



JANET T. MILLS
GOVERNOR

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION



GERALD D. REID
COMMISSIONER

MEMORANDUM

TO: Board of Environmental Protection
FROM: Staff, Bureau of Land Resources
RE: Nordic Aquafarms, Inc. – Proposed Groundwater & Surface Water Usage
DATE: May 13, 2020

Overview. As part of its land-based salmon aquaculture facility Nordic Aquafarms, Inc. (Nordic) proposes to withdraw freshwater from on-site groundwater wells, surface water from the Little River and public water from Belfast Water District (BWD). The project would also withdraw seawater from an intake pipe embedded in Belfast Bay. Intervenors expressed concern regarding water use at the site and potential effects on their private wells, salt water intrusion, and the stability of the Lower Dam which is adjacent to the site and the proposed location of an intake pipe. The Board heard oral testimony on this topic at its public hearing. The Board also observed the project site at its site visit on October 24, 2019 and February 10, 2020. This memorandum addresses Nordic’s proposed use of ground and surface water use.

Nordic stated the overall baseline consumption need for the proposed project is approximately 1,000 gpm (gallons per minute). Freshwater is necessary to create an optimal saltwater mix for growth of salmon and necessary for potable drinking water, however, the primary intake of water would be seawater. The applicant stated that it designed a water use plan that gives them flexibility should the need to make operational adjustments become necessary and proposed the following water use for the project:

- Groundwater withdrawal, three on-site production wells for a total of 455 gpm
- Surface water withdrawal from Belfast Reservoir One (otherwise known as the lower reservoir), 70 gpm plus in-flows (maximum 250 gpm) (Little River)
- Contract with Belfast Water District to supply 500 gpm of drinking water, process water and other uses pulled from the Goose River aquifer
- Seawater intake 3,925 gpm

Freshwater supplied by BWD would primarily be used for domestic use and fish processing. With additional treatment, water supplied from BWD could be used in the grow tanks, however, it is not the applicant’s preference. Freshwater from the proposed wells and surface water withdrawal would be used in the grow-out tanks, in greater quantities for the younger fish. Generally, as the fish age, they tolerate increased levels of salinity and more salt water is used in the tanks. Seawater would be drawn through two proposed intake pipes located approximately 6,400 feet from shore, elevated ten feet off the seafloor and including a one-inch mesh screen

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
(207) 941-4570 FAX: (207) 941-4584

PORTLAND
312 CANCO ROAD
PORTLAND, MAINE 04103
(207) 822-6300 FAX: (207) 822-6303

PRESQUE ISLE
1235 CENTRAL DRIVE, SKYWAY PARK
PRESQUE ISLE, MAINE 04769
(207) 764-0477 FAX: (207) 760-3143

over the ends of the pipe. Concerning water use, the applicant states that the project has been designed with flexibility to account for decreased fresh process water by increasing saltwater intake rates and increasing the salinity of the process water. Similarly, as discharge from the Little River into Belfast Reservoir Number One (lower reservoir) increases above baseflow, groundwater withdrawals can be slowed and more of the total process water can be supplied by surface water. This flexibility provides the operation leeway to allow for system maintenance (well maintenance or repairs) and hydrologic variability (decreased surface water inflows).

Nordic entered into an agreement with BWD to purchase 720,000 gallons per day or 500 gpm. The agreement requires Nordic to purchase a minimum of 100,000,000 gallons per year or make a payment in lieu of the minimum purchase. This water will be withdrawn from BWD's existing infrastructure in the Goose River aquifer. A 2018 A.E. Hodsdon Engineers report for Belfast Water District (referred to later as the 2018 capacity report) recommends that BWD bring one additional well, the Talbot well, which is in place but not currently operational, on line to meet the demands of the project.

Nordic submitted a site specific Hydrogeologic Investigation Report as Appendix 15-A of the application for the project site, which is located in the Little River aquifer. The report included a test well drilling program based on interpretation of a site-wide electrical resistivity survey, four separate aquifer pumping tests, and the development of a numerical groundwater flow model. The report identified potential sources of contamination in the vicinity of the site, which do not represent any significant threat to on site groundwater quality. It also presents data that can be interpreted as indicating salt water intrusion in the easternmost portion of the project area.

