limited contaminant range
- No EPA-certified results
- Can miss trace contaminants

Common DIY Tests:

- Hardness test strips ($10-20)
- Chlorine test kits ($15-30)
- pH meters ($20-50)
- Multi-parameter test strips ($25-40)

Laboratory Testing

Best For:

- Comprehensive contamination screening
- Accurate measurement of health hazards
- Legal/real estate purposes
- Designing a treatment system

Types of Lab Tests:

1. **Basic Bacteria Test ($25-50):** Total coliform and E. coli. Required for all well owners.
2. **Standard Water Quality Panel ($100-200):** Bacteria, nitrates, pH, hardness, lead, copper, iron, manganese, total dissolved solids (TDS)
3. **Comprehensive Panel ($200-400):** Everything in standard panel plus PFAS, pesticides, herbicides, arsenic, uranium, radon, VOCs (volatile organic compounds)

Recommended Labs:

- Tap Score (tapscorewater.com) - Easy kit ordering, detailed reports
- National Testing Laboratories (watercheck.com) - Comprehensive panels
- State/local health department labs - Often cheaper, slower turnaround

How to Collect a Water Sample

Proper sampling technique ensures accurate results:

For Bacteria Testing:

1. Use sterile bottle provided by lab (do NOT touch inside)
2. Let cold water run 1-2 minutes
3. Fill bottle to shoulder (not completely full)
4. Seal immediately
5. Keep cool and ship within 24 hours

For Chemical Testing:

1. Run cold water 2-3 minutes to clear standing water
2. Fill bottles as instructed (some need to be full, others need headspace)
3. Label bottles with location and date
4. Ship or deliver to lab per instructions

Special Case - Lead Testing:

1. Collect "first draw" sample (water that sat in pipes 6+ hours)
2. Don't run any water beforehand
3. This shows maximum lead exposure

Reading Your Test Results

Lab reports can be overwhelming. Here's how to interpret them:

Understanding Units

- **mg/L** (milligrams per liter) = **ppm** (parts per million)
- **µg/L** (micrograms per liter) = **ppb** (parts per billion)
- 1 ppm = 1,000 ppb

EPA Maximum Contaminant Levels (MCLs)

These are legally enforceable standards for public water systems:

Contaminant	MCL	Health Concern
Lead	15 ppb (action level)	Developmental/neurological
Arsenic	10 ppb	Cancer, cardiovascular
Nitrate	10 ppm	Blue baby syndrome
PFOA/PFOS	4 ppt each (proposed 2023)	Cancer, immune, developmental
Total Coliform	0 (presence/absence)	Indicator of fecal contamination
E. coli	0 (presence/absence)	Acute illness

Secondary Standards (Aesthetic Issues)

Not health hazards, but affect taste, odor, or appearance:

Parameter	Recommended Level
Hardness	< 120 ppm (soft to moderately hard)
Iron	< 0.3 ppm
Manganese	< 0.05 ppm
Sulfur (H_2S)	< 0.05 ppm
Chlorine	< 4 ppm
pH	6.5 - 8.5
TDS	< 500 ppm

What Results Mean for Treatment

If you have:

- **Bacteria detected** → UV sterilizer or chlorination required
- **Lead > 5 ppb** → Reverse osmosis or distillation at drinking taps
- **PFAS detected** → Reverse osmosis, activated carbon (long contact time)
- **Hardness > 120 ppm** → Water softener recommended
- **Arsenic > 5 ppb** → Reverse osmosis or specific arsenic media

- **Chlorine/chloramine** → Carbon filtration
- **Multiple issues** → Multi-stage system or whole house + point-of-use combo

Understanding Your Water Report (Municipal Users)

If you receive municipal water, your utility publishes an annual Consumer Confidence Report (CCR). Find it at:

- Your utility's website
- EPA's CCR database (epa.gov/ccr)

What the CCR Shows:

- Source water (river, lake, aquifer)
- Detected contaminants and levels
- Violations of EPA standards
- Treatment methods used

What the CCR Doesn't Show:

- Contamination that occurs in YOUR home's plumbing (lead from old pipes)
- Non-regulated contaminants
- Taste/odor issues

Action Step: Even with municipal water, test at your tap for lead and consider testing for PFAS and other emerging contaminants.

Chapter 3: Filtration Technologies

Different contaminants require different removal methods. This chapter explains how each technology works, what it removes, and what it doesn't.

