

Water Pollution Control System Operator Certification Commission Training Course Standards

The
North Carolina
Biological Wastewater
Treatment Systems Operator's
Grade One and Two Course

Revised: July 8, 2005

INTRODUCTION

This document represents the minimum training standards required for an individual to qualify to take North Carolina's biological certification examination. It was approved by the Water Pollution Control System Operators Certification Commission (WPCSOCC) and the Technical Assistance and Certification Unit of the North Carolina Department of Environment and Natural Resources (NCDENR).

All agencies and individuals conducting schools, courses, or classes for the purposes of meeting operator's training requirement for certification are required to follow this course standard and the Needs-To-Know for each specific grade level in developing their curriculum and teaching outlines. We encourage each of the agencies and individual teaching these courses to add to the standards, as you believe necessary to increase the learning of the operators.

ACKNOWLEDGMENTS

Special thanks to the following wastewater professionals who devoted many hours to making revisions to the Biological Wastewater Operators Course Standards and Needs to Know documents. They represent over twenty years of wastewater experience and expertise. We also appreciate the organizations that these individuals represent. They have demonstrated their commitment to quality training for the biological wastewater operators of North Carolina. These organizations allowed their employees time away from their work so that this project might be completed. In many cases, they paid the expense for travel and lodging. Again, to each of you we say, "Thank you".

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Water Pollution Control System Operator Certification Commission

Approved Training Course Standards

Wastewater Treatment Systems Operator Courses Summary

TIME REQUIRED: Each agency providing training may increase the time for training as necessary above the minimum times listed below.

Grade I	Time: 34 hours
Grade II	Time: 38 hours
Grade I and II Combined Course	Time: 59 hours

COURSE DESCRIPTION: This course is designed to provide the individual with a general knowledge of the operation of wastewater treatment systems. The course will provide the individual with knowledge of the laws and regulations related to wastewater treatment systems operation, and equipment usually employed in such plants and the ability to describe the general maintenance requirements for such plants. This course is designed to assist the individual in preparation for the North Carolina Water Pollution Control System Operators Certification Commission Examination.

INSTRUCTORS: Should possess an academic and/or professional background acceptable to the approved sponsoring agency.

TEXTS: **Grade I – Small Wastewater System Operation and Maintenance Volume I and II.**
Grade II – Operation of Wastewater Treatment Plant and Advanced Waste Treatment. Available from Kenneth D. Kerri, Office of Water Programs, California State University, Sacramento, 6000 J Street, Sacramento, California 95819-6025

PowerPoint Class Outline. Available from the North Carolina Department of Environment, Health and Natural Resources, Water Quality Section, Technical Assistance and Certification, 1618 Mail Service Center, Raleigh, NC 27699-1618. Phone (919) 733-0026, Fax (919) 733-1338. Instructors must present the topics as presented in the materials approved by the Water Pollution Control System Operators Certification Commission.

Needs to Know Manual. Available on the North Carolina Department of Environment, Health and Natural Resources, Water Quality Section, Technical Assistance and Certification web-site: h2o.enr.state.nc.us/tacu/manuals.

COURSE EVALUATIONS: Students will complete a course evaluation form provided by the school/agency conducting the course. The school/agency conducting the course is required to send a copy of all completed evaluation forms to the Technical Assistance and Certification Unit within 15 days of course completion.

CLASS ROSTERS: The instructor will keep Class rosters. One copy of the roster will be sent to the Technical Assistance and Certification Unit within 15 days of course completion. All students **must attend at least 80%** of the course in order to receive credit for completion.

Grade One: Wastewater Treatment Systems Operator Courses

Time Requirement by Topic

Needs-To-Know Topic	Minimum Time Required
Introduction to Wastewater	2.5 hours
Wastewater Collection Systems	0.5 hours
Grease Traps / Grease Interceptors	0.5 hours
Pumps	1.0 hours
Preliminary Treatment	1.0 hours
Wastewater Lagoons and Ponds	3.0 hours
Constructed Wetlands	1.0 hours
Septic Tank / Sand Filters Systems	3.0 hours
Disinfection	1.5 hours
Instrumentation and Controls	1.0 hours
Applied Electricity	1.0 hours
Lab and Sampling procedures	3.0 hours
Required Technical Knowledge	6.0 hours
Laws and Regulations	3.0 hours
Health and Safety	3.0 hours
Introduction to Activated Sludge	3.0 hours
Total Time	34.0 hours

Grade Two: Wastewater Treatment Systems Operator Courses Time Requirement by Topic

Needs-To-Know Topic	Minimum Time Required
Mechanical and Maintenance Operations	1.0 hours
Preliminary Treatment	1.0 hours
Sedimentation and Flotation	2.0 hours
Attached Growth Systems	2.0 hours
Activated Sludge	3.0 hours
Sludge Digestion	3.0 hours
Solids Handling and Disposal	2.0 hours
Advanced Treatment	3.0 hours
Disinfection	1.0 hours
Instrumentation and Controls	2.0 hours
Laboratory Procedures	3.0 hours
Sampling	1.0 hours
Laws and Regulations	3.0 hours
Public Relations	0.5 hours
Required Technical Knowledge (Math)	5.0 hours
Industrial Pretreatment	0.5 hours
Biology	2.0 hours
Health and Safety	3.0 hours
Total Time	38.0 hours

Grade One and Two: Wastewater Treatment Systems Operator Course

Time Requirement by Topic

Needs-To-Know Topic Required	Minimum Time
Introduction to Wastewater	2.5 hours
Wastewater Collection Systems	2.0 hours
Grease Traps / Grease Interceptors	0.5 hours
Pumps	1.0 hours
Preliminary Treatment	2.5 hours
Wastewater Lagoons and Ponds	3.0 hours
Constructed Wetlands	1.0 hours
Septic Tank / Sand Filters Systems	3.0 hours
Disinfection	2.5 hours
Instrumentation and Controls	3.0 hours
Applied Electricity	1.0 hours
Introduction to Activated Sludge	3.0 hours
Mechanical and Maintenance Operations	1.0 hours
Sedimentation and Flotation	2.0 hours
Attached Growth Systems	2.0 hours
Activated Sludge	3.0 hours
Sludge Digestion	2.0 hours
Solids Handling and Disposal	2.0 hours
Advanced Treatment	3.0 hours
Laboratory Procedures	3.0 hours

Laws and Regulations	3.0 hours
Public Relations	0.5 hours
Required Technical Knowledge (Math)	6.0 hours
Industrial Pretreatment	1.0 hours
Biology	2.0 hours
Health and Safety	3.0 hours
Total Time	58.5 hours

Introduction to Wastewater

1. What are the definitions and average ranges for the following parameters for "typical" domestic wastewater (see appendix):
 - A. TSS (total suspended solids)
 - B. BOD₅ (biochemical oxygen demand)
 - C. pH
 - D. NH₃ (ammonia)
2. What is the difference between inorganic and organic wastes?
3. What do the various odors of wastewater indicate?
4. What is the economic significance of improper treatment and disposal of wastewaters?
5. What are the effects of nitrogen and phosphorus on receiving waters?
6. What is treatment plant influent? Effluent?
7. What are the sources of wastewater?
8. What is a constructed wetland?
9. Differentiate between characteristics of fresh and stale wastewater.
10. Describe temperature variations of wastewater and their importance in treatment.
11. Describe how toxic materials could affect the biology of a wastewater treatment plant.
12. Describe typical daily and seasonal flow variations in wastewater.
13. Why is the oxygen content of streams important?
14. Define an oxygen sag point.
15. Explain the need for treatment of wastewater discharges.
16. Explain the importance of each of the following sources of organic and inorganic water pollutants:
 - A. Point source discharges
 - B. Non-point source discharges
18. Explain the role and importance of the hydrologic cycle in maintaining water resources.
19. Explain the difference between primary, secondary and tertiary treatment of wastewater.
20. Explain the purpose of each of the following treatment processes in a wastewater treatment plant and describe a reasonable arrangement for the processes.

- A. Primary settling
- B. Biological treatment
- C. Grit removal
- D. Flow measurement
- E. Screens
- F. Final settling
- G. Sludge solids
- H. Disinfection

Wastewater Collection Systems

1. Define and state the purpose of the following collection systems:
 - A. Sanitary
 - B. Stormwater
 - C. Combined
2. Define and describe typical sources of infiltration, inflow and illegal connections.
3. Describe the importance of reducing inflow and infiltration (I&I) into a collection system.
4. Explain the significance of placing sanitary sewers at a slope sufficient to produce a water velocity of approximately two feet per second.
5. Explain the differences between gravity and force mains.
6. Explain the problems associated with an extended flow time in the collection system.

Grease Traps / Grease Interceptors

1. Describe a grease trap / grease interceptor and the circumstances under which one would be used.
2. Describe why hydraulic loading plays a role in the effective operation of an oil/water separator.
3. Describe why a grease trap / grease interceptor should be located as close to the source of wastewater as possible at a food service facility.
4. Describe the proper maintenance procedures for a typical grease trap / grease interceptor used by a food service facility.

Pumps

1. What is the purpose of a pump?
2. What is water hammer?
3. Identify situations that would cause a loss of prime and how to re-prime these pumps.
4. Describe various types of pumps:

- A. Centrifugal
 - B. Positive displacement, plunger type
 - C. Positive displacement, diaphragm type
 - D. Positive displacement, progressive cavity (screw-flow type)
 - E. Air lift pumps
 - F. Peristaltic pumps
5. Describe the procedures for starting up and shutting down a centrifugal and positive displacement pump.
 6. Describe cavitation and how it affects a centrifugal pump.
 7. Describe basic pump maintenance.

Septic Tank/Sand Filter Systems

1. Describe how to inspect a septic tank for leakage and infiltration.
2. Describe the relationship between a septic tank and the dosing tank.
3. Describe the purpose of baffles within a septic tank.
4. Define detention time and how it affects septic tank performance.
5. Describe when, why and how to remove solids from a septic tank.
6. Describe the purpose of a dosing tank and the different types of dosing mechanisms.
7. Describe sand filters and how they function.
8. Describe recirculation and how it affects sand filter treatment efficiencies.
9. Describe the final disposal options associated with septic tank / sand filter systems.
10. Identify problems commonly associated with sand filters.
11. Identify the three functions of a septic tank (i.e. removal, storage and digestion).
12. Identify problems that may occur with septic systems and the visible signs that may indicate problems.
13. Identify the maintenance needs for sand filters.
14. Explain how media size, media depth and media surface affect treatment.
15. Explain how distribution of wastewater onto sand filter surfaces affects treatment.
16. Explain the importance of raking and leveling sand filters to avoid ponding.
17. Why is disinfection following filtration important.
18. List the safety hazards associated with septic tank / sand filter systems.

19. List the different forms of disinfection that may be used with septic tank / sand filters system.

Preliminary Treatment

1. Describe the objectives of screening in wastewater treatment plants.
2. Describe approved methods commonly employed for disposal of grit.
3. Explain corrective actions necessary in the event of failure of a mechanically-cleaned bar screen.
4. Identify different types of screens used in wastewater treatment plants and their advantages and disadvantages.
5. Identify the approved method(s) commonly employed for disposing of screenings in wastewater treatment plants.
6. Identify and state the purpose of comminutors.
7. What is grit in a wastewater? How does it affect a wastewater treatment plant?
8. What principle is used in designing grit removal chambers?

Wastewater Lagoons and Ponds

1. What is photosynthesis and why is it important in stabilization lagoons?
2. What are the advantages / disadvantages of waste treatment ponds?
3. What effect does detention time have on waste treatment ponds?
4. What is the normal color for a waste treatment pond and what do different colors indicate?
5. What are the advantages / disadvantages of operating waste treatment ponds in series and parallel modes?
6. What is "turnover" in waste treatment ponds and how does it affect treatment?
7. What is the purpose of recirculation in waste treatment ponds?
8. What is the purpose of "splash pads"?
9. What are the advantages of having a submerged inlet and outlet?
10. What is the role of algae in stabilization lagoons?
11. What is the difference between stabilization wastewater lagoons and polishing ponds?
12. What factors indicate that a stabilization lagoon is not operating properly?

13. What are safety hazards associated with wastewater treatment lagoons?
14. What are the advantages of baffles in a lagoon system?
15. Identify the different types of stabilization lagoons, explain the differences between them and describe proper operation and maintenance of each of the following types:
 - A. Facultative lagoons;
 - B. Aerobic lagoons;
 - C. Anaerobic lagoons.
16. Describe operating ranges for pH, dissolved oxygen and alkalinity in both facultative and aerobic lagoons.
17. For the following problems associated with stabilization lagoons, list probable causes and corrective actions to be taken:
 - A. Excessive algae blooms
 - B. Weed growths
 - C. Scum formation
 - D. Odor production
 - E. Erosion
 - F. Loss of algae
 - G. Septicity
 - H. Low pH
 - I. Blue-Green algae
18. In an aerobic lagoon, how are algae produced, how is oxygen produced by the algae, and what happens to the unstable organic matter?

Constructed Wetlands

1. Give two examples of plant life that may be used in wetlands discharge application.
2. What is the purpose of having a “sloped” bottom in wetlands disposal system?
3. What safety hazards are associated with wetland disposal systems?
4. Identify problems that can occur with a wetland system.
5. Describe how the two types of wetland systems operate.
6. Explain the most critical items in which an operator’s intervention is necessary during constructed wetland operations:
 - A. Adjustment of water levels,
 - B. Maintenance of flow uniformity,
 - C. Management of vegetation,
 - D. Odor control,
 - E. Control of nuisance pests and insects,
 - F. Maintenance of berms and dikes,

- G. Maturation of wetlands,
- H. Mechanical equipment maintenance, and
- I. Health and safety

- 7. Define water cycle.
- 8. Define plug flow.
- 9. Define vector.

Introduction to Activated Sludge

- 1. Define activated sludge
- 2. Define activated sludge process
- 3. Define oxidation.
- 4. Define microorganism.
- 5. Define food to microorganism ratio.
- 6. Define stabilized waste.
- 7. Define facultative, aerobic and anaerobic bacteria and their importance in the “Activated Sludge Process.”
- 8. Define eutrophication and its significance in lakes.
- 9. Define aerobic digestion.
- 10. Define biochemical oxygen demand (BOD) and the factors that affect its strength.
- 11. Define floc.
- 12. What are the end products of aerobic and anaerobic decomposition?
- 13. What are the purposes of clarifiers (primary and secondary)?
- 14. When solids are removed from the process where do they go?
- 15. What is the sludge age for extended aeration plant?
- 16. What is an air-lift used for in a extended aeration plant?
- 17. How is oxygen (air) supplied for aeration?
- 18. At what level should dissolved oxygen (D.O.) be maintained throughout the aeration tank?
- 19. Why is it necessary to waste sludge from the treatment process?

20. Why is oxygen added to the process?
21. When changes are made to the treatment process it may take how long for a response to be seen?
22. List four causes of odors at a treatment plant.
23. List causes of foaming at treatment plant.
24. Identify the following types of living organisms which are associated with wastewater, differentiate between them and know their significance:
25. Identify the importance of pH, alkalinity, dissolved oxygen (D.O.) and temperature in the biology of wastewater treatment.
26. What is the purpose of secondary activated sludge treatment?
27. What are a package plant and an oxidation ditch?

Disinfection

1. What is the purpose of disinfection of a treatment plant effluent? Explain the difference between disinfection and sterilization of wastewater.
2. What chlorine contact time usually provides reasonable disinfection of a wastewater treatment plant effluent?
3. What is the approved method of determining chlorine residual?
4. What would cause an increase in chlorine demand?
5. What are some alternate methods of disinfection:
 - A. Chlorine;
 - B. Ultraviolet;
6. What are fecal coliform bacteria?
7. What is dechlorination?
8. Define chlorine dosage, demand and residual.
9. Given data on chlorine demand and flow, be able to calculate daily requirements for chlorine additions.
10. Name three forms of chlorine that may be used to disinfect wastewater effluents.
11. State the physical and chemical properties of chlorine.
12. Why do you not store petroleum products and solid chlorine compounds in the same area?
13. Identify the safety equipment that must be available when handling chlorine.

14. Identify the following types of living organisms which are in wastewater, differentiate between them and know their significance:

Bacteria

- A. Pathogens
- B. Indicator organisms (coliforms, fecal coliforms)

15. Identify and briefly describe the following factors which affect the disinfection efficiency when using chlorine:

- A. Combined, total or free chlorine residuals
- B. Contact time
- C. Temperature
- D. pH
- E. Presence and types of organic matter
- F. Number of pathogens
- G. Reducing agents
- H. Maintenance of contact basin
- I. Maintenance of chlorine diffusers

Sampling

1. What is the purpose of sampling?
2. What are the differences between a grab and composite sample?
3. What are the objectives of routine process control and compliance sampling?
4. What field parameters are typically measured in the effluent and receiving waters?
5. Describe circumstances when grab and composite samples may be desirable.
6. Describe techniques and precautions necessary to collect representative samples of wastewater.
7. Explain the importance of the following in sampling:
 - A. Cleanliness of containers and measuring devices;
 - B. Accuracy of records (labels, locations, time, data, type sample, weather, other information);
 - C. Refrigeration of samples;
 - D. Chemical preservation of samples;
 - E. Chain-of-custody.
8. Why is it necessary to note the physical characteristics of the sample and sample site?
9. Why should the receiving waters be sampled above and below the discharge point?
10. Identify locations in a treatment system where it would be appropriate to make various solids determinations.
11. Describe how to solve problems to determine the volume that should be collected at each time interval to

form a composite sample that is flow proportional.

12. Define the following types of samples:
- A. Grab;
 - B. Flow proportional composite samples;
 - C. Continuous composite samples;
 - D. Timed composite samples.

Laboratory Procedures

1. What is the reason for performing wastewater analyses and discuss the requirements for using approved methods?
2. What measurements must be performed on a sample immediately after it has been collected?
3. What information should be included on chemical reagent bottle labels?
4. What is an Imhoff cone and how is it used? Given a drawing or diagram, be able to accurately read an Imhoff cone.
5. What is meant by the pH of wastewater and what is its significance?
6. Define each of the following analyses and explain its significance:
 - A. Temperature;
 - B. Dissolved oxygen (meter);
 - C. Chlorine residual;
 - D. Settleable solids.
 - E. Biochemical Oxygen Demand (BOD)
7. Describe the proper procedures for calibrating pH and dissolved oxygen meters.
8. Why should NO SMOKING areas, exits and evacuation routes be clearly identified?
9. Explain why distilled water, and/or deionized water, is necessary.
10. Explain the significance of the following common elements and compounds in wastewater treatment operations. Know the chemical symbols for each one.
 - A. Oxygen (O)
 - B. Carbon (C)
 - C. Phosphorus (P)
 - D. Nitrogen (N)
 - E. Carbon dioxide (CO₂)
 - F. Methane (CH₄)
 - G. Hydrogen Sulfide (H₂S)
 - H. Hydrogen (H)
 - I. Sulfur (S)

- J. Chlorine (Cl)
- K. Metals:
 - 1. Chromium (Cr)
 - 2. Lead (Pb)
 - 3. Copper (Cu)
 - 4. Zinc (Zn)
 - 5. Cadmium (Cd)
 - 6. Aluminum (Al)
 - 7. Iron (Fe)
 - 8. Nickel (Ni)

Required Technical Knowledge

1. Explain how to solve problems pertinent to treatment plant operations involving the following:
 - A. Fractions
 - B. Decimals
 - C. Addition and subtraction
 - D. Multiplication and division
 - E. Percentage
 - F. Measurement
 - G. Metric system
 - H. Units of expression

*** These items will not be taught at any of the schools. Operators are expected to have learned this information during their High School studies.**

2. Explain how to solve word problems, interpret formulas, and solve simple equations involving:
 - A. Addition.
 - B. Subtraction.
 - C. Multiplication.
 - D. Division.
3. Given appropriate data, be able to calculate the following:
 - A. Pounds formula - all variations
 - B. Circumference of a circle
 - C. Area of a circle
 - D. Area of a rectangle
 - E. Volume of a cylinder
 - F. Volume of a tank (rectangular)
 - G. Conversions to and from:
 - 1) Cubic feet to gallons
 - 2) Gallons to pounds
 - 3) MGD to GPD to GPM to CFS
 - 4) Micrograms, milligrams, grams and kilograms
 - 5) Milliliters, liters
 - 6) Seconds, minutes, hours, days, years
 - 7) Square feet, acres

- 8) Inches, feet, yards, millimeters, centimeters, meters, kilometers
- 9) Detention time
- 10) Efficiency or removal efficiency
- 11) Geometric means for fecal coliforms
- 12) Pond equations:
 - a. Pond population equivalent
 - b. Pond area: acres
 - c. Pond volume: acre-feet
 - d. Pond detention time: days
 - e. Pond hydraulic loading: inches/day
 - f. Pond organic loading: lbs BOD/day/acre
 - g. Pond population loading: persons/acre
 - h. Concentration to percent

- 4. Describe how to "read" or translate numbers into words and words into numbers.
- 5. Explain how to solve simple algebraic equations.
- 6. Calculate the geometric mean for the fecal coliform test when given appropriate data.

