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August 3, 2026

Maine Department of Environmental Protection
Bureau of Water Quality — Division of Water Quality Management
17 State House Station
Augusta, Maine 04333-0017
Attn: Laura Crossley, Licensing Coordinator
By email: Kingfish.DEP@maine.gov

RE: Public comment on the renewal application of Kingfish Maine, Inc. — MEPDES Permit #ME0037559 / Maine Waste Discharge License #W009238-6F-A-N, 9 Dun Garvin Road, Jonesport, Washington County. Application accepted for processing 3 June 2026.

Dear Reviewer:

I own property on Starboard Island in Machiasport and use the waters of Chandler, Englishman's and Machias Bays regularly. I walk Sandy River Beach in Jonesport and the trails at the Downeast Coastal Conservancy's Tide Mill Creek Preserve in Jonesboro, where the Bear Creek Trail follows the tidal creek and saltmarshes at the head of Englishman's Bay. I collect seaweed and marsh grass samples from these shorelands for analysis. I hold permission from private landowners in the Roque Archipelago to access those islands, where my family's connection dates to the residence of my forebears Daniel, William and Nehemiah Ingalls on Spruce and Little Spruce Islands. I observe seabirds in these bays, including at Pulpit Rock and Freemans Rock — two of only four sanctuary Razorbill nesting islands in Maine.

The degradation of water quality, loss of larval and juvenile shellfish and finfish through entrainment, and effects on nesting and migratory seabirds addressed in these comments would directly impair those uses.

I write in my personal capacity. I am a member of the Maine Lobstermen's Association, Downeast Trout Unlimited, the Sierra Club Maine chapter and Maine Audubon, but these comments are my own and are not submitted on behalf of any organization.

I support land-based aquaculture. After eight years researching these facilities, I believe a well-sited, well-designed facility at Jonesport could benefit this community. These comments are directed at whether the application as filed contains the information necessary to establish that this one is designed for operation in Maine's Essential Fish Habitat waters and some of the most productive lobstering waters in the State.

I have reviewed the comments submitted by the Eastern Maine Conservation Initiative on 8 July 2026 and the accompanying report by Remote Ecologist. These comments do not duplicate that submission. They address the intake structure and entrainment, the thermal design, the nitrogen removal train, coagulant use and effluent metals, the regulatory record of the applicant's parent facility, and the wildlife consultation — matters not covered there.

The Findings the Department Must Make

These comments are directed at findings the Department must make before a license may issue.

Under 38 M.R.S. § 464(4)(F)(1-A), the Department may only issue a waste discharge license where the applicant has demonstrated that the proposed activity would not have a significant impact on an existing in-stream use — defined to include impairing the viability of an existing population, including significant impairment to growth and reproduction — or, for uses involving fishing or commercial enterprises dependent on an existing level of water quality, that the activity would not result in significant degradation of that use. The burden of demonstration rests on the applicant.

Under 38 M.R.S. § 464(4)(A)(11), the Department may not issue a license for a discharge that would cause unreasonable degradation of marine waters, or where insufficient information exists to make a reasonable judgment whether the discharge would cause unreasonable degradation.

Section 464(4)(F)(1) further directs that, in determining existing in-stream uses to be protected, the Department shall consider aquatic, estuarine and marine life present in the water body; wildlife that utilize it; habitat supporting existing populations; and use of the water body for recreation, fishing, or commercial activity that depends directly on preservation of an existing level of water quality. Each of those categories is implicated here.

The comments below identify information absent from the application that is necessary to either finding. Seven of the ten ask for disclosure rather than denial.

Summary of Comments

1. The stated feed rate is inconsistent with the application's own production and standing biomass figures, and with the parent company's reported feed conversion ratios, by a factor of approximately three to four.
2. The total nitrogen loading of 745 kg/day cannot be verified, because no denitrification reactor volume appears anywhere in the 273-page application.
3. A Netherlands competent authority determined in 2021 that the parent facility's effluent nitrogen and phosphorus did not meet the applicable emission test at increased flow. The trial framework created to research Best Available Technique has never been invoked.
4. The 22.2 MGD heat recovery withdrawal is not required to heat the culture water; the applicant's own thermodynamic diagrams show that function is already fully met by effluent heat recovery.
5. The intake screen is 1-inch wedge wire — the recognized entrainment-reduction technology, set at fifty times the entrainment-reducing aperture.
6. Coagulant identity and dose are unspecified; iron and aluminum are reported as absent from a discharge into which a ferric coagulant is dosed; and required effluent estimates for four parameters are left blank.
7. The dilution basis is computed on a combined flow of which 77 percent is clean intake water, and the dye study required by the 2021 permit has never been performed.
8. The ambient monitoring program contains no endpoints capable of detecting the effects at issue.

9. The Department of Inland Fisheries and Wildlife appears to have reviewed this project on land-parcel materials only.

10. The proposed effluent sterilization dose is approximately one-eighth of the published requirement for the most disinfection-resistant relevant fish virus.

Comments

Comment 1. The stated feed rate is internally inconsistent with the application

Finding. Item 5 of the Fish Rearing Facilities form states average feed use of 22,000 lbs/day and maximum use of 26,000 lbs/day. That figure cannot be reconciled with the production capacity, standing biomass, or nitrogen loading stated elsewhere in the same application, or with the applicant's parent company's reported operating data.

Record basis:

- Average feed of 22,000 lbs/day equals 3,642 metric tons per year (one metric ton = 1,000 kg = 2,205 lbs; all tonnages in these comments and in the application are metric). Against the stated production of 6,000–8,000 metric tons, this implies a feed conversion ratio (FCR) of 0.61 to 0.46. FCR below 1.0 is not physically attainable for a carnivorous marine finfish.
- Three FCR figures are available from the applicant's corporate group: 1.50, used as the design basis by Witteveen+Bos in the engineering study prepared for the parent facility; and reported economic FCRs of 1.53 for 2024 and 1.70 for 2025 in The Kingfish Company's annual reports.
- At an FCR of 1.70, production of 8,000 metric tons requires approximately 82,150 lbs/day of feed — 3.7 times the stated figure. At 8,500 metric tons, 87,280 lbs/day. Even at the 1.50 design basis, 8,000 metric tons requires 72,500 lbs/day.
- Item 8 of the same form gives a maximum standing biomass of 7,712,000 lbs (approximately 3,498 metric tons). Feeding 22,000 lbs/day to that biomass is 0.29 percent of body weight per day. Yellowtail kingfish held at 23–25 °C feed at approximately 1.0–1.8 percent of body weight per day.
- The stated feed rate is, to within 2.5 percent, the actual 2024 feed consumption of the parent company's Kats facility — a plant that harvested 2,323 metric tons, not 6,000–8,000.
- The Kingfish Company's 2024 and 2025 annual reports describe the Jonesport facility as an 8,500 metric ton plant, while this application states 6,000–8,000 metric tons. The nitrogen loading in this application is calculated against the lower figure.

Requested action. The Department should require the applicant to correct Item 5; to state the design feed rate, feed crude protein content and design FCR on which the application relies; and to recalculate every mass-based effluent limitation derived from those figures. Appendix A sets out the calculation.

