July 6, 2021
Riparian Solutions
9720 Buna Ct.
Elk Grove, CA 95624

Alyssa Suárez
Planner II
Humboldt County Planning & Building Department
3015 H Street Eureka, CA 95501

Submitted by email to asuarez@co.humboldt.ca.us

RE: Nordic Aquafarms Permits Scoping Comments

Dear Ms. Suárez:

Nordic Aquafarms (Nordic) plans to build a fish farm (Project) on the Samoa peninsula in Humboldt County, California. I am a private citizen who has enjoyed the beauty of Humboldt County for most of my life, especially the beaches and the wildlife. It is not just my fondness for the beauty of the north coast that has me gravely concerned about the impacts that the Project will have on local wildlife and recreation. I am a scientist with a 42-year government career in habitat conservation and restoration. Twenty-seven of those years were with the U.S. Fish and Wildlife Service specializing in policy and application of the Endangered Species Act (ESA) and 5 years were as the Modeling Coordinator for the Delta Regional Ecosystem Restoration Implementation Plan. My areas of expertise include: Juvenile salmonid habitat, ESA policy, and habitat modeling for resource management decisions. I am mystified as to why Project impacts to critical habitat and to the juvenile life stages of coho salmon, Chinook salmon, steelhead, and green sturgeon have been treated so lightly by Nordic (GHD 2020b).

Please include my earlier comments on this Project in the comment record and response for the draft Environmental Impact Report (DEIR). These are included as attachments to the email submission of this letter and consist of: my May 23, 2021, comments on the Nordic Aquafarms Initial Study/Mitigated Negative Declaration (IS/MND), my June 4, 2021, comments on the California North Coast Regional Water Quality Control Board (RWQCB) Draft National Pollutant Discharge Elimination System (NPDES) Permit (ORDER R1- 2021-0026, NPDES NO. CA1000003) for discharge from the project, and my June 23, 2021, exposure analyses for the critical habitat of five ESA-listed species that are likely to be adversely affected by Project operations and effluent.

Nordic's *Marine Resources Biological Evaluation Report Samoa Peninsula Land-based Aquaculture Project* (Biological Evaluation, GHD 2020b) appears to rely on they-will-

just-swim-away philosophy of underrepresenting Project effects. For the majority of the species addressed in the Biological Evaluation the conclusion is: “Because … [they] are highly mobile, their exposure to the diffuser effluent is likely to be short term.” Sadly, juvenile salmonids, juvenile green sturgeon, eulachon, and longfin smelt do not have the evolutionary wherewithal to swim away from toxicants and diseases. Nor do they have the ability to cope with loss of food and cover in their nursery areas.

Untreated Effluent Components

The DEIR should include a comprehensive discussion of the untreated portions of Nordic’s effluent stream as well as a contingency plan for when the biofilm reactors or membrane bioreactor are compromised or fail. At this scale and application, the biofilm reactors and membrane bioreactor are untried, experimental methodology. As such, system inconsistencies in fulfilling operational objectives and system failures are to be expected. This is particularly the case in the early stages of application of new technology, but could potentially occur throughout the life of the Project.

There are two effluent sources with separate effluent streams from the sludge removal process: These are backwash from the sludge separators (the biofilm reactors and membrane bioreactor), and effluvia from the fish processing area (factory floor). Factory floor waste contains industrial cleansers, antibiotics, antifungals, fish blood, and other fish fluids. These separate, untreated effluent streams are likely to be a source of diseases in wild fish and degradation of salmonid macroalgae rearing habitat and eelgrass rearing habitat.

Untreated Effluent Risks and Concerns

There are both human and fisheries risks from the two untreated effluent streams generated by the Project and from any failures, tears, or degradation of the biofilters. The risk of spread of antibiotic-resistant bacteria from fish feed that includes poultry biproducts poses risk to surfers and other beachgoers, truckers hauling the sewage solids, factory workers, workers at the end-point composting facilities, commercial fishermen. Due to the fact that this is an emerging concern, rigorous monitoring is needed to ensure that local residents, workers, fishermen, and tourists will be protected from exposure. Beach closures and personal protective equipment are not typically popular forms of mitigation. However, these measures would become necessary to avoid injury, illness, and even death if antibiotic-resistant bacteria were introduced into the effluent solids and effluent stream.

