NEW YORK STATE | Environmental Facilities Corporation | Department of Environmental Conservation

Engineering Report Outline for New York State Wastewater Infrastructure Projects

October 1, 2023

For Projects to be Approved by the NYS Department of Environmental Conservation (DEC) and/or the NYS Environmental Facilities Corporation (EFC)

I. Statement of Purpose

This document provides guidance on the requirements of an acceptable engineering report for wastewater infrastructure projects in New York State. This outline was created to promote the development of comprehensive engineering evaluations that can be used to make informed decisions about wastewater infrastructure. An engineering report is a final and comprehensive description of the water quality problem and the proposed solution including applicable design criteria and data supporting the solution. A report should evaluate potential solutions to the defined problem and clearly demonstrate that acceptable engineering principles were used in the evaluation, that the data supports the conclusions, and that the proposed solution has reasonable expectations of solving the water quality problem. A report must also present an estimate of the costs of the recommended alternative and a schedule for its implementation. Early project planning is critical to successful projects. The goal of the report is to provide the intended audiences—regulatory and permitting agencies, funding agencies, and governing bodies that must authorize the project—sufficient information to make an informed decision. This also allows the municipalities to prepare overall project plans that include the selection of contract type which impacts schedules, project costs and permitting.

Use of this outline will help to ensure that a submitted report satisfies Clean Water State Revolving Fund (CWSRF) and DEC programmatic and technical requirements. While it is intended that all the items in the outline must be considered for every project, the engineer's evaluation may determine that some elements of the outline do not apply to a project. Conversely, an engineering report may need additional information before it is deemed acceptable or approvable. DEC may also use this outline for Industrial and Private/Commercial/Institutional (PCI) projects. Allocate sufficient time for review, comment, comment resolution and approval.

II. Engineering Report Preparation Standards

An engineering report shall be prepared, stamped, and signed by a qualified professional licensed to practice in New York State and developed in accordance with the latest editions of the following standards whenever practicable and as appropriate:

1. Recommended Standards for Wastewater Facilities - Policies for the Design, Review, and Approval of Plans and Specifications for Wastewater Collection and Treatment Facilities (commonly known as the Ten States Standards)[1]
2. Recommended Standards for Water Works
3. TR-16 Guides for the Design of Wastewater Treatment Works - New England Interstate Water Pollution Control Commission
4. New York State Stormwater Management Design Manual
5. New York State Design Standards for Intermediate Sized Wastewater Treatment Systems Statewide and Lake George Design Standards
6. New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act (CRRA)

[1] 6NYCRR Part 750-2.10

7. American Water Works Association Manual M6, Water Meters – Selection, Installation, Testing, and Maintenance, Fifth Edition

In instances where the design engineer proposes a deviation from the standards listed above, the report must clearly explain and justify the deviation. In all cases, facilities must be designed to treat permitted flows and loads.

There may be components described in the applicable standards that are pertinent to a project and are not addressed in this outline. The engineer preparing the report must ensure that all applicable standards are addressed during the development of the report. See Appendix D: Additional Considerations for Specific Technologies and Project Types for further design guidance.

If the engineering report will be used to seek assistance from the following federal agencies, the engineering report may also need to comply with the latest edition of the Engineering Report Interagency Memo (Bulletin 1780-2): Department of Agriculture – Rural Development, Environmental Protection Agency, Department of Homeland Security, or Housing and Urban Development.

III. Minimum Requirements for Environmental Facilities Corporation Funding

The primary functions of an engineering report are to identify an infrastructure or water quality problem, discuss various solutions and propose a capital improvement project to address the problem. The report also justifies the expenditure and, if being used to apply for funding, should satisfy requirements of the financing entity. To that end, any engineering report funded through the Engineering Planning Grant program, or used for funding projects through the EFC **must**:

- ☐ be current, meaning at the time of submission the report was prepared or updated no more than five years prior to the end of the current IUP period;
- ☐ be the final version, not a draft;
- ☐ be stamped and signed on the outside cover by a qualified professional licensed to practice in New York State;
- ☐ identify the problem and state a capital improvement project as the recommended solution;
- ☐ provide an alternatives analysis;
- ☐ provide an estimate of the total project cost;
- ☐ include or attach project location maps; and
- ☐ attach the completed engineering report certification.