Comment 2. The nitrogen loading cannot be verified because no reactor volume is stated

Finding. Attachment 2 gives total nitrogen of 745 kg/day (1,639 lbs/day). Reconstructing that figure from feed inputs requires approximately 54–58 percent removal of waste nitrogen. The application describes the treatment train only as "moving and fixed bed bioreactors for nitrification and denitrification." No reactor volume, carrier fill fraction, or design volumetric removal rate appears anywhere in the 273 pages.

Record basis:

- A feed-based mass balance at an FCR of 1.70 gives approximately 1,782 kg/day of waste nitrogen at 8,000 metric tons of production, implying 58 percent removal to reach 745 kg/day. At an FCR of 1.53 the implied removal is 54 percent.
- The engineering design prepared for the parent facility by Witteveen+Bos (report 123089/21-002.497, 15 February 2021) specifies four Upflow Sludge Blanket Reactors totaling 760 m³ gross volume, serving 1,217 metric tons/year of production, with a total nitrogen load to treatment of 315.6 kg/day and a calculated discharge of 114 kg TN/day.
- Scaled by production ratio to 8,000 metric tons per year (a factor of 6.57), that design predicts a discharge of 747 kg TN/day. The applicant states 745 kg/day — a difference of 0.5 percent.
- A second, independent check gives the same result. The Witteveen+Bos design assumes water refreshment of 1,107 m³ per metric ton of annual production. This application's 6.5 MGD process flow against 8,000 metric tons is 1,122 m³ per metric ton — a difference of 1.4 percent. Both the nitrogen loading and the process flow appear to be scaled from the same design basis.
- That scaling implies approximately 5,000 m³ of anoxic reactor volume at Jonesport. No structure of that magnitude is identified in the application or its attachments.
- The Witteveen+Bos report states that the design "will likely be copied to the KingFish farm in America, where a requirement of 30% nitrogen and phosphorus removal currently already applies," establishing the intended design relationship between the two facilities.

Requested action. The Department should require the applicant to state, before a draft permit is prepared: (a) total anoxic reactor volume and configuration; (b) design volumetric denitrification rate in kg N/m³/day at design salinity and temperature; (c) assumed solids capture efficiency; and (d) the complete calculation producing 745 kg/day. Absent these, the mass limitation derived from that figure has no verifiable engineering basis. Appendix B sets out the reconciliation.

Comment 3. The assumed removal performance has not been demonstrated at the parent facility

Finding. In 2021 a Netherlands competent authority determined that the parent facility's effluent nitrogen and phosphorus would not meet the applicable emission test at its expanded flow and created a large-scale trial framework to permit research into Best Available Technique for post-treatment. As of July 2026 that framework has never been invoked.

Record basis:

- The draft environmental permit decision for Phase 2B prepared by the municipality of Noord-Beveland, placed on public view from 3 November to 15 December 2021, records that the expansion does not fit within the existing water permit of 18 January 2019 (RWS-2019/1474), and that the BPRW assessment shows the effluent concentrations of phosphate and nitrogen do not satisfy the emission test at an increased flow rate of 500 m³/hour. It records that Rijkswaterstaat included means-based provisions permitting research into Best Available Technique for post-treatment, enabled under the Wabo through the provisions for large-scale trials. I have the draft decision; the final permit was issued on 23 February 2022 under reference O22021185, and I have requested the final text.
- Permit O2021185 of 23 February 2022 contains conditions 2.1 to 2.6 governing trials: a trial may commence only after written approval by the competent authority (2.1); the research plan must be submitted at least six weeks in advance (2.2); and a summary of results must be submitted within three months of completion (2.5).

- By decision of 27 July 2026 (reference Z2026-00006192), RUD Zeeland, acting for the Municipal Executive of Noord-Beveland, stated that since that permit was granted Kingfish has submitted no request for the approval of a trial, and that the authority holds no data on trial results. The authority's own qualification is that this "may mean" that no trial has yet been commenced or prepared.
- Discharge to the Oosterschelde is regulated separately by Rijkswaterstaat. A parallel request to that authority remains pending; by letter of 30 July 2026 (RWS-2026/18912) Rijkswaterstaat suspended its decision under Article 4.4(3) of the Open Government Act in order to obtain the views of an interested party, with a decision due by 26 August 2026.
- The Witteveen+Bos design report itself records, at design point 4, that at project completion it became clear the phosphate effluent requirement in the new permit would be stricter than the design had assumed, and that the bypass would have to be reduced or a separate phosphate-removal step introduced.
- The Kingfish Company's 2024 Annual Report describes, as one of its most ambitious projects for 2025, exploring redesigns of the wastewater treatment plant including evaluating elimination of the activated sludge process or adding dissolved air flotation, with the stated goal of improving phosphorus and nitrogen removal, together with research into alternative carbon sources and coagulants. The same report describes 2024 as a year of learning to work with the systems and records that the aggressive nature of the discharge water causes equipment wear and frequent pipe clogging.
- The 2025 Annual Report, covering the period in which that program was to be executed, does not report the coagulant change, the carbon source change, the dissolved air flotation addition, or the elimination of activated sludge. The only related item reported as delivered is a transition to water-based polymers in the flotation process. This is an inference from the absence of those items in a report that covers the same function in detail; it is not proof that the work did not occur.
- The 2025 Annual Report states that marine RAS wastewater presents challenges relatively new to the sector, that there is limited large-scale experience across the industry with treating this type of discharge water, and that 2025 remained an important learning year. It further records that on 13 February 2026 the regulatory authority notified the company that a new discharge permit application must be submitted following identification of an administrative issue in how the original permit was granted.

Requested action. The Department should not credit removal efficiencies that have not been demonstrated at operating scale. It should require either measured influent and effluent nitrogen and phosphorus data from the parent facility sufficient to substantiate the design removal rate at marine salinity, or a compliance schedule requiring demonstration at Jonesport before the facility reaches design production.

Comment 4. The 22.2 MGD heat recovery withdrawal is not required to heat the culture water

Finding. The applicant's own thermodynamic diagrams show that effluent heat recovery already meets the entire heating requirement of the 6.5 MGD process stream. Perhaps the 22.2 MGD withdrawal from Chandler Bay serves building envelope and ventilation load.

Record basis:

- Attachment 2 identifies three heat recovery steps. Step 1 is a counter-current exchanger raising intake water from 0 °C to 8 °C. Step 2 is a heat pump taking discharge water from 23 °C to 8 °C. Step 3 draws energy from 3,500 m^3/h of seawater — the 22.2 MGD stream.

