NEEDS TO KNOW GUIDE FOR WELL WATER SYSTEM OPERATORS

Presented by
NORTH CAROLINA WATERWORKS OPERATORS ASSOCIATION BOARD OF EXAMINERS

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PART I
NEED TO KNOW GUIDE - SMALL WATER SYSTEM OPERATION AND MAINTENANCE
Sections Listed are from 6th Edition

Guide for Small Water System Operation and Maintenance, A Field Study Training Program Prepared by California State University, Sacramento, School of Engineering, Applied Research and Design Center in Cooperation with the National Environmental Training Association.

PART II
NEED TO KNOW GUIDE - WATER TREATMENT PLANT OPERATION, VOLUME II
Sections Listed are from 6th Edition

Guide for Water Treatment Plant Operation. Volume II, A Field Study Training Program Prepared by California State University, Sacramento, School of Engineering, Applied Research and Design Center in Cooperation with the National Environmental Training Association.

PART III
NEED TO KNOW GUIDE - RULES GOVERNING PUBLIC WATER SYSTEMS
Sections Listed are from July 1, 2019

Guide for "Rules Governing Public Water Systems", Section .0100 through .2100, Title 15A, Subchapter 18C of the North Carolina Administrative Code, Department of Environment, Health and Natural Resources, Division of Environmental Health.

PART IV
NEED TO KNOW GUIDE - WELL CONSTRUCTION STANDARDS
Sections Listed are from October 1, 2009

Guide for "Well Construction Standards, "Section .0100, Title 15A, Subchapter 2C of the North Carolina Administrative Code, Department of Environment, Health and Natural Resources, Division of Environmental Health.

PART V
NEED TO KNOW GUIDE - RULES GOVERNING WATER TREATMENT FACILITY OPERATORS
Sections Listed are from December 1, 2008

Guide for "Rules Governing Water Treatment Facility Operators", Section .0100 through Section .0700, Title 15A, Subchapter 180 of the North Carolina Administrative Code, Department of Environment, Health and Natural Resources, Division of Environmental Health.

SMALL WATER SYSTEM OPERATION MAINTENANCE

SECTION	TOPIC	D	C	B	A
1	**KEY TERMS: INTRODUCTION TO SMALL WATER SYSTEMS**				
1.1	WATER AS A LIMITED RESOURCE	X	X	X	X
1.2	THE WATER SUPPLY SYSTEM	X	X	X	X
1.2.1	Sources of Water	X	X	X	X
1.2.1.1	Ocean	X	X	X	X
1.2.1.2	Surface Water	X	X	X	X
1.2.1.3	Groundwater	X	X	X	X
1.2.1.4	Reclaimed Water	X	X	X	X
1.2.2	Storage Facilities	X	X	X	X
1.2.3	Treatment Facilities	X	X	X	X
1.2.3.1	Water Treatment	X	X	X	X
1.2.4	Distribution System	X	X	X	X
1.3	SELECTION OF A WATER SOURCE	X	X	X	X
1.3.1	Water Rights	X	X	X	X
1.3.2	Sanitary Survey	X	X	X	X
1.3.3	Contamination	X	X	X	X
1.3.3.1	Physical Characteristics	X	X	X	X
1.3.3.2	Chemical Characteristics	X	X	X	X
1.3.3.3	Biological Factors	X	X	X	X
1.3.3.4	Radiological Factors	X	X	X	X
1.4	THE SAFE DRINKING WATER ACT	X	X	X	X
1.5	SMALL WATER SYSTEM OPERATORS	X	X	X	X
1.5.1	Operation & Maintenance	X	X	X	X
1.5.2	Supervision & Administration	X	X	X	X
1.5.3	Public Relations	X	X	X	X
1.5.4	Safety	X	X	X	X
1.6	MATH ASSIGNMENT	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
2	**KEY WORDS: WELLS**				
2.1	GROUNDWATER – CRITICAL LINK TO WELLS	X	X	X	X
2.1.1	Water (Hydrologic) Cycle	X	X	X	X
2.1.2	Aquifers	X	X	X	X
2.1.2.1	Porosity & Specific Yield		X	X	X
2.1.2.2	Overdraft		X	X	X
2.1.2.3	Saltwater Intrusion			X	X
2.1.3	Pollution Control	X	X	X	X
2.1.3.1	Geologic & Hydrologic Data		X	X	X
2.1.4	Wellhead Protection		X	X	X
2.1.4.1	National Program			X	X
2.1.4.2	Groundwater Protection Tips	X	X	X	X
2.2	WELL SITE SELECTION	X	X	X	X
2.2.1	Horizontal Distance	X	X	X	X
2.2.2	Design of Well Fields			X	X
2.2.3	Special Construction of Collection Systems Under Gravity Flow	X	X	X	X
2.2.4	Sanitary Control of Future Construction	X	X	X	X
2.3	STRUCTURE & COMPONENTS		X	X	X
2.3.1	Types of Wells		X	X	X
2.3.1.1	Dug Wells		X	X	X
2.3.1.2	Bored Wells		X	X	X
2.3.1.3	Driven Wells		X	X	X
2.3.1.4	Drilled Wells	X	X	X	X

SECTION	TOPIC	D	C	B	A
2.3.1.5	Shallow Collector Wells – Ranney Type			X	X
2.3.2	Subsurface Features of a Well	X	X	X	X
2.3.2.1	Conductor Casing	X	X	X	X
2.3.2.2	Well Casing			X	X
2.3.2.3	Intake Section of a Well	X	X	X	X
2.3.2.4	Annular Grout Seal	X	X	X	X
2.3.2.5	Gravel Pack		X	X	X
2.3.3	Surface Features of a Well	X	X	X	X
2.3.3.1	Well-Casing Vent			X	X
2.3.3.2	Gravel Tube			X	X
2.3.3.3	Sounding Tube		X	X	X
2.3.3.4	Pump Pedestal		X	X	X
2.3.3.5	Pump Motor Base Seal		X	X	X
2.3.3.6	Sampling Taps	X	X	X	X
2.3.3.7	Air Release & Vacuum Breaker Valves		X	X	X
2.3.3.8	Pump Blowoff	X	X	X	X
2.3.4	Well Appurtenances	X	X	X	X
2.3.4.1	Check Valves	X	X	X	X
2.3.4.2	Pump Control Valves		X	X	X
2.3.4.3	Foot Valves	X	X	X	X
2.3.4.4	Flowmeters	X	X	X	X
2.3.4.5	Sand Traps & Sand Separators			X	X
2.3.4.6	Surge Suppressors			X	X
2.3.4.7	Air & Vacuum Valves			X	X
2.3.4.8	Pressure Relief Valves	X	X	X	X
2.3.4.9	Hydropneumatic Pressure Tank Systems	X	X	X	X
2.4	TESTING & EVALUATION	X	X	X	X
2.4.1	Well Yield Tests	X	X	X	X
2.4.1.1	Bailing Test Method			X	X
2.4.1.2	Air Blow Test Method			X	X
2.4.1.3	Variable Rate Method			X	X
2.4.1.4	Constant Rate Method			X	X
2.4.1.5	Step-Continuous Composite Method			X	X
2.5	MAINTENANCE & REHABILITATION			X	X
2.5.1	Factors Affecting the Maintenance of Well Performance	X	X	X	X
2.5.1.1	Overpumping	X	X	X	X
2.5.1.2	Clogging or Incrustation of Screen	X	X	X	X
2.5.1.3	Corrosion or Collapse of Screen	X	X	X	X
2.5.1.4	Biofouling			X	X
2.5.2	Preventative Maintenance & Repairs	X	X	X	X
2.5.3	Casing & Screen Maintenance	X	X	X	X
2.5.3.1	Surging			X	X
2.5.3.2	High-Velocity Jetting			X	X
2.5.3.3	Acid Treatment		X	X	X
2.5.3.4	Chlorine Treatment	X	X	X	X
2.5.3.5	Polyphosphates		X	X	X
2.5.3.6	Explosive Charges			X	X
2.5.4	Water Quality Monitoring	X	X	X	X
2.5.5	Downhole Video Inspection		X	X	X
2.5.6	Summary	X	X	X	X
2.6	WELL PUMPS & SERVICE GUIDELINES	X	X	X	X
2.6.1	Types of Pumps	X	X	X	X
2.6.1.1	Centrifugal Pumps	X	X	X	X
2.6.1.2	Other Pumps	X	X	X	X

SECTION	TOPIC	D	C	B	A
2.6.1.3	Right-Angle Gear Drives			X	X
2.6.2	Selecting a Pump	X	X	X	X
2.6.3	Service Guidelines		X	X	X
2.6.4	Motors	X	X	X	X
2.6.5	Pump Testing & Evaluation			X	X
2.6.5.1	Guidelines for Testing			X	X
2.6.5.2	Evaluating Test Results			X	X
2.6.5.3	Pump Electrical	X	X	X	X
2.7	DISINFECTION OF WELLS & PUMPS	X	X	X	X
2.7.1	New Wells	X	X	X	X
2.7.2	Existing Wells	X	X	X	X
2.7.3	Contaminated Wells	X	X	X	X
2.7.4	Chlorine Requirement Calculations	X	X	X	X
2.8	ELECTRICAL SUPPY & CONTROLS		X	X	X
2.8.1	Electrical Supply		X	X	X
2.8.1.1	Motor Starters		X	X	X
2.8.1.2	Auxiliary Power		X	X	X
2.8.2	Pump Controls	X	X	X	X
2.8.2.1	Control Systems	X	X	X	X
2.8.2.2	Equipment	X	X	X	X
2.9	TROUBLESHOOTING	X	X	X	X
2.9.1	Decline in Yield	X	X	X	X
2.9.2	Sand in Well Water Systems			X	X
2.9.2.1	Problems Associated with Sand			X	X
2.9.2.2	Flushing Mains	X	X	X	X
2.9.2.3	Test for Sand, Volumetric Method			X	X
2.9.2.4	Acceptable Concentrations			X	X
2.9.2.5	Responding to Complaints			X	X
2.10	ABANDONING & PLUGGING WELLS			X	X
2.10.1	Permits			X	X
2.10.2	Abandoning & Plugging Guidelines			X	X
2.11	OPERATOR RESPONSIBILITY & RECORDKEEPING			X	X
2.11.1	Routine Facility Servicing			X	X
2.11.2	Records			X	X
2.12	MATH ASSIGNMENT	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
3	**KEY WORDS: SMALL WATER TREATMENT PLANTS**				
3.1	IMPORTANCE OF SMALL WATER TREATMENT PLANTS	X	X	X	X
3.1.1	Surface Waters	X	X	X	X
3.1.2	Groundwaters	X	X	X	X
3.1.3	Operator Responsibility	X	X	X	X
3.2	COAGULATION		X	X	X
3.3	FLOCCULATION		X	X	X
3.4	SETTLING (SEDIMENTATION)		X	X	X
3.5	FILTRATION		X	X	X
3.6	DISINFECTION OF WELLS & PUMPS	X	X	X	X
3.7	CORROSION CONTROL		X	X	X
3.8	SOLIDS-CONTACT CLARIFICATION		X	X	X
3.8.1	Fundamentals of Operation	X	X	X	X
3.8.2	Maintenance	X	X	X	X

