Attachment 2

I, James Coffman, having been duly sworn, do depose and say as follows:

I am a developmental biologist and member of the faculty at the MDI Biological Laboratory (MDIBL). Research in my laboratory is focused on understanding how early life stress negatively impacts health and promotes development of inflammatory disease. I am concerned that the aquafarm proposed for this lease application has potential to negatively impact the important, NIH-funded biomedical research being carried out at MDIBL, and urge the DMR to reject the application, for reasons detailed below.

The animal facility at the MDIBL houses several species of research model organisms, including zebrafish, African Turquoise Killifish, and axolotl salamanders, used for biomedical research focused on regeneration, aging, and the effects of stress on health. Many of the genetic strains of fish and salamanders maintained at MDIBL are unique in the world, providing an invaluable, internationally recognized scientific resource (not unlike that provided by the Jackson Laboratory for laboratory mice). MDIBL has invested millions of dollars in physical and human infrastructure to maintain these animals in environmentally controlled conditions. Such conditions are essential for scientific research, as animals are highly sensitive to their environment, and factors such as noise and vibrations (even at low levels not readily detectable by humans) can be a source of stress that affects their behavior. Such stress can negatively impact research by introducing uncontrolled variables that make experimental data less reliable, particularly in research that is focused on understanding the health effects of chronic stress. Stress can also negatively affect the breeding of animals. In the absence of pilot studies to determine the environmental impact of the proposed aquaculture operation it is impossible to know how the noise/vibrations generated by its activities will affect the research animals maintained at MDIBL, which poses a substantial risk to the research and investment at the lab.

In sum, given the potential risk that noise from the proposed aquafarm activities could be stressful for our research animals and thus interfere with our research, and given the total lack of impact studies providing data that might allay that concern, I urge the DMR to reject the lease application from Acadia Aquafarms.

Reference

Lara, R.A., Vasconcelos, R.O. Impact of noise on development, physiological stress and behavioural patterns in larval zebrafish. *Sci Rep* **11,** 6615 (2021). doi.org/10.1038/s41598-021-85296-1

DATED: Feb. 2 2022

James Coffman, PhD

STATE OF MAINE
COUNTY OF Hancock, ss.

Dated: February 2, 2022

PERSONALLY APPEARED before me the above-named James Coffman and made oath that the statements contained in this Affidavit are true to the best of his personal knowledge, information, and belief.

Before me,

Notary Public/Attorney-at-Law

AMY RICHARDS
Name Typed or Printed

My Commission Expires: Nov. 19, 2026

AMY RICHARDS
Notary Public, State of Maine
My Commission Expires Nov. 19, 2026

Attachment 4

I, Jane Disney, having been duly sworn, do depose and say as follows:

Comments on the Mussel Seed Aquaculture Project for Frenchman Bay
Jane E. Disney, PhD
February 1, 2022

I am Director of the Community Environmental Health Laboratory (Community Lab) at MDI Biological Laboratory in Salisbury Cove, Maine, which was established in 2000 with a mission of engaging citizens of all ages in preserving and improving the water quality of MDI through meaningful environmental research and community education. I work with the Maine Healthy Beaches program (currently a program of the Department of Environmental Protection), supporting the towns of Bar Harbor and Mt. Desert as well as Acadia National Park in assuring that their beach waters are healthy for swimmers and others with recreational contact of the water. I have worked with the Maine Volunteer Phytoplankton Monitoring program (a program of the Department of Marine Resources) since its inception in 1998, monitoring the waters around Mt. Desert Island for toxic red tide species, including the Bar Harbor town pier and the MDI Biological Laboratory dock in upper Frenchman Bay. The proposed 48 acre "Mussel Pipe" system proposed for the area between Leland Point and Googin's Ledge in Upper Frenchman Bay is problematic for the following reasons:

1. **The proposed project will interfere with a long-term phytoplankton monitoring and research program, a collaborative effort of MDI Biological Laboratory, Woods Hole Oceanographic Institute (WHOI), and Florida Fish and Wildlife Conservation Commission, aimed at understanding toxic phytoplankton species population dynamics in Frenchman Bay and the Gulf of Maine.**

Prior to 2016, the red tide or harmful algal blooms (HABs) responsible for shellfish growing area closures in the Gulf of Maine have involved the dinoflagellate *Alexandrium catenella,* a species that causes deadly paralytic shellfish poisoning (PSP) in humans. Interestingly, *Alexandrium* was seldom an issue in upper Frenchman Bay, that is why it became an attractive area for shellfish aquaculture.

