
TOWN OF HINESBURG

TO: SELECTBOARD
FROM: TODD ODIT, TOWN MANAGER
SUBJECT: POST CLOSURE AMENDMENT
DATE: 12/21/2022

ISSUE:

The issue is whether the Selectboard will approve submitting the post closure amendment for the landfill solar project.

DISCUSSION:

The next step in the solar project is to seek an amendment to the town's post closure permit to allow for the solar development. That amendment has been prepared by Sanborn Associates through Aegis and Acorn solar. The State will review the amendment request and make a decision. The Town's submission of the amendment is in line with its obligations under the lease option agreement.

COST:

There is no cost to the town.

RECOMMENDATION:

It is recommended that the Selectboard approve submitting the post closure amendment for the landfill solar project.



December 20, 2022

Dennis Fekert
Vermont Department of Environmental Conservation
Waste Management and Prevention Division
1 National Life Drive
Davis Building – 1st Floor
Montpelier, VT 05620-3704

Re: Amendment to Post-Closure Certification
Hinesburg Landfill Solar Project
Hinesburg, Vermont

Dear Mr. Fekert,

Attached is an application requesting an amendment to the Post-Closure Certification (Amendment) for the Hinesburg Landfill in Hinesburg, Vermont. The Amendment is being requested to allow for construction of the Hinesburg Landfill Solar Project (the project), which will involve the installation of solar arrays on top of the closed landfill. The Amendment addresses the requirements listed in the State of Vermont Agency of Natural Resources document entitled “Policy on Constructing Solar Photovoltaics on Solid Waste Landfills”, dated February 2013 and last amended in February 2018. The application was prepared by Sanborn, Head & Associates, Inc. (Sanborn Head) on behalf of the Town of Hinesburg (owner of the landfill) and Aegis Renewable Energy, Inc. (developer of the Project).

In addition to the Amendment, we have attached a Certificate of Service documenting that the Vermont Department of Environmental Conservation’s (VTDEC’s) “Official Notice” was sent to the adjoining landowners notifying them of the Project. We understand that you will post the applicable documents to the VTDEC’s Environmental Notice Bulletin after completing your review of the enclosures. Please let me know if you need any other information.

Sincerely,

Joy Dubin Grossman
Assistant Town Manager

Encl: Amendment
Certificate of Service

MEMORANDUM

To: Todd Odit/Joy Grossman

From: Aaron Lavallee, Aegis Renewable Energy, Inc.

Re: Post Closure Amendment Town of Hinesburg – Observatory Road Solar Array

Date: December 19, 2022

The purpose of this memorandum is to set forth the procedures and costs for our requested Post Closure Amendment (“PCA”) related to the proposed 150 kW solar array on the Town of Hinesburg’s landfill (the “Project”).

Executive Summary: there will be no incremental cost to Hinesburg, either for the ANR application or ongoing monitoring responsibilities, as a result of the proposed amendment being submitted or granted.

Acorn and Aegis have prepared the PCA in the form attached and propose to submit it with the Town’s signature, in the Town’s name to the Agency of Natural Resources (ANR) at no cost to the Town.

We have concluded that the Project will not require any additional stormwater permits, and Aegis/Acorn will bear the cost of the First year of quarterly inspections.

Schedule/Process

Aegis hopes to have this PCA signed by the town by January 4, 2023, and submitted to ANR directly after that. The approval process for this amendment will be similar to the approval process for the town’s post closure plan. With the town’s permission, Acorn or Aegis will respond to any public comments, reply to any questions that ANR may have about the solar array or this amendment, and will bear all costs off applying for the same.

Amendment Purpose

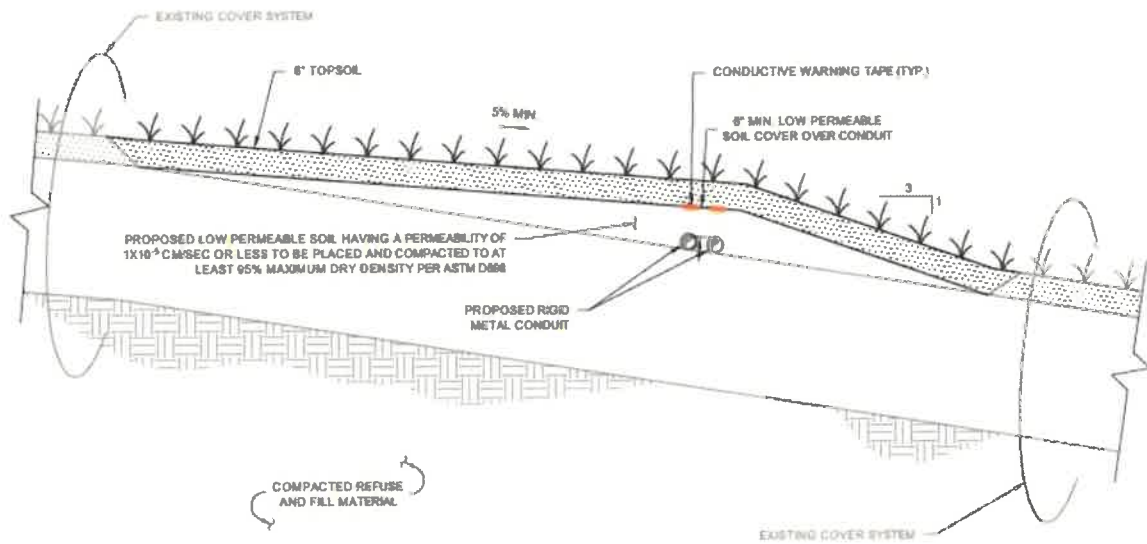
The purpose of the PCA is to demonstrate that constructing and operating a 150 kW solar array supported by crushed rock ballasts will not have an adverse effect on Hinesburg’s capped landfill.