The project includes the construction of a pumping station and an Intake Water Treatment Plant (IWTP), both of which would be constructed during Phase 1. The IWTP has been designed with a total flow capacity of approximately 5,130 gallons per minute (gpm), divided into 3,925 gpm seawater and 1,205 gpm freshwater.

Nordic proposes a monitoring plan to evaluate conditions of local groundwater and surface water resources that may be impacted by the proposed development, groundwater extraction, and surface water withdrawal. ("Water Resources Monitoring Plan" prepared by Ransom Engineering dated April 16, 2019 (WRMP)). Annual reports would be provided to the Department, City of Belfast and Town of Northport. Reports for each year ending Dec 31 would be submitted by March 31 of the following year. NORDIC would also provide the Department, City of Belfast and Town of Northport with quarterly tracking reports that would also include the volume of water withdrawn, water elevations, and additional parameters at monitoring points identified in the Monitoring Plan. For the first three months of groundwater extraction and surface water withdrawal following both initial Phase 1 and Phase 2 operations, Nordic would submit interim monthly reports of pumping rates, precipitation, groundwater and surface water levels. The purpose of the interim report is to assess any adverse impacts on water resources indicated by monthly data and propose operational modifications if appropriate.

During the public hearing, Nordic stated that it has the ability to reduce its overall water demand if necessary.

Statutory and Regulatory Criteria. Key standards related to the proposed water use are:

- NRPA: 38 M.R.S. §§ 480-D(3) and (10)
- Site Law: 38 § 484(3); Ch. 375, §§ 7 and 8
- Ch. 587

Site Law and NRPA require that an applicant develop a project consistent with State environmental standards and the provisions of these laws.

Site Law states that the Department shall approve a proposal when it finds the statutory review standards in 38 M.R.S. § 484 are met. The most pertinent finding required when evaluating the applicant's proposed water use is that:

The developer has made adequate provision for fitting the development harmoniously into the existing natural environment and that the development will not adversely affect existing uses, scenic character, air quality, water quality or other natural resources in the municipality or in neighboring municipalities.

...

F. In making a determination under this subsection regarding a structure to facilitate withdrawal of groundwater, the department shall consider the effects of the proposed withdrawal on waters of the State, as defined by section 361-A, subsection 7; water-related natural resources; and existing uses, including, but not limited to, public or private wells, within the anticipated zone of contribution to the withdrawal. In making findings under this paragraph, the department shall consider both the direct effects of the proposed water withdrawal and its effects in combination with existing water withdrawals.

38 M.R.S. § 484(3).

NRPA establishes that the Department shall grant a permit when it finds that the applicant has demonstrated the proposed activity meets the standards set forth in 38 M.R.S. § 480-D. This section contains the following standards that are particularly pertinent to review of the water use proposed by the applicant:

The activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life. 38 M.R.S. § 480-D(3).

If the proposed activity includes a significant groundwater well, the applicant must demonstrate that the activity will not have an undue unreasonable effect on waters of the State, as defined in section 361-A, subsection 7, water-related natural resources and existing uses, including, but not limited to, public or private wells within the anticipated zone of contribution to the withdrawal. In making findings under this subsection, the department shall consider both the direct

effects of the proposed withdrawal and its effects in combination with existing water withdrawals 38 M.R.S. § 480-D(10).

The Department's rules, in Chapter 375, §§ 7 and 8 elaborate on how a developer should address the Site Law criteria by the adequate provision for the protection of ground water quality and protection of groundwater quantity. The Department's rules, in Chapter 587, establish river and stream flows to protect natural aquatic life and other designated uses in Maine waters.

Issues Raised by Intervenors.

