



## **Wastewater System Operations Specialist**

**New Jersey Water Association  
U.S. Highway 9  
Lanoka Harbor, NJ 08734**

### **Appendix A - 2**

**WORK PROCESS SCHEDULE**

**AND**

**RELATED TECHNICAL INSTRUCTION OUTLINE**

# Wastewater System Operations Specialist

## Appendix A-2

### WORK PROCESS SCHEDULE

**OCCUPATION TITLE: Wastewater System Operator**  
**PROGRAM TITLE: Wastewater System Operations Specialist**  
**O\*NET-SOC CODE: 51-8031.00 RAPIDS CODE: 0507R**

This schedule is attached to and a part of these Standards for the above identified occupation.

**1. TYPE OF OCCUPATION**

Time-based                       Competency-based                       Hybrid

**2. TERM OF APPRENTICESHIP**

The term of the occupation is two (2) years with an on-the-job learning (OJL) attainment of approximately 4,000 hours, supplemented by a minimum recommended 288 hours of related instruction.

**3. RATIO OF APPRENTICES TO JOURNEYWORKERS (S and C License Class)**

The apprentice to Licensed Operator ratio is three (3) Apprentice to one (1) Licensed Operator on the jobsite.

**4. APPRENTICE WAGE SCHEDULE**

Apprentices shall be paid a progressively increasing schedule of wages based as outlined in Appendix E, Employer Acceptance Agreement.

Period of Apprenticeship	Advancement Requirements
Period 1	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation
Period 2	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation
Period 3	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation. Obtain the NJDEP Classification 1 Wastewater Operator License
Period 4	1,000 hours of on-the-job training + completion of the identified curriculum with a passing grade + satisfactory evaluation
Completion	Apprentice completes when all the above identified requirements are met

**5. WORK PROCESS SCHEDULE (See below)**

**6. RELATED INSTRUCTION OUTLINE (See below)**

## Wastewater System Operations Specialist

### WORK PROCESS SCHEDULE

**OCCUPATION TITLE: Wastewater System Operator**  
**PROGRAM TITLE: Wastewater System Operations Specialist**  
**O\*NET-SOC CODE : 51-8031.00    RAPIDS CODE : 0507R**

Apprentices shall receive on-the-job instruction and experience as is necessary to become, at a minimum, a S1 and/or C1 Licensed Wastewater System Operator versed in the theory and practice of the occupation. The following is a condensed schedule of work experience, which every apprentice shall follow as closely as conditions will permit.

WORK PROCESSES	Approximate Hours
<b>A. Tools, Equipment and Workplace Safety</b> <ol style="list-style-type: none"> <li>1. Become familiar with tools, pipe and other materials used out on the job</li> <li>2. Understand and use personal protective equipment and safety procedures</li> <li>3. Demonstrate general plant safety and security operations</li> <li>4. Plan and set up work areas for safety of crew and public</li> <li>5. Confined spaces and traffic control zones</li> <li>6. Perform all work in conformance with OSHA regulations</li> </ol>	<b>240</b>
<b>B. Vehicles and Specialized Equipment</b> <ol style="list-style-type: none"> <li>1. Ensure vehicles and equipment are adequately stocked &amp; serviced</li> <li>2. Become familiar working with excavation and other specialized equipment</li> </ol>	<b>400</b>
<b>C. System Operations &amp; Maintenance</b> <ol style="list-style-type: none"> <li>1. Develop a working knowledge of the operation, methods and procedures of a wastewater treatment &amp; collection system</li> <li>2. Perform installation and inspection of new sewer lines and services</li> <li>3. Understand customer metering and billing procedures</li> <li>4. Perform inflow and infiltration, and exfiltration assessments</li> <li>5. Reading meters, perform testing &amp; proper sizing</li> <li>6. Demonstrate ability to read and interpret maps and drawings of the wastewater system, to locate appurtenances such as manholes, chambers, and sewer mains</li> <li>7. Assist with the installation, maintenance and repair of the wastewater treatment plant, and the collection system, pump stations and lift stations</li> <li>8. Develop a working knowledge of preventive maintenance, troubleshooting &amp; repair of mechanical equipment</li> <li>9. Develop working knowledge of SCADA system</li> </ol>	<b>1920</b>
<b>D. Quality Control</b> <ol style="list-style-type: none"> <li>1. Learn to perform all aspects of sampling, monitoring and testing required to maintain compliance with Federal State and Local regulations</li> <li>2. Identify normal/out-of-range values</li> <li>3. Maintain open communication &amp; report results to supervisors</li> <li>4. Learn emergency response procedures</li> </ol>	<b>960</b>
<b>E. Logistics, Reports and Supervision</b> <ol style="list-style-type: none"> <li>1. Complete work order forms</li> <li>2. Document routine maintenance</li> <li>3. Order equipment and supplies as needed</li> <li>4. Visit other facilities to learn about new technology</li> </ol>	<b>480</b>
<b>TOTAL HOURS</b>	<b>4000</b>