The PCA seeks State of Vermont Department of Environmental Conservation Waste Management & Prevention Division (WMPD) approval for the development of the Project at the Facility. The PCA has been prepared by engineering firm Sanborn Head in accordance with the WMPD’s document entitled “Constructing Solar Photovoltaics on Closed Solid Waste Landfills,” last amended February 2018.

The following is a high-level summary of the proposed PCA. For a full description of the PCA, please refer to the enclosed document.

Stormwater Infiltration Considerations

The solar array installation does not require penetration of the existing cap system, which will limit the potential for an increase of stormwater infiltration through the cap system. The proposed electrical conduit located within the Landfill area has been designed to be installed on the cap cover soils with low permeable soil placed over the conduit to direct stormwater off the Landfill. The underground (above cap) conduit to be installed within the Landfill areas is shown in detail below:



3 CAP CONDUIT DETAIL
NOT TO SCALE

Design Considerations

Since the Landfill was closed and capped approximately 30 years ago, Sanborn Head has stated that it is likely that most of the potential settlement has already occurred, limiting the effects of strategically siting the PV system based on areas containing the oldest MSW.

The proposed ballasts for the racking systems have been selected to distribute the weight of the systems and limit differential settlement.

Maintenance Considerations

Maintenance costs to the town will be reduced as the owner of the array will be responsible for annual mowing and inspections throughout the array area over the lifetime of the system.

Stormwater Considerations

The proposed system is designed to avoid any penetrations of the existing cap, and the array itself will not require any additional stormwater permits. There is a small amount of impervious from the electrical pads (approximately 120 +/- square feet) that ANR has asked the Town to simply note on their next permit renewal, but they advise that no technical review is required. Please see the email from Abby Dery at Trudell Consulting Engineers, dated December 2, 2022, in Exhibit 1.

PV system design

The solar panel racking will be ballasted using wireform baskets filled with crushed stone. The ballast design is intended to:

- Weigh down the modules to resist moving or tipping from wind, ice, or snow loads;
- Distribute the load of the arrays to limit differential settlement; and
- Avoid creating a large, contiguous, impervious area that could cause stormwater control issues.

Sanborn-Head calculated the allowable load bearing pressure from the ballast loading at about 695 pounds per square foot (psf) on the soil cap. This bearing pressure will be distributed to limit damage to the Landfill cap systems and should reduce the potential of future settlement resulting from the construction of the solar array.

Sanborn-Head concluded that the ballasts will not likely cause a measurable increase in stormwater runoff because each ballast is isolated from the other with a vegetative buffer and is constructed of broken stone (instead of concrete). The layout of the solar PV system should not adversely impact stormwater flow, and construction activities should be managed to avoid impacting the existing stormwater management features.

Construction

Engineer Oversight: A qualified solid waste or geotechnical engineer is expected to provide construction oversight and inspections a minimum of twice per week during the installation of the ballast foundations. In addition, an engineer will inspect the erosion control measures for

the project and the landfill cap for rutting after rain events greater than 1-inch in a 24-hour period

Maintenance and Monitoring

In addition to remote system monitoring, the Owner of the system has a contract to perform annual or more frequent inspection of system components, including:

- Modules, conduit, conduit supports, racking system, ballasts, switchboard, transformer, and other supporting electrical equipment to assess whether the system is performing within design specifications

Regulatory Compliance

The post-closure monitoring activities associated with the permitted Landfill closure will continue under the direction of the Town of Hinesburg. **The owner of the Project will be responsible for maintenance of the solar arrays, mowing, and periodic inspections as agreed upon with the Town of Hinesburg.** The Project owner also has all decommissioning responsibilities at the end of the Project's useful life.

Post Closure Costs

For a description of post closure costs – please see the relevant Amendment exhibit below.