Please Note: Reports that do not include all eight of these items by the listing deadline may not be listed on the Annual List in the CWSRF IUP. A project may receive CWSRF financial assistance in the IUP Period only if it is on the Annual List.

IV. Engineering Report Outline - Table of Contents and Sections

Each engineering report should contain a Table of Contents, including page numbers. The Table of Contents below sets forth the basic outline of information necessary for the development of an engineering report. Please refer to the appropriate page number for details and guidance on each of the sections.

Cover

The cover of the engineering report should contain:

- A descriptive project title
- Name of the Owner/Municipality
- Applicable State Pollution Discharge Elimination System (SPDES) or Publicly Owned Sewer System (POSS) number
- Name of the engineering firm preparing the report
- Date of the report, including any revision dates
- Professional Engineer stamp and signature from a qualified P.E. licensed to practice in New York State and
- If funded by an Engineering Planning Grant, the EPG number and CWSRF project number, once listed

Executive Summary

Provide a brief description of the purpose of the report, need for the project, evaluations conducted, recommended alternative, and proposed course of action.

Project Background and History

1. Site Information

Describe the area(s) under consideration and include the following:

- Location
- Geologic conditions (soil type, depth to bedrock and groundwater, slope if significant)
- Environmental resources (potentially impacted waterbodies, aquifers, endangered species, wetlands, archeologically sensitive areas, agricultural districts, etc.) including any preliminary coordination with involved agencies
- Floodplain considerations[2] including identification of Base Flood Elevation for the site
- Project impacts to Potential Environmental Justice Area(s) (PEJA) and/or Disadvantaged Communities (DAC). The DECinfo Locator is a resource to identify these areas.

2. Ownership and Service Area

Describe the ownership of the facilities and area(s) being served or to be served. Include details of the following:

- Outside users
  - Discuss any existing/required inter-municipal/private/industrial agreements
- Industrial discharges or hauled waste (e.g. source, volume, composition)
- Population[3] trends and growth:
  - U.S. Census or other data (include sources) for the service area for at least the past twenty years or the Period of Probable Usefulness (PPU), if available. Reference the IUP to determine what year data should be used.
  - Discuss any planned or anticipated development.

[2] Floodplain considerations would also include consideration of CRRA guidance referenced throughout this document. The full guidance document can be found here.
[3] EFC uses population to determine the project category in the IUP when a project is listed.

- Total number of new and existing users/equivalent dwelling units[4] (EDUs) served

3. Existing Facilities and Present Condition

Provide overview of major system components and include the following:

- General description and history of major system components with process flow diagram
- Current or future projects on the same site
- State Pollutant Discharge Elimination System (SPDES) Permit conditions and effluent discharge limits. Include when the permit was last issued
- Current SPDES permit as an appendix to the report. Use the DECinfo Locator, if needed
- Publicly Owned Sewer System (POSS) Identification Number[5]
- Documented compliance issues (e.g. SPDES or other permit requirements, consent order, notice of violation, judicial order, EPA order) as an appendix to the report
- Design flows and waste loads (average and peak)
- Existing flows and waste loads from the last three years (average and peak)
- Analyses of production rates for processing and/or manufacturing operations (applicable to industry)
- Existing energy consumption (include energy audit results if available)
- Photographs
- History of damage due to storm or flood impacts (include elevation of floodwaters)

Describe each unit process being evaluated and its present condition. Include the following:

- Existing capacity, age, conveyance, treatment, storage, and/or disposal capabilities
- Past projects, significant operations and maintenance history, and preventative maintenance history.
- Failure history and component limitations
- Ability to meet current design standards for treatment
- Planned, current, or future improvements outside of the project scope
- Hydraulic capacity analysis of existing sewers where expansion or increased flow is proposed
- Security and/or Cybersecurity, if applicable to the system
- Inventory of existing assets, if available.

