

OPERATOR BASICS TRAINING SERIES NATIONAL VERSION 2005
SURFACE AND GROUND WATER SYSTEMS COURSE ACTIVITY DATA

ACTIVITY LOCATION / TITLE	TYPE	TIME
1.1 - What Is A Public Water Supply System?		
Characteristics Of A Public Water System	Illustration	:30
Classification Of Public Water Supply Systems	True/False	2:00
Water "Fit For Human Consumption"	Check All That Apply	1:00
1.1.1 - Purpose Of Public Water Supply Systems		
Compare Acute And Chronic Health Effects	Drag and Drop	1:00
Ethical And Legal Obligations	True/False	:15
1.1.2 - Types Of Public Water Supply Systems		
Categories Of Public Water Supply Systems	Multiple Choice	2:00
1.2 - Operator Certification Program		
Identify Certified Operator Responsibilities	Shooting Gallery	1:30
1.2.1 - Operator Certification Requirements		
What Is Needed To Become A Certified Operator And Maintain Certification?	Drag and Drop	1:30
1.2.2 - Operator Need For Continuing Education		
Collect Credits From Appropriate Sources To Maintain Certification	Check All That Apply	:45
2.1 Surface Water As A Source		
Uses Of Fresh Water In America	True/False	:45
2.1.1 - The Hydrologic Cycle		
Hydrologic Cycle	Illustration	:45
2.1.2 The Watershed		
Watersheds and Drainage Basins	Illustration	2:00
2.1.3 Characteristics Of Surface Waters		
Properties of Surface Water	Matching	1:00
2.1.4 Streams And Rivers		
Streams And Rivers Quiz	Multiple Choice	1:40
Submerged Intakes	Shooting Gallery	2:30
2.1.5 Lakes And Reservoirs		
Stream And Reservoir Withdrawals	Drag & Drop	:45
Dam Maintenance	Multiple Choice	1:00

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2.1.6 Raw Water Transmission, Storage And Measurement		
Weir Calculations	Simulation	5:00
Parshall Flume Calculations	Simulation	4:00
Moving And Storing Raw Water	Check All That Apply	1:00
2.2 – Ground Water Aquifers		
Identify Aquifer Types And Characteristics	Multiple Choice	2:30
Identify Zones Of Saturation	Drag and Drop	1:00
2.2.1 – Aquifer Characteristics		
Aquifer Characteristics Quiz	Drag and Drop	1:30
Calculate The Direction Of Ground Water Flow	Illustration	:45
Calculate A Hydraulic Gradient	Illustration/Quiz	1:30
2.2.2 - Well Pumping		
Identify Effects Of Well Pumping	Quiz	1:30
Compare The Effects Of Competing Wells	Illustration	1:00
Calculate Pumping Level Drawdown	Quiz	:30
2.2.3 - Recharge Of Aquifers		
Identify Recharge Areas	Quiz	1:00
Receiving Streams Vs. Losing Streams	Illustration	:30
2.3 - Ground Water Collection		
Overview Of Ground Water Collection Devices	Illustration	3:00
2.3.1 - What Is GWUDISW?		
Natural Filtration Of Pathogens	Illustration	:30
What Is Done In A Microscopic Particulate Analysis	Quiz	1:00
2.4 - Ground Water Contamination		
Sources Of Contamination	Illustration	2:30
The Possible Results Of Contamination	Shooting Gallery	1:30
2.4.1 – Contamination Of Water		
How Can A Well Become A Contamination Source?	Quiz	:30
Landfill Leachate Contamination	Illustration	1:00
Point And Nonpoint Sources Of Pollution	Drag & Drop	1:00
2.4.2 - Biological Contaminants		
Pathogen Quiz	Quiz	1:30
Blue-Green Algae	True/False	1:00