Applied Electricity

- 1. Define and explain the following terms:
 - A. Short circuit
 - B. Grounded circuit
 - C. Open circuit
- 2. Identify the type of instrument used to check the following:
 - A. Voltage
 - B. Amperage
 - C. A complete circuit
- 3. What is the purpose and function of fuses and circuit breakers?
- 4. Explain why many electric switches in wastewater treatment plants should be explosion proof and moisture proof.
- 5. Explain the reasons for the following basic precautions when working on or near electrical equipment:
 - A. Only qualified personnel should be allowed to work on electrical equipment.
 - B. Use of lockout switches and tags.
 - C. All electrical equipment and lines should be considered energized until proven otherwise.
 - D. Metal tools should be prohibited around electrical equipment.
 - E. Two men working as a team (buddy system) should be used while working on electrical equipment.
 - F. Rubber gloves should be worn when working on electrical equipment.
 - G. Avoid grounding of workers to metal or water.
 - H. Never bypass safety devices.
 - I. Use tools with insulated handles.
 - J. Use grounded electrical tools.

- K. Keep electrical equipment clean.
- 6. Describe the importance of grounding as a protective device.
- 7. Describe the purpose and operation of audio and visual warning devices.
- 8. Describe the proper operation and maintenance of motors and electrical equipment in a wastewater treatment plant.
- 9. Why should electric motors be kept clean?
- 10. Why should oil and grease be kept away from the windings of electrical motors?

Instrumentation and Controls

- 1. Given drawings or diagrams, be able to identify the following flow measuring devices and their functions:
 - A. Parshall flume
 - B. Rotameter
 - C. Weir
 - D. Bubbler system
 - E. Mechanical floats
 - F. Staff gauges
 - G. Magnetic flow meter
 - H. Ultrasonic
- 2. Explain how the following pump controls work:
 - A. Bubble tubes
 - B. Float switches
 - C. Pump alternator

Health and Safety

- 1. Explain the need for safety in wastewater treatment plants.
- 2. Explain reasons for the following basic rules of good personal hygiene in wastewater treatment plants as listed below:
 - A. Keep hands and fingers away from eyes, ears, nose and mouth.
 - B. Wear rubber gloves.
 - C. Wash hands before eating and smoking.
 - D. Do not store personal clothes with work clothes.
 - E. Give cuts and scratches first aid immediately.
 - F. Take a shower after work.
 - G. Receive inoculations for typhoid fever, tetanus, etc.
 - H. Provide waterless hand cleaners at various locations throughout the plant.
- 4. Explain why each of the following precautions is important:

- A. Do not lift more than can be handled comfortably.
 - B. Establish a solid footing and good balance before lifting.
 - C. Get as close to the load as possible when lifting or carrying.
 - D. Keep the back straight, gripping the object firmly, and using the legs to provide lift.
 - E. Never carry a load that is too large to see over or around.
5. Describe hazards commonly encountered with respect to falling and explain methods for minimizing them.
 6. Describe the hazards of infection and explain how to minimize them.
 7. Describe special hazards existing in treatment plants with respect to drowning and explain how to minimize them.
 8. Describe the basic good housekeeping measures listed below, explain the reason for each and describe why they encourage safety:
 - A. Have a routine cleaning program.
 - B. Keep floors dry or provide platforms.
 - C. Remove trash and loose debris.
 - D. Repair loose boards, holes, splinters and protruding nails.
 - E. Keep walkways free of oil, grease and sludge.
 - F. Keep combustible wastes in metal airtight containers and remove from the plant daily.
 - G. Regular painting.
 - H. Grass mowed and trimmed.
 - I. Prompt cleanup of spills.
 - J. Clean windows.
 - K. Use of kick plates on catwalks and raised surfaces.
 9. Describe the physiological effects of harmful gases to the respiratory system, nerves, blood, etc.
 10. Describe how to test for harmful gases before entering manholes or other closed structures.
 11. Describe why the following procedures are necessary when harmful gases exist in work areas:
 - A. Purging to remove toxic or flammable gases.
 - B. Use of self-contained air packs in the event of a chlorine leak.
 12. Describe the actions that should be taken and reports that should be prepared following an accident.
 13. Why should non-potable water sources be clearly marked?
 14. Why is it especially important for wastewater treatment plant operators to have knowledge of first aid?
 15. Identify electrocution hazards in wastewater treatment plants and explain how to minimize them.
 16. Identify and describe hazards and appropriate safety precautions in wastewater treatment plant and collection systems with respect to:
 - A. Gases
 - B. Poisonous substances
 - C. Suffocation

- D. Explosions
- E. Confined spaces
- F. Blood-borne pathogens
- G. Common wildlife hazards

17. Identify types of equipment that should be used for protection against poisonous gases.
18. Identify the explosive concentration range of the various gases encountered in wastewater treatment.
19. Identify types of protective clothing that should be available in wastewater treatment plants and describe conditions under which each type of protective clothing should be worn.
20. Identify the poisonous snakes and insects (water moccasins, black widow and brown recluse spiders, fire ants, wasps, etc.) that may be encountered in and around a wastewater treatment plant and describe the first aid actions that will be needed in the event of a bite or sting.
21. Identify where you can obtain training films and other training aids in order to carry out safety training programs.
22. Why is noise considered a safety hazard?
23. What action must be taken when electrical equipment is repaired or installed in a wastewater treatment plant and in collection systems?
24. What are the three ingredients necessary for a fire?
25. What is the Occupational Health and Safety Act (OHSA), what is involved in complying and who is the administrator?
26. What percent oxygen concentration is necessary in air to sustain life?
27. What is MSDS and what is its function?
28. What are the employer's responsibilities for providing necessary safety equipment?
29. What types of security measures should be enforced regarding the following and why?
 - A. Fencing
 - B. Limited access
 - C. Supervision of visitors
30. What emergency phone numbers should always be kept posted in a conspicuous place?
31. Explain the need for fire proofing chemical storage facilities.
32. Explain the importance of proper lighting as a safety measure.
33. Describe routine testing and maintenance procedures, which should be followed to ensure proper operation of safety equipment and measures.
34. State the purpose of each of the following items of safety equipment and explain how it works:

- A. Portable fresh air blower.
- B. Atmospheric testing equipment.
- C. Self-contained breathing apparatus.
- D. Respirator/Inhalator.
- E. First aid kit.
- F. Barricades, traffic cones and warning signs.
- G. Fire fighting equipment.
- H. Explosion-proof portable lights.
- I. Safety harness and lifelines.
- J. Ring buoys with line
- K. Chlorine repair kit.
- L. Protective clothing.

35. Describe the importance and typical locations for installation of guardrails, warning signs and other protective equipment in wastewater treatment plants.

36. Describe the reason for each of the following precautions when working in below-ground structures:

- A. Placing warning devices, barricades or guard rails around manholes.
- B. Placing trucks and equipment between working area and traffic.
- C. Removing manhole covers with hoists or hooks.
- D. Prohibiting smoking in any underground structure.
- E. Testing for oxygen deficiency and dangerous gases.
- F. Requiring each worker entering a manhole to wear a harness and lifeline.
- G. Stationing two men at the entrance to a manhole while a third worker is in the manhole.
- H. Ventilating and purging the underground structure with fresh air.
- I. Using non-sparking tools, shoes with rubber soles, and safety lights.
- J. Permitting no open flames in or near the structure.

37. Describe the safety requirements needed with respect to belts, coupling guards, electrical disconnects and lockout procedures.

38. Describe the requirements of the "Right to Know" regulations.

39. Describe how to organize and implement a good safety-training program. What are some of the main issues that should be addressed?

Laws and Regulations

REFERENCE - North Carolina Administrative Code: Chapter 8 – Water Pollution Control System Operators Certification Commission

1. Identify the North Carolina governmental agency that has principal responsibility for water pollution control activities statewide.

The Division of Water Quality (DWQ) in the Department of Environment and Natural Resources (DENR).

2. Identify the federal agency which has primary responsibility for establishing policy and regulations concerning water pollution control nation-wide.

The United States Environmental Protection Agency (US EPA)

3. Describe the functions of the Water Pollution Control System Operators Certification Commission.

The Commission has two functions:

1. Classification of water pollution control systems;
2. Certification of water pollution control system operators.

4. Explain the regulatory requirement for a certified operator in responsible charge (ORC) for each water pollution control system in North Carolina.

When notified by the Commission of the classification of a water pollution control system, the owner of that system must designate an operator in responsible charge (ORC) who holds a certificate of equal type and grade as the classification of the system.

5. Identify the agency to which NPDES reports must be sent and explain the frequency with which those reports must be submitted to the agency.

Monthly reports are to be sent to the Division of Water Quality (DWQ) in Raleigh.

6. Describe the justification for having the regulations regarding stand-by power.

Adequate stand-by power must be available to prevent overflows from wastewater collection systems and to prevent untreated wastewater from being released from water pollution control systems.

7. Describe the current State regulatory procedure with respect to water pollution violations and identify penalties that can be imposed for those violations.

A civil penalty of not more than \$25,000 per day per violation may be assessed for any NPDES permit limit violation, or water quality standard violation, against the permit holder, or the operator, of a water pollution control system. In addition, a civil penalty, not to exceed \$25,000 per day per violation, may be levied for continuous water quality violations against the permit holder, or the operator, of a water pollution control system.

8. Describe the five basic NPDES monitoring parameters and state the significance of each in the regulatory control of wastewater:

- A) Flow - The basic unit of daily volume discharge;
- B) BOD - The best indicator of wastewater strength;
- C) Suspended solids - Readily determined measure of treatment efficiency;
- D) pH - Critical factor in protecting aquatic life;
- E) Fecal coliform - Indicator organism for determining pollution problems.

9. Under what circumstances may a certified operator's certification be revoked?

The Water Pollution Control Systems Operator Certification Commission may revoke the certificate of any certified operator when it is found that:

- a) **The operator has practiced fraud or deception in the performance of his or her duties as a certified operator,**
- b) **Reasonable care, judgment, or the application of the operator's knowledge or ability were**

- not used during the performance of his or her duties as a certified operator; or**
- c) The operator is incompetent or unable to properly perform his or her duties as a certified operator.**
- d) Intentionally supplying false information in order to obtain, or maintain, certification; or**
- e) cheating on a certification examination.**

10. Distinguish between voluntary compliance and compulsory compliance.

Compulsory compliance is mandated by conditions of the user's permit. Voluntary compliance is an agreement between users and regulatory agencies usually of a temporary nature.

11. What is the Clean Water Act?

PL 92-500 is the Federal Water Pollution Control Act (1970). It is now the Clean Water Act. The ultimate goal is to maintain water qualities such that all waters are fishable and swimmable.

12. Be familiar with the laboratory certification requirements.

13. Explain the value of records as a tool in operating and planning wastewater treatment facilities.

14. State the purpose of NPDES Permit monthly monitoring reports.

15. Explain NPDES reporting procedures, including frequency of data collection, report preparation, report submission, responsibility for accuracy, and timeliness.

16. Identify the agency to which the NPDES reports should be submitted.

17. What monitoring reports are required by the State?

18. State the type of records and reports, which must be kept at the wastewater treatment plant and how long they must be kept there.

19. Given appropriate forms and data, prepare a monthly report to the State.

20. Identify reasons for maintaining the following records at a treatment plant and state what information must be included in each type of record:

- A. The plant log book;
- B. Wastewater flows (maximum, minimum, average);
- C. Wastewater temperature;
- D. Weather conditions;
- E. Plant units in operation;
- F. Plant units out of service and reasons why;
- G. Laboratory analytical results (see sampling laboratory procedures);
- H. Work in progress;
- I. Work completed;
- J. Important communications received and sent;
- K. Breakdowns;
- L. Personnel absences;
- M. Accidents;
- N. Visitors;
- O. Miscellaneous;

P. Sludge disposal records.

21. What is the laboratory field parameter certification? Who has to be certified and for what parameters?

Field Parameters Lab Rules:

22. What are the purposes of the Laboratory Certification rules?

- A. To assure that consistent and method compliant data is being reported to North Carolina regulatory agencies.
- B. To set certification criteria for laboratories performing any tests, analyses, measurements or monitoring required under G.S. 143 Article 21.
- C. Establish fees for certification program support.

23. What are the ways to assure that technicians performing field parameter testing are performing the analysis properly?

By a thorough review of bench sheets used by the facility by both internal and external data reviewers. When all information regarding the test parameters have been properly listed it, provides assurance that all of the method requirements have been achieved and performed properly. A copy of each approved analytical method is required to be kept on site.

24. What six analytical parameters (field tests) are covered by field parameter certification?

- A. Specific Conductance (Conductivity)
- B. Dissolved Oxygen
- C. pH
- D. Settleable Residue
- E. Total Residual Chlorine
- F. Temperature

25. What is the NCLC program, and what does it do?

The North Carolina Laboratory Certification program is the group responsible for compliance and enforcement of laboratory certification regulations.

26. What is involved in proficiency testing, and how often must this type of performance evaluation be performed once the laboratory is certified?

Proficiency testing consist of obtaining a blind sample of “unknown” value for each of the parameters for which you are certified, these “unknown” samples are obtained from an accredited provider that supplies the actual value of the “unknown” sample to the NCLC program and the client. North Carolina uses the NIST (National Institute of Standards and Technology) vendors. The certified laboratory then performs analysis of the sample and reports the value to the NCLC program where it will be reviewed for accuracy. Each facility must analyze one passing performance evaluation sample per year for each method for which certification is obtained.

27. Which two of the six analytical parameters that are covered by field parameter certification do not have performance evaluation (PE) samples of “unknown” value that can be used for annual proficiency testing?

Dissolved Oxygen and Temperature blind samples are not available; performance evaluation results are currently not required for these.

28. How long must the data for each analysis from a field parameter sample be kept and what information is required for each sample analyzed?

Pertinent data for each analysis must be maintained for 5 years. Required information is...

- Date and time sample collected
- Date and time of analysis
- Sample site
- Collector's and analyst's name
- Meter calibration record(s)
- True value and % recovery of all standards or buffers analyzed
- All data must be labeled with the proper units of measure

29. What is a bench sheet and what needs to be included on it?

A bench sheet is a printed sheet with spaces provided for information relative to the analysis being performed, it must contain...

- Date and time sample collected
- Date and time of analysis
- Sample site
- Collector's and analyst's name
- Meter calibration record(s)
- True value and % recovery of all standards or buffers analyzed
- All data must be labeled with the proper units of measure

30. For each instrument used for field parameter readings, how are calibrations documented?

A record of instrument calibration where applicable, must be filed in an orderly manner so as to be readily available for inspection upon request. It is recommended that calibration information is included on the same bench sheet as the daily data. Each facility must maintain a record of instrument calibration each analysis day. In cases such as residual chlorine and pH, where a calibration check standard is analyzed, the facility must document both the reading of the check standard as well as the applicable acceptance range.

31. What are some of the actions that can result in a laboratory being decertified?

- A. Failing to maintain the facilities, records, personnel, equipment or a quality control program.
- B. Submitting inaccurate data or information
- C. Failing to pay required fees by due date.
- D. Failing to discontinue supplying data for clients or programs when a decertification is in effect.
- E. Failing to provide a split sample to the state when requested.
- F. Failing to use approved methods.
- G. Failing to report changes in laboratory supervisor or equipment changes within 30 days.
- H. Failing to report analysis of required annual performance evaluation by due date.
- I. Failing to allow an inspection by an authorized representative.
- J. Failing to supply analytical data requested by state laboratory.

GRADE TWO NEEDS-TO-KNOW

Preliminary Treatment

1. Explain the operation of a comminutor.
2. Describe aerated grit removal units and their advantages and disadvantages.
3. Given the appropriate data, be able to calculate the velocity in a grit chamber.
4. Describe the control of velocity in a grit chamber through use of the following techniques:
 - A. Proportional weir (suro);
 - B. Parabolic weir;
 - C. Rectangular weir;
 - D. Parshall flume.
5. What is a typical velocity in a long channel grit chamber?
6. Explain the purpose of grit washing.
7. Describe the purpose and operation of a cyclone separator.
8. What are the typical amounts of grit removed from a wastewater influent?

Sedimentation and Flotation

1. Given drawings or diagrams, identify and describe the functions of the following components of clarifiers:
 - A. Circular clarifiers:
 - 1) Influent line;
 - 2) Stilling well;
 - 3) Skimmers;
 - 4) Scum trough;
 - 5) Scrapers;
 - 6) Sump;
 - 7) Sludge Withdrawal Pipe;
 - 8) Drive unit;
 - 9) Effluent trough;
 - 10) Vacuum sludge removal equipment;
 - B. Rectangular clarifiers:
 - 1) Influent line;
 - 2) Target baffle;
 - 3) Flights;
 - 4) Scum trough;
 - 5) Sump;
 - 6) Sludge withdrawal pipe;
 - 7) Drive unit;
 - 8) Effluent trough;
 - 9) Chains;

10) Skimmers.

2. Identify the importance of the following factors in the operation of sedimentation basins:
 - A. Sludge density;
 - B. Frequency of sludge removal;
 - C. Short circuiting.
3. Describe typical design requirements for clarifier detention times and removal efficiencies.
4. In a conventional wastewater treatment plant receiving only domestic wastewater, what is the approximate reduction in suspended solids and BOD through a primary clarifier?
5. What is usually done with the sludge and scum collected in a primary clarifier?
6. What types of equipment overload devices should be employed in connection with sedimentation basins?
7. Explain things to look for in identifying mechanical malfunctions of clarifiers.
8. What are some of the factors that must be considered in operating primary and secondary clarifiers in order to obtain best results?
9. Describe the effects of wind and temperature on settling basins and settleability.
10. Why is a secondary clarifier needed after a trickling filter or an aeration basin?
11. Describe the effects of influent flow variations on the efficiency of sedimentation.
12. Describe the effects of a clarifier malfunction on other treatment units.
13. Define and be able to calculate the surface loading rates and weir overflow rates for clarifiers.
14. What are the recommended weir overflow rates for primary clarifiers?
15. What are the recommended weir overflow rates for secondary clarifiers?
16. What are the effects of the recirculation of return sludge from final settling tanks to aeration tanks on detention time, surface settling rate and weir overflow rate for final settling tanks?
17. What is the effect of returning secondary sludge to be settled again in the primary clarifier?

BIOLOGY

1. Explain the nitrogen cycle.
2. What is nitrification and under what conditions will it occur?
3. What is denitrification and under what conditions will it occur?
4. Differentiate between the following types of organisms and describe their significance in wastewater

treatment:

- A. Algae
 - 1) Blue-green
 - 2) Green
- B. Rotifiers
- C. Nematodes
- D. Psychoda larvae
- E. Stalked ciliates
- F. Free-swimming ciliates
- G. Flagellates
- H. Filamentous
- I. Ameboids
- J. Worms
- K. Tardegrades

ATTACHED GROWTH SYSTEMS **(Trickling Filters and Rotating Biological Contactors-RBCs)**

1. What is an attached growth system?
 - A. Trickling Filter
 - B. Rotating Biological Contactors (RBCs)
2. Describe how to stop a rotating distributor on a trickling filter.
3. Why should the flow be shut off before attempting to work on the filter?
4. Describe needs and methods used in cleaning and flushing the orifices in trickling filter distributor arms.
5. Describe the purpose of trickling filter underdrains.
6. Explain the differences between various types of distribution systems on trickling filters.
7. Describe the characteristics of different types of trickling filter media.
8. Explain the importance of ventilation in trickling filters and how proper ventilation is assured in their design and operation.
9. Draw a flow schematic for a typical standard rate trickling filter plant.
10. Given diagrams or drawings of trickling filters, identify all of the following major components and describe the purpose of each.
 - A. Dosing siphons.
 - B. Different types of distribution device.
 - C. Central column sealing devices.
 - D. Bearing and bearing lubrication facilities.
 - E. Influent pipe.
 - F. Distributor base.