However, conditions have been changing in Frenchman Bay over the past several years. As early as 2013, we began to observe increases in other toxic red tide species at our regular sampling site off of the MDI Biological Laboratory dock (Mogensen, 2014). Phytoplankton populations changed dramatically with the emergence of *Pseudo-nitzschia* spp. and *Dinophysis* spp., which cause amnesic shellfish poisoning (ASP) and diarrhetic shellfish poisoning (DSP) respectively. In 2016, we saw shellfish closures in Frenchman Bay due to *Pseudo-nitzchia*, most likely resulting from the movement of water from the Scotian shelf into Frenchman Bay. These are the types of closures we would like to avoid in the future. It is unknown whether the mussel seed operation will produce nutrients that could trigger more blooms or more intensive blooms now that we

have these *Pseudo-nitzchia* species in the bay, but we should be considering all large-scale nutrient inputs into the bay as potentially harmful.

The increase in these other toxic species drew the attention of researchers affiliated with Woods Hole Oceanographic Institute (WHOI) with whom we have partnered to study ongoing red tide blooms. **Our partners are developing an adaptive observing network for real-time, in situ HAB Monitoring and data sharing across New England.**

MDI Biological Laboratory has provided a mooring for a sensor platform prototype so that WHOI researchers can test the capability of their equipment and perform real-time monitoring of HABs and water conditions. **WHOI researchers have chosen upper Frenchman Bay as a study site because it is one of the most rapidly changing areas in terms of HABS.** Eventually, they plan to deploy a network of sensors and sensor platforms around New England. The project will dramatically improve HAB surveillance, help direct state biotoxin testing, and support resource management decision-making.

In addition, we have partnered with researchers at Florida Fish and Wildlife Conservation Commission (FFWCC) to provide whole water samples for assessment of particulate toxins in the water column and filtered water samples for assessment of cellular toxins associated with red tide blooms in upper Frenchman Bay. They are studying the relationship between water quality parameters and species composition of red tide blooms using samples we collect for them weekly from Frenchman Bay (Bates et al., 2018, Clark et al. 2019, and Clark et al., 2021).

We continue to work with FFWCC researchers to study upper Frenchman Bay because it provides insight into how changing bay conditions determine phytoplankton population composition in a changing climate.

Massive mussel seed collection in proximity to our research effort at the MDI Biological Laboratory dock, may affect our on-going efforts to understand phytoplankton dynamics of both toxic and non-toxic phytoplankton species, because we will not know which changes are occurring due to the mussel seed operation and which changes are occurring due to other factors. The mussel seed operation will introduce a multitude of other, potentially confounding variables into the mix.

2. The proposed project is superimposed on a bay area that has had no history of industrial use. This area is already showing changes related to climate change. The proposed project would serve to industrialize an otherwise pristine area of Frenchman Bay. The proposed project may exacerbate and accelerate changes by shifting flow dynamics in the bay and introducing additional nutrients through excretion and biodeposition from mussels combined with the biofouling organisms likely to accumulate in large volume on the mussel collector and predator nets suspended from each floating pipe as well as from cleaning operations to remove biofouling organisms.

Although some studies might indicate that farmed mussels remove nutrients from marine waters, depending on site location and length of time since establishment of the site (Carlsson et al, 2012), others demonstrate that through mussel excretion and biodeposition in the forms of feces and pseudofeces, mussel farms make significant contributions of nutrients to marine waters (Cranford et al. 2007). Jon Lewis, Maine DMR (2017), published a report that also noted this variability depending on the siting of the operation. These studies all focus on a different kind of aquaculture that involves growing mussels to adult size on ropes suspended on rafts and are different in scale from the proposed aquaculture lease site. Since there are no operations like the one proposed by the lease applicants in the Gulf of Maine or other US waters it is impossible to predict the nutrient impact. However, given the potential for toxic phytoplankton blooms in the area, the correlation between nutrients and toxic blooms, and the potential for blooms to affect other economically important shellfish and other marine resources throughout the bay (see DMR landings data for Frenchman Bay, below), the risk seems to outweigh the benefit from the proposed mussel seed project.

3. It has been shown that intensive mussel aquaculture can actually result in phytoplankton depletion (Cranford et al., 2008 and Grant et al., 2008). This is another potential outcome to be considered, as phytoplankton in general are important to the ecology of the bay and are essential for the sustainability of all of the wild fisheries in Frenchman Bay. In the table below, DMR landings data for Frenchman Bay show the value of bay resources. There is a million-dollar clam fishery in Frenchman Bay. Clam resources depend on phytoplankton as a food source. There are other valuable yet vulnerable fisheries in Frenchman Bay that feed into the local economy and supporting local families. These could be at risk depending on how the mussel seed operation and concomitant bottom mussel aquaculture operations affect water quality or phytoplankton populations in the bay.

4.The proposed project, if successful in producing the 1000 tons of mussel seed predicted by the lease applicants, will transform the bottom mussel aquaculture leases for which the mussel seed are intended into much more intensive operations than they currently are. The availability of wild seed has been the limiting factor for more intensive culture of mussels on the current lease sites as well as the creation of new lease sites. More intensive culture and potentially expanded culture of bottom mussel aquaculture will lead to more disruption of ocean floor, more sedimentation along shorelines, and may adversely affect already tenuous eelgrass areas around Frenchman Bay.

