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| **Project Name:** |       | **Date:** |       |
| **Engineer Name:** |       | **AK P.E. License No.:** |       |
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| This checklist is required for the construction of a new or modification of an existing membrane filtration treatment system whose treatment objective is reduction of a primary contaminant. It may also be applicable when the treatment goal is removal of a secondary contaminant. Membrane filtration includes reverse osmosis (RO), nano‑, ultra-, and micro-filtration systems. Information and guidance on the use of membranes for microbial treatment can be obtained in the EPA Membrane Filtration Guidance Manual (MFGM), November 2005, (EPA 815-R-06‑009), available at <https://www.epa.gov/dwreginfo/long-term-2-enhanced-surface-water-treatment-rule-documents>.**Note:** When completing this checklist, please answer the question and also include where in the submittal detailed information is found for each submittal requirement. Please be as specific as possible (specify document name, page number, section number, paragraph, etc.). This will accelerate the review process. |

| **Submittal Requirements** | ***Regulatory Reference*** |
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| 1. **Design Documents and Specifications:** Does the submittal include drawings and specifications for construction of the treatment system? Are detailed manufacturer's specifications for the proposed membrane filtration system provided? Are relevant drawings for the membrane system provided? Drawings should include a process flow diagram showing how the membrane system will be integrated with the rest of the treatment plant unit processes; include details on pre and post treatment processes necessary for the membrane system design; include process and instrumentation diagrams, layout plans, profiles, and isometrics.
 | *18 AAC 80.205(a)(2)* |
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| 1. **Treatment Objectives:** What are the treatment objectives and target removal values? This should include how the proposed treatment was selected and its suitability for treating this water source. The design should address the full range of raw water quality expected and the basis of design for any pretreatment required for the membrane system to meet its treatment objective. Provide a summary of analytical data or pilot test results used as the basis supporting the proposed membrane system’s ability to meet the treatment objectives.
 | *18 AAC 80.205(a)(4)**18 AAC 80.205(b)(5)* |
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| 1. **Water Quality:** Does the submittal include results of laboratory analyses of untreated water for contaminants the proposed treatment system is designed to remove? Is the full range of expected values for each contaminant discussed, including seasonal variability? Provide other water quality analyses that have been performed such as those to assess the need for feed water pretreatment/conditioning (e.g. parameters that may affect fouling potential or membrane flux). It is recommended to express data in the form of min/max/average or percentiles e.g. 50th or 95th percentile.
 | *18 AAC 80.205(c)(1)(A)**MFGM Sections 7.2.1 and 7.3.2**AWWA Standard B112* |
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| 1. **Performance Verification:** Are objective and verifiable data provided to support performance claims? This may include third party certifications, data from independent third parties, pilot study data, the manufacturer's test data, and approvals from other states, countries, or federal agencies. The information must be sufficient for the Department to verify the effectiveness of the membrane system to meet its treatment objective under the site specific conditions.
 | *18 AAC 80.205(b)(5)**18 AAC 80.205(b)(9)**18 AAC 80.205(c)(1)(C)* |
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| 1. **Design Calculations:** Do the design calculations cover sizing of membranes and required pre or post treatment, loading rates, backwash/back flush/reverse flow rates, duration, frequency, event triggers, and other items necessary to assess the hydraulic efficiency of the proposed treatment process?
 | *18 AAC 80.205(a)(4)* |
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| 1. **Chemical Cleaning:** Has the engineer included a narrative describing chemical cleaning process (i.e. clean-in-place or CIP) operations? Describe the chemical cleaning process including information on chemicals used, their certification to NSF/ANSI Standard 60, cleaning duration, cleaning frequency, source of rinse water, disposal of spent chemicals and rinse water, and measures to prevent introduction of cleaning chemicals (or traces thereof) into the drinking water. Provide details on how the CIP equipment and membranes are isolated from the remaining potable water system during the CIP process and how the CIP equipment is isolated from the potable water system during water production; isolation via removable spools or double-block and bleed valves is required.
 | *18 AAC 80.010(b)(9)**18 AAC 80.030**MFGM Section 7.3.4* |
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| 1. **Initial Disinfection:** Which specifications address disinfection of the new treatment plant component(s) affected by the project before use? If AWWA Standard C653 is not specified, does the proposed method include adequate detail for the contractor to implement? Please note that some manufacturers may specify a maximum oxidant limit to prevent damage to the membranes.
 | *18 AAC 80.205(b)(9)**MFGM Section 8.5* |
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| 1. **Shutdowns:** How will the public water system’s water demand be met during scheduled shutdown events such as chemical cleaning and direct integrity testing?
 | *18 AAC 80.205(b)(9)* |
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| 1. **Compressed Air:** If compressed air is used for membrane processes such as backwash and integrity testing, has the engineer shown how air quality will be managed to prevent introduction of contaminants into the water and specified that an oil-less compressor/blower and food grade lubricants will be used?
