Solar Array and Groundwater Pumping System Draft Environmental Assessment National Cold-Water Marine Aquaculture Center Franklin, ME

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Prepared by Solv LLC for U.S. Department of Agriculture

Agricultural Research Service

U.S. DEPARTMENT OF AGRICULTURE

EXECUTIVE SUMMARY

This Environmental Assessment (EA) was prepared in accordance with the National Environmental Policy Act (NEPA), as amended (42 United States Code [U.S.C.] § 4321, et seq.); Executive Orders (EOs) 11514, 13807, and 11991; and the Council on Environmental Quality's (CEQ's) NEPA implementing regulations (40 Code of Federal Regulations (CFR) 1500-1508) The purpose of an EA is to assess whether the Proposed Action would pose a potential significant impact on the environment and to determine whether an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI) is required for the Proposed Action.

The purpose of this EA is to inform decision makers and the public of the likely environmental consequences of the action proposed at the United States Department of Agriculture (USDA) Agriculture Research Service's (ARS) National Cold-Water Marine Aquaculture Center (NCWMAC) in Franklin, Maine. This EA identifies and analyzes the potential impacts of the installation of a solar photovoltaic (PV) array and restoration of the yield of the groundwater supply to original design capacity at the NCWMAC. The specific purpose of and need for the Proposed Action evaluated in this EA are described in Section 1.4. The Proposed Action and No Action alternatives are evaluated to determine the impacts or changes that may occur to both the natural and human environment resulting from installation of the PV array and restoration of the groundwater supply. Two other alternatives are analyzed in this EA: installation of the PV array without restoration of the groundwater supply and restoration of the groundwater supply without installation of the PV array.

Impacts stemming from the Proposed Action would be minor and primarily short-term associated with construction-related activities; however, some minor long-term impacts could be expected as well. Impacts would be both beneficial and adverse. Beneficial impacts would include the continuation of the research mission of the NCWMAC, which would be facilitated by the restoration of groundwater yield at the site. Installation of the proposed solar array would enable reduced reliance on the local electrical grid, decreased utility costs, and compliance with federal regulations related to the use of renewable energy at federally-owned sites.

The construction and installation of the solar PV array would result in the removal of 3 to 4 acres of wildlife habitat for the lifetime of the array. This area serves as potential nesting and breeding grounds for migratory birds in addition to foraging areas for edge-reliant game species such as moose, eastern turkeys, and white-tailed deer. A limited number of trees and other woody vegetation around the periphery of the array site would need to be removed during the construction period, including hollow trees that serve as potential refugia for Northern long-eared bats. However, given the small area of the array, the small number of trees or other woody plants removed, and no indication of current refugia use by Northern long-eared bats, the removal of these areas is not expected to appreciably alter the amount of available habitat for any given species and is not outside the range of natural variation. Affected animals would likely be able to relocate from the study area to similar areas in the immediate vicinity of the site.

Although it is possible that the use of groundwater wells following restoration of the groundwater supply, particularly Well 6 on the far eastern side of the NCWMAC site, could exert influence on nearby private wells, USDA would implement all available best management practices (BMPs) to avoid impacting the neighbors' water supply. The implementation of BMPs would reduce the possibility that neighboring wells would need to be drilled deeper, or that the pumping equipment for these wells would need to be updated. Overall, if adverse impacts to neighboring wells occurred, impacts would likely be long-term and minor. Any long-term impacts would be mitigated to the greatest extent feasible. Previous permits for the facility required NCWMAC to submit a copy of agreements between NCWMAC and the adjacent property owners to the Maine Department of Environmental Protection, documenting how adjacent landowners would be accommodated in the event of adverse impacts from the NCWMAC operations. Such agreements may need to be updated (Etegra, Inc., 2020).

Careful design and the use of good engineering and best management practices would avoid, minimize, or mitigate the potential minor adverse impacts presented in this EA. No significant adverse impacts to the environment are anticipated. Therefore, preparation of an EIS is not required and a Finding of No Significant Impact (FONSI) is anticipated.

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Acronyms and Abbreviations

AMSL	above mean sea level
APE	Area of Potential Effect
ARPA	Archaeological Resources Protection Act
ARS	Agricultural Research Service
BCC	Birds of Conservation Concern
BFE	Base Flood Elevation
BMP	Best Management Practices
BWH	Beginning with Habitat
CAA	Clean Air Act
CCAR	Center for Cooperative Aquaculture Research
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CLG	Certified Local Government
CMR	Code of Maine Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibels
DDT	dichlorodiphenyltrichloroethane
DPS	Distinct Population Segment
DPW	Drinking Water Program
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
Ft	feet
FTE	Full-time equivalent
FY	Fiscal Year
gpm	gallons per minute
in	inch
IPaC	Information for Planning and Consultation
kW	kilowatt
kWh	kilowatt hour
MBTA	Migratory Bird Treaty Act

MCGP	Maine Construction General Permit
MCL	maximum contaminant level
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MGD	million gallons per day
Mg/L	milligrams per liter
MHPC	Maine Historic Preservation Commission
MIFW	Maine Department of Inland Fisheries and Wildlife
MNAP	Maine Natural Areas Program
MPDES	Maine Pollutant Discharge Elimination System
MRS	Maine Revised Statutes
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NCWMAC	National Cold-Water Marine Aquaculture Center
NEPA	National Environmental Policy Act
NLEB	Northern long-eared bat
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NRPA	Natural Resources Protection Act
NWI	National Wetlands Inventory
PLC	Programmable Logic Controller
PCB	polychlorinated biphenyl
PEM	Palustrine Emergent
PFO	Palustrine Forested
ppt	parts per trillion
PSS	Palustrine Scrub-shrub
PV	Photovoltaic
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SHPO	State Historic Preservation Officer
µm	micrometer
U.S.	United States
U.S.C.	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
VFD	variable frequency drive
W&C	Woodard and Curran
WDL	Waste Discharge License

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

The United States Department of Agriculture (USDA) Agricultural Research Service (ARS) is planning to install photovoltaic (PV) panels (i.e., solar arrays) for the National Cold-Water Marine Aquaculture Center (NCWMAC) in Franklin, Maine to generate electricity in a renewable manner. The USDA ARS is also planning to upgrade the facility's existing groundwater supply system to continue to support the facility's Cold-Water Research Program. The solar array project is also intended to increase the sustainable energy resiliency of the facility, while the groundwater system restoration will ensure reliable water resources at the facility. The USDA ARS has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code [USC] § 4321, et seq.), the ARS NEPA regulations at 7 Code of Federal Regulations (CFR) Part 520, and other relevant federal and state laws and regulations. This EA assesses whether the Proposed Action, action alternatives, and No Action alternative would pose a potential significant impact on the environment, whether a Finding of No Significant Impact (FONSI) is appropriate, or whether an Environmental Impact Statement (EIS) is required.

This EA has been prepared to inform decisionmakers and the public of the potential environmental consequences of the actions proposed at the NCWMAC. This EA identifies, documents, and evaluates the potential effects of the Proposed Action, which is the construction and operation of a solar array and restoration of the pumping yield of groundwater at the NCWMAC site. The Proposed Action, action alternatives, and No Action alternative have been evaluated by an interdisciplinary team to determine the effects or changes that may occur on both the natural and human environment because of the proposed improvements. This analysis is described in Chapter 3 of this EA.

1.2 SCOPING

Federal, state, and local agencies were made aware of the publication of the Draft EA by the posting of a public notice in the local newspaper. Comments received during the 30-day review period will be taken into consideration in development of the Final EA.

1.3 PROJECT BACKGROUND

The term 'marine aquaculture' refers to the breeding, rearing, and harvesting of aquatic plants and animals under controlled conditions. The NCWMAC conducts research to solve problems limiting the production efficiency of cold-water marine aquaculture. The NCWMAC is staffed by ARS scientists and support personnel managing a national research program addressing the cold-water marine aquaculture industry's highest priority research needs. The primary research objective is genetic improvement of Atlantic salmon, which the facility aims to accomplish by utilizing a family-based selective breeding program, resulting in the development of genetically improved North American Atlantic salmon lines for United States (U.S.) producers. Salmon production is currently constrained by the lack of genetic improvement, disease, and production efficiency. Meanwhile, producers are required to culture salmon of North American origin. The salmon research program is implemented to improve native stocks, which can then be the basis for farmed stocks (ARS, No Date).

The NCWMAC facilities include laboratory spaces with infrastructure to conduct research on salmon, as well as office and personnel support spaces. The NCWMAC raises salmon from eggs (in fresh water), and uses 234 separate 50-gallon culture tanks for rearing Atlantic salmon from the fry stage (a stage when the sac or yolk is gone and the salmon must find food on their own), to the parr stage, to the subsequent smolt stage (**Figure 1-1**). At the fry stage, fresh water is used in the tanks. In the parr stage, the salmon grow for 12 to 18 months in brackish water as they transition from living in fresh water to saltwater. At the smolt stage, the fish require salty water. At the smolt stage, fish from each family are sent to an industry collaborator that grows them for 18 months to a harvestable size just prior to sexual maturity. Once the fish are harvested, staff from NCWMAC travel to the processing plant to identify the fish and record growth data from each fish. These data are used to determine which families of fish will be bred together for the next generation of fish. All the tanks at NCWMAC that hold the fish are supplied with water from salty, brackish, and freshwater wells onsite via a recirculating filtration system.

Figure 1-1. Parr Tank Room with Automatic Feeding System

Photo Credit: E. Martin, 2020

1.4 PURPOSE AND NEED

The mission of the NCWMAC is to conduct research that will solve problems limiting the production efficiency of cold-water marine aquaculture. The current primary research focus is genetic improvement using an applied selective breeding program to increase efficiency and sustainability of Atlantic salmon culture. The purpose of the proposed project is to improve the sustainable performance of the NCWMAC through the implementation of a solar array, and to continue to provide the necessary water yield at the facility to allow the research mission to continue with improved water reliability.

The need for the project, or the need to which the USDA is responding, is also two-fold. The ARS needs to employ a sustainable method of electricity generation while also increasing the resilience of the electric system. Federal agencies are required to utilize renewable energy to make up at least 7.5 percent of their total electricity usage (Section 203 of the Energy Policy Act of 2005 (42 U.S.C. § 15852). Additionally, the electric grid at the facility is subject to brown outs and power outages, which impact the aquaculture operation. The facility currently relies on a backup generator to supply electricity when the power goes out. The proposed 750-kilowatt (kW) solar PV system would supply 50 percent of the facility's energy equivalent electric (740 kW per year) use. The solar array is expected to produce 951,000 kilowatt hours (kWh) annually, which is roughly equivalent to the site's annual 939,283 kWh electric usage. However, the facility would utilize electricity from the solar array only during the day, and would utilize electricity from the power grid or facility generator at night, since storage of energy produced by the solar array during the day would not be implemented. However, the solar PV system would be designed so that the equipment can be easily retrofitted with the batteries, generator, and control equipment to act as a microgrid in the future if desired. If utilized as a microgrid, the PV system would be capable of providing nearly all of the electricity needed at the facility.

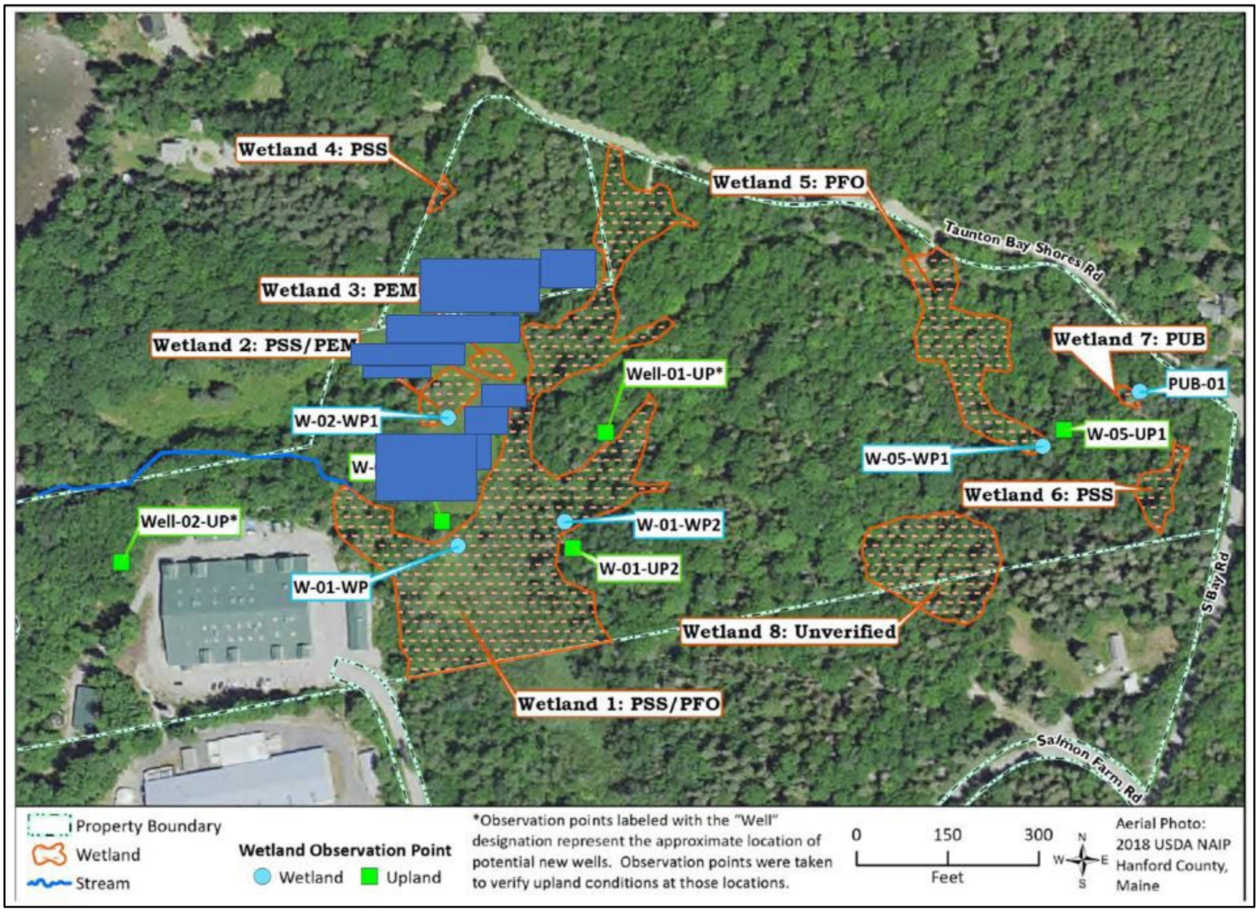
Secondly, well water yield at the NCWMAC has decreased from original conditions causing unreliable water yields. Thus, ARS needs to identify the cause of decreasing water yields from the existing wells and the pumping system at the property and to restore the water supply to meet the facility's needs. An assessment of the site's current groundwater usage is underway to determine the best approach to obtaining more water, either through the installation of new wells or refurbishing the existing wells, to meet research needs

1.5 Location of the Proposed Action

The NCWMAC is located at 25 Salmon Farm Road in Franklin, Maine (**Figure 1-2**). The town of Franklin is part of Hancock County. The facility is located in an inland coastal area adjacent to Taunton Bay, which connects to the Gulf of Maine. The facility is approximately 13 miles north of Bar Harbor, Maine. The project area for this EA includes the entire 27.2-acre NCWMAC site. The land is owned by the USDA ARS and is adjacent to the University of Maine's Center for Cooperative Aquaculture Research (CCAR). The CCAR was founded in 1999 as an aquaculture research and development facility to address industry needs at industry scale. CCAR's facilities include marine hatcheries, where juvenile fish, invertebrates, and sea vegetables are propagated for research and industry. Though the two facilities are owned and operated by separate entities, they share resources and infrastructure including a permitted National Pollutant Discharge Elimination System (NPDES) wastewater discharge, water supply infrastructure, holding tanks, and an access road. The NCWMAC site is also adjacent to a residential area, but is otherwise primarily surrounded by vegetation.

The proposed solar array location is immediately northeast of the existing buildings in an area that is partially clear of woody vegetation (**Figure 1-3**). The proposed solar array is sited so as to avoid placement on top of delineated wetlands (see Section 3.3 Groundwater and Surface Water). Groundwater is drawn from eight of the existing 12 wells, 10 of which are located on the NCWMAC property and two of which are located on the CCAR property (**Figure 1-4**).

Figure 1-2. Regional Location of the USDA ARS NCWMAC in Franklin, Maine



Source: Etegra, Inc., 2021

Note: This map, adapted from the Etegra et al. (2021) wetland delineation report, also shows delineated wetlands in orange and the observation points used during the field survey.

Figure 1-3. Proposed Solar Array Location at the USDA ARS NCWMAC

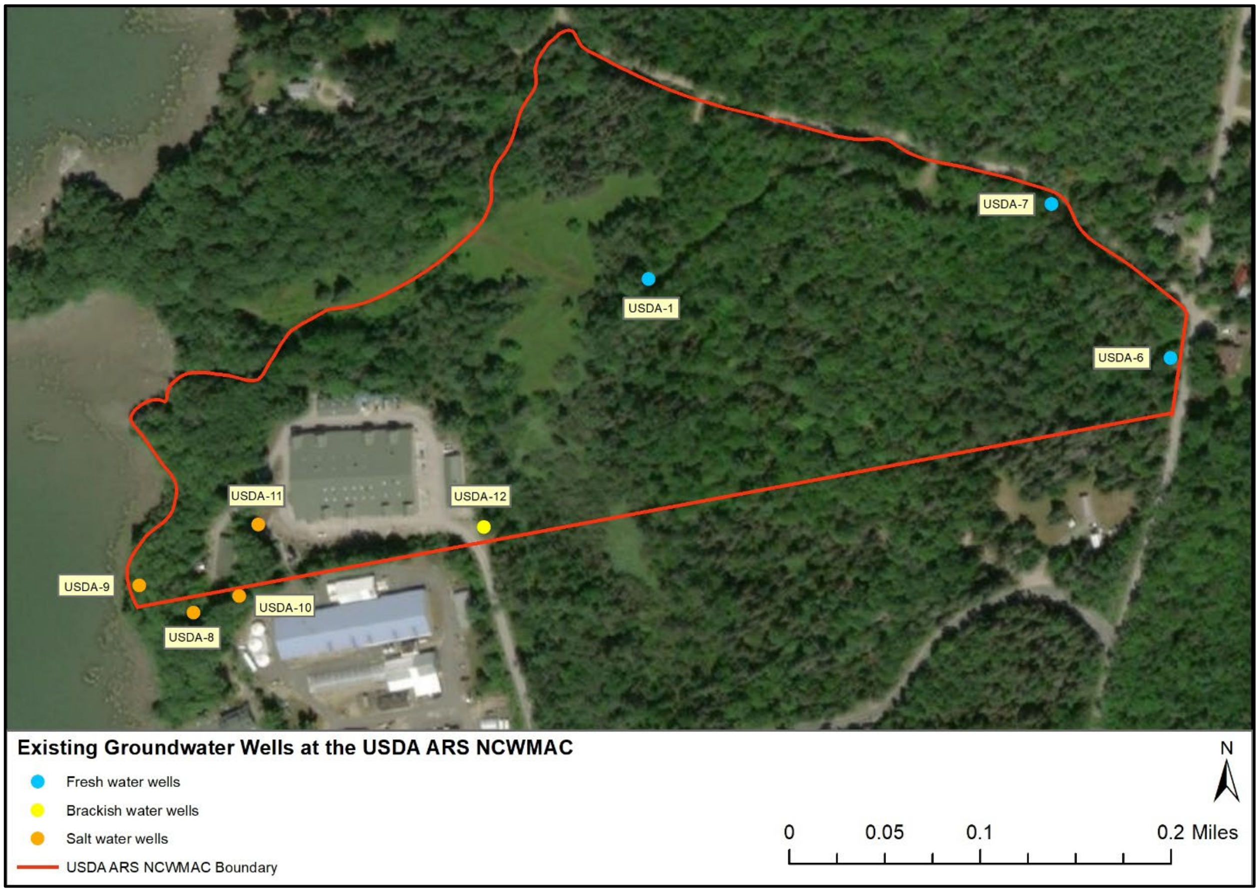


Figure 1-4. Existing Groundwater Wells for the USDA ARS NCWMAC

1.6 DECISIONS TO BE MADE

This EA evaluates the effects of the Proposed Action, action alternatives, and the No Action alternative on the environment. Based on the purpose and need identified, the scope of the project is limited to activities described in the Proposed Action, action alternatives, and the No Action alternative. The environmental analysis will provide the deciding official with the information to make the following decisions regarding the proposed solar array and groundwater yield restoration at NCWMAC:

- Which actions, if any, will be approved, and
- Any additional mitigation measures and monitoring requirements that may be needed to protect resources.

