Existing Conditions and Facility Evaluations - Milford

POWDER MILL FISH HATCHERY FEASIBILITY STUDY

New Hampshire Fish and Game Department

May 25, 2023

Contents

Tables

Figures

This page is intentionally left blank.

1 Introduction

Milford at a Glance

- Constructed in 1972
- Well source water
- Receives eggs from USFWS
- Produces approximately 158,000 fish (68,000 lbs) of fish annually

Milford State Fish Hatchery is located in the Town of Milford on the northwest edge of Hillsborough County, New Hampshire on North River Road. The hatchery was originally constructed in 1972. Situated on approximately 183 acres (~ 8 to 10 developed acres) of state-owned land, the facility consists of sixty (60) 25-foot diameter circular pools, a hatchery building, support buildings, and production water supply wells. The station currently produces Brown Trout, Brook Trout and Rainbow Trout. Past species produced by the Milford facility include tiger trout, steelhead trout, Lake Trout, splake, Coho Salmon and Chinook Salmon. The facility receives about one million Rainbow Trout eggs from August through December from White Sulphur Springs, West Virginia. Eggs have low survival rate (10-70%) due to being taken from 2 year old fish. As a result, they also receive additional Rainbow Trout eggs from J. Perry Egan Fish Hatchery in Bicknell, Utah. The facility receives Brook Trout and Fingerlings at 150 fish per pound and Brown Trout from New Hampton in March.

The Milford facility is authorized to discharge effluent through Outfall Number 001 into Purgatory Brook. An automatic sampler was recently added. There is no flowmeter at the effluent location.

The existing Site Plan (Figure 1-1) illustrate the hatchery boundary, approximate topographical information, and general hatchery infrastructure. The study drawings were developed using digitized (i.e., traced) Computer Aided Drafting (CAD) techniques and map overlay technology. The drawings are believed to be reasonable, to-scale representations of hatchery resources for planning purposes and were updated in 2022.

Water is supplied to the hatchery via production wells, which are located to the southwest of the hatchery. There are five wells of various ages at the facility, of which two remain in use. A 24-inch diameter River Well provides up to 1,200 gpm and 24-inch diameter Field Well provides approximately 600 gpm. Water from the two wells passes through Degassing Towers, which were built in the early 1990s. From the towers, aerated and degassed water flows by gravity to the Hatchery Building and outdoor round rearing tanks. The well water is approximately 60°F and high in total dissolved gases. There are no well water flow meters. Figure 1-2 shows a water flow diagram of the facility.