# Wastewater System Operations Specialist

## RELATED TECHNICAL INSTRUCTION

**OCCUPATION TITLE:** Wastewater System Operator  
**PROGRAM TITLE:** Wastewater System Operations Specialist  
**O\*NET-SOC CODE:** 51-8031.00    **RAPIDS CODE:** 0507R

A minimum of 288 hours of related instruction are required for each apprentice. Courses may be assigned from any of the following offerings: colleges, vocational/technical schools, industry associations, on-line. NJ requires Introduction to Water/Wastewater Operations and Advanced Wastewater Operations Courses for licensure.

### Year 1

Topic	Hours*
<p><b>A. ORIENTATION</b></p> <ol style="list-style-type: none"> <li>1. Apprenticeship Program overview                             <ol style="list-style-type: none"> <li>a. NJ Water Association Standards of Apprenticeship</li> <li>b. Qualifications for Apprenticeship</li> <li>c. Policy manual</li> <li>d. Apprenticeship Training &amp; Advisory Committee (ATAC)</li> </ol> </li> <li>2. Basic job duties &amp; work environment</li> <li>3. On the Job Learning (OJL)                             <ol style="list-style-type: none"> <li>a. Work process schedule</li> <li>b. Supervision</li> </ol> </li> <li>4. Related Instruction Opportunities and Requirements</li> <li>5. NRW Apprenticeship Tracking System</li> <li>6. NRW Next Thought Learning Management System</li> </ol>	<b>6</b>
<p><b>B. PROFESSIONAL REQUIREMENTS</b></p> <ol style="list-style-type: none"> <li>1. NJ Certifications &amp; licensure</li> <li>2. Responsibilities of a NJ Wastewater System Operator</li> <li>3. Ethics as a public health &amp; environmental professional</li> <li>4. Customer service &amp; community outreach</li> <li>5. Professional organizations</li> </ol>	<b>12</b>
<p><b>C. HEALTH &amp; SAFETY</b></p> <ol style="list-style-type: none"> <li>1. OSHA-10, General Industry                             <ol style="list-style-type: none"> <li>a. Introduction to USDOL Occupational Safety &amp; Health Administration</li> <li>b. Hazardous Chemical Safety</li> <li>c. Confined Space Awareness</li> <li>d. Electrical Hazard Awareness</li> <li>e. Personal Protective Equipment (PPE)</li> <li>f. Slip, Trip and Fall Hazard Protection</li> <li>g. Fixed and Portable Ladder Safety</li> <li>h. Fire Prevention, Protection and Emergency Egress Safety</li> <li>i. Dangers of unguarded equipment</li> <li>j. Forklift Safety</li> <li>k. Lockout/Tag Out</li> </ol> </li> </ol>	<b>27</b>

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<ol style="list-style-type: none"> <li>2. Drug and Alcohol Awareness</li> <li>3. Egress and Emergency Action Plans</li> <li>4. Hand and Portable Power Tools</li> <li>5. Roadside Safety Awareness</li> <li>6. CPR/AED/First Aid Certification (Certified Instructor)</li> <li>7. Trenching &amp; Shoring</li> <li>8. Hazard Communication/Right to Know/Global Harmonization Course</li> </ol>	
<p><b>D. EMERGENCY RESPONSE</b></p> <p><b>1. National Incident Management System</b></p> <ol style="list-style-type: none"> <li>a. IS-100: Introduction to Incident Command System (ICS) (1<sup>st</sup> 6 months of Year 1)</li> <li>b. IS-700: Introduction to the National Incident Management System (NIMS) (1<sup>st</sup> 6 months of Year 1)</li> <li>c. IS-800: Introduction to the National Response Framework (NRF) (1<sup>st</sup> 6 months of Year 1)</li> <li>d. ICS-200: Basic Incident Command System for Initial Response (2<sup>nd</sup> 6 months of Year 1)</li> </ol>	<b>12</b>
<p><b>E. INTRODUCTION TO WATER &amp; WASTEWATER OPERATIONS – PART I</b></p> <p>NJDEP Licensing Requirement</p> <p>Text: <i>Water Treatment Plant Operation, Volume I</i></p> <p>Text: <i>Operation of Wastewater Treatment Plant, Volume I</i></p> <p><b>1. MATHEMATICS:</b></p> <ol style="list-style-type: none"> <li>a. Basic Math             <ol style="list-style-type: none"> <li>i. Fractions and Decimals</li> <li>ii. Ration and Proportions</li> <li>iii. Percent and Unit Analysis</li> <li>iv. Graphs and Significant Numbers</li> <li>v. Review of Addition, Subtraction, etc.</li> <li>vi. Conversions and Averaging</li> <li>vii. Usage of Scientific Calculator</li> <li>viii. Metric System</li> </ol> </li> <li>b. Basic Algebra             <ol style="list-style-type: none"> <li>i. Simple Algebraic Equations</li> <li>ii. Exponentials, Logarithm, Scientific Notation</li> <li>iii. Formulas for Process Control</li> </ol> </li> <li>c. Geometric Figures             <ol style="list-style-type: none"> <li>i. Circle, Cone and Cylinder</li> <li>ii. Frustum</li> <li>iii. Rectangles</li> <li>iv. Triangles and Trapezoid</li> <li>v. Prismoidal Basin</li> </ol> </li> </ol>	<b>90</b>          <b>36</b>