Activated Carbon Filtration

How It Works: Water passes through porous carbon media. Contaminants adhere to the carbon surface through adsorption.

What It Removes:

- Chlorine and chloramine (excellent)
- Taste and odor compounds (excellent)
- VOCs - volatile organic compounds (good to excellent)
- Some pesticides and herbicides (moderate to good)
- PFAS (moderate - requires long contact time and specific carbon types)

What It Doesn't Remove:

- Heavy metals (lead, arsenic)
- Nitrates
- Bacteria and viruses
- Hardness minerals
- Fluoride
- Total dissolved solids (TDS)

Types of Carbon Filters:

1. Granular Activated Carbon (GAC)

- Loose carbon granules
- Higher flow rate
- Shorter contact time
- Good for whole house chlorine removal

2. Carbon Block

- Compressed carbon
- Lower flow rate, better filtration
- Longer contact time
- Better for PFAS and VOC removal
- Common in under-sink filters

Capacity and Replacement:

- Carbon saturates over time (becomes full of contaminants)
- Typical whole house GAC: 500,000 - 1,000,000 gallons
- Typical under-sink carbon block: 500 - 1,500 gallons
- Replace when water tastes/smells like chlorine again, or per schedule

Cost:

- Whole house carbon tank: $800-2,000 installed
- Under-sink carbon system: $150-400
- Replacement media: $100-300/year

Reverse Osmosis (RO)

How It Works: Water is forced under pressure through a semi-permeable membrane. Water molecules pass through; larger contaminants are rejected to drain.

What It Removes (excellent removal, typically 95-99%):

- Lead, arsenic, chromium-6, and other heavy metals
- PFAS and other fluorinated compounds
- Nitrates and nitrites
- Fluoride
- Sodium
- Many pesticides and herbicides
- Bacteria and parasites
- Total dissolved solids (TDS)

What It Doesn't Remove:

- Some VOCs (especially smaller molecules)
- Chlorine taste/odor (requires pre-carbon stage)

How RO Systems Work:

Typical RO system stages:

1. **Sediment pre-filter:** Removes particulates that could clog membrane
2. **Carbon pre-filter:** Removes chlorine (which damages RO membranes)
3. **RO membrane:** Removes dissolved contaminants
4. **Carbon post-filter:** Polishes taste before dispensing
5. **Storage tank:** Holds filtered water (RO is slow - 50-75 gallons per day)

Efficiency:

- Produces 1 gallon of filtered water for every 3-4 gallons sent to drain
- Modern systems are more efficient (1:1 to 1:2 ratios available)

Whole House vs. Point-of-Use:

- Most RO systems are point-of-use (under sink, drinking water only)
- Whole house RO is expensive and wasteful for all water uses
- Common setup: whole house carbon + under-sink RO for drinking/cooking

Cost:

- Under-sink RO system: $200-500 (DIY) or $400-1,200 (installed)
- Whole house RO: $5,000-15,000+
- Membrane replacement: $50-100 every 2-3 years
- Pre/post filters: $50-100/year

UV Purification

How It Works: Ultraviolet light at 254 nanometers wavelength damages DNA/RNA of microorganisms, preventing reproduction.

What It Removes:

- Bacteria (E. coli, coliform, Legionella) - 99.99%

- Viruses (hepatitis, norovirus, rotavirus) - 99.99%
- Parasites (Giardia, Cryptosporidium) - 99.99%

What It Doesn't Remove:

- Any dissolved contaminants (chemicals, metals)
- Sediment or particulates
- Taste, odor, or color

UV System Components:

1. **UV Chamber:** Stainless steel chamber water flows through
2. **UV Lamp:** Mercury vapor bulb producing UV-C light
3. **Quartz Sleeve:** Protects lamp from water, allows UV transmission
4. **Power Supply/Ballast:** Provides electricity to lamp

Requirements for Effective UV:

- Water must be clear (turbidity < 5 NTU) - sediment blocks UV
- Requires pre-filtration if water has particulates
- Lamp must be replaced annually (even if still glowing)
- Flow rate must not exceed rated capacity

Sizing UV Systems:

- Based on flow rate (GPM - gallons per minute)
- 12 GPM for whole house (typical)
- 6-8 GPM for well pump systems

Cost:

- Whole house UV system: $500-1,200
- Replacement lamp: $80-150/year
- Quartz sleeve: $50-80 (replace if cracked/cloudy)
- Electricity: ~$50-75/year

Best For: Well water with bacteria concerns, post-treatment disinfection after carbon filtration.

