ASTGU ANNUAL REPORT - 2023

PURPOSE

This Annual Report form is required to be completed and submitted annually for all projects with the MA Department of Energy Resources (DOER) which received qualification as an Agricultural Solar Tariff Generation Unit (ASTGU) under the SMART program. The form is provided to demonstrate conformance with the general provisions required for ASTGUs in 225 CMR 20.00; in particular pertaining to Section 20.06(1)(d) therein as well as associated ASTGU Guidelines; and specifically pertaining to annual reporting requirements.

The completed form will be reviewed by DOER and the MA Department of Agricultural Resources (MDAR) to determine that the farm is in conformance with all ASTGU provisions in general under the SMART Program, although more specifically to the annual production requirements.

BASIC FARM INFORMATION

Farm Contact Person Name: Paul Knowlton ☒ Farm Owner ☒ Farm Operator
Farm Name: Knowlton Family Trust
Legal Structure: ☐ Sole Proprietor ☐ LLC ☐ Corporation
☐ Partnership ☒ Other Trust
Mailing Address: 43 Estabrook St, Grafton, MA 01519
Street Address (if different):
Contact Phone: 774-535-1381 Contact Email: pknowltonandsons@gmail.com
Check all that apply: ☐Solar facility owner ☒Landowner ☒Applicant

Current Type of ASTGU Farm Operation (Check all that apply):
☒ Vegetables ☐ Fruit ☒ Livestock ☐ Poultry ☐ Hay
☐ Nursery ☐ Other _____

Total Acreage in ASTGU Farm Production: 12 acres forage, 2 acres vegetables

Gross Annual Revenue for ASTGU Farm Production: Total: Vegetables-$935 Livestock-$2200

Are any major modifications to the farm business expected in the next 5 years? ☐ Yes ☒ No
(Check all that apply.)
☐ Business Legal Structure ☐ Operation Type ☐ Expansion ☐ Diversification
☐ Retirement ☐ Sale ☐ Subdivision ☐ Other _____

BASIC SOLAR PROJECT INFORMATION

Solar System Company Owner: BWC Lake Ripple, LLC
Solar System Company Address: 282 Century Place, Suite 2000, Louisville, CO 80027
Solar Company Contact Person/email/tel#: Aravind Satheesh Aravind.satheesh@aes.com
813-573-0515

ASTGU Project Start-Up/History Information:

Date ASTGU Approved by DOER: 6/11/19

Date Solar Portion of ASTGU Project Commenced Construction: 12/31/20

Date Solar Portion of ASTGU Project was Completed & Operational: 4/6/22 (placed in service)

Date Original Agricultural Portion of the ASTGU Project Commenced: 4/1/22

Date Original Agricultural ASTGU Portion of Project Harvested/Sowed Products: 11/20/23

How many complete years, that is both solar and agricultural production, has the ASTGU been in operation? 1

SOLAR ARRAY DESIGN – PLEASE PROVIDE AS-BUIILT SYSTEM INFORMATION

Please provide the following information regarding the solar array design:

Nameplate capacity AC (in MW): (i) 0.24MW; (ii) 1.76 MW *(Note: 1 MW=1000 kW)*
Expected annual generation AC (MWh): 3,971.8 MWh *(Note: 1 MWh=1000 kWh)*
Acreage of farmland over which array is to be installed: (i) 2.09 acres, (ii) 11.54acres
System type: ☒ Fixed ☐ Tracking ☐ Other
Height of lowest panel edge (in feet): Ten feet six inches
Height of lowest elevated horizontal mounting (in feet): Ten feet

Type of mounting (mono poles, racking, etc.): Fixed tilt
Description of materials and process to be used for ground penetration: An excavator with a post-driver was used to pound galvanized steel posts into the ground and all-terrain lifts were used to install the panels and wiring.

Number of panels, capacity per panel, and panel spacing:
(i) SMALL ARRAY (fixed-tilt, 832 bi-facial Astronergy New Energy Technology panels); 410-watt modules; every third panel was removed within the racking table; rows are spaced at 16.7 feet (panel edge to panel edge).
(ii) LARGE ARRAY DESIGN - (fixed-tilt, 6,890 bi-facial Astronergy New Energy Technology panels): 410-watt modules; every third panel was removed within the racking table; rows are spaced at 16.7 feet (panel edge to panel edge).