SMALL WATER SYSTEM OPERATION MAINTENANCE

SECTION	TOPIC	D	C	B	A
3.9	SLOW SAND FILTRATION		X	X	X
3.9.1	Procedure for Treating Water	X	X	X	X
3.9.2	Components	X	X	X	X
3.9.2.1	Filter Tank	X	X	X	X
3.9.2.2	Underdrain System		X	X	X
3.9.2.3	Sand Media Bed		X	X	X
3.9.2.4	Flow Control Piping, Valves, & Gauges	X	X	X	X
3.9.2.5	Outlet Chamber		X	X	X
3.9.2.6	Finished Water Holding Facility	X	X	X	X
3.9.2.7	Hydraulic Controls & Monitoring Devices	X	X	X	X
3.9.3	Typical Filter Operating Cycle		X	X	X
3.9.3.1	Daily Operation	X	X	X	X
3.9.3.2	Cleaning the Filter Media			X	X
3.9.4	Preventive Maintenance	X	X	X	X
3.9.5	Troubleshooting	X	X	X	X
3.9.6	Finished Water Standards	X	X	X	X
3.9.7	Factors Affecting Filter Performance	X	X	X	X
3.9.7.1	Source Water Quality	X	X	X	X
3.9,7.2	Cyclic Influences		X	X	X
3.9.7.3	Mode of Operation	X	X	X	X
3.9.7.4	Hydraulic Loading Rate			X	X
3.9.8	Recordkeeping	X	X	X	X
3.9.9	Process Modifications	X	X	X	X
3.9.10	Example Slow Sand Filter Plant		X	X	X
3.9, 10.1	Construction Features		X	X	X
3.9.10.2	Startup	X	X	X	X
3.9.10.3	Operation	X	X	X	X
3.9.10.4	Filter Cleaning	X	X	X	X
3.9.10.5	Shutdown	X	X	X	X
3.10	IRON & MANGANESE CONTROL		X	X	X
3.11	SOFTENING		X	X	X
3.11.1	Ion Exchange Softening		X	X	X
3.12	OPERATION	X	X	X	X
3.13	MAINTENANCE	X	X	X	X
3.13.1	Tools	X	X	X	X
3.14	SAFETY	X	X	X	X
3.15	MATH ASSIGNMENT	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
4	**KEY WORDS: DISINFECTION**				
4.1	DRINKING WATER SAFETY	X	X	X	X
4.1.1	Safe Drinking Water Laws	X	X	X	X
4.2	FACTORS INFLUENING DISINFECTION	X	X	X	X
4.2.1	pH	X	X	X	X
4.2.2	Temperature	X	X	X	X
4.2.3	Turbidity	X	X	X	X
4.2.3.1	Organic Matter	X	X	X	X
4.2.3.2	Inorganic Matter	X	X	X	X
4.2.4	Reducing Agents	X	X	X	X
4.2.5	Microorganisms	X	X	X	X
4.2.5.1	Removal Processes				X
4.3	DISINFECTION PROCESS	X	X	X	X

SECTION	TOPIC	D	C	B	A
4.3.1	Physical Means of Disinfection	X	X	X	X
4.3.2	Chemical Disinfectants Other Than Chlorine			X	X
4.3.3	Chlorine		X	X	X
4.3.3.1	Chlorine Disinfection Action	X	X	X	X
4.3.3.2	Reaction with Water		X	X	X
4.3.3.3	Reaction with Impurities in Water		X	X	X
4.3.4	Hypochlorite	X	X	X	X
4.3.4.1	Reaction with Water		X	X	X
4.3.4.2	Differences Between Chlorine Gas & Hypochlorite Compound Reactions		X	X	X
4.3.4.3	Onsite Chlorine Generation		X	X	X
4.3.5	Chlorine Dioxide				X
4.3.5.1	Reaction in Water				X
4.3.5.2	Reaction with Impurities in Water				X
4.3.6	Breakpoint Chlorination	X	X	X	X
4.3.7	Chloramination		X	X	X
4.3.7.1	Methods for Producing Chloramines		X	X	X
4.3.7.2	Chlorine-to-Ammonia-Nitrogen Ratios		X	X	X
4.3.7.3	Special Water Users		X	X	X
4.3.7.4	Blending Chloraminated Waters		X	X	X
4.3.7.5	Chloramine Residuals		X	X	X
4.3.8	Nitrification		X	X	X
4.3.8.1	Nitrification Prevention & Control		X	X	X
4.3.9	Chlorine Residual Testing	X	X	X	X
4.3.9.1	Chlorine Residual Curve			X	X
4.3.9.2	Critical Factors			X	X
4.3.10	CT Values		X	X	X
4.3.11	Process Calculations			X	X
4.4	POINTS OF CHLORINE APPLICATION	X	X	X	X
4.4.1	Prechlorination	X	X	X	X
4.4.2	Postchlorination	X	X	X	X
4.4.3	Rechlorination	X	X	X	X
4.3.4	Wells	X	X	X	X
4.4.5	Mains	X	X	X	X
4.4.6	Tanks & Reservoir	X	X	X	X
4.5	OPERATION OF CHLORAMINATION EQUIPMENT	X	X	X	X
4.5.1	Hypochlorinators	X	X	X	X
4.5.2	Chlorinators		X	X	X
4.5.2.1	Chlorinator Flow Path		X	X	X
4.5.2.2	Chlorinator Parts & Their Purpose	X	X	X	X
4.5.3	**Chlorine Containers**	X	X	X	X
4.5.3.1	Plastic	X	X	X	X
4.5.3.2	Steel Cylinders	X	X	X	X
4.5.3.3	Ton Tanks		X	X	X
4.5.4	Safety Around Chlorine	X	X	X	X
4.5.5	Removing Chlorine from Containers	X	X	X	X
4.5.5.1	Connections	X	X	X	X
4.5.5.2	Valves	X	X	X	X
4.5.5.3	Ton Tanks		X	X	X
4.5.6	Performance of Chlorination Units	X	X	X	X
4.5.6.1	Hypochlorinators	X	X	X	X
4.5.6.2	Chlorinators	X	X	X	X

SMALL WATER SYSTEM OPERATION MAINTENANCE

SECTION	TOPIC	D	C	B	A
4.5.7	Normal & Abnormal Operation		X	X	X
4.5.7.1	Container Storage Area	X	X	X	X
4.5.7.2	Evaporators			X	X
4.5.7.3	Chlorinators, Including Injectors	X	X	X	X
4.5.7.4	Daily Operations		X	X	X
4.5.7.5	Laboratory Tests			X	X
4.5.8	Troubleshooting Gas Chlorinator Systems		X	X	X
4.5.9	Disinfection troubleshooting		X	X	X
4.5.10	Chlorination System Failure	X	X	X	X
4.6	MAINTENANCE		X	X	X
4.6.1	Chlorine Leaks		X	X	X
4.6.2	Installation			X	X
4.7	CHLORINE DIOXIDE FACILITIES		X	X	X
4.7.1	Safe Handling of Chemicals		X	X	X
4.7.2	Operation		X	X	X
4.7.2.1	Prestart Procedures		X	X	X
4.7.2.2	Startup		X	X	X
4.7.2.3	Shutdown		X	X	X
4.7.3	Maintenance		X	X	X
4.7.4	Troubleshooting		X	X	X
4.8	MEASUREMENT OF CHLORINE RESIDUAL	X	X	X	X
4.8.1	Methods of Measuring Chlorine Residual	X	X	X	X
4.8.2	ORP Probes		X	X	X
4.9	CHLORINE SAFETY PROGRAM	X	X	X	X
4.9.1	Chlorine Hazards	X	X	X	X
4.9.3	Why Chlorine Must Be Handled with Care	X	X	X	X
4.9.4	Hypochlorite Safety	X	X	X	X
4.9.5	Chlorine Dioxide Safety		X	X	X
4.9.6	Operator Safety Training	X	X	X	X
4.9.7	CHEMTRAC	X	X	X	X
4.10	ULTRAVIOLET SYSTEMS		X	X	X
4.10.1	Lamp Types		X	X	X
4.10.2	System Types		X	X	X
4.10.3	Safety		X	X	X
4.10.4	Operation		X	X	X
4.10.4.1	UV Light Intensity Effectiveness			X	X
4.10.4.2	Minimum UV Dose Management			X	X
4.10.4.3	Routine Operations Tasks		X	X	X
4.10.4.4	Wiping System		X	X	X
4.10.4.5	Equipment Shutdown/Startup Preliminary Steps		X	X	X
4.10.4.6	Shutdown Sequence		X	X	X
4.10.4.7	Cleaning the Tank		X	X	X
4.10.4.8	Startup Sequence		X	X	X
4.10.4.9	Monitoring Lamp Output Intensity			X	X
4.10.4.10	Monitoring Influent & Effluent Characteristics			X	X
4.10.5	Emergency Alarms		X	X	X
4.10.6	Maintenance		X	X	X
4.10.6.1	Quartz Sleeve Cleaning		X	X	X
4.10.6.2	Lamp Maintenance		X	X	X
4.10.7	Troubleshooting		X	X	X
4.10.7.1	System Hydraulics			X	X
4.10.7.2	Biofilms on UV Channel Walls & Equipment		X	X	X