Water Softeners (Ion Exchange)

How It Works: Hard water passes through resin beads charged with sodium ions. Calcium and magnesium ions swap places with sodium ions, effectively "softening" the water.

What It Removes:

- Calcium and magnesium (hardness)
- Some iron and manganese (at low levels)
- Small amounts of barium and radium

What It Doesn't Remove:

- Bacteria or viruses
- Chemicals (chlorine, PFAS, pesticides)
- Lead, arsenic, or other heavy metals (except through incidental removal)

How Softeners Work:

1. **Service Mode:** Hard water flows through resin tank, calcium/magnesium exchange with sodium
2. **Regeneration:** When resin is saturated with hardness minerals, system backwashes and regenerates with brine (salt water)
3. **Rinse:** Fresh water rinses salt from resin bed
4. **Return to Service:** System ready for softening again

Regeneration Methods:

- **Time-based:** Regenerates on schedule (e.g., every 3 days)
- **Meter-based:** Regenerates based on water usage (more efficient)
- **Demand-initiated:** Regenerates only when capacity is reached (most efficient)

Salt Types:

- Solar salt (crystals): Cheapest, can leave residue
- Evaporated salt pellets: Purer, preferred
- Block salt: Compressed pellets, lasts longer
- Potassium chloride: Salt alternative (expensive, less effective)

Sizing Water Softeners:

Capacity is measured in grains of hardness removal:

- Small home (1-2 people): 24,000-32,000 grain
- Medium home (3-4 people): 32,000-48,000 grain
- Large home (5+ people): 48,000-64,000+ grain

Cost:

- Standard softener: $600-1,500
- High-efficiency/demand-initiated: $1,000-2,500
- Installation: $300-800
- Salt: $60-120/year
- Water/drain cost for regeneration: $50-100/year

Health Note: Softened water adds sodium. If on sodium-restricted diet, consider potassium chloride or leave kitchen cold tap unsoftened for drinking.

Specialized Filtration Media

Iron/Manganese Filters

- Use oxidizing media (manganese greensand, Birm, Filox)
- Convert dissolved iron/manganese to solid form
- Filtered out through backwashing

Arsenic Filters

- Adsorptive media specifically designed for arsenic
- Effective for arsenic III and arsenic V
- Alternative to RO for wells with arsenic

Nitrate Filters

- Ion exchange or RO required
- Common in agricultural areas
- Critical for homes with infants

Sediment Filters

- Physical barrier (1-50 micron rating)
- Removes particulates, sand, silt, rust
- Protects other filtration equipment
- Inexpensive, frequently replaced

Whole House vs. Point-of-Use Systems

Whole House Systems:

Installed at main water line, treat all water entering home.

Advantages:

- Every tap has treated water
- Protects appliances and plumbing
- Convenient (no separate faucets)

Disadvantages:

- Higher upfront cost
- Cannot address all contaminants economically
- Wastes treatment on toilet, irrigation water

Best Whole House Applications:

- Sediment filtration (protects everything downstream)
- Carbon filtration for chlorine/chloramine
- Water softening
- UV disinfection for well water

Point-of-Use Systems:

Installed at specific taps (usually kitchen sink).

Advantages:

- Treats only water you consume (economical)
- Can use advanced filtration (RO) affordably
- Addresses drinking water contaminants specifically

Disadvantages:

- Only one tap has filtered water
- Requires separate faucet (often)
- Doesn't protect appliances

Best Point-of-Use Applications:

- Reverse osmosis for heavy metals, PFAS
- High-end carbon filtration for taste/odor
- Specific contaminant removal (lead, arsenic)

Optimal Setup for Most Homes:

- Whole house sediment + carbon (chlorine removal, appliance protection)
- Under-sink RO at kitchen (drinking/cooking water)
- Optional: whole house softener if hardness > 120 ppm

Chapter 4: Choosing the Right System

Now that you understand filtration technologies and your water test results, this chapter helps you match systems to your specific needs.