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2.4.3 - Chemical Properties And Contaminants		
Identify Chemical Substances Found Naturally In Rocks And Soils	Shooting Gallery	1:30
Identify The Contaminants That Are Organic Compounds	Check All That Apply	:45
Identify Adverse Health Effects Due To Chemical Contamination	Check All That Apply	1:15
Chemistry Of Natural Waters	Matching	1:15
2.4.4 -Physical Properties And Contaminants		
Turbidity Quiz	True/False	1:00
Chemical And Physical Characteristics Of Water	Drag & Drop	2:30
2.4.5 - Radiological Contaminants		
What Can Be Done To Solve Radiological Contamination Of A Public Water Supply?	Check All That Apply	:45
2.5 - Source Water Protection		
Contamination To Guard Against	Illustration	1:30
Protecting The Source	Check All That Apply	1:00
2.5.1 -The Multiple Barrier Concept		
What Is The Multiple Barrier Concept?	Illustration	1:30
2.5.2 – Why Protect Source Water?		
Protecting The Source Water	True/False	1:45
2.5.3 - The Source Water Assessment		
Drinking Water Source Assessment	Illustration	1:55
The Assessment Process	Matching	1:55
2.5.4 – The Source Water Protection Plan		
The Planning Process	Illustration	:45
Overview Of Possible Strategies	Illustration	4:15
The Planning Committee At Work	True/False	1:45
3.1 – Conventional Treatment Process		
Conventional Treatment	Illustration	3:00
3.1.1 – Coagulation, Flocculation And Sedimentation		
Coagulation/Flocculation Quiz	True/False	1:00
3.1.2 - Filtration		
Filter Operation	Illustration	1:00
Conventional Filtration Quiz	Check All That Apply	:30
Other Types Of Filtration	Illustration	1:30

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Alternative Filtration Quiz	Matching	1:00
3.1.3 – Backwash		
Backwash Operation	Illustration	1:40
Backwash Scenarios	Illustration	7:00
3.1.4 – Point Of Use Treatment		
Point Of Use Reverse Osmosis	Illustration	:45
3.1.5 Sand And Sediment Removal		
Sand Filter	Illustration	1:00
Sand And Sediment Quiz	Multiple Choice	:30
3.1.6 – Other Removal Processes		
Treating Chemical And Physical Properties Of Water	Illustration	2:10
Fluoridation, Corrosion Control And Softening Systems	Illustration	3:00
3.2 – Process Monitoring And Controls		
What Is The Purpose Of Monitoring And Control Equipment?	Multiple Choice	1:30
Identify Which Tests Are Part Of Process Monitoring	Check All That Apply	:30
Identify Which Pieces Of Equipment May Be Considered Control Equipment	Shooting Gallery	1:30
3.2.1 – Lab Instruments		
Identify The Lab Instruments	Matching	2:00
Using Lab Instruments	Multiple Choice	2:15
3.2.2 – Jar Tests		
Jar Test Simulation	Illustration	2:30
3.2.3 – Plant Automation		
Identify Which Scenarios Are On-Off Differential Control Scenarios	Check All That Apply	:30
Identify Which Scenarios Are Proportional Control Scenarios	Shooting Gallery	2:00
SCADA Systems	True/False	1:30
3.3 - Disinfection		
What Is Indicated By A Positive Coliform Test?	Check All That Apply	:30
Distribution System Contamination Risks	Illustration	1:15
What Is The Difference Between Disinfection And Sterilization?	Multiple Choice	1:00
3.3.1 - Chlorine		
“Breakpoint Chlorination” Experiment	Hot Spot	2:30
Use The (DPD) Colorimeter Test Method To Determine Chlorine Residuals	Multiple Choice	1:30
How Much Chlorine Is Enough?	Multiple Choice	1:30