SECTION	TOPIC	D	C	B	A
4.10.7.3	Particles Shielding Bacteria			X	X
4.11	OZONE SYSTEMS		X	X	X
4.11.1	Equipment		X	X	X
4.11.2	Gas Preparation			X	X
4.11.3	Electrical Supply Unit			X	X
4.11.4	Ozone Generator			X	X
4.11.5	Ozone Contactor			X	X
4.11.6	Ozone Residuals		X	X	X
4.11.7	Safety		X	X	X
4.11.8	Maintenance		X	X	X
4.11.9	Applications of Ozone		X	X	X
4.11.10	Advantages & Limitations of Ozone		X	X	X
4.12	MIXED OXIDANTS (MIOX) SYSTEMS		X	X	X
4.13	TYPICAL CHLORINATION MATH PROBLEMS	X	X	X	X
4.13.1	Chlorinators	X	X	X	X
4.13.2	Hypochlorinators	X	X	X	X
4.14	MATH ASSIGNMENT	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
5	**KEY WORDS: SAFETY**				
5.1	SAFETY PROGRAM	X	X	X	X
5.1.1	Tailgate Safety Sessions	X	X	X	X
5.1.1.1	Tailgate Safety Sample Script		X	X	X
5.1.2	Employee Right-To-Know Laws	X	X	X	X
5.2	VEHICLE SAFETY	X	X	X	X
5.2.1	Towing A Trailer	X	X	X	X
5.2.2	How to Charge a Battery	X	X	X	X
5.2.3	Boat Safety		X	X	X
5.3	PERSONAL SAFETY	X	X	X	X
5.3.1	Monitoring Equipment	X	X	X	X
5.3.2	Personal Protective Equipment	X	X	X	X
5.3.3	Slips & Falls	X	X	X	X
5.3.4	Handling & Lifting	X	X	X	X
5.3.5	Electrical Safety	X	X	X	X
5.3.6	Corrosive Chemicals	X	X	X	X
5.4	SAFTY AROUND WELLS	X	X	X	X
5.4.1	Location of Well Site	X	X	X	X
5.4.2	New Wells		X	X	X
5.4.3	Sanitary Seal	X	X	X	X
5.4.4	Surface Portion of Well	X	X	X	X
5.4.5	Tank Coatings	X	X	X	X
5.4.6	Well Chemicals		X	X	X
5.4.7	Working Around Electrical Units	X	X	X	X
5.4.8	Abandoning & Plugging Wells		X	X	X
5.4.9	Safety Inspection	X	X	X	X
5.5	PUMP SAFTY	X	X	X	X
5.5.1	Guards Over Moving Parts	X	X	X	X
5.5.2	Maintenance & Repair	X	X	X	X
5.5.3	Lockout Tagout Procedure	X	X	X	X
5.5.4	Storage of Lubricants & Fuel	X	X	X	X
5.6	WORKING IN STREETS	X	X	X	X
5.6.1	Fundamental Principles	X	X	X	X

SECTION	TOPIC	D	C	B	A
5.6.2	Definitions	X	X	X	X
5.6.3	Major Temporary Traffic Control Considerations	X	X	X	X
5.6.4	Individuals Qualified to Control Traffic ·	X	X	X	X
5.6.5	Permission to Work Within the Right-of Way of Streets or Highways	X	X	X	X
5.6.6	General Responsibilities	X	X	X	X
5.6.7	Regulations Concerning Street or Highway Work		X	X	X
5.6.8	Temporary Traffic Control Zones	X	X	X	X
5.6.8.1	Tapers		X	X	X
5.6.9	Pedestrian Safety	X	X	X	X
5.6.10	Worker Safety	X	X	X	X
5.6.10.1	Speed Limit in Work Zones	X	X	X	X
5.6.10.2	Flagger Control	X	X	X	X
5.6.11	Using Temporary Traffic Control Zone Devices	X	X	X	X
5.6.12	Excavations in Streets ·		X	X	X
5.6.12.1	Trenches	X	X	X	X
5.6.12.2	Cave-Ins	X	X	X	X
5.6.12.3	Ladders	X	X	X	X
5.6.12.4	Locate Underground Utilities Before You Dig	X	X	X	X
5.7	SAFTETY AROUND WATER STORAGE FACILITIES	X	X	X	X
5.7.1	Slips & Falls	X	X	X	X
5.7.2	Ladders	X	X	X	X
5.7.3	Application of Coatings	X	X	X	X
5.7.4	Confined Spaces	X	X	X	X
5.8	Working Near Noise	X	X	X	X
5.9	Safety Inspections	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
6	**KEY WORDS: LABORATORY PROCEEDURES**				
6.1	BASIC LABORATORY CONCEPTS	X	X	X	X
6.1.1	Laboratory Units - The Metric System		X	X	X
6.1.2	Chemical Names & Formulas	X	X	X	X
6.2	LABORATORY EQUIPMENT & TECHNIQUES			X	X
6.2.1	Water Laboratory Equipment			X	X
6.2.2	Using Laboratory Glassware			X	X
6.2.2.1	Reading Volumes			X	X
6.2.2.2	Using Pipets		X	X	X
6.2.3	Chemical Solutions		X	X	X
6.2.3.1	Mass Concentration			X	X
6.2.3.2	Molar Concentration			X	X
6.2.3.3	Normality			X	X
6.2.4	Data Recording & Recordkeeping	X	X	X	X
6.2.5	Laboratory Quality Control		X	X	X
6.3	LABORATORY SAFETY	X	X	X	X
6.3.1	Laboratory Hazards			X	X
6.3.2	Personal Safety & Hygiene			X	X
6.3.3	Preventing Laboratory Accidents			X	X
6.3.3.1	Chemical Storage			X	X
6.3.3.2	Moving Chemicals			X	X
6.3.3.3	Proper Laboratory Techniques			X	X
6.3.3.4	Accident Prevention			X	X
6.4	WATER QUALITY TESTS	X	X	X	X

SMALL WATER SYSTEM OPERATION MAINTENANCE

SECTION	TOPIC	D	C	B	A
6.4.1	Instrument-Based Tests	X	X	X	X
6,4.1.1	Temperature	X	X	X	X
6.4.1.2	pH	X	X	X	X
6.4.1.3	Turbidity	X	X	X	X
6.4.2	Titration-Based Tests			X	X
6.4.2.1	Alkalinity			X	X
6.4.2.2	Hardness			X	X
6.4.2.3	Chlorine Residual Curve			X	X
6.4.3	Tests for Plant Processes			X	X
6.4.3.1	Jar Test for Coagulation/Flocculation			X	X
6.4.3.2	Chlorine Demand			X	X
6.4.4	Biological Tests			X	X
6.4.4.1	Test Methods Overview			X	X
6.4.4.2	What is Tested	X	X	X	X
6.4.4.3	General Materials Required for Microbial Testing			X	X
6.4.4.4	Procedures for Testing Total Coliform Bacteria			X	X
6.4.4.5	Additional Test Methods			X	X
6.5	SAMPLING	X	X	X	X
6.5.1	Representative Sampling	X	X	X	X
6.5.1.1	Source Water Sampling	X	X	X	X
6.5.1.2	In-Plant Sampling		X	X	X
6.5.1.3	Distribution System Sampling	X	X	X	X
6.5.2	Types of Samples	X	X	X	X
6.5.2.1	Grab Samples	X	X	X	X
6.5.2.2	Composite Samples	X	X	X	X
6.5.3	Sampling Devices			X	X
6.5.4	Sampling Techniques	X	X	X	X
6.5.4.1	Surface Sampling	X	X	X	X
6.5.4.2	Depth Sampling	X	X	X	X
6.5.4.3	Water Tap Sampling	X	X	X	X
6.5.4.4	First Draw Sampling	X	X	X	X
6.5.5	Sampling Containers & Preservation of Samples	X	X	X	X
6.5.5.1	Chain-of-Custody Samples			X	X
6.5.6	Reporting			X	X
6.6	MATH ASSIGNMENT	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
7	**KEY WORDS: INTRODUCTION TO SMALL SYSTEM MANAGMENT**				
7.1	DEVELOPING WATER RATES			X	X
7.1.1	General Action Strategy			X	X
7.1.2	Developing a Hypothetical Water District			X	X
7.2	REVENUE REQUIREMENTS			X	X
7.2.1	Forecasting Expenditures			X	X
7.2.1.1	Declining Demand for Water			X	X
7.2.1.2	System Growth Rate			X	X
7.2.1.3	Inflation			X	X
7.2.1.4	Capital Improvement Plan			X	X
7.2.1.5	Financial Assistance			X	X
7.2.2	Itemizing System Expenses			X	X
7.2.3	Establishing the Revenue Base			X	X
7.3	COST ALLOCATION METHODS			X	X