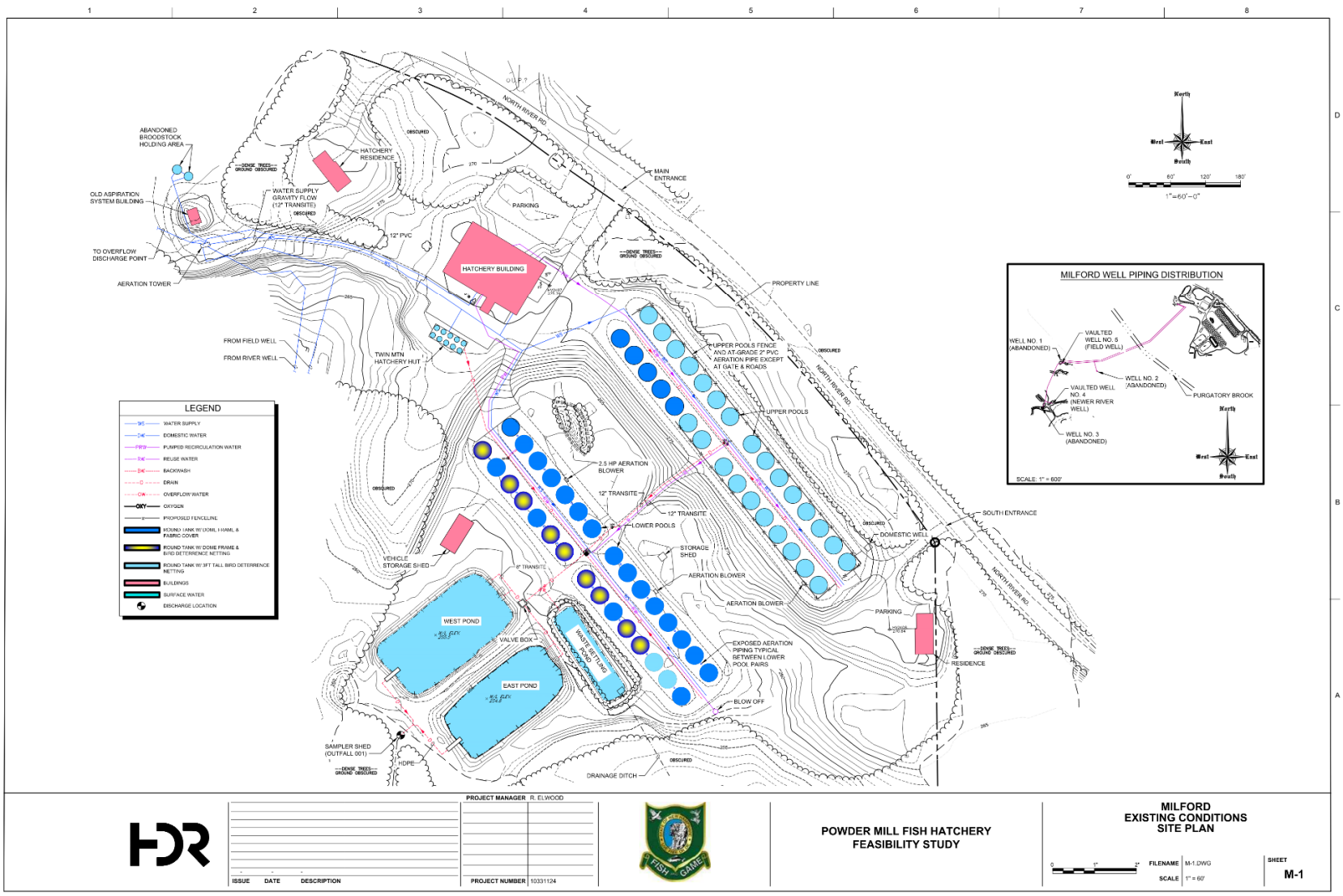

Figure 1-1: Existing Milford Site Plan

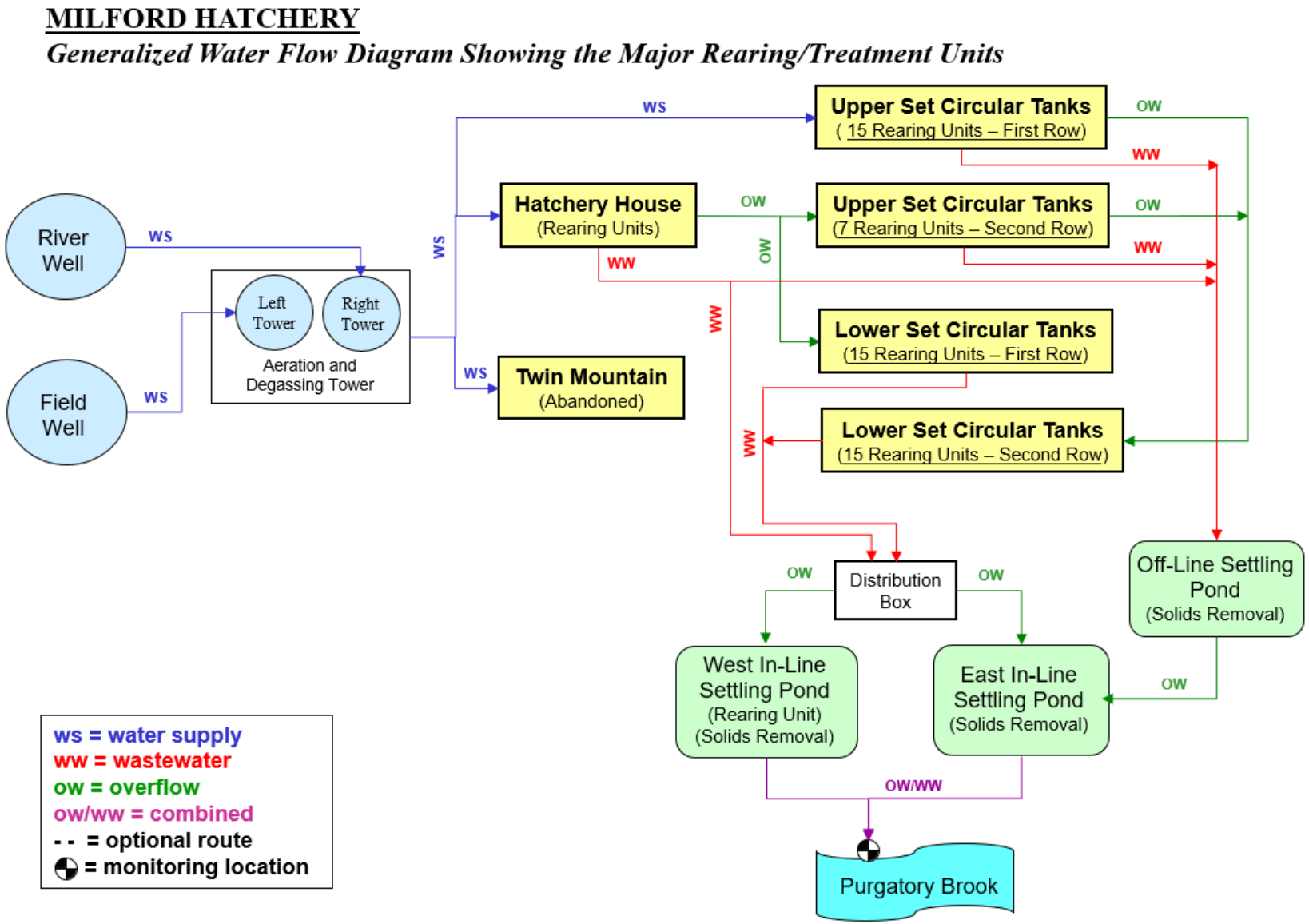

Figure 1-2: Milford Process Flow Diagram

NPDES has authorized Milford State Fish Hatchery to discharge its hatchery effluent through Outfall Number 001 to Purgatory Brook shown in Figure 1-2. Sampling and reporting requirements are summarized in Table 1-1. In 2021 the Region 1 Final Aquaculture General Permit (AQUAGP) was released (NHG130000), which superseded Milford's individual permit issued in 2011 (NH0110001).

Table 1-1: Milford Effluent Discharges Based on NPDES Permit

Outfall Number	Receiving Water Body	Raceway's Served	Monitoring Required
001	Purgatory Brook	All	Composite and Grab Sampling

A condition assessment field visit was performed by HDR on May 2, 2022. The team of engineers included process, mechanical, structural, electrical, and architectural disciplines. The goal of the condition assessment was to understand the remaining useful life of the existing facilities, understand deficiencies inherent in the existing design, and develop an understanding of whether existing facilities that are in poor condition can be rehabilitated or require complete replacement. The condition of the hatchery is reviewed in the following sections as witnessed on-site as well as through discussions with hatchery staff.

2 Best Management Practices

A set of three ponds at the end of the facility were originally intended as settling ponds for effluent pollution control. These ponds are located below and southwest of the lower circular units. However, over time modifications were made so that one of the ponds could be used for growout purposes. These three ponds are called the Waste Settling Pond, the West Pond, and the East Pond. The West Pond is currently being used as a production pond.

The other two ponds are used for settling of different waste streams. Overflow from production facilities is diverted only through the West Pond under normal conditions. When they are being cleaned, weir boards are rearranged in a splitter box to send the water to the East Pond. This keeps the West Pond, being used for production, cleaner. Effluent from the East and West Ponds join and flow to a southwest-running ditch to the river.

It should be noted that there have been no operational changes since issuance of the current NPDES permit and these ponds were identified as effluent treatment components (not in fish production use). Effluent from the ponds has always met the current NPDES Permit Standards.

Occasionally a contractor is hired to clean out the settling pond with a backhoe. The East Pond has not been cleaned for several years. The West Pond was cleaned in 2011.

Figure 2-1 West Pond (production) Looking from its Outlet

3 General Site Conditions

The site is broken into two sections with nearly all the facilities at the east end including the Hatch House, storage buildings, circular tanks, and ponds. This portion of the site is served by a paved entrance off N. River Road. The well water sources are all located approximately one-half mile west of the site on the other side of Purgatory Brook.

3.1 Predator Control System

Protective domes consisting of metal structure frames and reinforced PVC covers are used to deter bird and mammalian predation and provide shade control of the circular units. Problems with snow load failure and breakdown of the covers due to exposure to the sun and wind have resulted in significant damage to many and only a few of them appeared to provide complete protection at the time of the site visit. At the lower pools, the covers remain on approximately half of the circular tanks, but the remaining covers were in various stages of poor condition. Where covers have completely come off, netting to approximately three feet high has been applied to the dome frames to provide protection against ground predators, but these nets appear to provide no protection from predatory birds. NHFGD staff have noted that all pools holding fish are entirely netted over most of the year. These nets are removed seasonally from November through March due to risk of snow structural damage and accidental gilling of fish. Lower pools predatory controls are shown in Figure 3-1. Note many of the structures shown in Figure 3-1 and Figure 3-2 show pools that did not contain fish, once fish are added to the pools staff install predatory controls as appropriate and described in this section.

Figure 3-1: Lower Pools Predatory Controls

At the upper circular tank area, all but five of the covers have been completely removed, and the covers that remain are in poor condition. The tanks without covers are utilizing netting in the same manner as done in the lower pools. There is an outer chain-link fence around the upper tanks, but this fence does not fully enclose the tanks, so it offers no protection. Upper pools predatory controls are shown in Figure 3-2.

Figure 3-2: Upper Pools Predatory Protection

There is no predatory protection at the lower ponds. The magnitude of fish losses due to predation is not known but is estimated by hatchery staff to be significant. Staff have counted in excess of 50 birds of prey at one time at the West Pond. Herons are the principal predator followed by osprey, mink and otter. The facility currently has a federal depredation permit to take up to eleven blue heron, six hooded mergansers, four mallard ducks, three kingfishers, two common mergansers, and two herring gulls as well as a trapper for mink and otter.

3.2 Roads and Parking

The main entrance road to the hatchery is paved with a mixture of asphalt and rock and is in fair condition. Two parking lots exist at the hatchery near the hatchery building and the residence. The roads between the circular tanks are grass/dirt and are in fair condition.

3.3 Fencing and Security

The hatchery does not presently have complete perimeter security fencing, however there is a perimeter fence along River Road (shown in Figure 3-3), with a security gate at the main entrance from River Road. Additionally, each of the entrances leading to the well houses has a security gate. Staff noted that several breaches of the fencing have been made, where holes in the fence were cut.

Figure 3-3: Perimeter Fencing Along River Road

3.4 Site Drainage and Flooding

According to the hatchery staff, historically there was periodic flooding near the water production wells, which are located in the floodplain to the southwest of the hatchery. The Flood Insurance Rate Map (FIRM) from the National Flood Insurance Program (Map Number 33011C0452D, effective September 25, 2009) shows large portions of the area surrounding Purgatory Brook in Zone AE (1-percent-annual-chance of flooding) and Zone X (0.2-percent-annual-chance of flooding) but none of the facilities at the main site appear affected.

3.5 Domestic Water/Wastewater Systems

Domestic water for the hatchery building and residence is supplied by an artesian well. One well exists for the purpose of supplying drinking water for both residences and the hatchery building. Hatchery staff noted that problems with water pressure in the hatchery were fixed with a plumbing update in 2019. Water is pumped with a 5 horsepower pump. The hatchery and residences wastewater is treated through separate conventional septic systems. The residences septic tank is pumped every three years. Staff have not been able to locate the hatchery building septic system and indicated it smells at times.