- G. Distributor arm.
 - H. Stay rods.
 - I. Turnbuckles.
 - J. Arm dump gates.
 - K. Fixed nozzles.
 - L. Splash plates.
 - M. Ventilation ports.
 - N. Tile underdrains.
 - O. Media
11. Explain which tests would be run on a RBC and explain why it is necessary to run these tests on a RBC.
 12. How is oxygen supplied to the biological growth on the RBC media?
 13. Explain why the tanks holding the wastewater that the media drum rotates in are contoured to the general shape of the media drum.
 14. What are some of the reasons that RBC media drums are covered?
 15. What is the appearance of the biomass during normal operation? What is the appearance of the biomass during an organically overloaded condition?
 16. If the RBC unit experiences loss of electrical power for an extended period (more than 4 hours) what actions should be taken?

Activated Sludge

1. Explain the purpose of the following in diffused air aeration systems:
 - A. Blowers;
 - B. Valves;
 - C. Piping;
 - D. Air flow meters;
 - E. Air filters;
 - F. Diffusers and diffuser systems;
 - G. Provision for balancing and adjusting air flows;
 - H. Lubrication;
 - I. Air compressors;
 - J. Turbines;
 - K. Pressure-relief valves
 - L. Timers.
2. Identify factors that determine air requirements in an activated sludge aeration basin.
3. What happens to the air requirements in an activated sludge aeration basin when there is an increase or a decrease in the amount of mixed liquor suspended solids?
4. Describe and differentiate between diffused air and mechanical aeration systems.
5. Identify typical return sludge flow rates, expressed as percent of influent flow.

6. Explain typical causes and corrective actions for shock loads, pH changes, septic loads and irregular flow in aeration basin influents.
7. Identify the analyses that would be of greatest significance in evaluating conditions in the activated sludge aeration basin.
8. Identify the purpose and importance of the following parameters in the operation of activated sludge systems.
 - A. 30-minute settleability
 - B. Dissolved oxygen (DO)
 - C. Mixed liquor suspended solids (MLSS)
 - D. Mixed liquor volatile suspended solids (MLVSS)
 - E. pH
 - F. Temperature
 - G. Nitrogen content
 - H. Phosphorus content
 - I. MCRT
 - J. F/M (food to microorganism) ratio
 - K. Sludge Volume Index (SVI)
 - L. Oxygen uptake rate
9. Identify the minimum dissolved oxygen (DO) required for an activated sludge process.
10. Identify proper safety procedures in connection with activated sludge.
11. Describe when and how excess activated sludge is wasted and the impact of inappropriate wasting.
12. Identify the following typical operational problems in activated sludge plants including causes, types of laboratory tests needed to confirm the problem and test results that would be associated with these problems. Also, explain reasonable steps for correcting each of the problems.
 - A. Sludge bulking
 - B. Rising sludge
 - C. Ash on top of clarifier
 - D. Over aeration
 - E. Filamentous growths
 - F. Toxic substances
 - G. Pin floc
 - H. Straggler floc
13. Explain how variations in flow rates cause problems in activated sludge plants.
14. Explain and differentiate between the following types of activated sludge processes.
 - A. Extended aeration
 - B. Conventional activated sludge
 - C. High-rate activated sludge
 - D. Describe the operation of a Sequential Batch Reactor (SBR) activated sludge system
 - E. Fixed/Film/Suspended Growth Systems
 - F. Kraus process
 - G. Step aeration

- H. Complete mix
 - I. Modified aeration high rate activated sludge
 - J. Contact stabilization
15. What are nitrification and denitrification and how do they impact the operation of an activated sludge plant.
16. What effect might heavy metals or insecticides have on an activated sludge plant?
18. Why is food to microorganism (F/M) ratio based on mixed liquor volatile suspended solids instead of mixed liquor suspended solids?
19. Given appropriate data, be able to solve problems involving the following for activated sludge plants:
- A. SVI;
 - B. Mean cell residence time (MCRT);
 - C. Sludge wasting rates;
 - D. Organic loading
 - E. F/M (food to microorganism)

Disinfection **(Chlorination, Dechlorination And UV Disinfection)**

1. Identify and describe the function and basic components of hypochlorinators.
2. Describe procedures for the detection and correction of chlorine leaks.
3. How do you determine the proper feed rates of dechlorinating agents?
4. Explain the reactions which occur when chlorine is added to wastewater.
5. What are chloramines?
6. What chemicals are used for the dechlorination of chlorinated effluents?
7. Identify various uses for chlorine in wastewater treatment operations other than disinfection.
8. List the most commonly used methods of dechlorination.
9. In what way does the UV system disinfect the wastewater?
10. Why are ultraviolet systems considered a safer method of disinfection?
11. What is the most common method of generation of ultraviolet light?
12. What are the most common methods of exposing the wastewater to the UV light/radiation?
13. What are the safety concerns with the operation of an UV Disinfection System?
14. What can affect the efficiency of the UV system?

15. What are the most common maintenance tasks associated with UV systems?
16. What method is used for cleaning the quartz sleeves?
17. What method is used to dispose of burned out UV lamps?
18. Define ultraviolet light/radiation?
19. Identify and briefly describe the following factors which affect the disinfection efficiency when using chlorine:
 - A. Combined, total or free chlorine residuals
 - B. Contact time
 - C. Temperature
 - D. pH
 - E. Presence and types of organic matter
 - F. Number of pathogens
 - G. Reducing agents
 - H. Maintenance of contact basin
 - I. Maintenance of chlorine diffusers

Advanced Treatment Systems

1. What are the forms of nitrogen found in wastewater and why is it necessary to treat them?
2. What are the effects of nitrogen and phosphorus in the receiving waters?
3. Why is it sometimes necessary to remove phosphorous from municipal wastewaters?
4. How is phosphorous removed by conventional secondary (biological) wastewater treatment facilities?
5. Where in the treatment plant flow could chemical precipitants be added?
6. How is nitrogen removed or altered by conventional secondary or biological treatment?
7. What is a typical flow application rate in gallons per minute per square foot (gpm/ft²) for tertiary filters?
8. Define and describe a gravity mixed-media filter.
9. Describe the operation and maintenance strategy for a mixed-media filter and membrane filtration.
10. Describe common operational problems occurring with a gravity mixed-media filter.
11. List the advantages and disadvantages of deep-bed versus traveling-bridge tertiary filters.
12. Define coagulation and flocculation and describe how each relates to wastewater treatment.
13. Describe how the following chemicals are commonly used in wastewater treatment:
 - A. Aluminum Sulfate (dry and liquid);
 - B. Ferric chloride;

- C. Lime;
 - D. Polymeric Flocculants (dry and liquid).
15. Describe why the use of metering equipment is important for a chemical feed system.
 16. Define the steps for selecting a chemical feeder. What considerations must be made when a chemical feeder is selected?
 17. Describe how to determine chemical dosage.
 18. Describe the procedure for performing a jar test.
 19. Define and describe a microscreen and an operational strategy for it.
 20. What is filtration?

Solids Handling and Disposal

1. What is the difference in performance between sand and asphalt sludge drying beds?
2. Explain the purpose and advantage of sludge thickening or direct dewatering of the sludge before digestion.
3. Name some uses for dried sludge. What precautions should be observed in using dried sludge?
4. Describe the values of sludge as a soil conditioner and fertilizer.

Sludge Digestion

General:

1. Describe the sludge that is generated by wastewater treatment.
2. What is the purpose and objective of sludge digestion?
3. Explain the basic differences between aerobic and anaerobic digesters.
4. What is the proper disposal method for the supernatant from sludge digestion?
5. Why are digesters mixed?
 - A. Anaerobic
 - B. Aerobic
6. What maintenance steps are necessary for sludge pumps and pipelines?
7. Describe the purpose of supernatant withdrawal devices.

8. What causes coning in a digester?
9. Why are the following materials undesirable in an anaerobic digester?
 - A. Grit
 - B. Toxic materials
 - C. Grease
 - D. Plastic products
 - E. Industrial by products

Aerobic:

10. Define aerobic digestion.
11. Describe the safety measures associated with aerobic digesters.
12. Identify and explain the purpose of each of the following aerobic sludge digestion components:
 - A. Mixing:
 - 1) Mechanical
 - 2) Diffused air
 - B. Piping:
 - 1) Withdrawal
 - 2) Recirculation
 - 3) Addition
 - C. Supernatant withdrawal.
13. What is the proper level of dissolved oxygen that should be maintained in an aerobic digester and why?
14. How many days are typically required for complete digestion?
15. Explain how aerobic digester foaming can be controlled.
16. List and explain some of the factors that determine the size and number of aerobic sludge digestion tanks?
17. What is the volatile content of properly digested aerobic sludge?
18. What is the normal percentage reduction of solids in an aerobic digester?

Mechanical and Maintenance Operations

1. Explain (define) each of the following:
 - A. Suction head (lift)
 - B. Friction head
 - C. Discharge head
 - D. Total pump capacity
 - E. Total dynamic head
 - F. Water horsepower

- G. Brake horsepower
 - H. Motor horsepower.
2. Explain the concept of pump and motor efficiencies. (The actual value is usually specified by the manufacturer.)
 3. Describe how each of the following affect the capacity of a centrifugal pump:
 - A. Size of the suction and discharge ports
 - B. Speed
 - C. Total dynamic head
 - D. Wear on the impeller.
 4. Describe how each of the following affect shaft couplings:
 - A. Pump cycling
 - B. Shaft misalignment
 - C. Worn bearings
 - D. Lubrication.
 5. Describe how each of the following affect the performance of a centrifugal pump:
 - A. Temperature and viscosity of the liquid pumped
 - B. Specific gravity of the liquid pumped.
 6. Describe procedures which should be employed for inventory control in a wastewater treatment plant.
 7. Explain the importance of the following factors in corrosion of waste collection and treatment systems:
 - A. Oxygen
 - B. Acidity
 - C. Carbon dioxide (CO₂)
 - D. pH
 - E. Temperature
 - F. Bacteria
 - G. Gaseous substances
 - H. Humidity
 - I. Galvanic action.

Instrumentation and Controls

1. Why is an audible and visual alarm important with lift stations and other instrumentation systems?
2. What is telemetry and how would it be used in various wastewater systems.
3. Describe the following types of instruments and outline their applications in wastewater treatment plants:
 - A. Flow measurement and control
 - B. Pressure measurement and control
 - C. Temperature measurement and control
 - D. pH measurement and control

- E. Chlorine measurement and control
 - F. Water level measurement and control
 - G. DO measurement and control
 - H. Turbidity meter
 - I. Intensity meter
 - J. Transmittance measurement
4. Distinguish between indicators, recorders and totalizers and indicate the purpose of each.
 5. If a flow meter is not within 10% of the correct reading, what items should be checked as potential causes of the error?
 6. What maintenance is required for water-level float controls?
 7. What is the significance of the submergence in a Parshall flume?

Sampling

1. What is the purpose of sampling?
2. What are the differences between a grab and composite sample?
3. What are the objectives of routine process control and compliance sampling?
4. What field parameters are typically measured in the effluent and receiving waters?
5. Describe circumstances when grab and composite samples may be desirable.
6. Describe techniques and precautions necessary to collect representative samples of wastewater.
7. Explain the importance of the following in sampling:
 - A. Cleanliness of containers and measuring devices
 - B. Accuracy of records (labels, locations, time, data, type sample, weather, other information)
 - C. Refrigeration of samples
 - D. Chemical preservation of samples
 - E. Chain-of-custody.
8. Why is it necessary to note the physical characteristics of the sample and sample site?
9. Why should the receiving waters be sampled above and below the discharge point?
10. Identify locations in a treatment system where it would be appropriate to make various solids determinations.
11. Describe how to solve problems to determine the volume that should be collected at each time interval to form a composite sample that is flow proportional.
12. Define the following types of samples:
 - A. Grab

- B. Flow proportional composite samples
 - C. Continuous composite samples
 - D. Timed composite samples.
13. What are the objectives of pre-plant and in-plant investigative monitoring and how do they determine the monitoring procedures that are to be implemented?
 14. Describe the factors which must be considered in establishing sampling frequency.
 15. List the different types of sample containers and the samples that have to be collected in each type.

Laboratory Procedures

1. Describe proper techniques for washing glassware and the importance of such.
2. Why should acid be added to water rather than the reverse?
3. Why should you always use a rubber bulb or other mechanical means to pipette wastewater and chemical solutions?
4. Describe the most common test for fecal coliform bacteria.
5. Distinguish between the total coliform and fecal coliform tests.
6. Name a specific chemical commonly used in a wastewater treatment plant laboratory which must be stored in each type of container and why each type of container is important.
 - A. Dark
 - B. Plastic
 - C. Glass
 - D. Vented containers
7. Define each of the following analyses and explain the significance of each analysis in wastewater treatment:
 - A. Chemical oxygen demand (COD)
 - B. Settleability, 30-minute
 - C. Oil and Grease
 - D. Percent moisture
 - E. Oxygen uptake rate
 - F. Biochemical oxygen demand (BOD)
 - G. TSS
 - H. Fecal coliform bacteria
 - I. Nitrogen
 - 1) Ammonia (NH₃)
 - 2) Total Kjeldahl (TKN)
 - 3) Nitrite (NO₂)
 - 4) Nitrate (NO₃)
 - 5) Phosphorus
 - J) Effluent

8. Discuss the procedures for performing an activated sludge settleability test.
9. Given appropriate laboratory data, explain how to calculate the BOD of a sample.
10. What is a standard solution and why? How is it used?
11. Describe the proper labeling of standard solutions and outline precautions for proper handling of these solutions.
12. Why should approved methods be used when performing wastewater analyses? Where are approved methods found?
13. What are interferences and how do they affect analytical results?

Required Technical Knowledge

1. Describe how to read and interpret pump curves, graphs, charts, data trend curves, tables and nomographs.
2. Given appropriate data, be able to calculate each of the following:
 - A. Sludge wasting rates
 - B. Surface settling rate
 - C. Weir overflow rate
 - D. Trickling filter hydraulic and organic loadings
 - E. Sludge age
 - F. MCRT
 - G. BOD (unseeded)
 - H. Horsepower (water)
 - I. Percent settleable solids
 - J. Sludge volume index (SVI)
 - K. Recirculation rates
 - L. Velocity and flows
 - M. Aeration basin volume and radius/diameter from given detention time and plant flow
 - N. F/M

Industrial Pretreatment

1. What is meant by the term Industrial Pretreatment?
2. What is the purpose of pretreatment of industrial wastes before disposal into a municipal system?
3. What is meant by SIC number?
4. What is meant by shock load and what constitutes a shock load?
5. What constituents may be in industrial wastes which might interfere with biological treatment?

6. What is meant by industrial wastewater?
7. Why is knowledge of industrial wastes important in the operation of municipal treatment systems?
8. Identify the characteristics of industrial wastewater, which may be especially important and/or harmful in municipal treatment plants.
9. Identify some of the potential effects of industrial wastewaters on streams which are different from effects of domestic wastewater effluent.
10. Identify some of the major problems, which may be encountered in the operation of municipal plants as the result of industrial wastewater discharges.

Laws and Regulations

REFERENCE - North Carolina Administrative Code: Chapter 8 – Water Pollution Control System Operators Certification Commission; Appendix 1: Wastewater Rules; Appendix 2: NPDES Permit; Appendix 3: DMR Forms and Instructions; Appendix 4: CFR 503 Regulations

Certification Rules:

1. Identify the North Carolina governmental agency which has principal responsibility for water pollution control activities state-wide.

The Division of Water Quality (DWQ) in the Department of Environment and Natural Resources (DENR).

2. Identify the federal agency which has primary responsibility for establishing policy and regulations concerning water pollution control nation-wide.

The United States Environmental Protection Agency (US EPA)

3. Describe the functions of the Water Pollution Control System Operators Certification Commission.

The Commission has two functions:

1. Classification of water pollution control systems
2. Certification of water pollution control system operators.

4. Describe the current State regulatory procedure with respect to water pollution violations and identify penalties which can be imposed for those violations.

A civil penalty of not more than \$25,000 per day per violation may be assessed for any NPDES permit limit violation, or water quality standard violation, against the permit holder, or the operator, of a water pollution control system. In addition, a civil penalty, not to exceed \$10,000 per day per violation, may be levied for continuous water quality violations against the permit holder, or the operator, of a water pollution control system.

5. Describe the five basic NPDES monitoring parameters and state the significance of each in the regulatory control of wastewater:

A. Flow - The basic unit of daily volume discharge

- B. BOD - The best indicator of wastewater strength
- C. Suspended solids - Readily determined measure of treatment efficiency
- D. pH - Critical factor in protecting aquatic life
- E. Fecal coliform - Indicator organism for determining pollution problems.

6. Under what circumstances may a certified operator's certification be revoked, suspended, or reprimand?
7. The Water Pollution Control Systems Operator Certification Commission may revoke the certificate of any certified operator when it is found that:
- a) **the operator has practiced fraud or deception in the performance of his or her duties as a certified operator;**
 - b) **reasonable care, judgment, or the application of the operator's knowledge or ability were not used during the performance of his or her duties as a certified operator; or**
 - c) **the operator is incompetent or unable to properly perform his or her duties as a certified operator.**
 - d) **intentionally supplying false information in order to obtain, or maintain, certification; or**
 - e) **cheating on a certification examination.**
9. Distinguish between voluntary compliance and compulsory compliance.

Compulsory compliance is mandated by conditions of the user's permit. Voluntary compliance is an agreement between users and regulatory agencies usually of a temporary nature.

10. What is Public Law 92-500?

PL 92-500 is the Federal Water Pollution Control Act (1970). It is now the Clean Water Act. The ultimate goal is to maintain water qualities such that all waters are fishable and swimmable.

11. Be familiar with the permit requirements for land application of sludge.
12. Be familiar with the laboratory certification requirements.
13. Be familiar with the industrial pretreatment program requirements.
14. What are the Code of Federal Regulations (CFR) 503 regulations?
15. What are the requirements for reporting a spill?
16. Understand all sections of NPDES permit.
17. What is the frequency for calibration for flow measurement systems and what is the acceptable percentage of correct reading?

Field Parameters Lab Rules:

17. What are the purposes of the Laboratory Certification rules?

- A. To assure that consistent and method compliant data is being reported to North Carolina regulatory agencies.
- B. To set certification criteria for laboratories performing any tests, analyses, measurements or monitoring required under G.S. 143 Article 21.
- C. Establish fees for certification program support.

18. What are the ways to assure that technicians performing field parameter testing are performing the analysis properly?

By a thorough review of bench sheets used by the facility by both internal and external data reviewers. When all information regarding the test parameters have been properly listed it, provides assurance that all of the method requirements have been achieved and performed properly. A copy of each approved analytical method is required to be kept on site.

19. What 6 analytical parameters (field tests) are covered by field parameter certification?

- A. Specific Conductance (Conductivity)
- B. Dissolved Oxygen
- C. pH
- D. Settleable Residue
- E. Total Residual Chlorine
- F. Temperature

20. What is the NCLC program, and what does it do?

The North Carolina Laboratory Certification program is the group responsible for compliance and enforcement of laboratory certification regulations.

21. What is involved in proficiency testing, and how often must this type of performance evaluation be performed once the laboratory is certified?

Proficiency testing consist of obtaining a blind sample of “unknown” value for each of the parameters for which you are certified, these “unknown” samples are obtained from an accredited provider that supplies the actual value of the “unknown” sample to the NCLC program and the client. North Carolina uses the NIST (National Institute of Standards and Technology) vendors. The certified laboratory then performs analysis of the sample and reports the value to the NCLC program where it will be reviewed for accuracy. Each facility must analyze one passing performance evaluation sample per year for each method for which certification is obtained.