<p>2. PHYSICS</p> <ul style="list-style-type: none"> <li>a. Hydraulics <ul style="list-style-type: none"> <li>i. Basic Hydraulics-Detention Time, Force, Head, Velocity, etc.</li> <li>ii. Flow Calculation-Channels, Parshall Flume, Weirs, etc.</li> <li>iii. Pumps: <ul style="list-style-type: none"> <li>A. Types and Application</li> <li>B. Pump Curves and Computations</li> <li>C. Static and Dynamic Head and Calculations</li> <li>D. Valves and Related Equipment</li> <li>E. Maintenance</li> </ul> </li> </ul> </li> <li>b. Electricity <ul style="list-style-type: none"> <li>i. Basic Electricity <ul style="list-style-type: none"> <li>A. Ohm’s Law</li> <li>B. Parallel and Series Circuits</li> <li>C. Basic Generator and Power Transmission</li> <li>D. Transformers</li> <li>E. Power Requirements and Calculations</li> </ul> </li> <li>ii. Motors and Name Plate Data <ul style="list-style-type: none"> <li>A. Basic Components</li> <li>B. Horsepower Requirements and Efficiencies</li> </ul> </li> <li>iii. Instrumentation <ul style="list-style-type: none"> <li>A. Types and Application</li> </ul> </li> </ul> </li> <li>c. Simple Machines <ul style="list-style-type: none"> <li>i. Pulleys</li> <li>ii. Levers</li> </ul> </li> </ul>	<p>26</p>
<p>3. CHEMISTRY</p> <ul style="list-style-type: none"> <li>a. Basic Chemistry <ul style="list-style-type: none"> <li>i. Atomic Structure and components</li> <li>ii. Elements and Compounds</li> <li>iii. Chemical Symbols and Equations</li> <li>iv. Periodic Table</li> <li>v. Balancing of Equations</li> <li>vi. pH Values</li> <li>vii. Solution Preparation for Laboratory and Process Application</li> </ul> </li> </ul>	<p>11</p>

<p><b>4. MICROBIOLOGY</b></p> <ul style="list-style-type: none"> <li>a. Cell Structure</li> <li>b. Cell Metabolism-Reproduction</li> <li>c. Microorganisms-Bacteria, Algae</li> <li>d. Nitrogen and other Cycles</li> <li>e. Environmental Factors Affecting Microorganisms</li> <li>f. Classification                             <ul style="list-style-type: none"> <li>i. Aerobic</li> <li>ii. Anaerobic</li> <li>iii. Facultative</li> </ul> </li> <li>g. Pathogens</li> <li>h. Typical Microorganisms Related to Water and Wastewater</li> </ul>	<p>11</p>
<p><b>5. MISCELLANEOUS</b></p> <ul style="list-style-type: none"> <li>a. Terminology</li> <li>b. Laboratory Equipment Familiarization</li> <li>c. Basic Laboratory Testing                             <ul style="list-style-type: none"> <li>i. pH and temperature</li> <li>ii. Chlorine Residual</li> <li>iii. Settleable Solids</li> </ul> </li> </ul>	<p>6</p>
<p><b>E. INTRODUCTION TO WATER &amp; WASTEWATER OPERATIONS – PART II</b></p> <p><b><u>Wastewater Operations</u></b> NJDEP Licensing Requirement                  Text: <i>Operation of Wastewater Treatment Plant Operation, Volume. 1</i>                  Text: <i>Operation &amp; Maintenance Wastewater Collection Systems, Volume 1</i></p>	<p>45</p>
<p><b>1. ADMINISTRATIVE</b></p> <ul style="list-style-type: none"> <li>a. Rules and Regulations</li> <li>b. Reporting to Regulatory Agencies</li> <li>c. Budgeting</li> <li>d. Record Keeping</li> <li>e. Safety - OSHA</li> </ul>	<p>4</p>
<p><b>2. WASTEWATER SOURCES AND CHARACTERISTICS</b></p> <ul style="list-style-type: none"> <li>a. Domestic</li> <li>b. Industrial</li> <li>c. Parameter Ranges</li> <li>d. Flows</li> </ul>	<p>2</p>
<p><b>3. TREATMENT METHODS</b></p> <ul style="list-style-type: none"> <li>a. Preliminary                             <ul style="list-style-type: none"> <li>i. Screening</li> <li>ii. Grit Removal</li> </ul> </li> </ul>	<p>22</p>