4. Definition of the Problem

Describe the need for the project. Include any reports, maps, photographs, or schematics as they relate to:

- Health, sanitation, security, and/or cybersecurity
- Short-term asset need as supported by a Capital Improvement Plan or Asset Management Plan
- Aging infrastructure

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[4] a measurement of demand on district facilities equivalent to a typical single-family dwelling. Estimation methods for non-residential users are in New York State Design Standards for Intermediate Sized Wastewater Treatment Systems, March 5, 2014; Table B-3 Typical Per-Unit Hydraulic Loading Rates
[5] POSS numbers can be found at https://www.dec.ny.gov/fs/projects/sprtk/regismuni.xlsx

- Need for Redundancy
- Infiltration and inflow; CSO; SSO
    - Discuss Long Term Control Plan (LTCP) or Sewer System Evaluation Survey (SSES) requirements, as appropriate
- Reasonable growth
- County-wide or regional planning efforts
- Water, energy and/or waste considerations (include audits, if available)
- Suitability for continued use
- Physical risk due to climate change (sea level rise, storm surge, potential for flooding impacts, or other extreme weather event)
- Compliance with current standards (federal, state, and local laws)

5. Financial Status[6]

Briefly provide information regarding sources of income, current rate schedules, other capital improvement programs, and status of existing debts and required reserve accounts.

Discuss the system's current sewer rates and how they are determined, such as through equivalent dwelling units (EDUs), sewer connections, flow metering, inside/outside users, etc. For Towns and Counties with multiple sewer districts or service areas, specify the sewer district, extension, or consolidated district that will pay for the project. Estimate the impact of the project on current sewer rates or cost per EDU.

Alternatives Analysis

The report must include a comprehensive analysis of the following alternatives:

- No-action
- Repair or replacement versus new construction
- Green infrastructure for treatment of stormwater (including stormwater inflow into sewer systems)
- Regional consolidation opportunities
- Centralized versus decentralized (required for new systems), or a combination thereof (small cluster or individual systems)

Any alternatives considered technically infeasible should be identified as such and the rationale briefly discussed.

1. Description

Describe how each alternative will resolve the defined problem. Present the following information for each technically feasible alternative, as appropriate:

- Proposed preliminary design, design standards, sizing, and supporting calculations. Include runoff reduction volume calculations and site conditions for green infrastructure practices
- Impact on existing facility (design average and peak flows and loads)

[6] A more detailed financial profile of the municipality will be required by EFC as part of the Application for financial assistance. If this engineering report is to be utilized for other funding programs, more detailed financial information may be required by those programs.

- Outfall configuration concerns
- Land requirements
- Environmental impacts and mitigation measures
    - Potential State Environmental Quality Review (SEQR) concerns such as water quality and supply, noise levels, air quality, population growth, wetlands, floodplains, and other sensitive areas
    - Potential Impacts (negative or positive) on a PEJA or DAC
- Seasonal limits, challenges, and requirements
- Meet discharge permit requirements required by DEC whether they be existing requirements or new/proposed requirements. Note: It's important to engage the Regional Permit Administrator (RPA) early in the review of the project to ensure a timely coordinated review is done. Please contact NYSDEC to discuss the status of your SPDES permit and the potential need for permit review. If the project scope involves any of the following, a revised/modified SPDES permit and other necessary permits and/or approvals may be required by DEC before approval of design documents or construction can begin. Please include submittal of a full permit application (NY-2A) and time for permit review/issuance in your project schedule giving due consideration to the number and complexity of the permits and approvals needed:
    - Increase in flow or expansion of treatment facility
    - Change to the treatment process
    - Change in outfall location or design
    - Increase or alter the content of the wastes discharged (physical, chemical, or biological)
- Identify the water and energy efficiency measures used
    - Efficient water use, reuse, recapture, and conservation, and energy-efficient design, and/or renewable generation of energy
    - Energy efficiency in accordance with Appendix A – Energy Efficiency Best Practices, Table 1: NYSERDA Summary of Baseline Standard Practices and Energy Efficient Designs - Wastewater Sector
- Demonstrate consideration for future physical climate risks (sea-level rise, storm surge, potential for flooding impacts, or other extreme weather event)[7]
- Security and/or cybersecurity
- Constructability and schedule (account for seasonal limitations)