The deciding official is Dr. Thomas Shanower, Northeast Area Director, Agricultural Research Service, USDA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives that address the purpose and need for action. Four alternatives were identified and carried forward for analysis for the proposed projects: Alternative 1 (the Proposed Action) – Installation of Solar PV Array and Restoration of Groundwater Yield; Alternative 2 – Installation of Solar PV Array Only; Alternative 3 – Restoration of Groundwater Yield Only; and the No Action Alternative.

2.1 PROPOSED ACTION – ALTERNATIVE 1

The Proposed Action Alternative consists of two primary components: installation of a solar PV array and restoration of the yield of the groundwater supply to the original design capacity at the NCWMAC.

2.1.1 Installation of Solar PV Array

The Proposed Action includes the installation and operation of a ground-mounted solar PV system on the NCWMAC property. Individual PV cells are semiconductor devices that convert sunlight into electricity. The cells are connected to form modules that are combined and connected to form arrays of different sizes and power output. The solar array would be rack-mounted with a footprint of approximately 3 to 4 acres immediately northeast of the existing buildings (see **Figure 1-3**). The electrical infrastructure connecting the array to the buildings would be installed in an existing corridor of already disturbed land between the NCWMAC facility and the proposed solar array site, where underground pipes connect to groundwater wells. The array would be installed predominantly on land consisting of open field and occasional lone apple trees. It is likely that a limited number of trees and other woody vegetation would need to be removed to make room for the solar array. The solar array would be sited so as to avoid placement on top of any delineated wetlands. The addition of a small amount of impervious surface is anticipated as a result of installation of the framing to support the solar array. Native vegetation is proposed to be planted in between the array modules to enhance pollinator use of the site.

The work would involve the complete design and construction of a fully functioning turn-key solar array system including equipment selection, permitting, bonding, and construction and installation of a PV system. The 750-kW solar PV system would meet 50 percent of the facility's energy equivalent electric (740 kW per year) use. The solar array is expected to produce 951,000 kWh annually, which is roughly equivalent to the site's annual 939,283 kWh electric usage. The solar array would be net metered, meaning that excess electricity at any given time would be available to the grid through an agreement with the local utility provider. All excess energy generated during the day would be sold to the local utility provider. All electricity needed for the site at night would be purchased from the utility provider. The proposed project would be implemented through an Energy Sales Agreement in which a private developer would design, own, operate, and maintain the solar array on federal land. The private developer would sell the electricity produced to the ARS for less than the local utility. ARS would pay the developer through monthly electric invoices for 20 years.

The solar array would be installed in 2023. No new access roads or paths would be required for installation of the array.

2.1.2 Restoration of Groundwater Yield

The NCWMAC facility obtains its water supply from groundwater, supplemented by salt water intake from Taunton Bay. The NCWMAC operations require fresh, brackish, and salty water. Note that brackish water yields may be achieved through a combination of fresh water and salty water yields. The Proposed Action related to groundwater is to restore the groundwater yield at the NCWMAC to its original design capacity. The intended goal is to restore the current total yield of each well type to original design conditions by increasing yield by the following amounts:

- Brackish Water: 30-50 gallons per minute (gpm)
- Salty Water: 50 gpm
- Fresh Water: 15 gpm

Seawater use would remain at current levels.

Two potential methods for achieving the goals of the groundwater supply improvement component of the Proposed Action are analyzed in this EA: 1) rehabilitation of existing wells at the NCWMAC; and 2) installation of new wells at the site. ARS has completed a Phase 1 Water Supply Evaluation (Etegra, Inc., 2020) that studied the yield of existing groundwater wells at the NCWMAC site and discussed potential remedial actions to address the deficiencies of the current well system. The next stage of the water supply evaluation will include an investigation to determine why withdrawal rates from the existing system are reduced and to provide greater understanding of the yield that could be achieved through both installation of new wells and rehabilitation of the existing wells. Rehabilitation of the existing wells at the NCWMAC site could potentially be achieved through the installation of new pumping equipment or hydrofracturing, a process that may be used to increase the flow of water into a well. These rehabilitation methods would be carried out by a licensed contractor and are described in greater detail in Section 2.1.2.2. The determination of potential remedial action measures is considered part of Phase 1 of restoring the site's groundwater yield. Phase 2 would entail implementation of the selected remedial measure(s). Wells would be installed or rehabilitated in 2023.

Originally, 12 groundwater wells were drilled for the NCWMAC facility, six of which are currently in use (see **Figure 1-4**). USDA Wells 1, 7, 8, 9, 10, and 12 are the main wells used for NCWMAC's supply. Well use purposes are listed below:

- Well 1 produces fresh water which supplies drinking water for the facility.
- Well 7 produces fresh water used for fish culture.
- Well 6 produces fresh water and would only be used if the motors and pumps in Wells 1 and 7 suddenly failed to operate, as Well 6 was observed to cause excessive drawdown in neighboring residential wells (Etegra, Inc., 2020).
- Wells 8 and 9 produce salty water at 10-20 parts per thousand (ppt) and provide the greatest volume of water.
- Well 10 produces salty water at 10-20 ppt.
- Well 11 produces salty well water at 10-20 ppt but is generally not used due to mechanical issues (Etegra, Inc., 2020).
- Well 12 produces brackish water at 2-5 ppt and is always used.

Wells 2, 3, 4, and 5 are not in use as they did not provide sufficient yield at the time of drilling and are not equipped with pumps, power, or piping. These four wells remain open for monitoring and testing if needed and they have not been abandoned.

2.1.2.1 Installation of New Wells

Phase 1 of the Water Supply Evaluation recommended further investigation of existing wells at the NCWMAC to determine if rehabilitation would be possible. If this investigation concludes that the best method for restoring groundwater yield at the NCWMAC site includes the installation of new wells, these wells would be sited on the property based on identification of the best source water locations (i.e., type of water and yield potential). ARS's secondary priority for siting new wells would be proximity to the main building; new wells would be sited as close as possible to the building to reduce installation and operating costs. New wells would be installed and operated using best management practices (BMPs) that:

- Would not impact neighboring wells;
- Would not draw contaminated water, if any exists in the surrounding subsurface environment;
- Would not necessitate the clearing of large portions of land; and
- Would not be placed in wetlands.

The Draft Wetland Delineation for the National Cold Water Marine Aquaculture Center report (Etegra, Inc., 2021) identifies approximate locations in uplands for two potential new wells (see Figure 1-3).

2.1.2.2 Rehabilitation of Existing Wells

If further investigation conducted as part of Phase 2 of the water supply evaluation determines that the existing wells at the NCWMAC site could be rehabilitated for restored groundwater yield, this could be achieved through the installation of improved well water level monitoring, flow metering, water storage, and pumping equipment, or through hydrofracturing. These potential methods for improving groundwater yield are described in detail below.

Installation of New Pumping Equipment

If pumping equipment used in the existing wells at the NCWMAC property is determined by the remedial action study to be a hindrance to optimal groundwater yield, new pumping equipment may be installed to address this issue. The Phase 1 Water Supply Evaluation recommended that existing wells should be equipped with water level monitoring equipment, shut-off valves, Variable Frequency Drives (VFDs) with Programmable Logic Controllers (PLCs), and flowmeters. The storage tank should also be equipped with a level sensor and linked to the pumps so that the pumps are turned off prior to overflow. Such equipment would help control and optimize pumping rates and reduce wear and tear on pumps and motors (Etegra, Inc., 2020). New pumping equipment would be installed by a licensed contractor, and monitoring would occur during and after installation to ensure that any potential adverse impacts to the surrounding environment are limited or avoided.

Hydrofracturing

Hydrofracturing (or hydrofracking) may be used to increase the flow of water into low-yielding wells at the NCWMAC site. Data obtained from the investigation recommended by the Phase 1 Water Supply Evaluation will determine whether hydrofracturing is a feasible method for increasing well yields.

Hydrofracturing of wells involves injecting high-pressure water via the drilled well into the rock formations surrounding it. Hydrofracturing may widen fractures in the bedrock and extend them further into the formation to increase the network of water bearing fractures/fissures supplying water to the well (AGWT, 2020).

This technique involves injecting high-pressure water via the drilled well into the rock formations surrounding it. Hydrofracturing may widen fractures in the bedrock and extend them further into the formation to increase the network of water bearing fractures/fissures supplying water to the well (AGWT, 2020). The procedure involves first removing all pipes, wires, and the pump from the well. One or two inflatable hard rubber “sleeves” or “packers” are then lowered into the well and inflated to seal off a section of the well. The packers are usually set a minimum of 20 feet below the end of the casing and 60 feet below ground surface. Water is pumped at high pressure into the section of the well between the packers, or below the packer if only one is used. The water pressure within the sealed-off section of the well rises as the surrounding rocks resist the flow of water out of the well. A sign of successful hydrofracturing is a sudden drop in pressure indicating that the surrounding rocks are accepting water (AGWT, 2020).

If this process is determined necessary, hydrofracturing of wells at the site would be conducted by licensed contractors. This alternative would only be selected if studies indicate that it can be accomplished without adverse impacts to neighboring wells or increased intrusion of salt water. All water used for hydrofracturing would be chlorinated to avoid introducing bacteria into the well bore and fractures. Water samples would be taken after pumping the well for a period to avoid sampling the water introduced into the formation during hydrofracturing.

2.2 Installation of Solar PV Array Only – Alternative 2

Under Alternative 2, a ground-mounted solar PV array would be installed and operated at the NCWMAC site as described in Section 2.1.1. Under this alternative, restoration of groundwater yield would not occur concurrently with solar array installation.

2.3 Restoration of Groundwater Yield Only – Alternative 3

Under Alternative 3, the groundwater yield at the NCWMAC site would be restored through the installation of new wells or the rehabilitation of existing wells or both, as described in Section 2.1.2. Installation of the solar PV array would either not occur or would occur at a later date, to be determined based on the availability of funding and other considerations.

2.4 No Action Alternative

The No Action alternative is included and analyzed to provide a baseline for comparison with impacts from the project and to satisfy federal requirements for analyzing “no action” under NEPA (40 CFR 1502.14(d)). The No Action alternative assumes that no construction of the solar PV array or study and subsequent improvement of the groundwater supply system would occur at the NCWMAC site. This alternative would not meet the purpose and need of the project, which is to improve the sustainable performance of the NCWMAC through the implementation of a solar array, and to continue to provide necessary water yield at the facility to allow for the research mission to continue to occur with restored water reliability. The actions to improve sustainability and allow for the necessary conditions for continued research at the facility would not occur.

2.5 Alternatives Considered and Dismissed from Detailed Analysis

One alternative to the proposed solar PV array location was considered and dismissed from detailed analysis. This alternative entailed the installation of portions of the solar PV array on the roof of the main NCWMAC building and portions of the array on 2 acres on the ground in the adjacent field. This option was considered but rejected because the roof already contains many penetrations (e.g., sky lights, venting tubes, and dormers) that would make it difficult to fit in any additional components in accordance with building and fire codes. In addition to limited roof space, the pitched roof would make accessing the system for maintenance dangerous in certain seasons, such as in icy winter conditions.

No other alternatives for increasing the water yield at the facility were identified as feasible. Municipal water is not available at this location and thus is not an option for use. Desalination was determined to not be economically feasible due to the large volume of water that is required for the aquaculture systems.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Chapter 3 describes the current physical, biological, social, and economic environments of the area within and surrounding the NCWMAC site that may be affected by the Proposed Action and alternatives. This chapter also describes the potential environmental consequences associated with the Proposed Action and alternatives. Resource areas analyzed include biological resources, groundwater and surface water, geology and soils, topography, and seismicity, land use and visual resources, socioeconomics, utilities and infrastructure, cultural resources, and solid and hazardous waste management. Unless otherwise noted, the project area is defined as the entire NCWMAC site. The elements or components of each resource area that may be potentially affected are described.

The following resources are considered in this EA:

- Geology and Soils, Topography, and Seismicity;
- Groundwater and Surface Water;
- Biological Resources, including Wildlife;
- Air Quality and Climate Change;
- Noise;
- Land Use and Visual Resources;
- Cultural Resources;
- Utilities and Infrastructure;
- Transportation and Traffic;
- Solid and Hazardous Waste Management;
- Socioeconomics; and
- Environmental Justice and Protection of Children.

For resources listed that were determined not to be applicable to the proposed project, the rationale for excluding the resource from further study is provided in Section 3.10. Resources dismissed from detailed analysis include air quality and climate change, noise, transportation and traffic, and environmental justice and protection of children. For those resources listed that are applicable to the proposed project, an evaluation of impacts is presented herein.

3.1 METHODOLOGY

Overall, the ARS based the impact analyses and conclusions in this document on review of existing studies conducted for the NCWMAC and surrounding areas, professional judgments, and ARS staff insights.

Potential impacts are described in terms of type (beneficial or adverse), context, duration, and intensity. Both beneficial and adverse effects may be associated with the Proposed Action, action alternatives (Alternatives 2 and 3), and the No Action alternative. Effects can be positive or negative depending on the resource and desired future condition. The following general definitions were used to evaluate the context, intensity, duration, and the nature of impacts associated with project alternatives.

Context of Impact

Context is the setting within which an impact is analyzed, such as site-wide or regional. The Council on Environmental Quality requires that impact analyses in NEPA documents include discussions of context. Localized impacts are those that affect the resource area only on the project site or its immediate surroundings and would not extend into the region.

Duration of Impact

Impacts are also expressed in terms of duration. Temporary impacts would occur only during the time that project activities are being conducted. Short-term impacts would extend beyond the time of project activities but would not last more than one year. Long-term impacts would likely last more than one year and could potentially continue indefinitely, in which case they could also be described as permanent.

Intensity of Impact

Impact intensity is the degree to which a resource would be beneficially or adversely affected by an action. Impact intensities are quantified as negligible, minor, moderate, or major as defined in **Table 3-1**.

Table 3-1. Summary of Impact Levels

Negligible	Minor	Moderate	Major
Minimal impact on the resource would occur; any change that might occur would be barely perceptible and would not be easily measurable.	Change in a resource would occur, but no substantial resource impact would result; the change in the resource would be detectable but would not alter the condition or appearance of the resource.	Noticeable change in a resource would occur and this change would alter the condition or appearance of the resource; the integrity of the resource would remain intact.	Substantial impact or change in a resource would occur that is easily defined and highly noticeable and that measurably alters the condition or appearance of the resource; the integrity of the resource may not remain intact.

3.2 BIOLOGICAL RESOURCES

This section discusses the affected environment and environmental consequences that would result under each alternative for biological resources in the project area, including vegetation, fish, wildlife, non-native invasive species, and special status species. The project area for the analysis of biological resources is the 27.2-acre NCWMAC site.

3.2.1 Affected Environment

The affected environment for biological resources describes all components of the prevailing ecological communities within the project area, including vegetation, mammals, birds, fish, amphibians, reptiles, and any invasive or special status species.

Vegetation

The U.S. Environmental Protection Agency (EPA) divides the U.S. into discrete ecoregions containing similar types, qualities, and quantities of environmental resources to serve as a spatial framework for the research, assessment, management, and monitoring of ecosystems and their subsidiary components (Griffith et al., 2009). The system uses a Roman numeral hierarchical scheme of I – IV to denote regions which occur at differing scales; larger Roman numerals equate to smaller subdivisions of ecotype. The project area occurs within the Downeast Coast Level IV ecoregion, which is a subregion of the Acadian Plains and Hills Level III region. Overall, the Acadian Plains and Hills ecoregion can be described as a transition zone between the boreal spruce-fir forest to the north and the deciduous forest to the south, with the climatic and environmental conditions of the Atlantic Ocean strongly influencing vegetation dynamics. The Downeast Coast subregion of this area is characterized by rocky headlands and islands, with few isolated pocket beaches, gravel beaches, and coarse-grained tidal flats (Griffith et al., 2009). The cool, foggy climate of the area supports a vegetative community more typical for boreal environments.

The project area is composed primarily of spruce-fir forest (MNAP, No Date-a). Red spruce (*Picea rubens*) and white spruce (*Picea glauca*) dominate the overstory, although balsam fir (*Abies spp.*), eastern hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), mountain ash (*Sorbus spp*.), and heart-leaved paper birch (*Betula cordifolia*) also occur in canopy gaps. The herb and shrub layer of the surrounding forest is poorly developed and consists mostly of tree regeneration. Raspberry (*Rubus idaeus*), rough-stemmed goldenrod (*Solidago rugosa*), whorled wood aster (*Oclemena acuminata*), and hay-scented fern (*Dennstaedtia punctilobula*) are locally abundant in some canopy openings. The bryoid (i.e., mosses, liverworts, hornworts, and lichens) layer comprises over 15 percent of the ground cover and is dominated by *Dicranum* moss, pincushion moss (*Leucobryum glaucum*), and three-lobed bazzania (*Bazzania trilobata*).

The proposed site of the solar PV array occurs within a cleared portion of the project area that was previously disturbed by agricultural production surrounded by the spruce-fir forest described above. Apple trees (*Malus domestica*) sporadically occur within the clearing and are the only mature trees present within the array site. The shrub layer is virtually absent in this area and groundcover is dominated by bluejoint (*Calamgrostis canadensis*) with the occasional occurrence of tussock sedge (*Carex stricta*) and other sedges (MNAP, No Date-b). There are small palustrine wetland areas (roughly 1 acre in total) present characterized by the presence of cattails (*Typha spp.*) and woody vegetation, none of which are considered special status species.

Invasive Plant Species

Invasive non-native species infestation is a major resource management concern within the state of Maine. Invasive species can disrupt native ecosystems, displace native plant and wildlife, and degrade biological and cultural resources. Invasive species are also known to reduce food sources for wildlife, alter fire regimes, and disrupt pollination and dispersal relationships. All federal agencies are mandated by Executive Order (EO) 13112 to "prevent the introduction of invasive species and provide for their control and to minimize [their] economic, ecological, and human health impacts."

