



**Wastewater Systems Operations Specialist**

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

**Appendix A - 2**

**WORK PROCESS SCHEDULE**

**AND**

**RELATED INSTRUCTION OUTLINE**

# Wastewater Systems Operations Specialist

## Appendix A-2

**WORK PROCESS SCHEDULE**  
**Wastewater Systems Operation Specialist**  
**(Existing Title: Wastewater Systems Operator)**  
**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 OJL attainment of approximately 4,000 hours, supplemented by a minimum recommended 288 hours of related instruction.

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

The apprentice to Wastewater Treatment Plan Licensed Operator ratio is: one (1) Apprentice to one (1) Wastewater Treatment Plant 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 Class 1 Water 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 Systems Operations Specialist

### WORK PROCESS SCHEDULE

**OCCUPATION TITLE : Wastewater Systems Operation Specialist  
(Wastewater Systems Operator)**

**O\*NET-SOC CODE : 51-8031.00    RAPIDS CODE : 0507R**

Apprentices shall receive on-the-job instruction and experience as is necessary to become a S1 and/or C1 Licensed Wastewater Treatment Plant 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 Work Place 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. Demonstrate ability to read and interpret maps and drawings of the wastewater system</li> <li>4. Assist with the installation, maintenance and repair of the wastewater treatment plant, collection system, pump stations and lift stations</li> <li>5. Develop a working knowledge of preventive maintenance, troubleshooting &amp; repair of mechanical equipment</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. Order equipment and supplies as needed</li> <li>3. Document routine maintenance</li> <li>4. Visit other facilities to learn about new technology</li> </ol>	<b>480</b>
<b>TOTAL HOURS</b>	<b>4000</b>



## Wastewater Systems Operations Specialist

**OCCUPATION TITLE: Wastewater Systems Operation Specialist  
(Wastewater Systems Operator)  
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. NJ requires Introduction to Water/Wastewater Operations and Advanced Wastewater Operations Courses for licensure.

### Year 1

Topic	Hours*
<b>A. Orientation</b> 1. Apprenticeship Program overview <ul 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 Committee (ATC)</li> </ul> 2. Basic job duties & work environment 3. On the Job Learning (OJL) <ul style="list-style-type: none"> <li>a. Work process schedule</li> <li>b. Supervision</li> </ul> 4. Related Instruction Opportunities and Requirements 5. NRW Water University 6. WaterPro Online Community Apprenticeship Forum	<b>6</b>
<b>B. Safety</b> 1. Safety rules & practices <ul style="list-style-type: none"> <li>a. Personal Protective Equipment (PPE)</li> <li>b. Vaccinations</li> <li>c. OSHA Standards &amp; state guidelines</li> <li>d. Standard CPR/AED/First Aid Certification (American Red Cross)</li> </ul> 2. Safety Data Sheets (SDS) 3. 811 Call Before You Dig 4. Excavation, trenching & shoring 5. Confined space entry & hazardous gases 6. Fire & Electrical safety 7. Traffic control 8. Chlorine safety	<b>6</b>
<b>C. Introduction to Water &amp; Waste Water Operations – Part 1</b> NJDEP Licensing Requirement Courses are offered at colleges, vocational/technical schools, and on-line. Text: Water Treatment Plant Operation Vol I, II. Text: Water Distribution System Operation & Maintenance	<b>90</b>
1. MATHEMATICS: <ul style="list-style-type: none"> <li>a. Basic Math               <ul style="list-style-type: none"> <li>i. Fractions and Decimals</li> <li>ii. Ration and Proportions</li> </ul> </li> </ul>	<b>36</b>

<ul style="list-style-type: none"> <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> <li>b. Basic Algebra <ul 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> </ul> </li> <li>c. Geometric Figures <ul 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> </ul> </li> </ul>	
<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. Horse Power 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> </ul> </li> </ul>	<p>11</p>

<ul style="list-style-type: none"> <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>	11
<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>	11
<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>	6
<p><b>D. Introduction to Water &amp; Waste Water Operations – Part 2 - Wastewater Section</b></p>	45
<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. Safety</li> </ul>	4
<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>	2
<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>	25

<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

<b>6. COLLECTION SYSTEM</b> a. Gravity Systems i. Types and Size of Pipes ii. Slope and Velocity Requirements iii. Manhole A. Standard B. Drop iv. House Connection v. Maintenance b. Pumping Station and Force Main i. Sizing of Force Main ii. Pumps and Controls iii. Standby Power (Generator) iv. Odor Control v. Screenings and Grease Control vi. Maintenance c. Pretreatment i. Local and State Regulations ii. Treatment Impact d. Safety	6
<b>7. FIELD TRIP</b>	3
<b>Total Year 1 Related Technical Training</b>	<b>147</b>
<b>* - Hours are approximate and topics may change based on NJDEP requirements or industry needs.</b>	

### Year 2

Topic	Hours*
<b>A. ADVANCED WASTEWATER OPERATIONS COURSE</b>	<b>90</b>
1. ADMINISTRATIVE a. Review of Rules & Regulations, NJPDES Permit b. Filing Reports-DMR's, Sludge Reports, Lab. Certification, etc. c. Preparing Monthly Reports on Plant Operation d. Budgeting e. Importance of Continuing Education-Attending Conferences, Seminars, etc. f. Establishing Record Requirements and Record Keeping g. Safety and P.E.O.S.H.A. Requirements h. Toxic Catastrophe Prevention Act and Right to Know Act i. Utility Management	15
2. WASTEWATER SOURCES & CHARACTERISTICS REVIEW	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>	<p>27</p>
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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>	22
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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>5. ADVANCED TREATMENT</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>6. DISINFECTION</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>7. FIELD TRIP</p>	8
<p>8. LABORATORY ANALYSIS AND OPERATIONAL CONTROL</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>	3

<p>Note:</p> <p>1. Text required – Kerri Manuals for Wastewater Treatment Volume No. 1 and No. 2, and Advanced Treatment</p>	
<p><b>B. MISCELLANEOUS RELATED TRAINING</b></p> <p>1. Courses offered by NJWA, AWWA-NJ, NJDEP Approved Providers, Colleges/Vocational Schools and on-line providers.</p>	<b>27</b>
<p><b>C. SECURITY &amp; EMERGENCY RESPONSE</b></p> <p>1. Critical Infrastructure Sector designation</p> <ul style="list-style-type: none"> <li>a. Physical security</li> <li>b. Cybersecurity awareness</li> <li>c. Human elements</li> </ul> <p>2. Vulnerability assessments</p> <p>3. National Incident Management System</p> <ul style="list-style-type: none"> <li>a. ICS-100: Introduction to the Incident Command System Certificate (FEMA)</li> </ul> <p>4. Emergency response plans &amp; procedures</p>	<b>24</b>
<b>Total Year 2 Related Technical Training</b>	<b>141</b>
<b>Total Training Hours During Apprenticeship Period</b>	<b>288</b>
<p><b>* - Hours are approximate and topics may change based on NJDEP requirements or industry needs.</b></p>	