Dioxins and PCBs found in fish feed and farmed fish are additional health concerns affecting the public through diet and direct exposure. Additional human health monitoring should be used to determine the amount and significance of dioxin toxic-equivalents and PCBs being discharged from the Project and entering Humboldt Bay, as well as monitoring for EthoxyQuin, PBDEs, and mercury.

Untreated effluent risk to wild salmonids is another emerging concern. In collaboration with a colleague, I am currently conducting additional analyses on the potential exposure of wild fish to untreated effluent from the fish processing area of the Project and from the backwash from the sludge removal process. Preliminary analysis suggests the risk is high to very high. At issue are exposure of wild salmonids to viruses found in Project effluent. Viruses of immediate concern are: Infectious Pancreatic Necrosis Virus (IPN), Infectious Salmon Anemia Virus (ISA), Salmonid Alphavirus (SAV), Piscine Orthoreovirus and Novel Piscine Reovirus (PRV), Novel Totivirus CLuTV), and bacterial kidney disease (*Renibacterium salmoninarum*). Each of these viruses pose a risk to juvenile salmonids growing to adulthood in the marine habitat in the area of the diffuser pipe and those exposed to effluent during tidal cycles in Humboldt Bay and other estuaries in the affected area.

Infectious Salmon Anemia virus can also be transmitted to Pacific herring, allowing for spread of the disease to wild salmonids through foraging. Humboldt Bay and its surrounding waters are known to support large populations of Pacific herring.

As discussed in my earlier letters, antifungals and oxidants that degrade salmonid macroalgae habitat pose a risk to juvenile salmonid survival. The coastal marine habitat supports macroalgae that provides both food and cover for juvenile salmonids, juvenile green sturgeon, eulachon, and longfin smelt. Exposure to antifungals and oxidants are likely to cause bleaching and senescence of macroalgae. This, in turn, removes the structure that juvenile salmonids use for cover and diminishes the invertebrate food resources for salmonids, green sturgeon, eulachon, and longfin smelt.

The fish treatment drugs Parasite-S, Formalin-F, and Formacide-B (Formalin) may diminish salmonid, green sturgeon, eulachon, and longfin smelt prey in the effluent stream and effluent dispersal area, harming individual fish and compromising critical habitat. The powerful fungicide Virkon (currently not permitted for use in California) may have significant adverse effects on the vulnerable macroalgae ecosystem as a whole, as well as on individual species of kelp or seagrasses that juvenile salmonids depend upon for food and cover in the nearshore marine environment.

Modeling Needs

Modeling of Project effects is lacking in two areas: Mad River critical habitat reductions and the effluent dispersal area. For the Mad River, instream flow incremental methodology (IFIM) is a time-honored methodology that can be used to estimate the amount of habitat available at different flows. If IFIM data already exists for the Lower Mad River, it should be used to quantify Project effects from continuous water withdrawal during dry and very dry water years as well as episodic drought events. If IFIM data does not exist, this year's drought flows would be the ideal time to measure Mad River bathymetry and habitat parameters. An alternative bathymetry measurement technique would be the use of LiDAR (light detection and ranging), which is a remote sensing technique that is commonly used in flow studies.

If there is a low-flow event in the Mad River, such as happened in August 2008, river flows would be reduced by greater than 30 percent in the lower river and estuary. Such events prevent salmonids from accessing instream cover and result in increased water temperatures. Removal of flow from the shaded riverine edge and emergent aquatic vegetation along the Lower Mad River during dry and critically dry water years, or during an episodic drought event, could kill or injure listed species if temperature and flow-protection measures are not in place.

Considering that the Mad River is Clean Water Act Section 303(d) listed Impaired Water Body due to impairments to water quality by sediment/turbidity and high water-temperatures, it seems reasonable that Project commitments would be in place to ensure protection of critical life stages of salmonids and eulachon.