Invasive plant species have not been documented within the NCWMAC property, including the project area. Morrow's honeysuckle (*Lonicera morrowii*), coltsfoot (*Tussilago farfara*), bull thistle (*Cirsium vulgare*), and purple loosestrife (*Lythrum salicaria*) are known to occur around major roadways and thoroughfares of Franklin, Maine (iMapInvasives, No Date), including nearby roads such as Hog Bay Road, Downeast Highway (U.S. Route 1), and Franklin Road (State Highway 182).

Special Status Plant Species

The Beginning with Habitat (BWH) high value plant and animal map of Franklin, ME (BWH, 2016) and Maine Natural Areas Program (MNAP) rare plant database (MNAP, 2015) were reviewed to assess whether special status plants occur in the vicinity of the project area. BWH is a collaborative program of federal, state and local agencies, and non-governmental organizations which compile habitat information across a variety of sources for planning areas across the state of Maine; it is a recommended source for planning activities by the Maine Department of Inland Fisheries and Wildlife (MDIFW). According to the BWH review and MNAP database, no federal- or state-listed plant species occur within 1 mile of the project area.

Fish and Wildlife

The spruce-fir forests surrounding the project area provide habitat for a wide variety of wildlife, including mammals, birds, reptiles, amphibians, and fish. The combination of edge-habitat areas and intact forest areas allow for high levels of wildlife diversity. Common species found within these habitats are discussed below as a general point of reference and should not be interpreted as an indication of presence or absence of any given species in the project area.

The state of Maine supports 58 species of mammals, many of which are found within spruce-fir forests (MIFW, No Date-a). Common mammals which could potentially occur within or near the project area include American black bear (*Ursus americanus*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), woodland vole (*Microtus pinetorum*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cineroargenteus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), snowshoe hare (*Lepus americanus*), North American porcupine (*Erethizon dorsatum*), striped skunk (*Mephitis mephitis*), American red squirrel (*Tamiasciurus hudonicus)*, and cinerous shrew (*Sorex cinerous*).

Over 290 species of birds occur in the state of Maine (MIFW, No Date-b). Common birds which could potentially occur within or near the project area include northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), downy woodpecker (*Picoides pubescens*), eastern phoebe (*Sayornis phoebe*), osprey (*Pandion haliaetus*), red-tailed hawk (*Buteo jamicensis*), red-shouldered hawk (*Buteo lineatus*), Cooper's hawk (*Accipiter cooperii*), barred owl (*Strix varia*), great horned owl (*Bubo virginianus*), great blue heron (*Ardea herodias*), cattle egret (*Bubulcus ibis*), Canada goose (*Branta canadensis*), black duck (*Anas rubripes*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), ruffed grouse (*Bonasa umbellus*), and wild turkey (*Meleagris gallopavo*).

Wetlands, riparian areas, and forests in Maine support 18 species of amphibians (Hunter Jr. et al., 1992). Common amphibians which could potentially occur within or near the project area include blue spotted salamander (*Ambystoma laterale),* spotted salamander (*Ambystoma maculatum*), eastern newt (*notophthalmus viridescens*), dusky salamander (*Desmognathus fuscus*), two-lined salamander (*Eurycea bislneata*), spring peeper (*Pseudacris crucifer*), bullfrog (*Rana catebeiana*), green frog (*Rana clamitans*), and pickerel frog (*Rana palustris*).

Seventeen species of reptiles occur in Maine (Hunter Jr. et al., 1992). Common reptiles which could potentially occur within or near the project area include snapping turtle (*Chelydra serpentina*), painted turtle (*Chrysemys picta*), wood turtle (*Clemmy insculpata*), milk snake (*Lampropeltis Triangulum*), smooth green snake (*Opheodrys vernalis*), redbelly snake (*Storeria occipitomaculata*), and the common garter snake (*Thamnophis sirtalis*) (Hunter Jr. et al., 1992).

Although no marine or aquatic habitats are present within the project area, the directly adjacent Taunton Bay provides habitat to a large number of diadromous (species that live in both freshwater and saltwater) and marine fish species (Moore, 2008). Common fish species present within Taunton Bay include alewife (*Alosa pseudoharengus*), American eel (*Anguilla rostrata*), tautog (*Tautoga onitis*), stickleback (*Gasterosteidae spp.*), pipefish (*Syngnathinae spp.*), striped bass (*Morone saxatilis*), sculpin (*Cottoidea spp.*), and bluefish (*Pomatomus saltatrix*).

A large variety of benthic invertebrates occur within Taunton Bay, including many species of high commercial value (Moore and Sowles, 2010). Common benthic invertebrates in Taunton Bay include

Atlantic horseshoe crab (*Limulus polyphemus*), Atlantic rock crab (*Cancer irroratus*), blue mussel (*Mytilus edulis*), sea cucumber (*Holothuroidea spp.*), American oyster (*Crassotrea virginica*), soft-shelled clam (*Mya arenaria*), bloodworm (*Glycera dibranchiate*), bay scallop (*Argopecten irradians*), green sea urchin (*Strongylocentrotus droebachiensis)*, and American lobster (*Homarus americanus*).

Endangered Species Act (ESA)-Listed Animal Species

A review of special status wildlife was performed to develop a list of protected species that potentially occur in and near the project area. The list of special status species was compiled from the United States Fish and Wildlife Service (USFWS) IPaC (Information for Planning and Consultation) online project planning tool (USFWS, 2019) and from the high value plant and animal map of Franklin, Maine (BWH, 2016). According to the IPaC review, only two federally listed animal species occur in or near the project area, and there is no designated critical habitat. There are no state-listed species present with two miles of the project area according to the BWH review (BWH, 2016). **Table 3-2** lists the federal and state protected animal species potentially occurring in and near the project area.

Table 3-2. Federal and State Protected Animal Species in the Vicinity of the Study Area

Common Name	Scientific Name	Federal Status	State Status	Habitat
Mammals				
Northern long-eared bat	*Myotis septentrionalis*	Threatened	Threatened	Caves and mines in winter; riparian areas, upland forests, cracks and crevices in dead and live trees in summer
Fish				
Atlantic salmon – Gulf of Maine Distinct Population Segment (DPS)	*Salmo salar*	Endangered	Endangered	Large rivers and shoals

Sources: BWH, 2016; USFWS, 2019

Northern long-eared bat

Northern long-eared bats (NLEBs) are medium-sized bats with a body length of approximately three inches, a wingspan of nine to ten inches, and considerably longer ears than other *Myotis* bats. During winter months, NLEBs hibernate in caves, referred to as hibernacula, with constant temperatures, high humidity, and limited air currents and often occupy small crevices or cracks with only their noses and ears visible (USFWS, 2015). In southern months, NLEBs roost singly or in colonies in hollow cavities of both living and dead trees. Their range includes much of the eastern and north central U.S., including Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. NLEB breeding occurs in the late summer or early autumn months when males begin to swarm near hibernacula. Like most bats, the species is primarily nocturnal and emerge at dusk to hunt moths, flies, leafhoppers, caddisflies, and beetles in the understory of forested areas using echolocation to locate prey (USFWS, 2015).

NLEB populations are primarily threatened white-nose syndrome, a fungal infection which disrupts hibernation and causes affected bats to deplete fat reserves before spring and ultimately starve (USFWS, 2015). Loss of summer roosting habitat and collision with man-made structures such as wind turbines have also contributed to NLEB decline. In 2015, NLEBs were listed as threatened under the ESA and a final 4(d) rule was published in 2015 specifically defining “take” prohibitions for the species. No critical habitat has been designated for the species (Federal Register, 2016).

Atlantic salmon – Gulf of Maine DPS

Atlantic salmon are anadromous fish which spend the majority of their life in ocean environments but return to freshwater environments to reproduce. Juvenile salmon spend roughly the first three years of their life in cool, clean, well-oxygenated waters and use a wide variety of habitat types which occur in streams rivers, ponds and lakes (USFWS, 2019). After this period, Atlantic salmon migrate downstream to the ocean where they spend the winter and up to 1 year at sea foraging before returning to freshwater environments in spring months to breed. The Gulf of Maine DPS includes all anadromous Atlantic salmon whose freshwater range occurs in the watersheds from the Androscoggin River northward along the coast of Maine to the Dennys River and wherever these fish occur in the estuarine and marine environment. The marine range of the Gulf of Maine DPS extends from the Gulf of Maine throughout the northwest Atlantic Ocean to the coast of Greenland (USFWS, 2019). While in freshwater environments as juveniles, Atlantic salmon feed first on microscopic plankton and later on insects. Adult fish feed primarily on small baitfish while in marine environments.

Historically, over-utilization of salmon by both recreational and commercial fisheries contributed to the decline of the Gulf of Maine DPS. Today, the primary threats to the DPS include habitat loss, barriers to stream connectivity, degradation of water quality/quantity, and predation or competition from non-native fish species (USFWS, 2019). In 2000, the Atlantic salmon Gulf of Maine DPS was listed as endangered under the ESA and 45 specific areas comprised of 19,751 km of perennial river, stream, and estuary habitat and 799 square km of lake habitat in Maine were designated as critical habitat in 2009 (USFWS, 2019).

Other Special Status Animal Species

The Migratory Bird Treaty Act (MBTA) and EO 13186 on the Responsibility of Federal Agencies to Protect Migratory Birds, require the protection of migratory birds and their habitats. EO 13186 clarifies the responsibilities of federal agencies to consider the effects of agency actions on birds listed under MBTA. The USFWS IPaC online project planning tool (USFWS, 2019) identified four migratory bird species as potentially occurring in or near the project area, listed in **Table 3-3** as being of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in the project area. The 1988 amendment to the Fish and Wildlife Conservation Act mandates the USFWS to “identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973.” The BCC program is the most recent effort to carry out this mandate.

Table 3-3. Migratory Bird Species of Concern in the Vicinity of the Study Area

Common Name	Scientific Name	Level of Concern
Bald eagle	*Haliaeetus leucocephalus*	Non-BCC: Warrants attention because of the Bald and Golden Eagle Protection Act
Bobolink	*Dolichonyx oryzivorus*	BCC Rangewide (throughout range in the continental U.S. and Alaska)
Nelson's sparrow	*Ammodramus nelsoni*	BCC Rangewide
Prairie warbler	*Dendroica discolor*	BCC Rangewide

Source: USFWS, 2019

3.2.2 Environmental Consequences

This section describes the potential impacts associated with the Proposed Action and alternatives on biological resources both within and surrounding the project area.

3.2.2.1 Alternative 1 – Proposed Action

The analysis of environmental impacts of Alternative 1 considers the potential impacts of the installation and operation of the solar PV array, rehabilitation of existing groundwater wells, and installation and operation of new groundwater wells.

Installation and Operation of Solar PV Array

Approximately 3 to 4 acres of vegetation would be eliminated or damaged during construction of the proposed solar PV array. Although a small portion of these areas (less than 1 acre) would be removed from vegetative productivity for the lifetime of the array by the standing solar PV array and associated infrastructure, native warm season grasses and forbs would be planted in areas beneath and between panels and the overall loss of vegetated area would be minimal. Pollinators present within the project area, such as honeybees (*Apis mellifera*) and ruby-throated hummingbirds (*Archilochus colubris*), are expected to directly benefit from the planting of native forbs, which serve as nutrient sources for these species.

Electrical infrastructure (e.g., wires, poles, etc.) connecting the solar array to the NMCWAC would be installed within an existing corridor of previously disturbed vegetation and is not expected to appreciably change the distribution of vegetation species or habitat areas within the project area; however, this installation would result in the destruction of additional small areas of vegetation.

Direct and indirect adverse impacts to general and special status vegetation are expected to be localized, long-term, and of negligible intensity. The proposed clearing and disturbance would largely occur on previously disturbed land, and installation of the solar PV array is not expected to appreciably impact the prevalence of any given vegetative species or community within the immediate area or Hancock County as a whole. During the construction period, repeated disturbance of vegetation due to vehicle passes or foot traffic of construction personnel in areas where plants are not cleared would cause damage to plants and the vegetation mat. Soil compaction from this disturbance could impede root growth and could cause an increase in runoff and soil erosion. Disturbed ground would be susceptible to establishment and spread of invasive plant species, such as Morrow's honeysuckle and purple loosestrife. Exotic plant species could outcompete native plant species for sunlight, water, and soil nutrients, ultimately altering the composition of the vegetation community. Furthermore, although a small amount of disturbance would occur during operation and maintenance of the array from vehicle and foot traffic, intensive disturbance of the area would not persist beyond the construction phase and nearby vegetation is expected to recover fully. BMPs such as erosion control measures and equipment washing could also be implemented to prevent the establishment of invasive species and assist the recovery process.

Impacts to wetland vegetation are expected to be localized, long-term, and of negligible intensity. Dredging, filling, or clearing of vegetation within the 0.19 acre of wetlands present within the solar installation project area would not occur, although some disturbance to this area may occur during installation activities adjacent to two small wetlands and one larger wetland (see **Figure 1-3**). Although the final design of the array would avoid wetland areas to the extent practicable, it is possible that some areas would be subject to small amounts of disturbance from adjacent vehicle passes or foot traffic of construction personnel. Given the minimal wetland area that could possibly be impacted, low intensity of disturbance, and relatively short duration of the construction period, no individual wetland plant or animal species is expected to experience impacts outside of the range of natural variation.

Adverse impacts to wildlife from habitat reduction are expected to be localized, short-term, and of negligible intensity. The construction and installation of the approximately solar PV array would result in the removal of 3 to 4 acres of wildlife habitat for the lifetime of the array. This area serves as potential nesting and breeding grounds for migratory birds in addition to foraging areas for edge-reliant game species such as moose, eastern turkeys, and white-tailed deer. Furthermore, a limited number of trees and other woody vegetation around the periphery of the array site may need to be removed during the construction period, including hollow trees that serve as potential refugia for Northern long-eared bats. However, given the small area of the array, the small number of trees or other woody plants removed, and no indication of current refugia use by Northern long-eared bats, the removal of these areas is not expected to appreciably alter the amount of available habitat for any given species and is not outside the range of natural variation. Affected animals would likely be able to relocate from the project area to similar areas in the immediate vicinity of the site.

Adverse impacts from mortality to wildlife are expected to be localized, short-term, and of negligible to minor intensity. Wildlife mortality of some individual animals could potentially occur during the construction and installation of the solar PV array. These mortalities would mostly be associated with collisions or animals getting run over by vehicles and construction equipment and would be most pronounced for small ground-dwelling mammals, reptiles, and amphibians since they are generally less mobile and more cryptic than larger animals. To minimize the amount of wildlife mortality from vehicle collisions, construction areas should be surveyed for ground-nesting migratory birds prior to construction. Eggs and young of birds are particularly susceptible to mortality from nest destruction during nesting season. These impacts are particularly relevant to migratory bobolink, Nelson's sparrow, and prairie warbler, which nest close to the ground in heavy vegetative cover present within the project area.

Adverse impacts from disturbance of animals are expected to be localized, long-term, and of minor intensity. Impacts to wildlife from noise and associated visual disturbance during the construction period could result in the temporary displacement of some species while humans or equipment are present at the project area for the life of the project. Noise can startle individuals, cause stress, mask communication and other natural sounds, and displace animals from surrounding habitat areas. Wildlife disturbance would be limited to the general vicinity of the project area and to the period of construction and operation; animal species would likely return to the project area upon completion of the array in areas where habitat is still available. Increased human activity at the project area during the construction period could also potentially disrupt wildlife movements during migration, dispersal, breeding, nesting, and normal behavior. However, displaced animals could occupy areas of similar habitat in the vicinity outside the project area.

Adverse impacts to special status wildlife and vegetation from the installation and operation of the solar PV array are expected to be localized, long-term, and of negligible intensity. Although special status species vegetation and wildlife are not known to be present within the project area or its immediate vicinity (BWH, 2016), there are four BCCs that may occur in the vicinity of project area. Although impacts to BCCs would be largely similar to impacts to general wildlife, impacts can have a higher magnitude and extent on special status species because these species are already vulnerable to environmental stressors. In order to avoid adverse impacts to BCCs, the project area should be surveyed for migratory birds prior to construction. Precautions should be taken to not harm, remove, damage, or adversely alter habitat conditions for any special status species. Construction activities should also be timed to avoid sensitive nesting periods of bobolink, Nelson’s sparrow, prairie warbler, and bald eagles. Permanently disturbed areas would be unable to serve as nesting sites to these species for the duration of the project lifetime.

Rehabilitation of Existing Wells

Adverse impacts from disturbance of animals during the rehabilitation of existing wells are expected to be localized, short-term, and of negligible intensity. Disturbance-related impacts to wildlife from increased noise levels and human presence during well rehabilitation activities would be similar to those listed above for the construction of the solar array. Given its continuous use of pumps powered by 35 – 150 hp motors to provide water pressurized to 1,000 – 5,000 pounds per square inch (psi), hydrofracturing would likely produce the greatest disturbance to wildlife, although updating local pumps would also disturb nearby wildlife to some extent. Additive disturbance could potentially occur if rehabilitation of existing wells occurred simultaneously with the construction of the solar array, resulting in longer avoidance of the project area by local wildlife. However, given the short duration of rehabilitation activities (1-3 months) and isolated nature of existing wells, additional disturbance from rehabilitation activities is expected to be minimal. Rehabilitation and construction activities could also potentially be sequenced to avoid the occurrence of additive disturbance impacts.

The rehabilitation of existing wells through updating pumping apparatus or hydrofracturing could potentially reduce current freshwater flows at local streams, rivers, and wetlands in the vicinity of the project area. Reduction of flows in these waterways would reduce their suitability for reliant species of fish, wildlife, benthic macroinvertebrates, and birds. However, rehabilitation activities would be specifically evaluated and coordinated to avoid widespread impacts to surface water levels within the region (see Section 3.3 for more information). Any reduction of flows would likely be minimal at most and would not appreciably increase energy expenditures, foraging difficulty, or availability of space and cover for any reliant wildlife species outside of the range of natural variability. Similarly, any small reduction of surface water flows is not expected to appreciably alter the habitat suitability of nearby riparian areas for riparian or wetland vegetation. Given the low likelihood of widespread groundwater impacts from the rehabilitation of existing wells, the adverse impacts from reduced freshwater flows to biological resources are expected to be localized, long-term, and of negligible intensity at most.

Similarly, the intrusion of saltwater into regional groundwater from the rehabilitation of wells could potentially reduce the habitat suitability of the project area for sensitive native wetland or terrestrial vegetation and reliant wildlife. Sensitive wetland, riparian, or terrestrial vegetation species could potentially be displaced from the project area and replaced by other native, invasive, or noxious plant species that are more tolerant of a higher salinity in the water table. This would reduce the habitat value of the area for reliant wildlife. However, existing wells are located far enough from the coastline that the overall likelihood of saltwater intrusion is very low. Furthermore, the rehabilitation of wells would be specifically evaluated and coordinated to avoid widespread saltwater intrusion within the region (see Section 3.3 for more information). Any saltwater intrusion that does occur as a result of rehabilitation efforts would be minimal at most and would not appreciably reduce the habitat suitability of the area for vegetation or appreciably increase energy expenditures, foraging difficulty, or availability of space and cover for any reliant wildlife outside of the range of natural variability. As such, the adverse impacts from saltwater intrusion to biological resources are expected to be localized to regional, long-term, and of negligible intensity at most.