2. Cost Estimate

- Total project cost with construction costs, non-construction costs and contingency separately stated
    - Non-construction may include land/easement acquisition, legal, engineering, construction management, financial advisor, grant/loan administrator, etc.
    - Contingency up to 30% is acceptable
- Annual operation and maintenance (O&M) cost considering personnel, administration, water purchase or waste treatment costs, insurance, energy cost (fuel or electric), process chemical, monitoring and testing, short-lived asset maintenance and

[7] Storm and flood resiliency would also include consideration of CRRA guidance referenced throughout this document. The full guidance document can be found here.

replacement (see Appendix B: Examples of Short-Lived Assets), professional services, and residuals disposal. Include any income from energy generation or outside revenue.

- Average annual cost per user/ EDU

3. Non-Monetary Factors

Include discussion of all relevant non-monetary factors such as increased recreational opportunities, increased local employment, aesthetics, improved habitat, reduced carbon footprint, climate resiliency, standardization, personnel impacts, permit issues, community objections, or wetland relocation.

Summary and Comparison of Alternatives

Provide a summary table of all technically feasible alternatives identifying any major differences, pros and cons, non-monetary factors, and costs.

- Provide a summary life-cycle cost analysis for all technically feasible alternatives. A comprehensive life-cycle cost analysis may be warranted for projects involving new infrastructure technologies. This analysis should convert capital, O&M, short-term assets, and salvage costs to present worth values. State the time period and the interest rate used in the evaluation.
- Provide a comparison of current cost per user/EDU and each alternative's impact to sewer rates
- If the project objective is primarily energy efficiency, the payback period should be calculated and compared for each alternative (Appendix A: Energy Efficiency Best Practices, Table 2: Example Payback Period Calculation).
- For projects involving stormwater, including stormwater inflow to sanitary or combined sewer systems, a justification and cost analysis must be provided if a green infrastructure component is not part of the recommended alternative.

Recommended Alternative

Identify the recommended alternative and include:

1) Basis of Selection
   a) Prioritization of recommendations (e.g., which sewersheds are critical to be repaired first). Consider vulnerability, risk analysis, and cost-effectiveness.
   b) Justification of why certain alternatives were not selected.
2) Cost Estimate and proposed annual cost per user/EDU
3) Project Schedule
   a) Include time for review/issuance of any necessary SPDES permit modifications and any other necessary permits and/or approvals before approval of design
4) Next Steps
   a) Include descriptions of planned community engagement
   b) Discuss expected SEQR Review
   c) Engage the RPA early in the review of the project to be sure a coordinated review is done, if needed, and review/issuance of any other necessary permits and/or approvals
   d) Discuss anticipated procurement methods and plan of contracts (e.g. design/bid/build, energy performance contract, Project Labor Agreement, Wicks, design/build, etc.)

e) Attach signed Engineering Report Certification, if seeking funds through EFC (Appendix C)

Maps & Figures

Provide a series of maps, drawings, and/or figures that details information regarding the site, the project, and its impacts. For each figure, overlay with applicable information such as municipal boundaries, floodplain and/or resiliency guideline elevations, topography, and PEJA and DAC areas. Include necessary map elements including, but not limited to, a north arrow, legend, and scale.

1. Overall service area
    a. Service area boundaries
    b. Outfalls
    c. Pump stations
    d. Treatment plant(s)
2. Existing project site
    a. Site layout/overall schematic drawing
    b. Hydraulic profile
    c. Process flow diagram
3. Proposed improvements for each alternative
    a. Sewer lines (Identify type of improvement: new, repair, replace, line, etc.)
    b. Manholes
    c. Pump stations
    d. Treatment plant site(s)
    e. Outfall modifications
    f. Hydraulic profile
    g. Process flow diagram

Appendix A: Energy Efficiency Best Practices

New York State Energy Research and Development Authority (NYSERDA) has studied the energy usage for the wastewater treatment sector and identified certain practices and technologies that achieve performance and treatment requirements while also reducing the consumption of energy. These practices and technologies are identified in the NYSERDA Water and Wastewater Energy Management – Best Practices Handbook – March 2019 and are summarized on the following page.