3.6 Electrical

Electricity is provided to Milford Fish Hatchery by the utility company Eversource. Power is tapped from the overhead distribution line that runs along North River Road. Outages occur frequently

throughout the year as noted by hatchery personnel. Equipment failure alarms due to wind/ice storms are also frequent.

Electricity is provided to hatchery facilities at three service points. The Hatchery Building has a 208/120V, 3-phase service. The domestic well pump has a 240V, 1-phase service. The two production wells are each powered from a 480V, 3-phase service. The residence also has an independent utility service.

Backup power is provided to the Field Well and the River Well by separate backup propane generators. The generators power the well pumps and associated controls. An old propane generator was abandoned in place at the Hatchery Building and is no longer connected/operational. According to hatchery personnel, there are no critical loads in the hatchery building that would require backup power. It is recommended that the need for backup power be evaluated further after required modernization improvements have been determined.

Distribution to the raceways/ponds is via overhead lines. Hatchery staff regularly clears tree/vegetation around the lines to minimize outages, and do not have a concern with the reliability of the lines.

There is no site lighting at the covered raceways or ponds, but there is in the vicinity of the parking area. Expanded site lighting is desired by hatchery staff to improve site security and anti-predation, as well as facilitate operational safety.

An alarm system is used to monitor water levels at the aeration/degassing headbox. The alarm consists of an audible siren and auto-dialer. There is no remote monitoring/control of the well houses. The hatchery building has several alarm systems that have been abandoned in place and are no longer operational. There is a weather station on site for monitoring meteorological conditions that are communicated via Wi-Fi, but this equipment belongs to staff and not the state.

3.7 Other Utilities

The facility has telephone/internet service to the hatchery building.

One 4,000-gallon capacity underground storage tank (UST) is used to store #2 fuel oil. The fuel oil is utilized for building heat at the hatchery and requires a permit to operate by staff trained through New Hampshire Department of Environmental Services (DES). Propane is utilized for hot water. The USTs utilize leak detection as a pollution prevention system as mandated by DES.

3.8 Public Visitation Information & Education Services

This facility has a visitor center that consists of a general meeting area, an education and display room (Figure 3-4), public restrooms, and viewing area into the hatchery (Figure 3-5). The lower parking lot is designated for visitor parking and appears to be adequately signed to inform visitors where to park. There is a large welcome / information sign at the corner of the visitor parking area. At the lower pools, one of the circular tanks is set up as a show pond for visitors. These visitor facilities appear to be in fairly good condition, although many of them are not fully accessible.

Figure 3-4: Education & Display Room

Figure 3-5: Viewing Area

The visitor's parking lot does not have any designated accessible parking spaces, and there are no accessible routes from the visitor parking into the Hatch House where the public spaces are located, as the parking lot is lower than the building, there is only a set of stairs up from the parking lot, but no ramps. Both the main entrance and employee entrance have a step up to get into the building. The concrete stairs between the visitor parking lot and the building appear to be in fair to good condition, but these stairs to not have any handrails, and the transition between the top landing and the asphalt paved walkway is deteriorated and a tripping hazard Figure 3-6. At the main entrance from the visitor's parking, moss was observed to be growing on the walking surfaces along with some minor concrete cracking and spalling, see Figure 3-7. It is recommended to provide ADA compliant access should the building continue to be in service.

Figure 3-6: Stairs from Visitor Parking

Figure 3-7: Main Public Entrance

Although both the men's and women's bathrooms are adequately sized, neither is ADA compliant. The men's bathroom is set up as a single occupant bathroom, with a lock on the door, toilet, urinal, sink and mirror. The toilet is missing a grab bar along the back of it to be ADA compliant, while the urinal, sink and mirror are not compliant in either height or style. The women's room is set up with 2

stalls and a sink and mirror. Neither of the stalls are accessible stalls, and the sink and mirror are non-compliant. Evidence of black mold on the stalls in the women's bathroom was observed, and staff noted this is a recurring issue. It is recommended to provide ADA compliant access to the restrooms and remediation for black mold be conducted should the building continue to be in service.

4 Water Supply and Control Structures

Limited information about the aquaculture water supply collection and distribution piping system is available from NHFGD. Distribution piping to the facility is reported as 8” or 12” diameter PVC from the River Well and as 10” diameter asbestos-cement (transite) (2,500’) from the Field Well. River Well piping generally runs parallel to the Field Well except is approximately 950’ farther, see inset map on Figure 1-1. The piping for the River Well includes a 10” x 8” tapping gate, which cross connects to the line from the Field Well. The line from the Field Well crosses Purgatory Brook with iron pipe and is connected to the aeration/degassing head box. The supply system is fully drainable but has never been cleaned out since there are always fish on station. Water mains have no history of freezing, however smaller mineral deposits in the 2-inch pipes have caused them to freeze. During freezing weather water supplies to circular pools without fish are turned down to a trickle to prevent freezing.

4.1 Field Well

As its names implies, the Field Well is in an agricultural field. The area immediately around the well and well house is filled slightly above the field. The well is in a gravel pack and its head is in a concrete vault protruding above grade, see Figure 4-1. Field well water temperature ranges from 49 to 57 deg F.

Figure 4-1: Vaulted Field Well

The Field Well (Well No. 5) was replaced in 2020 approximately 30-ft away. Well No. 1’s abandoned line-shaft turbine pump and abandoned backup indoor engine drive is in a well house (shown in Figure 4-2) where Field Well controls now reside. Well No. 1 was required to be replaced due to high iron levels and declining output.

The Field Well pump is a submersible turbine pump. The vaulted discharge piping has a pressure gage, non-slam wafer check valve and butterfly valve, shown in Figure 4-3. Initial capacity was roughly 600 gpm; but has declined to 400 to 550 gpm also due to high levels of iron. It was chemically cleaned in summer of 2022, initially increasing capacity approximately 300 gpm, although its water level dropped from 30 to 40 ft down in three months. It is suspected the increase is not sustainable long term. It is recommended that new well locations or new source water supplies be explored to replace this well.

Electricity to the Field Well pump house is provided by a dedicated utility overhead distribution line that cuts through the adjacent farm field. Power is provided at 480V, 3-phase from a pole-mount 112.5 kVA transformer. The well house has a 400A main disconnect that powers the 30 hp variable frequency drive (VFD) and associated pump controls, as well as ancillary lighting/receptacles. Backup power is provided by a 45kVA propane generator and automatic transfer switch with a 1,000-gallon tank. There have been no issues with the VFD and there is no VFD bypass.

The electrical equipment appears to be in adequate operating condition, though beginning to show degradation due to general age and wear/tear. The generator is exhibiting advanced corrosion on the exterior surface and should be evaluated for replacement in the near future. The well house has several old/abandoned electrical systems that should be removed to improve safety and to clarify the electrical topology. There do not appear to be any instrumentation/controls beyond the VFD.

Figure 4-2: Old Well (No. 1) Building

Figure 4-3: Field Well (No. 5) Inside Concrete Vault (in use)

4.2 River Well

As its names implies, the River Well is near the Souhegan River in a wooded area. The well head is in a concrete vault protruding above grade. The well pump is a submersible turbine. Well pump controls are in a newer wooden well house on posts, see Figure 4-4. The well was built in 1986 and chemical cleaned using high pressure and a Muriatic Acid flush and NuWell 310 Bio-Acid Enhancer in 2014. The River Well was slated to be cleaned again in 2022 but because of the unforeseen issues with the Field Well that did not occur before fish needed to come on station. The River Well will be chemical cleaned in early spring of 2023. The River Well has high levels of manganese, which is discussed further along with the aeration/degas towers in Section 4.3. Its temperature ranges from 46 to 63.5 deg. F.

Electricity to the River Well pump house is provided by a dedicated utility overhead distribution line that runs down the access road. Power is provided at 480V, 3-phase from the pole-mount 45 kVA transformer.