Installation and Operation of New Wells

The installation and operation of new groundwater wells would directly remove very small areas (approximately 12-inch diameter for each well) of standing vegetation and wildlife habitat from productivity for the lifetime of the wells. However, wells would be specifically sited to avoid wetlands and the clearing of large areas. The loss of this vegetation would result in similar types of impacts as that of the installation of the solar array, but on a negligible scale.

Disturbance and groundwater impacts from the development of new groundwater wells would be similar to those listed above for the rehabilitation of groundwater wells; either option would likely induce some disturbance of local animals and could potentially impact regional groundwater. However, as with rehabilitation, the potential location of any new wells would be specifically evaluated and coordinated to avoid widespread impacts to wildlife and groundwater within the area. As such, disturbance and groundwater impacts from the installation and operation of new groundwater wells are expected to be localized to regional, short-term, and of negligible intensity at most.

Since the impacts of all activities under Alternative 1 are localized in extent, range from short-term to long-term in duration, and from negligible to minor in intensity, the overall impact of Alternative 1 on biological resources, including special status species, would be localized, long-term, and negligible to minor in intensity.

Adverse impacts to NLEBs under Alternative 1 would be localized, long-term, and of negligible magnitude. Although there are no known occurrences of NLEBs, hibernacula, or current roost trees within the project area, a small number of mature trees around the periphery of the array site which could potentially house roosting NLEBs may be removed in order to avoid blocking the solar array. However, these trees would be surveyed prior to removal for NLEBs and no active roost sites would be removed during the construction. As such, USDA ARS concludes that Alternative 1 “may affect, but not likely to adversely affect” NLEBs.

There would be no impacts to the Atlantic salmon Gulf of Maine DPS or their designated critical habitat under Alternative 1. The project area does not contain any riverine, marine, or estuarine habitat and does not contain any designated critical habitat for the DPS. Although this DPS may occur within the adjacent Taunton Bay, no activities conducted under Alternative 1 would directly or indirectly impact the DPS or any of its associated habitat. As such, USDA ARS concludes that Alternative 1 would have “no effect” on the Atlantic salmon Gulf of Maine DPS or their designated critical habitat.

3.2.2.2 Alternative 2 – Installation of Solar PV Array only

The impacts of Alternative 2 would be identical to those impacts discussed above for the installation and operation of solar PV arrays under Alternative 1 without any of the potential impacts related to the rehabilitation or installation and operation of groundwater wells. Since these impacts are all localized in extent, short-term to long-term in duration, and negligible to minor in intensity, the overall impact of Alternative 2 on biological resources, including special status species and designated critical habitat, would be localized to regional, long-term, and minor in intensity.

3.2.2.3 Alternative 3 – Restoration of Groundwater Yield Only

The impacts of Alternative 3 would be identical to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1; very small (12-inch diameter) areas would be removed from vegetative productivity and construction activities would likely disturb some local areas during the construction period of the project. Since these impacts are all localized to regional in extent, short-term to long-term in duration, and negligible in intensity, the overall impact of Alternative 3 on biological resources, including special status species and designated critical habitat, would be localized, long-term, and negligible in intensity.

3.2.2.4 No Action Alternative

Under the No Action alternative, no solar array would be constructed or operated, and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment would remain constant for the duration of the period of analysis; no biological resources would be adversely impacted directly or indirectly by mortality, removal of habitat areas, or disturbance. However, beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the research mission at the facility and reduced reliance on nonrenewable energy.

3.3 Groundwater and Surface Water

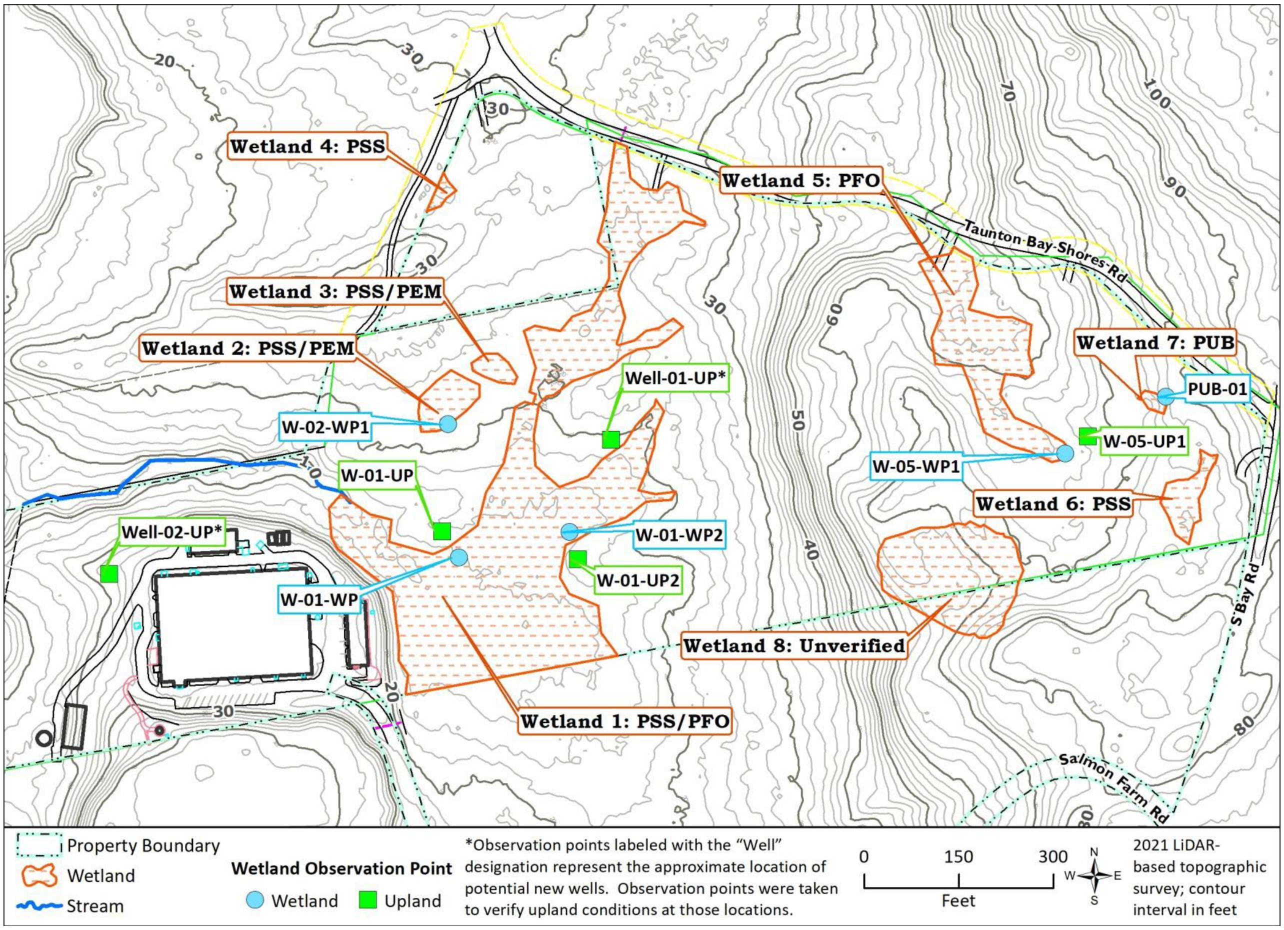
This section discusses the affected environment and environmental consequences that would result under each alternative for groundwater and surface water resources in the project area, including wetlands and floodplain areas. The project area for the analysis of groundwater and surface water includes the 27.2-acre NCWMAC site, and the neighboring CCAR facility and residential wells.

3.3.1 Affected Environment

The affected environment for groundwater and surface water describes all water resources located within and surrounding the project area.

Surface Water

The NCWMAC is located adjacent to the Taunton Bay estuary system consisting of Taunton, Egypt, and Hog Bays. The three bays collectively comprise a 3,282-acre estuary at the head of Frenchman's Bay in eastern Hancock County (Moore, 2004) and ultimately drain into the Gulf of Maine. Taunton Bay drains a watershed composed of eight towns and townships, including the Town of Franklin (Friends of Taunton Bay, 2007). The project area is located within Maine's Coastal Zone Management Act (CZMA)-designated coastal zone (DMR, No Date). A stream is located in the eastern portion of the project area; it meanders in and out of the northern property boundary, drains Wetland 1 (see **Figure 3-1**), and flows directly into Taunton Bay (Etegra, Inc., 2021).



Source: Etegra, Inc., 2021

Figure 3-1. Surface Waters and Wetlands at the USDA ARS NCWMAC Property

Maine designates three classes for the management of estuarine and marine waters: SA, SB, and SC. Taunton Bay is designated as an SB waterbody (MDEP, 2018). SB waters are general purpose waters that are managed to attain good quality water as defined by the parameters shown in **Table 3-4** (38 MRSA § 465-B). Per the requirements of Maine's Revised Statutes (MRS), discharges to Class SB waters may not cause adverse impact to estuarine and marine life in that the receiving waters must be of sufficient quality to support all estuarine and marine species indigenous to the receiving waters without detrimental changes to the resident biological communities (38 MRSA § 465-B).

Table 3-4. Parameters for Maine's Estuarine and Marine Water Classification Standard SB

Designated Uses	Dissolved Oxygen	Bacteria	Aquatic Life
• Recreation in and on the water • Fishing • Aquaculture • Propagation and harvesting of shellfish	Not less than 85% of saturation	Enterococcus of human and domestic animal origin not higher than geometric mean of 8/100 ml or instantaneous level of	Supports all indigenous estuarine and marine species

Designated Uses	Dissolved Oxygen	Bacteria	Aquatic Life
• Industrial process and cooling water supply • Hydroelectric power generation • Navigation • Habitat for fish and estuarine and marine life		54/100 ml from 5/15 to 9/30 May not exceed National Shellfish Sanitation Program criteria for shellfish harvesting	Discharge not to cause closure of shellfish beds

Source: 38 MRSA § 465-B.

The State of Maine 2016 Integrated Water Quality Monitoring and Assessment Report, prepared by the Maine Department of Environmental Protection (MDEP) pursuant to Sections 303(d) (list of impaired waters) and 305(b) (state reports on water quality) of the Clean Water Act (CWA), was published in 2018. It concluded that Taunton Bay is not listed for any impairments, except that all estuarine and marine waters of the state are listed as 'Category 5-D: Estuarine and Marine Waters Impaired by Legacy Pollutants". This refers to the impairment caused by the presence of polychlorinated biphenyls (PCBs), dioxins, dichlorodiphenyltrichloroethane (DDT), and other substances already banned from production or use. These chemicals have caused estuarine and marine waters to only partially support the designated use of fishing and harvesting of shellfish due to the persistent bioaccumulation of these toxins in the tissues of some fish and lobster tomalley (MDEP, 2018).

NCWMAC and the neighboring CCAR facility discharge wastewater into the bay via a shared effluent discharge pipe. The MDEP has issued a combined Maine Pollutant Discharge Elimination System (MPDES) permit and Maine Waste Discharge License (WDL) to the two facilities, with a total monthly average discharge flow limitation of 1.27 million gallons per day (MGD). With the exception of the two egg incubation systems, all water overflowing the NCWMAC's fish culture systems and all flows resulting from routine flushing of the fish culture system sumps and pipes is combined and piped to NCWMAC's Wastewater Treatment Building. All sanitary wastewater from the facility and the overflow from two egg incubation systems are routed into NCWMAC's septic system.

The Wastewater Treatment Building treats the fish culture system discharge using a 40-micron or 60-micron microscreen drum filter to capture larger particulate matter, UV radiation to disinfect the water, and an inclined traveling belt screen with 1.0 mm opening which serves as a fish exclusion screen. To account for the variation in discharge flows which can sometimes approach 700 gpm, the microscreen drum filter and inclined traveling belt were sized in excess of 1,000 gpm and the UV irradiation unit was sized to dose 45,000 µw-sec/cm2 to a flow of 715 gpm at a UV transmittance of 80 percent, a level that will inactivate most known fish pathogens.

Wastewater from the NCWMAC's aquaculture operations is generated by the frequent backwash of seven micro screen drum filters and the intermittent flushing of captured solids from the NCWMAC's settling units. This produces a flow of approximately 20-40 gpm of concentrated waste biosolids (500-1,200 milligrams per liter (mg/L)) that is pumped from the aquaculture building to the wastewater treatment building. There, the waste biosolids are first dewatered using chemical coagulation/flocculation, then filtered across an inclined traveling belt filter with a 100 micrometer (µm) filter cloth to exclude all eggs or fish from the discharge that may have escaped into the water entering the building. Following treatment, process wastewater streams from the NCWMAC and CCAR facilities are combined and discharged into Taunton Bay (MDEP, 2016).

The MPDES permit sets certain effluent limitations for discharges, including effluent toxicity (e.g., limits on the concentration of formalin, chloride, etc.), requires application of best practicable treatment, and contains monitoring requirements to ensure compliance with CWA and the state's water quality standards. The permit authorizes the discharge of fish hatchery and rearing facility/aquaculture research facility wastewater from Outfall #001B and imposes limits and monitoring requirements as specified in **Table 3-5.**

Table 3-5. Effluent Limitations and Monitoring Requirements for the CCAR and NCWMAC Facilities

Effluent Characteristic	Discharge Limitations				Minimum Monitoring Requirements
	Monthly Average	Daily Maximum	Monthly Average	Daily Maximum	Measurement Frequency
Flow	1.27 MGD	---	---	---	Daily
TSS	318 lbs./day	530 lbs./day	30 mg/L	50 mg/L	2/Month
Fish on Hand	---	Report lbs./day	---	---	1/Week
Formalin	Report lbs./day	38.6 lbs./day	---	---	1/Occurrence
Total Residual Chlorine	---	---	0.11 mg/L	0.16 mg/L	1/Occurrence

NCWMAC daily effluent discharge records for January to October 2020 indicate an average discharge of approximately 230 gpm, with a low monthly average of 199 gpm (May) and a high monthly average of 251 gpm (August). Flow rates by water type were estimated as follows (Etegra, Inc., 2020):

- Fresh Water: 40 gpm
- Brackish Water: 40 gpm
- Salty Water: 125 gpm
- Seawater: 25 gpm (according to the USDA, this usage is capped at 25 gpm)

Groundwater

Groundwater occurs in Maine in two primary types of aquifers: (1) sand and gravel, and (2) bedrock. The NCWMAC site overlays a granite bedrock aquifer.

The entire state of Maine is underlain with hard ledge (bedrock) composed of igneous (granite, etc.) and metamorphic (gneiss, etc.) rock. This bedrock is generally fractured due to many geological processes that have occurred since its formation between 360 and 650 million years ago. The fractures provide open spaces through which groundwater flows. Fractured bedrock in Maine recharges locally, and the groundwater obtained from drilled wells affects the water table only locally (DACF, No Date-a).

In 2002-2003, a pre-construction groundwater investigation was conducted at the NCWMAC site to develop a large enough groundwater supply to meet the projected water demands at the facility and to determine the risk of saltwater intrusion at the site. During the investigation, seven freshwater test wells

(USDA-1 through USDA-7) and one saltwater test well (USDA-Salt1) were drilled on the USDA property. All wells were drilled in bedrock to 500 feet (ft). Based on their yield, five of the eight wells were chosen to be tested and were hydrofractured, which significantly improved the yield of four of the test wells. The impact of pumping these wells on the groundwater yield of neighboring wells on the CCAR property, as well as other private wells in the vicinity, was also determined (W&C, 2003), since NCWMAC shares the aquifer with CCAR and nearby residents.

The investigation described the presence of two separate regions in the bedrock groundwater: the upper region (comprising USDA-3, USDA-6, USDA-7, three wells on the CCAR property [CCAR-5, CCAR-6, and CCAR- House], and two private wells [Williams and Barter]), and the lower region (comprising all other USDA and CCAR wells and the Clay private well). The regions are distinct in that wells pumped in one region have little or no effect on water levels in wells of the other region. The wells in the lower region were found to be more vulnerable to saltwater intrusion, whereas wells in the upper region exhibited more influence on nearby private wells (Williams and Barter wells) with a potential to impact the neighbors' water supply (W&C, 2003). **Table 3-5** below provides a summary of the test wells drilled on the USDA property prior to the construction of the NWCMAC facility.

Table 3-5. Description of Test Wells at the NCWMAC Site

Well	Region	Final Yield (gpm)	Possible Impacts to Wells Observed During Groundwater Investigation Study	Recommended Use
USDA-1	Lower	40	Saltwater intrusion to lower region	Secondary/backup
USDA-2	Lower	-	None	None/monitoring
USDA-3	Upper	-	None	None/monitoring
USDA-4	Lower	33	Saltwater intrusion to lower region, including Clay well	Secondary/backup
USDA-5	Lower	-	None	None/monitoring
USDA-6	Upper	50	Lowering of water levels in neighboring private wells	Primary
USDA-7	Upper	50	Lowering of water levels in the neighboring private wells	Primary
USDA-Salt1	Lower	100 (brackish)	Saltwater intrusion to lower region	Heat exchange, brackish water supply

Source: C&W, 2003

Following the groundwater investigation study, four additional wells were drilled on the NCWMAC property. The wells have been renumbered since the study and the numbers do not necessarily coincide with the groundwater study report. **Table 3-6** below provides an updated summary of existing wells at the USDA property.

Table 3-6. Summary of Existing Wells at the NCWMAC Site

Original Well Name	Current Well Name	Date of Construction	Type of Water Extracted	Currently in Use?
USDA-1	USDA-1	2003 or before	Freshwater	Yes
USDA-2	USDA-2	2003 or before	Freshwater	No
USDA-3	USDA-3	2003 or before	Freshwater	No
USDA-4	USDA-4	2003 or before	Freshwater	No

Original Well Name	Current Well Name	Date of Construction	Type of Water Extracted	Currently in Use?
USDA-5	USDA-5	2003 or before	Freshwater	No
USDA-6	USDA-6	2003 or before	Freshwater	Yes (only for use if the motors/pumps for Wells 1 and 7 suddenly failed to operate, due to impacts on neighboring wells)
USDA-7	USDA-7	2003 or before	Freshwater	Yes
USDA Salt-1	USDA-8	2003 or before	Salty water	Yes
USDA Salt-2	USDA-9	Between 2006 and 2009	Salty water	Yes
-	USDA-10	Between 2006 and 2009	Salty water	Yes
-	USDA-11	Between 2006 and 2009	Salty water	Yes (generally not used due to mechanical issues)
-	USDA-12	Between 2006 and 2009	Brackish water	Yes (currently not operational due to pump failure)

Source: C&W, 2003; Etegra, Inc., 2020

CCAR wells 1 and 2 also partially supply water to NCWMAC. Wells USDA-2, -3, -4, and -5 are currently not in use but are being kept in reserve as potential monitoring points and sampling points for future aquifer and water quality testing. These would not be considered for abandonment. The operation of well USDA-12 has caused excessive drawdown and subsequent cavitation. This well is planned to be equipped with a variable frequency drive (VFD) to facilitate flow control and restriction (Etegra, Inc., 2020).

The 2020 Phase 1 Water Supply Evaluation documents the presence of two additional residential wells in the vicinity of the NCWMAC property; the Pinkham residential well located northwest of the facility in the lower region, and the Joy residential well located east of the facility in the upper region (Etegra, Inc., 2020).