If you wish to provide additional descriptive information regarding the solar array design, including any system changes since original completion, you may include this information below, or in a typed attachment labeled "Solar Array Design."
The large array sends energy to an energy storage facility comprised of 16 battery modules, Samsung SDI. Storage is 1.44 MWac. Both arrays are managed as Community Shared Solar.

AGRICULUTRAL PLAN FOR DUAL-USE AREA

Planned agricultural use, Year 1. Check all that apply.
☒Vegetable, fruit, grains, for human consumption
☐ Hay
☒ Livestock production
☐ Poultry production
☐ Horticulture
☐ Floriculture
☐ Aquaculture
☐ Other, please describe:_____

Please fill the Crop Table results following this section for horticulture, flowers, vegetable, fruit, grain, and hay crops for your present year of operation. Fill out one Crop Narrative for each crop, detailing anticipated crop management (planting, irrigation, soil amendments, harvesting) and equipment to be used. **Crop Table – Current Season** follows this section. Also, please also fill out a **Crop Table – Next Season** and corresponding narrative at the end of this section with your best information available.

Please fill out the Grazing Table results following this section for livestock and poultry production for your present year of operation. Please also fill out the Grazing Narrative, detailing anticipated pasture and animal management and equipment to be used. **Grazing Table – Current Season** follows the Crop Table section. Also please fill out a **Grazing Table – Next Season** and corresponding narrative at the end of this section with your best information available.

Additional comments regarding agricultural production for Year 1:

How did the Agricultural Production perform versus expectations? Please explain why/why not if you can: ____Livestock were raised as expected. The production of pumpkins and squash performed as expected, with some loss due to rabbit pressure. We believe the fence and panels provide protection from ground and aerial predators respectively, increasing the ability for rabbits to eat the crops. Lettuce production performed below expectations due to the extreme rainfall and wet conditions of the 2023 season. _____

Did you plant the crops/graze the animals as you originally intended when your Pre-Determination Application was approved? If not please explain.

_____In the livestock array, livestock were grazed freely and supplementally fed as we continued to amend the soil and establish pasture. We encountered more rocks than expected as a result of solar array construction which have taken significant time to remove. In the vegetable array, we planted lettuce and pumpkins as expected. We encountered difficulty sourcing strawberry plant sets and did not plant any in 2023. In coordination with UMass researchers,

butternut squash was planted for study along with the lettuce.

Were the products marketable anticipated? Please explain how the production values (weight/bushels etc) were determined.

There were six calves born onsite. We estimate 1,200lb for the adults and 800lb for the calves. Four bulls are scheduled to be processed at New England Meat on December 13th, and other four are scheduled for processing on January 10th, 2025. Four small heifers will be sold as feeders. Due to rot, the Boston Butterhead lettuce from the first planting was unmarketable. We did harvest a bushel of small lettuces in the fall. We experienced lower marketability in the pumpkins and butternut squash due to rabbit damage but sold the marketable pumpkins and butternut squash to Houlden Farms for sale at their farmstand.

What occurred during the current season that wasn't anticipated? Positive & Negative.

The record rainfall that occurred throughout the summer negatively impacted our yields and operability. In addition to the July heavy rain events, precipitation continued throughout August and September which impaired our ability to cultivate weeds, prepare beds, and harvest a marketable lettuce crop. In addition, erosion became an issue at one particular location because of the intensive rainfall. We are in the process of repairing and mitigating that damage.

What Changes/Modifications do you expect to make to improve on production if needed?

We are continuing work to remove rocks, establish permanent pasture and rotationally graze the livestock. In the vegetable array, we already brought sixty loads of compost and will continue to amend the soil as needed. We intend to plant different lettuce varieties, either heading or leafy, that are less susceptible to rot. We will also install fencing around the perimeter that will better prevent rabbit damage. Continued seeding of cover crops after vegetable harvest and application of soil amendments (compost, lime, fertilizer) on both arrays will also improve production.

Do you expect to grow the same crops on the land in years 2 and 3? Briefly describe your crop rotation plan and what you expect to be growing on the land for the next 5 years. Will the same equipment be used? If not, is current array design compatible with future crop management needs and equipment?