The well house has a 100A main disconnect that powers the 50 hp pump motor VFD and associated pump controls, as well as ancillary lighting/receptacles. The VFD appears to have fully automatic control functionality with local monitoring/alarms. There does not appear to be any remote

communications capability. The VFD has a bypass full voltage motor starter in case the VFD fails. The VFD used to fault and require frequent resetting. It became so frequent that a part was added or replaced and the issue seems resolved.

Backup power is provided by a 100kW propane generator and automatic transfer switch with a 1,000-gallon tank. The generator and propane tank are located approximately 100 feet away across the access road at the location of the Old River Well House, see Figure 4-5. The automatic transfer switch is located in the New River Well House.

All electrical equipment in the River Well House appears to be relatively new and in good condition. The generator is exhibiting advanced corrosion on the exterior surface and should be evaluated for replacement soon. A small wall mounted exhaust fan and louver in the river well structure provides ventilation. The fan appears to be in good condition.

Figure 4-4: Newer River Well (No. 4) Structure

Figure 4-5: Old River Well (No. 3) Structure

4.3 Aeration/Degassing Headbox

An aeration/degassing headbox is located west of the Hatch House. It treats incoming water from the Field Well and River Well. Access to the top is via a new wooden stair tower that was incomplete at the time of the visit but finished by hatchery staff by the time this report was written. The stair tower was missing safety handrails on its upper section at the time of the site visit, as shown in Figure 4-6, but they have since been added along with solar lighting. Additional lighting in this area is still needed.

The aeration/degassing headbox replaced an aspiration system on a hill 30 feet to its north. The old aspiration system is no longer in use and has been abandoned in place inside the building it was housed within. The old aspirator building structure appears to still be fair condition, but it is recommended that the equipment and building be removed as part of any renovations, see Figure 4-7.

Figure 4-6: Broodstock Holding Tank (not in use) near Aeration-Degassing Headbox

Figure 4-7: Older Aspiration System Building (no longer in use)

For aeration and degassing, water from the two wells is piped independently to a pair of towers acting as packed columns atop elevated head tanks with overflow standpipes inside, see Figure 4-8. They were built in 2011 for combined typical flow of 1,325 gpm to a maximum of 1,700 gpm.

River well water historically was high in manganese and moderately high in iron which would foul the column packing; but it is now throttled in the well vault and manganese is lower. This intentional flow limitation could be done with the variable frequency drive; but there is a VFD bypass whose use could cause manganese to be a significant issue again. The VFD has not always been reliable; so the vault valve is kept throttled to be ready for VFD bypass use.

Field Well water is higher in iron. The Field Well column packing gets orange faster than the River Well column packing. Because of the minerals, both packed columns are cleaned every year or two. Also, when feasible, when the well pumps are restarted after having been off, such as for well cleaning, the piping is flushed to deter surging depositional material from the wells or their force-mains into the columns.

Figure 4-8: Aeration/Degassing Headbox

An abandoned green tank, residing next to the towers, used to occasionally hold broodstock; but has been abandoned for years, see Figure 4-6. Undesirably, the tank's use created an additional effluent point.

The headtanks have water level alarms. Water leaves the two headtanks and mixes into one PVC pipeline installed in 2011 to the Hatch House and outdoor round tanks. On the way, the pipeline is branched to a truck fill (Figure 4-9), which has a cracked pipe that slowly leaks. It is recommended that this be fixed during regular maintenance activities.

Figure 4-9: Truck Fill with Slow Exposed Leak

4.4 Water Quality and Pathogens

The facility has experienced a variety of water quality concerns including iron, manganese and variable total dissolved gas pressures. In addition, staff report that the temperatures from the wells can get warm, which can accelerate egg incubation faster than desired.

Pathogens of concern listed by hatchery staff included bacterial gill disease after rain events and gyro, which appears as the fall temperatures decrease.

While well water is almost always the better option for use at hatcheries, the significant iron in the well water and the cost of treating it makes the potential use of surface water more attractive. Although the Souhegan River is close to the well locations, caution is needed when reviewing whether or not we can use this as an intake source for the hatchery. Although Milford is in the vicinity of a Superfund pollution site, pollutants of concern have not been detected in the facility's wells. There is a vein containing pollutants of concern that leaches into the groundwater and into the river upstream of the hatchery. The other challenges with utilization of surface water are the variability in the temperature and the need to provide UV to kill pathogens. It is also likely that the surface water would require chilling to hit ideal temperatures for incubation. HDR recommends that a desktop evaluation be conducted comparing the capital and operational costs, as well as other benefits and draw backs of the two potential water sources to determine the most beneficial source water moving

forward. In general, groundwater is a better source for temperature and disease risk, and it is likely that treating the well water to remove the iron and manganese to a higher level is the better option.

4.5 Water Supply and Control Structures Summary

To summarize, the following limitations, deficiencies, and conditions were noted for the water supply and control structures during the on-site condition assessment:

Field Well:

- It is recommended that new well locations or new source water supplies be explored to replace this well.
- Backup generator should be replaced in the near future if this well continues to produce an adequate supply of water.
- Remove old and abandoned electrical systems in the well house to improve safety.

River Well:

- Backup generator should be replaced in the near future.

Aeration/Degassing Headbox:

- The old aspirator building structure appears to still be fair condition, but it is recommended that the equipment and building be removed as part of any renovations.
- Fix cracked pipeline that is branched to the truck fill to stop slow leak under regular maintenance activities.
- Additional lighting is needed in this area.

5 Incubation and Rearing Facilities

Incubation and early rearing occurs in the Hatch House. Intermediate rearing is in the circular tanks and growout is in the lower earthen ponds.

5.1 Hatch House

The Hatch House was constructed in 1977 as a joint effort between the NHFGD and the National Marine Fishery Service under the Anadromous Fish Conservation Act. This is the main building at this facility and it is located directly inside the main entry gate. This building is a 9,600 sf single story building. In addition to the primary function of providing an enclosed space for early rearing in the tank room (66ft x 80ft), it also houses an office, public / visitor spaces (general gathering area, viewing area, restrooms, and display / education area), staff spaces (crew quarters, locker room, bathroom), and support spaces (maintenance area, garage, feed storage, preparation room, storage room, lab, incubator room, and mechanical and electrical rooms). The front entrance side of the building is shown in Figure 5-1.

Figure 5-1: Hatch House (View of Front Entrance)

5.1.1 Process

The building is supplied with well water for early rearing and egg incubation, altogether 500 gpm peak and 300 gpm normal flow. There used to be an iron removal system and process water heating system. These were so costly to operate that they were removed except for the boiler which was abandoned. Iron removal would promote fish health and reduce staining. HDR has successful iron removal systems at other hatcheries, systems different than the old system that was removed.

Indoor Rearing Tanks

The Hatch House Tank Room contains twenty (20) linear concrete tanks (26-ft x 2.16ft x 2.41ft), see Figure 5-2. The operating water depth of the tanks is approximately 1.67-ft providing 93.2 cubic feet (CF) per unit or 1,864 CF total. Water flow per unit varies from 5 to 25 gpm giving a volume exchange rate per hour (R) of 0.4 to 2.2. Each tank can be drained within 5 minutes. The tanks have

packed columns for influent aeration and degassing and oxygen meters and ceramic oxygen diffusers. In May of 2022 there were approximately 15 high pressure oxygen gas cylinders in the tank room and one was connected with vinyl tubing to a SCH 80 PVC distribution system. The National Fire Protection Association recommends only brazed copper or stainless steel for distribution piping; so that upgrade is recommended. Portable liquid oxygen (LOX) cylinders or a microbulk LOX tank would be safer and require less frequent refilling. If there was a campus-wide bulk LOX tank-based system, it could be branched to the hatch house and then the smaller tanks would not be needed. An upgrade to one of these forms of LOX is recommended. The water leaves orange deposition, especially noticeable on the packed columns and their packing.