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What Is The Significance Of “Free Available Chlorine”?	True/False	:30
3.3.2 - Forms Of Chlorine		
Identify Characteristics Of Chlorine As A Gas, A Liquid And A Solid	Multiple Choice	5:00
3.3.3 - Full-Time Chlorination		
How Does A Basic Gas Chlorination System Work?	Illustration	1:00
Take The Full-Time Chlorination Quiz	Check All That Apply	:30
3.3.4 - Periodic Or Emergency Chlorination		
Discharge Of Chlorinated Water	Check All That Apply	:45
Iron Bacteria	Shooting Gallery	1:15
3.3.5 - Substituting Hypochlorite for Gas Chlorine		
Recalculating Chlorine Amounts	Multiple Choice	5:00
3.3.6 – Chlorine Gas		
What Special Design Features Are Required For Chlorine Rooms?	Illustration	:45
Take The Chlorine Safety Quiz	True/False	4:15
3.3.7 - Ultra Violet Light (UV)		
Ultraviolet Light Quiz	True/False	3:15
3.3.8 - Other Disinfectants		
Overview Of Alternative Disinfection Systems	Illustration	1:30
4.1 - System Components		
Basic Water Distribution System Components	Illustration	:30
Unaccounted-For Water In A Distribution System	Multiple Choice	1:00
4.1.1 - Piping		
Characteristics Of Water Supply Piping	Illustration	1:00
Pipe Materials	Matching	1:00
4.1.2 - Valves		
Distribution System Valve Operation	Illustration	2:00
Cause Of Water Hammer	Multiple Choice	:45
Valve Maintenance	Check All That Apply	:30
4.1.3 - Fire Hydrants		
Hydrant Basics	Hot Spot	1:15
Hydrant Maintenance	Check All That Apply	1:00

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The Flushing Program	Shooting Gallery	1:15
4.1.4 - Storage Reservoirs		
Maintenance Of Large Storage Tanks	True/False	2:00
Hydropneumatic Tanks Vs. Large Water Storage Tanks	Drag & Drop	1:15
Protecting Stored Water From Contamination	Check All That Apply	:45
4.1.5 - Booster Stations		
Basics Of The Booster Station	Shooting Gallery	1:00
4.2 - System Pressure And Basic Hydraulics		
Water Behavior In The Distribution System	Check All That Apply	1:00
4.2.1 - System Pressure		
Distribution System Water Pressure	Illustration	:45
Pressure Readings In The System	Matching	1:00
4.2.2 - Hydraulics		
Flow In A Pipe	True/False	1:45
Pressure Within A Tank Of Water	Drag & Drop	1:00
Information From The Meter	Matching	1:00
The Weight Of Water	Multiple Choice	:45
Conversion Of Flow Units	Multiple Choice	1:00
4.3 - Construction and Repair		
New Water Line Construction	Multiple Choice	2:00
4.3.1 - Minimum Separation Distances		
Pipe Placement	Shooting Gallery	1:15
4.3.2 - Looped Systems And Dead End Mains		
Dead End Water Lines	Hot Spot	:30
Layout Of Water Lines	Hot Spot	:30
4.3.3 - Preventing Contamination		
Procedures For Disinfection	Illustration	3:30
Prevention Of Contamination During Construction And Repair	Check All That Apply	1:00
4.3.4 - System Repairs		
How A Repaired System Is Put Back Online	Ordered List	1:00
Making Repairs To The Distribution System	Check All That Apply	:45
4.3.5 - Distribution System Recordkeeping		
Reasons For Water Systems To Keep Records	Shooting	1:15