SMALL WATER SYSTEM OPERATION MAINTENANCE

SECTION	TOPIC	D	C	B	A
7.3.1	Commodity-Demand Method			X	X
7.3.2	Base-Extra Capacity Method			X	X
7.3.3	Examples of Cost Allocations			X	X
7.4	DISTRIBUTING COSTS TO CUSTOMERS			X	X
7.5	RATE DESIGN			X	X
7.5.1	Information & Data Requirements			X	X
7.5.2	Rate Components			X	X
7.5.3	Typical Rate Structure			X	X
7.6	ADMINISTRATION OF RATES & CHARGES			X	X
7.6.1	Consumer Confidence Reports	X	X	X	X
7.7	PLANNING FOR FINANCIAL STABILITY			X	X
7.7.1	Measuring Stability			X	X
7.7.2	Budgeting	X	X	X	X
7.7.3	Recordkeeping	X	X	X	X
7.7.3.1	Computer Recordkeeping Systems			X	X
7.7.3.2	Types of Records			X	X
7.7.3.3	Disposition of Utility Records			X	X
7.4.4	Check-Up Program for Small Systems			X	X
7.8	EMERGENCY RESPONSE	X	X	X	X
7.8.1	Federal Requirements			X	X
7.8.2	Responding to Emergency Situations	X	X	X	X
7.8.3	Homeland Defense			X	X
7.8.3.1	Guarding Against Unplanned Physical Intrusion	X	X	X	X
7.8.3.2	Making Security a Priority for Employees	X	X	X	X
7.8.3.3	Coordination Actions for Effective Emergency Response			X	X
7.8.3.4	Investing In Security & Infrastructure Improvements			X	X
7.8.4	Managing Contamination Threats	X	X	X	X
7.8.4.1	Evaluating & Responding to Threats			X	X
7.8.4.2	*Cryptosporidium*	X	X	X	X
CHAPTER REVIEW	REVIEW ALL QUESTIONS	ALL	ALL	ALL	ALL
	APPENDIX A: INTRODUCTION TO BASIC MATH FOR OPERATORS				
	INTRODUCTION	X	X	X	X
	BASIC CONCEPTS (SECTIONS A 1 - A.4)	X	X	X	X
A.1	NUMBERS & OPERATIONS	X	X	X	X
A.1.1	Addition	X	X	X	X
A.1.2	Subtraction	X	X	X	X
A.1.3	Multiplication	X	X	X	X
A.1.4	Division	X	X	X	X
A.2	ORDER OF OPERATIONS	X	X	X	X
A.2.1	More on Exponents		X	X	X
A.3	BASIC ALGEBRA (SOLVING EQUATIONS)	X	X	X	X
A.4	PERCENTAGES	X	X	X	X
	INTERMIDIATE CONCEPTS (SECTIONS A.5 - A.6)	X	X	X	X
A.5	UNITS	X	X	X	X
A.5.1	Distance of Length	X	X	X	X
A.5.2	Area		X	X	X
A.5.2.1	Surface Area of a Rectangle	X	X	X	X
A.5.2.2	Surface Area of a Triangle			X	X
A.5.2.3	Surface Area of a Trapezoid			X	X
A.5.2.4	Surface Area of a Circle	X	X	X	X