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<ul style="list-style-type: none"> <li>iii. Comminution, Grinders, etc.</li> <li>iv. Pre-Chlorination and Pre-aeration</li> <li>b. Primary                             <ul style="list-style-type: none"> <li>i. Septic Tanks</li> <li>ii. Imhoff Tanks</li> <li>iii. Clarifiers</li> <li>iv. Chemical Precipitation</li> </ul> </li> <li>c. Secondary                             <ul style="list-style-type: none"> <li>i. Trickling Filters and RCB's</li> <li>ii. Activated Sludge Systems                                     <ul style="list-style-type: none"> <li>A. Conventional, Step-aeration, Extended, etc.</li> <li>B. Secondary Clarification</li> </ul> </li> </ul> </li> <li>d. Sludge Handling                             <ul style="list-style-type: none"> <li>i. Sludge Thickening                                     <ul style="list-style-type: none"> <li>A. Gravity</li> <li>B. Flotation</li> <li>C. Gravity Belt</li> </ul> </li> <li>ii. Sludge Digestion                                     <ul style="list-style-type: none"> <li>A. Aerobic</li> <li>B. Anaerobic</li> </ul> </li> <li>iii. Sludge Dewatering                                     <ul style="list-style-type: none"> <li>A. Mechanical Methods</li> <li>B. Drying Beds</li> </ul> </li> <li>iv. Sludge Disposal                                     <ul style="list-style-type: none"> <li>A. Incineration</li> <li>B. Composting</li> <li>C. Land Application</li> </ul> </li> </ul> </li> <li>e. Advanced Treatment (3 Hours)                             <ul style="list-style-type: none"> <li>i. Ammonia Removal</li> <li>ii. Phosphorus Removal</li> <li>iii. Stabilization Lagoons</li> </ul> </li> </ul>	
<p><b>4. DISINFECTION</b></p> <ul style="list-style-type: none"> <li>a. Types – Chlorination, Ultra-Violet Light, etc.</li> <li>b. Method of Application</li> <li>c. Dechlorination</li> <li>d. Operation</li> </ul>	2
<p><b>5. WASTEWATER ANALYSIS AND INTERPRETATION</b></p> <ul style="list-style-type: none"> <li>a. Process Control</li> <li>b. Laboratory Testing                             <ul style="list-style-type: none"> <li>i. BOD</li> <li>ii. Solids – Total, Suspended, Dissolved</li> <li>iii. Sludge Analysis</li> <li>iv. Others</li> </ul> </li> </ul>	3



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<p><b>6. COLLECTION SYSTEM</b></p> <ul style="list-style-type: none"> <li>a. Gravity Systems                             <ul style="list-style-type: none"> <li>i. Types and Size of Pipes</li> <li>ii. Slope and Velocity Requirements</li> <li>iii. Manhole                                     <ul style="list-style-type: none"> <li>A. Standard</li> <li>B. Drop</li> </ul> </li> <li>iv. House Connection</li> <li>v. Maintenance</li> </ul> </li> <li>b. Pumping Station and Force Main                             <ul style="list-style-type: none"> <li>i. Sizing of Force Main</li> <li>ii. Pumps and Controls</li> <li>iii. Standby Power (Generator)</li> <li>iv. Odor Control</li> <li>v. Screenings and Grease Control</li> <li>vi. Maintenance</li> </ul> </li> <li>c. Pretreatment                             <ul style="list-style-type: none"> <li>i. Local and State Regulations</li> <li>ii. Treatment Impact</li> </ul> </li> </ul>	6
<p><b>7. SAFETY</b></p>	3
<p><b>8. FIELD TRIP</b></p>	3
<p><b>E. INTRODUCTION TO WATER &amp; WASTEWATER OPERATIONS – Part II</b>  <b><u>Water Operations</u></b> NJDEP Licensing Requirement                  Text: <i>Water Treatment Plant Operation, Volume I</i>                  Text: <i>Water Distribution System Operation &amp; Maintenance, Volume I</i></p>	<b>45</b>
<p><b>1. ADMINISTRATIVE</b></p> <ul style="list-style-type: none"> <li>a. Rules and Regulations</li> <li>b. Reporting to Regulatory Agencies</li> <li>c. Budgeting</li> <li>d. Record Keeping</li> <li>e. Safety-OSHA</li> </ul>	6
<p><b>2. WATER SOURCES AND CHARACTERISTICS</b></p> <ul style="list-style-type: none"> <li>a. Hydrological Cycle</li> <li>b. Surface Water Supply</li> <li>c. Ground Water Supply and Others</li> </ul>	3
<p><b>3. WELLS</b></p> <ul style="list-style-type: none"> <li>a. Types and Construction</li> <li>b. Operation and Treatment</li> <li>c. Monitoring and Record Keeping</li> </ul>	3