We will continue raising cattle and have purchased a conservation seeder to help establish pasture and cover crop the vegetable array. We intend to plant sturdier lettuce varieties on the areas where the butternut squash was grown this year, and to grow butternut squash on the land where lettuce was grown this year in consultation with UMass. That rotation will likely continue, though we will be evaluating the success of a lettuce crop and adjust as needed. We will continue to grow pumpkins. We intend to plant strawberries in the spring, which will take a year to establish and then will produce for three or more years. The current equipment and array design is compatible with our crop plans.

Table A: Crop Production – Current Season					
Crop	**Area planted** ***(Row length and width or acreage, as appropriate)***	**Planting date(s)** ***(approximate)***	**Harvest date(s)** ***(approximate)***	**Expected productivity, total pounds harvested with dual use**	**Actual productivity, pounds, with dual use**
Lettuce	**~3,520 row feet**	**A. 5/30/23** **B. 9/21/23**	**A. N/A** **B. 11/7/23**	**A. 200 bushels** **B. 1 bushel**	**A. Crop loss due to extreme rain** **B. 1 Bushel**
Butternut Squash	**~12,500 sqft**	**6/5/23**	**10/5/23**	**500 lb**	**720 lb**
Pumpkins	**~19,385 sqft**	**6/18/23**	**9/27/23**	**500 lb**	**1000lb**

CROP NARRATIVE – Current Season

*Please detail the crop management for this past season, including approximate **dates** and **equipment** used. The purpose of this form is to provide empirical data regarding compatible equipment usage and crop management needs. If you need additional space, please include a typed attachment labeled "Crop Narrative."*

Crop: **See Attachment A**

Planting Plan:_____
_____
_____
_____

Soil Amendment Plan:_____
_____
_____
_____

Cultivation Plan: _____
_____
_____
_____

Irrigation Plan: _____
_____
_____
_____

Pesticide/Herbicide Plan: _____
_____
_____
_____

Harvest Plan:_____
_____
_____
_____

Table B: Grazing Production – Current Season							
Type(s) of animal grazed	**Area grazed *(acreage)***	**Grazing pressure *# animals per acre***	**Purpose (e.g. meat, dairy, eggs)**	**Grazing period(s)**	**Harvest date(s) *if applicable***	**Expected productivity with solar array**	**Actual productivity with solar array**
Hereford Cattle	~12 acres	2/3	Meat	8	January (expected)	1200 lbs/head	1200 lbs/head

GRAZING NARRATIVE – Current Season

*Please detail the past season animal and pasture management, including **dates** and **equipment** used. The purpose of this form is to provide empirical data regarding compatible equipment usage and production needs. If you need additional space, please include a typed attachment labeled "Grazing Narrative."*

Type(s) of Animals Grazed: Hereford Cattle

Pasture Management Plan: List any anticipated seeding, soil amendment, irrigation, pesticide, mowing, etc., including approximate dates and equipment used.

Lime was applied at 2800 lbs/acre on 3/30/23. Rocks were picked 4/29/23 and removed from array 10/30/23. Seeded pasture mix 11/27/23.

Animal Management Plan:

For each type of animal grazed, describe management regarding housing/shelter, water source, fencing, movement, disease treatment, harvest, etc. that was carried out within the solar array area. Describe equipment used in these activities.

The six bred cows were grazed freely throughout the 2023 growing season and each cow birthed one calf in the spring. The cattle resided in the heavy use area during inclement weather. Their water source is an agricultural well that was installed onsite. Temporary fencing was used in order to break up the twelve acres into smaller paddocks. Supplemental hay and grain was fed to the cows while the site continued to be de-rocked, limed, and seeded. There is no evidence of disease in the herd; no medications administered. The dump truck and tractor were used to load and feed hay bales (round and square). Four cattle will be processed at New England Meat on 12/13/23 and four on 1/10/24. Four young heifers were sold to a local farmer as breeding stock.

Describe any modifications to the solar array design that were made in order to reduce the risk of animal damage to the solar array, or risk of electrocution to animals.

Livestock fencing was installed at each of the gaps between the posts where the electrical relay was located so that the cattle would go around those bays. There have been no electrical issues as a result of the cows being present.