22. Which 2 of the 6 analytical parameters that are covered by field parameter certification do not have performance evaluation (PE) samples of “unknown” value that can be used for annual proficiency testing?

Dissolved Oxygen and Temperature blind samples are not available; performance evaluation results are currently not required for these.

23. How long must the data for each analysis from a field parameter sample be kept and what information is required for each sample analyzed?

Pertinent data for each analysis must be maintained for 5 years. Required information is...

- Date and time sample collected
- Date and time of analysis
- Sample site
- Collector's and analyst's name
- Meter calibration record(s)
- True value and % recovery of all standards or buffers analyzed
- All data must be labeled with the proper units of measure

24. What is a bench sheet and what needs to be included on it?

A bench sheet is a printed sheet with spaces provided for information relative to the analysis being performed, it must contain...

- Date and time sample collected
- Date and time of analysis
- Sample site
- Collector's and analyst's name
- Meter calibration record(s)
- True value and % recovery of all standards or buffers analyzed
- All data must be labeled with the proper units of measure

25. For each instrument used for field parameter readings, how are calibrations documented?

A record of instrument calibration where applicable, must be filed in an orderly manner so as to be readily available for inspection upon request. It is recommended that calibration information is included on the same bench sheet as the daily data. Each facility must maintain a record of instrument calibration each analysis day. In cases such as residual chlorine and pH, where a calibration check standard is analyzed, the facility must document both the reading of the check standard as well as the applicable acceptance range.

26. What are some of the actions that can result in a laboratory being decertified?

- Failing to maintain the facilities, records, personnel, equipment or a quality control program.
- Submitting inaccurate data or information
- Failing to pay required fees by due date.
- Failing to discontinue supplying data for clients or programs when a decertification is in effect.
- Failing to provide a split sample to the state when requested.
- Failing to use approved methods.
- Failing to report changes in laboratory supervisor or equipment changes within 30 days.
- Failing to report analysis of required annual performance evaluation by due date.
- Failing to allow an inspection by an authorized representative.
- Failing to supply analytical data requested by state laboratory.

Records and Reports:

27. Explain the value of records as a tool in operating and planning wastewater treatment facilities.

28. State the purpose of NPDES Permit monthly monitoring reports.

29. Explain NPDES reporting procedures, including frequency of data collection, report preparation,

report submission, responsibility for accuracy, and timeliness.

30. Identify the agency to which the NPDES reports should be submitted.
31. What monitoring reports are required by the State?
32. State the type of records and reports which must be kept at the wastewater treatment plant and how long they must be kept there.
33. Given appropriate forms and data, prepare a monthly report to the State.
34. Identify reasons for maintaining the following records at a treatment plant and state what information must be included in each type of record:
 - A. The plant log book
 - B. Wastewater flows (maximum, minimum, average)
 - C. Wastewater temperature
 - D. Weather conditions
 - E. Plant units in operation
 - F. Plant units out of service and reasons why
 - G. Laboratory analytical results (see sampling laboratory procedures)
 - H. Work in progress
 - I. Work completed
 - J. Important communications received and sent
 - K. Breakdowns
 - L. Personnel absences
 - M. Accidents
 - N. Visitors
 - O. Miscellaneous
 - P. Sludge disposal records.

Public Relations

1. Explain the need for maintaining good public relations as part of ensuring public support.
2. Explain the importance of maintaining good public relations with each of the following groups:
 - A. Regulatory agencies
 - B. City councils
 - C. Civic groups
 - D. Industries
 - E. Environmental groups
 - F. Governing agencies
 - G. Local Health Department.
3. Explain the role of each of the following as factors influencing public relations:
 - A. Attitude
 - B. Manner
 - C. Appearance
 - D. Conduct
 - E. Spirit

- F. Quality and quantity of work
 - G. Responsibility
 - H. Knowledge of work and responsibility
 - I. Morale and pride
 - J. Confidence
 - K. Interest
 - L. Honesty.
4. Explain the importance of having a designated spokesperson to deal with the press.
 5. Explain the role of the following in maintaining good public relations:
 - A. Good housekeeping
 - B. Odor control
 - C. Insect control
 - D. Information booklets, pamphlets, brochures, etc.
 - E. Handling complaints
 - F. Plant tours.
 6. Explain what should and should not be included in news releases.
 7. Explain the role of the following in ensuring good public relations:
 - A. News releases
 - B. Photographs
 - C. Advertisements
 - D. Bulletins and newsletters
 - E. Activities reports
 - F. Plant information booklets, pamphlets, brochures, etc.
 - G. Operating reports and records.

Health and Safety

1. Explain the need for safety in wastewater treatment plants.
2. Describe the hazards of infection and explain how to minimize them.
3. Explain reasons for the following basic rules of good personal hygiene in wastewater treatment plants as listed below:
 - A. Keep hands and fingers away from eyes, ears, nose and mouth.
 - B. Wear rubber gloves.
 - C. Wash hands before eating and smoking.
 - D. Do not store personal clothes with work clothes.
 - E. Give cuts and scratches first aid immediately.
 - F. Take a shower after work.
 - G. Receive inoculations for typhoid fever, tetanus, etc.
 - H. Provide waterless hand cleaners at various locations throughout the plant.
4. Explain why each of the following precautions is important:

- A. Do not lift more than can be handled comfortably.
 - B. Establish a solid footing and good balance before lifting.
 - C. Get as close to the load as possible when lifting or carrying.
 - D. Keep the back straight, gripping the object firmly, and using the legs to provide lift.
 - E. Never carry a load that is too large to see over or around.
5. Describe hazards commonly encountered with respect to falling and explain methods for minimizing them.
 6. Describe special hazards existing in treatment plants with respect to drowning and explain how to minimize them.
 7. Explain the importance of color selection in painting piping and other equipment in the treatment plant.
 8. Why should NO SMOKING areas, exits and evacuation routes be clearly identified?
 9. Why is it especially important for wastewater treatment plant operators to have knowledge of first aid?
 10. Describe the basic good housekeeping measures listed below, explain the reason for each and describe why they encourage safety.
 - A. Have a routine cleaning program
 - B. Keep floors dry or provide platforms
 - C. Remove trash and loose debris
 - D. Repair loose boards, holes, splinters and protruding nails
 - E. Keep walkways free of oil, grease and sludge
 - F. Keep combustible wastes in metal air-tight containers and remove from the plant daily
 - G. Regular painting
 - H. Grass mowed and trimmed
 - I. Prompt cleanup of spills
 - J. Clean windows
 - K. Use of kick-plates on catwalks and raised surfaces
 11. What types of security measures should be enforced regarding the following and why?
 - A. Fencing
 - B. Limited access
 - C. Supervision of visitors
 12. Identify electrocution hazards in wastewater treatment plants and explain how to minimize them.
 13. Identify and describe hazards and appropriate safety precautions in wastewater treatment plants and collection systems with respect to :
 - A. Gases
 - B. Poisonous substances
 - C. Suffocation
 - D. Explosions
 - E. Confined spaces
 - F. Blood-borne pathogens
 14. Describe the physiological effects of harmful gases to the respiratory system, nerves, blood, etc.

15. Describe why the following procedures are necessary when harmful gases exist in work areas:
 - A. Purging to remove toxic or flammable gases.
 - B. Use of self-contained air packs in the event of a chlorine leak.
16. What percent oxygen concentration is necessary in air to sustain life?
17. Define 'confined space' and the permit required for confined space.
18. Describe how to test for an oxygen deficiency and toxic gas.
19. Explain why the following conditions cause oxygen deficiency in wastewater treatment plants and collection systems:
 - A. Poor ventilation.
 - B. Displacement of air by another gas.
 - C. Absorption, consumption or biochemical depletion of air by decomposition of organic matter in sewers, manholes and covered tanks.
20. Describe procedures that should be followed if an oxygen deficiency exists.
21. Explain the difference between a gas mask and self-contained breathing apparatus.
22. Identify hazardous locations in small, simple wastewater treatment plants with respect to encouraging noxious gases and oxygen deficiency.
23. Identify types of protective clothing which should be available in wastewater treatment plants and describe conditions under which each type of protective clothing should be worn.
24. What are the three ingredients necessary for a fire?
25. Why is noise considered a safety hazard?
26. Explain the importance of proper lighting as a safety measure.
27. What action must be taken when electrical equipment is repaired or installed in a wastewater treatment plant and in collection systems?
28. Explain the need for fire proofing chemical storage facilities.
29. Describe routine testing and maintenance procedures that should be followed to ensure proper operation of safety equipment and measures.
30. Describe the importance and typical locations for installation of guard rails, warning signs and other protective equipment in wastewater treatment plants.
31. What agency administers the OSHA program in North Carolina?
32. Describe the reason for each of the following precautions when working in below-ground structures:

- A. Placing warning devices, barricades or guard rails around manholes.
- B. Placing trucks and equipment between working area and traffic.
- C. Removing manhole covers with hoists or hooks.
- D. Prohibiting smoking in any underground structure.
- E. Testing for oxygen deficiency and dangerous gases.
- F. Requiring each worker entering a manhole to wear a harness and lifeline.
- G. Stationing two men at the entrance to a manhole while a third worker is in the manhole.
- H. Ventilating and purging the underground structure with fresh air.
- I. Using non sparking tools, shoes with rubber soles, and safety lights.
- J. Permitting no open flames in or near the structure.

33. What emergency phone numbers should always be kept posted in a conspicuous place?
34. What are the employer's responsibilities for providing necessary safety equipment? How and why should employees be informed that it is for their benefit?
35. Describe the safety requirements needed with respect to belts, coupling guards, electrical disconnects and lockout procedures.
36. Identify the poisonous snakes and insects (water moccasins, black widow and brown recluse spiders, fire ants, wasps, etc.) that may be encountered in and around a wastewater treatment plant and describe the first aid actions that will be needed in the event of a bite or sting.
37. Describe how to organize and implement a good safety training program. What are some of the main issues that should be addressed?
38. Identify where you can obtain training films and other training aids in order to carry out safety training programs.
39. What is the Occupational Health and Safety Act (OHSA) and what is involved in complying with it in wastewater treatment plants?
40. Explain the importance of informing plant employees about safety laws and describe methods for encouraging compliance with them.
41. Describe the requirements of the "Right To Know" regulations.
42. What is an oxygen enriched and oxygen deficient atmosphere?

APPENDIX 1: WASTEWATER RULES

SUBCHAPTER 8G - AUTHORITY: ORGANIZATION: STRUCTURE: DEFINITIONS

SECTION .0100 - GENERAL PURPOSE AND DEFINITIONS

15A NCAC 08G .0101 PURPOSE

The purpose of these Rules is to:

- (1) protect the public health of the citizens of the State; and
- (2) conserve, protect, and maintain the quality of the water resources of the State as assigned by the North Carolina Environmental Management Commission; and
- (3) protect the public investment in water pollution control systems; and
- (4) provide for the classification of water pollution control systems; and
- (5) establish the procedures for the examination and certification of operators of water pollution control systems.

History Note: Authority G.S. 90A-35;
Eff. April 1, 1999.

15A NCAC 08G .0102 DEFINITIONS

- (a) "Activated sludge" means a biological wastewater treatment process in which predominantly biodegradable pollutants in wastewater are absorbed, or adsorbed, by living aerobic organisms and bacteria in an aerated suspension which is separated from the treated wastewater gravimetrically.
- (b) "Actual experience" means the time working as a water pollution control system operator or operator in responsible charge. An operator is an individual whose principal job responsibility is the actual physical operation of process equipment and systems at a water pollution control system. Primary job responsibilities such as laboratory testing, facility and equipment maintenance, administrative support, or direct or indirect supervision do not qualify as actual experience.
- (c) "Approved training" means any training, required in order to be eligible for an examination or to meet continuing education requirements as established in accordance with 15A NCAC 08G .0400 and 15A NCAC 08G .0701. The standards for approved training shall be developed by a committee consisting of representatives for training sponsors, DWQ staff, instructors and certified operators. The standards must be approved by the Commission and shall be known as "Water Pollution Control System Operator Certification Commission Training Course Standards" or "Needs to Know". These standards can be found at <http://h20.enr.state.nc.us/tacu>.
- (d) "Back-up ORC" means Back-up Operator in Responsible Charge and refers to the operator who is designated to act as surrogate for the Operator in Responsible Charge (ORC) when the ORC is absent from his or her professional duties as set forth in G.S. 90A-44.
- (e) "Basic sciences" means courses in agronomy, biology, botany, chemistry, engineering, environmental health and sciences, geology, math, physics, soil science, and zoology offered by an accredited college or university.
- (f) "Chemical process" means a water pollution control system process consisting exclusively of the addition of chemicals to treat wastewaters.
- (g) "Collection system" means a continuous connection of pipelines, conduits, pumping stations and other related constructions or devices used to conduct wastewater to a water pollution control system.
- (h) "Commission" means the Water Pollution Control System Operators Certification Commission created by G.S. 143B-300.
- (i) "Contact Hour" means one hour of Commission approved operator instruction in accordance with 15A NCAC 08G .0701.
- (j) "Contract operations firm" means any commercial water pollution control system operations firm which contracts with the owner of a water pollution control system to provide operational services for the system pursuant to G.S. 90A-45(a).
- (k) "Contract operator" means any certified water pollution control system operator who contracts with the owner of a water pollution control system to provide operational and other services for the system pursuant to G.S. 90A-45(a).
- (l) "Electrodialysis system" means a system utilizing a selective separation of dissolved solids process that is based on electrical charge and diffusion through a semipermeable membrane.
- (m) "Fixed growth" means a biological wastewater treatment system in which the wastewater is treated by contact with a biological growth that is affixed to support media and includes systems such as trickling filters, rotating biological contactors, and biological tower treatment systems.
- (n) "GED" means general educational development in reference to a high school diploma equivalency.
- (o) "Nutrient Reduction" means the reduction of total nitrogen or total phosphorous by an activated sludge or fixed growth process.
- (p) "Operator in Training (OIT)" means the certificate issued with Commission approval to an individual prior to the completion of the experience requirements for that level of certification.

- (q) "Operator in Responsible Charge (ORC)" means the individual designated by a person, firm, or corporation (municipal or private) owning or having control of a water pollution control system as the operator of record of the water pollution control system and who has primary responsibility for the operation of such system as defined in G.S. 90A-46.
- (r) "Owner" means the person, firm, or corporation (municipal or private) owning or having control of a water pollution control system as described in G.S. 90A-44.
- (s) "Passing score" means earning 70 percent of the available points on an examination administered by the Commission.
- (t) "Permanent certificate" means the certificate of competency issued by the Commission to an individual as the result of the individual obtaining a passing score on an examination administered by the Commission, or a certificate issued by reciprocity agreement by the Commission, and is subject to the provisions of G.S. 90A-40(a).
- (u) "Physical/Chemical system" means any water pollution control system which utilizes a physical or a chemical process or both.
- (v) "Physical process" means any water pollution control system process consisting of electro dialysis, adsorption, absorption, air stripping, gravimetric sedimentation, flotation or filtration as the means of treatment.
- (w) "Reciprocity certificate" means a certificate issued of the appropriate type and grade without examination to any person who is properly registered on the "National Association of Boards of Certification" Reciprocity Register and who meets all other requirements of these Rules as set forth in G.S. 90A-40(b).
- (x) "Regional office" means one of the seven local offices of the Division of Water Quality located across the State.
- (y) "Residuals" means any solid or semisolid byproduct that is produced by the treatment of wastewater in a water pollution control system.
- (z) "Reverse osmosis system" means a system which utilizes solutions and semipermeable membranes to separate and treat wastewaters.
- (aa) "Successful completion" means the attendance of at least 80 percent of the approved training for examination eligibility and 100 percent of training for continuing education.
- (bb) "Temporary certificate" means a certificate issued of an appropriate type and grade, without examination, to any person employed as a water pollution control system operator when the Commission finds that the supply of certified operators, or persons with the training and experience necessary for certification, is inadequate and the situation meets the requirements set forth in G.S. 90A-40(e).
- (cc) "Ultrafiltration system" means a system which utilizes a membrane filter process to remove pollutants from wastewater.
- (dd) "Valid certificate" means the certificate of an operator that has all required renewal fees paid, all required continuing education training completed, and has not been revoked relinquished, invalidated, or suspended.
- (ee) "Water pollution control system" means any system for the collection, treatment, or disposal of wastewater and is classified under the provisions of G.S. 90A-37.

*History Note: Authority G.S. 143B-300;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

SECTION .0200 - DUTIES AND RESPONSIBILITIES

15A NCAC 08G .0201 RESPONSIBILITY OF SYSTEM OWNERS TO DESIGNATE CERTIFIED OPERATORS

Owners of classified water pollution control systems must designate operators, certified by the Water Pollution Control System Operators Certification Commission (WPCSOCC), of the appropriate type and grade for the system, and, for each classification must:

- (1) designate one Operator In Responsible Charge (ORC) who possesses a valid certificate of the type and grade at least equivalent to the type and grade of the system;
- (2) designate one or more Back-up Operator(s) in Responsible Charge (Back-up ORCs) who possesses a valid certificate of the type of the system and no more than one grade less than the grade of the system, with the exception of no backup operator in responsible charge is required for systems whose minimum visitation requirements are twice per year; and
- (3) submit a signed completed "Water Pollution Control System Operator Designation Form" to the Commission (or to the local health department for owners of subsurface systems) countersigned by the designated certified operators, designating the Operator in Responsible Charge (ORC) and the Back-up Operator in Responsible Charge (Back-up ORC):
 - (a) 60 calendar days prior to wastewater or residuals being introduced into a new system; or
 - (b) within 120 calendar days following:
 - (i) receiving notification of a change in the classification of the system requiring the designation of a new Operator in Responsible Charge (ORC) and Back-up Operator in Responsible Charge (Back-up ORC) of the proper type and grade; or

- (ii) a vacancy in the position of Operator in Responsible Charge (ORC) or Back-up Operator in Responsible Charge (Back-up ORC).
- (c) within seven calendar days of vacancies in both ORC and Back-up ORC positions replacing or designating at least one of the responsibilities.

History Note: Authority G.S. 90A-37; 90A-38; 90A-39; 90A-40; 90A-41; 90A-42; 90A-43; 90A-44; 90A-45; Eff. April 1, 1999; Amended Eff. December 1, 2006.

15A NCAC 08G .0202 RESPONSIBILITIES OF SYSTEM OWNERS

History Note: Authority G.S. 90A-37 through 90A-45; Eff. April 1, 1999; Repealed Eff. December 1, 2006.

15A NCAC 08G .0203 RESPONSIBILITIES OF ALL CERTIFIED OPERATORS

Certified operators must:

- (1) comply with all terms and conditions of their certification as set forth in these Rules;
- (2) notify the Commission, in writing, within 30 calendar days of any changes in their mailing address;
- (3) be responsible for the renewal of their certification(s) as specified in Section .0700 of this Subchapter; and
- (4) comply with all statutes and rules regarding the operation of water pollution control systems.

History Note: Authority G.S. 90A-40; 90A-41; 90A-42; 90A-44; Eff. April 1, 1999; Amended Eff. December 1, 2006.