Although in social media posts, the applicants claim that their vessel, The Stewardship, "brings mussels up from the bottom without ever touching the seabed" (see Hollander and de Koning Social Media Post), I have personally witnessed and both recreational and commercial shellfish harvesters at Hadley Point have reported seeing plumes of sediment when the vessel is dragging the ocean bottom. Sediments can cloud the water, reducing transparency and transmission of light to eelgrass beds. The sediment can coat the plants, further reducing photosynthesis. The sediment layer on plants can promote epiphytic growth, that can further stress plants. More intensive use of these sites will certainly not help prevent eelgrass loss in these locations.

My knowledge of eelgrass growth and loss in upper Frenchman Bay stems from my work with hundreds of citizen scientists and multiple partner organizations to restore eelgrass in upper Frenchman Bay between 2007 and 2017 (Disney et al., 2017 and The Lost Sea Garden Esri StoryMap). Through development of a Voluntary Conservation Agreement with local mussel draggers including the lease applicants, areas have been set aside in upper Frenchman Bay in which harvesters have agreed not to drag. We replanted eelgrass in the Hadley Point, Thomas Island, and Berry Cove areas of upper Frenchman Bay and continue to monitor these areas. Despite the agreement and restoration efforts, eelgrass has continued to suffer setbacks despite initial successes in establishment of plants and their growth and spread. Some of these setbacks may be attributed to a combination of complex factors that include sedimentation issues, warming waters and increases in green crab populations (although these have declined since their peak in 2012-2013 based on our own crab surveys and local reports). Coincidentally, the activity at the Hadley Point bottom mussel aquaculture lease site has been less intensive in the last two years, and eelgrass is beginning to rebound along the shoreline.

2013-2014 Landings for Selected Harbors

Year	Species	Live Pounds	Value
2013	blue mussel	4,288,208	$1,019,604
2013	crab	14,291	$7,134
2013	elver	407	$748,024
2013	lobster	3,758,516	$10,002,440
2013	scallop	81,386	$120,963
2013	seaweed	2,006,714	$50,600
2013	shrimp	27,679	$48,874
2013	soft clam	565,568	$944,764
2013	worms	76,245	$758,267
			$13,700,670
2014	blue mussel	3,420,867	$944,836
2014	crab	12,568	$6,339
2014	elver	336	$280,863
2014	hard clam	187,326	$19,640
2014	lobster	3,742,953	$13,431,912
2014	other species	1,340,261	$45,597
2014	oysters	26,229	$72,777
2014	scallop	58,884	$117,519
2014	soft clam	442,086	$943,251
2014	worms	72,541	$809,211
			$16,671,945

Year	Port Included
2013	Bar Harbor
2013	Gouldsboro
2013	Hancock
2013	Hancock Point
2013	Lamoine
2013	Mount Desert
2013	Sorrento
2013	South Gouldsboro
2013	Trenton
2014	Bar Harbor
2014	Gouldsboro
2014	Hancock
2014	Hancock Point
2014	Lamoine
2014	Mount Desert
2014	Sorrento
2014	South Gouldsboro
2014	Trenton
2014	West Gouldsboro

References:

Bates, Stephen S., Katherine A. Hubbard, Nina Lundholm, Marina Montresor, and Chui Pin Leaw. "Pseudo-Nitzschia, Nitzschia, and Domoic Acid: New Research since 2011." *Harmful Algae*, Domoic acid 30 years on, 79 (November 1, 2018): 3–43. https://doi.org/10.1016/j.hal.2018.06.001.

Carlsson, MS, Engström, P, Lindahl, O, Ljungqvist, L, Petersen, JK, Svanberg, L, Holmer, M. Effects of mussel farms on the benthic nitrogen cycle on the Swedish west coast AQUACULTURE ENVIRONMENT INTERACTIONS Vol. 2: 177–191, 2012 doi: 10.3354/aei00039

Clark, Suzanna, Katherine A. Hubbard, Dennis J. McGillicuddy, David K. Ralston, and Sugandha Shankar. "Investigating Pseudo-Nitzschia Australis Introduction to the Gulf of Maine with Observations and Models." *Continental Shelf Research* 228 (October 1, 2021): 104493. https://doi.org/10.1016/j.csr.2021.104493.

Clark, Suzanna, Katherine A. Hubbard, Donald M. Anderson, Dennis J. McGillicuddy, David K. Ralston, and David W. Townsend. "Pseudo-Nitzschia Bloom Dynamics in the Gulf of Maine: 2012–2016." *Harmful Algae* 88 (September 1, 2019): 101656. https://doi.org/10.1016/j.hal.2019.101656.

Cranford, P. J., B. T. Hargrave, and L. I. Doucette. "Benthic Organic Enrichment from Suspended Mussel (Mytilus Edulis) Culture in Prince Edward Island, Canada." *Aquaculture* 292, no. 3 (July 15, 2009): 189–96. https://doi.org/10.1016/j.aquaculture.2009.04.039.