SECTION	TOPIC	D	C	B	A
A.5.2.5	Surface Area of a Cylinder	X	X	X	X
A.5.2.6	Surface Area of a Cone			X	X
A.5.2.7	Surface Area of a Sphere			X	X
A.5.3	Volume	X	X	X	X
A.5.3.1	Cube			X	X
A.5.3.2	Rectangular Prism			X	X
A.5.3.3	Triangular Prism			X	X
A.5.3.4	Cylinder			X	X
A.5.3.5	Cone			X	X
A.5.3.6	Sphere			X	X
A.5.4	Mass & Weight	X	X	X	X
A.5.5	Density Specific Weight, and Specific Gravity	X	X	X	X
A.5.6	Concentration	X	X	X	X
A.5.7	Velocity & Flow Rate			X	X
A.5.8	Force & Pressure			X	X
A.5.9	Work, Head, & Power			X	X
A.6	METRIC SYSTEM			X	X
A.6.1	SI Base Units	X	X	X	X
A.6.2	Measure of Length	X	X	X	X
A.6.3	Measure of Capacity or Volume	X	X	X	X
A.6.4	Measure of Weight	X	X	X	X
A.6.5	Temperature	X	X	X	X
	ADVANCED CONCEPTS (SECTIONS A.7 - A.8)				
A.7	PUMPS			X	X
A.7.1	Pressure			X	X
A.7.2	Work			X	X
A.7.3	Power			X	X
A.7.4	Horsepower			X	X
A.7.5	Head			X	X
A.7.6	Pump Characteristics			X	X
A.7.7	Evaluation of Pump Performance			X	X
A.7.7.1	Capacity			X	X
A.7.7.2	Efficiency			X	X
A.7.8	Pump Speed-Performance Relationships			X	X
A.7.9	Friction or Energy Losses			X	X
A.8	ANALYSIS & PRESENTATION OF DATA			X	X
A.8.1	Causes of Variations in Results			X	X
A.8.1.1	Water or Material Being Examined			X	X
A.8.1.2	Sampling	X	X	X	X
A.8.1.3	Testing	X	X	X	X
A.8.2	Controlling Variation			X	X
A.8.2.1	Reading Charts	X	X	X	X
A.8.3	Describing Data or Results			X	X
A.8.3.1	Graphs & Charts	X	X	X	X
A.8.3.2	Numerical Representation of Data	X	X	X	X
A.8.4	Moving Averages			X	X
A.8.5	More Applications of Graphs			X	X
A.8.5.1	Volume of Sludge in a Digester			X	X
A.8.5.2	Tracking BOD Loading			X	X
A.8.6	Regression Analysis (Prediction Equations, Trends, & Correlations)			X	X
A.8.6.1	Correlations			X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
12.	**WORDS: IRON AND MANGANESE CONTROL**	X	X	X
12.0	NEED TO CONTROL IRON AND MANGANESE	X	X	X
12.10	Occurrence Of Iron And Manganese	X	X	X
12.11	Collection Of Iron And Manganese Samples	X	X	X
12.12	Analysis For Iron And Manganese	X	X	X
12.2	REMEDIAL ACTION	X	X	X
12.20	Alternate Source	X	X	X
12.21	Phosphate Treatment	X	X	X
12.22	Removal By Ion Exchange	X	X	X
12.23	Oxidation By Aeration	X	X	X
12.24	Oxidation With Chlorine	X	X	X
12.25	Oxidation With Permanganate	X	X	X
12.26	Operation Of Filters	X	X	X
12.27	Proprietary Processes	X	X	X
12.28	Monitoring Of Treated Water	X	X	X
12.29	Summary	X	X	X
12.3	OPERATION OF AN IRON MANGANESE REMOVAL PLANT	X	X	X
12.30	Description Of Equipment And Process	X	X	X
12.31	Regeneration Of Manganese Greensand	X	X	X
12.32	Troubleshooting	X	X	X
12.4	MAINTENANCE OF A CHEMICAL FEEDER	X	X	X
12.5	TROUBLESHOOTING RED WATER PROBLEMS	X	X	X
13.	**WORDS: FLUORIDATION**		X	X
13.0	IMPORTANCE OF FLUORIDATION	X	X	X
13.1	FLUORIDATION PROGRAMS		X	X
13.2	COMPOUNDS USED TO FURNISH FLUORIDE ION		X	X
13.3	FLUORIDATION SYSTEMS		X	X
13.30	Chemical Feeders		X	X
13.31	Saturators		X	X
13.32	Downflow Saturators		X	X
13.33	Upflow Saturators		X	X
13.34	Large Hydrofluosilicic Acid Systems		X	X
13.40	Avoid Overfeeding		X	X
13.41	Review Of Designs And Specifications		X	X
13.5	CHEMICAL FEEDER START-UP		X	X
13.60	Fine Tuning		X	X
13.61	Preparation Of Fluoride Solution		X	X
13.62	Fluoridation Log Sheets		X	X
13.620	Hydrofluosilicic Acid		X	X
13.621	Sodium Silicofluoride		X	X
13.63	Equipment Check Procedures		X	X
13.7	PREVENTION OF OVERFEEDING		X	X
13.8	UNDERFEEDING		X	X
13.9	SHUTTING DOWN CHEMICAL SYSTEMS		X	X
13.10	MAINTENANCE		X	X
13.11	SAFETY IN HANDLING FLUORIDE COMPOUNDS		X	X
13.110	Avoid Overexposure		X	X
13.111	Symptoms Of Fluoride Poisoning		X	X
13.112	Basic First Aid		X	X
13.113	Protecting Yourself And Your Family		X	X
13.114	Training		X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
13.12	CALCULATING FLUORIDE DOSAGES		X	X
14.	**WORDS: SOFTENING**		X	X
14.0	WHAT MAKES WATER HARD?	X	X	X
14.1	WHY SOFTEN WATER?	X	X	X
14.2	CHEMISTRY OF SOFTENING		X	X
14.20	Hardness		X	X
14.21	pH		X	X
14.22	Alkalinity		X	X
14.30	Basic Methods of Softening		X	X
14.31	Chemical Reactions	X	X	X
14.310	Lime			X
14.311	Removal of Carbon Dioxide			X
14.312	Removal of Carbonate Hardness			X
14.313	Removal of Noncarbonate Hardness			X
14.314	Stability			X
14.315	Caustic Soda Softening			X
14.316	Calculation of Chemical Dosages			X
14.32	Lime Softening		X	X
14.33	Split Lime Treatment		X	X
14.34	Lime-Soda Ash Softening		X	X
14.35	Caustic Soda Softening		X	X
14.36	Handling, Application, and Storage of Lime		X	X
14.4	INTERACTIONS WITH COAGULANTS		X	X
14.5	STABILITY		X	X
14.6	SAFETY		X	X
14.7	SLUDGE RECIRCULATION AND DISPOSAL		X	X
14.8	RECORDS		X	X
14.9	JAR TESTS			X
14.90	Typical Procedures			X
14.91	Examples			X
14.92	Calculation of Chemical Feeder Settings			X
14.10	DESCRIPTION OF ION EXCHANGE SOFTENING PROCESS	X	X	X
14.11	OPERATIONS	X	X	X
14.110	Service	X	X	X
14.111	Backwash	X	X	X
14.112	Brine	X	X	X
14.113	Rinse	X	X	X
14.12	CONTROL TESTING OF ION EXCHANGE SOFTENERS	X	X	X
14.13	LIMITATIONS CAUSED BY IRON AND MANGANESE	X	X	X
14.14	DISPOSAL OF SPENT BRINE	X	X	X
14.15	MAINTENANCE	X	X	X
14.160	Test Units	X	X	X
14.161	Service Stage	X	X	X
14.162	Backwash Stage	X	X	X
14.163	Brine Injection Stage	X	X	X
14.164	Rinse Stage	X	X	X
14.17	START-UP AND SHUTDOWN OF UNIT	X	X	X
14.18	ION EXCHANGE ARITHMETIC	X	X	X
14.19	BLENDING	X	X	X
14.20	RECORDKEEPI NG	X	X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
15.	**WORDS: TRIHALOMETHANES**	X	X	X
15.0	THE TRIHALOMETHANES (THM) PROBLEM	X	X	X
15.1	FEASIBILITY ANALYSIS PROCESS	X	X	X
15.2	PROBLEM DEFINITION	X	X	X
15.20	Sampling	X	X	X
15.21	THM Calculations	X	X	X
15.22	Chemistry of THM Formation	X	X	X
15.3	CONTROL STRATEGIES	X	X	X
15.4	EXISTING TREATMENT PROCESSES	X	X	X
15.50	Consider Options	X	X	X
15.51	Remove THM's After They Are Formed	X	X	X
15.52	Remove THM Precursors	X	X	X
15.53	Alternative Disinfectants	X	X	X
15.6	SELECTION & IMPLEMENTATION OF A COST-EFFECTIVE ALTERNATIVE	X	X	X
15.7	REGULATORY UPDATE	X	X	X
15.8	SUMMARY AND CONCLUSIONS	X	X	X
15.100	Why Are We Concerned About Arsenic?	X	X	X
15.101	What Are the Sources of Arsenic?	X	X	X
15.102	Chemistry of Arsenic		X	X
15.110	New Source Alternative to Treatment		X	X
15.111	Summary of Arsenic Treatment Options	X	X	X
15.112	Engineered Blending		X	X
15.113	Ion Exchange (IX)		X	X
15.114	Active Alumina (AA)			X
15.115	Oxidation-Filtration & Iron Based Adsorption			X
15.116	Point of Use (POU) & Point of Entry (POE) Devices		X	X
15.117	Proprietary Media		X	X
15.12	TYPICAL ARSENIC TREATMENT PLANT	X	X	X
15.120	Plant Start-Up & Shutdown		X	X
15.121	Operation		X	X
15.122	Maintenance		X	X
15.123	Troubleshooting			X
15.124	Safety & Security Issues	X	X	X
15.125	Review of Plans & Specifications			X
15.13	WASTEWATER AND RESIDUALS		X	X
15.140	MONITORING - Analysis of Arsenic	X	X	X
15.141	Types of Arsenic Sampling/Monitoring		X	X
15.142	Monitoring for Compliance		X	X
15.143	Monitoring for Process Control		X	X
15.15	RECORDKEEPING AND REPORTING		X	X
15.150	Records	X	X	X
15.151	Reporting		X	X
16.	**WORDS: DEMINERALIZATION**		X	X
16.0	MEMBRANE TREATMENT TECHNOLOGIES		X	X
16.10	Pressure Units or Submerged Flow		X	X
16.11	Membrane Flow Types		X	X
16.12	Membrane Fouling		X	X
16.130	Pretreatment - Operation Experience		X	X
16.131	Summary of Experiences		X	X
16.132	Need for Bench- or Pilot-Scale Studies		X	X
16.20	0 & M - SCADA System		X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
16.21	Components of a Typical Plant		X	X
16.22	Operational Procedures		X	X
16.23	Membrane Performance Monitoring		X	X
16.24	Troubleshooting Equipment & Process Failures		X	X
16.30	Records		X	X
16.31	Summary of Records		X	X
16.310	Water Quality Monitoring Records		X	X
16.311	Plant Operation & Water Production		X	X
16.312	Troubleshooting Records		X	X
16.313	Membrane Filter Maintenance & Inspection		X	X
16.40	Types of Maintenance		X	X
16.41	Routine Maintenance		X	X
16.42	Preventive Maintenance		X	X
16.43	Breakdown or Corrective Maintenance		X	X
16.5	SOURCES OF MINERALIZED WATER		X	X
16.6	DEMINERALIZING PROCESS		X	X
16.70	What is Reverse Osmosis?		X	X
16.71	Reverse Osmosis Membrane Structure and Composition		X	X
16.72	Membrane Performance and Properties		X	X
16.73	Definition of Flux		X	X
16.74	Mineral Rejection		X	X
16.75	Effects of Feedwater Temperature and pH on Membrane Performance		X	X
16.76	Recovery		X	X
16.8	COMPONENTS OF A REVERSE OSMOSIS UNIT		X	X
16.80	Pressurization Pump			X
16.81	Piping			X
16.82	Pressure Vessel Housings			X
16.83	Concentrate Control Valve			X
16.84	Sample Valves			X
16.85	Flush Connections			X
16.86	Cleaning Connections			X
16.87	Permeate Rinse			X
16.88	Permeate Drawback Tank			X
16.89	Energy Recovery Devices			X
16.810	Membranes			X
16.90	Pretreatment		X	X
16.91	Removal of Turbidity and Suspended Solids		X	X
16.92	pH and Temperature Control		X	X
16.93	Other Potential Sealants		X	X
16.94	Microbiological Organisms		X	X
16.95	RO Plant Operation		X	X
16.96	Typical RO Plant Operations Checklist		X	X
16.97	Membrane Cleaning		X	X
16.98	Safety			
16.980	Use of Proper Procedures		X	X
16.981	Chemical Safety		X	X
16.982	Hydraulic Safety		X	X
16.983	Electrical Safety		X	X
16.10	ELECTRODIALYSIS			X
16.110	PRINCIPLES OF ELECTRODIALYSIS - Anions and Cations in Water			X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
16.111	Effect of Direct Current (D.C.) Potential on Ions			X
16.112	Anion- and Cation-Permeable Membranes and Three-Cell Unit			X
16.113	Multi-Compartment Unit			X
16.120	PARTS OF AN ELECTRODIALYSIS UNIT - Flow Diagram			X
16.121	Pretreatment			X
16.122	Pumping Equipment and Piping			X
16.123	D.C. Power Supply			X
16.124	Membrane Stack			X
16.125	Chemical Flush System			X
16.13	ROUTINE OPERATING PROCEDURES			X
16.130	Design Specifications for Feedwater			X
16.131	Detailed Operating Procedures			X
16.14	SAFETY PRECAUTIONS			X
17.	**WORDS: HANDLING AND DISPOSAL OF PROCESS WASTES**		X	X
17.0	NEED FOR HANDLING AND DISPOSAL OF PROCESS WASTES		X	X
17.1	SOURCES OF TREATMENT PROCESS WASTES		X	X
17.2	PROCESS SLUDGE VOLUMES		X	X
17.3	METHODS OF HANDLING AND DISPOSING OF PROCESS WASTES		X	X
17.4	DRAINING AND CLEANING TANKS		X	X
17.5	BACKWASH RECOVERY PONDS (SOLAR LAGOONS)		X	X
17.6	SLUDGE DEWATERING PROCESSES			
17.60	SLUDGE DEWATERING PROCESS - Solar Drying Lagoons		X	X
17.61	Sand Drying Beds		X	X
17.62	Belt Filter Presses		X	X
17.63	Centrifuges		X	X
17.64	Filter Presses		X	X
17.65	Vacuum Filters		X	X
17.7	DISCHARGE INTO COLLECTION SYSTEMS (SEWERS)		X	X
17.8	DISPOSAL OF SLUDGE		X	X
17.9	EQUIPMENT			
17.90	Vacuum Trucks		X	X
17.91	Sludge Pumps		X	X
17.10	PLANT DRAINAGE WATERS		X	X
17.11	MONITORING AND REPORTING		X	X
18.	**WORDS: MAINTENANCE**		X	X
18.0	TREATMENT PLANT MAINTENANCE - GENERAL PROGRAM	X	X	X
18.00	Preventive Maintenance Records	X	X	X
18.01	Library of Manufacturers' Operation and Parts Manuals	X	X	X
18.02	Emergencies	X	X	X
18.03	Lockout/Tagout Procedures	X	X	X
18.10	Beware of Electricity	X	X	X
18.100	Recognize Your Limitations	X	X	X
18.11	Understanding Electricity	X	X	X
18.110	Volts	X	X	X
18.111	Direct Current (D.C.)	X	X	X
18.112	Alternating Current (AC.)	X	X	X
18.113	Amps	X	X	X
18.114	Watts	X	X	X
18.115	Power Requirements	X	X	X