- Upstream Watch:
 - Saltwater intrusion
 - What's the contingency plan?
 - Upper dam is in poor condition and if fails it could affect the integrity of Lower Dam
- The Fish are Okay:
 - G. Flimlin, retired aquaculture teacher from Rutgers, closest abutter has reviewed project and sees no cause for alarm. Dirk Faegre testified that he is satisfied with Nordic's proposal to monitor his well and commitment to resolve unanticipated problems at the well in the future.
 - 2018 A.E. Hodsdon Engineers report for Belfast Water District (BWD) indicates adequate water supply for BWD to serve Nordic and its existing customers
- Northport Village Corporation:
 - Lower Dam is in poor condition with no plans for maintenance
 - Surface Water is contaminated (turbidity) and requires treatment (pre-filed testimony of B. Bryden)
 - Groundwater depends on recharge from precipitation that would be intercepted and rerouted by perimeter drains and stormwater management system.
 - Nordic has already experienced salt water intrusion into one of its wells and testified that existing wells would experience a drop of 10-14 feet in water level
- Lawrence Reichard
 - Nordic's other facilities are 1/5th the size of proposed facility, states that they don't know how much water they would use and that the company is not capable of running a facility of this size.
 - Climate Change would bring uncertainty
- Eleanor Daniels & Donna Broderick
 - Abutters concerned with water use (July 3, 2019 pre-filed testimony)

Discussion

Department staff reviewed the proposed project, including information received from the public, intervenors, and during the public hearing, in consideration of the above referenced statutes and rules.

Dr. John Hopeck, Division of Environmental Assessment, wrote two memos (September 17, 2019 and January 14, 2020 revised January 27, 2020):

- Dr. Hopeck provided a number of technical comments regarding the proposed monitoring plan. During construction, he recommended the applicant collect background data regarding groundwater level and quality and measurement of those data no less often than monthly for deep unpumped wells, although more frequent measurement would be appropriate for shallow overburdened wells and water supply wells; drinking water wells and shallow groundwater wells are likely to show more rapid fluctuations in water levels and should be monitored more frequently; surface water levels may vary rapidly and should be monitored in near-real time. Shorter reporting intervals between collection of groundwater level data would be necessary during the period ramping up to full production and for some time after, depending on the amount and rate of groundwater withdrawal. Dr. Hopeck indicates that it may be appropriate to reduce data collection and reporting frequency at some or all monitoring points if groundwater usage by the project stabilizes at some level less than anticipated full production volume, provided that the Department determines that data collected to that point show no unreasonable impact or threats of impact on groundwater or surface water quality and quantity. Any production increases beyond this lower rate would then require approval by the Department and would trigger the return to the original monitoring plan.
- The applicant agreed to install new overburden monitoring wells as pairs of shallow and deep wells with shallow wells screened in the silty overburden and deeper wells extending to and below the overburden/weathered rock transition. The applicant also proposes to install shallow and deep piezometers in the vicinity of wetland W7. Dr. Hopeck noted these should be installed as close to possible to a wetland monitoring tract. The location of these piezometers and wetland tract location should be shown in the revised monitoring plan to be submitted for review and approval. Pressure transducers and automated data loggers should be used unless an acceptable alternative is demonstrated. Water levels in shallow piezometers could be expected to fluctuate relatively rapidly, so that monthly monitoring would not be sufficient to assess the range of normal conditions during the background monitoring phase, although quarterly data reporting should be acceptable during the background data collection phase. Automated data collection would allow frequent measurements sufficient to assess conditions before and during operation of the pumping well. If the rate of variation in the wetland piezometers is shown to be relatively slow during operation of the facility, the applicant may apply to reduce the measurement frequency.
- The relevant section of the Little River channel presents certain problems for collection of accurate flow data at some times of year and under certain flow conditions. However, instrumentation can be installed to obtain real-time and continuous data during most of the year at a measured cross section, particularly since the bedrock channel minimizes the risk of major changes in channel cross-section, and an appropriate location for such measurement should be defined as part of the background monitoring plan. Monthly or even weekly stage measurements are not adequate to accurately assess pumping impacts on surface water systems, which are subject to rapid changes due to precipitation and other factors, or to capture the possible range of flow conditions, although monthly download frequency may be acceptable during non-pumping periods, provided that data

storage is sufficient to allow automated data collection at a frequency acceptable to the Department.