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<p>4. WATER TREATMENT</p> <ul style="list-style-type: none"> <li>a. Sedimentation and Precipitation                             <ul style="list-style-type: none"> <li>i. Operation and Records</li> <li>ii. Operation Parameters and Problems</li> <li>iii. Applied Math</li> </ul> </li> <li>b. Filtration                             <ul style="list-style-type: none"> <li>i. Gravity and Pressure Filters</li> <li>ii. Construction</li> <li>iii. Operation Parameters and Problems</li> <li>iv. Applied Math</li> </ul> </li> <li>c. Aeration and Air Stripping</li> <li>d. Reverse Osmosis</li> <li>e. Water Softening</li> <li>f. Iron Removal</li> <li>g. Distillation</li> </ul>	12
<p>5. DISINFECTION</p> <ul style="list-style-type: none"> <li>a. Types-Chlorination, Ultra-Violet Light, others</li> <li>b. Method of Application</li> <li>c. Operation</li> </ul>	3
<p>6. WATER ANALYSIS AND INTERPRETATION: (3 Hours)</p> <ul style="list-style-type: none"> <li>a. Drinking Water Standards</li> <li>b. Process Evaluation</li> </ul>	3
<p>7. DISTRIBUTION SYSTEM</p> <ul style="list-style-type: none"> <li>a. Types of Pumps and Pipe</li> <li>b. Main Installation and Repair</li> <li>c. Water Meters and Valves</li> <li>d. Hydrant Installation and Repairs</li> <li>e. Physical and Cross-Connections</li> </ul>	9
<p>8. SAFETY</p>	3
<p>9. FIELD TRIP</p>	3
<p><b>Total Year 1 Related Technical Training</b></p>	<b>237*</b>
<p><b>* <u>Hours are approximate</u>, and topics may change based on NJDEP requirements or industry needs.</b></p>	

## Wastewater System Operations Specialist

### Year 2

Topic	Hours*
<p><b>A. ADVANCED WASTEWATER OPERATIONS COURSE (OPTIONAL)</b>                      NJDEP Requirement for Higher License Categories                      Text: <i>Operation of Wastewater Treatment Plants, Volume I</i>                      Text: <i>Operation of Wastewater Treatment Plants, Volume II</i>                      Text: <i>Advanced Waste Treatment</i>                      Text: <i>Utility Management</i></p>	<b>90</b>
<p><b>1. ADMINISTRATIVE</b></p> <ul style="list-style-type: none"> <li>a. Review of Rules &amp; Regulations, NJPDES Permit</li> <li>b. Filing Reports-DMR's, Sludge Reports, Lab. Certification, etc.</li> <li>c. Preparing Monthly Reports on Plant Operation</li> <li>d. Budgeting</li> <li>e. Importance of Continuing Education-Attending Conferences, Seminars, etc.</li> <li>f. Establishing Record Requirements and Record Keeping</li> <li>g. Safety and P.E.O.S.H.A. Requirements</li> <li>h. Toxic Catastrophe Prevention Act and Right to Know Act</li> <li>i. Utility Management</li> </ul>	15
<p><b>2. WASTEWATER SOURCES &amp; CHARACTERISTICS REVIEW</b></p>	1