NCWMAC and CCAR facilities share water resources and currently obtain potable freshwater from wells USDA-1 and USDA-7. Neither USDA-1 or USDA-7 are currently permitted for drinking water purposes but are used for potable water and water supply for research purposes (Etegra, Inc., 2020). Since the facilities are currently not working at full capacity due to Covid-19 restrictions and have a combined employee count of less than 25 people, a permit is not required.

Well USDA-1 is periodically tested for a limited number of drinking water parameters, but USDA-7 is not. Previous reports of water quality testing performed in 2003 indicated that USDA-1 exceeded the maximum contaminant levels (MCLs) for arsenic; however, the most recent data from February 2020 indicates that the arsenic levels are below the MCLs (Etegra, Inc., 2020).

The facility does not have equipment capable of monitoring groundwater withdrawals, either individually or collectively, and does not have the equipment to monitor water levels in wells. Potable water at the facility is not treated.

Well water is continuously added to the recirculating aquaculture system to keep the water at an appropriate quality. There are no flow meters on the wells to measure the capacity of water withdrawal. However, all water that is discharged out of the facility into Taunton Bay is measured with a flow meter. This measurement gives the total well water usage per day, after the subtraction of the small amount of sea water usage. Sea water comes from the bay and is used in certain systems based on fish needs. The measured discharge, including sea water, is approximately 140 to 200 gpm, indicating that approximately 200 gpm are simultaneously being added to the aquaculture system. About 5,000 gpm are filtered and recirculated in the system itself. Only enough new water is added to counteract evaporation and to dilute impurities in the water (e.g., nitrates) so that the water clarity and quality supports the health of the salmon. As mentioned previously, in the original design for fish rearing, 98 percent of water used was to be recirculated; currently, approximately 96 percent of water is recirculated.

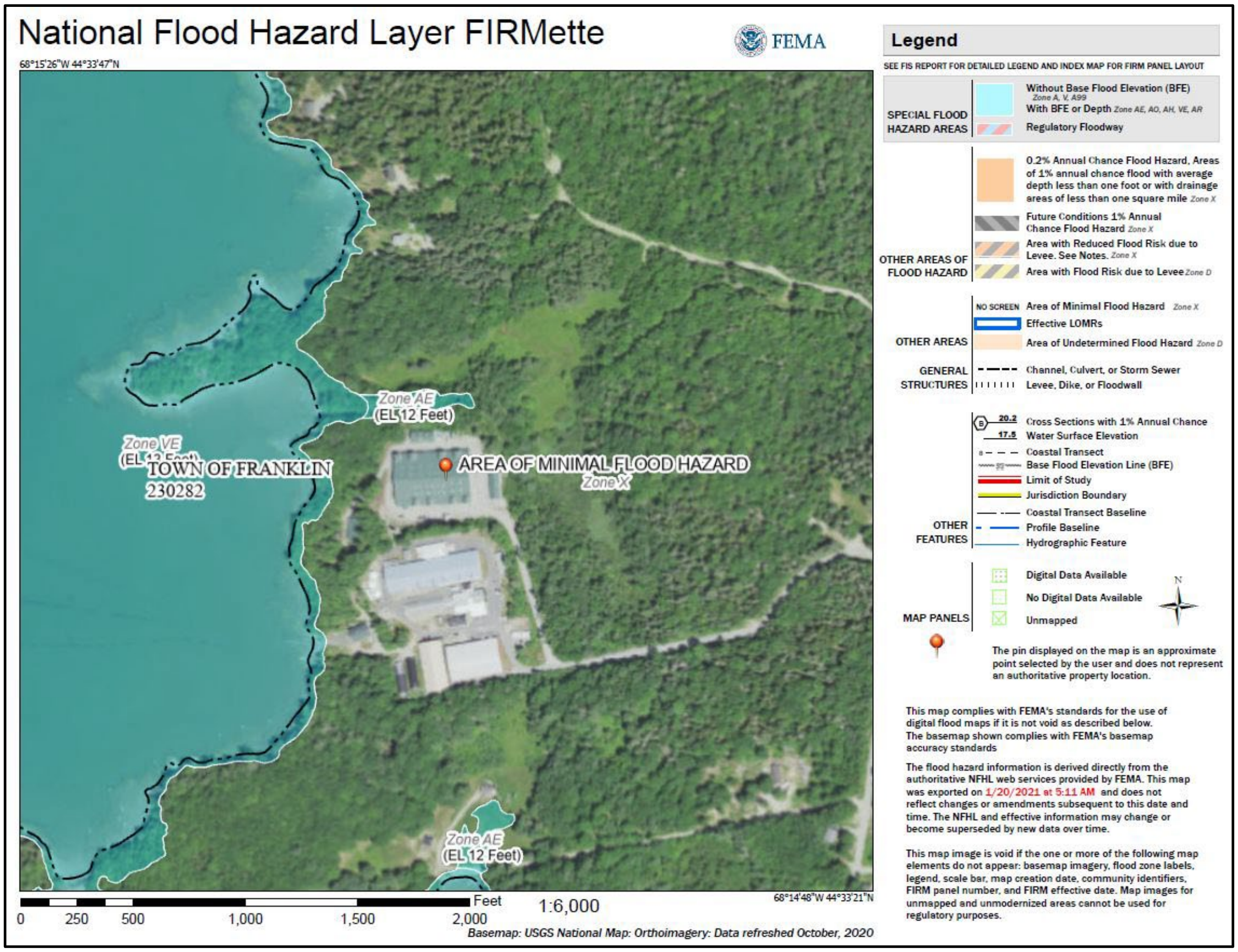
Wetlands

EO 11990, Protection of Wetlands, states that each agency “shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency’s responsibilities”.

A wetland delineation of the project area was conducted in October 2021 (Etegra, Inc., 2021). The intent of this survey was to identify wetlands, as well as other waters of the U.S., so as to avoid placing any new wells or the solar array in areas that could impact them. The survey found approximately 4.95 acres of wetlands and 595 linear feet of stream (Figure 3-1). Except for a pond and possibly one isolated emergent wetland, wetlands and waters appear to meet federal jurisdictional criteria (Etegra, Inc., 2021). According to the Cowardin Classification System (USFWS, 1979), these wetlands comprise Palustrine System habitat types including palustrine scrub-shrub (PSS), palustrine forested (PFO), and palustrine emergent (PEM).

Floodplains

A review of the Federal Emergency Management Agency’s (FEMA) “Flood Insurance Rate Map” (FIRM) for Hancock County was conducted to evaluate if planned construction is within the 100-year floodplain (see **Figure 3-2**).



Source: FEMA, 2020

Figure 3-2. Floodplain Map of the USDA ARS NCWMAC Property

The project area lies in the vicinity of special flood hazard areas subject to inundation by the one percent annual chance flood. The one percent annual chance flood, also known as the base flood or 100-year flood, has a 1 percent chance of happening or being exceeded each year. Areas located in 100-year flood zones are highly prone to hazards from flooding and the populations, structures, facilities and other resources located in such zones are vulnerable to impacts from flood damages. The Base Flood Elevation (BFE) is the water surface elevation of the one percent annual chance flood. Special flood hazard areas for flood insurance rating, Zones AE and VE, occur at the project site. AE flood zones are areas that present a 1 percent annual chance of flooding. VE flood zones are areas that present a 1 percent annual chance of flooding but are associated with the additional hazard of storm waves. Zone AE lies less than 80 feet to the west of the proposed solar array site, whereas Zone VE extends over the Taunton Bay. None of the existing wells are located within a floodplain. **Table 3-7** provides a brief description of these zones and their corresponding BFE values (FEMA, 2019).

Table 3-7. Special Flood Hazard Areas at the Project Site

Zone	Description	Base Flood Elevation (ft)
AE	The flood insurance rate zone that corresponds to the one percent annual chance floodplains. BFEs derived from hydraulic analyses are shown within this zone	12
VE	Flood insurance rate zone that corresponds to high velocity water including waves; they are defined by the one percent annual chance (base) flood limits and wave effects 3 feet or greater. The hazard zone is mapped with BFEs that reflect the combined influence of stillwater flood elevations, primary frontal dunes, and wave effects 3 feet or greater.	13

Source: FEMA, 2019

3.3.2 Environmental Consequences

This section describes the potential impacts associated with the Proposed Action and alternatives on the water resources within and surrounding the project area.

3.3.2.1 Alternative 1 – Proposed Action

Installation and Operation of Solar PV Array

Under the Proposed Action, a solar array would be installed in an existing corridor of already disturbed land with a footprint of approximately 3 to 4 acres immediately northwest of the NCWMAC building. Impacts to water resources would primarily result from the activities that would be undertaken during the construction and installation of the solar PV array. The water resources affected by the Proposed Action would be the wetlands and floodplains occurring in the project area due to their proximity to the construction site; however, the proposed solar array would not be installed within any wetlands or floodplains. Impacts to Taunton Bay would not occur due to its considerable distance (approximately 0.2 miles) from the proposed solar array installation site.

The impacts to water quality from the use of construction equipment would be adverse, localized, short-term, and of minor intensity. The use of construction vehicles would result in ground disturbances and movement of earth, exposing soils and increasing the likelihood of soil erosion and sediment delivery to the nearby wetlands and floodplains. This could result in localized turbidity increases and mobilization of fine sediments in wetlands and floodplains, resulting in the degradation of their water quality. Repeated disturbance of vegetation and soils (i.e., due to vehicle passes or foot traffic of construction personnel) during project activities, or the removal of vegetation, although limited, would also cause surface erosion. Measures to control erosion, sediment release, and stormwater runoff would be utilized during construction activities to minimize adverse impacts to water resources. Native vegetation would be planted in between the array modules following construction, thus stabilizing soils and improving water quality in nearby water resources.

Effects to water resources from accidental fuel spills during construction would be unlikely, but if they occurred would be adverse, localized, short-term, and of negligible intensity. Fuel products (petroleum, oils, lubricants) would be needed to operate the equipment used for construction. This poses some risk of an accidental fuel or chemical spill, which would adversely affect water quality if the spill were to enter groundwater or the neighboring wetlands and floodplain areas. To prevent accidental fuel or chemical spills, no refueling would occur near wetlands and floodplains. The fueling operation would be closely monitored and an emergency spill kit containing cleanup items would be readily available on site in the event of an accidental spill.

No adverse impacts to Coastal Zone water resources are expected to occur from the implementation of the Proposed Action at the project site. Site preparations, construction, and other activities associated with the Proposed Action would occur in a manner consistent with all applicable enforceable policies listed in Maine's Coastal Program. As required by the CZMA, a Consistency Determination would be prepared for concurrence of findings by the MDEP for the Proposed Action.

Given that the area of disturbance during construction would exceed one acre, installation of solar PV array may require coverage under the Maine Construction General Permit (MCGP) from the MDEP to regulate the discharges of stormwater from construction activities.

MDEP has determined that the existing uses of Taunton Bay would be maintained and protected and the discharge would not cause or contribute to the failure of the waterbody to meet standards for Class SB classification for NCWMAC's current operations (MDEP, 2016). A third-party laboratory tests the effluent twice per month. NCWMAC has not reported any instances of non-compliance with permit conditions thus far. No changes to the present designated uses of the Taunton Bay or to its classification are expected to occur upon implementation of the Proposed Action.

Rehabilitation of Existing Wells

Impacts on water resources from rehabilitation of existing wells would likely be adverse, regional, long-term, but of negligible intensity. The rehabilitation of existing wells through updated pumping apparatus or hydrofracturing could reduce current freshwater flows at the wetlands and floodplains in the project area and could adversely impact the wetland and floodplain vegetation and habitat. However, rehabilitation would be evaluated and coordinated to avoid widespread impacts to groundwater levels within the region.

Adverse impacts from increased pumping capacity, such as drawdown and subsequent saltwater intrusion, and reduced water supply from neighboring residential wells are expected to be regional, long-term, and of minor intensity. The increases in the pumping efficiency of the rehabilitated wells and the greater quantities of groundwater pumped compared to current levels could, over the long term, lead to drawdowns and the intrusion of saltwater into regional groundwater. This would be of particular concern in relation to the rehabilitation of wells in the lower region, which could adversely impact the groundwater quality by increasing its salinity and affecting the operations at the NCWMAC facility. Saltwater intrusion into local wetlands and floodplains could adversely affect the vegetation and habitat in these areas. However, rehabilitation would be specifically evaluated and coordinated to avoid widespread drawdown and saltwater intrusion within the region, such as by routinely testing the quality of the pumped groundwater and halting operations if intrusion occurs.

The use of wells following rehabilitation, particularly the wells in the upper region, would exert influence on nearby private wells, potentially impacting the neighbors' water supply. In such a situation, the neighboring wells may need to be drilled deeper, or the pumping equipment may need to be updated. Previous permits for the facility required NCWMAC to submit a copy of the agreements between NCWMAC and the adjacent property owners to the DEP, documenting how the landowners would be accommodated in the event of adverse impacts from the NCWMAC operations. Such agreements may need to be updated (Etegra, Inc., 2020).

The adverse impacts on water resources in the project area from hydrofracturing would be regional (extending to neighboring wells), long-term, and of minor intensity. If existing wells at the facility are rehabilitated via hydrofracturing, it is possible that water levels in the neighboring wells would drop immediately following the hydrofracturing process. This would be temporary and the water level in neighboring wells would be expected to return to normal levels. However, as mentioned above, increased pumping efficiency could ultimately lead to saltwater intrusion into the regional groundwater and permanently impact the neighboring wells in the long term. No impacts to water quality are anticipated since the contractor would use only disinfected/chlorinated water for the hydrofracturing process. If hydrofracturing is to occur in the existing wells, a Notice of Intent to Hydrofrack would be required to send to the adjacent landowners from the State of Maine Water Well Commission (Etegra, Inc., 2020).

Additionally, as mentioned in Section 3.3.1, wells USDA-1 and USDA-7 are not currently permitted for drinking water purposes. If the facilities return to a full employee count of 25 or more post-Covid-19, USDA-1 and potentially USDA-7 would be permitted as a Non-community, Non-transient public water system with approval from the Maine Drinking Water Program (DWP) in the Department of Health and Services. Appropriate testing, operating procedures, and inspections would be required (Etegra, Inc. 2020)[1] following the permitting process.

In addition, additive disturbance could potentially occur if rehabilitation of existing wells occurred simultaneously with the construction of the solar array. However, given the short duration of rehabilitation activities and isolated nature of existing wells, additional disturbance from rehabilitation activities is expected to be minimal. Rehabilitation and construction activities could also potentially be sequenced to avoid the occurrence of additive disturbance impacts.

Installation and Operation of New Wells

Direct adverse impacts to water resources from the installation and operation of new groundwater wells are expected to be localized, short-term, and of minor intensity. The installation and operation of new groundwater wells would directly remove small areas of standing vegetation for the lifetime of the wells. However, wells would be specifically sited to avoid wetlands, floodplains, and the clearing of large areas of vegetation. The impacts from construction equipment and the presence of construction personnel on water resources would be similar to those described above under the installation and operation of solar PV arrays, including the requirement for a MCGP if the area of disturbance exceeds 1 acre.

Impacts from installation and operation of new wells on drawdown and subsequent saltwater intrusion and/or the neighboring wells would be similar to those described above under rehabilitation of existing wells, i.e., adverse, regional, long-term, and of minor intensity. Depending on where the wells are sited, there could be a risk of drawdown and saltwater intrusion into the regional groundwater system (siting in the lower region) or adversely impacting the neighbors’ water supply (siting in the upper region). There may also be a need to apply for a Non-community, Non-transient public water system permit from the Maine DWP.

[1] A non-community public water system is one that serves at least 25 of the same persons for 6 months or more per year.

Any new well installed at the project site and withdrawing at least 75,000 gallons of groundwater per week or 50,000 gallons of groundwater on any day would be regulated under the Natural Resources Protection Act (NRPA) and would require a permit from the MDEP prior to their establishment and operation.

Installation of wells deeper than 500 feet would increase the chances of encountering elevated levels of radionuclides (uranium, radium, and radon), as well as arsenic. Aquifer testing would be required for such wells to determine the need for water treatment measures to address the elevated concentrations of arsenic, uranium, radium, and/or other related compounds. Water discharged from such wells may also need to be treated. Depending on the use of the water (potable water or process water), the Maine Geological Survey, the MDEP, and/or local regulators may have additional testing requirements, particularly for potable water (Etegra, Inc., 2020).

Once the location of the wells is determined, a Site Location Development Act application would need to be submitted to enable review of the proposed project. The well driller would be required to submit a completed Setback Reduction Notification Form for all wells drilled less than 100 feet from a disposal field, or 60 feet from a septic tank or holding or lifting station (Etegra, Inc., 2020).

As with well rehabilitation, additive disturbance could potentially occur if installation of new wells occurred simultaneously with the construction of the solar array. Rehabilitation and construction activities could potentially be sequenced to avoid the occurrence of additive disturbance impacts.

3.3.2.2 Alternative 2 – Installation of Solar PV Array only

The impacts of Alternative 2 would be similar to those impacts discussed above for the installation and operation of solar PV arrays under Alternative 1. Since these impacts would be localized in extent, short-term in duration, and negligible to minor in intensity, the overall impact of Alternative 2 on water resources would be adverse, localized, short-term, and minor in intensity.

3.3.2.3 Alternative 3 – Restoration of Groundwater Yield Only

The impacts of Alternative 3 would be similar to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1. Since these impacts are all localized to regional in extent, short-term to long-term in duration, and negligible to minor in intensity, the overall impact of Alternative 3 on water resources would be regional, long-term, and minor in intensity. Overall, the impacts to water resources under Alternative 3 would be greater in magnitude compared to Alternative 2 primarily due to the risk of long-lasting impacts on the regional groundwater resources from saltwater intrusion.

3.3.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated and no wells would be rehabilitated or developed at the NCWMAC site. Pumping of groundwater from existing wells would continue to have drawdown impacts on the aquifer and the neighboring residential wells. If the facilities return to a full employee count of 25 or more post-Covid-19, USDA-1 and potentially USDA-7 would need to be permitted as a Non-community, Non-transient public water system with approval from the Maine DWP. Appropriate testing, operating procedures, and inspections would be required (Etegra, Inc. 2020) following the permitting process. Beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the fishery research mission at the facility. Cost savings related to the decreased need to purchase electricity from the local provider would not be realized.

3.4 Geology and Soils, Topography, and Seismicity

This section describes the existing geology and soils, topography, and potential for seismicity within the project area and the potential for the implementation of the project to affect these resources within the project area. The project area for the analysis of geology and soils, topography, and seismicity is the 27.2-acre NCWMAC site.

3.4.1 Affected Environment

The affected environment for geology and soils, topography, and seismicity describes the current setting for these resources in the project area and surrounding region.

Geology and Topography

The project area is located in Hancock County, Maine, which is in the coastal area of the New England Uplands section of the New England Physiographic Province (NRCS, 1998; USGS, No Date). The New England Province is a northward extension of the larger Appalachian Mountains or Highlands region. It is a plateau-like upland that rises steadily inland from the coast and is crowned by mountain ranges or peaks (USFWS, 1997). It is made up of highly deformed Precambrian and Paleozoic metamorphic rocks including gneisses, schists, slates, quartzite, and marble. The Precambrian rocks occur primarily in the western and southern regions of the Province, while Paleozoic sedimentary and metasedimentary (metamorphosed sedimentary) rocks make up the rest of the region. In certain areas, erosion has exposed substantial masses of coarsely crystalline Paleozoic granite. The Province shows depositional and erosional effects of glacial ice from the glaciation that occurred during the Pleistocene epoch (NPS, 2018).