- The applicant has agreed to record intake data daily “on a source-specific basis.” Such usage prior to operational-level usage can be reported to the Department monthly, but more frequent reporting and possibly a more detailed breakdown to identify peak usage times could be required at some point if the Department finds such information useful in interpreting streamflow, stage, or groundwater elevation data.
- Dr. Hopeck recommends that the applicant utilize an on-site weather station or a weather station controlled by the applicant, within the Little River watershed and near the areas potentially impacted by the development.
- The applicant agreed with Department that it is necessary to establish warning levels that are “indicative of conditions trending toward a potential adverse impact, as opposed to being confirmation of occurrence,” and that these levels must be defined by analysis of the baseline data and approved by the Department.
- BWD draws its water from the Goose River sand and gravel aquifer and, according to the applicant, BWD monitors water quantity and quality of the Goose River aquifer. The applicant stated that this information would be provided to the Department along with additional information regarding flows and flow measurement locations. However, this information has not been submitted to the Department to date. Dr. Hopeck requests this information, along with a determination of minimum flows required in the Goose River to maintain flows consistent with Department requirements, prior to the start of construction. The information is required to define the operational standard for review and approval sufficiently far in advance of the operational phase for adequate background data to be obtained and for effective performance standards and warning and action levels to be determined. A monitoring plan similar to the one required for the Little River and its associated aquifer should be required for the Goose River and its associated aquifer. The monitoring plan should include equipment setup at a measured cross section of the river where reliable data can be collected to relate water depth to flow; a data logger recording water depth at frequent intervals and some other system to function during ice and very high flow conditions, unless the Department determines that data collection during predictable spring high flows is not required; piezometers to record water levels in the aquifer near the river and pumping well(s); and daily usage data from the pumping well(s). Dr. Hopeck recommends including a Special Condition to resolve this matter.
- Dr. Hopeck further recommends implementation of a monitoring plan to assess project impacts on existing groundwater and surface waters. Possible impacts include salt water intrusion and lower water levels in wells, and reduced groundwater discharge to wetlands and surface waters, including induced recharge from the Little River and Goose River. Impacts of groundwater withdrawal on streams and wetlands near the project site are expected to relate largely to the extent to which they receive groundwater discharge from the weathered bedrock or deeper fractured bedrock aquifer, and the extent to which the overlying marine sediments isolate these resources from groundwater in the bedrock.

Although some elements of a monitoring plan have been agreed on, a final monitoring plan has not been submitted for review and approval. The applicant has agreed with the Department that it is necessary to establish, as part of the monitoring plan, warning levels that are “indicative of conditions trending toward a potential adverse impact, as opposed to being confirmation of occurrence,” and that these levels must be defined by analysis of the baseline data and approved by the Department. The monitoring plan must be finalized as soon as possible so that sufficient background data can be collected to characterize pre-operation conditions and to allow for determination of warning and action levels at each monitoring location; any changes to this plan, once approved, will require Department approval prior to implementation. Dr. Hopeck recommends a Special Condition requiring review and approval of this plan prior to construction.

Rob Mohlar, an engineer in the Division of Environmental Assessment, reviewed the application and determined that the proposed surface water usage from the lower reservoir of the Little River was developed to comply with Chapter 587. (R. Mohlar email to B. Callahan July 30, 2019)

Based on current BWD operations, the Department expects that the public water supply system within the Goose River aquifer is being operated in compliance with Chapter 587, however, no information has been provided to date. The issue is relevant to this project because Nordic proposes to utilize water from BWD in its operations, enough water to require an additional ground water well to be put into service as recommended by the 2018 capacity analysis conducted by A.E. Hodsdon Engineers. Nordic’s use will increase the amount of water withdrawn from the Goose River aquifer which may impact surface or groundwater in the Goose River aquifer. The extent of the potential impact is unclear. The 2018 capacity analysis submitted by the applicant explicitly states that this increased use will result in induced recharge from the Goose River to the aquifer, and consequently lower flows in the Goose River. Additional information prior to operation by Nordic is required to evaluate the potential impacts.

In order to ensure the Standards of both the Site Law and the NRPA are met, the Board may elect to consider requiring as a condition the submission of monitoring plans for both the Little River and Goose River, along with the associated aquifers, as recommended by Dr. Hopeck. The Board could require that monitoring plans must be reviewed and approved by the Department prior to implementation. The Board also could require collection of background data during project construction to the extent practicable. Submission of regular monitoring reports also could be required as recommended by Dr. Hopeck. Any future changes to the monitoring plan would then have to be reviewed and approved by the Department.