**Town of Hinesburg Landfill Post Closure Monitoring
20211205**

Cost Summary					
	Task	Professional Services	Consultant	Expenses	Total
1	Task 1 - One-Time Costs- Monitoring Well Installation and Survey (not annual)	\$3,774	\$20,571	\$1,545	\$25,889
2	Task 2 - Environmental Monitoring (2 events per year)	\$5,488	\$18,258	\$3,284	\$27,029
3	Task 3 - Data Evaluation and Reporting (2 events per year)	\$4,204	\$0	\$0	\$4,204
4	Task 4 - Annual Facility Inspection and Report	\$820	\$0	\$72	\$892
5	Task 5 -Annual Landfill and POET Maintenance	\$256	\$6,524	\$2,300	\$9,080
TOTAL Annual Costs		\$10,768	\$24,782	\$5,655	\$41,206

Present Worth of 5-Year Post-Closure Care	
One-time Costs of Monitoring Well Installation and Survey	\$25,889
Total Annual Costs (3% Inflation)	\$47,387
Estimated Rate of Inflation (i)	0.03
Post-Closure Period, years (n)	5
Present Worth of Annual Costs:	4.58
$P/A = (1-(1+i)^{-n})/i$	
Present Worth of Post-Closure Care	\$242,907
$\$25,889 + 4.58 * \$46,108$	

The cost estimate presented above was included in the Town of Hinesburg's Post-Closure Plan prepared by Stone Environmental, Inc. of Montpelier, Vermont dated November 3, 2021 (with revisions to the cost estimate dated December 5, 2021). There are no proposed changes to the Town of Hinesburg's financial responsibilities. The quarterly inspections required for the first year of operation of the solar array will be paid for by the Array Owner and are estimated to cost approximately \$5,200.

Exhibit 1



Aaron Lavallee <alavallee@aegiswind.com>

20-301 RE: Aegis Observatory Rd Site Plan for PCAR

4 messages

Abby A. Dery, PE <Abby.Dery@tcevt.com>

Fri, Dec 2, 2022 at 8:54 AM

To: Thomas Flynn <tflynn@aegis-re.com>, Nick Morehouse <nmorehouse@aegis-re.com>, Nils Behn <nbehn@aegis-re.com>, Aaron Lavallee <alavallee@aegis-re.com>, Will Waterstrat <wwaterstrat@aegis-re.com>

Good Morning all-

I'll attaching the CAD file for Observatory Road as file transfer in a following e-mail to Sanborn-Head. It's a huge file, which is why I'm not simply attaching it to this e-mail. RE: Item 3 Stormwater... We did receive confirmation that the ballasts will not be considered impervious and therefore no new stormwater permit is needed for this project. There is a nearly negligible amount of impervious from the electrical pads that the ANR has asked the town to simply note it in their next permit renewal, but no technical review is required. It's possible this will get overlooked and most likely be of no consequence. See attached e-mail for ANR correspondence and Aegis request to hold further until after the next Selectboard meeting next week.

Best,

Abby



Abigail Dery, P.E.

Director of Project Management



e. Abby.Dery@tcevt.com

p. 802.879.6331 x107

tcevt.com

478 Blair Park Road, Williston, VT 05495

42 Mapleville Depot, St. Albans, VT 05478

**Hinesburg Landfill Solar Project
Post-Closure Amendment Request Application**

HINESBURG LANDFILL
Hinesburg, Vermont

Prepared for Aegis Renewable Energy, Inc.
File No. 3978.04
December 16, 2022



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Figure 1 Locus Plan

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Appendix D Post-Closure Opinion of Cost



1.0 INTRODUCTION

On behalf of the Town of Hinesburg and Aegis Renewable Energy, Inc. (Aegis), Sanborn, Head & Associates, Inc. (Sanborn Head) prepared this Post-Closure Amendment (Amendment) request to support the development of a solar photovoltaic (PV) system at the Hinesburg Landfill (Facility), known as the Hinesburg Landfill Solar Project (Project). The landfill is located on Observatory Road in Hinesburg, Vermont. The PV system is proposed to be located on the closed, unlined landfill (Landfill) that historically accepted municipal solid waste (MSW). The Landfill was closed and capped with a soil cap in 1992.

The proposed solar arrays for the 150-kilowatt (kW) Project will be installed on approximately 1.3 acres of the capped Landfill. The proposed solar PV installation was designed to not adversely affect the following:

- Vegetation and cap conditions;
- Stormwater management and drainage;
- Geotechnical loading and settlement;
- Sensitive environmental receptors; and
- Abutting properties.

This Amendment identifies the PV system components, materials, and mitigation measures that will be used during system construction, operation, and maintenance, as well as post-closure monitoring to substantiate that the PV installation will not compromise the ongoing environmental and public health protection afforded by the Landfill cap, including the integrity of the capping system, surface water (stormwater) controls, and the groundwater monitoring system.

1.1 Purpose

The purpose of this Amendment is to request approval for an amended post-closure certification from the State of Vermont Department of Environmental Conservation Waste Management & Prevention Division (WMPD) for the development of the Project at the Facility. This Amendment request has been prepared in accordance with the WMPD's document entitled "Constructing Solar Photovoltaics on Closed Solid Waste Landfills", last amended February 2018.