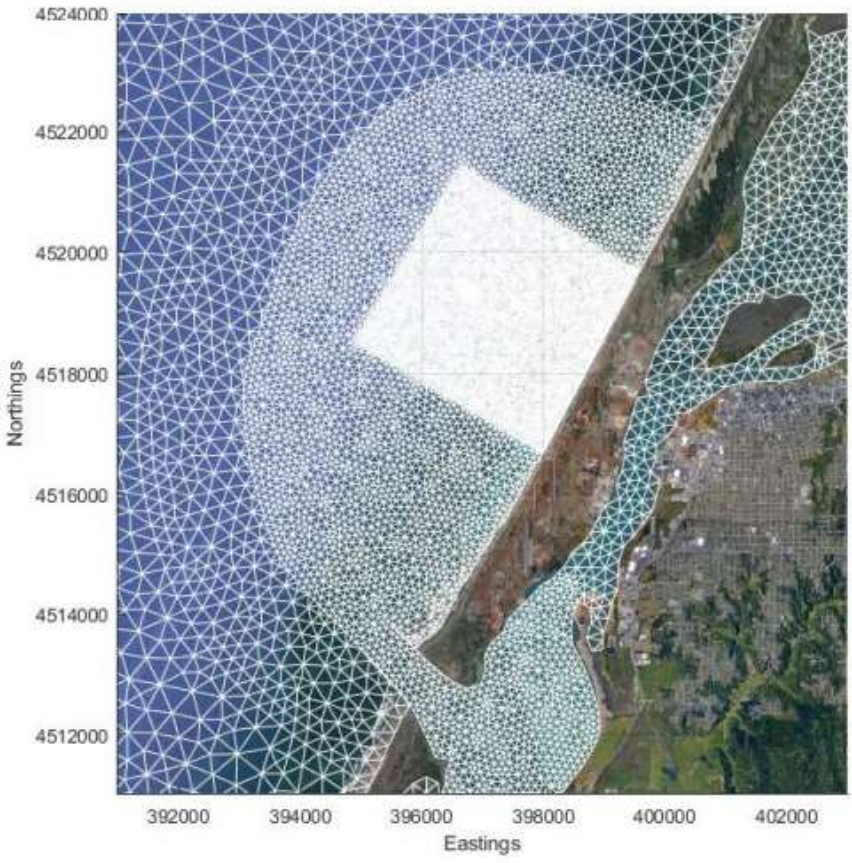

Figure 1. Excerpt from Figure 7 of the *Nordic Aquafarms California LLC Samoa Peninsula Land-based Aquaculture Project Numerical Modelling Report* (GHD 2020a). This preliminary modeling is only based on a 180º directional current and does not include local currents, northward flows, or marine upwelling.

The *Nordic Aquafarms California LLC Samoa Peninsula Land-based Aquaculture Project Numerical Modelling Report* (GHD 2020a) clearly shows that effluent from the

Project discharged into coastal marine water will enter Humboldt Bay (Figure 1). Because only a unidirectional, southbound current (*i.e.*, 180º) was used, the modeling in GHD 2020a is incomplete. In the vicinity of the outfall pipe, strong currents shift daily from a southbound current to a northbound current. The effluent dispersal modeling should be re-done to take into account local currents.

Marine upwelling was not addressed in GHD 2020a. This is a serious omission, considering that precipitated nitrogenous compounds could be released in high concentrations during upwelling events. Upwelling modeling that addresses the local vertical nitrate flux with the addition of the 298 metric tons of nitrogen loading per year in the Project effluent discharge should be conducted. The Biologically Effective Upwelling Transport Index (BEUTI) should be used to estimate upwelling and nutrient transport within the full dispersal area of Project effluent (see Jacox 2018).

Critical Habitat for ESA-Listed Species

Adverse effects to critical habitat from Project water withdrawals and effluent are reasonably certain to occur. Modeling of flow reductions in the Mad River and the combined impact of effluent-laden sediments, marine upwelling, tidal surge, and daily south-north current changes will allow for a more complete exposure profile for Project effects to critical habitat for coho salmon, Chinook salmon, steelhead, green sturgeon, and eulachon. Once the effluent distribution has been fully analyzed and explained, the effects of the effluent on the primary constituent elements of critical habitat and the physical or biological features essential for conservation listed species should be determined. Preliminary analyses for exposure of critical habitat of five ESA listed-species to Project effluent is included as an attachment to the email submission of this letter (Willy Preliminary Critical Habitat Exposure Analyses 24jun2021.pdf.)