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	Gallery	
Types Of Records To Keep	Check All That Apply	:45
4.4 - Cross Connections And Backflow Defined		
Examples Of Small System Cross-Connections	Illustration	2:00
Cross-Connection Definitions	Matching	1:15
Back-Pressure, Backflow And Back-Siphonage	Drag & Drop	1:30
4.4.1 - Public Health Significance		
Public Health Implications	Check All That Apply	1:00
Backflow Event Degree Of Hazard	Hot Spot	1:15
Backflow Events	Shooting Gallery	1:00
4.4.2 - Types Of Cross-Connection Control		
Distinguishing Between Containment And Isolation	Drag & Drop	1:15
4.5 - Backflow Preventers		
Cross-Connection Prevention Devices	Simulation	2:45
Specialty Valve Roles	Check All That Apply	1:00
4.5.1 - Air Gap		
Identification Of Air Gaps	Hot Spots	1:15
4.5.2 - Atmospheric / Hose Bibb Vacuum Breakers		
AVB At Work	Illustration	1:00
Atmospheric Vacuum Breaker Basics	Check All That Apply	1:15
4.5.3 - Pressure Vacuum Breaker Assembly		
How A PVB Works	Illustration	1:00
PVB Basics	Shooting Gallery	1:00
4.5.4 - Double Check Valve Assembly		
How A Double Check Valve Works	Illustration	:45
Double Check Valve Basics	Hot Spot	1:15
4.5.5 - Reduced Pressure Principle Assembly		
Functioning Of The RP	Illustration	1:00
Basics Of The Reduced Pressure Principle	True/False	1:15

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Assembly		
4.5.6 - Installation And Servicing		
General Installation Requirements	Check All That Apply	:45
Providing For Thermal Expansion	Hot Spot	:45
Inspection And Testing	True/False	1:15
4.6 - Cross-Connection Control Plans		
Elements Of The Cross-Connection Plan	Check All That Apply	1:00
Managing And Reporting Backflow Events	Illustration	1:00
5.1 - Well Construction		
Well Construction Basics	Illustration	1:30
5.1.1 - Water Rights And Well Log Reports		
Interpret Well Log Data	Multiple Choice	2:00
How Do Water Rights Apply To Ground Water Systems?	Shooting Gallery	1:00
What Information Is Included In A Well Log Report?	Illustration	1:00
5.2 - Well Construction		
Well Construction Basics	Illustration	1:30
5.1.2 - Well Construction Methods		
Common Methods Used To Construct A Well	Illustration	3:00
What Are Good Reasons For Replacing An Old Dug Well?	Check All That Apply	1:00
5.1.3 - Casing Type And Size		
Minimum Design Standards For Well Casings	Multiple Choice	1:15
Casing Basics	Shooting Gallery	1:00
5.1.4 - Perforated Interval And Screens		
Why Perforate The Well Casing?	Multiple Choice	1:00
When Is A Well Screen Needed?	Hot Spot	1:00
5.1.5 - Grouting And Sealing		
Grouting Procedure For Public Wells	Illustration	1:30
5.1.6 - Test Pumping		
What Is The Reason For Test Pumping A Well?	Check All That Apply	1:00
Well Production Terms And Concepts	Illustration	1:30
5.1.7 - Adapters, Caps, Seals And Vents		
Pitless Adapter Parts Identification	Hot Spot	2:30
Why Must Wells Be Vented?	Check All That Apply	1:00
5.2 - Site Considerations		