Figure 5-2: Indoor Linear Rearing Tanks

The Tank Room also has one oval fiberglass tank approximately 4-ft x 8-ft and four 6-ft-dia. operated with 2-ft water depth. For the earliest rearing, each round tank flows from 1 to 6 gpm and later flow is increased to 20 gpm. These tanks have packed columns and oxygen like the linear tanks. The indoor linear and indoor round tanks were painted brown in the 1980's. The paint is in poor condition, worse on the tank interiors than exteriors. The interior of one of the round tanks is shown in Figure 5-3. It is recommended that these be recoated with epoxy.

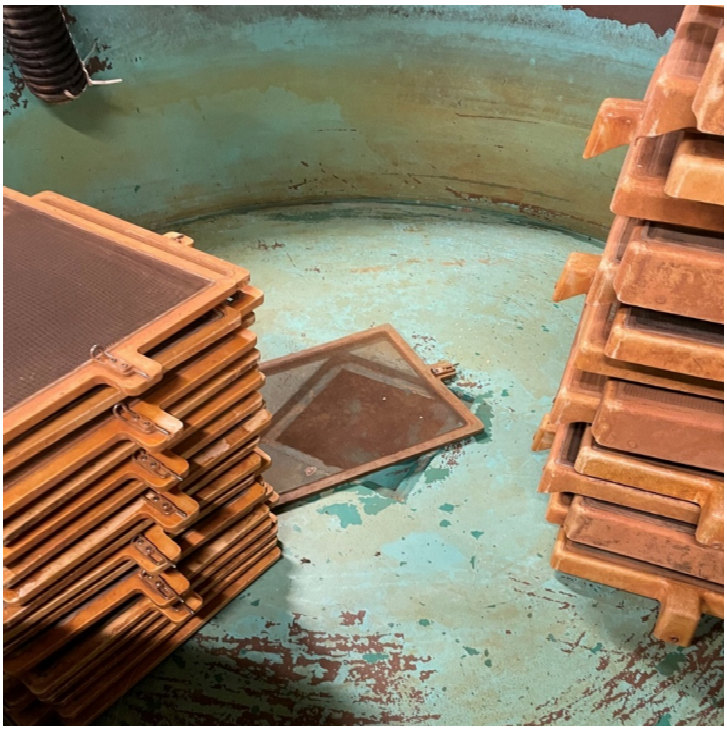

Figure 5-3: Once-brown Round Tank Bottom and Incubator Parts Water-stained Orange

Egg Incubation

The Hatch House Incubators Room has frames for at least seven stacks of 8-tray incubators on top of seven more stacks 8-tray incubators. Up to twelve stacks with 8 trays each are used, although the lowest 3 trays in each stack are not used.

There is a water chilling system with recirculation pump and ultraviolet light disinfection adequate to operate 5 incubator stacks. The average flow rate per incubation tray is approximately 5 gpm.

Few of the incubators in the Incubators room are used often. The quality of imported eggs has been poor. Mortality is 50-60% and the morts are difficult to remove quickly from the stacks, so the stacks clog. Lately eggs have been put in frames with fine netting out over the raceways where mortality is manageable.

The effluent from all the Hatch House's rearing units normally flow to the outdoor lower circular units; but, from within the building, during cleaning of rearing units, effluent is diverted to a separate wastewater pipe that goes to a Settling Pond.

5.1.2 Structural

The Hatch House is a one-story masonry block building with interior masonry-block partition walls and a flat roof made of galvanized roof decking supported by steel roof trusses. The roof is prone to leaking, with known leaks in the lounge area and in the furnace/mechanical room. The hatchery area is largely open. No significant deterioration of the building foundation, walls or roof support system was noted. Due to lack of working HVAC systems, in the summer months the Hatch House experiences high temperatures and humidity, resulting in mold. The incubation room is particularly prone and shows significant rusting of the steel hangers supporting incubator piping. Hatchery

personnel noted that mold is also an issue in the open hatchery area, due to inadequate ventilation. An area of the suspended ceiling in the lounge area near the front of the building had been removed due to roof leakage and resulting mold. The concrete of the rectangular rearing tanks is in good condition.

Figure 5-4: Rear Facade of Hatch House and Addition

Figure 5-5: Rusting Hangers in Incubation Room

Figure 5-6: Area of Roof Leak in Lounge Area, with Removal of Suspended Ceiling

5.1.3 Architectural

Roof

The Hatch House has a flat membrane roof on metal decking supported by steel roof trusses. The roof overhangs the exterior wall approximately 2 feet, which is supported on a series of pilasters extruding from the walls. The edges of the roof are closed off by a shallow parapet. The exact age of the roof is unknown, but staff believe the roof to be over 30 years old, which is well past the life expectancy for a membrane flat roof. Based on the extent of roof leakage observed and noted by staff, it is recommended that the roof be completely replaced.

There is no access to the roof from within the building, and no access was provided during the inspection, so the roof was not fully inspected to confirm condition of roof drains, equipment mounts, flashings, and proper number of drains and slope to the drains. However, a minimum number of roof drains were visually observed from within the building, so it may be possible there is an insufficient number of roof drains, which may be resulting in ponding.

The roof deck and supports do not appear to be pitched, so it is believed that the roof pitch is provided by tapered roof insulation. However, based on the age of the building, it is anticipated that the existing roof insulation has been damaged due to being subjected to water leakage, and does not provide sufficient insulation and does not meet current building code insulation values.

It is recommended that a full inspection and survey of the roof be performed in order to provide a complete design for the roof replacement.

Exterior Walls

The exterior walls consist of concrete masonry units (CMU) with an exterior stucco finish. The CMU and stucco appear to be in good condition see Figure 5-7. There are no details on the existing building construction, so it is unknown if the exterior stucco system has insulating properties. However, based on the amount of moisture that builds up on the interior face of the exterior walls, especially in the tank room, it is likely that the exterior stucco does not provide adequate insulation for the exterior walls. It is recommended that the exterior finish be removed and replaced with a better insulating finish system.

Figure 5-7: East Facade of Hatchery Building

Windows

This building only has exterior windows at the office and crew areas. The windows are aluminum frame 3 lite sliding windows. The windows are operable and appear to be in good condition though staff have noted they are not secure and are leaky. There are no windows into the tank room.

Exterior Doors

The hatchery building has (7) seven exterior doors; (2) main entrance doors into the public access and employee areas, (3) doors into the tank room, (1) door to the garage bay, and (1) door to the mechanical space. The main entrance doors are metal doors with glass lites and side lites see Figure 5-8. The doors appear to be in good condition but are not insulated. The doors to the garage, mechanical spaces, and hatchery space are all hollow metal doors, with no insulation. Staff noted that during the winter, up to a couple inches of ice accumulate on the inside face of the doors in the tank room, making them freeze shut. The doors around the tank room (Figure 5-9) show varying levels of rusting. It is recommended that all the exterior doors be replaced with new insulated doors with thermal break frames.

Figure 5-8: Main Entrance Doors

Figure 5-9: Doors to Tank Room

Interior Finishes

The interior finishes consist typically of vinyl tile flooring in the public and staff areas; painted concrete floors in the maintenance, hatchery and back of house rooms; painted CMU walls; and acoustic drop ceilings or exposed roof deck. The floors and walls appear to be in good condition. The ceiling was in fair to poor condition, with missing tiles where they had been removed due to water damage from the leaking roof, and other with holes in them where old lights or fire alarm equipment had been removed, see Figure 5-10 and Figure 5-11.

Figure 5-10: Missing Ceiling Tiles in Crew Area

Figure 5-11: Missing Ceiling Tiles and Holes in Public Areas

In the tank room, staff noted that black mold has been an on-going issue on both the ceiling and on the walls, due to improper air circulation and insulation, see Figure 5-12 and Figure 5-13. Due to the issues with black mold, it is recommended that all “soft” interior finishes, such as drywall and acoustic ceiling tiles be removed and the spaces be “gutted” back to structural or “hard” surfaces such as CMU walls and the underside of the roof deck, so that proper cleaning of the surfaces can be performed. New interior finishes can be installed after the black mold remediation, roof replacement, insulation, and HVAC upgrades.