Both the primary constituent elements of critical habitat and the physical or biological features essential for conservation include water quality and food resources as essential to the survival of the coho salmon, Chinook salmon, steelhead, green sturgeon and eulachon. Baseline benthic macroinvertebrate studies and prey indices have yet to be conducted and calculated in order to quantify the food resources for listed species that are likely to be impacted by Project effluent. Baseline benthic macroinvertebrate studies and prey indices should be completed for the effluent dispersal area (identified from updated modeling that includes local currents) in the coastal marine area, Humboldt Bay, and critical habitat prior to Project operation.

A thorough analysis of how Project chemicals affect water quality, food resources, and aquatic vegetation should be conducted. Industrial cleaners (especially oxidants), antifungals, antibiotics, and other fish treatment drugs (*e.g.*, Virkon, Parasite-S, Formalin-F, and Formacide-B) all affect water quality and can diminish salmonid, green sturgeon, and eulachon cover and prey in waters affected by the effluent stream.

Of the five essential habitat types identified in the coho salmon critical habitat designation (NOAA Fisheries 1999), two are relevant to this discussion: (a) juvenile

migration corridors and (b) areas for growth and development to adulthood. These essential habitat types include estuarine and nearshore marine habitat. Within these areas, essential features of coho salmon critical habitat include adequate water quality, water temperature, cover/shelter, and food.

Critical habitat for Chinook salmon and steelhead includes estuary and nearshore marine features that are essential to the conservation of both species. Primary constituent elements #4 and # 5 of critical habitat for Chinook salmon and steelhead (NOAA Fisheries 2005, p. 52521) both include (a) water quality and quantity conditions and forage—including aquatic invertebrates and fishes supporting growth and maturation—and (b) aquatic vegetation, because: "without them juveniles cannot successfully transition from natal streams to offshore marine areas."

In addition to the final rules listing critical habitat for these species, recent studies provide supplemental information demonstrating the importance of aquatic vegetation in the nearshore marine environment and estuarine environment for supporting juvenile salmon and their prey (Shaffer 2002, Shaffer 2004, Shaffer et al. 2019, Shaffer et al. 2020). Now is the time to take a hard look at the effect of Project effluent on these important aspects of critical habitat. Once the distribution of effluent has been determined with updated modeling and habitat mapping, impacts to primary constituent elements #4 and #5 should be addressed through consultation with NOAA fisheries.

A closer look at effluent effects is needed in Elk River, Salmon Creek, Freshwater Creek, Jacoby Creek, Mad River, and Eel River. The proximity of Elk River and Salmon Creek to the entrance of Humboldt Bay indicates that these drainages are likely to be exposed to higher concentrations of Project effluent and consequently experience greater adverse effects.

In eulachon critical habitat, the physical and biological features that are essential to the conservation of eulachon include food, cover, and water quality (NOAA Fisheries 2011). Prey items in a concentration able to support foraging leading to adequate growth and reproductive development for juveniles in the estuarine environment, and adults and juveniles in the marine environment, are necessary for eulachon survival. At a minimum, the invertebrates identified in eulachon critical habitat (copepods, euphausiids, malacostracans, cumaceans, mysids, barnacle larvae, and worm larvae) should be protected throughout the life of the Project. The water quality requirement essential for conservation of eulachon is water that is free of contaminants that may disrupt behavior, growth, and viability of eulachon and their prey. This is a high bar that may require full treatment of Project water prior to discharge in order to be met.

Tributaries to Humboldt Bay that are included in the green sturgeon critical habitat designation are: Elk River, Eureka Slough, Freshwater Creek, Freshwater Slough, Bannon Slough, Jacoby Creek, Liscom Slough, Mad River Slough, McDaniel Slough, Rocky Gulch/Washington Gulch, Salmon Creek, an unnamed tributary, and White Slough. Green sturgeon critical habitat includes those characteristics necessary for

normal behavior, growth, and viability of all life stages. Effluent exposure profiles are needed for all of these tributaries.

A risk analysis for loss of prey species, cover, and overall water quality should be conducted. This is necessary in order to determine Project effects to coho salmon, Chinook salmon, steelhead, green sturgeon, and eulachon critical habitat, as well as individual and population-level effects to these species.