The New England Uplands section is "an upraised peneplain bearing occasional monadnocks and dissected by narrow valleys" (USGS, No Date). The area consists of till-mantled, rolling to undulating hilly topography in the northern part and gently sloping valleys terminating in coastal lowlands in the southern part. The coastal valleys are covered by two types of sediments: glaciolacustrine and glaciomarine. Local relief ranges from sea level to 1,528 feet above sea level at the larger mountains in the area (NRCS, 1998). The overall relief at the project site ranges from approximately 0 feet above mean sea level (AMSL) on the coast to approximately 80 feet AMSL on the eastern side of the USDA facility (Etegra, Inc., 2020).

The geology of the bedrock and surficial materials influences the natural quality of surface and groundwater resources and the interaction between the surface and ground waters. Bedrock geology reflects a wide variety of complex geologic processes – sedimentation, deformation, metamorphism, igneous activity, and erosion (USGS, No Date). The project area has two different bedrock geologic formations, distinguished by rock type and age: Cambrian and Precambrian-Ordovician (MEGS, 2002). The entire project area is underlain by Devonian granite. The granite is described as a muscovite-biotite granite with abundant metasedimentary inclusions. It is part of the Lucerne Pluton, which is documented to produce elevated concentrations of uranium, radon, and arsenic concentrations, particularly in deeper wells (Etegra, Inc., 2020).

Most surficial materials in Maine are deposits formed by glacial and deglacial processes during the last stage of continental deglaciation, which began approximately 25,000 years ago. The remaining surficial materials are products of postglacial geologic processes such as river floodplains or are the result of human activities such as fill or other land-modifying features. The project area is marked by the presence of moraine ridges and Pleistocene (postglacial deposits formed during glacial to late-glacial time, prior to 10,000 years before present) till deposits; a light- to dark-gray nonsorted to poorly sorted mixture of clay, silt, sand, pebbles, cobbles, and boulders. These deposits are generally less than 3 m thick (MEGS, 2012).

Coastal bluffs are present along portions of the western boundary of the project area. A bluff is a steep shoreline slope formed in sediment (loose material such as clay, sand, and gravel) that has three feet or more of vertical elevation just above the high-tide line (DACF, No Date-b). The project area contains stable bluff, i.e., gently sloping bluff with continuous cover of grass, shrubs, or mature trees. A relatively wide zone of ledge or sediment occurs at the base of the bluff. The shoreline at or below the high-tide line is characterized as beach/flat with sediments ranging in texture from mud (tidal flats) to cobbles (gravel beaches) and may include small rocky outcrops or small patches of vegetation (MEGS, 2005).

Soils

The type of soils occurring in the project area are described below in **Table 3-8**.

Table 3-8. Types of Soils Present at the Project Site

Soil Unit Symbol	Soil Unit Name	Slope	Soil Unit Description
BwC	Buxton silt loam	8 to 15 percent	Very deep, strongly sloping, moderately well drained soil in coastal lowlands and river valleys. Slopes are smooth and convex.
LaB	Lamoine silt loam	3 to 8 percent	Very deep, gently sloping, somewhat poorly drained soil in coastal lowlands and river valleys. Slopes are smooth and convex.
LbB	Lamoine-Scantic complex	0 to 8 percent	Very deep, nearly level to gently sloping unit in coastal lowlands and river valleys. The Lamoine soils are on small knolls, and the Scantic soils are in depressions. Slopes are smooth and slightly convex on Lamoine soils and slightly concave on the Scantic soils. The unit consists of about 45 percent somewhat poorly drained Lamoine soils, 40 percent poorly drained Scantic soils, and 15 percent other soils.
LCB	Lamoine-Scantic-Buxton complex	0 to 15 percent	Very deep, nearly level to strongly sloping soils on coastal wetlands and river valleys. The Lamoine and Buxton soils are on small knolls and ridges surrounded by the nearly level Scantic soils. Slopes are smooth. The unit contains about 35 percent somewhat poorly drained Lamoine soils, 30 percent poorly drained Scantic soils, 20 percent moderately well drained Buxton soils, and 15 percent other soils.
The	Monadnock and Hermon soils	15 to 45 percent	Very deep, hilly to steep unit on side slopes of ridges of ground moraine mainly in coastal areas. Up to 3 percent of the surface of the soil is covered with stones. Slopes are complex. This unit is about 45 percent somewhat excessively drained Hermon soils, 35 percent well drained Monadnock soils, and 20 percent other soils.

Soil Unit Symbol	Soil Unit Name	Slope	Soil Unit Description
Sa	Scantic silt loam	0 to 3 percent	Very deep, nearly level, poorly drained soil in low areas on coastal lowlands and along streams and rivers. Slopes are smooth and slightly convex.

Sources: NRCS, 2020; NRCS, 1998

Seismicity

Seismic activity in Maine is typical of the Appalachian region of northeastern North America. There is a low but steady rate of earthquake occurrence in the state. Earthquakes are presumably caused by modern stress being released occasionally along zones of weakness, such as faults, in the earth's crust, but a more specific cause is not currently known (MEGS, 2015).

During the groundwater resources investigation study conducted between 2002-2003, W&C examined aerial photographs of the NCWMAC and CCAR sites taken in 1955, 1966, and 1981 to identify photolineaments. Photolineaments are lines that can be observed on aerial photographs as contrasts in color, tone, etc. and are often associated with bedrock structural features such as faults, fracture zones, intrusive basalt dikes, and bedrock contacts. The most prominent lineament on the site is a north-northeast trending lineament that bisects the property, extending from a small inlet south of the site to another small inlet north of the site. There are five smaller lineaments observed on the site that are generally oriented east west, all but one of which do not traverse the entire property (W&C, 2003).

3.4.2 Environmental Consequences

This section analyzes the direct and indirect impacts of the Proposed Action and alternatives on the geology, soils, topography, and seismicity within the project area.

3.4.2.1 Alternative 1 – Proposed Action

Installation and Operation of Solar PV Array

There would be no adverse impacts to geology, topography, and seismicity during the installation and operation of the solar PV array since disturbance would be restricted to the ground surface.

Impacts to soil resources would be adverse, localized, short-term, and of minor intensity. During installation of the solar PV array, construction vehicles would clear vegetation and disturb soils to install supports for the array. Construction vehicles would also be used to transport the components of the array to the installation site on the NCWMAC property. The use of construction vehicles would result in ground disturbances and movement of earth, leading to detachment of soils and transport of freshly disturbed soils in wind and stormwater flow. Construction equipment and foot traffic from construction personnel may compact the soils, reducing soil moisture and potentially resulting in increased runoff and erosion. Erosion and sediment control measures would be implemented to minimize adverse impacts to soils in the project area. Soil exposure and potential erosion following construction would be minimized by clearing only those portions of the site required, leaving existing vegetation in place where possible. The soils would be stabilized by revegetating the impacted areas with native vegetation.

The disturbance of soils is likely to create habitat for colonization by invasive species. Appropriate measures would be implemented, such as frequent cleaning and inspection of construction equipment, to prevent the introduction of invasive species at the project site. Spills and leaks of hazardous materials during construction, such as fuel and grease, although unlikely could cause soil contamination and toxicity. Proper control of hazardous materials during construction and prompt response to spills or releases would, however, minimize these impacts, resulting in negligible adverse effects to soils.

Overall, impacts of installing the solar PV array on soils would be adverse, localized, short-term, and minor in magnitude if the above-mentioned measures are taken to minimize impacts.

Rehabilitation of Existing Wells

Impacts to soil resources would be adverse, localized, short-term, and of minor intensity. Under Alternative 1, groundwater yield at the facility would be restored by rehabilitating the existing wells either through updated pumping apparatus or hydrofracturing. Both rehabilitation methods would require the use of construction equipment, which would result in impacts to soil resources; however, no impacts to geology, topography, and seismicity are expected. The use of construction vehicles would result in ground disturbances and movement of earth, leading to detachment of soils and transport of freshly disturbed soils in wind and stormwater flow. Construction equipment and foot traffic from construction personnel may compact the soils, reducing soil moisture and potentially resulting in increased runoff and erosion. Erosion and sediment control measures would be implemented to minimize adverse impacts to soils in the project area. Soil exposure and potential erosion following construction would be minimized by clearing only those portions of the site required, leaving existing vegetation in place where possible. The soils would be stabilized by revegetating the impacted areas with native vegetation.

The disturbance of soils could create habitat for colonization by invasive species. Appropriate measures would be implemented, such as frequent cleaning and inspection of construction equipment to prevent the introduction of invasive species at the project site. Spills and leaks of hazardous materials during construction, such as fuel and grease, although unlikely could cause soil contamination and toxicity. Proper control of hazardous materials during construction and prompt response to spills or releases would, however, minimize these impacts, resulting in negligible adverse effects to soils.

The impact of hydrofracturing on geology and seismicity would be adverse, regional, long-term, and minor. Rehabilitation of wells via hydrofracturing would impact the bedrock geology at the selected well sites by increasing the size of the fractures from which groundwater is withdrawn and extending them further into the formation to increase the network of water bearing fractures supplying water to the well. The injection of high-pressure water via drilled wells into the rock formations surrounding them could lead to induced seismicity, resulting in tremors or even earthquakes; however, the likelihood of this occurring would be extremely low. A licensed contractor would be hired to conduct hydrofracturing and measures would be taken to avoid or minimize adverse impacts to the site’s geology and groundwater resources. Hydrofracturing is not expected to have any impacts on soils and topography.

Additive disturbance could potentially occur if rehabilitation of existing wells occurred simultaneously with the construction of the solar array. However, given the short duration of rehabilitation activities and the isolated nature of existing wells, additional disturbance from rehabilitation activities is expected to be minimal. Rehabilitation and construction activities could also potentially be sequenced to avoid the occurrence of additive disturbance impacts.

Installation and Operation of New Wells

Adverse impacts from the presence and operation of construction equipment are expected to be adverse, localized, short-term, and minor. Impacts resulting from the use of construction equipment and the presence of construction personnel on soils would be similar to those described above related to the rehabilitation of new wells. As discussed above, construction equipment would not impact geology, topography, or seismicity.

As noted in Section 3.4.2.1, installation of wells deeper than 500 feet would increase the chances of encountering elevated levels of radionuclides (uranium, radium, and radon), as well as arsenic in groundwater due to the nature of the bedrock geology of the project area. Aquifer testing would be required for such wells to determine the need for water treatment measures to address the elevated concentrations of arsenic, uranium, radium, and/or other related compounds. Water discharged from such wells may also need to be treated.

Adverse impacts from the drilling of new wells and hydrofracturing on soils, geology and seismicity would be adverse, regional, long-term, and minor. Drilling of new wells to intercept water-bearing fractures in the bedrock would impact the geology of the bedrock and would lead to localized soil disturbances at the site of the drilled well. If hydrofracturing is used to improve the yield of the newly drilled wells, impacts would be similar to those described above under rehabilitation of existing wells. Impacts to topography are not anticipated.

3.4.2.2 Alternative 2 – Installation of Solar PV Array only

The impacts of Alternative 2 would be similar to those discussed above for the installation and operation of solar PV arrays under Alternative 1. The overall impact of Alternative 2 on soils would be adverse, localized, short-term, and minor in intensity.

3.4.2.3 Alternative 3 – Restoration of Groundwater Yield Only

The impacts of Alternative 3 would be similar to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1. Since these impacts would be localized to regional in extent, short-term to long-term in duration, and minor in intensity, the overall impact of Alternative 3 on geology, soils, topography, and seismicity would be regional, long-term, and minor in intensity. Overall, impacts to these resources under Alternative 3 would be greater compared to Alternative 2, particularly if restoration of groundwater yield occurs via hydrofracturing or by drilling of new wells on the NCWMAC property.

3.4.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment would remain constant; geology and topography, soils, and seismicity would not be adversely impacted. However, beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the research mission at the facility and reduced reliance on nonrenewable energy.

3.5 Land Use and Visual Resources

Land use refers to the management practices for a given plot of land in terms of its use by humans (e.g., residential, commercial, agriculture, etc.). Visual resources are those visible natural or manmade elements of a landscape that are particularly valued by a community or protected by law. Examples of visual resources include scenic water or land formations, trees, parks, buildings or clusters of buildings, and other distinctive manmade elements such as bridges or public art installations. Land use and visual resources are linked through their contribution to the visual setting of a given area. Alterations to this setting can occur through physical changes in land use within the setting or manipulation of viewing conditions (e.g., light or glare conditions) within a given area, or both. This section discusses the affected environment and environmental consequences that would result under each alternative for land use and visual resources within in the project area. The project area for the evaluation of visual resources encompasses the potential location of the solar PV array, new or existing groundwater wells, and their potential viewshed.

3.5.1 Affected Environment

Land use within the project area is predominantly undeveloped, although the proposed site of the solar array was historically used for agriculture before the establishment of NCWMAC. Land cover present within the project area is characterized by a mix of previously disturbed land, open field areas, mixed forest cover, and small existing groundwater wells which represent impervious cover. Standing vegetation (mature spruce-fir forest cover) and local topography obstruct views of the project area and the project area is not currently visible from the surrounding roads or bays.

The NCWMAC property is adjacent to Taunton Bay, which hosts a variety of recreational users including both residents and visitors to the area. Visually, these users are accustomed to the natural features of Taunton Bay, although several isolated coastal residences have been built along the Taunton Bay coastline north of the project area. The closest sites listed on the National Register of Historic Places (NRHP), Granite Store and the Gavin Watson site, are situated over 2 miles away from the project area (NPS, 2012). Although Taunton Bay is encircled by coastal highways and roads, several of which are within the viewshed of the project area, no designated scenic byway is present within 2 miles of the project area (USDOT, No Date). There are no designated national areas or National River Inventory designated wild and scenic river segments within 2 miles of the project area (NPS, 2019). Franklin Memorial Park is the sole designated recreational area within the potential viewshed of the project area. The closest residential areas that would potentially have views of the project area are predominantly shielded by topography and forests.

3.5.2 Environmental Consequences

This section describes the potential impacts of the Proposed Action and alternatives on land use and visual resources within and surrounding the project area.

3.5.2.1 Alternative 1 – Proposed Action

Impacts to land use and visual resources could potentially result from the installation and operation of the solar PV array, rehabilitation of existing wells, and installation and operation of new wells under Alternative 1.

Installation and Operation of Solar PV Array

The construction and operation of the ground-mounted solar array would convert roughly 3-4 acres of undeveloped land within the project area to utility use for the lifetime of the project. Much of this area has been previously disturbed and the removal of native woody vegetation would be avoided to the extent possible. Non-woody and low-growing vegetation would be planted in areas between solar panels to minimize the conversion of open field areas to impervious surface. Given the relatively small area of the proposed solar array, the previously disturbed nature of the field, the avoidance of wetlands, minimal woody vegetation removal, and mitigation planting, this conversion is not expected to appreciably alter the prevailing land cover patterns of the converted use area. As such, adverse impacts to land use from the installation of impervious surfaces are expected to be localized, long-term, and of negligible to minor intensity.

Once constructed, the solar array would likely only be visible from small sections of Taunton Bay Shores Road and Little Cove Road if at all, making it unlikely to contribute any adverse impacts to the visual setting of the project area. Based on the prevailing topography and surrounding forest cover, the final array would not be within the viewshed of any national historic properties, designated natural areas, national scenic byways, wild and scenic rivers, or from Taunton Bay itself. Glare from the PV panels may be visible from some small sections (less than half a mile) of Taunton Bay Shores Road and Little Shores Road, however the panels themselves would likely not be visible from these areas or any local residences given the surrounding mixed forest vegetation. As such, no adverse impacts are expected to occur to visual resources from the final solar PV array or its operations.

Large construction machinery used during the installation period of the project would likely be visible from Taunton Bay, small sections of Taunton Bay Shores Road and Little Cove Road, and several coastal residences, and could result in short-term degradation of the visual character of the project area. Cranes and large earthmoving equipment could potentially rise above the topographical limitations and tree line of the project area and would likely be visible from Taunton Bay Shores Road, Little Cove Road, and from the water of Taunton Bay. The presence of this equipment would likely detract from the natural visual setting of Taunton Bay. However, these adverse impacts would not persist beyond the conclusion of the construction period and would likely only serve as a temporary annoyance to residents and visitors. As such, the impact to visual resources from large construction equipment is expected to be localized, short-term, and of negligible to minor intensity.

Rehabilitation of Existing Wells

The rehabilitation of existing wells through updated pumping apparatus or hydrofracturing could theoretically reduce current freshwater flows at local streams, rivers, and wetlands of the region or increase saltwater intrusion and subsequently alter the total amount of wetland and riparian cover areas and their resulting visual quality. Reduction of flows in these areas would reduce their suitability for reliant species of wetland and riparian plants and eventually result in the establishment of other cover types. However, rehabilitation activities would be evaluated and coordinated to avoid widespread impacts to groundwater levels within the region (see Section 3.4 for more information). Any reduction of flows would be minimal at most and would not likely appreciably alter land use, cover, or visual quality of the area.

Construction-related impacts to visual resources from the presence of large machinery during rehabilitation activities would be similar to those listed above for the construction of solar arrays. Given the short duration of rehabilitation activities and isolated nature of existing wells, any additional disturbance from the simultaneous presence of equipment is expected to be minimal. The sequencing of construction and rehabilitation activities would prolong the presence of construction equipment within the viewshed of the project and would likely prolong the occurrence of negative impacts to visual resources. Adverse impacts from the presence of heavy machinery during the rehabilitation of existing wells is expected to be localized, short-term, and of negligible intensity.

Installation and Operation of New Wells

The installation and operation of new groundwater wells would convert very small areas of undeveloped land to utility land use. These new wells would replace very small areas of vegetated, mixed forest cover (approximately 12-inch diameter areas) with impervious surface for the lifetime of the wells. Wells would be sited to avoid wetlands and the clearing of large areas of vegetation. The replacement of these vegetated areas is not expected to appreciably impact the prevalence of any given cover type. As such, direct adverse impacts to land use from the installation and operation of new groundwater wells is expected to be localized, long-term, and of negligible to minor intensity.

Groundwater impacts and construction-related impacts to visual resources from the development of new groundwater wells would be similar to those listed above for the rehabilitation of groundwater wells; either option would involve the presence of heavy machinery within the project area and could potentially impact regional groundwater. However, as with the rehabilitation option, the potential location of any new wells would be evaluated and coordinated to avoid widespread impacts to groundwater within the area and any simultaneous presence of additional heavy machinery from both the installation of new wells and the installation of solar panels is not expected to appreciably increase the magnitude of any associated impacts to visual resources.

Since the impacts to visual resources from the installation and operation of new groundwater wells under Alternative 1 would be localized in extent, range from short-term to long-term in duration, and from negligible to minor in intensity, and the impacts from the installation and operation of the solar PV array would be localized in extent, range from short-term to long-term in duration, and would be negligible to minor in intensity, the overall impact of Alternative 1 on land use and visual resources would be localized, long-term, and minor in intensity.