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Identify Well Location Specifications	Hot Spot	2:30
Well Setback Criteria	True/False	1:00
5.2.1 - Drainage Around The Wellhead		
Wellhead Drainage	True/False	1:00
5.2.2 - Well Pits		
Identify Problems Associated With Well Pits	Check All That Apply	1:30
5.2.3 - Pump Power Cable Installation		
What To Watch For In Cable Conduit Installations	Illustration	1:00
5.2.4 - Yard Hydrants And Sample Taps		
What Is The Main Purpose Of The Sample Tap	Multiple Choice	1:00
Potential For Contamination By Improper Yard Hydrant Installations	Illustration	2:00
5.2.5 - Artesian Wells		
Artesian Well Site Considerations	Hot Spot	2:30
5.2.6 - Well Abandonment		
Identify Conditions That May Require A Well To Be Abandoned	Check All That Apply	1:00
5.3 - Well Pumps And Components		
How A Well Pump System Works	Illustration	3:00
Identify Submersible Pump Components	Hot Spot	1:30
Identify Pump Characteristics	Matching	1:00
The Process Of Selecting A Pump	Illustration	1:30
5.3.1 - Plumbing A Pump Station		
Eliminate Galvanic Corrosion By Choosing Compatible Materials	Drag & Drop	2:30
5.3.2 - Electrical Safety		
What Is The Correct Procedure Used To “Lock Out” Electrical Equipment?	Illustration	3:30
Identify Unsafe Conditions	True/False	1:00
5.3.3 - Pressure Tanks		
How A Pressure Tank Works	Illustration	2:00
5.4 - Well And Pump Maintenance		
Why Is It Important To Keep Well Records?	Check All That Apply	:45
5.4.1 - Routine Maintenance		
Routine Well And Pump Maintenance	Illustration	1:30
5.4.2 - Troubleshooting Declining Yield		
How To Troubleshoot Declining Yield	Illustration	1:30
Ways To Measure The Water Level In A Well	True/False	2:30
Elements Of The Preventive Maintenance Plan	Matching	1:30
6.1 - Laws and Regulations		

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What Is System Capacity?	Check All That Apply	:30
What Is The Safe Drinking Water Act (SDWA)?	Check All That Apply	:45
Define The Concept Of Primacy	Multiple Choice	1:15
6.2 - Types Of Drinking Water Regulations		
What Is A Maximum Contaminant Level Goal?	True/False	:45
What Is The Primary Purpose Of Public Water System Regulations?	Multiple Choice	1:00
Multiple Barrier Concept For Ground Water Systems	Multiple Choice	3:30
6.3 - Plan / Specification Review And Approval		
Which Plans Must Receive Approval Prior To Construction?	Drag & Drop	1:00
6.4 - Monitoring And Reporting		
Monitoring: Who Does What?	True/False	1:15
6.4.1 - Microbiological Quality		
Indicator Organisms	Matching	1:15
Total And Fecal Coliform Bacteria	Drag & Drop	1:15
Routine, Repeat, And Special Samples	Shooting Gallery	1:15
What Is Included In A Sample Site Plan?	Check All That Apply	1:00
6.4.2 – The Filtration Process		
Turbidity Monitoring Quiz	Shooting Gallery	:45
Filter Backwash Recycling	Check All That Apply	1:15
6.4.3 - Chemical Contaminants		
Responsibility For Lab Test Results	True/False	:30
Chemical Monitoring Quiz	Check All That Apply	1:15
Health Effects Of Chemical Contamination	True/False	1:30
6.4.4 – Disinfectant Residual		
Define “Point Of Application” And “Distribution System Residual”	Check All That Apply	1:15
Benefits And Drawbacks Of Disinfection Residual	Drag & Drop	1:00

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6.4.5 - Disinfectants And Disinfection Byproducts		
Organic And Inorganic Chemicals	Check All That Apply	1:00
DBP Quiz	Shooting Gallery	1:30
6.4.6 - Fluoridation		
What Is The Regulatory Philosophy Concerning Fluoride?	Multiple Choice	:30
What Fluoride Level Is Considered To Be Optimal?	Hot Spot	:45
6.4.7 - Lead And Copper / Corrosion Control		
Identify Health Effects Caused By Lead And Copper Consumption	Drag & Drop	:45
Lead And Copper In Tap Water	Matching	2:00
6.4.8 - Secondary Contaminants And Concerns		
What Is A Sequestering Agent?	Multiple Choice	:30
Health Concerns Vs. Aesthetic Concerns	Drag & Drop	:45
6.4.9 - Professional Water Haulers For Cisterns		
Regulations For Commercial Water Haulers	Multiple Choice	:30
6.5 - The Sanitary Survey		
Preparing For A Sanitary Survey	Illustration	9:00
Points Classification System	Simulation	6:45
6.6 - Public Notification		
What Is The Primary Purpose Of Public Notification?	Multiple Choice	1:15
In What Circumstances Is Public Notification Required?	Check All That Apply	:30
6.7 - Future Regulations		
New Requirements For The Small System	Check All That Apply	:45
7.1 - Elements Of A Safety Program		
Common Water System Safety Hazards	Illustration	1:30
Risks Of Injuries To Water System Workers	Multiple Choice	2:00
7.1.1 - Electrical Safety		
Identifying Electrical Hazards	Hot Spot	1:45
Safety Precautions To Use Around Electrical Equipment	True/False	2:15
7.1.2 - Chemical Safety		
What Information Do You Get In An MSDS?	Illustration	4:00