Consultation Needs

Take of ESA and CESA listed species, as well as mammals protected under the Marine Mammal Protection Act is reasonably certain to occur. The Biological Evaluation for the Project (GHD 2020b) summarizes take under the ESA, CESA, Marine Mammal Protection Act, and Migratory Bird Treaty Act. The Biological Evaluation made several unsupportable determinations of "Less Than Significant" effects to listed species, marine mammals, and migratory birds. In actuality, both ESA and CESA listed species are likely to be adversely affected by Project effluent and operations. The state-listed longfin smelt will be exposed to the effluent stream with every southbound longshore current and incoming tide into Humboldt Bay. Federally-listed coho salmon, Chinook salmon, steelhead, and green sturgeon juveniles will be exposed to the effluent stream. The federally-listed eulachon will be exposed to Project effluent as adult fish in the nearshore marine environment. Modeling may show that juvenile eulachon in the Mad River will also be exposed to effluent. Exposure to fish diseases, Project chemicals, and intake facilities is highly likely to harm, injure, and kill listed species and their prey. Loss of food, loss of cover, and harmful algal blooms will result in harm to fish and potentially significant shifts in population viability.

The introduction of viral and bacterial pathogens to the marine environment is one of the most significant risks of the Project to wild salmonids. For example, Piscine Orthoreovirus (a strain of PRV called PRV-1) is a highly contagious virus that is known to enter the environment from fish processing areas. PRV causes heart and skeletal muscle inflammation and is associated with kidney and liver damage in Chinook salmon. While farmed salmon show low mortality rates when infected with PRV, wild salmonids are unlikely to survive their return to spawning areas. The added from strain on their physiology from migrating with compromised organs becomes too much (Miller 2017), and infected salmonids will not have the metabolic resources to meet the energetic demands of migration. Wild salmonids exposed to fish diseases from the Project are likely to be harmed, injured, or killed.

Entrainment is another significant risk. Project intakes in the Mad River and Humboldt Bay will need to be modified to reduce impingement and entrainment into intake pipes. Death and injury to listed species and their prey from entrainment and impingement at intake pipes will need to be exempted through ESA consultation with NOAA fisheries and CESA consultation with California Department of Fish and Wildlife. From Nordic "office hours" meetings, they are well aware that impingement and entrainment will kill listed species, but sought to separate their development and operations from profited

take at the intakes, shifting liability to Humboldt County. The Humboldt County Planning Department showed considerable insight in choosing to address the Project in its entirety through the CEQA process.

Knowing violations of Section 9 of the ESA come with stiff penalties. It would be wise for Humboldt County to seek incidental take exemptions for each affected federally-listed species from NOAA Fisheries prior to making a final decision on the EIR.

Although regulations under the ESA changed in 2019, an analysis of direct and indirect effects of the Project continues to be warranted under 50 CFR 402. Due to the fact that partially-treated and untreated effluent will flow directly into critical habitat and be transported into critical habitat with tidal flows, impacts to ESA-listed species and critical habitat would not occur but for the Project.

Adverse effects to ESA-listed species should be addressed through consultation with NOAA Fisheries and adverse effects to CESA-listed species should be addressed through consultation with California Department of Fish and Wildlife.

While larger marine mammals may move their young away from the effluent stream, both adults and juveniles could still be exposed to domoic acid and subsequent neurological effects if the warm and nutrient-laden effluent waters from the Project result in harmful *Pseudo-nitzchia* algal blooms leading to a proliferation of domoic acid. Sea lions and harbor seals are at the greatest risk from domoic acid poisoning, which results in lethargy, disorientation, loss of pregnancy, seizures, brain damage, and death. Although the Project is not the proximal cause of marine warming, *per se*, the enormous amount of power to needed to operate the Project has a carbon footprint comparable to 10,000 new homes. When the full energy demand is finally calculated, including use of refrigerants and cooling systems, the energy demand may be considerably higher. If a marine warming event happens in the early stages of operation, the Project would be contributing to the magnitude of a harmful algal bloom. As the Project contributes significantly to the carbon emissions in Humboldt County, the magnitude and duration of marine warming events is likely to increase.

Marine warming has led to harmful algal blooms and bioaccumulation of domoic acid in the food chain along the coast of California. Additional nutrient loading and thermal pollution (9.0 to 10.9°C in winter months) from the Project effluent could extend the season for harmful algal blooms and extend exposure to marine mammals. California sea lions are particularly hard hit from domoic acid poisoning.