3.5.2.2 Alternative 2 – Installation of Solar PV Array only

The impacts of Alternative 2 would be identical to those impacts discussed above for the installation and operation of solar PV arrays under Alternative 1 without the additional impacts posed by the restoration of groundwater yield. Since these impacts would be localized in extent, short-term to long-term in duration, and negligible to minor in intensity, the overall impact of Alternative 2 on land use and visual resources would be localized, long-term, and minor in intensity.

3.5.2.3 Alternative 3 – Restoration of Groundwater Yield Only

The impacts of Alternative 3 would be identical to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1 without the additional impacts posed by the installation of the solar PV array. Since these impacts would be localized to regional in extent, short-term to long-term in duration, and negligible in intensity, the overall impact of Alternative 3 on land use and visual resources would be localized, long-term, and negligible in intensity.

3.5.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment would remain constant; no land use patterns or visual resources would be adversely impacted by the installation of solar panels or groundwater wells, the presence of heavy machinery, or altered groundwater conditions. However, beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the research mission at the facility and reduced reliance on nonrenewable energy.

3.6 SOCIOECONOMICS

This section discusses the affected environment and environmental consequences that would result under each alternative for the social and economic environment of the project area and surrounding counties, which are together defined as the region of influence (ROI) for the socioeconomic analysis.

3.6.1 Affected Environment

The project area occurs within the small municipality of Franklin in Hancock County, Maine. For the purposes of this socioeconomic analysis, four census blocks (230099657001, 230099667001, 230099657002, 230099667004) encompassing the small municipalities of Franklin, Sullivan, Schoodic, and Sorrento were defined as the Region of Influence (ROI) due to their similar population sizes and the interdependent nature of their economies. Socioeconomic data are also provided for Hancock County as a point of reference.

The ROI has a current population estimate of 5,238 people, which is approximately 9.5 percent of the 54,987 that currently live in Hancock County (USEPA, 2020-a; USEPA 2020-b). The per capita income of the ROI is $25,946, which is 17 percent lower than the $31,178 per capita income of Hancock County. The unemployment in the ROI is 1 percent higher than that of the County, at 4 percent and 3 percent respectively. Roughly 75 percent of homes are owner-occupied in each area.

3.6.2 Environmental Consequences

This section describes the potential impacts of the Proposed Action and alternatives on the social and economic environment within and surrounding the project area.

3.6.2.1 Alternative 1 – Proposed Action

Installation and Operation of Solar PV Array

Construction of the 3-acre ground-mounted solar array would likely marginally increase construction expenditures within the ROI for the duration of the construction. This benefit would be largely confined to the awarded contractor as revenues at local businesses within the project are not expected to appreciably increase as a result of a small construction project over a short period of time. Given the small size of the project area, specialized technical knowledge required, and short time frame of the project, a significant number of jobs are not expected to be directly created within the ROI by increased demand for construction or indirectly created by increased retail demand. Furthermore, no populations are expected to migrate into the ROI to meet any increased demand that does occur. Therefore, the direct and indirect beneficial socioeconomic impact of the construction of the 3-acre ground-mounted solar array would likely be regional, short-term, and negligible in intensity.

The proximity of the project site to Little Cove Road and Taunton Bay Road could potentially increase traffic for local residents and visitors of Franklin for the duration of the construction period. Prolonged and periodic traffic delays from the transportation of heavy machinery, building materials, and construction waste or debris on these two-lane roads could potentially reduce resident and visitor access to local community or recreational resources in Taunton Bay. However, delays would likely only occur while large equipment occupied the roadway and would not persist beyond the duration of the construction period. Increased traffic is not expected to appreciably impact recreational values or quality of life within the ROI in the long term. As such, the direct and indirect adverse socioeconomic impact of increased traffic levels within the ROI would likely be regional, short-term, and negligible in intensity.

Increased noise levels, artificial lighting, and human activity during the construction period could disturb local fish and wildlife and displace them from the project area for the duration of the construction period. Increased noise levels, artificial lighting, and human activity during the construction period have the potential to temporarily disturb fish and wildlife in the immediate project area, causing them to concentrate for a short time on nearby properties, potentially increasing their recreational value and subsequent recreational spending. However, given the relatively short timeframe and small size of the project area, no social or economic effects would be anticipated from these movements. During the post-construction lifetime of the project, disturbance to fish and wildlife from maintenance activities would be minimal and no long-term effects to socioeconomic resources within the ROI are expected.

The construction and installation of solar arrays would reduce energy costs at the NCWMAC for the lifetime of the installation and could potentially result in the creation of a maintenance job within the ROI by the array owner. Upon the completion and operation of the arrays, the NCWMAC would purchase energy from the privately owned and operated arrays at a reduced market rate for a period of 20 years. Additionally, the owner of the array would potentially create up to 1 full-time equivalent (FTE) operations and maintenance job within the ROI to ensure the proper operation of the arrays for the entirety of their lifetime. However, these impacts would be largely marginal and would not appreciably impact the economy of Franklin or Hancock County; large numbers of jobs would not be created and other revenues within the ROI would not likely be impacted. As such, the beneficial socioeconomic impact of energy savings and job creation are expected to be localized, long-term, and negligible in intensity. As such, the overall impact of the installation and operation of solar arrays on would be localized, long-term, and of negligible intensity.

Rehabilitation of Existing Wells

Construction-related socioeconomic impacts from increased construction revenues, increased traffic, and increased fish and wildlife disturbance in the ROI during rehabilitation activities would be similar to those listed above for the construction of solar arrays. Revenues could marginally increase if rehabilitation of existing wells occurred simultaneously with the construction of the solar array, but the overall impact of the benefit would be largely the same. Given the short duration of rehabilitation activities, it is still not likely that increased revenues within the ROI would cause widespread increases in consumer demand. As with the installation of the solar PV array, the marginal increase in fish and wildlife disturbance is not expected to generate any social or economic impacts within the ROI. As such, beneficial socioeconomic impacts from the rehabilitation of existing wells are expected to be regional, short-term, and of negligible intensity.

The rehabilitation of existing wells through updated pumping apparatus or hydrofracturing could marginally reduce groundwater flows of the region or marginally increase saltwater intrusion and subsequently raise the cost of potable water within the area. Reduction of groundwater levels and saltwater intrusion from these efforts would likely marginally increase the pumping cost of potable water. Reduced freshwater flows at local streams, rivers, and wetlands could also marginally reduce their suitability for reliant species of wetland and riparian plants and eventually result in the reduction of recreational values and revenues. However, rehabilitation activities would be specifically evaluated and coordinated to avoid widespread impacts to groundwater levels within the region. Any reduction of flows would be minimal at most and would not likely appreciably alter groundwater pumping, land use, cover, or visual quality throughout the ROI. No adverse social or economic impacts are expected from alterations of groundwater.

Installation and Operation of New Wells

The beneficial economic impact of the additional construction revenues produced within the ROI during installation and operation of new groundwater wells would be similar to those produced during the installation and operation of solar panels. Local construction revenues could marginally increase if the installation and operation of new wells occurred simultaneously with the construction of the solar array, but the overall impact of the benefit would be largely the same. These additional construction activities would not likely create large numbers of jobs or stimulate overall consumer demand within the ROI.

The groundwater and construction-related impacts to socioeconomic resources from the development of new groundwater wells would be identical to those listed above for the rehabilitation of groundwater wells; either option could potentially marginally impact regional groundwater sources. However, as with the rehabilitation, potential location of any new wells would be specifically evaluated and coordinated to avoid widespread impacts to groundwater within the ROI. No adverse social or economic impacts are expected from alterations of groundwater. As such, the overall beneficial impact of well rehabilitation and installation and operation of new wells under Alternative 1 is regional, short-term, and negligible in intensity.

Since the beneficial impacts of all activities under Alternative 1 would be localized to regional in extent, range from short-term to long-term in duration, and would be negligible in intensity, the overall beneficial impact of Alternative 1 on socioeconomic resources within the ROI would be localized, long-term, and negligible in intensity. Since all adverse impacts to socioeconomic resources from all activities under Alternative 1 would be localized in extent, short-term to long-term in duration, and negligible in intensity, the overall adverse impact of Alternative 1 on socioeconomic resources within the ROI would be localized, long-term, and negligible in intensity.

3.6.2.2 Alternative 2 – Installation of Solar PV Array only

The socioeconomic impacts of Alternative 2 would be identical to those impacts discussed above for the installation and operation of the solar PV array under Alternative 1. Since these impacts would be localized to regional in extent, short-term to long-term in duration, and negligible in intensity, the overall impact of Alternative 2 on socioeconomic resources would be regional, long-term, and negligible in intensity.

3.6.2.3 Alternative 3 – Restoration of Groundwater Yield Only

The socioeconomic impacts of Alternative 3 would be identical to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1. Since these impacts would be localized to regional in extent, short-term to long-term in duration, and negligible in intensity, the overall impact of Alternative 3 on socioeconomic resources would be regional, long-term, and negligible in intensity.

3.6.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment would remain constant; no socioeconomic resources within the ROI would be beneficially or adversely impacted by the installation and operation of the solar PV array or restoration of groundwater yields. However, beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the research mission at the facility and reduced reliance on nonrenewable energy.

3.7 Utilities and Infrastructure

This section describes the existing utilities and support infrastructure within and adjacent to the project area and the potential for the implementation of the project to affect the utility usage and support infrastructure. For the purpose of analysis, it was determined that the project area includes utilities located on or adjacent to the 27.2-acre NCWMAC site and utilities used by the NCWMAC site.

3.7.1 Affected Environment

Numerous existing utilities and support infrastructure, including those for water, propane and electric, stormwater, septic, and communications are located on or near the site.

3.7.1.1 Water Utilities

The NCWMAC site is not connected to a municipal or private water provider; the fresh water, salt water, and brackish water required for facility operations is sourced from the onsite wells. In total there are 12 groundwater wells. The configuration of existing wells at the NCWMAC site is shown in **Figure 1-4**. Water quality is discussed in Section 3.3, Groundwater and Surface Water.

3.7.1.2 Electrical and Propane Utilities

Electricity at the NCWMAC site is provided by Versant Power, a regulated electric transmission and distribution utility. The yearly consumption of electricity is approximately 950,320 kWh. In fiscal year (FY) 2020, electricity consumption at the facility was 939,283.5 kWh. Electricity is needed to operate the onsite water pumps and wells and is vital to the facility's aquaculture operations. At any given time, the facility's well pump motors are drawing on average 33 amperes (amps) of electric current. Electricity is also consumed to power the facility's lighting and office electronics equipment. Currently, the electric grid providing electricity to the site is subject to brown outs and power outages that typically occur twice per month and last for several hours. During these outages, the facility relies on the use of a low sulfur diesel fuel powered 800-kW, 8.5 MMBtu/hr backup generator. In addition to operating during all power outages, the generator runs for a 30-minute exercise each week. In total, the generator was operated for 104.3 hours in 2018 and 87.9 hours in 2019.

The facility's main heating source is propane supplied by R.H. Foster Energy, who delivers the propane to two 1,000-gallon onsite tanks. The tanks are connected to the facility by 800-psi underground gas pipelines. In FY 2020, the facility used 8,000 gallons of propane.

3.7.1.3 Stormwater Infrastructure

Stormwater runoff from the NCWMAC property drains west into Taunton Bay which is part of the Atlantic Ocean. One stormwater drain is located on the property. The drain consists of a 24-inch (in) by 24-in square grate leading to a 16-in diameter culvert that discharges into a ditch on the facility property. There is less than 1 acre of impervious surface on the 27.2-acre property.

3.7.1.4 Septic

The facility uses a 1,500-gallon septic tank with a leach field. The contents of the septic tank are pumped as needed by a local septic contractor and delivered to the Ellsworth Wastewater Treatment Plant.

3.7.1.5 Telecommunication

The NCWMAC's telephone and cable are provided by private utilities. Telephone and cable lines are located aboveground on power poles until reaching a point near the main facility building, at which point they are connected to the building underground.

3.7.2 Environmental Consequences

This section describes the direct and indirect impacts of the Proposed Action and alternatives on utilities and infrastructure both within the project area and within the surrounding area.

3.7.2.1 Alternative 1 – Proposed Action

Installation and Operation of Solar PV Array

The operation of the 3-4-acre solar array would decrease demand on the local electrical utility for the entirety of the project life. The solar array is expected to produce 951,000 kWh annually, which would exceed the site's annual 950,320 kWh electric usage. The site would purchase the electricity produced for less than the current local utility, and excess electricity produced at any given time would be available to the grid through an agreement with the local utility provider. The operation of the solar array would provide the site and local area with a renewable source of electricity. As such, the impact to electrical utilities from the operation of the solar array equipment is expected to be beneficial, localized, long-term, and of moderate intensity.

The installation of framing to support the solar panels could potentially decrease the amount of stormwater that penetrates into the ground by adding impervious surface. This could increase the amount of stormwater runoff that flows into stormwater infrastructure for the entirety of the project life; however, the increase in impervious ground coverage would be negligible and mitigated by the planting of native vegetation between the array modules. The overall likelihood of stormwater-associated adverse events is not expected to appreciably increase from current conditions. As such, adverse impacts to stormwater infrastructure from increased stormwater runoff from the project area are expected to be localized, long-term, and of negligible intensity.

No impacts on utilities and infrastructure are expected from construction activities associated with the installation and operation of the solar PV array because construction contractors would adhere to BMPs and would be aware of the location of existing infrastructure. There is no propane, sewage, septic, or telecommunication infrastructure located within the 3-4-acre solar array area. As such, no adverse impacts are expected to occur to septic or telecommunication infrastructure from the installation and operation of the solar PV array.

The impacts from the installation and operation of the solar PV array on utilities and infrastructure would be localized and long-term and range from beneficial to adverse and negligible to moderate; since the beneficial impact is moderate and the adverse impact is negligible, the overall impacts on utilities and infrastructure would be beneficial, localized, long-term, and moderate.

Rehabilitation of Existing Wells

The rehabilitation of existing wells through the installation of new pumping equipment or hydrofracturing would increase the use of existing water infrastructure; however, rehabilitation would not increase the water flow beyond the design capacity of the existing infrastructure. During the installation of new equipment or the hydrofracturing process, water flow from the affected wells would likely be temporarily shut off. As such, adverse impacts to water utilities are expected to be localized, temporary, and of minor intensity. Once the well system is successfully rehabilitated, the efficiency of the system would increase considerably for the entirety of the life of the project. As such, beneficial impacts to water utilities are expected to be localized, long-term, and of moderate intensity.

No impacts are expected to occur to electrical, propane, stormwater, septic, or telecommunication utilities and infrastructure from the rehabilitation of existing wells through the installation of new pumping equipment or hydrofracturing.

The impacts from the rehabilitation of existing wells on utilities and infrastructure would be localized and would range from adverse to beneficial, temporary to long-term, and minor to moderate. Since the beneficial impact would be moderate and the adverse impact would be minor, the overall impact from the rehabilitation of existing wells on utilities and infrastructure would be beneficial, localized, long-term, and moderate.

Installation and Operation of New Wells

Although the demand for water utilities would remain the same as described in the affected environment, the installation and operation of new wells would add water utilities infrastructure, including pumps and pipes, to the existing water utilities infrastructure for the entirety of the project life. The new wells would not decrease the groundwater yields of neighboring wells and would be sited as close as possible to the building to reduce installation and operating costs. As such, adverse impacts to water utilities and infrastructure from the installation and operation of new groundwater wells is expected to be localized, long-term, and of negligible intensity.

The operation of new wells would require the installation and use of additional pumps, which could increase the electrical utility demand on site for the entirety of the project life; however, this increase is not expected to be appreciably larger than current conditions, and demand is expected to remain within the facility's capabilities. As such, adverse impacts to electrical utilities and infrastructure from the installation and operation of new groundwater wells is expected to be localized, long-term, and of negligible to minor intensity.

No impacts on utilities and infrastructure are expected from construction activities associated with the installation and operation of new wells because construction contractors would adhere to BMPs and would be aware of the location of existing infrastructure. No impacts are expected to occur to propane, stormwater, septic, and telecommunication utilities and infrastructure from the installation and operation of new groundwater wells.

The overall impacts from the installation and operation of new wells on utilities and infrastructure would be adverse, localized, long-term, and negligible.

3.7.2.2 Alternative 2 – Installation of Solar PV Array only

Under Alternative 2, a ground-mounted solar PV array would be installed and operated and the restoration of groundwater yield would either not occur or would occur at a later date; therefore, the impacts of Alternative 2 would be similar to those impacts discussed above for the installation and operation of solar PV arrays under Alternative 1. Adverse impacts under Alternative 1 would be localized in extent, long-term in duration, and negligible in intensity. The beneficial impact to electrical utilities would be localized, long-term, and of moderate intensity. Therefore, the overall impact of Alternative 2 on utilities and infrastructure would be beneficial, localized, long-term, and moderate in intensity.

3.7.2.3 Alternative 3 – Restoration of Groundwater Yield Only

Under Alternative 3, the groundwater yield would be restored to previous levels through either the installation of new wells or the rehabilitation of existing wells and the installation of solar arrays would either not occur or would occur at a later date; therefore, the impacts of Alternative 3 would be similar to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1. Adverse impacts under Alternative 1 would be localized in extent, range from temporary to long-term in duration, and would be negligible to minor in intensity. Beneficial impacts under Alternative 1 would be localized, long-term, and moderate. Therefore, the overall impact of Alternative 3 on utilities and infrastructure would be beneficial, localized, long-term, and moderate in intensity.

3.7.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated, and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment would remain constant and no direct or indirect impacts would occur to utilities and infrastructure. However, beneficial impacts stemming from the implementation of renewable energy at the NCWMAC site would not be realized, including reduced reliance on nonrenewable energy. Cost savings related to the decreased need to purchase electricity from the local provider would also not be realized.

3.8 Solid and Hazardous Waste Management

This section describes the existing solid and hazardous waste management within the project area and the potential for the implementation of the project to affect the amount and/or management of solid and hazardous waste within the project area. The project area for this resource is the 27.2-acre NCWMAC site.

3.8.1 Affected Environment

Solid and hazardous waste management is regulated by the EPA under the Resource Conservation and Recovery Act (RCRA). Under RCRA, 40 CFR 261.2(a), solid waste includes discarded or abandoned material, material that is accumulated, stored, or treated prior to certain forms of recycling, or material that is inherently waste-like. The classification of solid waste is not limited to “solids”; liquid or sludge-like waste streams can also be considered solid waste. Hazardous waste is a subset of solid waste which exhibits characteristics of ignitability, corrosivity, reactivity, or toxicity—characteristics which make the waste potentially dangerous or harmful to human health or the environment. Universal waste is a further subset of hazardous waste that includes batteries, pesticides, mercury-containing equipment, and lamps. Although these wastes would meet the requirements to be considered hazardous waste under RCRA, due to their common occurrence as commercial and household waste products universal wastes are regulated under a more streamlined process under 40 CFR 273 (eCFR, 2020).

The 1979 Maine Hazardous Waste, Septage and Solid Waste Management Act established the MDEP as the state’s RCRA program enforcing authority (MDEP, No Date-a). The state’s solid waste management rules are codified in 06-096 CMR Chapters 400 through 425, and the hazardous waste rules are found in 06-096 CMR Chapters 850 to 858 (MDEP, No Date-a; MDEP, No Date-b).