15A NCAC 08G .0204 RESPONSIBILITIES OF AN OPERATOR IN RESPONSIBLE CHARGE (ORC)

An Operator in Responsible Charge (ORC) of a water pollution control system must:

- (1) possess a valid certificate of the appropriate type and grade for the system;
- (2) visit the system as often as is necessary to insure the proper operation of the system but in no case less frequently than specified in the following schedule, unless otherwise specified in permit:
 - (a) biological grade I systems with the exception of Sub-item (2)(e) of this Rule; weekly;
 - (b) biological grade II, III, and IV systems, other than those systems specified in Sub-item(2)(f) of this Rule; five days per week, excluding holidays;
 - (c) surface irrigation systems with the exception of Sub-item (2)(e) of this Rule; weekly;
 - (d) collection systems; within 24 hours of knowledge of a bypass, spill, or overflow of wastewater from the system unless visited by a collection system Back-up Operator in Responsible Charge;
 - (e) domestic wastewater systems with a treatment capacity of 1500 gallons per day or less; twice per year with a six month interval between visits;
 - (f) domestic wastewater aerobic treatment units (ATUs) with a treatment capacity of 1500 gallons per day or less; weekly;
 - (g) systems permitted under rules adopted by the Commission for Health Services; as required by 15A NCAC 18A .1961;
 - (h) physical/chemical systems:
 - (i) grade I systems, including groundwater remediation systems; weekly;
 - (ii) grade II systems; five days per week, excluding holidays
 - (i) land application systems during or within 48 hours after application of residuals;
 - (j) systems not otherwise classified; as specified by the Commission based on the complexity of the system;
- (3) operate and maintain the system efficiently and attempt to insure the compliance of the system with any permit(s) issued for the system as well as any other applicable local, state, and federal environmental permitting and regulatory requirements;
- (4) certify, by signature, as to the validity of all monitoring and reporting information performed on the system as prescribed in any permit issued for the system and provide the owner a copy;
- (5) document the operation, maintenance, and all visitation of the system in a daily log that must be maintained at the system;
- (6) notify the owner of the system as soon as possible, and in writing within five calendar days of first knowledge, of any:

- (a) overflows from the system or any treatment process unit;
 - (b) bypasses of the system or any treatment process unit; or
 - (c) violations of any limits or conditions of the permit.
- (7) notify the owner, in writing, of the need for any system repairs and modifications that may be necessary to insure the compliance of the system with all local, state, and federal environmental permitting and regulatory requirements;
- (8) be available:
- (a) for consultations with the system owner and regulatory officials;
 - (b) to handle emergency situations; and
 - (c) to provide access to the facility by regulatory agencies; and
- (9) upon vacating an ORC position, notify the Commission and the appropriate regional office of the Division of Water Quality (or the local health department for owners of subsurface systems) of the vacancy, in writing within 14 calendar days.

*History Note: Authority G.S. 90A-37 through 90A-40; 90A-44;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0205 RESPONSIBILITIES OF A BACK-UP OPERATOR IN RESPONSIBLE CHARGE (BACK-UP ORC)

The Back-up Operator in Responsible Charge (Back-up ORC):

- (1) may act as surrogate for the Operator in Responsible Charge (ORC), if he/she possesses a valid certificate of the appropriate type and grade for the system, for a period:
 - (a) not to exceed 40 percent of the system visitations required per calendar year under Rule .0204(2) of this Section; or
 - (b) not to exceed 120 consecutive calendar days when the Operator in Responsible Charge (ORC) is absent due to:
 - (i) the vacancy of the Operator in Responsible Charge (ORC) position; or
 - (ii) personal or familial illness; and
- (2) must fulfill all of the requirements of Rule .0204 of this Section when acting as surrogate for the Operator in Responsible Charge (ORC); and
- (3) upon vacating a Backup ORC position, notify, in writing, the Commission and the appropriate regional office of the Division of Water Quality (or the local health department for owners of subsurface systems) of the vacancy within 14 calendar days.

*History Note: Authority G.S. 90A-37; 90A-44;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

SECTION .0300 - CLASSIFICATION OF WATER POLLUTION CONTROL SYSTEMS

15A NCAC 08G .0301 APPLICABILITY

- (a) The purpose of this Section is to establish procedures for the classification of water pollution control systems.
- (b) Notwithstanding the requirements in Rules .0302 through .0307 of this Section, the Commission may modify the classification of a water pollution control system when:
 - (1) conditions created by system design features, or inherent operational requirements, exist which make normal operation of the system more or less complex;
 - (2) upgrades or other modifications to a system are completed; or
 - (3) changes in Commission classification rules are made.
- (c) In-plant processes and related water pollution control equipment which are integral parts of direct industrial production, are not considered water pollution control systems for the purpose of this Section.
- (d) Water Pollution Control Systems permitted under rules adopted by the Commission for Health Services shall be classified pursuant to Rule .0307 of this Section.
- (e) Water Pollution Control Systems permitted under rules adopted by the Environmental Management Commission shall be classified pursuant to Rules .0302 through .0308 of this Section.
- (f) Reservoirs, settling ponds and associated pumps and piping which are an integral part of closed-loop water recycle systems for the non-biological and non-toxic treatment of process water at sand, gravel, crushed stone and similar operations shall not be subject to

the requirements of these Rules unless the Commission determines that the system is not being properly operated or maintained in accordance with permit conditions.

(g) Any water pollution control system, regardless of type or ownership, may be classified and required to designate an Operator in Responsible Charge (ORC) and a Back-up Operator in Responsible Charge (Back-up ORC), in the event that the Commission determines that the system is not being properly operated or maintained.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0302 CLASSIFICATION OF BIOLOGICAL WATER POLLUTION CONTROL TREATMENT SYSTEMS

(a) The following discharging systems are assigned a classification of Grade I Biological Water Pollution Control System unless the permitted flow, or operational complexity of the system requires a higher classification:

- (1) septic tank/sand filter systems;
- (2) biological lagoon systems; and
- (3) constructed wetlands and associated appurtenances.

(b) Systems that utilize an activated sludge or fixed growth process with a permitted flow less than or equal to 0.5 million gallons per day (mgd) are assigned the classification of Grade II Biological Water Pollution Control System.

(c) Systems utilizing an activated sludge or fixed growth process with permitted flows of greater than 0.5 through 2.5 million gallons per day (mgd) are assigned the classification of Grade III Biological Water Pollution Control System.

(d) Systems utilizing an activated sludge or fixed growth process with a permitted flow greater than 2.5 million gallons per day (mgd) are assigned a classification of Grade IV Biological Water Pollution Control System.

(e) Any system receiving a classification of Grade II Biological Water Pollution Control System that is required to achieve nutrient reduction is assigned the classification of Grade III Biological Water Pollution Control System.

(f) Any system receiving a classification of Grade III Biological Water Pollution Control System that is required to achieve nutrient reduction is assigned the classification of Grade IV Biological Water Pollution Control System.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0303 CLASSIFICATION OF WATER POLLUTION CONTROL COLLECTION SYSTEMS

(a) Water pollution control collection systems operated to convey wastewater to water pollution control systems which are permitted or tributary to municipalities, regional water pollution control systems, water and sewer authorities, public utilities, or are a Grade II, III or IV state or federally owned system, are subject to classification in accordance with Rule .0303(b) of this Section. Any collection system, regardless of ownership, is classified pursuant to this Rule and required to designate an Operator in Responsible Charge (ORC) and a Back-up Operator in Responsible Charge (Back-up ORC) if the Commission determines that the system is not being operated and maintained in a manner which prevents the escape of wastewater from the system into the environment.

(b) Collection systems are assigned the lower grade classification that is either:

- (1) the same as the grade of the biological water pollution control system to which the collection system is tributary; or
- (2) based on the population served by the collection system in accordance with the following chart:

(A)	1,500 or less	Grade I;
(B)	1,501 to 15,000	Grade II;
(C)	15,001 to 50,000	Grade III;
(D)	50,001 or more	Grade IV.

In the event that the population served cannot be determined, the equivalent population served shall be calculated by using the design flow of the system divided by a flow of 60 gallons per day per person.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0304 CLASSIFICATION OF SURFACE IRRIGATION WATER POLLUTION CONTROL SYSTEMS

(a) Systems which utilize surface irrigation for the treatment, reuse or disposal of wastewater are classified as surface irrigation water pollution control systems. Those systems which contain only preliminary treatment processes such as septic tanks, sand filters,

oil/water separators, lagoons, storage basins, physical screening, or sedimentation processes are not subject to additional operator requirements as specified in Rule .0302 or .0306 of this Section.

(b) Any surface irrigation system that has, as part of its treatment process, systems other than those specified in Paragraph (a) of this Rule, is subject to additional classification pursuant to these Rules.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0305 CLASSIFICATION OF LAND APPLICATION OF RESIDUALS SYSTEMS

Systems permitted for the land application of:

- (1) residuals that are produced by a water pollution control system; or
- (2) contaminated soils;

are classified as a land application of residuals system.

*History Note: Authority G.S. 90A-3;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0306 CLASSIFICATION OF PHYSICAL/CHEMICAL WATER POLLUTION CONTROL TREATMENT SYSTEMS

(a) Any water pollution control system, including systems designed for the remediation of contaminated groundwater, that utilizes a primarily physical process to treat wastewaters is classified as a Grade I Physical/Chemical Water Pollution Control System.

(b) Any water pollution control system that utilizes a primarily chemical process to treat wastewaters, including those systems whose treatment processes are augmented by physical processes, is classified as a Grade II Physical/Chemical Water Pollution Control System. Any reverse osmosis, electro dialysis, and ultrafiltration system is classified as a Grade II Physical/Chemical Water Pollution Control System.

(c) Any water pollution control system that has, as part of its treatment process, a biological water pollution control system is subject to additional classification as a biological water pollution control system.

(d) Any water pollution control system subject to classification under Rule .0302 of this Section, utilizing a physical or chemical process to enhance an activated sludge or fixed growth process, is not subject to additional classification under this Rule.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0307 CLASSIFICATION OF SUBSURFACE WATER POLLUTION CONTROL SYSTEMS

(a) Systems permitted under rules adopted by the Environmental Management Commission which utilize the soil for the subsurface treatment and disposal of wastewater shall be classified as subsurface water pollution control systems.

(b) Any subsurface water pollution control system that is required to have a certified operator under 15A NCAC 18A .1961 shall be deemed classified as a subsurface water pollution control system.

(c) Any subsurface water pollution control system that has as part of its treatment process a water pollution control system that may be classified under Rules .0302 through .0307 of this Section shall be subject to additional classification. If the subsurface system consists only of septic tanks, pump tanks, siphon or pump dosing systems, sand filters, grease traps or grease interceptors, or oil/water separators, and subsurface disposal of the wastewater, no additional classification will be required.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999.*

15A NCAC 08G .0308 SYSTEMS NOT OTHERWISE CLASSIFIED

The Commission may classify any water pollution control system which is not otherwise classified when that system is receiving wastewater that has distinctly different characteristics from typical domestic wastewater or is a water pollution control system which contains treatment processes that are sufficiently different from the conventional treatment processes classified in Rules .0302 through .0306 of this Section.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999.*

SECTION .0400 - ELIGIBILITY REQUIREMENTS FOR EXAMINATIONS

15A NCAC 08G .0401 GENERAL REQUIREMENTS

(a) An applicant for certification as an operator of a water pollution control system must meet the following criteria and possess the knowledge and abilities listed as they relate to the specific type of system for which certification is being sought and shall, at a minimum, include:

- (1) possess a high school diploma or a general educational development (GED) equivalent;
- (2) be at least 18 years of age;
- (3) have a general knowledge of typical wastewater characteristics and treatment processes; and
- (4) have the ability to:
 - (A) read and understand the statutes and rules which govern water pollution control system operators and the operation of the type of system for which certification is being sought;
 - (B) perform mathematical calculations required to operate the system for which certification is being sought;
 - (C) complete and maintain logs and regulatory reporting forms required to document the proper operation of the system; and
 - (D) safely and effectively operate the equipment employed in the type of system for which certification is being sought; and
 - (E) describe the general maintenance requirements for such equipment.

(b) An applicant who has failed to achieve a passing score on a specific type and grade of examination after three consecutive attempts must:

- (1) attend and successfully complete approved training for the same type and grade as the certification being sought; and
- (2) provide verification, in the form of a certificate of completion or other such documentation, of the successful completion of the required training with any subsequent application made to the Commission to sit for the examination.

(c) An applicant for certification must not have had any certification revoked by the Commission within the two - year period prior to the date of the application for certification.

(d) An applicant for certification is not allowed to sit for any examination offered by the Commission during the period of a suspension of any certification held by the applicant with the Commission.

(e) An applicant who holds a valid biological or collection certification of any level on April 1, 1999, may progress to the highest level of certification of the same type without meeting the requirements of Subparagraph (a)(1) of this Rule.

*History Note: Authority G.S. 90A-37;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0402 ELIGIBILITY REQUIREMENTS FOR BIOLOGICAL WATER POLLUTION CONTROL SYSTEM OPERATORS

Eligibility for certification as a Biological Water Pollution Control System Operator is based on the following qualifications:

- (1) for Grade I certification, the applicant must:
 - (a) have successfully completed approved training for Grade I Biological Water Pollution Control System operators.
- (2) for Grade II certification, the applicant must:
 - (a) hold a valid North Carolina Grade I Biological Water Pollution Control System Operator certificate;
 - (b) have 6 months of actual experience at a Grade II or higher biological water pollution control system; and
 - (c) have successfully completed approved training for Grade II Biological Water Pollution Control System operators.
- (3) for Grade III certification, the applicant must:

- (a) hold a valid North Carolina Grade II Biological Water Pollution Control System Operator certificate;
 - (b) have successfully completed approved training for Grade III Biological Water Pollution Control System operators; and
 - (c) either:
 - (i) have two years of actual experience at a Grade II, or higher, biological water pollution control system, or
 - (ii) be a graduate of two or four year college or university and have taken, and passed, a minimum of six courses in the basic sciences and have 18 months of actual experience at a Grade II, or higher, biological water pollution control system.
- (4) for Grade IV certification, the applicant must:
- (a) hold a valid North Carolina Grade III Biological Water Pollution Control System Operator certificate;
 - (b) have successfully completed approved training for Grade IV Biological Water Pollution Control System operators; and
 - (c) either:
 - (i) have three years of actual experience at a Grade III, or higher, biological water pollution control system, or
 - (ii) be a graduate of a two or four year college or university and have taken, and passed, a minimum of six courses in the basic sciences and have two years of actual experience at a Grade III, or higher, biological water pollution control system.

*History Note: Authority G.S. 90A-39.
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0403 ELIGIBILITY REQUIREMENTS FOR WATER POLLUTION CONTROL COLLECTION SYSTEM OPERATORS

Eligibility for certification as a Water Pollution Control Collection System Operator is based on the following qualifications:

- (1) for Grade I certification, the applicant must: have successfully completed approved training for Grade I water pollution control collection system operators.
- (2) for Grade II certification, the applicant must:
 - (a) hold a valid North Carolina Grade I Water Pollution Control Collection System Operator certificate;
 - (b) have six months of actual experience in water pollution control collection system operations; and
 - (c) have successfully completed approved training for Grade II water pollution control collection system operators.
- (3) for Grade III certification, the applicant must:
 - (a) hold a valid North Carolina Grade II Water Pollution Control Collection System Operator certificate;
 - (b) have successfully completed approved training for Grade III water pollution control collection system operators; and
 - (c) either:
 - (i) have two years of actual experience in water pollution control collection system operations, or
 - (ii) be a graduate of a two or four year college or university and have taken and passed, a minimum of six courses in a field directly related to the operation and maintenance of a collection system, e.g. civil, mechanical, or environmental engineering, and have one year of actual experience in the operation of a water pollution control collection system.
- (4) for Grade IV certification, the applicant must:
 - (a) hold a valid North Carolina Grade III Water Pollution Control Collection System Operator certificate;
 - (b) have successfully completed approved training for Grade IV water pollution control collection system operators; and
 - (c) either:
 - (i) have three years of actual experience in water pollution control collection system operations, or
 - (ii) be a graduate of a two or four year college or university and have taken and passed, a minimum of six courses in a field directly related to the operation and maintenance of a collection system, e.g. civil, mechanical, or environmental engineering, and have two years of actual experience in the operation of a water pollution control collection system.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;*

Amended Eff. December 1, 2006.

15A NCAC 08G .0404 ELIGIBILITY REQUIREMENTS FOR LAND APPLICATION OF RESIDUALS OPERATORS

An applicant for certification as a Land Application of Residuals Operator must have successfully completed approved training for land application of residuals operators and:

- (1) have one year of actual experience in the land application of residuals;
- (2) be a graduate of a two or four year college or university and have taken and passed a minimum of six courses in the basic sciences; or
- (3) hold a valid grade III or higher biological water pollution control system operator certification.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0405 ELIGIBILITY REQUIREMENTS FOR PHYSICAL/CHEMICAL WATER POLLUTION CONTROL SYSTEM OPERATORS

Eligibility for certification as a Physical/Chemical Water Pollution Control System Operator is based on the following qualifications:

- (1) for the Grade I have successfully completed approved training for Grade I Physical/Chemical Water Pollution Control System Operators.
- (2) for the Grade II:
 - (a) possess a valid Grade I Physical/Chemical Water Pollution Control System Operator certificate;
 - (b) have one year of actual experience at a Grade II Physical/Chemical Water Pollution Control System; and
 - (c) have successfully completed approved training for Grade II Physical/Chemical Water Pollution Control System Operators.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0406 ELIGIBILITY REQUIREMENTS FOR SURFACE IRRIGATION WATER POLLUTION CONTROL SYSTEM OPERATORS

An applicant for certification as a Surface Irrigation Water Pollution Control System Operator must have successfully completed approved training for surface irrigation water pollution control system operators and:

- (1) have one year of actual experience in the operation of a surface irrigation water pollution control system;
- (2) be a graduate of a two or four year college or university and have taken and passed a minimum of six courses in the basic sciences;
- (3) be a private homeowner who intends to operate only his/her own domestic spray irrigation water pollution control system; or
- (4) hold a valid grade III or higher biological water pollution control system operator certification.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0407 ELIGIBILITY REQUIREMENTS FOR SUBSURFACE WATER POLLUTION CONTROL SYSTEM OPERATORS

An applicant for certification as a Subsurface Water Pollution Control System Operator must have successfully completed approved training for subsurface water pollution controls system operator and:

- (1) have one year of actual experience in the operation of a subsurface water pollution control system;
- (2) be a graduate of a two or four year college or university and have taken and passed a minimum of six courses in the basic sciences;
- (3) be a private homeowner who intends to operate only his/her own domestic subsurface water pollution control system; or
- (4) hold a valid grade III or higher biological water pollution control system operator certification.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;*

Amended Eff. December 1, 2006.

15A NCAC 08G .0408 ELIGIBILITY REQUIREMENTS FOR OPERATOR IN TRAINING (OIT) CERTIFICATION

- (a) The Commission may allow an applicant for any water pollution control system operator certificate to take the examination if the individual has met all of the prerequisite education and certification requirements but is unable to meet the actual experience requirement.
- (b) Upon achieving a passing score on the examination, the applicant shall be issued an Operator In Training (OIT) certificate of the same type and grade as the examination.
- (c) The Operator In Training (OIT) must not be designated as the Operator in Responsible Charge (ORC) or Back-up Operator In Responsible Charge (Back-Up ORC) of a system.
- (d) Operator In Training (OIT) certificates must be renewed annually as stipulated in 15A NCAC 08G .0701.
- (e) When the holder of an Operator in Training (OIT) certificate completes the prerequisite experience for the permanent certificate at that type and level, the holder must submit an application documenting the experience, with the appropriate fee for a replacement certificate in order to receive the permanent certificate at that level.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0409 ELIGIBILITY REQUIREMENTS FOR CONDITIONAL WATER POLLUTION CONTROL SYSTEM OPERATORS

Conditional Certificates shall remain valid contingent upon the individuals holding the certificates meeting renewal requirements as found in Section .0700 of this Subchapter.

*History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0410 RECIPROCITY CERTIFICATION

- (a) The Commission shall issue certification(s) to individuals certified in other States or legal jurisdictions if the individuals:
 - (1) meet or exceed all eligibility requirements or the equivalent thereof as determined by the Commission as found in Rules .0302 to .0308 of the Section, with the exception of completion of approved training,
 - (2) complete Application for Reciprocity Form and submit it with the appropriate non-refundable fee as specified in G.S. 90A-42,
 - (3) provide a letter of verification from certifying State agency that applicant is certified at stated level and that no disciplinary actions are outstanding against the applicant, and
 - (4) apply for and achieve a passing score on a Commission-administered examination of the same type and grade as that for which reciprocity certification is being requested. The requirement for completion of approved training is waived in the case of applicants pursuant to this Rule.
- (b) Applicants pursuant to this Rule must not have taken and failed to achieve a passing score on a Commission –administered examination of the same type and grade as that for which reciprocity certification is being requested, within the previous two year period prior to the date of application for reciprocity.
- (c) Applicants failing to achieve a passing score on three or more examinations of the same type and grade as that for which certification is being requested, must successfully complete approved training for that certification before being eligible for that examination.
- (d) Applicants who obtain certification by providing false information to the Commission shall be subject to disciplinary actions as set forth in Section .0800 of this Subchapter.