Monitoring Needs

It has been well established that discharge from aquafarms introduces diseases to wild fish populations. The Project poses a significant risk to wild salmonids, ESA- and CESA-listed species, critical habitat for five species, and Essential Fish Habitat. Disease within salmonid populations can now be monitored in advance of high viral-loading and physiological impairment. To get ahead of disease outbreaks, Nordic

should conduct monthly salmon host transcriptional biomarkers analysis in each rearing tank and grow-out tank. The salmon host transcriptional biomarkers analysis was developed by Miller *et al*. (2017) and used by Laurin *et al*. (2019) to detect bacterial, protozoan, and parasite histopathological change. A simple explanation of the methodology and its uses can be seen in Dr. Miller's September 15, 2017, presentation to Watershed Watch https://www.youtube.com/watch?v=qflGzDrTtJA . The methodology utilizes a simple gill clip and provides for rapid testing to denote overall fish health over a broad range of diseases. Host transcriptional biomarkers analysis should be used as the preliminary screening methodology to monitor genetic shifts in the captive population to indicate impairment or infection prior to obvious signs of disease. If host transcriptional biomarker analysis indicates that disease is present at the Project, direct testing for PRV, IPN, ISA, SAV, CLuTV, and bacterial kidney disease should commence immediately on all fish stock and effluent streams.

Nordic does not currently propose treatment of effluvia from the fish processing area or the backwash from the sludge separator. Without adequate treatment of effluvia, it is important to protect workers and surfers from an antibiotic-resistant biome becoming established in the facility, the surf zone, and Humboldt Bay. Nordic should conduct monthly monitoring of the sewage sludge and processing waste (*e.g.*, fish guts and carcass fluids) for known antibiotic-resistant bacteria strains such as *Escherichia coli*, *Staphylococcus aureus*, *Enterococcus sp.*, *Campylobacter sp.*, *Vibrio vulnificus*, and *Vibrio parahaemolyticus*. If antibiotic-resistant bacteria are found in any area of the Project, Nordic should immediately work with Humboldt County public health officials to establish additional resistome-monitoring in areas where there is commercial or recreational contact with affected waters and where facility workers and truckers may be exposed.

Monitoring of changes in prey availability and cover for listed species is essential for tracking the population impacts of the Project. Monitoring protocols should be reflective of the baseline sampling methodology, in order to fairly track Project impacts to local ecosystems.

Monitoring of changes in the amounts of PCBs, dioxin equivalents, methylmercury, EthoxyQuin, PBDEs is needed in the tidal flats within Humboldt Bay at a minimum.

Baseline Data Needs

Disease profiling for salmonids in Mad River (including the Mad River Fish Hatchery), Humboldt Bay and its tributaries, and the Eel River is an optimal measure to track and monitor wild fish health prior to Project operations. This baseline monitoring is essential for protecting fishery resources if fish diseases emanating from the Project begin to compromise wild and hatchery populations. At the very minimum, host transcriptional biomarker analysis should be conducted on wild salmonids, as well as direct testing for PRV, IPN, ISA, SAV, and CLuTV. Pacific herring should also be tested for ISA, because of their status as a potential disease vector.

Baseline benthic macroinvertebrate studies and sampling of water column crustaceans and forage fish are needed to establish available food resources for coho salmon, Chinook salmon, steelhead, green sturgeon, eulachon, and longfin smelt. For forage fish and water column crustaceans, prey indices should be developed in order to be able to compare pre- and post-Project prey availability.

Baseline macroalgae and eelgrass distribution within the entirety of the revised effluent dispersal area is needed. Mapping of both patch size and distribution, as well as species composition, is are needed to understand the baseline cover for juvenile salmonid foraging and migration. Ideally, mapping of macroalgae from Trinidad Head to Centerville County Park would provide a good baseline. If revised modeling indicates effluent distribution has a lesser geographical extent, the revised exposure area should be where baseline mapping occurs.

The residence time of effluent within different areas of Humboldt Bay is likely to exceed the tidal cycle, depending upon tidal prism effects in each locality. Spatial analysis of the eelgrass beds in Humboldt Bay and its tributaries is needed, so that effluent residence time can be correlated with prey response, viral loading, and nutrient loading.