- At the stated process flow of 1,000 m^3/h, Steps 1 and 2 deliver 8.9 MW and 16.8 MW respectively. Their sum, 25.7 MW, equals the 25.7 MW required to raise 6.5 MGD from 0 °C to 23 °C. Step 3 contributes a further 11.8 MW, which is surplus to process water heating.
- In the summer case the same diagrams give 17.8 MW recovered from the effluent against an 11.2 MW process requirement — a surplus of 6.6 MW before the bay-water loop contributes anything. Summer is the period of peak larval abundance in Chandler Bay and building heat demand in coastal Maine in summer approaches zero.
- The Kingfish Company's 2024 Annual Report states that at its Kats facility it directly reuses energy from discharge water to heat incoming water and additionally operates aquifer thermal energy storage, with three cold-water and three warm-water infiltration points licensed to store and reuse 5,000–10,000 MWh annually. The parent company does not use an open estuary thermal loop at its flagship facility.
- Two qualifications are offered in the interest of completeness. At the parent facility's intensity, seasonal thermal storage would cover roughly 2–4 MW at Jonesport's scale rather than the full 11.8 MW, so it would work alongside effluent recovery and building-load reduction rather than replacing them. And the 2025 Annual Report records operational and technical issues in that heating system during 2025, requiring greater reliance on gas.
- The National Marine Fisheries Service, Greater Atlantic Regional Fisheries Office, concluded in its June 2022 review for the U.S. Army Corps of Engineers that the proposed intake would entrain eggs, larvae and juveniles in numbers characterized as ranging from millions to billions.
- Entrainment losses are not confined to eggs, larvae and juveniles. The withdrawal also removes the planktonic community on which those early life stages depend. Bivalve larvae are obligate suspension feeders on phytoplankton, and larval lobster feed on zooplankton. The application itself records that the heat recovery water returned to Chandler Bay "has reduced suspended solids" compared with the water taken into the pump station. In a productive estuary that suspended material is substantially living plankton, and it is retained in the facility's filters rather than returned to the bay.

Requested action. The Department should require an alternatives analysis addressing elimination of the heat recovery withdrawal, seasonal curtailment during the May–September larval period, and substitution of closed-loop seasonal thermal storage and building-load reduction, before authorizing continued withdrawal at 22.2 MGD. Appendix C sets out the thermal calculation.

Comment 5. The intake screen aperture is fifty times the entrainment-reduction benchmark

Finding. Attachment 8, Sheet C-300 specifies a removable hexagonal intake screen of six panels in 1-inch (25 mm) wedge wire. Wedge wire is the technology recognized as best available for reducing entrainment; the recognized entrainment-reducing aperture is 0.5 mm. On either of the two possible intake operating configurations the configuration as drawn meets the impingement velocity criterion, while passing every organism of concern. The design addresses impingement and disregards entrainment.

Record basis:

- The sheet callout reads "1" [25mm] WEDGE WIRE SCREEN, SIX PANELS." The structure is a hexagonal screen approximately 12 feet across with panels approximately 3.5 feet in height, over a 48-inch intake riser, with lift lugs and a slide on-off connection.
- The application states that the facility takes in 19,812 gallons per minute of seawater "through two seawater intake pipes," but does not state whether both operate simultaneously or one serves as an

alternate while the other is cleaned. For the outfalls the application is explicit that only one runs at a time. The calculations below are therefore presented for both configurations. The conclusion is the same in either case.

- At 25 mm the screen functions as a trash rack. Scallop veliger (0.1–0.3 mm), fish eggs (approximately 1 mm) and stage-I lobster larvae (7–8 mm) pass without obstruction, as does the entire planktonic food base on which those early life stages depend.
- On the geometry as drawn, the through-slot velocity at 25 mm and 28.7 MGD is approximately 0.05–0.06 m/s if both screens operate, or 0.10–0.12 m/s through a single screen. Both are below the 0.15 m/s (0.5 ft/s) impingement benchmark. The design therefore demonstrates awareness of the velocity criterion.
- Refitting the same structure with 0.5 mm wedge wire reduces open area from roughly 90 percent to roughly 20–25 percent. At 28.7 MGD the resulting velocity is 0.19–0.27 m/s across two screens, or 0.37–0.54 m/s through one. The impingement criterion fails in both cases — by a factor of 1.2 to 1.8 on two screens, and 2.5 to 3.6 on one.
- At the 6.5 MGD process flow, 0.5 mm wedge wire gives 0.04–0.06 m/s across two screens or 0.08–0.12 m/s through one. Both are compliant.
- The intake structure as drawn can therefore accommodate entrainment-reducing screening at a compliant velocity at flows up to approximately 16 to 23 MGD if both screens operate, or 8 to 12 MGD through a single screen. It cannot at 28.7 MGD on either configuration. It can at 6.5 MGD on either. The heat recovery withdrawal addressed in Comment 4 is the reason fine screening does not fit within the structure already designed.
- The screens are described as removable, and the diffusers carry three additional capped ports for redundancy and cleaning, indicating that fouling requiring periodic servicing is anticipated.
- The sheet carries a CAD file date of 28 July 2020 and is marked NOT FOR CONSTRUCTION. No aperture or through-slot velocity value appears anywhere in the text of the application, so the specification is not carried into any enforceable permit term.

Requested action. The Department should require the applicant to state the screen aperture, the design through-slot velocity, and whether the two intake pipes operate simultaneously or in alternation, none of which appears in the application text. It should condition any authorized intake on 0.5 mm through-slot wedge wire at a maximum approach velocity of 0.15 m/s. Because required screen area scales with flow, the reduction sought in Comment 4 makes that specification achievable within the intake geometry already proposed. Appendix D sets out the calculation.

Comment 6. Coagulant use is unspecified, effluent metals are reported as absent, and required effluent estimates are blank

Finding. Ferric chloride appears in the application's chemical inventory with no stated purpose, application method or concentration. On EPA Form 2D, iron and aluminum are marked as believed absent from the effluent while being marked as present in the intake water. Required maximum daily discharge estimates for chemical oxygen demand, total organic carbon, ammonia and nitrate-nitrite are left blank.

Record basis:

- In Attachment 6, at page 120 of the application, Ferric Chloride is listed with the purpose, application method and concentration fields blank, and the location given only as Hatchery/Growout. Every other chemical on that list carries at least a stated purpose.

- On EPA Form 2D, Table B items 14 (Aluminum, total, CAS 7429-90-5) and 18 (Iron, total, CAS 7439-89-6) are marked “believed absent” from the effluent and separately marked “yes” under Intake Water — Believed Present. No mass or concentration is reported for either.
- That combination is not internally coherent. The application states that iron and aluminum are present in the intake water. Ferric chloride is dosed within the facility. Water containing iron is withdrawn, further iron is added, and the resulting discharge is reported as believed free of iron. Either the coagulant is not used as the inventory indicates, or the capture of dosed iron is assumed to be complete, or the form is inaccurate. Each possibility warrants clarification.
- On Table A, the Maximum Daily Discharge column is marked “required.” Biochemical oxygen demand and total suspended solids carry figures of 2,714 lbs maximum and 1,629 lbs average. Chemical oxygen demand, total organic carbon and Ammonia (as N) are blank. On Table B, Nitrate-nitrite is likewise blank.
- Ammonia and nitrate-nitrite are the nitrogen species of concern in a recirculating aquaculture discharge, and the parameters against which nitrification and denitrification performance would be measured. Their omission leaves the treatment claim addressed in Comment 2 unverifiable from the form as well as from the design.
- The figure of 1,639 lbs/day appears on Table B at item 7, “Nitrogen, total organic (as N)” — a subset of total nitrogen. Attachment 2 describes the same figure as total nitrogen, and the permit limitation is expressed as total nitrogen. Which parameter the figure represents should be clarified, since the two differ materially.
- The parent facility design doses ferric chloride at an Fe:P molar ratio of 3. Applying that ratio to the phosphorus figure stated in this application implies approximately 970 kg Fe/day, or roughly 40 mg/L in the process stream. Because influent phosphorus exceeds discharged phosphorus, this is a lower bound.
- The Kingfish Company’s 2024 Annual Report states that the company is conducting ongoing research into alternative carbon sources and coagulants, such as switching from iron chloride to alum, to reduce chemical consumption and improve treatment efficiency. This is described as a next step for 2025, not a completed change. Aluminum sulfate does not appear in this application’s chemical inventory.
- Alum’s effective coagulation range is approximately pH 5.5–7.5. Full-salinity seawater is approximately pH 8 and strongly buffered, placing alum above its working range; ferric chloride functions to approximately pH 8.5. Equivalent molar dosing with alum also requires roughly 1.8 times the product mass.
- There is no United States saltwater aquatic life criterion for aluminum; the EPA 2018 aluminum criteria are freshwater only. The Australian and New Zealand default guideline value for marine aluminum is 24 µg/L. The Department has relied on comparable non-promulgated screening values elsewhere in this same permit record for total nitrogen.
- Applying the application’s own near-field dilution of 60x, an effluent concentration of approximately 1.44 mg/L dissolved aluminum would correspond to 24 µg/L at the edge of the near-field mixing zone — approximately 7 percent carryover of the dose.