DEC and EFC endorse the reduction of energy usage. The cost savings from employing these technologies generally outweigh the initial cost. As such, it is expected that engineering reports address the feasibility of employing energy reduction technologies identified by NYSERDA. If the selected option within an engineering report does not employ the preferred technology (or a technology that provides greater energy efficiency) identified by NYSERDA, the report should provide justification for not selecting the more energy efficient alternative.

Table 1: NYSERDA Summary of Baseline Standard Practices and Energy Efficient Designs Wastewater Sector

Operation Process	Standard Practice	Typical Energy Efficiency Measures*
Influent Pumping	On/Off Level Control and Standard or High Efficiency Motors	VFD with Control Loop; Premium or Super Premium Efficiency Motors; Multiple Pumps to Match Actual Flow Conditions
Primary Treatment	Standard or High Efficiency Motors; Timers on Sludge Draw-off	Premium or Super Premium Efficiency Motors; VFDs on Sludge Draw-off; Chemically Enhanced Primary Settling
Secondary Treatment	Standard or High Efficiency Motors	Premium or Super Premium Efficiency Motors; Automatic Controls
Fixed Film	Standard or High Efficiency Motors	Premium or Super Premium Efficiency Motors; Flow Control/VFDs on Recycle
Mechanical Aeration	Standard or High Efficiency Motors	Premium or Super Premium Efficiency Motors; Level Control on Effluent Weir; Blowers with Diffuser System; Multi-Speed Motors or VFDs
Diffuser System	Coarse or Medium Bubble Aeration	Fine or Ultra Fine Bubble Diffusers; Fine or Ultra Fine Bubble Diffusers with Mixers (Used Under Mixing Limited Conditions)
Aeration Blowers	Multi-Stage Centrifugal Blowers with Standard or High Efficiency Motors	Premium or Super Premium Efficiency Motors; Inlet Flow Control; Single-Stage Centrifugal Blowers with VFD or Turbo Blowers
Aeration Blowers	Positive Displacement Blowers with Standard or High Efficiency Motors	Premium or Super Premium Efficiency Motors; VFDs; Single-Stage Centrifugal Blowers with VFD or Turbo Blowers
DO Control	Manual handheld DO Monitoring with Manual Adjustment	VFDs with DO or Pressure Control Loop; Start/ Stop Blowers; Control Airflow and Output
WAS/RAS Pumps	Timed Operation and Standard or High Efficiency Motors	VFD with Control Loop; Premium or Super Premium Efficiency Motors
Tertiary Treatment	Flow Control Valves and Standard or High Efficiency Motors	VFD with Control Loop; Premium or Super Premium Efficiency Motors
UV Disinfection	Medium Pressure UV Lamps	Low Pressure High Output Lamp Technology or Hybrid (Fewer Lamps, Low Power) Technology with Dimming Capability; Dose Pacing
Effluent Pumping	On/Off Level Control; Flow Control Valves and Standard or High Efficiency Motors	VFD with Control Loop; Premium or Super Premium Efficiency Motors; Multiple Pumps to Match Actual Flow Conditions
Sludge Processing	Standard or High Efficiency Motors	Premium or Super Premium Efficiency Motors and VFDs, Where Appropriate
Anaerobic Digesters Mixers	Gas Mixing, Hydraulic Sludge Mixing, Mechanical Mixing Technologies	Large Bubble Compressed Biogas, Pumps with VFDs, Vertical Linear Mixers
Plant Water System	Constant Speed Pumps; System-wide Pressure	VFD with Pressure Control; Booster Pumps at Specific Processes
Building Systems	Building Energy Code Compliant	Lighting, HVAC, etc. More Efficient than Building Energy Code
Distributed Renewable Generation	None	Incorporation of Renewable Distributed Generation Assets

*Typical Energy Efficiency Measures were developed for standard conditions and run times. Actual recommendations are evaluated on a case-by-case basis.