SECTION	TOPIC	C	B	A
18.116	Conductors and Insulators	X	X	X
18.120	Tools, Meters and Testers		X	X
18.121	Voltage Testing		X	X
18.122	Ammeter		X	X
18.123	Megger		X	X
18.130	Ohmmeters	X	X	X
18.131	Fuses	X	X	X
18.132	Circuit Breakers	X	X	X
18.133	Overload Relays	X	X	X
18.134	Motor Starters	X	X	X
18.140	Classifications	X	X	X
18.141	Troubleshooting	X	X	X
18.142	Record Keeping	X	X	X
18.150	Safety First	X	X	X
18.151	Standby Power Generation	X	X	X
18.152	Emergency Lighting	X	X	X
18.153	Batteries	X	X	X
18.160	Transmission	X	X	X
18.161	Switch Gear		X	X
18.162	Power Distribution Transformers		X	X
18.17	Electrical Safety Checklist	X	X	X
18.20	Repair Shop		X	X
18.21	Pumps		X	X
18.210	Centrifugal Pumps		X	X
18.211	Let's Build a Pump		X	X
18.212	Vertical Centrifugal Pumps		X	X
18.213	Horizontal Centrifugal Pumps		X	X
18.214	Reciprocating or Piston Pumps		X	X
18.215	Progressive Cavity (Screw-Flow) Pumps		X	X
18.216	Chemical Metering Pumps		X	X
18.220	Purpose of Lubrication	X	X	X
18.221	Properties of Lubrication		X	X
18.222	Lubrication Schedule		X	X
18.223	Precautions		X	X
18.224	Pump Lubrication		X	X
18.225	Equipment Lubrication		X	X
18.230	Section Format		X	X
18.231	Preventative Maintenance		X	X
1.	Pumps, General		X	X
2.	Reciprocating Pumps, General		X	X
3.	Propeller Pumps, General		X	X
4.	Progressive Cavity Pumps, General		X	X
5.	Pump Controls		X	X
6.	Electric Motors		X	X
7.	Belt Drives		X	X
8.	Chain Drives		X	X
9.	Variable Speed Belt Drives		X	X
10.	Couplings		X	X
11.	Shear Pins		X	X
18.240	Starting a New Pump		X	X
18.241	Pump Shutdown		X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
18.241	Pump Shutdown		X	X
18.242	Pump-Driving Equipment		X	X
18.243	Electrical Controls		X	X
18.244	Operating Troubles		X	X
18.245	Starting and Stopping Pumps		X	X
18.2450	Centrifugal Pumps		X	X
18.2451	Positive Displacement Pumps		X	X
18.25	Compressors	X	X	X
18.260	Uses of Valves	X	X	X
18.261	Gate Valves	X	X	X
18.262	Maintenance of Gate Valves	X	X	X
12.	Gate Valves	X	X	X
18.263	Globe Valves	X	X	X
18.264	Eccentric Valves	X	X	X
18.265	Butterfly Valves	X	X	X
18.266	Check Valves	X	X	X
18.267	Maintenance of Check Valves	X	X	X
13.	Check Valves	X	X	X
18.268	Automatic Valves	X	X	X
18.30	Gasoline Engines	X	X	X
18.300	Need to Maintain Gasoline Engines	X	X	X
18.301	Maintenance	X	X	X
18.302	Starting Problems	X	X	X
18.303	Running Problems	X	X	X
18.304	How to Start a Gasoline Engine	X	X	X
18.3040	Small Engines	X	X	X
18.3041	Large Engines	X	X	X
18.310	How Diesel Engines Work.	X	X	X
18.311	Operation		X	X
18.312	Fuel System		X	X
18.313	Water-Cooled Diesel Engines		X	X
18.314	Air-Cooled Diesel Engines		X	X
18.315	How to Start Diesel Engines		X	X
18.316	Maintenance and Troubleshooting		X	X
18.32	Cooling Systems		X	X
18.330	Code Requirements	X	X	X
18.331	Diesel	X	X	X
18.332	Gasoline	X	X	X
18.333	Liquid Petroleum Gas (LPG)	X	X	X
18.334	Natural Gas	X	X	X
18.34	Standby Engines	X	X	X
18.40	Chemical Storage	X	X	X
18.41	Drainage from Chemical Storage and Feeders	X	X	X
18.42	Use of Feeder Manufacturer's Manual	X	X	X
18.43	Solid Feeders	X	X	X
18.44	Liquid Feeders	X	X	X
18.45	Gas Feeders	X	X	X
18.46	Calibration of Chemical Feeders	X	X	X
18.460	Large-Volume Metering Pumps	X	X	X
18.461	Small-Volume Metering Pumps	X	X	X
18.462	Dry Chemical Systems	X	X	X
18.47	Chlorinators	X	X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
18.50	Scheduling Inspections	X	X	X
18.51	Steel Tanks	X	X	X
18.52	Cathodic Protection		X	X
18.53	Concrete Tanks		X	X
18.6	BUILDING MAINTENANCE	X	X	X
19.	**WORDS: INSTRUMENTATION**		X	X
19.00	Importance & Nature of Instrumentation & Control Systems		X	X
19.01	Importance to Water Treatment Operator		X	X
19.02	Nature of the Measurement Process		X	X
19.03	Explanation of Control Systems		X	X
19.030	Modulating Control Systems		X	X
19.031	Motor Control Stations		X	X
19.10	General Precautions		X	X
19.11	Electrical Hazards		X	X
19.12	Mechanical & Pneumatic Hazards		X	X
19.13	Confined Spaces		X	X
19.14	Oxygen Deficiency or Enrichment		X	X
19.15	Explosive Gas Mixtures		X	X
19.16	Falls & Associated Hazards		X	X
19.20	General Principles of Sensors		X	X
19.21	Pressure Measurements		X	X
19.22	Level Measurements		X	X
19.23	Flow (Rate of Flow and Total Flow)		X	X
19.24	Chemical Feed Rate		X	X
19.25	Process Instrumentation		X	X
19.26	Signal Transmitters/Transducers		X	X
19.30	Primary Elements		X	X
19.31	Panel Instruments		X	X
19.310	Indicators		X	X
19.311	Recorders		X	X
19.312	Totalizers		X	X
19.313	Alarms		X	X
19.32	Automatic Controller		X	X
19.33	Pump Controllers		X	X
19.34	Air Supply Systems		X	X
19.35	Laboratory Instruments		X	X
19.36	Test and Calibration Equipment		X	X
19.370	Computer Control Systems		X	X
19.371	Typical Computer Control System Functions		X	X
19.40	Proper Care of Instruments		X	X
19.41	Indications of Proper Function		X	X
19.42	Start-up/Shutdown Considerations		X	X
19.43	Preventive Maintenance		X	X
19.44	Operational Checks		X	X
20.	**WORDS: SAFETY**		X	X
20.00	What is Safety?		X	X
20.01	Causes of Accidents		X	X
20.02	Steps to Avoid Accidents		X	X
20.10	Safe Handling of Chemicals		X	X
20.11	Acids		X	X
20.110	Acetic Acid (Glacial)			X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
20.111	Hydrofluorosilicic Acid		X	X
20.112	Hydrogen Fluoride			X
20.113	Hydrochloric Acid			X
20.114	Nitric Acid			X
20.115	Sulfuric Acid			X
20.12	Bases		X	X
20.120	Ammonia	X	X	X
20.121	Calcium Hydroxide			X
20.122	Sodium Hydroxide (Caustic Soda)	X	X	X
20.123	Sodium Silicate			X
20.124	Hypochlorite	X	X	X
20.125	Sodium Carbonate			X
20.13	Gases		X	X
20.130	Chlorine	X	X	X
20.131	Carbon Dioxide			X
20.132	Sulfur Dioxide			X
20.14	Salts	X	X	X
20.145	Fluoride Compounds	X	X	X
20.150	Potassium Permanganate	X	X	X
20.151	Powdered Activated Carbon		X	X
20.152	Other Powders		X	X
20.17	Chemical Storage Drains		X	X
20.20	Fire Prevention	X	X	X
20.21	Classification of Fires and Extinguishers	X	X	X
20.22	Fire Extinguisher Operation and Maintenance	X	X	X
20.23	Fire Hoses	X	X	X
20.24	Storage of Flammables	X	X	X
20.25	Exits	X	X	X
20.30	Maintenance Hazards	X	X	X
20.31	Cleaning	X	X	X
20.32	Painting	X	X	X
20.33	Cranes	X	X	X
20.34	Confined Spaces	X	X	X
20.35	Manholes	X	X	X
20.36	Power Tools	X	X	X
20.37	Welding	X	X	X
20.38	Safety Valves	X	X	X
20.40	Types of Vehicles	X	X	X
20.41	Maintenance	X	X	X
20.42	Seat Belts	X	X	X
20.43	Accident Prevention	X	X	X
20.44	Forklifts	X	X	X
20.50	Electrical Safety	X	X	X
20.51	Current - Voltage	X	X	X
20.52	Transformers	X	X	X
20.53	Electric Starters	X	X	X
20.54	Electric Motors	X	X	X
20.55	Instrumentation	X	X	X
20.56	Control Panels	X	X	X
20.57	Lockout/Tagout Procedure	X	X	X
20.6	LABORATORY SAFETY			
20.60	Laboratory Hazards		X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
20.61	Glassware		X	X
20.62	Chemicals		X	X
20.63	Biological Considerations		X	X
20.64	Radioactivity		X	X
20.65	Laboratory Equipment		X	X
20.650	Hot Plates		X	X
20.651	Water Stills		X	X
20.652	Sterilizers		X	X
20.653	Pipet Washers		X	X
20.70	Operator Safety	X	X	X
20.71	Respiratory Protection		X	X
20.72	Safety Equipment		X	X
20.73	Eye Protection		X	X
20.74	Foot Protection		X	X
20.75	Hand Protection		X	X
20.76	Head Protection		X	X
20.77	Water Safety		X	X
20.8	PREPARATION FOR EMERGENCIES	X	X	X
21	**ADVANCED LABORATORY PROCEDURES**			X
21.0	USE OF A SPECTROPHOTOMETER		X	X
21.1	TEST PROCEDURES		X	X
2.	Calcium		X	X
3.	Chloride		X	X
4.	Color			X
5.	Dissolved Oxygen			X
6.	Fluoride		X	X
7.	Iron (Total)		X	X
8.	Manganese		X	X
9.	Marble Test (Calcium Carbonate Saturation Test)			X
10.	Metals		X	X
11.	Nitrate		X	X
12.	pH	X	X	X
13.	Specific Conductance (Conductivity)		X	X
14.	Sulfate			X
15.	Taste and Odor		X	X
16.	Trihalomethanes	X	X	X
17.	Total Dissolved Solids		X	X
22.	**WORDS: DRINKING WATER REGULATIONS**		X	X
22.0	HISTORY OF DRINKING WATER LAWS AND STANDARDS	X	X	X
22.1	HOW EPA DEVELOPS DRINKING WATER STANDARDS	X	X	X
22.10	Types of Contaminants	X	X	X
22.11	Identifying Contaminants To Be Regulated	X	X	X
22.12	Unregulated Contaminants	X	X	X
22.14	Setting Standards	X	X	X
22.15	Types of Water Systems	X	X	X
22.2	PRIMARY DRINKING WATER STANDARDS	X	X	X
22.20	Inorganic Chemical Standards		X	X
22.200	Antimony		X	X
22.201	Arsenic		X	X
22.202	Asbestos		X	X
22.203	Barium		X	X