Requested action. The Department should require the applicant to: state the coagulant identity, dose rate and design metal-to-phosphorus ratio; complete the required maximum daily discharge estimates for chemical oxygen demand, total organic carbon, ammonia and nitrate-nitrite; clarify whether the 1,639 lbs/day figure is total nitrogen or total organic nitrogen; and reconcile the iron and aluminum entries with the use of a ferric coagulant. The Department should further require effluent monitoring for both total and dissolved iron and aluminum, and should condition the permit to require notification and Departmental review before any coagulant substitution. Appendix E sets out the dose and carryover calculation.

Comment 7. The dilution basis is computed on a flow that is 77 percent clean intake water

Finding. The near-field and far-field dilution factors relied upon throughout the application are computed at the combined discharge of 28.7 MGD. The nitrogen mass is carried in the 6.5 MGD process stream. The 22.2 MGD of heat recovery water functions as dilution ahead of the compliance point. The dye study required by the 2021 permit to verify actual mixing has never been performed.

Record basis:

- The modelling inputs specify an effluent flow of 1,250 L/s (44.14 ft^3/s) at a total nitrogen concentration of 6.9 mg/L. That flow is the combined 28.7 MGD.
- The same nitrogen mass in the 6.5 MGD process stream alone is approximately 31 mg/L. The heat recovery water therefore provides approximately 4.4-fold dilution ahead of the diffuser. The 2021 permit provides that certain parameters may be sampled once mixed with the heat recovery water.
- The near-field dilution of 60x and far-field dilution of 173x are both derived at 44.14 ft^3/s. At the process flow alone the diffuser discharge falls to approximately 10 ft^3/s and the near-field dilution on which the modelling relies cannot be assumed to hold.
- The 2021 permit required a dye study to confirm the outfall's actual mixing characteristics during the first summer of discharge at full buildout. There has been no buildout, no discharge, and no dye study. The Department is asked to carry forward mixing assumptions that remain unverified by field measurement.
- The application's equilibrium finding rests on the spatial maximum extent of the plume not substantially increasing after approximately seven days, over runs extending to 28 days. Spatial extent and concentration accumulation are distinct quantities; a plume may reach its maximum footprint while concentrations within poorly flushed sub-embayments continue to rise over seasonal timescales. A facility that cannot be shut down without loss of stock operates continuously, and a 28-day maximum simulation cannot resolve seasonal accumulation.
- Independent modelling by Dr. Kincaid, using a four-dimensional regional ocean model over a 262-day simulation and a domain encompassing Chandler, Englishman's and Machias Bays, indicates transport of the discharge plume into Englishman's Bay eelgrass areas, and southward past Beals Island into Class SA waters at Great Wass.
- The diffuser is mis-sized at both ends of the flow range. At the permitted 28.7 MGD, the report submitted by the Eastern Maine Conservation Initiative calculates an exit velocity of approximately 19.7 ft/s (11.6 knots) at each of six 8.3-inch ports, against documented Maine coastal currents typically not exceeding 2 knots. At the 6.5 MGD process flow the same ports would discharge at roughly a fifth of that velocity, with correspondingly reduced momentum and dilution. The diffuser was sized for a flow that is three-quarters seawater from the heat transfer mechanism.

Requested action. The Department should require the near-field and far-field models to be re-run at the actual process flow with a correspondingly resized diffuser; should require simulation over a period representative of continuous year-round operation; should require the model domain to represent exchange with Englishman's and Machias Bays; and should not carry forward the 2021 dilution factors without the verification study the 2021 permit itself required. Appendix F sets out the dilution arithmetic.

Comment 8. The ambient monitoring program cannot detect the effects at issue

Finding. The Ambient Water Quality Monitoring Plan required by Special Condition H provides sonde and grab sampling at four stations at three-week intervals between May and October. It contains no benthic, larval, or metals endpoints, and no defined action thresholds.

Record basis:

- The endpoints of concern identified in this record — entrainment of eggs and larvae, benthic deposition of coagulant floc, and dissolved metal residuals — are not measured by the existing program.
- Landings in the Jonesport and Beals area averaged approximately 13 million pounds per year between 2021 and 2025, the majority lobster.
- The Oosterschelde, which receives the discharge from the parent company's Kats facility, supported reported lobster landings of approximately 12,000–19,000 kg per year (approximately 26,000–42,000 lbs) between 2018 and 2023, falling to approximately 1,000 kg in 2024 and to a few hundred kilograms in 2025.
- Dutch investigations have excluded known pathogens, shellfish viruses, bacterial infection and heavy metals from tidal barrier slag. A further program examining environmental, anthropogenic and benthic factors is underway, with results expected in approximately four years.
- No causal link between that decline and the Kingfish Zeeland facility has been established, and none is asserted here. The relevance of the Oosterschelde experience is that the length of the investigation reflects the absence of monitoring capable of answering the question at the time the decline began.
- The fishery at risk in Chandler Bay is approximately 380 times the scale of the Oosterschelde fishery.

Requested action. The Department should require, as a condition of renewal: a pre-operational baseline of not less than two years; benthic community and sediment endpoints at stations on a gradient from the outfall; larval abundance sampling during the entrainment season; effluent and ambient metals monitoring; and defined action thresholds triggering review. The cost of establishing a baseline before operation is trivial against the cost of being unable to answer the question afterwards.

Comment 9. The wildlife consultation appears to have been conducted on incomplete materials

Finding. The Department of Inland Fisheries and Wildlife review of this project appears to have been conducted on materials describing the land parcel only. The consultation record does not indicate that the intake and outfall locations, pipe alignments, screening design, or withdrawal and discharge volumes were provided.

Record basis:

- Two of the four sanctuary Razorbill nesting islands in Maine — Pulpit Rock and Freemans Rock — lie within Chandler, Englishman's and Machias Bays. Razorbill is listed as Threatened under Maine's endangered species law.
- Piping Plover, listed as Endangered in Maine, occurs on beaches within the affected area.
- Both species forage principally on invertebrates and small forage fish in the waters and shorelands that the intake and discharge would affect.
- The National Marine Fisheries Service review of June 2022 identified entrainment of eggs, larvae and juveniles in numbers characterized as millions to billions — the forage base on which these species depend.
- Section 464(4)(F)(1)(b) requires the Department, in determining existing in-stream uses to be protected, to consider wildlife that utilize the water body.