The payback period should be calculated for energy efficient practices included in the recommended alternative and compared to the expected useful life of the equipment. If the project objective is primarily for energy efficiency, the payback period should be calculated for each alternative.

Table 2: Example Payback Period Calculation

Operation/Process: Aeration Blowers	Baseline/Existing Standard Practice	Energy Efficiency Practice
Annual Electric Use (kWh/yr.)	2,000,000	750,000
Annual Energy Cost ($)	$200,000	$75,000
Estimated Construction Cost	$1,000,000	$1,200,000
Annual Electric Savings (kWh/yr.)	1,250,000	
Annual Energy Savings ($/yr.)	$125,000	
Energy Savings (%)	62.5%	
Incremental Cost Increase ($)	$200,000	
Simple Payback (SPB) of Incremental Cost (yr)	1.6	
Expected Useful Life of Component (yr)	15	

$$\text{Payback Period} = \frac{(incremental\ cost\ of\ EE\ measure[\$] + incremental\ O\&M\ cost\ of\ EE\ measure[\$])}{Energy\ Savings\ [\$/yr]}$$

Appendix B: Examples of Short-Lived Assets

Table 1: Treatment Related vs. Collection System Related

Treatment Related	Collection System Related
Pump	Pump
Pump Controls	Pump Controls
Pump Motors	Pump Motors
Chemical Feed Pumps	Trash Racks/Bar Screens
Membrane Filter Fibers	Sewer Line Rodding Equipment
Field & Process Instrumentation Equipment	Air Compressors
UV Lamps	Vaults, Lids & Access Hatches
Centrifuges	Security Devices & Fencing
Aeration Blowers	Alarms & Telemetry
Aeration Diffusers & Nozzles	Chemical Leak Detection Equipment
Trickling Filters, RBC's, etc.	
Belt Presses & Driers	
Sludge Collecting & Dewatering Equipment	
Level Sensors	
Pressure Transducers	
Back-up Power Generator	
Chemical Leak Detection Equipment	
Flow Meters	
SCADA Systems	

Appendix C: Engineering Report Certification

(Required for EFC financial assistance)

Engineering Report Certification

To Be Provided by the Professional Engineer Preparing the Report

During the preparation of this Engineering Report, I have studied and evaluated the cost and effectiveness of the processes, materials, techniques, and technologies for carrying out the proposed project or activity for which assistance is being sought from the New York State Clean Water State Revolving Fund. In my professional opinion, I have recommended for selection, to the maximum extent practicable, a project or activity that maximizes the potential for efficient water use, reuse, recapture, and conservation, and energy conservation, taking into account the cost of constructing the project or activity, the cost of operating and maintaining the project or activity over the life of the project or activity, and the cost of replacing the project and activity.

Title of Engineering Report:

Date of Report:

Professional Engineer's Name:

Signature:

Date:

Appendix D: Additional Considerations for Specific Technologies and Project Types

If a report is evaluating any of the following project types, please include the appropriate considerations within the report. This is not a comprehensive list, nor will all considerations apply in every case. These are common considerations to assist in the preparation and review of engineering reports. See the *Engineering Report Preparation Standards* section for additional guidance.

Collection/Conveyance

1. New Collection System
    - Consider local sewer use laws and ordinances. Determine if they need to be modified or amended.
    - Describe the methodology used to estimate flow rates and capacity of the new system based on the proposed service area.
    - Discuss relevant environmental and site considerations, such as wetlands, shallow bedrock, and environmentally sensitive areas.
    - Discuss ownership (e.g. sewage works corporations) of the proposed system and whether easements or land acquisition will be required.
    - Evaluate decentralized alternatives.
    - Provide assurance from the affected community that the existing population will connect to the system within a reasonable time following project completion.
    - Include documentation that the receiving community has appropriate capacity.
    - Review and discuss relevant Intermunicipal Agreements (IMAs). Verify they are valid and binding.