Table A: Crop Production – Next Season					
Crop	**Area planted** ***(Row length and width or acreage, as appropriate)***	**Planting date(s)** ***(approximate)***	**Harvest date(s)** ***(approximate)***	**Expected productivity, total pounds harvested without dual use**	**Expected productivity, total pounds, with dual use**
Lettuce	**~3,520 row feet**	**5/30/24**	**7/8/24**	**Head Lettuce: 100 Bushel Leaf Lettuce: 800 lb**	**Head Lettuce: 80 Bushel Leaf Lettuce: 640 lb**
Butternut Squash	**~12,500 sqft**	**6/1/24**	**10/5/24**	**1250 lb**	**1000 lb**
Pumpkins	**~19,385 sqft**	**6/8/24**	**10/1/24**	**1500 lb**	**1200lb**
Strawberries	**~2,500 sqft**	**4/15/24**	**No harvest first year**	**0 lb**	**0 lb**

CROP NARRATIVE – Next Season

*Please detail the crop management planned for next season, including approximate **dates** and **equipment** used. The purpose of this form is to provide planned data for the upcoming season regarding compatible equipment usage and crop management needs. If you need additional space, please include a typed attachment labeled "Crop Narrative."*

Crop: **See Attachment B**

Planting Plan:_____
_____
_____
_____

Soil Amendment Plan:_____
_____
_____
_____

Cultivation Plan: _____
_____
_____
_____

Irrigation Plan: _____
_____
_____
_____

Pesticide/Herbicide Plan: _____
_____
_____
_____

Harvest Plan:_____
_____
_____
_____

Table B: Grazing Production – Next Season							
Type(s) of animal grazed	**Area grazed *(acreage)***	**Grazing pressure *# animals per acre***	**Purpose (e.g. meat, dairy, eggs)**	**Grazing period(s)**	**Harvest date(s) *if applicable***	**Expected productivity without solar array**	**Expected productivity with solar array**
Hereford Cattle	~12 acres	2/3	Meat	8	December	1200 lbs/head	1200 lbs/head

GRAZING NARRATIVE – Next Season

*Please detail the next season animal and pasture management, including **dates** and **equipment** used. The purpose of this form is to provide planned data for the upcoming season regarding compatible equipment usage and production needs. If you need additional space, please include a typed attachment labeled "Grazing Narrative."*

Type(s) of Animals Grazed: Hereford Cattle

Pasture Management Plan: List any anticipated seeding, soil amendment, irrigation, pesticide, mowing, etc., including approximate dates and equipment used.

The equivalent of 2 tons per acre of lime will be applied in the spring. The intent is to seed another round of permanent pasture mix in the spring to achieve greater plant density.

Animal Management Plan:
For each type of animal grazed, describe management regarding housing/shelter, water source, fencing, movement, disease treatment, harvest, etc. that was carried out within the solar array area. Describe equipment used in these activities.

Our plan is to purchase 6 yearlings in the spring and allow them to graze the site using portable high-tensile wire to create small paddocks. We anticipate that the cows will be moved a total of no less than eight times and ideally more than twenty times throughout the year. There are buried irrigation lines which supply multiple spigots throughout the array to provide a water source to each paddock. The existing shelter and heavy use area will continue to be utilized during inclement weather. We anticipate the cattle being processed in December of 2024.

Describe any modifications to the solar array design that were made in order to reduce the risk of animal damage to the solar array, or risk of electrocution to animals.

No new design changes are planned.

Waiver for Decreased Yield

i. Waiver for Decreased Yield
Due to unforeseen circumstances, such as but not limited to weather events, pests, or change in crops, the projected agricultural yield for any given year may be lower than stated in the agricultural plan or previous year's annual report. In these instances, an applicant can request a waiver to the Department for the decreased yields. The applicant must demonstrate to the satisfaction of the Department, and in consultation with MDAR, that a waiver is warranted for good cause. Waiver requests must be submitted by November 1st of the applicable calendar year and sent to DOER.SMART@mass.gov.