1.2 Project Overview

The project includes the installation of a 150-kW solar PV array on the Landfill cap. The Project components include:

- Approximately 360 PV modules mounted on ballasted racking systems at a 25-degree tilt. Each rack will support modules mounted in two rows in a portrait configuration and interconnected with aboveground electrical lines;
- The solar array will be supported by foundations constructed on slopes of up to 15 percent. The foundations will consist of a proprietary system constructed of wireform baskets filled with stone. Foundations that are installed on slopes greater than 5 percent will be leveled in the horizontal plane with gravel placed on the topsoil/vegetative layer of the cap.

Foundations installed on slopes less than 5 percent will be installed directly on the topsoil/vegetative layer of the Landfill cap; and

- An equipment pad located outside the limit of waste to the northeast of the proposed solar array area. The equipment pad will support the equipment for the proposed solar array and will connect to the solar array via underground conduit. Underground electrical lines will connect the equipment pad to a utility pole.

2.0 BACKGROUND INFORMATION

Sanborn Head used information from various sources to prepare the following subsections. There are no record drawings available for this Facility; therefore, as part of this evaluation, we performed a subsurface exploration program on July 14, 2022. The explorations included advancing hand augers through the cap cover soils to evaluate cap cover soil types and thicknesses. Subsurface exploration logs are included as Appendix A. The information used in our evaluation described in the subsections below is based in part on the data obtained during the subsurface exploration program and the following documents:

- Report titled “Sanitary Landfill Facility” prepared by Frank R. O’Brien Consulting Engineers, of Shelburne, Vermont (date unknown);
- Report titled “Hinesburg Landfill, Vermont Landfill Assessment Program” prepared by Engineering Consulting Engineers of Burlington, Vermont dated 1990;
- Report titled “Closure Plan for Hinesburg Landfill, Hinesburg, Vermont” prepared by Donald L. Hamlin, Consulting Engineers, Inc. of Essex Junction, Vermont dated December 11, 1989 and last revised October 8, 1990;
- Report titled “Post-Closure Plan, Town of Hinesburg Landfill, Closed Municipal Solid Waste Landfill” prepared by Stone Environmental, Inc. (Stone) of Montpelier, Vermont dated November 3, 2021; and
- Solid Waste Management Facility Certification prepared by the WMPD dated March 29, 2022.

2.1 Landfill Description

The landfill Facility is located off Observatory Road in Hinesburg, Vermont. It is comprised of an unlined landfill that historically accepted municipal solid waste and was closed with a soil cap in 1992. The Facility currently has a Solid Waste Management Facility Certification dated March 29, 2022. The approximate coordinates of the Landfill are latitude N44.32285° and longitude W73.07751°. The Landfill location is depicted in Figure 1.

2.2 Soil Cap Components

As mentioned above, there are no record drawings or information related to the closure of the landfill. On July 14, 2022, Sanborn Head advanced two explorations in the cap system using a 3-inch outer diameter hand auger. The purpose of the explorations was to obtain information on



the cap construction and materials within the proposed solar array. The explorations showed that the soil cap generally consisted of the following (from top to bottom):

- Topsoil: ± 6 inches thick; and
- Cap material consisting of silt with varying amounts of gravel and sand or sand/gravel with varying amounts of silt: ± 24 to ± 36 inches thick.

3.0 PROPOSED POST-CLOSURE USE

Aegis, in conjunction with the Town of Hinesburg, is seeking an Amendment in accordance with State of Vermont Solid Waste Management Rule 6-1003(f)(1) to construct a 150-kW solar PV system on approximately 1.3 acres of the Landfill cap and associated parcel. The following subsections provide a general overview of some of the design considerations used for the proposed Project. Drawings that depict the existing and proposed conditions and the civil design details for the Project are included in Appendix B.

3.1 Design Considerations

3.1.1 Potential Differential Settlement Considerations

According to the United States Environmental Protection Agency (USEPA) document titled “Best Practices for Siting Solar Photovoltaics on Municipal Solid Waste Landfills”, dated February 2013, there are three factors that should be considered regarding differential settlement, addressed as follows:

- PV System Component Selection. The recommended PV system components have been selected to augment the use of available resources while limiting the weight impact on the soil cover system of the Landfill;
- Siting of the PV System. Since the Landfill was closed and capped approximately 30 years ago, it is likely that most of the potential settlement has already occurred, limiting the effects of strategically siting the PV system based on areas containing the oldest MSW; and
- Engineering Measures to Mitigate Settlement. The proposed ballasts for the racking systems have been selected to distribute the weight of the systems and limit differential settlement.

3.1.2 Cap Maintenance Considerations

The height and row spacing of the PV modules and racking systems allows for continued maintenance and visual monitoring of the vegetated soil cap system and other facility infrastructure.