Cranford, Peter J, William Li, Øivind Strand, and Tore Strohmeier. "Phytoplankton Depletion by Mussel Aquaculture: High Resolution Mapping, Ecosystem Modeling and Potential Indicators of Ecological Carrying Capacity," International Council for the Exploration of the Seas Theme H: Ecological Carrying Capacity in Shellfish Aquaculture n.d., 5. 2008 https://www.ices.dk/sites/pub/CM%20Doccuments/CM-2008/H/H1208.pdf

Disney, Jane E., Emma L. Fox, Anna Farrell, Carrie LeDuc, and Duncan Bailey. "Engagement in Marine Conservation through Citizen Science: A Community-Based Approach to Eelgrass Restoration in Frenchman Bay, Maine, USA." In *Citizen Science for Coastal and Marine Conservation*. Routledge, 2017.

Grant, Jon, Cedric Bacher, Peter J. Cranford, Thomas Guyondet, and Michel Carreau. "A Spatially Explicit Ecosystem Model of Seston Depletion in Dense Mussel Culture." *Journal of Marine Systems* 73, no. 1 (September 1, 2008): 155–68. https://doi.org/10.1016/j.jmarsys.2007.10.007.

Lewis, Jon, and Marcy Nelson. DMR Aquaculture Environmental Section "INVESTIGATION OF BENTHIC CONDITIONS UNDER MUSSEL-RAFT FARMS," 2008 n.d., 20. https://www.maine.gov/dmr/aquaculture/reports/documents/musselrafts.pdf

Mogensen, H.M., 2014. Investigating complex phytoplankton dynamics: Pseudo-nitzschia spp. 2531 diversity and toxicity in the nearshore Gulf of Maine. Honors Project, Department of 2532 Biological Sciences, Smith College, Northampton, Massachusetts. 79 pp.

The Lost Sea Garden Esri StoryMap
https://storymaps.arcgis.com/stories/f6bdc297fd0a450db94d284ea98d08f8

Trainer, Vera L., Stephanie K. Moore, Gustaaf Hallegraeff, Raphael M. Kudela, Alejandro Clement, Jorge I. Mardones, and William P. Cochlan. "Pelagic Harmful Algal Blooms and Climate Change: Lessons from Nature's Experiments with Extremes." *Harmful Algae*, Climate change and harmful algal blooms, 91 (January 1, 2020): 101591. https://doi.org/10.1016/j.hal.2019.03.009.

DATED: 2/2/2022

Jane Disney

Jane Disney, PhD

STATE OF MAINE
COUNTY OF Hancock, ss.

Dated: February 2, 2022

PERSONALLY APPEARED before me the above-named Jane Disney and made oath that the statements contained in this Affidavit are true to the best of his personal knowledge, information, and belief.

Before me,

Notary Public/Attorney-at-Law

AMY RICHARDS

Name Typed or Printed

My Commission Expires: Nov 19, 2026

AMY RICHARDS
Notary Public, State of Maine
My Commission Expires Nov. 19, 2026

Attachment 6

I, Hermann Haller, M.D., President of the MDI Biological Laboratory and an international leader in kidney disease, hypertension, and blood vessel regeneration, having been duly sworn do depose and say as follows:

I am Hermann Haller, M.D., President of the MDI Biological Laboratory. I am speaking this evening in opposition to the proposed 48-acre Leland Point lease application from Acadia Aquafarms.

The noise and vibration produced by the proposed Acadia Aquafarms operation proposes significant risk to ongoing and future federally funded biomedical research underway at the MDI Biological Laboratory. As others will testify in more detail, research organisms are extremely sensitive to noise and vibrations, causing behavioral and hormonal changes that can have a direct impact on sensitive research results. Scientists working at the MDI Biological Laboratory have $20 million in active federally funded research projects that are dependent upon healthy research animals.

MDIBL has been conducting research in Salisbury Cove for 100 years when, at the invitation of George Dorr, a small but intrepid group of biologists relocated from South Harpswell, Maine to our current location in Salisbury Cove. Dorr, in his 1916 dedication speech for Acadia National Park, clearly outlined his vision that Mount Desert Island be not only a place that is enjoyed for its pristine beauty, but also a place where scientists could study and learn from nature. In his words, Dorr sought to “provide down here, in a spot so full of biologic interest and unsolved biologic problems, so rich in various beauty and locked around by the cool northern sea, a home for men of science to work on a fresh field of life, bird or plant or animal.”

The MDI Biological Laboratory has been fulfilling George Dorr’s vision and commitment to preserving the health of Eastern Bay for 100 years.

This deep connection to the natural world continues to define us today. It is who we are. As an international physician scientist who travels all over the world lecturing and collaborating, I can tell you that scientists around the world know MDIBL as a place where solitude and striking beauty stimulate creativity, collaboration, and thoughtful conversation. Where scientists can step away from their day-to-day responsibilities and take advantage of our tranquil environment to think deeply about solutions to complex biological problems.