SECTION	TOPIC	C	B	A
22.204	Beryllium		X	X
22.206	Cadmium		X	X
22.208	Chromium		X	X
22.209	Copper		X	X
22.2010	Cyanide		X	X
22.2011	Fluoride		X	X
22.2012	Lead and Copper		X	X
22.2013	Mercury		X	X
22.2014	Nitrate		X	X
22.2015	Nitrite		X	X
22.2016	Selenium		X	X
22.2017	Thallium		X	X
22.21	Organic Chemical Standards		X	X
22.210	Trichloroethylene		X	X
22.211	1,1-Dichloroethylene		X	X
22.212	Vinyl Chloride		X	X
22.213	1,1,1-Trichloroethane		X	X
22.214	1,2-Dichloroethane		X	X
22.215	Carbon Tetrachloride		X	X
22.216	Benzene		X	X
22.217	Para-Dichlorobenzene (p-Dichlorobenzene)		X	X
22.22	Microbial Standards		X	X
22.220	Total Coliform Rule		X	X
22.221	2012 Revised Total Coliform Rule (RTCR)			
22.2200	Sanitary Survey		X	X
22.2201	Sampling Plan		X	X
22.2202	Laboratory Procedures		X	X
22.2203	Monitoring Frequency		X	X
22.2204	Determining Compliance			X
22.2205	Reporting and Notification Requirements		X	X
22.23	Disinfectants and Disinfection By-Products (D/DBPs)		X	X
22.24	Radiological Standards		X	X
22.3	SECONDARY DRINKING WATER STANDARDS	X		
22.30	Enforcement of Regulations	X	X	X
22.31	Secondary Maximum Contaminant Levels	X	X	X
22.32	Monitoring	X	X	X
22.33	Secondary Contaminants		X	X
22.330	Aluminum		X	X
22.331	Chloride		X	X
22.332	Color		X	X
22.333	Copper		X	X
22.334	Corrosivity		X	X
22.335	Fluoride		X	X
22.336	Foaming Agents		X	X
22.337	Iron and Manganese		X	X
22.338	Iron		X	X
22.339	Manganese		X	X
22.3310	Odor		X	X
22.3311	pH		X	X
22.3312	Silver		X	X
22.3313	Sulfate		X	X
22.3314	Total Dissolved Solids (TDS)		X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
22.3315	Zinc		X	X
22.4	SAMPLING PROCEDURES		X	X
22.40	Safe Drinking Water Regulations		X	X
22.41	Overview of Sampling		X	X
22.42	General Guidelines for Water Sampling		X	X
22.43	Selecting Sampling Locations		X	X
22.44	Use of Dedicated Sampling Stations		X	X
22.45	Sampling Points		X	X
22.46	Sampling Point Selection		X	X
22.47	Sampling Schedule		X	X
22.48	Sampling Route		X	X
22.49	Sample Collection		X	X
22.410	Frequency of Sampling		X	X
22.411	Chain-of-Custody Procedures		X	X
22.5	REPORTING PROCEDURES		X	X
22.6	NOTIFICATION REQUIREMENTS		X	X
22.7	RECORDKEEPI NG		X	X
22.8	CONSUMER CONFIDENCE REPORT (CCRs)		X	X
23	**WORDS: ADMINISTRATION**			X
23.0	NEED FOR UTILITY MANAGEMENT			X
23.1	FUNCTIONS OF A MANAGER			X
23.2	PLANNING			X
23.3	ORGANIZING			X
23.40	STAFFING - The Utility Manager's Responsibilities			X
23.41	How Many Employees Are Needed			X
23.42	Qualifications Profile			X
22.430	Advertising the Position			X
23.431	Paper Screening			X
23.432	Interviewing Applicants			X
23.433	Selecting the Most Qualified Candidate			X
23.44	New Employee Orientation			X
23.450	Probationary Period			X
23.451	Compensation			X
23.452	Training and Certification			X
23.453	Performance Evaluation			X
23.454	Dealing with Disciplinary Problems			X
23.455	Example Policy: Sexual Harassment			X
23.456	Labor Laws Governing Employer/Employee Relations			X
23.457	Personnel Records			X
23.5	COMMUNICATION			X
23.50	Oral Communication			X
23.51	Written Communication			X
23.6	CONDUCTING MEETINGS			X
23.70	Establish Objectives			X
23.71	Utility Operations			X
23.72	The Mass Media			X
23.73	Being Interviewed			X
23.74	Public Speaking			X
23.75	Telephone Contacts			X
23.76	Consumer Inquiries			X
23.77	Plant Tours			X
23.8	FINANCIAL MANAGEMENT			X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
23.80	Financial Stability			X
23.81	Budgeting			X
23.82	Equipment Repair/Replacement Funds			X
23.83	Water Rates			X
23.84	Capital Improvements and Funding in the Future			X
23.85	Financial Assistance			X
23.90	The Manager's Responsibilities			X
23.91	Purpose of O & M Programs			X
23.92	Types of Maintenance			X
23.93	Benefits of Managing Maintenance			X
23.94	SCADA Systems			
23.940	Description of SCADA Systems			X
23.941	Typical Water Treatment and Distribution SCADA Systems			X
23.95	Cross Connection Control Program			
23.950	Importance of Cross Connection Control			X
23.951	Program Responsibilities			X
23.952	Water Supplier Program			X
23.953	Types of Backflow Prevention Devices			X
23.954	Devices Required for Various Types of Situations			X
23.96	Geographic Information System (GIS)- New Section			X
23.100	Planning for Emergency Response			X
23.101	Homeland Defense			X
23.1021	Handling the Threat of Contaminated Water Supply-Toxicity			X
23.1022	Emergency Contaminant Limits			X
23.1023	Protective Measures			X
23.1024	Emergency Countermeasures			X
23.1025	In Case of Contamination			X
23.1026	*Cryptosporidium*			X
23.110	Safety Program Responsibilities			X
23.1100	SAFETY PROGRAM-Everyone is Responsible for Safety			X
23.1101	Regulatory Agencies			X
23.1102	Managers			X
23.1103	Supervisors			X
23.1104	Operators			X
23.111	First Aid			X
23.112	Hazard Communication Program & Worker Right-To-Know (RTK) Laws			X
23.113	Confined Spaces Entry Procedures			X
23.114	Reporting			X
23.115	Training			X
23.116	Measuring			X
23.117	Human Factors			X
23.120	Purpose of Records			X
23.121	Types of Records			X
23.122	Types of Plant Operations Data			X
23.123	Maintenance Records			X
23.124	Procurement Records			X
23.125	Inventory Records			X
23.126	Equipment Records			X
23.127	Computer Record Keeping Systems			X
23.128	Disposition of Plant Records			X
23.130	Need for Conservation	X	X	X

Part II
WATER TREATMENT PLANT OPERATION – VOLUME II

SECTION	TOPIC	C	B	A
23.131	What Is Water Conservation?	X	X	X
23.132	Elements of Water Conservation Program		X	X
23.1320	Residential Water Surveys		X	X
23.1321	Residential Plumbing Retrofits		X	X
23.1322	System Water Audits, Leak Detection, and Repair		X	X
23.1323	Meeting with Commodity Rates			X
23.1324	Large Landscape Conservation Programs			X
23.1325	High-Efficiency Clothes Washers			X
23.1326	Public Information Programs			X
23.1327	School Education Programs			X
23.1328	Conservation Programs for Commercial, Industrial & Institutional (Cll) Sectors			X
23.1329	Wholesale Agency Assistance Programs			X
23.13210	Conservation Pricing			X
23.13211	Conservation Coordinator			X
23.13212	Water Waste Prohibition			X
23.13213	Residential ULFT Replacement Programs			X
23.13214	Potential Best Management Practices			X
23.133	EPA's WaterSense: Efficiency Made Easy			X
	APPENDIX			
A.2	BASIC FORMULAS		X	X
A.30	Iran and Manganese Control		X	X
A.31	Fluoridation		X	X
A.32	Softening		X	X
A.33	Specialized Treatment Processes		X	X
A.34	Membrane Treatment Processes		X	X
A.35	Maintenance		X	X
A.36	Advanced Laboratory Procedures		X	X
A.37	Regulations		X	X
A.38	Administration, Safety		X	X

Part III
"RULES GOVERNING PUBLIC WATER SUPPLY"