Figure 5-12: Black Mold Spots on ceiling in tank room

Figure 5-13: Black Mold Stains on walls in tank room

Interior Spaces

The Hatch House consists of 19 rooms, see Figure 5-14 for a floor plan. Refer to Section 3.8 for a description of the public and visitor spaces.

The staff spaces include an office, crew quarters, locker room and staff bathroom. The office includes two desks and work stations, and file storage, and the crew quarters serves as a breakroom, consisting of a couch and a few miscellaneous chairs. The locker room houses a few lockers, coat and boot storage, and cleaning supplies. The staff bathroom includes a sink, toilet stall, and shower.

The garage bay is used for miscellaneous maintenance work for small vehicles and equipment and for storage of small maintenance equipment. It can be accessed from outside via two overhead garage doors on the east side, or a man door on the south façade. The garage has connections to the maintenance storage room, feed storage room, and the prep room. While the garage bay is adequate for maintaining smaller vehicles and equipment, it is not tall enough for larger vehicles or equipment, which need to be serviced outside.

The feed storage room is accessed through the garage by means of a double door. Similar to other facilities, the feed storage room has trouble preventing rodents since it is connected directly to the garage, which often leave the garage doors open, and the double doors are propped open.

The tank room takes up the entire western half of the Hatch House, with the support rooms along the east side. The incubator room (Figure 5-15) consists of a row of incubation tray racks along one wall with pumps and other equipment along the other walls. The door that separates the incubation room from the tank room has been removed due to the fact that the door swings inward, which takes up too much space within the room.

Next to the incubation room is the old lab space (Figure 5-16), which is currently used by conservation officers. The lab sink has been removed, and the water pipes have been capped, while the drain pipe has been cut and left exposed. The handle and lock to the door have been removed. There are three lockers and a refrigerator currently in this room.

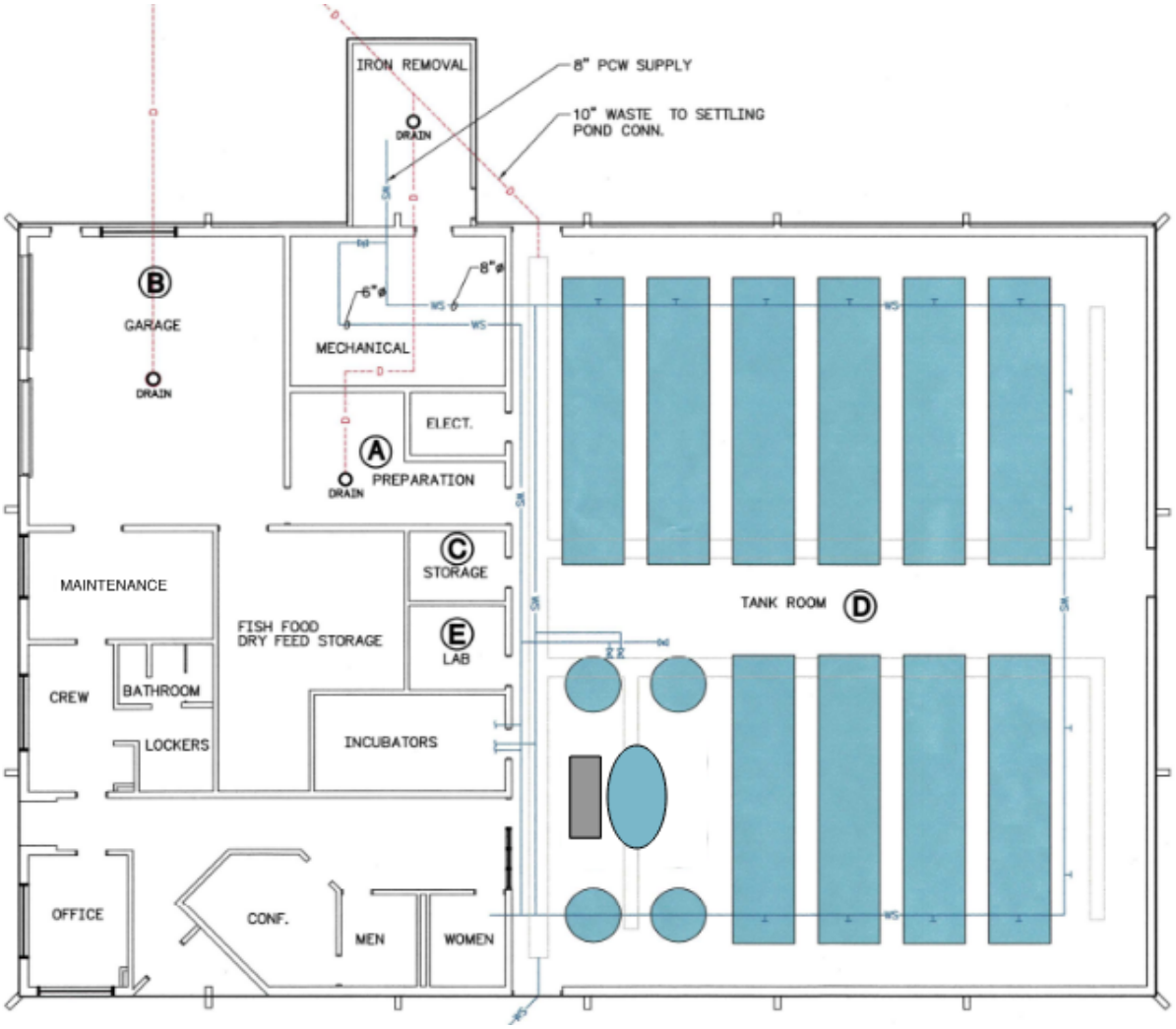

Figure 5-14: Existing Hatch House Plan

The next room is the storage room (Figure 5-17), which consists of storage shelves on either side of the room to store trays and miscellaneous parts for the tanks. The door to this room swings out into the tank room but was being propped open by various materials at the time of the site visit.

Next to the storage room is the preparation room (Figure 5-18), which consists of a long countertop for preparation work, a utility sink, and a cold storage room. This room also provides access between the garage and the tank room with doors on either side.

Adjacent to the preparation room is the electrical room, which houses the electrical panels for the hatch house, along with the fire alarm panel, which has been disconnected. Refer to the electrical section below for additional information on the electrical equipment.

The mechanical room is accessed from the exterior of the Hatch House, through an addition on the south side of the building. Refer to the HVAC and Plumbing section below for information on the equipment in the mechanical room.

All of the support spaces have similar finishes as described earlier for the interior finishes, and the rooms appear to be in fair condition. However, the equipment, shelves, doors, or other components related to the functionality of these rooms appears to be outdated or being used in ways other than what was originally intended. It is recommended that as part of the renovation work noted for the interior finishes, that these support rooms be renovated and updated to better meet the needs of the staff and facility.

Figure 5-15: Incubation Room

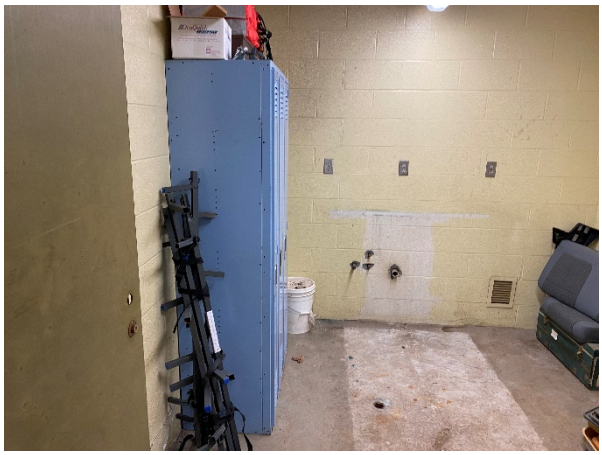

Figure 5-16: Lab Space

Figure 5-17: Storage Room

Figure 5-18: Preparation Room

Building Addition / Iron Removal

The addition, which may have originally been used for iron removal, is currently used for miscellaneous storage and houses some electrical panels. The space is constructed of a concrete curb foundation with wood stud wall and roof framing, and a concrete slab on grade floor. The walls are finished with aluminum siding on the exterior and asbestos paneling on the interior, and the roof

is a low slope shed style roof. The exterior siding appears to be in good condition. The interior asbestos panels have water stains from roof leaks, and various support angles and hangers that are no longer used are rusted (Figure 5-19). The roof was not visible during the site visit, but based on the extent of water damage inside, the roof is believed to be in poor condition. The exterior door to the addition is wood, and the bottom half is rotted (Figure 5-20).