 | *18 AAC 80.205(b)(8)* |
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| 1. **Monitoring Scheme:** Describe the monitoring scheme that will be used to assess process efficiency and reliability during daily operation. Include information on monitoring frequency and sample location.
 | *18 AAC 80.205(c)(1)(C)* |
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| 1. **Sample Taps**: Which design drawing shows the location of compliance and operational sample points in the water treatment plant? Which specification requires the project to provide fixed labels on all compliance sample taps?
 | *18 AAC 80.655**18 AAC 80.205(c)(6)* |
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| 1. **Process Control and Monitoring Equipment:** For automated membrane treatment systems, are the process and instrumentation diagrams, PLC logic loop descriptions, and a process control narrative included? Describe the instruments that will be used by the operator for process control and performance monitoring (e.g. make/model, accuracy, and sensitivity).
 | *18 AAC 80.205(a)(2)**18 AAC 80.205(b)(9)* |
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| 1. **Automation and Alarms:** Describe reliability features including system alarms, critical alarm triggers, alarm follow-up actions (e.g. auto shut-off, filter-to-waste), and the system's capability for effective and safe manual operation.
 | *18 AAC 80.205(b)(9)* |
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| 1. **Power Supply for Critical Controls:** Has a power quality analysis been performed to determine if an uninterruptible power supply (UPS) is required for critical electronic equipment and alarm systems?
 | *18 AAC 80.205(b)(9)* |
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| 1. **Effects on Other Unit Processes:** For new RO or NF membrane systems installed in existing public water systems, include an evaluation of potential effects from water quality changes (e.g. pH and corrosivity) on downstream processes and the distribution system. Any mitigating treatment (e.g. corrosion inhibitors, blending, and pH adjustment) should also be described.
 | *18 AAC 80.205(b)(9)* |
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| 1. **Chemical Feed Pump(s):** What are the make and model of the chemical feed pump(s)? Has the engineer provided the criteria for selection of the chemical feed pump(s), including: pump’s suitability for the chemical it will be injecting, and calculations showing the feed pump(s) are sized for the expected water flow rates and chemical dosages?
 | *18 AAC 80.030**18 AAC 80.205(a)(4)**18 AAC 80.205(b)(9)* |
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| 1. **Chemical Overfeed and Cross-Connection control:** How has the engineer addressed overfeed protection for chemical feed systems? Which methods and devices are incorporated into the design for preventing the potential for backflow from and cross-connections with chemical solution tanks (e.g. water used for chemical mixing)?
 | *18 AAC 80.205(b)(9)**18 AAC 80.025**AWWA Manual M14* |
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| 1. **Heat Exchangers:** Is it specified that all heat exchangers for drinking water contact be double-wall models?
 | *18 AAC 80.025* |
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| 1. **Waste Stream Management:** Is the disposal of backwash/backflow/reverse flow water, reject/concentrate, filter-to-waste, monitoring equipment waste streams, storage tank overflows, and solid waste addressed? Proper air-gaps should be specified and shown in drawings for waste streams prior to discharge to sewer lines/floor drains. The engineer must identify required wastewater and solid waste disposal permits and a schedule for applying for them. If a backwash wastewater surge tank is specified, do the calculations show the adequacy of its storage capacity with respect to wastewater generated during each backwash and effluent pumping capacity?
 | *APDES**18 AAC 72**18 AAC 60**18 AAC 80.025**AKG380000* |
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| 1. **O&M Manual:** Is the party responsible for completing the system’s O&M manual identified and the schedule for completing manual included? Please note that at least a draft version will be required when applying for interim operational approval. The O&M manual should include procedures and “quick reference guides” addressing, at a minimum, the following general concepts: Treatment start and stop cycles; maintenance and calibration of monitoring equipment; membrane integrity verification; evaluation and optimization of backwashing and cleaning regimes, including process(es) for evaluating membrane fouling; trouble-shooting; response to alarm conditions; and monthly regulatory reporting.
 | *18 AAC 80.207* *(b)(3)(A)**MFGM Appendix A**NSF/ANSI Standard 419 Annex G* |
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| 1. **Startup/ Commissioning:** How will the plant startup be implemented? Include details on any temporary piping and the anticipated startup schedule. If the project replaces an existing water treatment plant, where in the submittal is a discussion of how the transition will be made from the existing system to the new? Describe functional and performance tests that will be performed during commissioning/startup. Please note that copies of these test results may be requested for operational approval.
 | *18 AAC 80.205(b)(9)**MFGM Section 8.7**AWWA Standard B112* |
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| 1. **Operator On-site Training:** Does the written plan for training the water system operator(s) to operate the membrane treatment system include who will provide the training, the scheduled date of training relative to the proposed system startup, training forms to be used, and spreadsheets and schedules the operator will be provided? The scope of training should include collecting, recording, and interpreting data necessary for on-going compliance and performance verification.