<p><b>3. TREATMENT METHODS</b></p> <ul style="list-style-type: none"> <li>a. Preliminary           <ul style="list-style-type: none"> <li>i. Screening               <ul style="list-style-type: none"> <li>A. Types of Screens</li> <li>B. Function &amp; Operation</li> </ul> </li> <li>ii. Comminutors, Grinders, etc.               <ul style="list-style-type: none"> <li>A. Function &amp; Operation</li> <li>B. Maintenance</li> </ul> </li> <li>iii. Grit Removal Systems               <ul style="list-style-type: none"> <li>A. Mechanical Systems                   <ul style="list-style-type: none"> <li>1. Function &amp; Operation</li> <li>2. Design Criteria</li> <li>3. Maintenance</li> </ul> </li> <li>B. Aerated System                   <ul style="list-style-type: none"> <li>1. Function &amp; Operation</li> <li>2. Design Criteria</li> <li>3. Maintenance</li> <li>4. Pre-chlorination &amp; Pre-aeration</li> </ul> </li> </ul> </li> </ul> </li> <li>b. Primary Clarification           <ul style="list-style-type: none"> <li>i. Function &amp; Operation</li> <li>ii. Design Criteria</li> <li>iii. Operation Parameters &amp; Problems</li> <li>iv. Applied Mathematics</li> <li>v. Efficiencies</li> </ul> </li> <li>c. Secondary Treatment           <ul style="list-style-type: none"> <li>i. Trickling Filters and RBC's               <ul style="list-style-type: none"> <li>A. Function &amp; Operation</li> <li>B. Design Criteria</li> <li>C. Operation Parameters &amp; Problems</li> <li>D. Applied Mathematics</li> <li>E. Process Control &amp; Efficiencies</li> </ul> </li> <li>ii. Activated Sludge Systems               <ul style="list-style-type: none"> <li>A. Conventional                   <ul style="list-style-type: none"> <li>1. Function &amp; Operation</li> <li>2. Design Criteria</li> <li>3. Aeration Systems</li> <li>4. Operation Parameters &amp; Problems</li> <li>5. Applied Mathematics</li> <li>6. Process Control</li> </ul> </li> <li>iii. Modified Activated Sludge System                   <ul style="list-style-type: none"> <li>A. Contact-Stabilization, Step Aeration, Oxidation Ditches, etc.                       <ul style="list-style-type: none"> <li>1. Function &amp; Operation</li> <li>2. Design Criteria</li> <li>3. Operation Parameters &amp; Problems</li> <li>4. Applied Mathematics</li> </ul> </li> </ul> </li> </ul> </li> </ul> </li> </ul>	27
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<ul style="list-style-type: none"> <li>5. Process Control</li> <li>6. Clarification                             <ul style="list-style-type: none"> <li>a. Function &amp; Operation</li> <li>b. Design Criteria</li> <li>c. Operation Parameters &amp; Problems</li> <li>d. Applied Mathematics</li> </ul> </li> </ul> <p>4. SLUDGE DIGESTION AND SOLIDS HANDLING</p> <ul style="list-style-type: none"> <li>a. Sludge Thickening Methods                             <ul style="list-style-type: none"> <li>i. Gravity, Flotation, Gravity Belt, Centrifuges                                     <ul style="list-style-type: none"> <li>A. Function &amp; Operation</li> <li>B. Operation Parameters &amp; Problems</li> <li>C. Applied Mathematics</li> <li>D. Process Control</li> </ul> </li> </ul> </li> <li>b. Sludge Digestion                             <ul style="list-style-type: none"> <li>i. Aerobic                                     <ul style="list-style-type: none"> <li>A. Function &amp; Operation</li> <li>B. Operation Parameters &amp; Problems</li> <li>C. Applied Mathematics</li> <li>D. Process Control</li> </ul> </li> <li>ii. Anaerobic                                     <ul style="list-style-type: none"> <li>A. Digestion Ranges – Psychro, Meso &amp; Thermophilic</li> <li>B. Stages of Digestion   <ul style="list-style-type: none"> <li>1. Acid Production</li> <li>2. Acid Regression</li> <li>3. Intensive Digestion</li> </ul> </li> </ul> </li> <li>iii. Methane Gas Equipment                                     <ul style="list-style-type: none"> <li>A. Gas Meters</li> <li>B. Waste Burners</li> <li>C. Pressure &amp; Vacuum Relief Valves</li> <li>D. Manometers</li> <li>E. Flame Cells</li> <li>F. Others</li> </ul> </li> <li>iv. Design Criteria</li> <li>v. Operation Parameters &amp; Problems</li> <li>vi. Applied Mathematics</li> <li>vii. Process Control</li> </ul> </li> <li>c. Sludge Dewatering                             <ul style="list-style-type: none"> <li>i. Mechanical Methods                                     <ul style="list-style-type: none"> <li>A. Centrifuges</li> <li>B. Vacuum Filters</li> <li>C. Belt Press</li> <li>D. Others</li> </ul> </li> <li>ii. Drying Beds                                     <ul style="list-style-type: none"> <li>A. Construction</li> </ul> </li> </ul> </li> </ul>	<p>22</p>
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<ul style="list-style-type: none"> <li>B. Function &amp; Operation</li> <li>C. Applied Mathematics</li> <li>D. Sludge Disposal                             <ul style="list-style-type: none"> <li>1. Rules &amp; Regulations</li> <li>2. Incineration</li> <li>3. Composting</li> <li>4. Land Application</li> </ul> </li> </ul>	11
<p><b>5. ADVANCED TREATMENT</b></p> <ul style="list-style-type: none"> <li>a. Stabilization Lagoons                             <ul style="list-style-type: none"> <li>i. Function &amp; Operation</li> <li>ii. Process Control</li> </ul> </li> <li>b. Nitrification and Denitrification                             <ul style="list-style-type: none"> <li>i. Function &amp; Operation</li> <li>ii. Design Criteria</li> <li>iii. Operation Parameters &amp; Problems</li> <li>iv. Applied Mathematics</li> <li>v. Process Control</li> </ul> </li> <li>c. Phosphorus Removal                             <ul style="list-style-type: none"> <li>i. Function &amp; Operation</li> <li>ii. Design Criteria</li> <li>iii. Operation Parameters &amp; Problems</li> <li>iv. Applied Mathematics</li> <li>v. Process Control</li> </ul> </li> </ul>	3
<p><b>6. DISINFECTION</b></p> <ul style="list-style-type: none"> <li>a. Types</li> <li>b. Methods of Application</li> <li>c. Dechlorination</li> <li>d. Operation</li> </ul>	3
<p><b>7. FIELD TRIP</b></p>	8
<p><b>8. LABORATORY ANALYSIS AND OPERATIONAL CONTROL</b></p> <ul style="list-style-type: none"> <li>a. B.O.D.* and C.O.D.</li> <li>b. Solids-Total*, Suspended*, Dissolved*</li> <li>c. Ammonia</li> <li>d. Total Kjeldahl Nitrogen</li> <li>e. T.O.C.</li> <li>f. D.O.*, pH*, Chlorine Residual*</li> <li>g. Phosphorus</li> <li>h. Sludge Analysis                             <ul style="list-style-type: none"> <li>i. Activated Sludge</li> <li>ii. Digested Sludge</li> <li>iii. Sludge Cake</li> </ul> </li> <li>i. Others</li> </ul>	8
<p>Note: 1. Text required – Kerri Manuals for Wastewater Treatment Volume No. 1 and No. 2, and Advanced Treatment</p>	