Possible conditions are included at the end of this memo to assist the Board in its review of the project and with its deliberations.

There are no regulations that govern the amount of seawater that can be withdrawn other than §480-D(3), which considers the potential to unreasonably harm estuarine or marine fisheries or other aquatic life. Staff’s review indicates because of the volume of seawater, the location and configuration of the intake pipes, the proposed seawater withdrawal would not unreasonably harm estuarine or marine fisheries, or other aquatic life.

Post-hearing Briefs. In a letter dated February 25, 2020, Kristin Racine, on behalf of Northport Village and Upstream Watch, argues that the Board should require a revised monitoring plan prior to issuance of any license.

Nordic responded in its post-hearing brief, that it proposes to submit an addendum to its WRMP that will propose alert and action levels in appropriate locations (private water supply wells, key surface water and groundwater points, etc.) and consider the baseline data collected, groundwater model predictions and appropriate thresholds. It will also include remedial actions Nordic can undertake in the event that adverse impact is observed to be imminent or occurring. Nordic continues to state that the implementation of its proposed WRMP will ensure that the significant groundwater well network would avoid unreasonable adverse impacts.

Nordic also stated that the surface water withdrawal from the Little River would primarily operate as run-of-river withdrawal, except that in the absence of inflow to the lower reservoir, a withdrawal of 70 gpm is allowed. It argues that because the Little River does not continue below the lower dam, up to 100% of the inflows into the lower reservoir could be withdrawn and the project would still meet Chapter 587. The estimated 250 gpm surface water withdrawal is based on 5% of the duration flow (a 5% chance that stream flows will be 250 gpm or less in any given year). Based on the estimated mean annual flow of the Little River, most of the year, the inflow to the lower reservoir will exceed the total freshwater demand for the project at full build-out.

Potential Conditions

Should the Board find all the review standards have been met and issue a permit for the project, possible conditions the Board may wish to consider include:

1. Prior to the start of construction, the applicant shall submit for review and approval a specific monitoring program for the Little River aquifer identifying the instrumentation to be installed at specific locations by specific dates, and the proposed monitoring parameters and frequencies at each location. The monitoring plan shall include all the monitoring components the applicant has agreed to include to date, as well as information detailing the location and depths of the proposed overburden monitoring wells; the installation of shallow and deep piezometers in the vicinity of wetland W7; a monitoring tract must be established in wetland W7; information regarding instrumentation to be installed in the relevant section of the Little River to obtain real-time and continuous flow data, during most of the year; a plan to utilize an on-site weather station or a weather station controlled by the applicant, within the Little River watershed and near the areas potentially impacted by the development, and weather station data shall be included in monitoring reports. The monitoring program shall propose warning levels that are indicative of conditions trending toward a potential adverse impact and that these levels must be defined by analysis of the baseline data as well as remedial actions. Any future changes to the monitoring plans must be pre-approved by the Department prior to implementation.
2. During construction, the applicant shall collect background data regarding groundwater level and quality, and report those results to the Department no less

often than monthly; drinking water wells and shallow groundwater wells are likely to show more rapid fluctuations in water levels and should be monitored more frequently; surface water levels may vary rapidly and should be monitored in near-real time. Details of the background data collection monitoring and reporting shall be proposed in the monitoring plan to be submitted by the applicant and approved by the Department prior to the start of construction.

3. Prior to project construction, the applicant shall submit information establishing background data regarding water quantity and quality of the Goose River and its associated sand and gravel aquifer including information regarding river flows and flow measurement locations. Monitoring requirements for the Goose River and the associated aquifer are similar to those required for the Little River and its associated aquifer. The monitoring plan shall include equipment setup at a measured cross section of the river where reliable data can be collected to relate water depth to flow; a data logger recording water depth at frequent intervals and some other system to function during ice and very high flow conditions, unless the Department determines that data collection during predictable spring high flows is not required; piezometers to record water levels in the aquifer near the river and pumping well(s); and daily usage data from the pumping well(s).