It is recommended that the roof of the addition be replaced along with the roof over the main building. Due to the extent of water damage to the asbestos panels, it is recommended that they be abated, and replaced with gypsum wall board, and additional wall insulation should be installed.

Figure 5-19: Interior of Addition showing water stains and rusted hangers

Figure 5-20: Rotted door to addition

5.1.4 HVAC & Plumbing

No freezers/coolers exist in the support building. Heating oil (#2) is used to fire the furnaces that supplies heat to the support building. There is an underground storage tank on site. One furnace serves the tank room and the other furnace serves the rest of the building. One furnace pulls outside air from the garage and pulls in vehicle exhaust when a car is parked inside. The heating system and ductwork are in good condition. The furnace in the hatch house tank room was replaced in 2013 and the office heating furnace was replaced in 2021. There is no air conditioning system for the main hatchery building. There is an oil-fired boiler abandoned in place in the mechanical room. There is a 40 gallon gas fired water heater located in the mechanical room. While the HVAC equipment appears to be in good condition, staff report that it is not working, causing high temperatures and high humidity in the summer months which leads to black mold issues. It is recommended that the HVAC systems be replaced. The water heater appears to be in good condition, but at the end of its service life and should be replaced.

5.1.5 Electrical

The hatchery building is powered by a utility pad-mount transformer located on the south side of the building. Electricity is provided at 208/120V, 3-phase from the transformer to the main 225A circuit breaker, and then the main panel (MP). Panel MP powers two 100A load panels, LP-1 and LP-2, as well as HVAC equipment including exhaust fans and furnaces. Panel LP-1 serves the hatchery space lighting/receptacles. Panel LP-2 serves the administrative space lighting/receptacles. In

general, the electrical infrastructure is old/degraded, and may be original to the facility construction. Although it is currently functional, a renovation should be considered to ensure continued reliable operation.

The electrical room has several electrical or control systems (Figure 5-23 and Figure 5-24) that have been abandoned and no longer in use. Such equipment may include a fire alarm panel, a power failure alarm system, an intercom control system, and emergency power system including generator, transfer switch, and load panel, a lighting control time clock, and a high-water temperature alarm system. Similarly, the building addition has an old panelboard and several lighting contactors. The abandoned systems should be removed to improve clarity on system operation/functionality, and to allow for efficient future modernization.

Figure 5-21: Electrical Panels in Addition

Figure 5-22: Electrical Panel in Addition

Figure 5-23: Electrical Room North Wall with Disconnected Fire Alarm Panel

Figure 5-24: Electrical Room East Wall

Facility lighting is fluorescent, surface-mount, gasketed fixtures in the hatchery space, and recessed fluorescent in the administrative space. Light levels and condition of lighting equipment appears to be adequate for facility operations. Energy efficient lighting upgrades were made in 2019.

It is recommended to evaluate the need to install a new backup generator and transfer switch to support future modernization upgrades such as recirculation. It is recommended to evaluate the fragmented control systems and consider replacement with a centralized SCADA (PLC) system.

5.2 Twin Mountain Hatchery Hut

The Twin Mountain Hatchery Hut is a separate structure adjacent to the Hatch House, previously used for early rearing, see Figure 5-25. The structure consists of a curved Quonset Hut metal frame on a concrete slab on grade foundation, with a fabric covering and wood sides on the two ends. The structure appears to be in good condition.

Twelve (12) circular fiberglass rearing tanks are located in the Twin Mountain Hut. The tanks are 8 feet in diameter and are 2 to 2.5 feet deep. The typical water flow per early rearing tank varies from 1 to 6 gpm with a maximum rate of 20 gpm. The individual rearing tanks can be drained in 2 to 5 minutes. The tanks are galvanized steel and have been corroded to the point of significant leakage. Thus, the building has been abandoned.

Figure 5-25: Twin Mountain Hatchery Hut

5.3 Circular Tanks

The campus has sixty (60) 25-foot diameter circular pools (circular units). The units provide 655 CF of rearing volume each (39,300 CF total) when operated at 1.5 feet water depth. The units are divided into two (2) areas (lower and upper, see Figure 5-26 and Figure 5-27, respectively) with thirty (30) pools in each area. Approximately thirty (30) of sixty (60) units have PVC metal frame dome covers, but many of the PVC covers have deteriorated to the point that they have been removed or are still in place but are torn and in tatters. The circular units are approximately fifty (50) years old and are constructed of concrete.

Figure 5-26: View of Lower Circular Tank Area

Figure 5-27: View of Upper Circular Tank Area

5.3.1 Process

Maximum flow to the circular units is 50 to 60 gpm each. This causes the tank volume to be displaced at the rate of approximately 0.67 exchanges per hour, half the rate recommended in published aquaculture references. All units are fully drainable and individual units drain in about 15 minutes.

The upper pools receive only fresh well water. Lower pools receive reuse water from the Hatch House and reuse water from the upper pools. Each unit has a buried curb-stop valve and exposed 2” PVC supply header with PVC ball valve with handle removed. To deter freezing and clogging, influent is rarely completely stopped in winter (during spring and summer it can be shut off).

Each circular unit has a screened center drain with underfloor 6” pipe to a side effluent box with weir boards to set the tank water level. Normally effluent spills over the weir in the middle of the side-box. A stop gate is hand pulled from an opening through the deep boards to surge the tank flow under the upper boards for cleaning. Opening the stop gate also allow the tank to be emptied or the weir boards can be removed. Lower pools’ side boxes flow to a single buried pipeline to east and west ponds discussed later.

The upper pools’ side-boxes are wider than the lower pools’ side boxes. The upper pool side-boxes have two sets of weir boards and a subdivision wall in the back half (Figure 5-28). One side has the hand pull gate (Figure 5-29) and leads to a drain/waste main leading to a small Settling Pond. The other side overflows to a serial reuse main down to the lower pools.

Figure 5-28: Upper Pool Side-Box with Separate Low Hand Gate Opening for Waste

Figure 5-29: Hand Gate

When a unit needs to be empty and dry, the influent header can be rotated so that influent bypasses the unit and flows into the effluent side-box.

Diffusers connected to aeration blowers are placed in the upper and lower units to improve the dissolved oxygen levels. Most of the low-pressure air distribution piping for the upper pools is PVC, resting on top of the ground. Most of the lower pool air piping is buried PVC. One 2.5 horsepower blower feeds 30 diffusers in the 30 upper pools. Two blowers feed 30 diffusers in the 30 lower pools. Overall, dissolved oxygen levels in the Lower Pools are lower than the Upper Pools. It is recommended that an oxygenation system be added with a bulk liquid oxygen (LOX) tank routinely filled with purchased oxygen as a source.

5.3.2 Structural

The concrete of the circular tanks is in fair to poor condition, with spalls and exposed reinforcing at the top of the walls and significant loss of mortar with exposed aggregate below the water line of the walls and slabs, see Figure 5-30. The outfall boxes are also deteriorated with efflorescence, spalling and cracking resulting in exposed rebar. The circular tanks and outfall boxes in the worst condition have concrete repairs done by staff each year, see Figure 5-31 and Figure 5-32, but ongoing deterioration makes it difficult for staff to keep all of the tanks in usable condition. The circular tanks in the upper area are generally in the worst condition, with mortar loss on the walls and slabs up to ½” deep on many of the tanks.