From its earliest beginnings, our Laboratory has also been a place that is dedicated to training the next generation of scientists, physicians, and entrepreneurs. Each year we welcome more than 600 students to our campus to participate in highly competitive research fellowships, attend international courses, conferences, and workshops, and participate in targeted short-term training programs. These students not only take advantage of the tremendous scientific expertise available on our campus, they also immerse themselves in the pristine natural environment. For many, it is their first time seeing a bald eagle or watching a seal come alongside their kayak as they explore the unique geological features of Eastern Bay.

The Acadia Aquafarms lease puts all of this at risk.

More specifically, it also threatens to jeopardize more than $20 million dollars in ongoing federal research projects and a new initiative to provide our unique comparative research animals to the global pharmaceutical industry as a tool for improving early-stage drug discovery.

While the State of Maine has identified aquaculture as part of its economic strategy, so too has it earmarked biotechnology as a major driver of improving Maine's ability to compete in the global knowledge-based economy. The MDI Biological Laboratory has received $10 million from the Maine Technology Institute to support commercialization of our research. All of that stands to be lost if we cannot reliably and consistently produce the research organisms that are vital to this work.

Designated by the town of Bar Harbor as a Marine Research District, our historic campus contains laboratory buildings constructed in the 1920's and 30's. Those facilities, where much of this work takes place, sit just 30 feet from the high tide mark and less than 2,000 feet from the proposed lease.

While we certainly do not want to limit Maine's economic potential, we do feel strongly that we cannot risk an established entity employing 80 employees, with an operating budget of $12 million annually, training more than 600 Maine students each year and leading a state-wide research and training network that serves as the backbone of Maine's R&D sector and has brought more than $180M in federal grants into our state over the last 20 years.

For these reasons, I respectfully urge Commissioner Keliher and the staff at the Maine Department of Marine Resources to deny the application by Acadia Aquafarms.

Thank you.

DATED: _____ _____

Hermann Haller, MD

STATE OF MAINE Dated: February _____, 2022
COUNTY OF _____, ss.

PERSONALLY APPEARED before me the above-named, Hermann Haller, and made oath that the statements contained in this Affidavit are true to the best of his personal knowledge, information, and belief.

Before me,

_____
Notary Public/Attorney-at-Law

Amy Richards
Name Typed or Printed

My Commission Expires: _____

Attachment 8

I, Karlee Markovich, having been duly sworn, do depose and say as follows:

My name is Karlee Markovich, and I am the Animal Facility Manager at the MDI Biological Laboratory. I am also a marine biologist.

The 48-acre aquaculture lease proposed by Acadia Aquafarms, located less than 2,000 feet from the MDI Biological Laboratory, poses significant risk to our ongoing animal breeding and husbandry programs.

Currently the MDI Biological Laboratory operates one of the largest aquatic breeding facilities for genetically defined research organisms on the east coast. Our lab maintains robust zebrafish, axolotl, and African Turquoise Killifish colonies with more than 25,000 organisms on hand at any given time. These organisms are utilized in federally funded research projects by the 40 scientific research personnel employed at the MDI Biological Laboratory and are essential to our day-to-day operations.

Maintaining the health and viability of these organisms is our top priority. As the Animal Facility Manager, I work with a team of 5 animal care technicians who work seven days a week to provide our scientists with the highest quality research animals available anywhere in the world. We adhere to strict federal animal care and use guidelines to ensure that the health and wellbeing of these animals is our top priority.

The sensitivity of aquatic research animals to noise and vibration is well documented and have a direct impact on normal behavior and fecundity. We take extensive precautions to minimize noise or vibrations in our facilities, including careful planning of any maintenance or construction, advanced notification of our research staff so that any breeding or experimentation can be halted until up to two weeks after the actual event due to lingering effects, and carefully monitor the colonies for signs of stress including swimming erratically, not eating, failure to breed and failure to produce viable offspring.

We use a sophisticated water filtration system to ensure a stable and consistent water supply and parameters for our animals. However, vibrations can cause soil to loosen and minerals and other materials to seep into our water supply and cause significant damage to the health and viability of our animals.

The MDI Biological Laboratory is currently renovating a research laboratory on our lower campus, located 30 feet from the high tide mark, to accommodate growing demand for our research animals. In my opinion and based on my experience, the fish in this facility could be negatively impacted by the noise and vibration generated by the proposed operations at the Leland Point lease site. Noise levels from the 75-foot barge, hydraulic harvesting and power washing equipment and generators will undoubtedly be felt at measurable levels in this facility. Unfortunately, the lack of specific data regarding noise levels from this equipment in the application make it difficult to predict with certainty the extent of the impact on our breeding colonies.