**Please note that this project was approved in June of 2019 and is subject to the ASTGU guidelines in place at that time, thus we do not believe we are subject to this provision.

ii. Failure to Report
If the ASTGU fails to submit an annual report, the Department may declare the project ineligible for the ASTGU adder for one year. If the annual report is not completed for a second year, then the Department may permanently disqualify the ASTGU from continuing to receive the ASTGU Adder for the remainder of the STGU's tariff term.

SIGNATURES AND ATTESTATIONS

Prior to submitting the Pre-Determination Form, please read and sign as directed below.

Landowner

I hereby certify that I have personally examined and am familiar with the information submitted herein, and, based upon my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete.

Signature of Landowner — Date: 12-07-2023

Farm Operator and Landowner

I/we hereby certify that the information submitted regarding the current farm conditions and practice and the Agricultural Plan for the Dual-Use Area is accurate and complete to the best of my/our knowledge and intentions, and that I/we have engaged with the University of Massachusetts Amherst Clean Energy Extension and thereby its agricultural extension service to review the Agricultural Plan and its compatibility with the solar array structures and shading. Further, I/we agree, conditional on being provided eligibility to the SMART program as an ASTGU, to submit a report, through a template provided by the University of Massachusetts Clean Energy Extension, annually throughout the duration of the SMART incentive with ASTGU adder, on the operations and productiveness of the solar array and agriculture along with any changes to the Agricultural Plan for the following year. I/we understand that failure to maintain productive agricultural activities and annual reporting may result in the disqualification of the facility as an ASTGU in the SMART program.

Signature of Farm Operator — Date: 12-07-2023

Signature of Landowner — Date: 12-07-2023

Solar Facility Owner

I hereby certify that the information submitted regarding the Solar Array Description and inputs and outputs of the Shading Analysis is accurate and complete to the best of my/our knowledge and intentions.

Signature of Solar Facility Owner — Date: 12/11/2023

Attachment A

CROP NARRATIVE – Current Season

Crop: Lettuce

Planting Plan: Seeded 3600 Boston Butterhead lettuce 5/2/23. Transplanted into white plastic mulch beds (laid with the tractor-mounted plastic mulch layer) on 5/30/23 with a ride-along waterwheel transplanter implement. A second, smaller round of Boston Butterhead lettuce was planted 9/21/23. For personal consumption and to evaluate growing conditions under the panels, cucumbers, zucchini, summer squash, and green beans were planted 6/20/23. We engaged with Regenerative Design Group to explore future crop design potential. Cover crop of winter rye seeded with the Fronter CS 1360 seeder on 11/29/23.

Soil Amendment Plan: 1600 pounds of pelletized lime spread 4/22/23 across production area of veggie array. Rocks were picked 4/30/23.

Cultivation Plan: Wet weather prevented the cultivation of the aisles between the plastic beds. The area was tilled 11/7/23 to prepare for cover crop seeding.

Irrigation Plan: The lettuce was watered with submerged drip tape the day of planting and once more the following week. No other irrigation was required.

Pesticide/Herbicide Plan: None applied.

Harvest Plan: The first lettuce crop was a loss due to extreme rains and wet conditions. The fungal pathogen, Rhizoctonia, caused bottom rot disease which made the crop unmarketable. The second lettuce crop performed well for such a late planting and was harvested 11/7/23.

Crop: Butternut Squash

Planting Plan: Direct seeded 6/5/23. Cover crop of winter rye seeded with the Fronter CS 1360 seeder on 11/29/23.

Soil Amendment Plan: 1600 pounds of lime spread 4/22/23 (across two acres of vegetable array). Rocks were picked 4/30/23. Fertilized by hand 7/29/23 with ~25 pounds of 46-0-0.

Cultivation Plan: Weeded the crop by hand and with a weed whacker on 7/24/23 and again 9/27/23. The area was tilled 11/7/23 to prepare for cover crop seeding.

Irrigation Plan: None

Pesticide/Herbicide Plan: None

Harvest Plan: Harvested by hand 10/5/23. Used a front-loading tractor to pick up the squash and transfer to the barn.

Crop: Pumpkins

Planting Plan: Direct seeded 6/18/23. Cover crop of winter rye seeded with the Fronter CS 1360 seeder on 11/29/23.

Soil Amendment Plan: Fertilized by hand 7/29/23 with ~25 pounds of 46-0-0.