<p><b>A. ADVANCED WASTEWATER COLLECTION SYSTEMS COURSE (OPTIONAL)</b>          Text: <i>Operation and Maintenance of Wastewater Collection Systems, Volume I</i>          Text: <i>Operation and Maintenance of Wastewater Collection Systems, Volume II</i></p> <p><b>1. INTRODUCTION/COURSE OVERVIEW</b></p> <ul style="list-style-type: none"> <li>a. NJDEP Licensing Requirements</li> <li>b. Sewer Use Ordinance/Regulations</li> <li>c. Collection System Math</li> <li>d. Quiz</li> </ul> <p><b>2. WASTEWATER COLLECTION SYSTEM COMPONENTS</b></p> <ul style="list-style-type: none"> <li>a. <u>Pipeline Facilities</u> <ul style="list-style-type: none"> <li>i. Pressure, Gravity &amp; Vacuum</li> <li>ii. Sanitary Sewers</li> <li>iii. Combined Sewers</li> <li>iv. Storm Sewers</li> </ul> </li> <li>b. <u>Materials of Construction</u> <ul style="list-style-type: none"> <li>i. PVC, P.E., A.B.S</li> <li>ii. Vitrified Clay</li> <li>iii. Reinforced Concrete</li> <li>iv. Ductile Iron</li> <li>v. Cast Iron</li> <li>vi. Truss</li> <li>vii. Lined</li> <li>viii. Asbestos Cement</li> <li>ix. Joints &amp; Couplings</li> <li>x. Valves</li> </ul> </li> <li>c. <u>Appurtenance Facilities</u> <ul style="list-style-type: none"> <li>i. Flow Regulators</li> <li>ii. Manholes</li> <li>iii. Inverted Siphons</li> <li>iv. Flow Metering</li> <li>v. Air Release</li> <li>vi. Cleanout</li> <li>vii. Sewage Retention Tanks</li> <li>viii. Disinfection</li> <li>ix. Odor Control</li> <li>x. House/Building Connections</li> </ul> </li> <li>d. <u>Alternative Facilities</u> <ul style="list-style-type: none"> <li>i. STEP System</li> <li>ii. Community Collection System – Subsurface Disposal</li> <li>iii. Small Diameter Pressure Sewer</li> <li>iv. Vacuum Collection Sewer</li> </ul> </li> </ul> <p><b>3. COLLECTION SYSTEM APPLICATIONS</b></p> <ul style="list-style-type: none"> <li>a. <u>Fluid Mechanics</u> <ul style="list-style-type: none"> <li>i. Hydraulic Elements</li> <li>ii. Pressure/Gravity</li> <li>iii. Head versus PSI</li> </ul> </li> </ul>	<p><b>45</b></p>
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## Wastewater System Operations Specialist