*History Note: Authority G.S. 90A-4; 90A-40;
Eff. December 1, 2006.*

SECTION .0500 - CERTIFICATION BY EXAMINATION

15A NCAC 08G .0501 APPLYING FOR EXAMINATION

- (a) All applications for examination submitted to the Commission must be:
 - (1) submitted on an a WPCSOCC Examination Application;
 - (2) accompanied by the appropriate non-refundable application fee per G.S. 90A-42;

- (3) completed in entirety with all required information, documentation, and signatures provided; and
- (4) postmarked at least 30 days prior to the scheduled date of the examination if an examination is scheduled.
- (b) Upon receipt of an application by the Commission, the application shall be reviewed for completeness and a determination as to the eligibility of the applicant to sit for the requested examination shall be made. Incomplete applications shall be returned to the applicant.
- (c) Each applicant shall be notified, in writing, of the applicant's eligibility to sit for the requested examination. Individuals determined to be eligible for an examination shall be sent written notification containing information concerning the date, time and location of the examination. This written notification shall be considered a receipt from the Commission to the applicant for the examination fee. Applicants found to be ineligible for an examination shall be sent written notification of the ineligibility determination.
- (d) Any applicant who obtains certification by supplying false information to the Commission shall be subject to disciplinary action(s) as set forth in Section .0800 of this Subchapter.

History Note: Authority G.S. 90A-39; 90A-41; 90A-42;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.

15A NCAC 08G .0502 INELIGIBLE APPLICANTS

History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Repealed Eff. December 1, 2006.

15A NCAC 08G .0503 EXAMINATION ADMINISTRATION

- (a) The Commission shall set the dates, times, and locations for all examinations.
- (b) Examinations may be administered by the Commission at any time, or at any location, when a sufficient number of applications have been received to warrant such an examination.
- (c) Before each applicant receives an examination paper, an applicant shall display a valid driver's license, photo identification or other form of identification satisfactory to the proctor.

History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.

15A NCAC 08G .0504 EXAMINATION GRADING

- (a) A passing score on any examination administered by the Commission is 70 percent of the available points on the examination.
- (b) Each applicant, and only the applicant, shall be notified, in writing, of the results on an examination.
- (c) If a passing score is attained by an applicant on an examination, the written notification to the applicant shall constitute the certification of the applicant as an operator or operator in training of a water pollution control system of the same type and grade as the examination.

History Note: Authority G.S. 90A-39; 90A-40;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.

15A NCAC 08G .0505 EXAMINATION REVIEWS

- (a) Any applicant who fails to make a passing score on an examination may request to review the examination. All requests to review an examination must be received by the Commission in writing within 15 calendar days of receiving notification of failing to make a passing score on an examination.
- (b) Applicants who submit a written request to review an examination shall be notified of a date, time, and location at which the applicant shall be given the opportunity to review the examination. This shall be the only opportunity the applicant will be allowed for reviewing the examination.
- (c) An applicant shall not be allowed to review the examination within 30 calendar days of an upcoming examination date.

History Note: Authority G.S. 90A-39;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.

SECTION .0600 - CERTIFICATION WITHOUT EXAMINATION

15A NCAC 08G .0601 RECIPROCITY CERTIFICATION

History Note: Authority G.S. 90A-40; 90A-42;
Eff. April 1, 1999;
Repealed Eff. December 1, 2006.

15A NCAC 08G .0602 TEMPORARY CERTIFICATES

(a) Temporary certificates, of any type and grade, may be issued by the Commission to the operator of a water pollution control system, for a period not to exceed one year, due to:

- (1) the vacancy of the Operator in Responsible Charge (ORC) or the Back-up Operator in Responsible Charge (Back-up ORC);
- (2) the suspension or revocation of the certification of the Operator in Responsible Charge (ORC) or the Back-up Operator in Responsible Charge (Back-up ORC);
- (3) a change in the classification of the system due to a permit modification or the completion of an upgrade or expansion; or
- (4) a modification to Commission rules.

(b) Temporary Certificates shall only be issued for the Operator in Responsible Charge (ORC) or the Back-up Operator in Responsible Charge (Back-up ORC) of the system specified on the application.

(c) All applications for a temporary certificate must:

- (1) be submitted by the owner of the system for the applicant;
- (2) be accompanied by the required fee; and
- (3) include a letter from the owner that contains:
 - (A) an explanation for the need of a temporary certificate for the applicant;
 - (B) an explanation of all of the efforts that were made to employ an operator who possessed the required certification;
 - (C) a statement designating the applicant as either the Operator in Responsible Charge (ORC) or Back-up Operator in Responsible Charge (Back-up ORC) of the system; and
 - (D) a plan that describes the actions that:
 - (i) the applicant will pursue in order to attempt to obtain permanent certification during the effective period of the temporary certificate; and
 - (ii) the owner of the system will be pursuing in the event that the applicant fails to obtain permanent certification during the effective period of the temporary certificate.

(d) Applicants for a temporary certificate must:

- (1) Either:
 - (A) for biological or collection system grade II or higher operator certification, possess a valid certificate of the same type as the system and that is no more than one grade lower than the classification of the system when applying as an Operator in Responsible Charge (ORC) and no more than two grades lower than the classification of the system when applying as a Back-up Operator in Responsible Charge (Back-up ORC); or
 - (B) for a Grade I biological, Grade I Physical/Chemical, Grade I Collection, Surface Irrigation, Land Application, or Subsurface Water Pollution Control System; have a minimum of three months of actual experience in the operation of the type of system for which a temporary certificate is being applied if the temporary certificate is requested.
- (2) be eligible for permanent certification prior to the expiration date of the temporary certificate;
- (3) not have made three previous unsuccessful attempts to make a passing score on the same type and grade examination as the temporary certificate; and
- (4) have never relinquished, nor had revoked, any water pollution control operator certificate issued by the Commission.

(e) Applicants who obtain a temporary certificate by providing false information to the Commission shall be subject to disciplinary action(s) as set forth in Section .0800 of this Subchapter.

History Note: Authority G.S. 90A-40; 90A-42;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.

15A NCAC 08G .0603 TEMPORARY CERTIFICATE RENEWAL

(a) All applications for renewal of a temporary certificate must:

- (1) be submitted by the owner of the system 60 calendar days prior to the expiration date of the original temporary certificate;
- (2) be accompanied by the required fee; and
- (3) include a letter from the owner that explains:
 - (A) the need for renewal of the temporary certificate;
 - (B) the reasons for the failure of the applicant to obtain permanent certification during the original effective period of the temporary certificate;
 - (C) the efforts that have been made by the owner to employ a properly certified operator during the effective period of the original temporary certificate; and
 - (D) the actions that will be taken by:
 - (i) the applicant in order to obtain permanent certification during the effective period of the renewed temporary certificate; and
 - (ii) the owner if the applicant does not obtain permanent certification during the effective period of the renewed temporary certificate.

(b) The renewal request shall be denied if the applicant has failed:

- (1) to seek permanent certification by examination during the original effective period of the temporary certificate; or
- (2) to obtain permanent certification after four examination attempts during the original effective period of the temporary certificate.

(c) A temporary certificate may be renewed only once for the same operator.

(d) Applicants who obtain a temporary certificate renewal by providing false information to the Commission shall be subject to disciplinary action(s) as set forth in Section .0800 of this Subchapter.

*History Note: Authority G.S. 90A-40; 90A-42;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0604 CONVERSION OF VOLUNTARY CERTIFICATION TO MANDATORY CERTIFICATION

*History Note: Authority G.S. 90A-39; 90A-40; 90A-42;
Eff. April 1, 1999;
Repealed Eff. December 1, 2006.*

SECTION .0700 - RENEWAL OF CERTIFICATION

15A NCAC 08G .0701 REQUIREMENTS

(a) In order to maintain a valid certificate, the certificate must be renewed annually by:

- (1) Submitting payment of the appropriate required annual renewal fee, as set forth in G.S. 90A-42, by the end of the effective year; and
- (2) Each operator must provide documentation of a minimum of six contact hours of Commission approved training during each year following the year of initial certification.

(b) Certificate(s) that are not renewed when due shall be considered invalid. In order to renew a certificate that has been invalid for up to two years, all outstanding renewal fees and supplemental processing fees and penalties that have accrued since the certificate was last renewed must be paid and all accrued continuing education requirements must be met. In order to renew a certificate that has been invalid for two or more consecutive years the operator shall be required to take and make a passing score on an examination of the same type and grade as the former certificate. In order to qualify for the examination, all relevant requirements of Section .0400 of this Subchapter must be met. Any requirements in Section .0400 of this Subchapter for Commission approved training must have been met within the previous 12 month period. Invalid Conditional Certificates are not renewable.

(c) Renewal notices shall be mailed to each certified operator, at the last known address for the operator on file with the Commission, 60 calendar days prior to the renewal due date. Failure to receive a renewal notice does not relieve a certified operator of the responsibility to renew the certificate by the renewal due date.

*History Note: Authority G.S. 90A-40; 90A-42; 90A-44; 90A-46.1;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

SECTION .0800 - DISCIPLINARY ACTIONS

15A NCAC 08G .0801 GROUNDS FOR DISCIPLINARY ACTIONS

The Commission may take disciplinary actions, in accordance with Rule .0802 of this Section, against a certified operator for:

- (1) practicing fraud or deception in the performance of duties;
- (2) failure to use reasonable care or judgment in the performance of duties;
- (3) failure to apply their knowledge or ability in the performance of duties;
- (4) incompetence or the inability to perform duties;
- (5) supplying false information in order to obtain or maintain certification; or
- (6) cheating on a certification examination.

*History Note: Authority G.S. 90A-41;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0802 DISCIPLINARY ACTIONS

- (a) The Commission shall revoke or suspend the certification of an operator or issue a letter of reprimand to an operator in accordance with the provisions of G.S. 90A-41, 150B-3 and this Rule.
- (b) The Chairman of the Commission may issue notification of summary suspension, the intention to revoke or suspend the certification of an operator or the intent to issue a letter of reprimand.
- (c) The Chairman shall convene an advisory committee to review the circumstances of the proposed disciplinary action(s).
 - (1) The advisory committee shall include at least:
 - (A) the Chairman of the Commission;
 - (B) the Vice Chairman of the Commission;
 - (C) the member of the Commission who represents the type of system at which the operator is employed or another member of the Commission appointed by the Chairman of the Commission; and
 - (D) a certified operator appointed by the Chairman.
 - (2) The members of the advisory committee shall offer guidance to the Commission chairman in regards to the actions that should be taken against an operator.
- (d) Notification of the advisory committee meeting shall be sent by certified mail at least 15 calendar days prior to the date of the meeting, to the last known address of the operator. This notification shall contain the alleged facts or conduct upon which the proposed revocation or suspension of the certification or letter of reprimand is based.
- (e) The operator shall have an opportunity to submit a written response to the Chairman prior to the date of the advisory committee meeting. The operator shall also be given the opportunity to make an oral statement before the advisory committee.
- (f) Within 10 working days of the conclusion of the advisory committee meeting, the Chairman shall issue a decision. If this decision is to issue a revocation or suspension or a letter of reprimand, the Chairman shall advise the operator of the effective date of the action and the facts or conduct upon which the action is based. The revocation or suspension of a certification or the letter of reprimand shall be delivered to the affected operator and the owner of the system(s) at which the operator works by certified mail, at the last known address for the operator and owner on file with the Commission, at least 20 calendar days prior to the effective date of the revocation or suspension or letter of reprimand.
- (g) The revocation, suspension or letter of reprimand becomes a final Commission action if the operator does not file a petition for a contested case hearing in the Office of Administrative Hearings as provided in the Administrative Procedure Act, G.S. 150B.
- (h) If an applicant is caught cheating on an examination by a proctor of the examination, the applicant shall be excused from the examination, the examination shall not be graded, the fee for the examination shall be forfeited by the applicant and any other certification(s) held by the applicant with the Commission shall be subject to revocation as set forth in G.S. 90A-41 and in this Rule.
- (i) If the Commission determines, after the examination has been graded, that an applicant cheated on an examination and certification has been conveyed to the applicant, the certification obtained through the examination shall be revoked and any other certification(s) held by the applicant with the Commission shall be subject to revocation as set forth in G.S. 90A-41 and in this Rule.

*History Note: Authority G.S. 90A-40; 90A-41; 143B-300; 150B-23;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0803 CERTIFICATION FOLLOWING DISCIPLINARY ACTIONS

- (a) An individual who has had certification revoked by the Commission shall petition the Commission for any new certification sought and may not petition the Commission for such new certification sooner than two years after the effective date of the revocation.

Following the denial of eligibility for re-certification after relinquishment or revocation, an operator must wait one year before reapplying for certification.

(b) The following information must be included in the petition for certification:

- (1) a written statement explaining the actions that the individual has taken to correct those problems that lead to the revocation of the certification previously held with the Commission; and
- (2) a statement that attests to the Commission that, upon obtaining certification, the individual shall comply with all laws governing the proper operation of water pollution control systems.

(c) After submittal of the petition for certification, the petitioner may be required to appear before the Commission at a regularly scheduled meeting. The petitioner shall be notified, by certified mail, of the date, time and location of the meeting at least 15 calendar days prior to the meeting.

(d) Within 120 calendar days following receipt of a petition for certification, the Commission shall notify the individual, in writing, of its decision to deny or grant examination eligibility in accordance with the procedures set forth in Section .0500 of this Subchapter. Eligibility for certification shall be granted only if there is substantial evidence that those conditions that lead to the revocation of previous certification held by the petitioner have been corrected.

(e) Certification of an individual whose previous certification has been revoked shall occur only after the individual sits for, and obtains a passing score on, an examination. Once approval is granted by the Commission for certification after reviewing the petition for certification, the individual must submit an application, accompanied by the appropriate examination fee, and meet the examination eligibility requirements for the type of certification being sought as set forth in Section .0400 of this Subchapter. The individual must begin the certification process at the lowest grade level offered for the type of certification sought. Operational experience accrued by the individual prior to the revocation of any previously held certification(s) shall not be considered when determining the eligibility of the individual for the examination.

(f) Applicants for certification who were previously determined to be ineligible for certification due to supplying false information to the Commission must follow the procedures set forth in Paragraphs (a) through (e) of this Rule in order to obtain certification.

*History Note: Authority G.S. 90A-39; 90A-41; 150B-23;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

15A NCAC 08G .0804 CONTESTED CASE PROCEDURES

(a) Administrative hearings shall be held in accordance with G.S. 150B and the administrative hearing procedures codified at 15A NCAC 01B .0200 et seq., are hereby incorporated by reference including any subsequent amendments and additions.

(b) For information on obtaining a copy of 15A NCAC 01B .0200, you may contact the Rules Division of the NC Office of Administrative Hearings at (919) 733-2678.

*History Note: Authority G.S. 143B-300; 150B-23;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.*

SECTION .0900 - CONTRACT OPERATION OF WATER POLLUTION CONTROL SYSTEMS

15A NCAC 08G .0901 RESPONSIBILITIES OF CONTRACT OPERATORS AND CONTRACT OPERATIONS FIRMS

Each contract operator, or contract operations firm, that enters into a contract with the owner of a water pollution control system to operate the system must notify the owner, in writing, within five calendar days of:

- (1) any change in the designation of the Operator in Responsible Charge (ORC) or the Back-up Operator in Responsible Charge (Back-up ORC) of the system; or
- (2) becoming aware of any situation or problem (preexisting, anticipated, or otherwise) which may interfere with the proper operation of the system and necessitate corrective action by the owner. This notice shall include the comments and recommendations of the operator in regards to actions or measures that should be taken to correct the noted situation or problem.

*History Note: Authority G.S. 90A-44; 90A-45;
Eff. April 1, 1999.*

15A NCAC 08G .0902 ANNUAL REPORT

History Note: Authority G.S. 90A-45;
Eff. April 1, 1999;
Repealed Eff. December 1, 2006.

SECTION .1000 - RULE MAKING PROCEDURES AND PETITIONS FOR REGULATORY ACTIVITY

15A NCAC 08G .1001 PETITIONS FOR REGULATORY ACTIVITY

(a) Any person(s) desiring to request the adoption, amendment, or repeal of a rule may make such request in a petition filed pursuant to G.S. 150B-20, addressed to the Water Pollution Control System Operators Certification Commission and mailed to the Chairman at 1618 Mail Service Center, Raleigh, NC 27699-1618. Such petitions must contain:

- (1) a draft of the proposed rule or a summary of its intent;
- (2) reasons for adoption of the proposed rule(s) and the effect it will have on existing rules and practices; and
- (3) the name(s) and address(es) of the petitioner(s).

(b) Petitions shall be placed on the agenda of the next regularly scheduled meeting of the Commission if received at least four weeks prior to the meeting. The Chairman shall prepare recommended responses to petitions for the Commission's consideration. Petitions shall be considered in accordance with the requirements of G.S. 150B-20.

History Note: Authority G.S. 143B-300; 150B-20;
Eff. April 1, 1999;
Amended Eff. December 1, 2006.

SECTION .1100 - ADMINISTRATIVE DUTIES

15A NCAC 08G .1101 REFUNDING OF FEES

History Note: Authority G.S. 90A-42;
Eff. April 1, 1999;

Repealed Eff. December 1, 2006.

Appendix 2: NPDES Permit

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
DIVISION OF WATER QUALITY

PERMIT

TO DISCHARGE WASTEWATER UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of North Carolina General Statute 143-215.1, other lawful standards and regulations promulgated and adopted by the North Carolina Water Quality Commission, and the Federal Water Pollution Control Act, as amended,

Town of Mount Pilot
Mount Pilot Wastewater Management Facility

is hereby authorized to discharge wastewater from a facility located at

Mount Pilot WWMF
Old Barney Road
North of Mount Pilot
Happy County

to receiving waters designated as Bee Creek in the Clear River Basin

in accordance with the discharge limitations, monitoring requirements, and other conditions set forth in Parts I, II, III, and IV hereof.

This permit shall become effective February 1, 2004.

This permit and the authorization to discharge shall expire at midnight on May 31, 2008.

Signed this day December 31, 2003.

Alan W. Klimek, P.E., Director
Division of Water Quality
By the Authority of the Environmental Management Commission

SUPPLEMENT TO PERMIT COVER SHEET

All previous NPDES Permits issued to this facility, whether for operation or discharge, are hereby revoked. [The exclusive authority to operate this facility arises under this permit. The authority to operate the facility under previously issued permits bearing this number is no longer effective.] The conditions, requirements, terms and provisions of this permit authorizing discharge under the NPDES govern discharges from this facility.

Town of Mount Pilot **Mount Pilot Wastewater Management Facility**

is hereby authorized to:

1. Continue to operate an existing **2 MGD** wastewater treatment facility consisting of mechanical bar screens, manual bar screen, grit chamber, preaeration, primary clarifiers, biological nutrient removal, extended aeration basins, secondary clarifiers, polishing ponds, tertiary filters, methanol feed system, chlorination and dechlorination, post aeration, and anaerobic digesters located at Mount Pilot WWMF, Old Barney Road, north of Mount Pilot, Happy County, and
2. Discharge wastewater from said treatment works at the location specified on the attached map into Bee Creek which is classified C Sw-NSW waters in Clear River Basin.
3. Continue to operate a water reclamation and distribution system to provide beneficial reuse for treated effluent from the treatment plant, as approved pursuant to Permit No. WQ0000000.