3.8.1.1 Non-Hazardous Solid Waste

The NCWMAC facility generates approximately 1.3 tons of cardboard per year that is temporarily stored in an on-site designated dumpster prior to being recycled. Other non-hazardous solid waste generated at NCWMAC includes dewatered biosolids, which mostly consist of uneaten fish feed and fish waste that is filtered out from the recirculating aquaculture systems. This waste is a byproduct of the NCWMAC’s wastewater treatment process, during which biosolids are removed from the water used in the recirculating aquaculture system.

Wastewater from the NCWMAC’s aquaculture operations and the CCAR’s aquaculture operations is combined and pumped to the NCWMAC’s wastewater treatment building (MDEP, 2016). Wastewater from the NCWMAC’s aquaculture operations is generated by the frequent backwash of seven microscreen drum filters and the intermittent flushing of captured solids from the NCWMAC's settling units. This produces a flow of approximately 20-40 gpm of concentrated waste biosolids (500-1,200 mg/L) that is pumped from the aquaculture building to the wastewater treatment building. There, the waste biosolids are first dewatered using chemical coagulation/flocculation, then filtered across an inclined traveling belt filter with a 100 micrometer (µm) filter cloth. After this process, the waste biosolids are approximately 10 percent solids. The dewatered biosolids are then pumped to a covered slurry storage tank which is 20 ft in diameter and 20 ft in height and has the capacity to store 6 months' worth of the dewatered biosolids. The biosolids are stored in this tank and are pumped out before the tank becomes 25 percent full. On average, this requires contractor removal of biosolids twice per year. Following removal, biosolids are delivered to a local wastewater treatment facility.

3.8.1.2 Hazardous Waste

The NCWMAC site (EPA Site ID: MER000507640) is a conditionally exempt small quantity generator of hazardous waste. The facility previously used a water quality nitrate test that generated 2-3 gallons per year of hazardous waste containing cadmium (EPA Hazardous Waste Number D006) (CMR, No Date-a). The facility has since switched to a nitrate test alternative and no longer generates cadmium waste. The only hazardous waste currently generated is a methanol compound. Less than 5 gallons per year of methanol waste is generated from High-Performance Liquid Chromatography analysis of astaxanthin and fat extraction methods. This waste is stored in a waste container located in a designated hazardous waste storage area. Methanol is considered to be a hazardous waste because it is ignitable (EPA Hazardous Waste Number U154); therefore, the NCWMAC facility must comply with the MDEP's hazardous waste accumulation, transportation, and record keeping and reporting requirements (CMR, No Date-a). In summary, the facility is permitted to accumulate the hazardous waste for up to 90 days if stored in accordance with 06-096 CMR Chapter 851, Standards for Generators of Hazardous Waste. If stored for longer periods of time, a license would need to be obtained. Prior to transportation for off-site disposal, the facility must properly package and label the waste and only transporters licensed by the state of Maine are permitted to transport the hazardous waste (CMR, No Date-b).

The NCWMAC also generates small quantities of universal waste such as fluorescent tubes, which is stored in a designated area within the main building. The NCWMAC facility must comply with the MDEP's universal waste accumulation, transportation, and recordkeeping and reporting requirements (CMR, No Date-c).

3.8.2 Environmental Consequences

This section describes the potential impacts of the Proposed Action and alternatives on solid and hazardous waste management both within the project area and within the surrounding area.

3.8.2.1 Alternative 1 – Proposed Action

Installation and Operation of Solar PV Array

The installation of the solar array could potentially increase the amount of non-hazardous solid waste produced onsite during the construction phase. Construction activities could produce solid waste including plastic, cardboard, aluminum, and other disposable or recyclable construction material; however, this increase in solid waste would only occur during the installation process. Typically, temporary dumpsters are used during construction if the extra waste and debris produced are expected to exceed the facility's existing solid waste management capacity. As such, the adverse impact to solid waste management from the installation of the solar array is expected to be localized, temporary, and of minor intensity.

During the installation of the solar PV array, the operation of construction vehicles and equipment may result in accidental fuel spills; however, accidental leaks and discharges from equipment would be unlikely to occur because construction contractors adhere to BMPs to avoid such accidents. Any spills of hazardous material such as diesel fuel or gasoline from installation activities would be immediately contained and spilled material would be disposed of in accordance with federal, state, and local regulations. An accidental fuel spill would result in a temporary increase in the amount of hazardous waste generated at the NCWMAC site; therefore, if a spill were to occur, adverse impacts would be localized, temporary, and minor.

The disposal of the solar arrays at the end of their usable life, which can range from 25 to 30 years, is out of the scope of this EA. The operation of the solar array is not expected to impact solid and hazardous waste management. The overall impacts from the installation and operation of the solar PV array on solid and hazardous waste management would be adverse, localized, temporary, and of minor intensity.

Rehabilitation of Existing Wells

Additional non-hazardous solid waste generated onsite as a result of installing new pumping equipment or hydrofracturing is not expected to be appreciably more than existing conditions. As such, adverse impacts to solid waste management are expected to be localized, temporary, and of negligible intensity. No additional hazardous waste is expected to be generated as a result of installing new pumping equipment or hydrofracturing. The chlorinated water that would be used for hydrofracturing is not considered to be hazardous and would not be removed from the ground after injection. Hydrofracturing processes for well rehabilitation do not produce wastewater.

The operation of vehicles and equipment during the rehabilitation of existing wells through hydrofracturing may result in accidental fuel spills; however, accidental leaks and discharges from equipment would be unlikely to occur because contractors adhere to BMPs to avoid such accidents. Any spills of hazardous material such as diesel fuel, gasoline, or cleaning chemicals would be immediately contained, and spilled material would be disposed of in accordance with federal, state, and local regulations. An accidental fuel spill would result in a temporary increase in the amount of hazardous waste generated at the NCWMAC site; therefore, if a spill were to occur, adverse impacts would be localized, temporary, and minor.

The impacts from the rehabilitation of existing wells on solid and hazardous waste management are adverse and temporary and range from localized to regional and negligible to minor; therefore, the overall impacts on solid and hazardous waste management would be adverse, regional, temporary, and minor.

Installation and Operation of New Wells

The installation of new wells would likely result in a temporary increase in non-hazardous solid waste generation during the construction phase; however, the expected increase would not be appreciably larger than the existing solid waste generation and would include common waste such as cardboard, plastic, aluminum, and other construction material. As such, adverse impacts to solid waste management from the installation of new groundwater wells is expected to be localized, temporary, and of negligible intensity.

During the installation of new wells, the operation of construction vehicles and equipment may result in accidental fuel spills; however, accidental leaks and discharges from equipment would be unlikely to occur because construction contractors adhere to BMPs to avoid such accidents. Any spills of hazardous material such as diesel fuel or gasoline from installation activities would be immediately contained and spilled material would be disposed of in accordance with federal, state, and local regulations. An accidental fuel spill would result in a temporary increase in the amount of hazardous waste generated at the NCWMAC site; therefore, if a spill were to occur, adverse impacts would be localized, temporary, and minor.

No impacts are expected to occur to solid or hazardous waste management from the installation and operation of new groundwater wells. Impacts to solid and hazardous waste management would be adverse, localized, temporary, and range from negligible to minor; therefore, the overall impacts from the installation and operation of new wells on solid and hazardous waste management would be adverse, localized, temporary, and minor.

3.8.2.2 Alternative 2 – Installation of Solar PV Array only

Under Alternative 2, a ground-mounted solar PV array would be installed and operated and the restoration of groundwater yield would either not occur or would occur at a later date; therefore, the impacts of Alternative 2 would be similar to those impacts discussed above for the installation and operation of solar PV arrays under Alternative 1. Adverse impacts under Alternative 1 would be localized in extent, temporary in duration, and minor in intensity. Therefore, the overall impact of Alternative 2 on solid and hazardous waste management would be localized, temporary, and minor in intensity.

3.8.2.3 Alternative 3 – Restoration of Groundwater Yield Only

Under Alternative 3, the groundwater yield would be increased through either the installation of new wells or the rehabilitation of existing wells and the installation of solar arrays would either not occur or would occur at a later date; therefore, the impacts of Alternative 3 would be identical to those impacts discussed above for the rehabilitation of existing wells or installation and operation of new wells under Alternative 1. Adverse impacts under Alternative 1 would be localized to regional in extent, temporary in duration, and negligible to minor in intensity. Therefore, the overall impact of Alternative 3 on solid and hazardous waste management would be regional, temporary, and minor in intensity.

3.8.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated, and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment section would remain constant and no impacts would occur to solid and hazardous waste management. However, beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the research mission at the facility and reduced reliance on nonrenewable energy.

3.9 Cultural Resources

This section describes the current setting for potential cultural resources at the NCWMAC site and evaluates the potential environmental effects to cultural resources under each alternative.

3.9.1 Affected Environment

Cultural resources are historic properties as defined by the National Historic Preservation Act of 1966 (NHPA), cultural items as defined by the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), archaeological resources as defined by the Archaeological Resources Protection Act of 1979 (ARPA), sacred sites as defined by EO 13007, and collections and associated records as defined by 36 CFR 79. Cultural resources are associated with human use of an area. They may include archaeological sites, historic properties, or ethnographic locations associated with past and present use of a site or region. A cultural resource can be physical remains, intangible traditional use areas, or an entire landscape, encompassing past cultures or present, modern-day cultures. Physical remains of cultural resources are usually referred to as archaeological sites or historic properties.

The Area of Potential Effect (APE) for the Proposed Action is the 27.2-acre NCWMAC site (project area). USDA ARS acquired the NCWMAC site in 1999, constructed the NCWMAC facility, and installed the groundwater wells. Prior to construction, the site consisted only of vegetation. There are no structures within the NCWMAC site known to be more than 45 years old. The area of the NCWMAC site on which changes are proposed is largely undisturbed land composed of mixed forest cover and wetlands.

The NRHP lists one historic landmark in the City of Franklin, the Robertson Quarry Galamander, which is located approximately 1.5 miles from the APE (HCPC, No Date). No other cultural resources have been identified in or around the project site through research of other field studies in the area.

The City of Franklin has not established any historic preservation ordinances and is not included in the Maine Historic Preservation Commission's (MHPC's) Certified Local Government (CLG) Program, which aims to promote preservation planning and protection of cultural resources at the local government level (MHPC, No Date-a).

3.9.2 Environmental Consequences

This section describes the potential impacts of the considered alternatives upon the cultural resources in and around the project area.

3.9.2.1 Alternative 1 – Proposed Action

Since there are no known cultural resources in and around the project area, no impacts to cultural resources are currently anticipated under the Proposed Action Alternative.

Per the requirements of Section 106 of the NHPA, ARS consulted with the Maine State Historic Preservation Officer (SHPO). Such a consultation is required for (1) the identification of historic properties in the project area and determining their eligibility for the NRHP; (2) consideration of effects of the project on historic properties; and (3) establishing measures to avoid or reduce adverse effects to historic properties (MHPC, No Date-c). Based upon ARS review of publicly available information and research for this project location, ARS finds that no historic properties would be affected pursuant to 36 CFR Part 800.4(d)(1). The Maine SHPO concurred that no historic properties (architectural or archaeological) would be affected by the Proposed Action and alternatives. The Section 106 response letter from the Maine SHPO can be found in Appendix A.

If any archaeological resources are identified at the project area, measures would be taken to avoid or minimize adverse impacts from the proposed activities in accordance with the applicable federal, state, and local laws and regulations. The activities that could potentially impact cultural resources include the presence and operation of construction equipment or ground disturbances (either from drilling of new wells or from hydrofracturing of existing wells).

3.9.2.2 Alternative 2 – Installation of Solar PV Array only

Since there are no known cultural resources in and around the project area, no impacts to cultural resources are currently anticipated under Alternative 2. As with Alternative 1, if any archaeological resources are identified at the project site, measures would be taken to avoid or minimize adverse impacts from the proposed activities in accordance with the applicable federal, state, and local laws and regulations. The activities that could potentially impact cultural resources include the presence and operation of construction equipment and associated ground disturbances.

3.9.2.3 Alternative 3 – Restoration of Groundwater Yield Only

Since there are no known cultural resources in and around the project area, no impacts to cultural resources are currently anticipated under Alternative 3. As with Alternatives 1 and 2, if any archaeological resources are identified at the project site, measures would be taken to avoid or minimize adverse impacts from the proposed activities in accordance with the applicable federal, state, and local laws and regulations. The activities that could potentially impact cultural resources include the presence and operation of construction equipment or ground disturbances (either from drilling of new wells or from hydrofracturing of existing wells).

3.9.2.4 No Action Alternative

Under the No Action alternative, no solar arrays would be constructed or operated, and no wells would be rehabilitated or developed. As such, the conditions described in the affected environment would remain constant; no cultural resources would be adversely impacted. However, beneficial impacts stemming from restoration of the groundwater yield and the implementation of renewable energy at the NCWMAC site would not be realized, including fulfillment of the research mission at the facility and reduced reliance on nonrenewable energy.

3.10 Resources Considered But Dismissed

Based on the nature and scope of the Proposed Action and alternatives, the elements of the human environment identified below do not require additional analysis in this EA.

Air Quality and Climate Change

The Clean Air Act (CAA) delegates the responsibility of protecting and improving the nation’s air quality to the EPA. Under the CAA, the EPA has established National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: ozone, particulate matter, carbon monoxide, lead, sulfur dioxide, and nitrogen dioxide. Greenhouse gases such as carbon dioxide, methane, nitrous oxide, and fluorinated (i.e., fluorine containing) gases, are heat trapping air pollutants that are the major drivers of global climate change (IPCC, 2013). In Maine, the MDEP is responsible for regulating the emissions of air pollutants and maintaining air quality standards. The NCWMAC currently holds an air emissions license (Permit Number: A-925-71-C-R) issued by the MDEP for the use of the facility’s back-up generator. This license covers a 10-year term and is scheduled for renewal under 06-096 CMR Chapter 115, Major and Minor Source Air Emission License Regulations (CMR, No Date). The Proposed Action to install solar panels and/or restore the facility’s groundwater yield would not impact the existing level of air emissions at the NCWMAC. During installation of the solar array, the generator may be used for a short time to maintain power to the fish rearing equipment during the final electrical interconnection work. However, generator use would not otherwise be changed during construction.

Vehicles and equipment used during the construction period could include trucks, small generators, chainsaws, post drivers, forklifts, skid loaders, and drill rigs for deliveries for the duration of the installation period. Some brush and trees may be cleared to provide space for the solar array and perimeter fence or for safety. Any potential impacts would be mitigated by best management practices such as wetting down dust, prohibiting unnecessary idling of engines, and using the lowest impact vehicle possible.

During maintenance periods for the solar array, access needs would be minimal. Vehicles and equipment used for maintenance could include trucks, small generators, chainsaws, post drivers, forklifts, skid loaders, and drill rigs for deliveries. However, no net increase in traffic-related air emissions on-site or adjacent to the NWMC property are anticipated; therefore, no air quality or climate change-related impacts are anticipated due to an increase in traffic.

Environmental Justice

Environmental justice was considered but eliminated from detailed consideration as a resource due to the extremely low likelihood of impacts, either beneficial or adverse, to environmental justice communities within the ROI, defined as census blocks 230099657001, 230099667001, 230099657002, and 230099667004. Although no minority environmental justice communities were present within the ROI, 18 percent of the residents of the project area census block are below the poverty level and constitute an environmental justice community. However, the development of a small solar array and restoration of groundwater yields within the project area would not significantly impact the overall economy within the ROI; no jobs would likely be created for unemployed environmental justice community members and the overall cost of living of the area would not be impacted.

Adverse impacts to environmental justice community members would be limited to the temporarily increased noise levels, air emissions, or commute times during the construction period of the solar array and potential additional groundwater well. However, the project area is in a remote location away from major population centers in the ROI. These impacts would be negligible at most and would not disproportionately affect low-income persons. Similarly, although salt intrusion within local groundwater sources is not expected to result from the restoration of project area groundwater, any additional intrusion of salt in groundwater would be largely limited to the project area and would not disproportionately impact environmental justice communities. Hence, environmental justice was eliminated from detailed consideration in this EA.

Noise

Noise impacts were considered but dismissed from detailed study due to the low likelihood of adverse effects from noise. Community noise is the combined effect of all noise sources in the area and noise impacts are assessed by land use type. The major existing noise sources in the project area are traffic along the roadways and noise from equipment at the NCWMAC. The land use types at the NCWMAC are E (office) and/or F (agricultural/industrial). In the vicinity of the NCWMAC, the prevailing use type is C (residential). The acceptable upper limits of exterior noise by land use type are as follows: E – 72 to 75 decibels (dB), F - no limit, and C – 67 to 70 dB (FHWA 2011).

New noise sources associated with the Proposed Action would be very slightly increased traffic during construction, equipment noise during construction, potential very low-level humming of electrical components at the solar panels and pumps during operation, and potential very low-level mechanical noises of switches and pumps during operation. Maintenance and repair operations would introduce negligible traffic and likely much lower noise levels than construction.

Depending on the final layout of the solar facility, the closest potential residence would be 400 feet away from construction activity and the nearest NCWMAC facilities would be about 200-300 feet away.

Rehabilitation of wells could take place as close as 85 feet from residences and as close as 30 feet from NCWMAC facilities. If new wells are required, it is not yet known how far they would be from residences or NCWMAC facilities. Construction site noise would be anticipated to average about 85dB at 50 feet (based on noise ratings for anticipated equipment types in the Federal Highway Administration (FHWA) Construction Noise Handbook, 2009). This would be experienced as about 73dB at 200 feet, within the acceptable range for uses at NCWMAC, and about 67 dB at 400 feet, within the acceptable range at nearby residences. Intervening topography and vegetation would provide further attenuation. Certain instances may exceed 85dB during land clearing when multiple chainsaws may run concurrently with other equipment; during site preparation if impact equipment is required to break up rock; and during construction if pile drivers are used to advance support structures, well bores, or well sleeves. It is expected that these instances would make up a limited portion of the overall construction timeline and would not be continual noise sources. Timing these instances during normal business hours would reduce potential impacts to neighboring residential uses and office-type uses within the NCWMAC. Rehabilitation or construction of new wells nearby residences and NCWMAC office uses would need to be timed to avoid disturbance. These activities would likely be very short in duration. Work during normal business hours would reduce disturbance to residential areas, while work during weekend hours would reduce disturbances to NCWMAC office uses.

The FHWA defines a discernable increase in noise levels as 5 decibels (dB) and a doubling of perceived loudness as 10 dB. Doubling the amount of traffic on a roadway would increase noise by 3 dB, less than a discernable increase (FHWA 2011). The amount of traffic potentially generated at any stage of the Proposed Action would not be anticipated to double traffic on local roadways, and therefore would be anticipated to create a less than discernable or negligible increase in traffic noise. Therefore, detailed traffic noise analysis is not required for this project.

Transportation and Traffic

Project installation would be anticipated to last less than 6 months and generate less than 50 vehicle trips per day, generating negligible to no impacts on local transportation infrastructure and traffic volumes and patterns. Most trips would be light vehicles for the transportation of workers with only occasional heavy vehicle trips associated with transport of construction equipment and materials. Project operations and maintenance would be anticipated to generate less than 25 vehicle trips annually. Transportation and traffic are not further evaluated in this document.

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