As other testimony and published data will confirm, even modest changes in noise levels can have a serious effect on the behavior and stress levels of research animals. These changes directly impact the results of research studies, jeopardizing millions of dollars in research experiments and significantly impeding the progress of our scientists.

The proposed 48-acre lease will also have a significant impact on marine mammals such as porpoise, harbor, and gray seals and even the occasional whales that frequent Eastern Bay. The impact of vertical lines in the water column on these animals is well documented and are known to cause entanglement and death. Other marine wildlife such as diving birds can also become entangled in these lines. Predatory nets around the perimeter of the lease site would not prevent this.

Abundant availability of a potential new food source will also attract predators that may not currently frequent our Bay. Marine invertebrates will be drawn to the mussels, as well marine mammals. This may result in the disruption of normal feeding and migration patterns.

The scale of this lease will give rise to a new ecosystem within the bay, disrupting and competing with the natural ecosystems in this area. Cleaning of the abundant biofoul on the floating nets will undoubtedly increase nitrogen levels in the bay.

This lease represents a grave threat, not only to native flora and fauna in the bay, but also to the health of the MDI Biological Laboratory's research animals. For these reasons I implore Commissioner Keliher and his staff to deny the Acadia Aquafarms application.

DATED:
02/02/2022

K Markovich
Karlee Markovich

STATE OF MAINE
COUNTY OF Hancock, ss.

Dated: February 2, 2022

PERSONALLY APPEARED before me the above-named Karlee Markovich, and made oath that the statements contained in this Affidavit are true to the best of his personal knowledge, information, and belief.

Before me,

Notary Public/Attorney-at-Law

AMY RICHARDS
Notary Public, State of Maine
My Commission Expires Nov. 19, 2026

Amy Richards
Name Typed or Printed

I, James Strickland, having been duly sworn, do depose and say as follows:

James Strickland
Director or MDI Bioscience
MDI Biological Laboratory
February 1st, 2022

Background on MDI Bioscience
MDI Biological Laboratory is a world-renowned independent research institute investigating critical mechanisms of injury and healing. The significance of MDIBL's research extends well beyond Salisbury Cove. I work for MDIBL as the Director of MDI Bioscience, a new division dedicated to translating the lab's work to the discovery of new medicines. This new endeavor leverages MDIBL's experience with comparative biological models like zebrafish and *C. elegans* to help uncover whether new molecules are potentially effective against human disease, or alternatively, whether the same molecule may have an undesirable side effect.

Potential for Disruption of Scientific Research
MDI Bioscience represents a significant financial commitment for MDIBL. The Halsey building on the MDIBL campus is undergoing a significant renovation to meet the stringent standards of the pharmaceutical industry. These standards are designed to ensure that the risk of experimental errors or inaccurate data are minimized. The Halsey building is located on the shoreline of Hull's Cove with very little distance between the north facing wall of the building and the highwater line. The renovation includes new state of the art facilities for housing zebrafish and small roundworms called *C. elegans*. These species are used in early-phase pharmaceutical discovery studies addressing areas such as renal, cardiovascular, and neurological diseases as well as different kinds of cancers. This work is vital to uncovering the next generation of medicines for improving and saving human lives.

The unfortunate reality of the present proposal is that the precise degree and frequency of noise and vibration associated with aquaculture operations and seed harvesting is unknowable, particularly as it applies to the potential disruption experienced in MDI Bioscience's Halsey facility. However, what is known in science is that persistent and variable sounds and vibrations cause an increase in stress hormones like cortisol and changes the behavior in aquatic species and nematodes. [1,2,3,4] Many of the tests used to assess pharmaceutical compounds evaluate the behavior of the organisms to determine whether there are any desirable or undesirable neurological or developmental effects. [5,6,7,8] As such, excessive noise and vibration would make it very difficult or likely impossible to determine whether an observed behavior change is attributable to background noise and vibration instead of the pharmaceutical compound. This type of interference and ambiguity would render the data unusable, thereby making it impossible to conduct studies for the pharmaceutical industry when behavior is an evaluation criteria.

Pharmaceutical Industry Standards

As previously noted, pharmaceutical companies have high standards for selecting research partners due to the critical nature of early studies in determining which compounds are prioritize for further development. Data from early studies can often be the foundation for investments of >$2b in research and development to achieve FDA approval. [9] For these reasons, pharmaceutical companies have highly selective vendor qualification process to make sure that they reduce the potential of obtaining data that is inaccurate, or worse, misleading. A facility audit is often a critical part of selecting and qualifying new partners. These audits consider the environment around a research facility and whether are any external factors of concern to the proposed research. It is quite possible, if not likely, that the noise associated with mussel seed harvesting would be a source of concern to an auditor, whose job is to identify all relevant risks associated with conducting research with a prospective partner.