A. (1.) EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS – FINAL

During the period beginning on the effective date of the permit and lasting until expiration, the Permittee is authorized to discharge up to **2 MGD** of municipal wastewater from outfall 001. Such discharges shall be limited and monitored by the Permittee as specified below:

Effluent Characteristics	Limits			Monitoring Requirements		
	Monthly Average	Weekly Average	Daily Maximum	Measurement Frequency	Sample Type	Sample Location ¹
Flow	14 MGD			Continuous	Recording	Influent or Effluent
BOD, 5 day (20°C) ² [April 1 – October 31]	5.0 mg/l	7.5 mg/l		Daily	Composite	Influent & Effluent
BOD, 5 day (20°C) ² [November 1 – March 31]	10.0 mg/l	15.0 mg/l		Daily	Composite	Influent & Effluent
Total Suspended Solids ²	30.0 mg/l	45.0 mg/l		Daily	Composite	Influent & Effluent
NH ₃ as N [April 1 – October 31] ³ [Through October 31, 2004]	2.0 mg/l	6.0 mg/l		Daily	Composite	Effluent
NH ₃ as N [Nov. 1 – March 31] ³ [Through October 31, 2004]	4.0 mg/l	12.0 mg/l		Daily	Composite	Effluent
NH ₃ as N [April 1 – October 31] ³ [Beginning November 2004]	1.0 mg/l	3.0 mg/l		Daily	Composite	Effluent
NH ₃ as N [Nov. 1 – March 31] ³ [Beginning November 2004]	2.0 mg/l	6.0 mg/l		Daily	Composite	Effluent
Dissolved Oxygen ⁴				Daily	Grab	Effluent
Dissolved Oxygen				3/Week	Grab	Upstream & Downstream
Fecal Coliform (geometric mn) ⁵	200/100 ml	400/100 ml		Daily	Grab	Effluent
Fecal Coliform (geometric mean)				3/Week	Grab	Upstream & Downstream
Total Residual Chlorine ⁶			18 µg/l	Daily	Grab	Effluent
TKN (mg/l)	Monitor & Report			Weekly	Composite	Effluent
NO ₂ -N + NO ₃ -N (mg/l)	Monitor & Report			Weekly	Composite	Effluent
TN (mg/l) ⁷	Monitor & Report			Weekly	Composite	Effluent
Total Monthly Flow (MG)	Monitor & Report			Monthly	Calculated	Effluent
TN Load ⁸	Monitor & Report 157,684 lb/year (Annual Mass Loading) ⁹			Monthly Annually	Calculated Calculated	Effluent Effluent
Total Phosphorus ¹⁰	2.0 mg/L (Quarterly Average)			Weekly	Composite	Effluent
Temperature (°C)				Daily	Grab	Effluent
Temperature (°C)				3/Week	Grab	Upstream & Downstream
Conductivity				Daily	Grab	Effluent
Conductivity				3/Week	Grab	Upstream & Downstream
Chronic Toxicity ¹¹				Quarterly	Composite	Effluent
Total Copper				Monthly	Composite	Effluent

Total Zinc				Monthly	Composite	Effluent
pH ¹²			6-9	Daily	Grab	Effluent

A. (1.) EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS – FINAL

(Continued)

Footnotes:

1. **Sample locations: Upstream at Old Buckcreek Road and downstream at NC Highway 251. Stream samples shall be grab samples and shall be collected 3/Week during June – September and 1/Week during the remaining months of the year. Instream monitoring is provisionally waived in light of the permittee's participation in the Lower Clear Creek Basin Association. Instream monitoring shall be conducted as stated in this permit should the permittee end its participation in the Association.**
2. **The monthly average effluent BOD5 and Total Suspended Solids concentrations shall not exceed 15% of the respective influent value (85% removal).**
3. **See Condition A.(5) regarding phased NH3-N limits. More stringent NH3-N limits shall become effective November 1, 2004.**
4. **The daily average dissolved oxygen effluent concentration shall not be less than 7.0 mg/l.**
5. **Refer to Condition A. (6) regarding fecal coliform limits.**
6. **Total residual chlorine monitoring is required only if chlorine or a chlorinated compound is used as a disinfectant (or elsewhere in the process).**
7. **TN means Total Nitrogen. For a given wastewater sample, TN is the sum of Total Kjeldahl Nitrogen and Nitrate-Nitrite Nitrogen: $TN = TKN + NO_2-N + NO_3-N$.**
8. **TN Load is the mass load of TN discharged by the Permittee in a period of time. See Special Condition A.(2.), Calculation of TN Loads.**
9. **The annual TN Load limit shall become effective with the calendar year beginning on January 1, 2003. Compliance with this limits shall be determined in accordance with Special Condition A.(3.), Annual Limits for Total Nitrogen.**
10. **The quarterly average for total phosphorus shall be the average of composite samples collected weekly during the calendar quarter (January-March, April-June, July-September, October-December).**
11. **Chronic Toxicity (Ceriodaphnia dubia) P/F at 90%: February, May, August, and November [see Special Condition A.(4)]. Toxicity monitoring shall coincide with metals monitoring.**
12. **The pH shall not be less than 6.0 standard units nor greater than 9.0 standard units.**

There shall be no discharge of floating solids or visible foam in other than trace amounts.

A.(2.) CALCULATION OF TOTAL NITROGEN LOADS

- a. The Permittee shall calculate monthly and annual TN Loads as follows:

i. Monthly TN Load (lb/mo) = TN x TMF x 8.34

where:

- TN = the average Total Nitrogen concentration (mg/L) of the composite samples collected during the month
- TMF = the Total Monthly Flow of wastewater discharged during the month (MG/mo)
- 8.34 = conversion factor, from (mg/L x MG) to pounds

ii. Annual TN Load (lb/yr) = Sum of the 12 Monthly TN Loads for the calendar year

- b. The Permittee shall report monthly Total Nitrogen results (mg/L and lb/mo) in the discharge monitoring report for that month and shall report each year's annual results (lb/yr) in the December report for that year.

A.(3.) ANNUAL LIMITS FOR TOTAL NITROGEN

- a. Total Nitrogen (TN) allocations and TN Load limits for NPDES dischargers in the Neuse River basin are annual limits and are applied for the calendar year.
- b. For any given calendar year, the Permittee shall be in compliance with the annual TN Load limit in this Permit if:
 - i. the Permittee's annual TN Load is less than or equal to said limit, or
 - ii. the Permittee is a Co-Permittee Member of a compliance association.
- c. The TN Load limit in this Permit (if any) may be modified as the result of allowable changes in the Permittee's TN allocation.
 - i. Allowable changes include those resulting from purchase of TN allocation from the Wetlands Restoration Fund; purchase, sale, trade, or lease of allocation between the Permittee and other dischargers; regionalization; and other transactions approved by the Division.
 - ii. The Permittee may request a modification of the TN Load limit in this Permit to reflect allowable changes in its TN allocation. Upon receipt of timely and proper application, the Division will modify the permit as appropriate and in accordance with state and federal program requirements.
 - iii. Changes in TN limits become effective on January 1 of the year following permit modification. The Division must receive application no later than August 31 for changes proposed for the following calendar year.
 - iv. Application shall be sent to:

NCDWQ / NPDES Unit
Attn: Neuse River Basin Coordinator
1617 Mail Service Center
Raleigh, NC 27699-1617

- d. If the Permittee is a member and co-permittee of an approved compliance association, its TN discharge during that year is governed by that association's group NPDES permit and the TN limits therein.
 - i. The Permittee shall be considered a Co-Permittee Member for any given calendar year in which it is identified as such in Appendix A of the association's group NPDES permit.
 - ii. Association roster(s) and members' TN allocations will be updated annually and in accordance with state and federal program requirements.
 - iii. If the Permittee intends to join or leave a compliance association, the Division must be notified of the proposed action in accordance with the procedures defined in the association's NPDES permit.

- (1) Upon receipt of timely and proper notification, the Division will modify the permit as appropriate and in accordance with state and federal program requirements.
 - (2) Membership changes in a compliance association become effective on January 1 of the year following modification of the association's permit.
- e. The TN monitoring and reporting requirements in this Permit remain in effect until expiration of this Permit and are not affected by the Permittee's membership in a compliance association.

A. (4.) CHRONIC TOXICITY PERMIT LIMIT (QTRLY)

The effluent discharge shall at no time exhibit observable inhibition of reproduction or significant mortality to *Ceriodaphnia dubia* at an effluent concentration of **90 %**.

The permit holder shall perform at a minimum, *quarterly* monitoring using test procedures outlined in the "North Carolina *Ceriodaphnia* Chronic Effluent Bioassay Procedure," Revised February 1998, or subsequent versions or "North Carolina Phase II Chronic Whole Effluent Toxicity Test Procedure" (Revised-February 1998) or subsequent versions. The tests will be performed *during the months of February, May, August, and November*. Effluent sampling for this testing shall be performed at the NPDES permitted final effluent discharge below all treatment processes.

If the test procedure performed as the first test of any single quarter results in a failure or ChV below the permit limit, then multiple-concentration testing shall be performed at a minimum, in each of the two following months as described in "North Carolina Phase II Chronic Whole Effluent Toxicity Test Procedure" (Revised-February 1998) or subsequent versions.

The chronic value for multiple concentration tests will be determined using the geometric mean of the highest concentration having no detectable impairment of reproduction or survival and the lowest concentration that does have a detectable impairment of reproduction or survival. The definition of "detectable impairment," collection methods, exposure regimes, and further statistical methods are specified in the "North Carolina Phase II Chronic Whole Effluent Toxicity Test Procedure" (Revised-February 1998) or subsequent versions.

All toxicity testing results required as part of this permit condition will be entered on the Effluent Discharge Monitoring Form (MR-1) for the months in which tests were performed, using the parameter code TGP3B for the pass/fail results and THP3B for the Chronic Value. Additionally, DWQ Form AT-3 (original) is to be sent to the following address:

Attention: North Carolina Division of Water Quality
Environmental Sciences Branch
1621 Mail Service Center
Raleigh, North Carolina 27699-1621

A. (4.) CHRONIC TOXICITY PERMIT LIMIT (QTRLY) (cont'd.)

Completed Aquatic Toxicity Test Forms shall be filed with the Environmental Sciences Branch no later than 30 days after the end of the reporting period for which the report is made.

Test data shall be complete, accurate, include all supporting chemical/physical measurements and all concentration/response data, and be certified by laboratory supervisor and ORC or approved designate signature. Total residual chlorine of the effluent toxicity sample must be measured and reported if chlorine is employed for disinfection of the waste stream.

Should there be no discharge of flow from the facility during a month in which toxicity monitoring is required, the permittee will complete the information located at the top of the aquatic toxicity (AT) test form indicating

the facility name, permit number, pipe number, county, and the month/year of the report with the notation of "No Flow" in the comment area of the form. The report shall be submitted to the Environmental Sciences Branch at the address cited above.

Should the permittee fail to monitor during a month in which toxicity monitoring is required, monitoring will be required during the following month.

Should any test data from this monitoring requirement or tests performed by the North Carolina Division of Water Quality indicate potential impacts to the receiving stream, this permit may be re-opened and modified to include alternate monitoring requirements or limits.

NOTE: Failure to achieve test conditions as specified in the cited document, such as minimum control organism survival, minimum control organism reproduction, and appropriate environmental controls, shall constitute an invalid test and will require immediate follow-up testing to be completed no later than the last day of the month following the month of the initial monitoring.

A. (5.) Effective Date for More Stringent NH₃-N Limits

The limits of 2 mg/l (April 1 – October 31) and 4 mg/l (November 1 through March 31) shall be in effect until **November 1, 2004**, at which time new limits of 1 mg/l and 2 mg/l shall become effective.

A. (6.) Fecal Coliform Compliance Condition

Should the Town of Mount Pilot be deemed by the Division of Water Quality to be chronically noncompliant with the weekly average and/or monthly average fecal coliform limit after completion of the expansion to 14 MGD, the City shall submit plans and specifications within 90 days after notification by the Division. The plans and specifications shall provide for an adequately designed chlorine disinfection facility. If another method of disinfection is proposed, it should conform to conventional design parameters, as well as any minimum requirements specified by the Division. Bidding and subsequent construction of the project shall commence immediately after the issuance of the Authorization to Construct permit.

A. (7.) EFFLUENT POLLUTANT SCAN

The permittee shall perform an annual pollutant scan of its treated effluent for the following parameters:

Ammonia (as N)	Trans-1,2-dichloroethylene	Bis (2-chloroethyl) ether
Chlorine (total residual, TRC)	1,1-dichloroethylene	Bis (2-chloroisopropyl) ether
Dissolved oxygen	1,2-dichloropropane	Bis (2-ethylhexyl) phthalate
Nitrate/Nitrite	1,3-dichloropropylene	4-bromophenyl phenyl ether
Total Kjeldahl nitrogen	Ethylbenzene	Butyl benzyl phthalate
Oil and grease	Methyl bromide	2-chloronaphthalene
Total Phosphorus	Methyl chloride	4-chlorophenyl phenyl ether
Total dissolved solids	Methylene chloride	Chrysene
Hardness	1,1,2,2-tetrachloroethane	Di-n-butyl phthalate
Antimony	Tetrachloroethylene	Di-n-octyl phthalate
Arsenic	Toluene	Dibenzo(a,h)anthracene
Beryllium	1,1,1-trichloroethane	1,2-dichlorobenzene
Cadmium	1,1,2-trichloroethane	1,3-dichlorobenzene
Chromium	Trichloroethylene	1,4-dichlorobenzene
Copper	Vinyl chloride	3,3-dichlorobenzidine
Lead	<i>Acid-extractable compounds:</i>	Diethyl phthalate
Mercury	P-chloro-m-cresol	Dimethyl phthalate
Nickel	2-chlorophenol	2,4-dinitrotoluene
Selenium	2,4-dichlorophenol	2,6-dinitrotoluene
Silver	2,4-dimethylphenol	1,2-diphenylhydrazine
Thallium	4,6-dinitro-o-cresol	Fluoranthene
Zinc	2,4-dinitrophenol	Fluorene
Cyanide	2-nitrophenol	Hexachlorobenzene
Total phenolic compounds	4-nitrophenol	Hexachlorobutadiene
<u>Volatile organic compounds:</u>	Pentachlorophenol	Hexachlorocyclo-pentadiene
Acrolein	Phenol	Hexachloroethane
Acrylonitrile	2,4,6-trichlorophenol	Indeno(1,2,3-cd)pyrene
Benzene	<u>Base-neutral compounds:</u>	Isophorone
Bromoform	Acenaphthene	Naphthalene
Carbon tetrachloride	Acenaphthylene	Nitrobenzene
Chlorobenzene	Anthracene	N-nitrosodi-n-propylamine
Chlorodibromomethane	Benzidine	N-nitrosodimethylamine
Chloroethane	Benzo(a)anthracene	N-nitrosodiphenylamine
2-chloroethylvinyl ether	Benzo(a)pyrene	Phenanthrene
Chloroform	3,4 benzofluoranthene	Pyrene
Dichlorobromomethane	Benzo(ghi)perylene	1,2,4-trichlorobenzene
1,1-dichloroethane	Benzo(k)fluoranthene	
1,2-dichloroethane	Bis (2-chloroethoxy) methane	

1. The total set of samples analyzed during the current term of the permit must be representative of seasonal variations.
2. Samples shall be collected and analyzed in accordance with analytical methods approved under 40 CFR Part 136.
3. Unless indicated otherwise, metals must be analyzed and reported as total recoverable.
4. Test results shall be reported to the Division in DWQ Form- DMR-PPA1 or in a form approved by the Director, within 90 days of sampling. Two copies of the report shall be submitted along with the DMRs to the following address:
Division of Water Quality, Water Quality Section, Central Files, 1617 Mail Service Center, Raleigh, North Carolina 27699-1617.

Appendix 3: DMR Forms and Instructions

General Instruction for Completing DMRs

I. Facility Information

1. NPDES Permit No. - Number issued by the Division of Water Quality consisting of the letters "NC" followed by a seven digit number. Information from non-discharge facilities should not be reported on the MR series of forms.
2. Discharge No. - Three digit number which corresponds to the effluent pipe for which the data are being reported (i.e., 001, 002, 003, etc.). Numbers are found within the NPDES permit.
3. Facility Name - Name of the facility as it appears on the NPDES permit.
4. Class - The class of the facility as designated by the Water Pollution Control System Operators Certification Commission. The rating will be either 0, I, II, III or IV. You should enter the water quality classification of the receiving stream in this space.
5. County - County in which the discharge outfall is located.
6. Operator In Responsible Charge - The printed name of the certified WWTP operator designated as operator in responsible charge. Unrated (class 0) facilities do not require an operator in responsible charge.
7. Grade - Certificate grade of the operator in responsible charge as awarded by the Water Pollution Control System Operators Certification Commission.
8. Certified Laboratory - Name of the certified laboratory (-ies) performing analyses (if applicable).
9. Person(s) Collecting Samples - Printed name of the individual who collected the sample for which the data was reported. In the case of several individuals, please specify as a group name, such as "operators" or "staff," etc.
10. Signature Of Operator In Responsible Charge - Dated signature of the operator in responsible charge. Each month's report must include an original signature in ink. Copies are not acceptable.

II. Data Reporting

1. Operator Arrival Time - Record the time of arrival of a certified operator using a 2400 clock value. If the facility is staffed by operators 24 hours a day, record the arrival time of the 1st shift operator.
2. Operator Time On Site - Record the number of hours spent by certified operators at the facility. If the facility is staffed on all three shifts, enter "24." If more than one operator is on duty at the same time, this value is not the sum of all hours worked by the operators, but the total number of hours the facility was staffed.

3. ORC On Site? - Record yes (Y) or no (N) as to whether the designated ORC visited the site on that date. If the designated backup operator served as ORC on a particular day, record "B" in this column for that date. It is also appropriate to record "H" in the cell if the date is a legal holiday.

4. Data - Enter the analytical results for each sample under the appropriate parameter code in the row that corresponds to the day upon which the sample was taken. Please note that Flow should always be reported as a decimal number (do not use scientific notation) in units of millions of gallons per day (MGD), unless the permit states otherwise.

5. Parameter Codes - Codes for the more commonly monitored parameters can be found on the back of form MR-1 or MR-1.1. Click here if you are uncertain about the correct code for a particular parameter, or please contact your local DWQ Regional Office, a member of the Point Source Compliance/Enforcement Unit staff at (919) 733-5083.

6. Units of Measurement - All data values must be accompanied by corresponding units of measurement, noted at the top of the data column for the particular parameter. If your permit contains a numeric limit for any parameter, then the reporting units must be the same units of measurement of that limit. If your reporting units are other than those on the pre-printed form, the printed units should be marked out and the reporting units be clearly designated at the top of the column.

7. Additional Parameters - Enter the appropriate parameter code, name of the parameter and units of measurement in the space provided.

8. Average, Maximum, Minimum - Enter the average, maximum and minimum values for the results recorded in the data column. Please note no average is to be calculated for pH. Any average for Fecal Coliform is to be calculated as a geometric mean. If you are uncertain about how to calculate the geometric mean, please contact your local DWQ Regional Office or a member of the Point Source Compliance/Enforcement Unit staff at (919) 733-5083. If only one value is reported for a parameter during the reporting month, that value should be reported as the average, maximum and minimum.

9. Sample Type - Enter the sample description in each column for which data is being reported. Enter the letter "C" for composite or the letter "G" for grab.

10. Monthly Limit - Enter the monthly limit for each parameter as found in the current NPDES permit, Special Order by Consent or Judicial Order by Consent.

III. Facility Status Information

1. Facility Status - Mark the appropriate box to show whether facility was compliant or noncompliant with regard to permit, SOC or JOC requirements. If noncompliant, use the comment section to explain in detail the course of action taken or to be taken to achieve compliance.

2. Signature of Permittee - Record the name of the permittee or his or her authorized agent (printed or typed), the dated signature of that person and a mailing address and phone number at which he or she may be reached during working hours. If someone other than the permittee is to be the signatory, the requirement noted by the double asterisk "*" must be met. Also record the expiration date of the

current permit in this section. While this is not on the form, you may also wish to provide an e-mail address in this space that can provide the Division with another avenue of communication.

IV. Stream Monitoring Information

1. Stream - Name of the stream from which the upstream or downstream monitoring samples are taken.
2. Location - Location of the site on the stream from which the sample was taken. This may be recorded as a distance (e.g. "100 feet upstream of outfall") or a specific location (e.g. "S.R. 1111").

V. General

1. Submitting Reports - An original and one copy of each month's monitoring report is required to be submitted to the Division of Water Quality's Central Files office (address listed on form MR-1) and must be received by the Division within thirty (30) days after the end of the month for which the report is made.

2. Appearance - Forms must be completed in ink. Please make all entries on forms legible. All information other than signatures must be printed or typed. If you fill out forms by hand, please make sure the originals are completed in ink and that all entries are legible. Copies of the original report must also be readable and must include a reproduction of the back side of the effluent reporting form containing the permittee's certification. If you utilize a computer generated report, you must also ensure that the report is legible and that proper copies are made. DWQ will notify if you are the user of a form that is deemed deficient and will advise you of what modifications need to be made.