Requested action. The Department should re-refer this application to the Department of Inland Fisheries and Wildlife with the complete intake and outfall design, withdrawal and discharge volumes, screening specification, and the June 2022 National Marine Fisheries Service review, and should not act on the application until that consultation is complete.

Comment 10. The proposed effluent sterilization is inadequate against the most resistant relevant pathogen.

Finding. Attachment 2 specifies discharge sterilization as 0.4 mg/L ozone or 30 mJ/cm² UV, as alternatives rather than in series, with no stated contact time, ultraviolet transmittance assumption, reactor validation basis or dose monitoring. Against infectious pancreatic necrosis virus (IPNV) the ultraviolet option delivers approximately 0.4 log reduction where 3-log is the design standard. The ozone option alone, unless properly applied and then removed, would generate bromate and hypobromous acid discharged to Chandler Bay.

Record basis:

- The Conceptual Flow Diagram of Discharge Water Filtration in Attachment 2 gives the sterilization step as "0.4 mg/L ozone or 30 mJ/cm² UV." Elsewhere the application states only that sterilization uses ozone or UV "at recommended levels," without identifying the source of the recommendation.
- Published dose-response data for IPNV (Liltved, Vogelsang, Modahl and Dannevig, Aquacultural Engineering 34(2):72–82, 2006, as compiled by the International Ultraviolet Association) give approximately 82, 165, 246 and 325 mJ/cm² for 1, 2, 3 and 4-log inactivation respectively. The curve is approximately log-linear at a slope near 80 mJ/cm² per log. Extrapolated to 30 mJ/cm², the delivered reduction is approximately 0.35 to 0.4 log — roughly 55 to 60 percent inactivation.
- The same body of work gives 3-log doses of 7.7 mJ/cm² for infectious salmon anemia virus and 105 mJ/cm² for Atlantic halibut Noda virus. A 30 mJ/cm² dose would adequately inactivate infectious salmon anemia virus, infectious hematopoietic necrosis virus and viral hemorrhagic septicemia virus, but neither IPNV nor the Noda viruses. Earlier work (MacKelvie and Desautels, 1975) reported IPNV requiring 720 to 792 mJ/cm², so the 246 mJ/cm² figure used here is already conservative in the applicant's favor.
- For comparison, the United States Environmental Protection Agency requires 186 mJ/cm² for 4-log inactivation of viruses in drinking water. The proposed discharge sterilization is approximately one sixth of that.
- Ozonating seawater oxidizes bromide to hypobromous acid and hypobromite, and thence to bromate. Ozone reacts with bromide approximately 83 times faster than with chloride, so seawater ozonation is dominated by bromine chemistry. Liltved et al. document acute toxicity of these products — a reported rainbow trout LC50 of 0.068 mg/L for hypobromite — and conclude that a dedicated residual bromine removal unit is required when seawater is ozonated in aquacultural systems. Crecelius (Journal of the Fisheries Research Board of Canada, 1979) reports a bromate LC50 of 30 mg/L for Pacific oyster larvae.
- Because no contact time is stated, the product of concentration and time on which ozone disinfection depends cannot be evaluated at all from the information provided.
- Norway made disinfection of intake water mandatory for new land-based facilities with effect from 1 July 2025, specifying ultraviolet irradiation at a dose of not less than 25 mJ/cm² or another method approved by the Norwegian Veterinary Institute. The consultation draft preceding that regulation had proposed disinfection of both intake and discharge water.

- Research published by Nofima records that, of the pathogens tested, IPNV was the sole outlier requiring a high ultraviolet dose, and that the existence of a vaccine for that virus reduces the need to eliminate it. The 25 to 30 mJ/cm² design convention therefore rests on vaccination. The Kingfish Company's 2025 Annual Report lists "No antibiotics or vaccines" among its production attributes, and no aquabirnavirus vaccine is licensed for Seriola species.
- In the interest of accuracy, two qualifications are offered. IPNV carriage is not documented in the primary literature for Seriola lalandi specifically; the aquabirnavirus disease record concerns Seriola quinqueradiata and Seriola dumerili. And IPNV is already endemic in Maine waters. The concern raised here is therefore not the introduction of an exotic pathogen, but the concentrated point-source discharge of an endemic and highly disinfection-resistant virus, from a facility withdrawing 28.7 MGD from those same waters, after treatment delivering on the order of 0.4 log reduction.
- That concern is not hypothetical in this watershed. In November 2023 the Downeast Salmon Federation destroyed its entire year class of juvenile Atlantic salmon at the Peter Gray Hatchery in East Machias — reported as between 155,000 and 170,000 fish, for the East Machias and Narraguagus rivers — following IPNV detection in fish that appeared healthy. The NOAA United States Atlantic Salmon Assessment Committee Annual Report No. 36 records that the virus was likely introduced to the hatchery through the influent.
- The Gulf of Maine Distinct Population Segment of Atlantic salmon is listed as endangered, and critical habitat designated at 74 Fed. Reg. 29300 (19 June 2009), codified at 50 C.F.R. § 226.217, includes the East Machias, Machias, Narraguagus and Pleasant watersheds and their estuaries.
- A controlled study (Molloy et al., Applied and Environmental Microbiology, 2013) found that blue mussels bioaccumulate viable IPNV within two hours of exposure and transmit it to cohabiting Atlantic salmon smolts, though at low frequency. Chandler Bay supports active shellfish and lobster harvesting.
- Infectious pancreatic necrosis is not listed by the World Organisation for Animal Health and is not a listed disease under European Union Regulation 2016/429. The 2025 Annual Report's statement that the facilities were verified free from notifiable fish diseases and pathogens is therefore consistent with the presence of IPNV.
- The federal aquaculture effluent guidelines at 40 C.F.R. Part 451 are narrative and address solids, drug reporting and best management practices; they are silent on pathogens and disinfection. No numeric ultraviolet or ozone dose appears to be specified in any United States aquaculture discharge permit. There is accordingly no federal numeric standard on which the Department may rely.

Requested action. The Department should require the applicant to state the design disinfection dose, contact time, ultraviolet transmittance assumption and reactor validation basis, and whether ozone and ultraviolet treatment operate in series or as alternatives. It should require disinfection validated to a recognized protocol at not less than 3-log reduction of IPNV, or a combined train demonstrated to equivalent performance, together with continuous ultraviolet intensity monitoring, in-line transmittance measurement, flow pacing, and lamp fouling and aging compensation, with alarm and discharge interlock. If ozonation of seawater is retained, the Department should require demonstration of a maintained contact time sufficient for 3-log inactivation, effluent limitations for bromate and total residual oxidant protective of larval organisms, and a dedicated residual oxidant destruction unit ahead of discharge. The Department should further refer this application to the Department of Marine Resources and to the National Marine Fisheries Service, given the Gulf of Maine Distinct Population Segment recovery rivers and designated estuarine critical habitat in the receiving watershed.

Reservation and Conclusion

Requests under the Netherlands Open Government Act are pending with Rijkswaterstaat concerning discharge monitoring, compliance and trial records at the parent facility, with a decision due by 26 August 2026. I have also requested the final text of the Noord-Beveland environmental permit of 23 February 2022. I respectfully reserve the right to supplement these comments, and request that the Department not take final action before that material can be submitted.