Matching Filtration to Your Water Issues

Scenario 1: Municipal Water, Chlorine Taste/Odor

Your Test Results:

- Chlorine: 2.5 ppm
- No heavy metals or bacteria
- Moderate hardness: 150 ppm

Recommended Solution:

- Whole house carbon filter (removes chlorine throughout home)
- Optional: under-sink carbon filter for better taste at kitchen

Why This Works:

- Carbon excels at chlorine removal
- Treats all water (shower, laundry benefit from chlorine-free water)
- Affordable and low maintenance

Cost Estimate: $800-1,500 for whole house carbon system

Scenario 2: Municipal Water, Old Home with Lead Pipes

Your Test Results:

- Lead: 18 ppb (above EPA action level of 15 ppb)
- Chlorine present
- Otherwise meets EPA standards

Recommended Solution:

- Under-sink reverse osmosis at kitchen tap
- Whole house carbon to remove chlorine (protects RO membrane, improves taste everywhere)

Why This Works:

- RO removes 95-99% of lead
- Treats drinking/cooking water affordably
- Whole house carbon for showering comfort

Cost Estimate: $1,200-2,000 (whole house carbon + under-sink RO)

Long-term Solution: Replace lead pipes (expensive but eliminates source)

Scenario 3: Well Water with Bacteria and Hardness

Your Test Results:

- Total coliform: PRESENT
- Hardness: 280 ppm (very hard)
- Iron: 1.2 ppm (causes staining)
- No chemicals detected

Recommended Solution:

1. Sediment filter (5 micron) - removes particulates
2. Iron filter (oxidizing media) - removes iron
3. Water softener - removes hardness
4. UV sterilizer - kills bacteria

System Order Matters: Sediment → Iron Filter → Softener → UV

Why This Order:

- Sediment first (protects equipment downstream)
- Iron filter before softener (iron fouls softener resin)
- Softener before UV (hardness minerals coat UV sleeve)
- UV last (ensures bacteria killed after all other treatment)

Cost Estimate: $3,500-5,500 installed

Scenario 4: Well Water with Arsenic

Your Test Results:

- Arsenic: 22 ppb (above EPA MCL of 10 ppb)
- pH: 7.8 (neutral)
- Otherwise clean

Recommended Solution:

- Under-sink reverse osmosis (removes 95%+ arsenic)
- Whole house sediment filter (protects plumbing)

Alternative: Whole house arsenic-specific media filter (more expensive, treats all water)

Why RO for Drinking Water:

- Arsenic primarily a concern through ingestion
- Showering/bathing in arsenic water not a major exposure route
- RO is most cost-effective for arsenic removal

Cost Estimate: $500-800 for under-sink RO

Scenario 5: Municipal Water with PFAS Detected

Your Test Results:

- PFOA: 8 ppt
- PFOS: 6 ppt
- Combined: 14 ppt (above proposed EPA limit of 4 ppt per compound)

Recommended Solution:

- Under-sink reverse osmosis OR
- High-quality carbon block filter with NSF P473 certification for PFAS

Why These Options:

- RO removes 90%+ of PFAS compounds
- Specific carbon filters certified for PFAS work well
- Treatment only at drinking water tap (cost-effective)

Cost Estimate: $300-700

Note: Standard carbon filters vary widely in PFAS removal. Look for NSF P473 certification or manufacturer testing data specifically for PFAS.

Budget Considerations

Under $500:

- Under-sink carbon filter system
- Basic RO system (DIY install)
- Countertop filter

Best for: Renters, apartments, minor taste/odor issues

$500-$1,500:

- Under-sink RO (installed)
- Whole house carbon filter
- Basic water softener (DIY)

Best for: Municipal water with chlorine, homeowners addressing single issue

$1,500-$3,500:

- Whole house carbon + under-sink RO
- Water softener (installed)
- UV sterilizer + sediment filter

Best for: Well water with bacteria, homes with moderate hardness

$3,500-$7,000:

- Complete well water system (sediment, iron, softener, UV)
- Whole house RO
- Multi-stage whole house filtration

Best for: Complex water issues, high contaminant levels, whole house treatment needed

Installation Requirements

DIY-Friendly Systems:

- Under-sink carbon filters (2-3 hours, basic tools)
- Countertop filters (no installation)
- Basic under-sink RO kits (4-6 hours, moderate skill)

Professional Installation Recommended:

- Whole house systems (requires plumbing into main line)
- Water softeners (drain line, electrical, plumbing)
- UV systems (electrical wiring)
- Systems requiring backwash drain

Typical Installation Costs:

- Under-sink system: $100-300
- Whole house system: $300-800
- Complex multi-stage system: $800-2,000

Permits: Some municipalities require permits for water treatment equipment. Check local codes.