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What Do You Do If Corrosive Chemicals Get On Your Clothing?	True/False	1:00
Acids, Bases and Water	Drag & Drop	1:30
7.1.3 - Chemical Storage Issues		
Define Compatibility and Containment	Matching	1:00
The Do's And Don'ts Of Storing Flammable Chemicals	True/False	1:45
7.1.4 - Chlorine Safety		
Chlorine Safety Issues	True/False	1:00
7.1.5 - Traffic Control Clothing		
Traffic Safety	Illustration	1:00
7.1.6 - Shoring And Trenching		
Know What You're Getting Into	Illustration	:30
Shoring And Trenching	Check All That Apply	1:00
7.1.7 - Confined Spaces		
Test Your Knowledge Of Confined Spaces	True/False	1:45
Gases In Confined Spaces	Check All That Apply	:45
Safety Procedures	Check All That Apply	1:00
7.1.8 - Fire Safety		
What Type Of Fire Extinguisher Should Be Used?	Matching	1:30
7.1.9 - First Aid		
What's In A Red Cross First Aid Kit?	Illustration	:45
7.1.10 - Personal Hygiene And Protective Clothing		
Protective Equipment And Clothing	Check All That Apply	:45
7.2 - Identification Of Possible Disruption Threats		
Examples Of Emergency Events	Illustration	1:30
Effects Of Emergencies On A Water System	Multiple Choice	2:00
Water System Tampering	Illustration	2:00
7.2.1 - System Protection And Security		
Fencing Around The Wellhead	Multiple Choice	:30
Protect Your Well From Livestock	Illustration	:45
Beefing Up System Security	Multiple Choice	1:15
7.2.2 - Designation Of An Emergency Coordinator		
Role Of The Emergency Coordinator	Check All That Apply	1:00

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7.2.3 - Available Resources		
Emergency Notification	True/False	:30
Important Items To Have On Hand	True/False	:30
Extra Help Is Available	Shooting Gallery	1:30
7.2.4 - Well Shutdown Procedures		
Continued Operation In An Emergency	Check All That Apply	1:00
Water Outages	Shooting Gallery	1:30
7.2.5 - Communicating During An Emergency		
Communication With Customers	Check All That Apply	:45
Trucking Water In An Emergency	True/False	1:00
7.2.6 - Resumption Of Water		
How To Resume Water Service	Illustration	1:15
7.3 - Records Maintenance		
Important Drinking Water Records	Matching	1:15
7.3.1 - Planning For The Future		
Rate Structures	Matching	2:00
How To Compute The True Cost Of Water	Illustration	7:40
7.3.2 - Effective Communication		
Effective Communication	Illustration	1:00
7.3.3 - Consumer Confidence Reports		
The Anatomy Of A CCR	Illustration	4:00
7.3.4 - Public Notification		
What Is To Be Included In A Public Notification?	Illustration	3:00
Time Allowed For The Public To Be Notified	Matching	1:00
The Basics Of Public Notification	Check All That Apply	1:00
7.3.5 - Relief Operator		
Who Can Serve As A Relief Operator?	Multiple Choice	:45
7.3.6 - Contacts For The Small Water System Operator		
Important Contacts For Small Systems	Drag & Drop	2:00