2. Sanitary Sewer System Evaluations and Infiltration and Inflow Reports
    - Compare dry and wet weather flows.
    - Consider local sewer use laws and ordinances. Determine if they need to be modified or amended.
    - Consider peak infiltration, peaking factors, peak inflow rates, total yearly infiltration, and total yearly inflow.
    - Discuss
        - Asset Management Program implementation and risk assessment of critical infrastructure.
        - Average low groundwater infiltration.
        - Determination of rainfall/inflow volume relationship.
        - Identified storm/sanitary sewer cross connections from building inspections and/or surveys as sources of inflow.
        - Monitoring of groundwater and precipitation.
    - Evaluate repair versus replacement.
    - If there are documented CSOs or SSOs in the system, demonstrate how the project will eliminate or reduce frequency and volume of overflow events.
    - Include recommendations for further studies of infiltration and inflow sources.
    - Include sewer capacity analysis and modeling that demonstrates adequate capacity of the project design.
    - Provide a summary of results for any flow monitoring, manhole inspection, TV inspection, and smoke or dye testing in the collection system.
    - Provide an inventory of existing system relevant to project scope.

- Review and discuss relevant IMAs. Verify they are valid and binding.

Processes and Technologies for Treatment Works

1. Disinfection

   All disinfection technologies shall consider the process influent bacteria count, the target organisms, treatment dosage, permit conditions, and process influent TSS concentrations.
   - Chlorination/Dechlorination
     - Discuss the choice of chlorination method considering wastewater flow rates, receiving waterbody characteristics, application and demand rates, pH of wastewater, cost of equipment, chemical availability, required maintenance, and safety concerns.
     - Discuss the design of the system including sizing of feed equipment, chemical storage, type of feed system, mixing point and residual time.
     - If dechlorination is required, discuss where the chemicals will be applied and the required contact period.
   - Ultraviolet (UV) Disinfection
     - Ensure that UV systems can provide the minimum UV dose at the point of disinfection at design average and peak flows necessary to comply with a facility's permit.
     - In determining the design dose, particle size distribution, hardness, and transmittance (UVT) should be considered. Include test results as an appendix to the report.
     - Perform a transmittance study covering weekdays, weekends, and summer months if possible.
       - Use 254 nm wavelength for testing if designing a low-pressure UV disinfection system.
       - Measure transmittance for multiple wavelengths between 200-400 nm if medium-pressure UV lamps are under consideration.
   - When there is a choice between disinfection methods, consider providing life-cycle cost analyses of each option.

2. Innovative Systems

   - Cite references from peer-reviewed literature to support the effectiveness of the technology and the validity of the design calculations.
   - Explain any new staff training that may be required with the system.
   - Provide a thorough description of the system's operation and maintenance requirements. Consider any weaknesses/sensitivities of the innovative technology and explain how they would be accommodated.
   - Provide case studies demonstrating the effectiveness of the technology for similar waste streams in a similar climate.
   - Provide design calculations for all constituents the innovative system is expected to treat.
   - Provide the manufacturer's sizing and design information for review.

3. Nutrient Removal

   - Nitrogen Removal
     - Compare methods of nitrification and/or denitrification. Thoroughly describe the method chosen, process flow rates, and recycling flow rates.
   - Phosphorus Removal
     - Compare biological methods and physical/chemical methods.
     - Conduct pilot tests and provide the results.
     - Describe effect on sludge handling, disposal, and cost.

- Describe effects on disinfection rate.
- Provide a comparison of filter technologies.
- Provide a comparison of water treatment chemicals (WTC) and potential for toxicity.

4. Secondary Treatment

- Define the treatment objectives and outline how the chosen technology most efficiently and effectively meets those goals.
- If a standard treatment process is not being proposed, justify why (e.g., no flow equalization provided).
- If the preliminary and primary treatment are pre-designed into a package plant, demonstrate that adequate volume and dimensioning for grit removal, solids separation and solids storage are provided.
- Provide flow equalization for all treatment modes except for septic tanks, single-pass sand filters, and lagoons.