Maintenance Requirements

Different systems require different upkeep:

Low Maintenance (1-2x per year):

- Carbon filters: Replace cartridges annually
- Sediment filters: Replace quarterly to annually
- Simple systems: Filter changes only

Moderate Maintenance (quarterly):

- RO systems: Pre/post filter changes every 6-12 months, membrane every 2-3 years
- UV systems: Annual lamp replacement, sleeve cleaning

Higher Maintenance (monthly to quarterly):

- Water softeners: Refill salt monthly, clean resin bed annually
- Iron filters: Backwash cycle, media replacement every 5-7 years
- Complex systems: Multiple filter changes on different schedules

Budget for Ongoing Costs:

- Carbon filters: $50-150/year
- RO filters: $75-150/year
- UV lamp: $80-150/year
- Softener salt: $60-120/year
- Professional service calls: $100-300 each

Common Mistakes to Avoid

1. **Buying a system before testing your water:** You can't solve a problem you haven't identified. Over-treatment wastes money. Under-treatment leaves contaminants.
2. **Choosing based on price alone:** Cheapest system often has highest operating costs. Poorly designed systems need frequent replacement. Certified systems ensure contaminant removal.
3. **Installing systems in wrong order:** Example: UV before sediment filter (UV won't work). Example: Softener before iron filter (iron ruins softener). Proper sequencing is critical.

4. **Undersizing systems:** Softener too small regenerates constantly (wastes salt/water). UV too small doesn't treat at peak flow. Carbon tank too small saturates quickly.
5. **Ignoring maintenance:** Saturated carbon filters do nothing. Old UV lamps don't sterilize. Fouled RO membranes waste water.
6. **Falling for marketing gimmicks:** "Structured water" has no scientific basis. "Magnetized water" doesn't prevent scale. Look for NSF certification, not pseudoscience.

Certification and Standards

NSF International is the leading independent certification body for water treatment equipment.

Key NSF Standards:

- **NSF/ANSI 42:** Aesthetic effects (chlorine taste/odor, particulates)
- **NSF/ANSI 53:** Health effects (lead, VOCs, cysts)
- **NSF/ANSI 55:** UV disinfection systems
- **NSF/ANSI 58:** Reverse osmosis systems
- **NSF/ANSI 44:** Water softeners
- **NSF P473:** PFAS reduction (emerging)

Why Certification Matters:

- Independent testing verifies manufacturer claims
- Ensures contaminant reduction meets standards
- Provides confidence the system works as advertised

Check certification at: nsf.org or check manufacturer documentation

Chapter 5: Maintenance & Troubleshooting

Proper maintenance ensures your water treatment system performs effectively for years. This chapter covers schedules, common problems, and solutions.

Filter Replacement Schedules

Sediment Filters

- **How Often:** Every 3-6 months (or when pressure drops)
- **Why:** Clogged filters restrict flow and can burst
- **Cost:** $10-30 per filter

Signs to Replace Early:

- Visible dirt/sediment on filter
- Reduced water pressure throughout home
- Cloudy water after filter

Carbon Filters

Whole House GAC:

- **How Often:** Every 5-7 years (backwashing systems) or when chlorine taste returns
- **Why:** Saturated carbon no longer adsorbs contaminants
- **Cost:** $150-300 for media replacement

Under-Sink Carbon Cartridges:

- **How Often:** Every 6-12 months
- **Why:** Small cartridges saturate quickly
- **Cost:** $20-60 per cartridge

Signs to Replace:

- Chlorine taste/odor returns
- Water tastes "off"
- Reached stated gallon capacity

RO System Components

Pre-Filters (sediment + carbon):

- **How Often:** Every 6-12 months
- **Why:** Protect membrane from fouling
- **Cost:** $30-60 for set

RO Membrane:

- **How Often:** Every 2-3 years
- **Why:** Membrane degrades, loses rejection rate
- **Cost:** $50-120

Post-Carbon Filter:

- **How Often:** Annually
- **Why:** Polishing filter for taste
- **Cost:** $15-30

Signs RO System Needs Maintenance:

- Water production slows dramatically
- TDS meter shows high TDS in filtered water (membrane failure)
- Taste deteriorates
- Tank doesn't refill

UV System

UV Lamp:

- **How Often:** Annually (every 9,000-10,000 hours)
- **Why:** UV intensity degrades even if lamp still glows
- **Cost:** $80-150

Quartz Sleeve:

- **How Often:** Every 2-3 years or if cracked/cloudy
- **Why:** Mineral buildup or damage blocks UV transmission
- **Cost:** $50-80

Signs UV Needs Maintenance:

- Alarm/indicator light shows lamp failure

- Annual replacement date passed
- Visible mineral buildup on quartz sleeve

Water Softener

Salt Refill:

- **How Often:** Monthly (check brine tank, refill when low)
- **Why:** Softener needs salt to regenerate resin
- **Cost:** $5-10 per 40-lb bag

Resin Bed Cleaning:

- **How Often:** Annually
- **Why:** Iron and sediment can foul resin
- **Cost:** $15-30 for resin cleaner

Resin Replacement:

- **How Often:** Every 10-15 years (or when softening stops working)
- **Why:** Resin beads break down over time
- **Cost:** $150-300 for resin + service

Signs Softener Needs Attention:

- Hard water symptoms return (scale, soap scum)
- Salt level isn't dropping (not regenerating)
- Water is salty (regeneration issues)
- Resin beads in water (resin bed breakdown)

System Cleaning and Sanitization

When to Sanitize:

- New system installation
- After filter changes
- After well work or plumbing repairs
- If water has odor/taste issues
- Annually as preventive maintenance

How to Sanitize Water Systems:

1. **Turn off system power/water**
2. **Remove filters** (don't sanitize through carbon - it removes bleach)
3. **Mix bleach solution:** 1 cup bleach per 10 gallons of system capacity
4. **Pour bleach into system** (or pour into well for whole house)
5. **Run water** at every tap until you smell bleach
6. **Let sit** for 2-8 hours (overnight is ideal)
7. **Flush thoroughly** until no bleach smell remains
8. **Install fresh filters**
9. **Resume normal operation**

Never sanitize through:

- Carbon filters (ruins them)
- RO membranes (damages them)

Common Problems and Solutions

Problem: Low Water Pressure After Filter Installation

Causes:

- Filter too restrictive for flow rate
- Clogged sediment filter
- Undersized system for home

Solutions:

- Replace sediment filter
- Upgrade to larger filter housing
- Check system is sized for peak demand (GPM)

Problem: Water Still Tastes Like Chlorine

Causes:

- Carbon filter saturated
- Insufficient contact time (flow too fast)
- Wrong type of carbon for chloramine

Solutions:

- Replace carbon filter
- Upgrade to larger carbon tank
- If utility uses chloramine, ensure carbon is catalytic (special type for chloramine)

Problem: RO System Makes Constant Running Water Sound

Causes:

- Auto shut-off valve (ASO) failed
- Check valve stuck open
- Tank pressure low

Solutions:

- Replace ASO valve
- Replace check valve
- Repressurize tank (should be 7-8 PSI when empty)

Problem: Soft Water Tastes Salty

Causes:

- Softener regenerating too frequently
- Brine tank overfilled
- Injector clogged (pulling too much salt)

Solutions:

- Adjust regeneration schedule
- Check brine tank float (should stop at ~6" of water)
- Clean or replace injector

Problem: Water Has Rotten Egg Smell After Softener

Causes:

- Sulfate-reducing bacteria in resin bed
- Softener not regenerating frequently enough

Solutions:

- Shock resin bed with bleach or hydrogen peroxide

- Increase regeneration frequency
- Consider upstream chlorination or peroxide injection

Problem: UV System Alarm Keeps Triggering

Causes:

- Lamp needs replacement (annual or 9,000 hours)
- Poor electrical connection
- Ballast failure
- Quartz sleeve dirty

Solutions:

- Replace lamp if due
- Check wiring connections
- Clean quartz sleeve
- Replace ballast if lamp and connections OK

Problem: Black Specks in Water After Carbon Filter

Causes:

- Carbon fines (normal with new filters)
- Carbon filter breaking down

Solutions:

- Flush new carbon filters for 5-10 minutes before use
- If filter is old, replace it

Problem: Scale Buildup Returns Despite Softener

Causes:

- Softener bypass open (not treating water)
- Resin bed exhausted (needs replacement)
- Not enough salt in brine tank
- Hardness level increased beyond softener capacity

Solutions:

- Check bypass valve is closed

- Ensure brine tank has salt
- Test hardness of softened water (should be < 1 gpg)
- Adjust regeneration settings or upgrade softener size

Extending System Lifespan

Do:

- Follow manufacturer maintenance schedules
- Use correct replacement parts
- Keep system area clean and accessible
- Monitor performance (taste, pressure, TDS)
- Test water annually to confirm treatment is working