3. Calculations(a) Averages All averages are to be calculated as the arithmetic mean of the recorded values with the exception of that of Fecal Coliform, which is to be calculated as a geometric mean. If you are uncertain about how to calculate the geometric mean, please contact your local DWQ Regional Office or a member of the Point Source Compliance/Enforcement Unit staff at (919) 733-5083.

(b) Use of "less than" values For calculation purposes only, recorded values of less than a detectable limit (< #.##) may be considered to equal zero (0) for all parameters except Fecal Coliform, for which values of "less than" may be considered to be equal to one (1). Values of testing results which are less than a detectable limit should be reported in the daily cells using the "less than" symbol (<) and the detectable limit used during the testing (or the value with appropriate unit conversion). Please note there is never a case when an average would need to be recorded along with a "less than" symbol.

(c) Use of "greater than" values Such values are only expected (and then only infrequently) in the reporting of Fecal Coliform and BOD. If a "greater than" value is reported, the numeric portion of the value should be sufficiently high so as to make the facility aware of the extent of any problems with treatment efficiency. Upon receipt of "greater than" testing results, a facility should consult its laboratory to see if changes in testing procedure need to be made in order to get discreet values from the analysis. For calculation purposes only, the numeric portion of the value must be used to calculate either an arithmetic or geometric mean.

4. Enforcement - Failure to comply with any of the requirements listed above may result in the facility being issued a Notice of Violation or being subject to other appropriate enforcement action.

5. Order of Report Forms-DMR submittals typically include the results of monitoring of the facility's effluent, its influent and its receiving stream. It is requested that for any DMR, the report be bound with the Effluent page(s) (DWQ form MR-1 or MR-1.1) on top, followed by the Influent page (form MR-2, if influent monitoring is required) and finally the Upstream/Downstream page (form MR-3).

6. Number of Reports-You are required to submit the original and one copy of the report to DWQ. Each copy should be a discreet report for the month, put together in the order described above.

7. Multiple Submittals-School systems and contract operations, please take note of this request. If you submit reports for multiple permits within one mailing, please bind together the submittals (original and one copy) for the various facilities. Please do not segregate the reports into any other type of organization (e.g., binding together all effluent or stream monitoring pages). To do so will cause reports to be taken apart and placed together properly, which slows processing and introduces opportunity for mistakes to be made. If you send many DMRs in one envelope, it is advisable that you send a summary sheet along with the DMRs that lists what reports are contained in the package.

8. Permits for Other Program Areas-Please note that this discussion pertains to submittal of DMRs required of NPDES permittees (point source discharges – pipes to streams). You may have permits for activities in other program areas such as DWQ's non discharge program (wastewater spray irrigation or land application of residuals) or the Division of Environmental Health's public water supply program (drinking water). Please consult those permits for instructions for their submittal. It is not advisable to submit any other reports along with your DMR submittals.

9. Toxicity Reporting-Some permittees will have monitoring requirements for Toxicity within their permits. Please be aware that this parameter has a dual reporting requirement. Results of toxicity testing should be reported on DMR forms, but the toxicity testing results forms must be submitted to the Aquatic Toxicity Unit at the address listed below.

Aquatic Toxicology Unit
DWQ Environmental Sciences Branch
1621 Mail Service Center Raleigh, NC 27699-1621

10. Corrected or Amended Reports-In the event that you omit or erroneously report data on a DMR, the information should be updated with the submittal of an amended report. To best handle the amended data, the following procedure is recommended.

- A. Regenerate or make a copy from your files of the DMR previously submitted to DWQ.
- B. Make changes to the individual data points on the form, including updated summary information.
- C. Initial and highlight changes to the original submittal.
- D. At the top of the reporting page, write very conspicuously: "Amended Report" or "Corrected Report."

- E. Provide a short cover page describing the changes to the DMR or note changes in the comment area on the back of the MR-1 form.

Use of this procedure will be a great help to DWQ's data entry staff. Without specifically identifying changes on the DMR, each data point must be evaluated between the original and amended reports to ensure the values in our database are correct. Calling attention to just those values that are changed both speeds up our processes and decreases the possibility for errors to be made.

11. Contacts-DWQ deals with a tremendous number of permitted entities that may be experiencing their own changes involving administration and personnel. In dealing with NPDES permit matters, DWQ must deal with only one representative of the permitted facility (someone with authority to see that changes are made at the facility if they are necessary) in order to be effective. You are encouraged to keep DWQ informed of any updates as to the person responsible for the permit, addresses or phone numbers in order to facilitate the best possible communication between our two organizations. This can be done by sending an e-mail to our Unit or by using the back of the MR-1 form under the permittee certification section. Regulations regarding who may be deemed responsible for a permit and who may sign as the "permittee" on the DMR can be found (respectively) in the North Carolina Administrative Code in sections 15A NCAC 2H .106(e) and 15A NCAC 2B .0506 (b)(2).

NCDENR- Division of Water Quality - 512 N. Salisbury Street, Raleigh, NC 27604 (919 733-5083,
Fax (919) 733-9612, Email us at dwqpsc@ncmail.net
DWQ - DENR - NCGOV

Appendix 4: CFR 503 Regulations

Land Application of Biosolids

Pollutant Limits, Pathogen and Vector Attraction Reduction Requirements

All biosolids applied to the land must meet *the ceiling concentrations for pollutants*, listed in the first column of Table 2-1.

**TABLE 2-1
Pollutant Limits**

Pollutant	Ceiling Concentration Limits for All Biosolids Applied to Land (milligrams per kilogram) ^a	Pollutant Concentration Limits for EQ and PC Biosolids (milligrams per kilogram) ^a	Cumulative Pollutant Loading Rate Limits for CPLR Biosolids (kilograms per hectare)	Annual Pollutant Loading Rate Limits for APLR Biosolids (kilograms per hectare per 365-day period)
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Chromium	3,000	1,200	3,000	150
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum ^b	75	—	—	—
Nickel	420	420	420	21
Selenium	100	36	100	5.0
Zinc	7,500	2,800	2,800	140
Applies to:	All biosolids that are land applied	Bulk biosolids and bagged biosolids ^c	Bulk biosolids	Bagged biosolids ^c
From Part 503	Table 1, Section 503.13	Table 3, Section 503.13	Table 2, Section 503.13	Table 4, Section 503.13

^a Dry-weight basis

^b As a result of the February 25, 1994, Amendment to the rule, the limits for molybdenum were deleted from the Part 503 rule pending EPA reconsideration.

^c Bagged biosolids are sold or given away in a bag or other container.

Land Application of Biosolids

TABLE 2-5
Summary of Class A and Class B
Pathogen Reduction Requirements

<p style="text-align: center;">CLASS A</p> <p>In addition to meeting the requirements in one of the six alternatives listed below, fecal coliform or <i>Salmonella</i> sp. bacteria levels must meet specific density requirements at the time of biosolids use or disposal or when prepared for sale or give-away (see Chapter Five of this guidance)</p> <p>Alternative 1: Thermally Treated Biosolids Use one of four time-temperature regimens</p> <p>Alternative 2: Biosolids Treated in a High pH-High Temperature Process Specifies pH, temperature, and air-drying requirements</p> <p>Alternative 3: For Biosolids Treated in Other Processes Demonstrate that the process can reduce enteric viruses and viable helminth ova. Maintain operating conditions used in the demonstration</p> <p>Alternative 4: Biosolids Treated in Unknown Processes Demonstration of the process is unnecessary. Instead, test for pathogens—<i>Salmonella</i> sp. or fecal coliform bacteria, enteric viruses, and viable helminth ova—at the time the biosolids are used or disposed of or are prepared for sale or give-away</p>	<p>Alternative 5: Use of PFRP Biosolids are treated in one of the Processes to Further Reduce Pathogens (PFRP) (see Table 5-4)</p> <p>Alternative 6: Use of a Process Equivalent to PFRP Biosolids are treated in a process equivalent to one of the PFRPs, as determined by the permitting authority</p> <p style="text-align: center;">CLASS B</p> <p>The requirements in one of the three alternatives below must be met</p> <p>Alternative 1: Monitoring of Indicator Organisms Test for fecal coliform density as an indicator for all pathogens at the time of biosolids use or disposal</p> <p>Alternative 2: Use of PSRP Biosolids are treated in one of the Processes to Significantly Reduce Pathogens (PSRP) (see Table 5-7)</p> <p>Alternative 3: Use of Processes Equivalent to PSRP Biosolids are treated in a process equivalent to one of the PSRPs, as determined by the permitting authority</p>
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Note: Details of each alternative for meeting the requirements for Class A and Class B designations are provided in Chapter Five.

TABLE 2-6
Summary of Vector Attraction
Reduction Options

<p>Requirements in one of the following options must be met:</p> <p>Option 1: Reduce the mass of volatile solids by a minimum of 38 percent</p> <p>Option 2: Demonstrate vector attraction reduction with additional anaerobic digestion in a bench-scale unit</p> <p>Option 3: Demonstrate vector attraction reduction with additional aerobic digestion in a bench-scale unit</p> <p>Option 4: Meet a specific oxygen uptake rate for aerobically treated biosolids</p> <p>Option 5: Use aerobic processes at greater than 40°C (average temperatures 45°C) for 14 days or longer (e.g., during biosolids composting)</p> <p>Option 6: Add alkaline materials to raise the pH under specified conditions</p> <p>Option 7: Reduce moisture content of biosolids that do not contain unstabilized solids from other than primary treatment to at least 75 percent solids</p> <p>Option 8: Reduce moisture content of biosolids with unstabilized solids to at least 90 percent</p> <p>Option 9: Inject biosolids beneath the soil surface within a specified time, depending on the level of pathogen treatment</p> <p>Option 10: Incorporate biosolids applied to or placed on the land surface within specified time periods after application to or placement on the land surface.</p>

Note: Details of each vector attraction reduction option are provided in Chapter Five.

Appendix 5: Math Formulas

Math Formulas for Wastewater Systems

Grade I/II: General

- 1) **Lbs** = mg/l x MGD x 8.34 (lbs/gal)
- 2) **Circumference of a circle** = π x diameter, or $2 \times \pi$ x radius, where $\pi = 3.14$
- 3) **Area of a circle** = $\pi (r^2)$, or $0.785 \times (d^2)$ d=diameter r=radius
- 4) **Area of a triangle** = $\frac{1}{2}$ base x height
- 5) **Area of a rectangle** = length x width
- 6) **Volume of a cylinder** = area of the circular base x height
- 7) **Volume (ft³)** = length (ft) x width (ft) x depth (ft)
- 8) **Volume of a cone** = $\frac{1}{3}$ x (volume of a cylinder)
- 9) **Volume of a tank** = cubic feet (ft³) in the tank x 7.48 gals/ft³
- 10) **Temperature Conversions:** Centigrade = $\frac{\text{Fahrenheit} - 32}{1.8}$,
Fahrenheit = $\frac{9}{5}$ Centigrade + 32

Grade III/IV: General

- 11) **Geometric mean** = antilog of $\frac{\text{sum of logs of sample results}}{\text{number of samples}}$
- 12) **Volume/Concentration conversion** mls x normality = mls x normality
- 13) **Slope** = Rise/Run
- 14) **Percent Slope** = Rise/Run x 100%
- 15) **Watts** = volts x amps = $\frac{\text{voltage}}{\text{ohms}}$

Grade I: Process Control

- 1) **Detention time (hrs.)** = $\frac{\text{tank volume in gallons} \times 24 \text{ hr./day}}{\text{flow in gallons per day}}$
- 2) **% Efficiency of Removal** = $\frac{\text{mg/l influent} - \text{mg/l effluent}}{\text{mg/l influent}} \times 100\%$

- 3) **Pond population equivalent, in persons** = $\frac{\text{Flow in MGD} \times \text{BOD in mg/l} \times 8.34 \text{ lbs/gal}}{0.2 \text{ lbs BOD/day/person}}$
- 4) **Pond area, acres** = $\frac{\text{average width in ft.} \times \text{average length in ft}}{43560 \text{ ft}^2/\text{acre}}$
- 5) **Pond volume, acre feet (ac ft)** = area in acres (ac) x depth in feet (ft)
- 6) **Pond influent flow in ac-ft/day** = $\frac{\text{gals per day}}{7.48 \text{ gal/ft}^3 \times 43560 \text{ ft}^2/\text{acre}}$
- 7) **Pond detention time (days)** = $\frac{\text{pond volume in ac-ft}}{\text{influent rate in ac-ft/day}}$
- 8) **Pond hydraulic loading, inches per day** = $\frac{\text{depth of pond in inches}}{\text{detention time in days}}$
- 9) **Pond organic loading (lbs. BOD/day/acre)** = $\frac{\text{BOD in mg/l} \times \text{MGD} \times 8.34}{\text{pond area in acres}}$
- 10) **Pond population loading** = $\frac{\text{population served in \# of persons}}{\text{pond area in acres}}$

Grade II: Process Control

- 11) **% Settleable Solids** = $\frac{\text{mls of settled sludge after 30 min.}}{\text{vol. of settleometer}} \times 100$
- 12) **Sludge Volume Index (SVI)** = $\frac{(\% \text{ settleable solids} \times 10,000)}{\text{MLSS in mg/l}}$
- 13) **Recirculation ratio for trickling filters** = $\frac{\text{recirculated flow}}{\text{influent wastewater flow}}$
- 14) **Surface loading (overflow) rate, gpd/ft²** = $\frac{\text{flow in gpd}}{\text{surface area in ft}^2}$
- 15) **Weir overflow rate** = $\frac{\text{flow in gpd}}{\text{feet of weir}}$
- 16) **Trickling Filter Organic Loading, lbs/day/1000 ft³** = $\frac{\text{BOD applied in lbs. per day}}{\text{volume of media in 1000 ft}^3}$
- 17) **Trickling Filter Hydraulic Loading, gpd/ft²** = $\frac{\text{gal/day (including recirculation flow)}}{\text{surface area in ft}^2}$
- 18) **Mean cell residence time (MCRT) in days**

$$= \frac{\text{MLSS in mg/l} \times \text{MG (aer. tank + sec. clar. vol.)} \times 8.34}{(\text{Eff. SS in mg/l} \times \text{MGD} \times 8.34) + (\text{WAS in mg/l} \times \text{WAS MGD} \times 8.34)}$$

19) **Sludge age, days** = $\frac{\text{MLSS in mg/l} \times \text{aerator volume in MG} \times 8.34}{\text{Primary Eff. SS in mg/l} \times \text{MGD} \times 8.34}$

20) **BOD₅ (unseeded), mg/l** = $\frac{\text{DO}_i - \text{DO}_5}{p}$ where DO_i = Initial DO

DO_5 = DO after 5 days

$$p = \frac{\text{mls of sample}}{300 \text{ (mls in a BOD bottle)}}$$

21) **BOD₅, mg/l (seeded)** = $\frac{(\text{DO}_i - \text{DO}_5) - ((B_1 - B_5) f)}{p}$

where DO_i = Initial DO, in mg/L

DO_5 = DO after 5 days, in mg/L

p = the decimal volumetric fraction of sample used = $\frac{\text{mls of sample}}{300 \text{ (the \# of mls in a BOD bottle)}}$

B_1 = DO_i of the seed control before incubation, in mg/l

B_5 = DO_5 of the seed control after 5 day incubation at 20° C, in mg/l

f = $\frac{\text{volume of seed (in mls) in diluted sample}}{\text{volume of seed (in mls) in seed control bottle}}$

22) **Wasting rate, gpm** = pumping rate, MGD x 694 gpm/MGD

Grade III: Process Control

23) **Total Suspended Solids (TSS), mg/l** = $\frac{\text{dry solids in grams} \times 1000 \text{ mg/g} \times 1000 \text{ ml/l}}{\text{sample volume in mls}}$

or = $\frac{\text{weight of solids in mg} \times 1000 \text{ mls/l}}{\text{sample volume in mls}}$

24) **Total Solids (TS), mg/l** = $\frac{A - B \times 1000}{\text{sample volume in mL}}$

where A = weight of dish + dried residue in milligrams

B = weight of dish in milligrams

$$25) \text{ Volatile Solids (VS), mg/L} = \frac{(A - B) \times 1000}{\text{sample volume in mL}}$$

where A = weight of residue + dish before ignition in milligrams
B = weight of residue + dish after ignition in milligrams

$$26) \text{ Percent (\%) Volatile Solids} = \frac{(A - C) \times 100}{A - B}$$

where A = weight of dish + dried residue in milligrams
B = weight of dish in milligrams
C = weight of residue + dish after ignition in milligrams

$$27) \text{ F/M (food to microorganism) ratio} = \frac{\text{BOD (or COD) in mg/l} \times \text{MGD} \times 8.34}{\text{MLVSS in mg/l} \times \text{aeration basin vol. in MG} \times 8.34}$$

$$28) \text{ Dry solids to a digester, lbs/day} = \text{sludge in gpd} \times 8.34 \times \frac{\% \text{ Total solids}}{100}$$

$$29) \text{ Volatile Solids to a digester, lbs/day} = \text{sludge in gpd} \times 8.34 \times \frac{\% \text{ Total Solids}}{100} \times \frac{\% \text{ Vol. Solids}}{100}$$

$$30) \text{ Volatile Solids Destroyed in a digester, lbs/day/ft}^3 = \frac{\text{Volume of sludge in gal/day} \times \% \text{ solids} \times \% \text{ volatile} \times \% \text{ reduction} \times 8.34}{\text{Digester volume in ft}^3}$$

31) % Volatile Solids Destroyed in a digester

$$= ((\text{in} - \text{out}) / \text{in} - (\text{in} \times \text{out})) \times 100\%$$

32) Return Activated Sludge (RAS) Rate calculated using Settleability

$$\text{MGD} = \text{Secondary influent flow, MGD} \times \text{Return Sludge Rate Ratio}$$

$$\text{where the Return Sludge Rate Ratio} = \frac{30 \text{ min settled sludge volume in ml/l}}{\text{clear liquid volume in ml/l}}$$

Grade IV: Process Control

33) Total waste activated sludge (WAS) in MGD = current rate in MGD + additional rate in MGD

$$34) \text{ Stream Conc. Formula} = \frac{\text{lbs/day discharged from plant} + \text{lbs/day upstream total flow}}{\text{MGD (plant flow} + \text{stream flow)} \times 8.34}$$

35) Nitrogenous Oxygen Demand (NOD), mg/l =
NH₃, mg/l x 4.6 mg/l O₂ per mg/l NH₃ converted to NO₃

36) Ultimate Oxygen Demand (UOD), mg/l = (1.5 x BOD, mg/l) + (4.6 x NH₃, mg/l)

37) Chemical Oxygen Demand, mg/l =

$$\frac{(\text{mls of FAS to titrate blank} - \text{mls of FAS to titrate sample}) \times \text{normality of FAS} \times 8000}{\text{mls of sample}}$$

(*FAS = Ferrous Ammonium Sulfate)

38) Waste Activated Sludge (WAS) pumping rate = $\frac{\text{Solids to be wasted in lbs/day}}{\text{WAS SS in mg/l} \times 8.34}$

Pump and/or Flow

39) $Q = A \times V$ where Q = quantity of flow (in units of $\text{ft}^3/\text{sec.}$)
 A = cross sectional area
 V = velocity

40) Velocity in ft/sec = $\frac{\text{flow rate} - \text{in } \text{ft}^3/\text{sec}}{\text{cross-sectional area} - \text{in } \text{ft}^2}$

41) Water horsepower (Water HP) = $\frac{\text{gpm} \times \text{total head in ft}}{3960}$

42) Brake horsepower (Brake HP) = $\frac{\text{flow in gpm} \times \text{total head in ft}}{3960 \times \text{pump efficiency}}$

43) Motor horsepower (Motor HP) = $\frac{\text{gpm} \times \text{total head in ft}}{3960 \times \text{pump efficiency} \times \text{motor efficiency}}$

44) Pump electrical costs per year

= hp x 0.746 kW/hp x # of hrs pump operates per day x cost (\$) per kW/hr x 365 day/yr.