5. Sludge Handling and Disposal

- Discuss alternative technologies of treating the sludge onsite as well as hauling sludge elsewhere.
- Discuss how potential odor or other environmental problems have been considered.
- Discuss the magnitude of additional loadings from nutrient removal and treatment.
- Present the results of any testing done to determine sludge volume and characteristics.
- Provide adequate sludge treatment for the method of final disposal selected
- Sludge digestion: Provide volume requirements, mixing requirements, gas collection, air requirements, and supernatant collection.
- Thickeners: Present comparison of technologies. Include design parameters such as tank size and polymer additions.

<u>Processes and Technologies for Non-Publicly Owned Treatment Works Elements</u>

1. Decentralized Wastewater Systems

- Evaluate the following systems: septic tanks and drain fields, small-diameter sewers, cluster systems, pressure or vacuum sewers, privately owned individual systems (e.g., PCI facilities).

2. Reuse/Land Application Treatment

- Consider frozen and/or saturated soil impacts. Identify storage needs.
- Consider distances to and impacts on local drinking water wells and surface waters.
- Consider quantity and location of any monitoring wells (upgradient and downgradient).
- Describe the level of (pre-) treatment prior to land application.
- Evaluate sampling plan(s).
- Evaluate the potential land treatment site: land use area, USDA NRCS Soil Classification, presence of fill or disturbed soil, acceptable geology, identification of vegetation, description of topography, description of surface and ground water hydrology, consideration of application methods and rates (volume and loading).
- Provide results of any boring logs, percolation tests, infiltration tests, or other subsurface investigations.
- Recognize that applying wastewater to the land is not considered reuse unless it is for irrigation.

3. Stormwater

- Compare gray versus green alternatives for stormwater management.
- Depict the stormwater flow path and areas of stormwater permit coverage (if available/ appropriate).
- Discuss reduction in stormwater volume and possible impacts on CSOs or SSOs achieved by infiltration, groundwater recharge, harvest and reuse, recycle, and evaporation/evapotranspiration through the use of green infrastructure techniques as a standard practice.
- Evaluate the need for stormwater permit coverage.
- For green infrastructure methods, include the following:
    - Current land use
    - Depth to bedrock (for infiltrating practices)
    - Depth to water table (for infiltrating practices)
    - Discussion of any other site considerations (e.g. wetlands, flood-plain elevations, brownfield remediation)
    - Results of any boring logs, infiltration tests, or other subsurface investigations (for infiltrating practices)
    - USGS Soil Classification (for infiltrating practices).

Flood Risk Evaluation

1. Determining Guideline Elevations
    - Non-critical equipment should be designed at 2 feet above the baseline flood elevation (BFE) and corresponding horizontal flood plain
    - Critical equipment should be designed at 3 feet above BFE, or the 500-year flood plain
2. Sea-level Rise Adjustment (applicable to critical equipment within tidal areas)
    - Use a relevant sea-level rise mapper to determine if a project site is within six feet of sea level rise by 2100.
    - Add applicable (high sea-level rise projection for critical projects and medium projection for non-critical projects) sea-level rise projection to the current BFE, and add applicable freeboard on top of that

TABLE A 1. 6 NYCRR PART490 PROJECTED SEA LEVEL RISE (INCHES OF RISE RELATIVE TO 2000 2004 BASELINE), ADOPTED FEBRUARY 22, 2017.

Rate of Rise	Low	Low medium	Medium	High medium	High
Region	**Mid-Hudson**				
2020s	1	3	5	7	9
2050s	5	9	14	19	27
2080s	10	14	25	36	54
2100	11	18	32	46	71
Region	**New York City/Lower Hudson**				
2020s	2	4	6	8	10
2050s	8	11	16	21	30
2080s	13	18	29	39	58
2100	15	22	36	50	75
Region	**Long Island**				
2020s	2	4	6	8	10
2050s	8	11	16	21	30
2080s	13	18	29	39	58
2100	15	21	34	47	72

3. For further details regarding guidance on flood risk considerations and sea level rise, refer to the New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act.