Don't:

- Skip filter changes (damages downstream components)
- Use generic parts not compatible with your system
- Ignore warning lights or alarms
- Let salt run out in softener
- Use hot water through systems rated for cold only

When to Call a Professional

DIY-Friendly Maintenance:

- Filter replacements
- Salt refilling
- Basic cleaning
- UV lamp replacement

Call a Pro For:

- System not working after troubleshooting
- Electrical issues
- Plumbing leaks
- Resin bed replacement
- System redesign or sizing corrections

- Well pump or pressure tank issues

Finding a Qualified Technician:

- Look for WQA (Water Quality Association) certification
- Check reviews and references
- Ask if they service your specific brand/model
- Get written estimate before work

Record Keeping

Track:

- Filter change dates
- UV lamp replacement dates
- Softener salt usage
- Water test results (annual)
- Unusual taste/odor events
- Maintenance costs

Why:

- Spot trends (filters clogging faster = worsening source water)
- Stay on schedule
- Troubleshoot problems
- Maintain warranty
- Documentation for home sale

Simple Log: Create a notebook or spreadsheet:

Date	Action	Cost	Notes
3/15/26	Replaced sediment filter	$15	Very dirty
3/15/26	Replaced carbon pre-filter	$25	On schedule
3/15/26	Added 3 bags salt	$30	Brine tank was low

Resources

Testing Services

Tap Score (tapscorewater.com)

- Comprehensive testing kits
- Detailed reports with treatment recommendations
- Nationwide service

National Testing Laboratories (watercheck.com)

- Well-established lab
- Various test packages
- EPA-certified methods

State Health Department Labs

- Often cheapest option
- Varies by state
- Check [state].gov/health

Regulatory Information

EPA Drinking Water Standards

- epa.gov/ground-water-and-drinking-water
- Current MCLs and health advisories
- Consumer Confidence Report database

CDC Water Information

- cdc.gov/healthywater
- Health effects of contaminants
- Emergency disinfection procedures

Purchasing Equipment

Where to Buy:

- Amazon (wide selection, affiliate tag: mindshift061-20)
- Home Depot / Lowe's (installation services available)
- Specialty water treatment dealers (expert advice, higher prices)
- Online retailers (discountfilters.com, cleanwaterstore.com)

What to Look For:

- NSF certification for your contaminants
- Warranty (5-10 years typical for quality systems)
- Replacement part availability
- Customer reviews
- Return policy

Professional Organizations

Water Quality Association (WQA)

- wqa.org
- Find certified installers
- Educational resources

National Sanitation Foundation (NSF)

- nsf.org
- Product certification database
- Standards information

Additional Learning

Books:

- "The Drinking Water Book" by Colin Ingram
- "Water Treatment Plant Design" (technical)

Websites:

- WaterFilterGeek.com - Product reviews, guides, calculators

- EWG Tap Water Database - Local water quality data
- CDC Healthy Water - Health information

Emergency Situations

Boil Water Advisory:

1. Boil water at rolling boil for 1 minute
2. Or use bottled water
3. Don't use ice from automatic icemakers
4. Follow local health department guidance

Well Contamination:

1. Stop drinking the water
2. Use bottled water
3. Contact health department for testing
4. Don't use for cooking, tooth brushing, ice
5. Showering generally safe for most contaminants (not bacteria)

Flood Impact on Well:

1. Don't drink well water after flooding
2. Wait for water to recede
3. Pump and discard water until clear
4. Sanitize well (hire professional or follow health dept protocol)
5. Test for bacteria before resuming use

Final Thoughts

Clean water is fundamental to health and quality of life. This handbook has provided the knowledge to:

1. **Understand** what's in your water and why it matters
2. **Test** your water accurately
3. **Choose** the right treatment technology for your situation
4. **Maintain** your system for long-term performance

Your Next Steps:

1. **Test your water** if you haven't recently
2. **Identify your priority issues** (health hazards first, then nuisance issues)
3. **Research systems** that address your specific contaminants
4. **Get quotes** from multiple sources
5. **Install and maintain** your chosen system

Remember: there's no one-size-fits-all solution. Your water is unique, and your treatment should match your specific needs and budget.

For detailed product reviews, buying guides, and affiliate links to purchase equipment, visit WaterFilterGeek.com

Amazon purchases: Use affiliate tag mindshift061-20 to support our work.