3.1.3 Stormwater Infiltration Considerations

The solar array installation does not require penetration of the existing cap system which will limit the potential for an increase of stormwater infiltration through the cap system. The proposed electrical conduit located within the Landfill area has been designed to be installed on the cap cover soils with low permeable soil placed over the conduit to direct stormwater off the



Landfill. The underground (above cap) conduit to be installed within the Landfill areas is shown in Detail 3 on Sheet 5 of Appendix B-1.

3.2 PV System Design

3.2.1 PV Array Layout and Racking System

Most of the PV arrays will be installed on slopes generally less than 10 percent, with some PV arrays proposed in areas containing slopes of up to 15 percent as shown on Sheet 4 of the Drawings in Appendix B-1. There will be some isolated areas on the Landfill cap where fill will likely be required to maintain slopes less than 15 percent. Fill areas will be constructed with low permeable soil and topsoil. Based on the topography provided by Trudell Consulting Engineers (TCE) of Williston, Vermont on September 9, 2021, the thickness of the fill will be generally limited to less than 14 inches. The low permeable fill material will be compacted and will have a hydraulic conductivity of 1×10^{-5} cm/s or less.

The proposed racking system for the PV arrays will be a fixed-tilt, ground-mounted system, supporting the modules at a fixed angle of 25 degrees. This tilt angle provides an efficient system design and sufficient energy production while providing an economic use of the available land area and reducing the wind and snow loading on the racking system and modules. According to APA Solar Racking of Ridgeville Corners, Ohio, the racking system designer, the proposed racking system will meet the required wind and snow loading for the area.

As mentioned previously, each rack will hold two rows of PV modules mounted in a portrait configuration. The height of the racked modules will allow grass to grow on the cap as designed. These racks will be ballasted using wireform baskets filled with stone. The ballast design is intended to:

- Weigh down the modules to resist moving or tipping from wind, ice, or snow loads;
- Distribute the load of the arrays to limit differential settlement; and
- Avoid creating a large, contiguous, impervious area that could cause stormwater control issues.

The ballast foundations will be installed on slopes no greater than 15 percent and will be leveled with stone in areas with slopes greater than 5 percent. The allowable load bearing pressure from the ballast loading was calculated to be about 695 pounds per square foot (psf) on the soil cap. This bearing pressure will be distributed to limit damage to the Landfill cap systems and should reduce the potential of future settlement resulting from the construction of the solar arrays. The loading resulting from the installation includes the modules, racks, and ballasts, as well as lateral and lift loads from wind and snow.

The ballasts will not likely cause a measurable increase in stormwater runoff because each ballast is isolated from the other with a vegetative buffer and is constructed of stone (instead of concrete). The layout of the solar PV system should not adversely impact stormwater flow, and



construction activities should be managed to avoid impacting the existing stormwater management features.

3.2.2 Equipment Pads and Utility Poles

The proposed solar arrays will feed the equipment pad to the northeast of the array system. One ground mounted transformer is proposed to be located on the equipment pad. An underground electric line is proposed to extend from the solar array to the equipment pad and from the equipment pad to the interconnection point.

3.3 Construction/Constructability

The following means and methods of construction were developed to be protective of the landfill capping system during construction activities:

- **Low Ground Pressure Equipment:** For work on the Landfill, only low ground pressure (LGP) equipment will be used, as typical on other types of landfill projects. Typical LGP equipment is track-mounted or mounted on large rubber tires to reduce point loads. If the wireform ballast foundations are filled with stone in place, a track-mounted skid steer is expected to be used with a ground pressure of 7 pounds per square inch or less;
- **Construction Sequencing:** The construction activities will be phased to limit the number of vehicle trips over the Landfill cap;
- **Equipment Staging Area:** Staging of construction is expected to occur in an area to the east of the Landfill, which will help limit potential impacts to the Landfill cap;
- **Engineer Oversight:** A qualified solid waste or geotechnical engineer is expected to provide construction oversight and inspections a minimum of twice per week during the installation of the ballast foundations. In addition, an engineer will inspect the erosion control measures for the project and the landfill cap for rutting after rain events greater than 1-inch in a 24-hour period;
- **Wet Weather:** The engineer providing oversight will evaluate the weather and Landfill cap conditions prior to initiation of construction activities. Construction will be suspended during wet weather conditions that would likely pose a threat to the Landfill cap. The engineer providing oversight will assess when construction activities can resume;
- **Rutting:** The engineer providing oversight will observe rutting and other impacts caused by LGP vehicles traversing the Landfill cap. If ruts are observed to be greater than 4-inches deep, then the engineer will require that the construction activities in that area of the Landfill be suspended until the ruts are repaired or conditions otherwise improve. Measures to prevent further rutting, such as constructing temporary access ways and installing timber mats for equipment access on the cap will be implemented. Ruts that occur will be repaired by placing additional low-permeable fill and/or topsoil in the rut to meet the surrounding grade. These areas will be reseeded and mulched to establish vegetation;



- **Excavation:** The removal of topsoil is anticipated in proposed fill and conduit installation areas and excavation is anticipated outside of the cap cover system for installation of underground conduit. Any areas requiring excavation are not to be left open for an extended period or overnight. Additionally, these excavations should not be conducted during wet weather conditions. If waste is encountered during excavation, it will be disposed of at an appropriate waste disposal facility or other location approved by the WMPD; and
- **Vegetation:** The vegetative cover is to be maintained in all areas except for the areas of fill placement. Vegetation that is disturbed or destroyed within the existing Landfill during construction is to be restored as soon as feasible.