Nine of the ten comments above ask the Department to require information that the applicant should already possess and that the Department needs in order to make the findings 38 M.R.S. § 464(4)(F)(1-A) requires. The tenth asks for monitoring adequate to detect the effects in question.

The renewal application, as filed, states a feed rate that cannot support the production it proposes; a nitrogen loading that cannot be reconciled to any stated reactor volume; a dilution basis computed on a flow three-quarters of which is clean intake water, unverified by the dye study the existing permit required; an intake screen specified at fifty times the entrainment-reduction benchmark; a coagulant with no stated dose and no proposed monitoring; and a disinfection dose an order of magnitude below the published requirement for the most resistant relevant pathogen.

These are matters of completeness. Each is capable of being cured by disclosure. Section 464(4)(A)(11) provides that where insufficient information exists to make a reasonable judgment whether a discharge would cause unreasonable degradation of marine waters, a license may not issue.

I would welcome the opportunity to review in writing any of the calculations set out in the Technical Appendix, and will provide the underlying working to the Department on request.

Respectfully submitted,

Holly Faubel

Technical Appendix

All calculations use seawater density 1,025 kg/m³ and specific heat 3.93 kJ/kg·K unless otherwise stated. Figures are shown to the precision of the inputs. Where an input is assumed rather than taken from the record, the assumption is identified at the point of use. Corrections are welcomed.

Appendix A — Feed and nitrogen mass balance

Feed required at stated production, using the applicant's corporate group's own feed conversion ratios:

Production	FCR 1.50 (design basis)	FCR 1.53 (2024)	FCR 1.70 (2025)
6,000 t/yr	54,400 lbs/day	55,450 lbs/day	61,600 lbs/day
8,000 t/yr	72,500 lbs/day	73,930 lbs/day	82,150 lbs/day
8,500 t/yr	77,050 lbs/day	78,550 lbs/day	87,280 lbs/day
Stated in Item 5	22,000 lbs/day	22,000 lbs/day	22,000 lbs/day

Nitrogen mass balance at 8,000 metric tons per year and FCR 1.70, assuming 46 percent crude protein and 35 percent nitrogen retention in harvested fish. Both assumptions are stated here because neither appears in the application:

Step	Value
Feed	37,260 kg/day
Nitrogen fed (46% CP ÷ 6.25)	2,742 kg N/day
Retained in harvested biomass (35%)	960 kg N/day
Waste nitrogen generated	1,782 kg N/day
Stated discharge (Attachment 2)	745 kg N/day
Implied removal	58%

At FCR 1.53 the corresponding figures are 1,604 kg N/day of waste nitrogen and 54 percent implied removal.

Appendix B — Nitrogen removal and reactor volume

The Witteveen+Bos design for the parent facility specifies, per tank:

Parameter	"High-load" USBR	"Low-load" USBR
Gross tank volume	130 m³	250 m³
Nitrate load	41 kg N/day	81 kg N/day
Denitrification capacity	12.5 kg N/day	77 kg N/day
Removal achieved	30%	95%
Carbon dosing	none (hydrolysis-limited)	glycol, COD:N 4.5
Volumetric rate	0.096 kg N/m³/day	0.308 kg N/m³/day

Two tanks of each type were designed, totaling 760 m³ and serving 1,217 metric tons/year (phases 1A and 1B). The design report states that in the high-load reactor hydrolysis is the limiting factor and carbon is deliberately not dosed; in the low-load reactors carbon dosing is limiting, with glycol selected on cost grounds. These are design values from an independent engineer, specific to marine RAS effluent; they are not validated operating data.

Scaling by production ratio to 8,000 metric tons per year (a factor of 6.57):

Quantity	Kats (1,217 t/yr)	Jonesport scaled (8,000 t/yr)
Total nitrogen load to treatment	315.6 kg/day	2,074 kg/day
Total nitrogen discharged	114 kg/day	749 kg/day
Stated in this application	—	745 kg/day
Reactor volume	760 m³	≈ 5,000 m³
Refreshment per metric ton produced	1,107 m³/t	1,122 m³/t (6.5 MGD)

The scaled prediction is 749 kg N/day against a stated 745 — a difference of 0.5 percent. The independent flow check differs by 1.4 percent. No reactor volume of the implied magnitude is identified anywhere in the application.

Appendix C — Thermal duty of the 22.2 MGD withdrawal

From Attachment 2, winter case, at a process flow of 1,000 m³/h and a heat recovery flow of 3,500 m³/h:

Heat recovery step	Temperature change	Duty
Step 1 — counter-current exchanger	intake 0 → 8 °C	8.9 MW
Step 2 — heat pump on effluent	effluent 23 → 8 °C	16.8 MW
Subtotal recovered from effluent	—	25.7 MW
Process water requirement	0 → 23 °C	25.7 MW
Step 3 — heat pump on bay water	3 → 0 °C	11.8 MW

Steps 1 and 2 alone meet the process water requirement. The 11.8 MW drawn from Chandler Bay is therefore attributable to building envelope, ventilation and evaporative losses.

Summer case: intake at 13 °C, process requirement 11.2 MW; Steps 1 and 2 deliver 8.9 MW each, totaling 17.8 MW — a surplus of 6.6 MW before the bay-water loop contributes.

For context, the parent facility consumed 28,259 MWh in 2025 at an energy intensity of 10.67 MWh per metric ton of production, essentially unchanged in total from 28,261 MWh in 2024 despite a 3.7 percent production increase. At that intensity, 8,000 metric tons at Jonesport corresponds to approximately 9.7 MW of average load — a floor, since Zeeland's winter seawater is approximately 4–6 °C against Chandler Bay's 0–2 °C.

Appendix D — Intake screening and entrainment

The application states that the facility takes in 19,812 gallons per minute of seawater "through two seawater intake pipes," but does not state whether both operate simultaneously or one serves as an alternate during cleaning of the other. For the outfalls the application is explicit that only one runs at a time. Both configurations are therefore presented below.

Total withdrawal of 28.7 MGD is 1.257 m³/s. The hexagonal screen as drawn presents approximately 11.7–13.5 m² of gross screen face. The hexagon width of approximately 12 feet and the panel height of approximately 3.5 feet were scaled from Sheet C-300, on which neither is dimensioned; the one dimensioned value on that detail is 10 ft [3.05 m] from the intake pipe to the top of the screen, which includes the riser.

Configuration	Both screens operating	Single screen
25 mm at 28.7 MGD (as designed)	0.05–0.06 m/s	0.10–0.12 m/s
0.5 mm at 28.7 MGD	0.19–0.27 m/s	0.37–0.54 m/s
0.5 mm at 6.5 MGD	0.04–0.06 m/s	0.08–0.12 m/s
Impingement benchmark	0.15 m/s (0.5 ft/s)	0.15 m/s (0.5 ft/s)
Max flow at 0.5 mm within benchmark	≈ 16–23 MGD	≈ 8–12 MGD

The conclusion does not depend on which configuration is correct. At 25 mm the design meets the impingement benchmark either way. At 0.5 mm it fails at 28.7 MGD either way — by a factor of 1.2 to 1.8 across two screens, or 2.5 to 3.6 through one. At 6.5 MGD it complies either way.