SECTION	TOPIC	D	C	B	A
.0102	DEFINITIONS	X	X	X	X
	G.S. 130A-2. Definitions	X	X	X	X
	G.S. 130A-313. Definitions	X	X	X	X
	141.2 Definitions	X	X	X	X
.0203	PUBLIC WELL WATER SUPPLIES	X	X	X	X
.0301	APPLICABILITY: PRIOR NOTICE	X	X	X	X
.0303	SUBMISSIONS REQUIRED BY ENGINEER AND APPLICANT	X	X	X	X
.0304	APPLICATION FOR APPROVAL: BY WHOM MADE	X	X	X	X
.0305	APPROVALS NECESSARY BEFORE CONTRACTING OR CONSTRUCTING	X	X	X	X
.0306	CHANGES IN ENGINEERING PLANS OR SPECIFICATIONS AFTER APPROVAL	X	X	X	X
.0307	ENGINEER'S REPORT, WATER SYSTEM MANAGEMENT PLAN AND OTHER PLANS	X	X	X	X
.0309	FINAL APPROVAL	X	X	X	X
.0402	WATER SUPPLY WELLS	X	X	X	X
.0404	WATER TREATMENT FACILITIES	X	X	X	X
.0405	STORAGE OF FINISHED WATER	X	X	X	X
.0406	DISTRIBUTION SYSTEMS	X	X	X	X
.0407	ELECTRICAL SYSTEMS	X	X	X	X
.0408	LEAD FREE CONSTRUCTION	X	X	X	X
.0409	SERVICE CONNECTIONS	X	X	X	X
.0708	GRAVITY FILTERS			X	X
.0709	PREVENTION OF BACKFLOW AND BACK SIPHONAGE			X	X
.0801	CAPACITIES: DETERMINING MINIMUM EFFECTIVE VOLUME			X	X
.0802	CAPACITIES: DETERMINING PEAK DEMAND			X	X
.0803	CAPACITIES: DETERMINING TOTAL VOLUME			X	X
.0804	CAPACITIES: GROUND STORAGE PLUS HYDROPNEUMATIC TANKS			X	X
.0805	CAPACITIES: ELEVATED STORAGE		X	X	X
.0901	SIZE OF WATER MAINS	X	X	X	X
.0902	NUMBER OF RESIDENCES ON A WATER MAIN	X	X	X	X
.0903	DEAD END WATER MAINS	X	X	X	X
.0904	PIPE LAYING	X	X	X	X
.0905	TESTING NEW WATER MAINS	X	X	X	X
.0906	RELATION OF WATER MAINS TO NON-POTABLE WATER LINES	X	X	X	X
.0907	VALVES	X	X	X	X
.1001	DISINFECTION OF NEW SYSTEM	X	X	X	X
.1002	DISINFECTION OF WELLS	X	X	X	X
.1003	DISINFECTION OF STORAGE TANKS & DISTRIBUTION SYSTEM	X	X	X	X
.1004	DISINFECTION OF WATER TREATMENT FACILITIES		X	X	X
.1108	CONTINUOUS DISINFECTION OF WATER SUPPLY	X	X	X	X
.1301	GENERAL REQUIREMENTS	X	X	X	X
.1302	TESTS, FORMS & REPORTING	X	X	X	X
.1303	FACILITY OVERSIGHT	X	X	X	X
.1304	WATER SYSTEM OPERATION AND MAINTENANCE	X	X	X	X
.1400	FLUORIDATION OF PUBLIC WATER SUPPLIES			X	X
.1401	POLICY			X	X
.1402	FORMAL APPLICATION			X	X
.1404	FEEDING EQUIPMENT			X	X
.1405	PROTECTION OF OPERATOR			X	X
.1406	CONTROL OF FLUORIDE PROCESS			X	X

Part III
"RULES GOVERNING PUBLIC WATER SUPPLY"

SECTION	TOPIC	D	C	B	A
.1407	APPROVAL MAY BE RESCINDED			X	X
.1501	WATER QUALITY STANDARDS - PURPOSE	X	X	X	X
.1502	MONITORING OF CONSECUTIVE PUBLIC WATER SYSTEMS		X	X	X
.1503	MICROBIOLOGICAL CONTAINMENT SAMPLING AND ANALYSIS	X	X	X	X
.1504	MAXIMUM MICROBIOLOGICAL CONTAINMENT LEVELS	X	X	X	X
.1505	TURBIDITY SAMPLING AND ANALYSIS	X	X	X	X
.1506	MAXIMUM CONTAINMENT LEVELS FOR TURBIDITY	X	X	X	X
.1507	CORROSION CONTROL AND LEAD AND COPPER MONITORING	X	X	X	X
.1508	INORGANIC CHEMICAL SAMPLING & ANALYSIS	X	X	X	X
	141.23 (a-e) Inorganic Chemical Sampling & Analytical Requirements	X	X	X	X
.1509	SPECIAL MONITORING FOR SODIUM	X	X	X	X
.1510	MAXIMUM CONTAMINANT LEVEL FOR INORGANIC CHEMICALS	X	X	X	X
.1511	CONCENTRATION OF IRON	X	X	X	X
.1512	CONCENTRATION OF MANGANESE	X	X	X	X
.1516	SPECIAL MONITORING OF UNREGULATED CONTAMINANTS	X	X	X	X
.1517	MAXIMUM CONTAMINANT LEVEL FOR ORGANIC CHEMICALS			X	X
.1518	MAXIMUM CONTAMINANT LEVEL FOR ORGANIC CONTAMINANTS	X	X	X	X
.1519	MONITORING FREQUENCY FOR RADIOACTIVITY		X	X	X
.1520	MAXIMUM CONTMAINANT LEVELS FOR RADIUM		X	X	X
.1521	MAXIMUM CONTAMINANT LEVEL GOALS FOR RADIONUCLIDES				X
.1523	PUBLIC NOTIFICATION REQUIREMENTS	X	X	X	X
.1524	REPORTING FOR UNREGULATED CONTAMINANT MONITORING RESULTS	X	X	X	X
	Subpart Q – Public Notification of Drinking Water Violations	X	X	X	X
.1525	REPORTING FOR REQUIREMENTS	X	X	X	X
.1526	RECORD MAINTENANCE	X	X	X	X
.1527	CERTIFIED LABORATORIES	X	X	X	X
.1529	POINT-OF-ENTRY, BOTTLED WATER, & OTHER TREATMENT DEVICES				X
.1532	VARIANCES AND EXEMPTIONS				X
.1534	COLIFORM SAMPLING	X	X	X	X
.1535	MAXIMUM CONTAMINANT LEVEL FOR COLIFORM BACTERIA	X	X	X	X
.1536	TREATMENT TECHNIQUES			X	X
.1537	DRINKING WATER TREATMENT CHEMICALS & SYSTEM COMPONENTS	X	X	X	X
.1538	CONSUMER CONFIDENCE REPORT		X	X	X
.1601	REQUIREMENTS FOR VARIANCE				X
.1602	VARIANCE REQUEST				X
.1603	CONSIDERATION OF VARIANCE REQUEST				X
.1604	DISPOSITION OF VARIANCE REQUEST				X
.1605	PUBLIC HEARINGS ON VARIANCES AND SCHEDULES				X
.1606	VARIANCES FOR FLUORIDE				X
.1607	NUCLIDES				X
.1608	REQUIREMENTS FOR AN EXEMPTION				X
.1609	EXEMPTION REQUEST				X
.1610	CONSIDERATION OF VARIANCE REQUEST				X
.1611	DISPOSITION OF VARIANCE REQUEST				X
.1612	PUBLIC HEARINGS ON VARIANCES AND SCHEDULES				X
.1613	FINAL SCHEDULE				X
.1614	BOTTLED WATER AND POINT-OF-USE DEVICES				X
.1904	WHEN PENALTIES MAY BE ASSESSED	X	X	X	X
.1905	AMOUNT OF PENALTY ASSESSMENT	X	X	X	X
.1913	RIGHT OF ENTRY AND INSPECTION	X	X	X	X

Part III
"RULES GOVERNING PUBLIC WATER SUPPLY"

SECTION	TOPIC	D	C	B	A
.2001	GENERAL REQUIREMENTS (FILTRATION & DISINFECTION)		X	X	X
.2008	DISINFECTANTS & DISINFECTANTS BYPRODUCTS	X	X	X	X
.2100	OPERATING PERMITS		X	X	X
.2101	PERMITS		X	X	X
.2102	APPLICATION FOR PERMITS		X	X	X
.2103	INITIAL PERMIT PERIOD		X	X	X
.2104	RENEWAL FEES		X	X	X
.2105	REVOCATION		X	X	X
.2201	GROUNDWATER-APPLICABILITY & RESIDUAL DISINFECTANT CONCENTRATIONS	X	X	X	X
.2202	GROUND WATER RULE	X	X	X	X
	APPENDIX A – General Statutes	X	X	X	X
	APPENDIX B – (Figure 2) – NORTH CAROLINA GUIDELINES CROSS CONNECTION CONTROL IN WATER DISTRIBUTION SYSTEMS	X	X	X	X

Part IV
WELL CONSTRUCTION STANDARDS

SECTION	TOPIC	D	C	B	A
.0101	GENERAL PROVISIONS	X	X	X	X
.0102	DEFINITIONS	X	X	X	X
.0105	PERMITS	X	X	X	X
.0107 (d)	CASING	X	X	X	X
.0107 (e)	GROUTING	X	X	X	X
.0107 (f)	WELL SCREENS		X	X	X
.0107 (g)	GRAVEL-AND-SAND PACKED WELLS		X	X	X
.0107 (h)	WELL DEVELOPMENT	X	X	X	X
.0107 (i)	WELL HEAD COMPLETION	X	X	X	X
.0109	PUMP AND PUMPING EQUIPMENT		X	X	X
.0110	WELL TESTS FOR YIELD		X	X	X
.0111	DISINFECTION OF WATER SUPPLY WELLS	X	X	X	X
.0112	WELL MAINTENANCE: REPAIR: GROUNDWATER RESOURCES	X	X	X	X
.0113	ABANDONEMENT OF WELLS	X	X	X	X
.0114	DATA AND RECORDS REQUIRED	(b) X	(b) X	(b) X	(b) X