These parameters and other site-specific details (if needed) will be included in the means and methods construction plan provided to the contractor prior to construction.

3.4 Landfill Maintenance and Environmental Monitoring

The Town of Hinesburg, its contractors, and/or system operator will provide the permitted monitoring and maintenance program following the approval of the Amendment, as set forth below:

System Operator (Array Owner) Responsibilities

- Remote monitoring of the energy production to identify outages or other system malfunctions;
- Occasional panel washing (with water only) and vegetation maintenance;
- Annual or more frequent inspection of system components, including the modules, conduit, conduit supports, racking system, ballasts, switchboard, transformer, and other supporting electrical equipment to assess whether the system is performing within design specifications;
- Quarterly inspections for the first year of array's operation which will include observing for signs of differential settlement, erosion, or lateral foundation movement and the establishment of permanent vegetation in areas disturbed because of the array's construction;
- Preventative maintenance on system meters and other mechanical components approximately every five years;
- Project decommissioning and removal will be at system operator's expense at the end of the Project's productive life; and
- Compliance with permits that have been received as part of the permitting process for this Project.



Town of Hinesburg (Landfill Owner) Responsibilities

- Annual (or more frequent) inspection of the Landfill cap, including observation for signs of differential settlement, erosion, or lateral foundation movement. This annual inspection is already required by the current post-closure certification for the Town of Hinesburg landfill; and
- All other Town obligations under its current post-closure certification and other related permits (environmental monitoring, cap maintenance, stormwater management, etc.) shall remain unchanged.

If these inspections and routine maintenance activities identify deficiencies in the system operations, then appropriate response actions will be taken. The response actions may include: adjustments to the racking system, replacement of parts or equipment, adjustments to the ballast foundations, and increased inspections.

3.5 Site Security and Protection of Other Facility Appurtenances

The Project will use the Facility’s existing site security features to the extent possible.

4.0 GEOTECHNICAL EVALUATION

4.1 Structural Loading

The solar PV rack system foundations will be placed on top of the existing Landfill cap. Several design loadings were evaluated based on the proposed ballast and racking configurations presented in the design drawings prepared by APA Solar Racking dated September 2, 2022 included as Appendix B-2. The configuration that produced the highest load was used for our geotechnical evaluation. The design load of the solar PV array ballasts considered seismic, wind and snow loading and consisted of the following:

- Ballast Dimensions – The ballasts will be approximately 2 feet (ft) wide, 7 ft long, and 22 inches high. The ballast/array combination that produced the highest load resulted in the following values:
 - Highest contact stress under highest anticipated loading: 491 psf
 - Lowest contact stress under lowest anticipated loading: 138 psf
 - Normal service loading, including wind and snow loads: 309 psf

Our settlement calculations indicate that future total settlement could be on the magnitude of about 14 inches, as discussed in Section 4.3 and presented in Appendix C-1; however, given the variable composition of the waste fill, the actual amount of settlement (including differential settlement) that may occur is unknown, but may be up to or greater than 10% of the waste thickness. Additionally, differential settlement could occur in areas where metal or other larger objects were disposed of due to larger potential voids in the waste mass. The PV array racking system can be readjusted if differential settlement were to occur. If actual settlement causes

stormwater to pond, the ballasts will be temporarily removed using LGP equipment and the area will be re-graded with low permeable soil to promote drainage. The ballast will then be repositioned accordingly.

4.2 Bearing Pressure

An allowable bearing pressure for the Landfill cap was evaluated and compared to the highest anticipated and normal service loads. The allowable bearing pressure was calculated based in part on the ballast bottom having an area of about 14 square feet. The depth of loading influence from the PV array generally ranges between two to four times the ballast width; therefore, the Landfill cap material and underlying waste were both considered when evaluating allowable bearing pressure. The Terzaghi Method was used for both evaluations and the bearing pressure calculations are presented in Appendix C-1. According to the WMPD document titled "Procedure for Incorporating Seismic Considerations into Municipal Solid Waste Landfill Siting and Design in Vermont," dated February 10, 1994, the lowest allowable factor of safety for static conditions is as follows: 1.5 for bearing capacity and settlement; 1.25 for structural design; and 1.5 for final cover. The calculated factors of safety for the ballast loads when compared to the ultimate bearing pressure for the material layers underneath the topsoil layer are provided in Appendix C-1 and meet the WMPD's minimum factor of safety.