Open-area ratios of approximately 90 percent at 25 mm and 20 to 25 percent at 0.5 mm are typical manufacturer values for wedge wire and are not taken from the drawing. The calculation counts the vertical screen band only; if the hexagon top is also screened, the margin improves. A ten percent error in the assumed panel height moves each result proportionally and does not approach either threshold.

Annual withdrawal at the stated flow is approximately 39.6 million m³, using the applicant's own figure of 108,600 m³/day, of which the heat recovery stream is 77 percent. Curtailment from May to September would remove approximately 12.9 million m³ from the period of peak larval abundance.

The organisms at risk are not confined to eggs, larvae and juvenile fish and shellfish. A 25 mm aperture retains nothing of the planktonic community: phytoplankton, on which bivalve larvae feed obligately as suspension feeders, and zooplankton, on which larval lobster depend. The application states that the heat recovery water returned to Chandler Bay "has reduced suspended solids" compared with the water taken into the pump station. In a productive estuary that suspended material is substantially living plankton. By the applicant's own description, the water is returned to the bay depleted of it.

Appendix E — Coagulant dose and metal carryover

Using the phosphorus figure stated in Attachment 2 (178.7 kg/day) at the Fe:P molar ratio of 3 specified in the parent facility design:

Quantity	Ferric chloride	Alum equivalent
Metal dose	≈ 970 kg Fe/day	≈ 470 kg Al/day
Concentration in process stream	≈ 40 mg/L	≈ 19.5 mg/L
Product mass	≈ 2,800 kg/day	≈ 5,100 kg/day
Hydroxide floc generated	≈ 1,850 kg/day	≈ 1,350 kg/day

Influent phosphorus exceeds discharged phosphorus, so these are lower bounds on the true dose.

Applying the application's own near-field dilution of 60x, an effluent concentration of approximately 1.44 mg/L dissolved aluminum corresponds to 24 µg/L at the edge of the near-field mixing zone — approximately 7 percent carryover of the dose. That is a narrow margin for a coagulant operated approximately one pH unit above its effective range.

On the iron side, floc capture governs the outcome. At 5 percent escape, approximately 92 kg/day of ferric hydroxide would deposit in the near field, or approximately 34 metric tons per year onto benthic habitat.

Appendix F — Dilution and discharge modelling

Quantity	Value
Modelled effluent flow	1,250 L/s (44.14 ft^3/s) = 28.7 MGD
Modelled effluent total nitrogen	6.9 mg/L
Implied nitrogen mass	≈ 745 kg/day
Same mass in 6.5 MGD process stream	≈ 31 mg/L
Dilution provided by heat recovery water	≈ 4.4x
Near-field dilution (at 44.14 ft^3/s)	60x
Far-field dilution (at 44.14 ft^3/s)	173x
Process flow alone	≈ 10 ft^3/s

Diffuser momentum flux scales with the square of port velocity at fixed port area, so both dilution factors require re-derivation at the actual design flow with a resized diffuser.

Appendix G — Cost basis for nitrogen removal

The Witteveen+Bos report estimates direct construction costs for the 760 m^3 plant — reactors, pumps, mixers, chemical storage, dosing equipment and pipework — at approximately EUR 780,000 excluding VAT, at a bandwidth of plus or minus 30 percent, expressly excluding management, engineering and overhead. Annual operating costs are estimated at approximately EUR 390,000, of which sludge disposal at EUR 242,000 is 62 percent.

The same report states that for new industrial wastewater treatment, the factor from foreseen direct construction costs to total investment costs varies from 2.0 to 2.7.

Basis	Kats (760 m^3)	Jonesport scaled (≈ 5,000 m^3)
Direct construction cost	EUR 780,000	≈ EUR 5.1 million
Total investment at 2.0–2.7x	EUR 1.56–2.11 million	≈ EUR 10.2–13.8 million
Annual operating cost	EUR 390,000	≈ EUR 2.6 million

These figures exclude any United States cost premium for Maine labor, frost detailing and marine-grade specification. They are presented because the scale of the omitted infrastructure bears directly on whether the nitrogen loading stated in the application is supported by anything the applicant has designed or costed.

Appendix H — Effluent disinfection

Published ultraviolet dose-response for infectious pancreatic necrosis virus, from Liltved et al. (2006) as compiled by the International Ultraviolet Association:

Log reduction	Fluence required
1 log (90%)	≈ 82 mJ/cm^2
2 log (99%)	≈ 165 mJ/cm^2
3 log (99.9%)	≈ 246 mJ/cm^2
4 log (99.99%)	≈ 325 mJ/cm^2
Proposed in this application	30 mJ/cm^2
Implied reduction at 30 mJ/cm^2	≈ 0.35–0.4 log (55–60%)

Comparative 3-log ultraviolet doses for other relevant fish pathogens:

Pathogen	3-log dose
Infectious salmon anemia virus	3.3–7.7 mJ/cm^2
Infectious hematopoietic necrosis virus	1.0–10.0 mJ/cm^2
Viral hemorrhagic septicemia virus	3.1–7.9 mJ/cm^2
Piscine orthoreovirus	≥ 50 mJ/cm^2
Atlantic halibut nodavirus	104–105 mJ/cm^2
Infectious pancreatic necrosis virus	122–246 mJ/cm^2
EPA drinking water, 4-log virus	186 mJ/cm^2
Norwegian aquaculture minimum (from 1 July 2025)	25 mJ/cm^2

A dose of 30 mJ/cm^2 is therefore sufficient for infectious salmon anemia virus, infectious hematopoietic necrosis virus and viral hemorrhagic septicemia virus, and insufficient for piscine orthoreovirus, the nodaviruses and IPNV. Earlier work reported IPNV requiring 720 to 792 mJ/cm^2 for 3-log inactivation, so the figures used here are conservative in the applicant's favor.

Qualifications. The implied reduction at 30 mJ/cm^2 is an extrapolation below the lowest measured point on the published curve; dose-response curves for non-enveloped viruses may exhibit shoulder behavior at low fluence, which would make the delivered reduction smaller rather than larger. Delivered dose also falls with reduced ultraviolet transmittance, suspended solids and particle shielding, and lamp fouling, none of which is addressed in the application. Several figures above are reproduced in vendor literature; in each case the underlying primary reference is Liltved et al., which should be consulted directly.

Ozone in seawater. Ozone reacts with bromide approximately 83 times faster than with chloride, so ozonation of seawater proceeds through hypobromous acid and hypobromite to bromate. Reported acute toxicity includes a rainbow trout LC50 of 0.068 mg/L for hypobromite and a Pacific oyster larval LC50 of 30 mg/L for bromate. Liltved et al. conclude that a dedicated residual bromine removal unit is required where seawater is ozonated in aquacultural systems. Because the application states a concentration of 0.4 mg/L but no contact time, the concentration-time product on which ozone disinfection depends cannot be evaluated.

Regulatory context. The federal aquaculture effluent guidelines at 40 C.F.R. Part 451 are narrative and silent on pathogens. No numeric ultraviolet or ozone dose appears to be specified in any United States aquaculture discharge permit reviewed. Norway made intake disinfection mandatory for new land-based facilities from 1 July 2025 at not less than 25 mJ/cm^2; the consultation draft preceding that regulation had proposed covering discharge water as well.