Economic Impact

MDI Bioscience has a well-established business model in a high-growth industry with significant economic potential for both MDIBL, Mount Desert Island, and the life science sector in Maine. The total addressable market for preclinical research is estimated to be $4.5b and is expected to grow at a rate of 8.1% per year over the next 6 years. [10]

The relevance and use of non-mammalian research models for drug development is also surging, with the number of publications on the use of zebrafish in pharmaceutical applications growing 4-fold between 2009 and 2019. [7] This growth is also supported by initiatives from FDA and the European Medicines Agency which call for new research models to reduce or replace the use of mammalian animals in pharmaceutical research. For these reasons, annual revenue from MDI Bioscience is expected to exceed $4m by 2030, supporting approximately 30 new high-wage jobs and returning significant financial support back to MDIBL's general operating fund. However, MDI Bioscience's growth would be greatly impeded should noise or vibration from mussel seed aquaculture operations limit the ability to conduct behavioral studies or animal studies general.

Disruption to Other Lab Activities

As already established in this testimony and others, all three components of noise can induce stress on the animal models we use to conduct our research: intensity (loudness), frequency of the sound wave (pitch), and duration or length of time. However, what has not yet been addressed if the impact of noise on the conduct of MDIBL's other vitally important day to day activities.

In addition, MDIBL operates a biomedical life sciences incubator for startup companies that are Maine based or relocating to Maine, whose work depends upon the same laboratory standards that require a consistent, stable environment protected from noise.

MDIBL's visiting scientist program, now in its 101st year, utilizes 3,891 sq. ft. of laboratory buildings located along the shoreline in direct line exposure to the proposed lease site.

MDIBL conducts many of the summer teaching seminars and meetings in the lab's outdoor classroom, on Star Point, or in other outdoor environments on the campus.

Also situated on the shoreline, facing directly toward the proposed lease site, is the Maine Center for Biomedical Innovation (MCBI), established in 2017 with the assistance of a $3 million state bond. This is a 6,560 sq. ft. state-of-the-art R&D facility containing laboratory and classroom space for training Maine's STEM workforce and promoting science and technology entrepreneurs. Anecdotally, Dr. Disney has reported that the sound of cheering from soccer games in Lamoine, across Eastern Bay, is loud enough to drown out human voices inside the MCBI. We know the scientific explanation of sound being amplified by travel over water, but we do not know how the noise from lease activities will impact our operations.

The only reference to noise intensity on the lease application states:

> "According to the manufacturer the noise of the running harvest machine is very mild, less than a 4-stroke outboard engine." (pg. 11 9.c.).

For points of reference, we have noted the following:

Motor Boat & Yachting magazine conducted a comparative test of six popular four-stroke engines up to 5 hp.

SPEED	NOISE RANGE
Idle	66-74 dB(A)
Average	77-85 dB(A)
Maximum	84-89 dB(A)

OSHA has set as a legal workplace limit that dictates workers can be continuously exposed to sounds up to 90 dB(A) during an eight-hour workday. When the sound is increased by 5 db(A), the allowed exposure is cut in half. The 90 number is significant because studies show that extended exposure above that level causes nausea, fatigue, muscle tension, insomnia, an increased heart rate and a spike in blood pressure. It can also hinder concentration.

The Town of Bar Harbor does not quantify a limit for noise, but the Maine State Planning Office, Maine Department of Environmental Protection and others have published a Technical Assistance Bulletin on Noise to guide communities. The following is excerpted from the attached bulletin:

> Intensity, the sound level, is the sound pressure level (SPL): the pressure that sound waves exert as they travel through the air. Intensity is measured in decibels (dB) on a logarithmic scale. This means that a sound of 60 dB is not twenty percent (20%) louder than one of 50 dB, it is ten (10) times (one thousand percent [1,000%]) louder. Fortunately, the human ear does not perceive it as that great of an increase, but following table provides some typical human perceptions of noise increases.

PERCEPTIONS OF NOISE INCREASES	
Increase in Noise Level (dBA)	**Human Perception**
0 to 2	Not usually noticeable
3	Just noticeable
6	Clearly noticeable
10	Twice as loud
20	Four times as loud

> If the noise standard sets a 65 dBA threshold for a rural area, but the background noise in the rural area is currently only forty-five (45), then the ordinance would permit an increase in noise level of 20 dB, perceived as a 4-fold increase. Thus, residents in the area would perceive a very significant increase in noise.

We measured the background sound level at Star Point, across from the proposed lease site, in the 35-40 dB(A) range, so we would expect to experience a greater than fourfold increase in noise level from a four stroke-engine operating just at idle in the 66-74 dB(A) range, and obviously a far greater perception of increase in noise at higher decibel levels.

The Bulletin offers a basic standard:

> This is a relatively simple sound level standard which should be easily administered. It is most suitable for small communities with few planning and code enforcement resources.

Abutting Use	Sound Level Limits dBA	
	7 a.m. – 7 p.m.	7 p.m. – 7 a.m.
Residential	55	45
Commercial	65	55
Industrial	70	60
Institutional	55	45

We are requesting more data before consideration of granting a lease, including quantification of the noise that will be generated and the response to the noise mitigation considerations DMR Chapter 2: Aquaculture Lease Regulations 2.37(9) pg. 18.