4.3 Settlement

Settlement of waste within a landfill generally occurs through the following mechanisms:

- Primary settlement from surcharge loading (loads from ballast and raise-in-grade fill above the cap);
- Primary settlement (compression of the waste) from the weight of the waste and the cover system;
- Secondary settlement due to volume changes from the biological and chemical decomposition of the waste; and
- Secondary settlement from the movement of waste (ground loss) into void spaces within the waste.

Reportedly, the Landfill stopped receiving waste about 30 years ago; therefore, most of the settlement has likely already occurred. Based on visual observations, the top of the Landfill cap is moderately sloped with some minor undulations indicating that some uniform settlement has likely occurred. Based on Sanborn Head's July 2022 site visit, small, localized depressions were not observed that would indicate substantial differential settlement in the Project area.

As discussed above, the weight of the solar PV arrays could result in settlement of the Landfill cap. Settlement resulting from the load of the proposed solar PV arrays was evaluated and the settlement calculations are presented in Appendix C-1. The settlement evaluation assumes a modified primary compression index value (C'_c) of 0.2, which results in approximately 5.5 inches



of primary settlement based on the ballast configuration with the highest combined loading. Secondary settlement was also calculated based on a closure year of 1992, a solar array system design life of 25 years, and a modified secondary compression index (C'_α) of 0.04, which results in approximately 8.3 inches of secondary settlement based on the ballast configuration with the highest combined loading, for a total of about 14 inches of anticipated settlement over the design life of the solar array. The racking system will be adjusted as needed when settlement occurs. Depending on the level of settlement, the ballast foundation may need to be adjusted by removing it and installing a new leveling pad. Only LGP equipment will be used to adjust the ballast foundations to protect the integrity of the cap.

4.4 Stability

A stability evaluation was performed for the ballasts. The evaluation included analysis of the ballasts installed perpendicular to the horizontal plane. Based on the evaluation, the ballast foundations described in Section 4.1 have a factor of safety of 1.5 or higher against sliding failure mechanisms. The calculations are presented in Appendix C-2.

5.0 STORMWATER PERMIT REQUIREMENTS

Based on our understanding, TCE has been working with the Watershed Management Division (WMD) regarding stormwater permitting requirements and the WMD has indicated that the ballasts will not be considered impervious. Based on correspondence from TCE, no new stormwater permit will be needed for this Project and the WMD has requested that the Town of Hinesburg note the installation of the equipment pads into their next stormwater permit renewal. No stormwater treatment systems are expected to be installed on the capped landfill due, in part, to the difficulty in siting and constructing these items on landfill slopes.

As mentioned previously, the stone-filled wireform ballasts will not likely cause a measurable increase in stormwater runoff; therefore, the layout of the solar PV system should not adversely impact stormwater flow.

A Construction General Permit (CGP) will be needed since more than 1 acre of area will be disturbed. Construction activities and the staging of equipment and materials will be coordinated with the contractor to help limit rutting or other possible erosion issues during construction. The Project will be classified as Low Risk and will likely involve the installation of erosion control devices downgradient of construction areas to help prevent the migration of sediment. Following construction and the establishment of vegetation, the erosion control devices will be removed. The soil cap will be repaired if it is disturbed.

There will be a small volume of sheet flow from the solar PV arrays on to the vegetative cover immediately in front of each row of modules. This area is not likely to be subject to erosion because of the relatively small volume of water, the short distance between the array and the ground, and the presence of well-established vegetative cover. If erosion does occur in front of the arrays, it will be mitigated as part of ongoing maintenance activities at the Landfill.



6.0 REGULATORY COMPLIANCE

6.1 Protection of Wetlands and Other Significant Natural Resources

Based on the Figures prepared by TCE dated January 4, 2021 (last revised December 15, 2022) included as Appendix B-3, there are no regulated wetlands (i.e. Class II) or other significant natural resources located near the Project area.

6.2 Financial Assurance

The post-closure monitoring activities associated with the permitted Landfill closure will continue under the direction of the Town of Hinesburg. The financial assurance requirement associated with the post-closure maintenance and monitoring of the modified use is expected to be incorporated in a contract between the owner of the Project and the Town of Hinesburg. The owner of the Project will be responsible for maintenance of the solar arrays, mowing, and periodic inspections as agreed upon with the Town of Hinesburg. The updated annual post-closure costs, including the quarterly inspections of the cap system as outlined in Section 3.4, are included in Appendix D.

6.3 Other Permits and Project Requirements

As mentioned previously, an operational stormwater permit will not be required for this Project. A Construction General Permit will be required for this Project which is a standard permit applicable to most construction projects in the State of Vermont. A Certificate of Public Good from the Public Utility Commission has been previously issued for this Project.

7.0 REFERENCES

The following are references used as part of preparing this Post Closure Amendment Request:

Frank R. O'Brien Consulting Engineers, Inc., (date unknown). *Sanitary Landfill Facility*, Hinesburg, Vermont.