(see sources below)

Sources

Application and permit record

- Kingfish Maine, Inc., MEPDES/WDL renewal application #ME0037559 / W009238-6F-A-N, submitted 6 May 2026, accepted for processing 3 June 2026. 273 pp. Includes EPA Form 2D, Fish Rearing Facilities form (Items 5 and 8), Outfall Information form, and Attachments 1–10.
- Maine DEP, MEPDES Permit #ME0037559 / WDL #W009238-6F-A-N, issued 25 June 2021, with fact sheet and Special Condition H.
- Kingfish Maine, Attachment 2 — effluent characterization table, Conceptual Flow Diagram of Discharge Water Filtration, and Fishfarm Thermodynamics diagrams (summer and winter cases).
- Kingfish Maine, Attachment 6 — chemical inventory.
- Kingfish Maine, Attachment 8 — Intake and Outfall Pipe, Screening and Diffuser Figures; Woodard & Curran Sheet C-300, CAD file dated 28 July 2020, marked NOT FOR CONSTRUCTION.
- Kingfish Maine, Near- and Far-Field Discharge Modeling Report, Chandler Bay (Ramboll), including CORMIX and TUFLOW FV configuration, Table 3.5, and Section 4.3.
- The University of Maine, 2025 Ambient Water Quality Monitoring Report for Kingfish Maine, Jonesport, Washington County, Maine.
- Eastern Maine Conservation Initiative, public comment of 8 July 2026, and Remote Ecologist, A Careful Path Forward for Aquaculture and Chandler Bay (Krumholz, Pochtar and Hudson).
- Chris Kincaid, Development of the CEM-ROMS Hydrodynamic-Transport Model for Circulation and Transport Processes in Chandler Bay (ME) and Surrounding Waters, Kincaid Consulting LLC, 2023.
- Maine DEP, Kingfish Maine project record: https://www.maine.gov/dep/projects/kingfish/index.html

Federal consultation

- Louis A. Chiarella, Assistant Regional Administrator, NOAA Fisheries Greater Atlantic Regional Fisheries Office — response letter to the U.S. Army Corps of Engineers, June 2022 (9 pp.), obtained under the Freedom of Information Act.
- NOAA Fisheries, Information Needs to Assess Essential Fish Habitat Impacts From Offshore Aquaculture Projects Along the U.S. Atlantic Coast.

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- Sweco Nederland B.V., Veranderingsaanvraag fase 2B Kingfish Zeeland, project 373509, 8 July 2021 (Definitief), with English translation.
- Witteveen+Bos, Advies waterzuivering Kingfish Zeeland, report 123089/21-002.497 (Definitief), 15 February 2021, bundled as Bijlage 2 to the above. Tables 4.1–4.3; Chapter 5 cost estimate; Chapter 6 phased approach; Appendix I load extrapolation.
- Gemeente Noord-Beveland, ontwerp-omgevingsvergunning O2021185 / Z21.023683, Chapter 17 (Afvalwater) and Chapter 20 (Grootschalige proeven); final permit issued 23 February 2022 under reference O22021185.
- RUD Zeeland, decision on Woo request, reference Z2026-00006192, 27 July 2026, with English translation.

- Rijkswaterstaat Zee en Delta, suspension notice, reference RWS-2026/18912, 30 July 2026, with English translation.
- Staatscourant 2025 nr. 9267, 12 March 2025 — notice of decision RWS-2025/6121 amending the Kingfish Zeeland permit with respect to postponement of Phase 3.

Corporate reporting

- The Kingfish Company N.V., Integrated Annual Report 2024, published 26 March 2025. Sustainability Report pp. 40–43: discharge water treatment; heat recovery and aquifer thermal energy storage; Next Steps for 2025.
- The Kingfish Company N.V., Annual Report 2025, published July 2026. Farming Operations (production and FCR); Energy Use and Efficiency; Discharge Water Treatment; Fish Health and Welfare; Permit.
- The Kingfish Company N.V., Q4 and full year 2024 financial results, 27 March 2025.

Fisheries data and Oosterschelde investigations

- Maine Department of Marine Resources, commercial landings by port, Jonesport and Beals, 2021–2025.
- Rijksdienst voor Ondernemend Nederland landings data, reported via Wageningen Marine Research.
- Wageningen University & Research, Kreeftensterfte in de Oosterschelde: een verkenning van mogelijke oorzaken.
- Downeast Salmon Federation IPNV event, Peter Gray Hatchery, East Machias, November 2023, as reported by Maine Public (7 November 2023) and NewsCenter Maine.

Technical and regulatory references

- Liltved, H., Vogelsang, C., Modahl, I. and Dannevig, B.H. (2006), High resistance of fish pathogenic viruses to UV irradiation and ozonated seawater, Aquacultural Engineering 34(2):72–82; Liltved, H., Hektoen, H. and Efraimsen, H. (1995), Aquacultural Engineering 14(2):107–122; Øye and Rimstad (2001); MacKelvie and Desautels (1975).
- International Ultraviolet Association, Fluence (UV Dose) Required to Achieve Incremental Log Inactivation of Bacteria, Protozoa, Viruses and Algae (Malayeri, Chevrefils et al.).
- Crecelius, E.A. (1979), Measurements of Oxidants in Ozonized Seawater and Some Biological Reactions, Journal of the Fisheries Research Board of Canada.
- Molloy, S.D. et al. (2013), Experimental Transmission of Infectious Pancreatic Necrosis Virus from the Blue Mussel, Mytilus edulis, to Cohabitating Atlantic Salmon Smolts, Applied and Environmental Microbiology.
- Norwegian Ministry of Trade, Industry and Fisheries, aquaculture biosecurity regulation in force 1 July 2025 (minimum UV dose 25 mJ/cm^2 or method approved by the Norwegian Veterinary Institute).
- NOAA, Annual Report of the U.S. Atlantic Salmon Assessment Committee, Report No. 36 (2023).
- Endangered and Threatened Species; Designation of Critical Habitat for Atlantic Salmon (Salmo salar) Gulf of Maine Distinct Population Segment, 74 Fed. Reg. 29300 (19 June 2009); 50 C.F.R. § 226.217.
- 40 C.F.R. Part 451, Concentrated Aquatic Animal Production Point Source Category.
- Nofima, CtrlAQUA Intake project, Strategies for water treatment in closed-containment aquaculture.

- Golding, L.A. et al. (2015), derivation of a marine water quality guideline value for aluminium; ANZG marine default guideline value of 24 µg/L.
- U.S. EPA, Aquatic Life Ambient Water Quality Criteria for Aluminum (2018) — freshwater only.
- U.S. EPA, cooling water intake structure requirements, 40 C.F.R. Part 125 subparts I and J.
- 38 M.R.S. § 464(4)(A)(11), § 464(4)(F)(1), § 464(4)(F)(1-A), § 464(4)(F)(4) and § 464(4)(F)(5).

Note on calculations. Where this submission derives a figure, the derivation is set out in the Technical Appendix so that the Department may check it. Where an input is assumed rather than drawn from the record — principally feed crude protein content, nitrogen retention fraction, and wedge wire open-area ratios — that is identified at the point of use. Corrections are welcomed.