 | *18 AAC 80.007**MFGM section 8.8* |
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| **Questions below pertain to membrane filtration used as a microbial barrier.** |  |
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| 1. **Manufacturer’s Specifications:** Provide manufacturer's specifications for the proposed membrane filtration system, including: membrane model number, type (spiral wound, hallow fiber), classification (MF, UF, NF, RO), nominal and maximum membrane pore size or molecular weight cutoff rating, membrane material, feed side filtration area, membrane module dimensions and hold-up volume, membrane fiber characteristics (diameter, length, number/module), filtration flow direction (i.e. inside-out or outside-in), hydraulic configuration (i.e. deposition or suspension), and operating limits (e.g. maximum filtrate flux, maximum transmembrane pressure, max feed turbidity or SDI, oxidant tolerance, and pH tolerance range).
 | *18 AAC 80.205(a)(2)**NSF/ANSI Standard 419-Annex C,* *AWWA Standard B112-Appendix B* |
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| 1. **Direct Integrity Testing:** Describe the method used for direct integrity testing (DIT) of the membrane including information on the process (i.e. Can groups of modules be isolated for DIT testing while others continue producing water? ), what triggers a DIT, frequency of routine DITs, resolution of the test (must be able to detected defects ≤ 3 µm), and its sensitivity (max log removal value that can be reliably verified by the DIT). Include specifications for the DIT test procedure (e.g. applied test pressures, test duration, allowable decay rate or control limits) and specifications of instrumentation used in the DIT test (e.g. pressure gages). Do the design calculations show how the DIT resolution and sensitivity were determined? If a liquid-membrane contact angle (Θ) other than zero is used in the calculations, please provide documentation and data to support the selection. **Please note**: membranes that cannot be direct integrity tested are assigned microbial removal credits similar to bag/cartridge filters.
 | *40 CFR 141.719(b)(3)**MFGM Section 4.0* |
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| 1. **Indirect Integrity Monitoring:** What methods will be used for continuous indirect integrity monitoring of the membrane including parameters monitored, sampling frequency, and instrument resolution and sensitivity? Include information onupper control limit (UCL) that would trigger a direct integrity test (if using turbidity, the DIT trigger cannot be set higher than a turbidity value of 0.15 NTU occurring in two consecutive readings no greater than 15-minutes apart) and any related alarm setpoints.
 | *40 CFR 141.719(b)(4)**MFGM section 5.0* |
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| 1. **Turbidity Monitoring:** Describe turbidity monitoring. For continuous monitoring, the description should include turbidimeter specifications and sample point locations. If the turbidimeter signal is to be sent to a data logger, provide analog scaling settings (e.g. 4 mA=0 NTU and 20 mA=10 NTU); scaling should allow recording of turbidities over 5 NTU.
 | *40 CFR 141.1703**40 CFR 141.500**40 CFR 141.503* |
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| 1. **Target Microbe Removal Verification:** Provide a copy of the independent, third‑party verification or challenge testing report that documents the membrane’s log-removal efficiency achieved for the target pathogenic microorganism (e.g. NSF/ANSI Standard 419 challenge test report) The report must document how the challenge test meets the criteria in 40 CFR 141.719(b)(2)(i) through (vii). Please note that rain catchment and seawater systems are subject to a treatment technique requirement of 4-log virus and 3-log *Giardia* removal/inactivation (seawater systems also require a minimum 2-log *Cryptosporidium* removal).
 | *40 CFR 141.719(b)(2)**MFGM sections 1.3 & 3.0**MFGM Appendix E* |
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| 1. **Quality Control Release Value (QCRV):** Does the validation/challenge testing report derive a QCRV for a non-destructive performance test (NDPT) for the proposed membrane model? The QCRV is the NDPT criteria applied by the manufacturer to similar production membrane modules that were not directly challenge tested to verify that they would perform as well as the validated modules.
 | *40 CFR 141.719(b)(2)(vii)**MFGM Section 3.6* |
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| 1. **Performance Monitoring:** Are there written performance goals for the operators that include Log Removal Value (LRV), percent recovery, permeability/ resistance, transmembrane pressure (TMP), flux, and turbidity? Example LRV > 4.0 and individual filter unit effluent turbidity < 0.15 NTU. SCADA/HMI programming should be transparent and show sufficient data to allow manual verification for calculated performance measures such as LRV and permeability.
 | *18 AAC 80.205**40 CFR 141.719(b)(3) & (4)* |
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| 1. **SCADA:** Provide description of SCADA programming and calculations needed to verify control limits, LRV, and other performance measures. Provide an example of the SCADA or HMI screen and the ladder logic showing how LRV is calculated to facilitate regulatory oversight and process control monitoring. DEC recommends using a conservative approach for LRV calculations (e.g. using current flow rate and most recent pressure decay test results) in order to demonstrate the membrane's performance under actual on-site conditions.
 | *18 AAC 80.205**NSF/ANSI 419, Annex G* |
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