Conclusion

Science is advancing rapidly in the area of fish disease detection, habitat monitoring, aquatic modeling, and the community and global effects of high-density aquaculture. In the meantime, so much is happening to our communities and wildlife: Fires, drought, marine warming and domoic acid proliferation, closed fisheries, fish and sea lion die-offs, viruses jumping between species, and friends or family members dying from antibiotic-resistant bacteria.

Now is the time to press pause and ask: What can we do to protect our communities? How can we support local economies that lead to stability in the future? Will this multinational aquaculture corporation take care of our community? Can we afford the energy burden of the Project? How many members of our community will lose income, tourist dollars, or their health and wellbeing as a result of the Project? Who will take the sewage sludge if it is too salty or pathogen laden to go into traditional composting facilities? Who will really fill the Project's "created" jobs? How many existing jobs will be lost as a result of Project impacts on the local fisheries and tourist trade? Is external profiteering worth the risks imposed on our community and local environment?

Now is not the time to put a heavy energy burden on the region. Rather than depend on the community to reduce its carbon footprint to make up for the Project's carbon footprint, the Project should be designed as carbon neutral. To that end, the energy demand of the Project should be determined by a third-party, and the carbon-neutral energy sources should be fully operational at the time of initiation of Project operations.

Adverse effects to local fisheries are reasonably certain to occur as a result of the Project. These adverse effects would come at a time when our fisheries and local

wildlife are already stressed from climate change, marine warming, and harmful algal blooms. Protecting the nearshore marine environment and local estuaries are a way to protect and conserve not only the environment but also the local community that depends upon a dynamic and productive fishery.

The Project site has already left a burden on the county, community, and ecosystem as an eyesore and a source of toxic contaminants. If the Project fails, a contingency plan and funding for clean-up should be in place for the purpose of remediation—guaranteeing financial protections for the county and its taxpayers. Funding for remediation should be in a non-wasting account, so that the cost of cleanup does not fall to Humboldt County or the Harbor District.

It is my hope that the unique nature and beauty of Humboldt Bay and the coastal marine ecosystems along the coast of the Samoa Peninsula are preserved for future generations. Please ensure that the Project has measures in place to protect and conserve wild fisheries, local wildlife, natural resource values, and community vibrancy.

Thank you for your consideration of these comments.

Sincerely,

Alison Willy, M.S.

Email attachments:

Willy comment letter Nordic Aquafarms 23may2021.pdf
Willy NPDES comment letter Nordic Aquafarms 04jun2021.pdf
Willy Preliminary Critical Habitat Exposure Analyses 24jun2021.pdf

References

GHD. 2020a. Nordic Aquafarms California LLC Samoa Peninsula Land-based Aquaculture Project Numerical Modelling Report August 2020. 53pp.

GHD. 2020b. Marine Resources Biological Evaluation Report Samoa Peninsula Land-based Aquaculture Project Prepared for Nordic Aquafarms California. August 24, 2020. 29pp.

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Willy, A. *in litt.* 2021a. May 23, 2021, letter from Alison Willy of Riparian Solutions to John Ford, Director, Humboldt County Planning and Building Department, and Planning Commissioners regarding Initial Study/Mitigated Negative Declaration for Nordic Aquafarms under the California Environmental Quality Act. filename: Willy comment letter Nordic Aquafarms 23may2021.pdf. 15pp.

Willy, A. *in litt.* 2021b. June 4, 2021, letter from Alison Willy of Riparian Solutions to the California North Coast Regional Water Quality Control Board regarding Nordic Aquafarms Draft National Pollutant Discharge Elimination System (NPDES) Permit (ORDER R1- 2021-0026, NPDES NO. CA1000003) for discharge from the proposed Nordic Aquafarms (Nordic) fish farm (Project) on the Samoa peninsula, Humboldt County, California. Filename: Willy NPDES comment letter Nordic Aquafarms 04jun2021.pdf. 16pp.

Willy, A. 2021c. Critical Habitat Exposure Analyses. Supplemental information provided by Alison Willy to Pacific Fisheries Management Council on June 24, 2021. Filename: Willy Preliminary Critical Habitat Exposure Analyses 24jun2021.pdf. 9pp.