Figure 5-30: Typical Concrete Deterioration Upper Area

Figure 5-31: Previous Concrete Repair at Lower Area Tank Walls (Show Tank)

Figure 5-32: In-Process Concrete Repairs of Circular Tank Outlet Box

5.3.3 Electrical

Single-phase 240V power is fed from the hatchery building and routed overhead through the circular tank area to provide power to aerators. There are two aerators one at the lower tanks, and one at the upper tanks. Electrical provisions for a second aerator at the upper tanks have been abandoned in place. It is not clear if power lines are connected. The blowers are 2hp and 2.5hp, single-phase and have pole-mounted motor controllers and plug receptacles. The electrical equipment and overhead power lines are in good condition.

There is no site lighting. Hatchery staff has indicated a need for site lighting to improve security, while also improving the capability of conducting tasks at night.

5.4 Lower Earthen Ponds

A set of three ponds make up the Lower Earthen Ponds: The Waste Settling Pond, the West Pond, and the East Pond. These ponds are located below and southwest of the lower circular units. All three ponds were originally intended as settling (effluent/pollution control) ponds but the West Pond has been converted to a production pond.

The Upper Pools' cleaning waste is diverted to the Settling Pond which overflows to the East Pond. Overflow from the Lower Pools is diverted only through the West Pond under normal conditions. The Hatch House waste goes into West Pond. When Lower Pools are being cleaned, weir boards are rearranged in a splitter box to send the water to the East Pond. This keeps the West Pond, being used for production, cleaner. Effluent from the East and West Ponds join and flow to a southwest-running ditch to the river.

It should be noted that the current NPDES permit was issued prior to the operational changes outlined above and these ponds were identified as effluent treatment components (not in fish production use). However, under the existing operation, the effluent from the ponds has always met the current NPDES Permit Standards.

Figure 5-33: West Pond (production) Looking from its Outlet

Figure 5-34: Access Walkway to West Pond Outlet Box; East Pond (treatment) in Background

Occasionally a contractor is hired to clean out the settling pond with a backhoe. The east pond and west pond were cleaned in 2011. Solids tend not to accumulate in the west pond for producing fish on overflow water.

5.4.1 Process

The East and West ponds have asbestos concrete influent piping. The Settling Pond has a corrugated polyethylene effluent pipe to the east corner of the East Pond. Effluent piping from the East and West Ponds joins into 18” corrugated metal before reaching the outfall. It is recommended that these ponds be cleaned every five years as a minimum or more frequently depending upon the accumulation rate of solids.

5.4.2 Structural

The concrete outlet box at the West Pond is in fair to good condition. Its water entry has dual slots. The very front slots hold weir boards topped with a bar screen. The other slots were empty in May 2022. Access to the outlet box is via a wooden walkway that has no safety railing, it is recommended that these be added. The embankments of the ponds are in good shape. They are fully vegetated with no signs of erosion.

5.4.3 Electrical

Single-phase 240V power is fed from the Hatch House and routed overhead to the electrical equipment board at the West Pond. Power is connected to several receptacles (old and new) for the connection of pond aerators. While not currently connected, hatchery staff has indicated a desire to maintain the capability to run aerators in the future. The electrical equipment and overhead power lines are in good condition.

There is no site lighting. Hatchery staff has indicated a need for site lighting to improve security, while also improving the capability of conducting tasks at night.

5.5 Sampler Shed

The facility has one permitted outfall located just southwest of the earthen ponds. A mobile composite sampler and prefabricated protective shed was added in summer of 2022. At the time of the site visit in May 2022, the shed was missing the door, and the left side roof fascia was rotted and fallen off (Figure 5-35 and Figure 5-36). A door and light were added to the shed after the condition assessment site visit occurred. It is recommended that the roof fascia be fixed.

Figure 5-35: Sampling Shed -Front/Right (May 2022)

Figure 5-36: Sampling Shed - Rear / Left (May 2022)

5.6 Incubation and Rearing Facilities Summary

To summarize, the following limitations, deficiencies, and conditions were noted for the incubation and rearing facilities during the on-site condition assessment:

- The conditions of water lines have not been determined since they require special inspection procedures to access.
- Hatch House
    - It is recommended that rearing tanks be recoated with epoxy.
    - Replace rusted pipe supports in the incubation room.
    - Replace roof including insulation. This necessitates a full inspection and survey of the roof be performed.
    - Replace exterior finishes with bettering insulating finishing system
    - Replace exterior doors with new insulated doors with thermal break frames
    - Renovate supporting rooms to better suit current uses
    - Replace the roof of the Hatch House addition. Abate asbestos panels and replace with gypsum wall board and additional wall insulation
    - Replace boilers and HVAC systems
    - Remediate black mold; Remove all “soft finishes” and replace after black mold is remediated, roof is replaced, insulation is replaced, and HVAC equipment is replaced
    - Renovate old/degraded electrical infrastructure to ensure continued reliable operation.
    - Remove abandoned electrical equipment and systems including fire alarm panel, power failure alarm system, intercom, load panel, lighting control time clock, and a high-water temp. alarm system
    - Replace backup generator and transfer switch
    - Replace abandoned controls with centralized SCADA (PLC) system
    - Replace fluorescent lights with LEDs
    - Add back an improved iron removal system. It will promote fish health, reduce clogging of packed column media in the indoor aeration columns and reduce iron staining.
    - Provide ADA compliant access in the parking area, into the building, and within the publicly accessed portions of the building.
- Twin Mountain Hatchery Hut
    - N/A
- Circular Tanks
    - Replace netting and covers for predator protection
    - Concrete repair of all circular tanks
    - Install site lighting for safety and security
- Lower Earthen Ponds
    - Install safety railing on the wooden walkway

    - Install site lighting
- Sampler Shed
    - Replace roof fascia

6 Garages and Storage Areas

Milford State Fish Hatchery includes several support buildings that provide storage, shop, and garage spaces for the facility. These buildings are detailed and assessed for condition in the sections that follow.

6.1 Vehicle Storage Shed

The Vehicle Storage Shed is a single bay (22-ft x 45-ft) Quonset hut style shed (shown in Figure 6-1) with open ends that is used to store maintenance equipment. The structure consists of a concrete slab that is in good condition, wood curbing supports for metal framing, and a PVC cover over the framing. The metal framing is in good condition, as are the anchors of the frame to the storage building slab. The fabric covering is in poor condition and in need of replacement.

Site grading/drainage is such that water ponds in front of the building and during heavy rains runs through the building. In the winter, the ponding water freezes, resulting in ice buildup in front of the building.

Staff noted that the open ends provide limited to no protection from wind, rain, snow and animals, which along with the drainage issues, limits what they are able to store in this building. Staff noted that the curved shape of the structure minimizes the height along the sides, which also limits the amount of equipment that can be stored here and indicated that simply fixing the cover would not meet their storage needs for this area, which includes the need for storage space for four (4) pickup trucks.

Hatchery personnel indicated their preference is to have a new storage building constructed on site for equipment and feed, potentially in a level area between the Upper and Lower Pools.

Figure 6-1: Vehicle Storage Building

6.2 Storage Shed

There is an old storage shed located between the Upper and Lower Pools that is in poor condition, see Figure 6-2. This shed is wood construction and is rotting and falling apart. Staff noted that they are no longer able to store anything inside. This shed is a safety hazard and should be demolished as part of any renovation work.

Staff also noted that this shed was too small for their storage needs and noted that they need something closer to 20ft x 20ft that can be sealed off from animals and the elements would be preferred for their storage needs.

Figure 6-2: Storage Shed

6.3 Garages and Storage Areas Summary

To summarize, the following limitations, deficiencies, and conditions were noted for the garages and storage areas during the on-site condition assessment:

- Vehicle Storage Building
  - Replace fabric covering
  - Improve grading and drainage
  - Consider replacing with a new structure capable of storing four pickup trucks and a new feed room.
- Storage Shed
  - Demolish and Replace