Cultivation Plan: Weeded the crop by hand and with a weed whacker on 7/24/23. The area was tilled 11/7/23 to prepare for cover crop seeding.

Irrigation Plan: None

Pesticide/Herbicide Plan: None

Harvest Plan: Harvested by hand 9/27/23. Used a front-loading tractor to pick up the pumpkins and transfer to the barn.

Attachment B

CROP NARRATIVE – Next Season

Crop: Lettuce

Planting Plan: The plan is to grow different varieties of lettuce that are less susceptible to rot and do not need to "head" to be marketable (contrary to the Boston Butterhead) such as Salanova leaf lettuces and romaine. They will be seeded in a greenhouse in late April and transplanted late May with the waterwheel transplanter on plastic mulch beds or bare ground.

Soil Amendment Plan: The soil will be amended prior to planting with lime (the equivalent of 2 ton per acre) and fertilizer as needed according to soil tests (see attachment C).

Cultivation Plan: The plan is for the aisles between lettuce beds to be mowed and/or rototilled as needed, likely three to four weeks after planting. The lettuce beds will be hand-weeded roughly three weeks after planting.

Irrigation Plan: We intend to drip-irrigate the lettuce when it is planted. Later irrigation may be necessary depending on precipitation.

Pesticide/Herbicide Plan: No pesticide/herbicide use is planned.

Harvest Plan: The plan is to harvest when the lettuce has matured, likely early July.

Crop: Butternut Squash

Planting Plan: The plan is to direct seed butternut squash in late May, early June.

Soil Amendment Plan: The soil will be amended prior to planting with lime (the equivalent of 2 ton per acre) and fertilizer as needed according to soil tests (see attachment C).

Cultivation Plan: Based upon the performance of the squash planting this year, we intend to mimic the method by mowing the cover crop instead of tilling it. We intend to cultivate a two foot area around the squash plants at planting and approximately three weeks after planting. The grass farther than two feet from the plant will be mowed with a weed whacker and a brush hog. The intent is to outcompete weeds and reduce tillage.

Irrigation Plan: These will not be irrigated unless a significant drought occurs. In that case, we can deploy drip irrigation.

Pesticide/Herbicide Plan: No pesticide or herbicide use is planned.

Harvest Plan: The squash will be harvested when mature, likely October, by hand-clipping and picking up with a front-loading tractor.

Crop: Pumpkins

Planting Plan: The plan is to direct seed by hand pumpkins in June.

Soil Amendment Plan: The soil will be amended prior to planting with lime (the equivalent of 2 ton per acre) and fertilizer as needed according to soil tests (see attachment C).

Cultivation Plan: Based upon the performance of the pumpkin planting this year, we intend to mimic the method by mowing the cover crop instead of tilling it. We plan to cultivate a two-foot area around the pumpkin plants at planting and approximately three weeks after planting. The grass farther than two feet from the plant will be mowed with a weed whacker and a brush hog. The intent is to outcompete weeds and reduce tillage.

Irrigation Plan: These will not be irrigated unless a significant drought occurs. In that case, we can deploy drip irrigation.

Pesticide/Herbicide Plan: No pesticide or herbicide use is planned.

Harvest Plan: The pumpkins will be harvested when mature, likely late September or early October, by hand-clipping and picking them up with a front-loading tractor.

Crop: Strawberries

Planting Plan: The strawberry plants are planned to be purchased this winter with planting to commence in March or April of 2024. They will be planted on bare ground.

Soil Amendment Plan: The soil will be amended prior to planting with lime (the equivalent of 2 ton per acre) and fertilizer as needed according to soil tests (see attachment C).

Cultivation Plan: The strawberry beds will be hand-weeded as needed throughout the season, and the aisles in between will be cultivated as needed.

Irrigation Plan: The plan is to irrigate the strawberry plants with drip irrigation and water as needed, weather depending.

Pesticide/Herbicide Plan: None are planned to be applied this year while the plants get established.

Harvest Plan: The strawberries will need a full year to grow and mature. They will not be harvested in the first year; harvest will commence in the spring of 2025.

