

Attachment C

Biochemical Oxygen Demand (BOD₅) & Total Suspended Solids (TSS)

Applicable BOD and TSS Licensing criteria

Maine law 38 M.R.S. §469, *Classifications of estuarine and marine waters*, states that all estuarine and marine waters lying within the boundaries of coastal counties of the State of Maine and that are not otherwise classified are Class SB waters.

Maine law 38 M.R.S. §465-B, *Standards for classification of estuarine and marine waters*, states in part “2. Class SB waters. Class SB waters shall be the 2nd highest classification.” Subsection 465-B(2)(b) further states in part; “The dissolved oxygen content of Class SB waters may not be less than 85% of saturation.” Subsection 465-B(2)(C) further state in part; “Discharges to Class SB waters may not cause adverse impact to estuarine and marine life in that the receiving waters must be of sufficient quality to support all estuarine and marine species indigenous to the receiving water without detrimental changes in the resident biological community.”

Maine law 38 M.R.S. §464 *Classification of Maine Waters*, states in part as follows:

38 M.R.S. §464 (F)(3): “The department may only issue a discharge license pursuant to section 414-A or approve water quality certification pursuant to the Federal Water Pollution Control Act, Section 401, Public Law 92-500, as amended, if the standards of classification of the water body and the requirements of this paragraph are met. The department may issue a discharge license or approve water quality certification for a project affecting a water body in which the standards of classification are not met if the project does not cause or contribute to the failure of the water body to meet the standards of classification.”

38 M.R.S. §464 (C): “Where natural conditions, including, but not limited to, marshes, bogs and abnormal concentrations of wildlife cause the dissolved oxygen or other water quality criteria to fall below the minimum standards specified in sections 465, 465-A and 465-B, those waters shall not be considered to be failing to attain their classification because of those natural conditions.”

Maine law 38 M.R.S. §414-A(1)(D), *Conditions of licenses*, states in part (emphasis added):

“The discharge will be subject to effluent limitations that require application of the best practicable treatment. “Effluent limitations” means any restriction or prohibition including, but not limited to, effluent limitations, standards of performance for new sources, toxic effluent standards and other discharge criteria regulating rates, quantities and concentrations of physical, chemical, biological and other constituents that are discharged directly or indirectly into waters of the State. “Best practicable treatment” means the methods of reduction, treatment, control and handling of pollutants, including process methods, and the application of best conventional pollutant control technology or best available technology economically achievable, for a category or class of discharge sources that the department determines are best calculated to protect and improve the quality of the receiving water and that are

consistent with the requirements of the Federal Water Pollution Control Act, as amended, and published in 40 Code of Federal Regulations. If no applicable standards exist for a specific activity or discharge, the department must establish limits on a case-by-case basis using best professional judgment, after consultation with the applicant and other interested parties of record. In determining best practicable treatment for each category or class, the department shall consider the existing state of technology, the effectiveness of the available alternatives for control of the type of discharge and the economic feasibility of such alternatives.”

Department Staff Discussion

BOD₅ is a measurement of dissolved oxygen that is used by aerobic microorganisms when decomposing organic matter in water. Elevated BOD discharged into a receiving water can cause the ambient dissolved oxygen to be depleted. TSS are solids in water that can be trapped by a filter. Elevated levels of TSS can settle to the bottom of receiving water and impact the resident biological community.

Currently there are no state or federally promulgated best practicable treatment (BPT) numeric standards for BOD₅ and TSS for land based recirculating aquaculture system (RAS) facilities. In 2002, the United States Environmental Protection Agency (USEPA) promulgated standards for RAS facilities based on narrative best management practices (BMPs) controls but opted not to establish numerical standards for BOD₅ and TSS. However, the Department has in other instances been more stringent than the federally promulgated standards and has established numeric limitations for both parameters. The Department has issued MEPDES permits for other RAS facilities establishing monthly average and daily maximum concentration limits of 30 mg/L and 50 mg/L respectively, for BOD₅ and TSS based on Department best professional judgment (BPJ) of BPT for RAS facilities. These limits were based on BPT recommendations included in USEPA's 2002 proposed draft National Effluent Guidelines for TSS for re-circulated fish hatchery wastewater receiving a secondary level of treatment and the Department's long-standing view of the relationship with and significance of BOD₅. For the proposed discharge from the proposed Nordic facility, mass limits would be calculated based on the monthly average flow limit of 7.7 MGD, the applicable concentration limit used by the Department based on BPJ and a conversion factor of 8.34 lbs/gal for water.

The limits would be calculated as follows:

$$\text{Monthly average: } (7.7 \text{ MGD})(30 \text{ mg/L})(8.34 \text{ lbs/gal}) = 1,926 \text{ lbs/day}$$

$$\text{Daily maximum: } (7.7 \text{ MGD})(50 \text{ mg/L})(8.34 \text{ lbs/gal}) = 3,211 \text{ lbs/day}$$

The Department staff has modeled the impact of the BPT discharge levels calculated above for BOD₅ and TSS on the ambient dissolved oxygen and believe that, based on its review and analysis to date, the proposed discharge, if permitted, would not have a discernable influence on ambient dissolved oxygen. The proposed discharge of BOD₅ at 30 mg/L has the potential to increase ambient BOD₅ concentrations by up to 0.1 mg/L, based on a far-field dilution factor of 300:1 ($30 \text{ mg/L}/300 = 0.1 \text{ mg/L}$). BOD is exerted at an approximate rate of 20% per day, which would suggest a relative influence on dissolved oxygen of approximately 0.02 mg/L ($0.1 \text{ mg/L}/5 = 0.02 \text{ mg/L}$). This degree of influence is significantly less than what could be measured within a reliable degree of accuracy. Dissolved oxygen monitoring instrumentation is only accurate to with plus or minus 0.1 mg/L.

According to data collected by the applicant and included in their MEPDES permit application and data collected by the Department in the summer of 2019, there are areas of naturally occurring dissolved oxygen levels that do not attain the Class SB 85% saturation standard. The discharge pipe as proposed would, if permitted, discharge at approximately 11.5 meters below the mean low water mark and would be fitted with a multiport diffuser designed to enhance mixing with the receiving water. The discharge would tend to be buoyant due to the fresh water component of the discharge. The pycnocline is the area of separation between two different densities of water due to changes in salinity and temperature gradients. Areas above the pycnocline tend to be better mixed due to wave action and water below the pycnocline tend to be hydraulically isolated due to greater density. The Department's water quality modelling engineer and marine biologist have assessed this situation and based on their review and analysis to date, believe the impact to the naturally occurring area of dissolved oxygen saturation levels of less than 85% is not measurable given the buoyance of the proposed discharge.

It is noted Nordic's application for a MEPDES permit indicates that if the maximum efficiencies of the proposed waste water treatment facility are realized, the proposed discharge concentration of BOD₅ and TSS may be as low 6 mg/L, representing a 99% removal rate for both parameters.

Based on Department staff's review and analysis to date, the establishment of BPT based limitations for BOD₅ and TSS would, if permitted, meet the dissolved oxygen standard licensing criteria of 85% saturation and the anti-degradation provision in that the discharge would not cause or contribute to failure of the receiving water to meet the standards of its assigned classification.