Specifically, we would like to have an actual measure of decibel level of the harvest machine when it is operating, an analysis of how that sound may be magnified by travel over water to our campus, the frequency and duration of harvesting and other noise generating operations.

Given the data we sourced, we need assurance that the lease operations will not adversely impact the long-standing education and research activities that have made the lab an internationally recognized scientific institution.

1. Lara RA, Vasconcelos RO. Impact of noise on development, physiological stress and behavioural patterns in larval zebrafish. Sci Rep. 2021 Mar 23;11(1):6615. doi: 10.1038/s41598-021-85296-1. PMID: 33758247; PMCID: PMC7988139.

2. Sugi T, Okumura E, Kiso K, Igarashi R. Nanoscale Mechanical Stimulation Method for Quantifying C. elegans Mechanosensory Behavior and Memory. Anal Sci. 2016;32(11):1159-1164. doi: 10.2116/analsci.32.1159. PMID: 27829619.

3. Best C, Vijayan MM. Cortisol elevation post-hatch affects behavioural performance in zebrafish larvae. Gen Comp Endocrinol. 2018 Feb 1;257:220-226. doi: 10.1016/j.ygcen.2017.07.009. Epub 2017 Jul 13. PMID: 28713045.

4. Nedelec SL, Simpson SD, Morley EL, Nedelec B, Radford AN. 2015 Impacts of regular and random noise on the behaviour, growth and development of larval Atlantic cod (Gadus morhua). Proc. R. Soc. B 282: 20151943. http://dx.doi.org/10.1098/rspb.2015.1943

5. Tao Y, Li Z, Yang Y, Jiao Y, Qu J, Wang Y, Zhang Y. Effects of common environmental endocrine-disrupting chemicals on zebrafish behavior. Water Res. 2022 Jan 1;208:117826. doi: 10.1016/j.watres.2021.117826. Epub 2021 Nov 2. PMID: 34785404.

6. Thawkar BS, Kaur G. Zebrafish as a Promising Tool for Modeling Neurotoxin-Induced Alzheimer's Disease. Neurotox Res. 2021 Jun;39(3):949-965. doi: 10.1007/s12640-021-00343-z. Epub 2021 Mar 9. PMID: 33687726.

7. Liu X, Lin J, Zhang Y, Guo N, Li Q. Sound shock response in larval zebrafish: A convenient and high-throughput assessment of auditory function. Neurotoxicol Teratol. 2018 Mar-Apr;66:1-7. doi: 10.1016/j.ntt.2018.01.003. Epub 2018 Jan 10. PMID: 29330026.

8. Miyawaki I. Application of zebrafish to safety evaluation in drug discovery. J Toxicol Pathol. 2020 Oct;33(4):197-210. doi: 10.1293/tox.2020-0021. Epub 2020 Jul 25. PMID: 33239838; PMCID: PMC7677624.

9. Tufts Center for the Study of Drug Development. http://csdd.tufts.edu/cost-study

10. Grandview Research. Preclinical CRO Market Size, Share & Trends Analysis Report By Service (Toxicology Testing, Bioanalysis & DMPK Studies), By End Use (Biopharmaceutical Companies, Government & Academic Institutes), And Segment

Forecasts, 2021 – 2028. https://www.grandviewresearch.com/industry-analysis/preclinical-cro-market

Other References:

Department of Marine Resources: *Chapter 2: Aquaculture Lease Regulations,* https://www.maine.gov/dmr/laws-regulations/regulations/documents/Chapter2_03132021.pdf

Maine State Planning Office, Maine Department of Environment Protection, et al. "Technical Assistance Bulletin: Noise." *TA Bulletin #4,* (May 2000). https://www.maine.gov/dacf/municipalplanning/docs/noisetabulletin.pdf

Motorboat & Yachting, *"The ultimate 5hp outboard engine group test."* (January 14, 2016). https://www.mby.com/gear/ultimate-5hp-outboard-engine-group-test-50627/7

United States Department of Labor, Occupational Safety and Health Administration, *"Occupational Noise Exposure: Standards."* https://www.osha.gov/noise/standards

DATED: February 2nd, 2022

James Strickland

STATE OF INDIANA
COUNTY OF Marion, ss.

Dated: February 2, 2022

PERSONALLY APPEARED before me the above-named James Strickland and made oath that the statements contained in this Affidavit are true to the best of his personal knowledge, information, and belief.

ARIEL BLACKBURN
Notary Public - Seal
Marion County - State of Indiana
Commission Number NP0737269
My Commission Expires Nov 4, 2029

Before me,

ariel blackburn
Notary Public/Attorney-at-Law

Ariel Blackburn
Name Typed or Printed

My Commission Expires: NOV. 4, 2029