Attachment C - Soil Test

Soil and Plant Nutrient Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Soil Test Report

Prepared For:
AFT / Knowlton Farms
jfine@farmland.org

Sample Information:
Sample ID: 01059-100323-GRZ

Order Number: 69597
Lab Number: S231011-418
Area Sampled: 4 sq ft
Received: 10/11/2023
Reported: 10/20/2023

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	6.0	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	1.2	4-14
Potassium (K)	71	100-160
Calcium (Ca)	673	1000-1500
Magnesium (Mg)	133	50-120
Sulfur (S)	11.1	>10
Micronutrients *		
Boron (B)	0.1	0.1-0.5
Manganese (Mn)	7.5	1.1-6.3
Zinc (Zn)	2.5	1.0-7.6
Copper (Cu)	0.2	0.3-0.6
Iron (Fe)	27.5	2.7-9.4
Aluminum (Al)	170	<75
Lead (Pb)	1.2	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	11.5	
Exch. Acidity, meq/100g	6.9	
Base Saturation, %		
Calcium Base Saturation	29	50-80
Magnesium Base Saturation	10	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.90	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

Soil and Plant Nutrient Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Recommendations for Grass Pasture - Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / acre		
5000	50	150	100

Comments:

-Calcitic limestone is acceptable since soil magnesium levels are sufficient.
-The lead level in this soil is less than 22 ppm, which falls below the listed optimum level. However, many variables affect this result, and safety thresholds vary by location and soil use. There is still a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Grass Pasture - Maintenance

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / acre		
5000	50	140	80

Comments:

-Calcitic limestone is acceptable since soil magnesium levels are sufficient.
-The lead level in this soil is less than 22 ppm, which falls below the listed optimum level. However, many variables affect this result, and safety thresholds vary by location and soil use. There is still a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

General References:

Interpreting Your Soil Test Results	http://soiltest.umass.edu/fact-sheets/interpreting-your-soil-test-results
Soil Lead: Testing, Interpretation & Recommendations	http://ag.umass.edu/soil-plant-nutrient-testing-laboratory/fact-sheets/soil-lead-fact-sheet
For current information and order forms, please visit	http://soiltest.umass.edu/
UMass Extension Nutrient Management	http://ag.umass.edu/agriculture-resources/nutrient-management

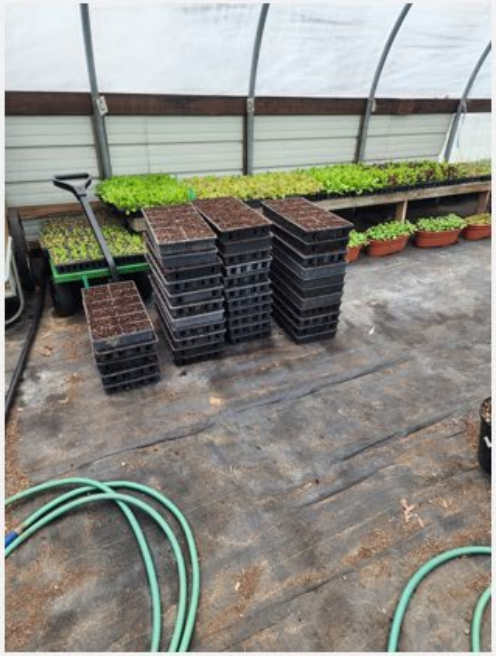
Grafton ASTGU

Spring – Calves Born

Grafton ASTGU

April - Rock Picking

Grafton ASTGU



May – Lettuce Seeding

Grafton ASTGU



May – Compost Spread

Grafton ASTGU

May – Lettuce Planting

Grafton ASTGU

May – Lettuce Planting cont'd

Grafton ASTGU

July – Lettuce Crop Loss

Grafton ASTGU

July – Butternut Squash

July – Pumpkins

Grafton ASTGU

August – Lettuce Seeding, Round Two

Grafton ASTGU

August – Butternut Squash

Grafton ASTGU

August – Pumpkins

Grafton ASTGU

September – Lettuce Planting, Round Two

Grafton ASTGU






September –
Pumpkin Harvest

Grafton ASTGU

October – Butternut Squash Harvest

Grafton ASTGU

November – Lettuce Crop, Round Two

Grafton ASTGU

October – Paul with Cattle and Frontier CS (Conservation Seeder) 1360

Grafton ASTGU

November – Rock Picking