### b. Flow Quantity

- i. Average, Specific
- ii. Flow Per Capita
- iii. Inflow/Infiltration
- iv. Industrial Equivalent

### c. Flow Velocity

- i. Velocities in Sewers, Scouring Velocities
- ii. Calculated versus Field Measurement
- iii. Flow Composition
- iv. Pressure and Gravity Flow Devices and Field Measurements
- v. Chemical/Solution Additions
- vi. Quiz

## 4. OPERATION & MAINTENANCE OF PIPELINES

### a. Pipe Cleaning, Preventative Maintenance & Maintenance Inspecting and Testing

- i. Air
- ii. Smoke
- iii. Pressure
- iv. Water
- v. Trenching & Installation
- vi. TV Inspection
- vii. Illegal Hookups
- viii. Root Control
- ix. Safety/Traffic Control

## 5. NEW CONSTRUCTION, START-UP

### a. Plans & Specifications

- i. Joints
- ii. House Connection
- iii. Pipe Slope
- iv. Trenching
- v. Construction Safety
- vi. Bedding & Backfill
- vii. Testing

## 6. SEWER/MANHOLE

### a. Rehabilitation & Repair

- i. Replacing Structurally Damaged Pipes
- ii. Grouting
- iii. Slip Lining
- iv. Repair/Replace/Rehabilitation
- v. Mechanical Sealing
- vi. Chemical Sealing
- vii. Quiz



## Wastewater System Operations Specialist

### 7. PUMPING FACILITIES AND APPURTENANCES

#### a. Pumping Station, Submersible Pump, Lift Station, Ejector, Air Release, Cleanout, Grinder Pumps, Force Main, Grit Removal, Screenings, Comminution, Chemical Additions

- i. Start-up
- ii. Testing
- iii. Cleaning
- iv. Maintenance & Preventative Maintenance
- v. Operation
- vi. Odor/Sulfide Control
- vii. Disinfection – Chlorination
- viii. Ozonation
- ix. Ventilation
- x. Auxiliary Power Source
- xi. Cross-Connections
- xii. Explosion Proof Equipment

### 8. SAFETY

- a. Management Responsibilities
- b. Sewers
- c. Electrical Hazards
- d. Mechanical Equipment Hazards
- e. Explosion & Fire Hazards
- f. Bacterial Infection (Health Hazard)
- g. Chlorine Hazard
- h. Oxygen Deficiency & Noxious Gases
- i. Laboratory Hazards
- j. Safety Equipment
- k. Process Chemical Handling
- i. References

### 9. EMERGENCY RESPONSE AND TROUBLESHOOTING

- a. Cause & Effect
- b. Protection Measures
- c. Response & Reporting Requirements
- d. Test

### 10. PUBLIC RELATIONS, MAINTENACE MANAGEMENT

- a. Public Relations
  - i. Relationships with Government Agencies
  - ii. Relationships with General Public
  - iii. Relationships with Property Owners
  - iv. Relationships with Contractors
  - v. Construction Procedure Contact
- b. Maintenance Management
  - i. Logistics
  - ii. Organizations
  - iii. Equipment
  - iv. Records & Reports

## Wastewater System Operations Specialist

<p><b>B. MISCELLANEOUS RELATED TRAINING</b>                  1. Courses offered by NJWA, AWWA-NJ, NJDEP Approved Providers, Colleges/Vocational Schools and on-line providers.</p>	<p><b>27</b></p>
<p><b>C. EMERGENCY RESPONSE &amp; SECURITY</b>                  1. Security                      a. Critical Infrastructure Sectors/National Infrastructure Protection Plan                      b. Physical Security Considerations (Deter, Delay, Detect)                      c. Cybersecurity Plans &amp; Policies                   2. Emergency Response                      a. Vulnerability Assessments (J100)                      b. Emergency Response Plans                      c. Emergency Response Protocols &amp; Procedures                          • Detection/Investigation                          • Information Gathering/Sharing                      e. Response Coordination                      f. Resource Needs</p>	<p><b>24</b></p>
<p><b>Total Year 2 Related Technical Training</b></p>	<p><b>51</b></p>
<p><b>Total Training Hours During Apprenticeship Period</b></p>	<p><b>288*</b></p>
<p><b>* Hours are approximate, and topics may change based on NJDEP requirements or industry needs.</b></p>	