Engineering Consulting Engineers, 1990. *Hinesburg Landfill, Vermont Assessment Program*, Hinesburg, Vermont, 1990.

Donald L. Hamlin, Consulting Engineers, Inc., 1990. *Closure Plan for Hinesburg Landfill*, Hinesburg, Vermont, December 11, 1989, revised October 8, 1990.

Stone Environmental, Inc., 2021. *Post-Closure Plan, Town of Hinesburg, Closed Municipal Solid Waste Landfill, 907 Beecher Hill Road, Hinesburg, VT*, November 3, 2021.

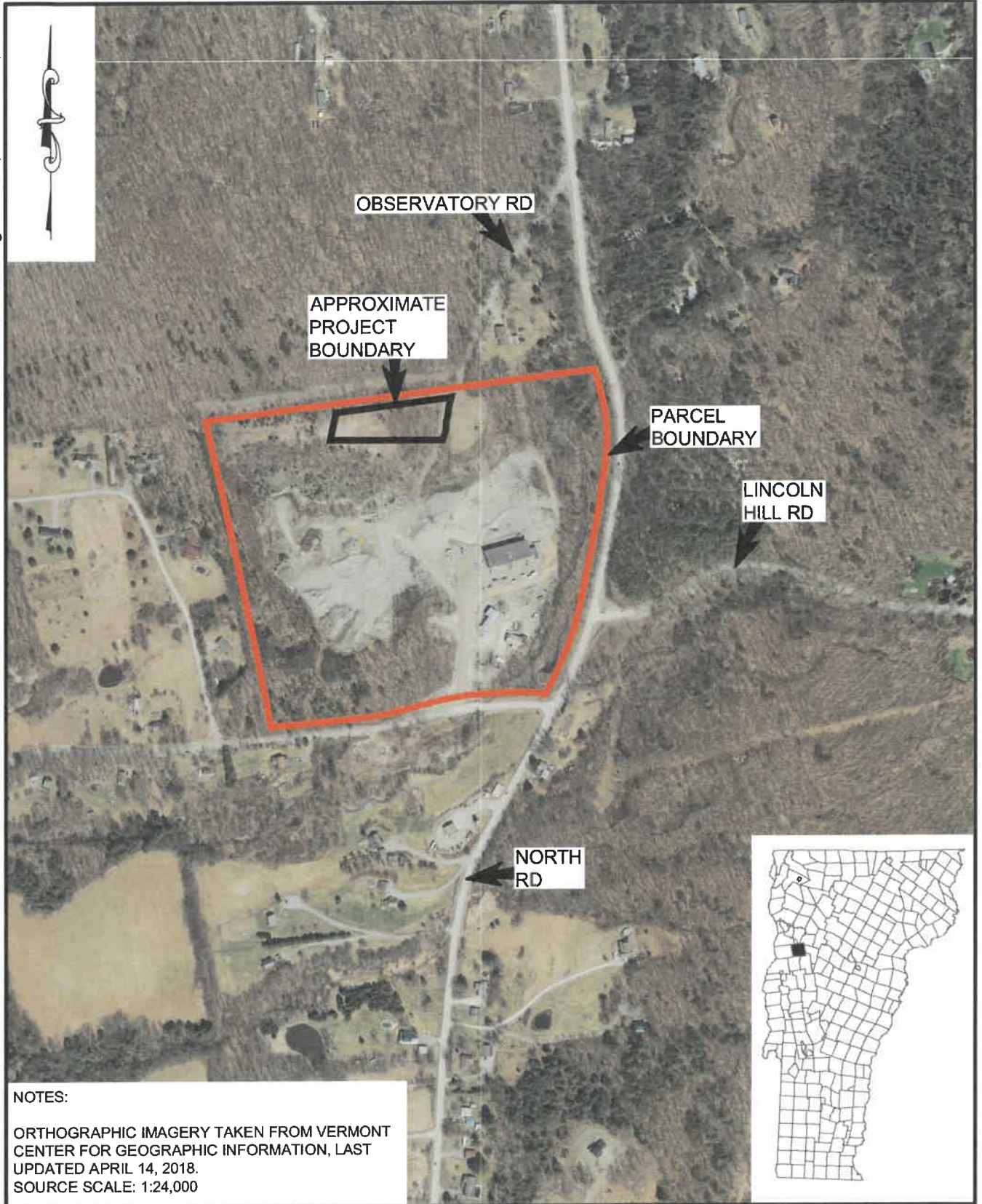
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Figures

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NOTES:
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AEGIS RENEWABLE ENERGY
 HINESBURG, VERMONT

HINESBURG LANDFILL SOLAR PROJECT
LOCUS PLAN



SCALE: 1" = 500'	DRAWN BY: JCS	FILE NO. 3978.04
DATE: DECEMBER 2022	CHECKED BY: JHG	FIGURE NO. 1

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 PLOT DATE: 12-14-22