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## **Exhibit P – Carbon Debt Analysis**

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To: Aileen Kenney  
Vice President of Permitting,  
Deepwater Wind

Date: June 22, 2017

## Memorandum

Project #: 42256.00

From: Susan Moberg PWS, CFM

Re: DWW Solar, Simsbury CT – Carbon Debt Analysis

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VHB provided services to DWW Solar LLC (DWW) that included performing a carbon debt analysis for DWW's proposed solar installation in Simsbury, Connecticut (the Project). The purpose of this analysis was to determine whether the Project can have a net improvement in carbon reduction compared to the loss of 30.0 acres of trees. Approximately 151 acres of the 289-acre Project Site is forested; proposed tree clearing represents 19.8 percent of the Project Site's forested areas and 10.4 percent of the total Project Site (see Figure: Tree Clearing Plan).

The analysis relied upon a US Environmental Protection Agency (US EPA) conversion factor to identify the amount of carbon sequestered in one year by one acre of average U.S. forest: 1.06 metric tons (MT) CO<sub>2</sub> (US EPA, 2016). As the Project requires the removal of approximately 30.0 acres of trees, the associated "carbon debt" is estimated to be 31.8 MT CO<sub>2</sub> per year. Over 20 years, this would equate to the sequestration of 636.0 MT CO<sub>2</sub>.

The Project is expected to produce approximately 43,500 MWh of energy in its first year of operation. Using an emission factor specific to the Project's eGrid region: NPCC New England (The Climate Registry, 2015), the estimated annual carbon offset of the Project is 12,597.7 MT CO<sub>2</sub>. Attachment A provides greenhouse gas equivalencies for this estimated offset, examples of which include:

- 2,661 passenger vehicles driven for one year;
- 1,417,538 gallons of gasoline consumed; and
- 1,330 homes' energy use for one year.

**Anticipating an annual "carbon debt" of 31.8MT CO<sub>2</sub> and a carbon offset of 12,597.7 MT CO<sub>2</sub>, it would take the Project approximately 2 days to begin to have a net improvement in carbon reduction. It would take just under a month (20 days) to recover 20 years' worth of carbon that the cleared trees would have otherwise sequestered.**

This analysis does not account for energy used as part of material extraction; solar panel manufacturing and production; or project installation, including the act of land clearing. It also does not include the carbon dioxide that is expected to be released from the trees upon removal. Lastly, it does not account for the GHG emissions reduction benefit that would result from the proposed conversion of active agriculture (row crops) at the Project Site to a non-agricultural land use. Field crop agriculture generates GHG emissions (primarily carbon dioxide and nitrous oxide) from the use of fossil fuels by vehicles, as well as production and application of fertilizer (MSU, 2017).

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## References

Michigan State University (MSU). (2017). *US Cropland Greenhouse Gas Calculator*. Retrieved 3 April 2017, from <http://surf.kbs.msu.edu/>

The Climate Registry. (2015). 2016 Default Emissions Factors. Retrieved from <https://www.theclimateregistry.org/wp-content/uploads/2015/04/2015-TCR-Default-EF-April-2015-FINAL.pdf>

U.S. Environmental Protection Agency (US EPA). (2017). *Greenhouse Gases Equivalencies Calculator - Calculations and References*. Retrieved 3 April 2017, from <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references>

## Equivalency Results

[How are they calculated?](#)

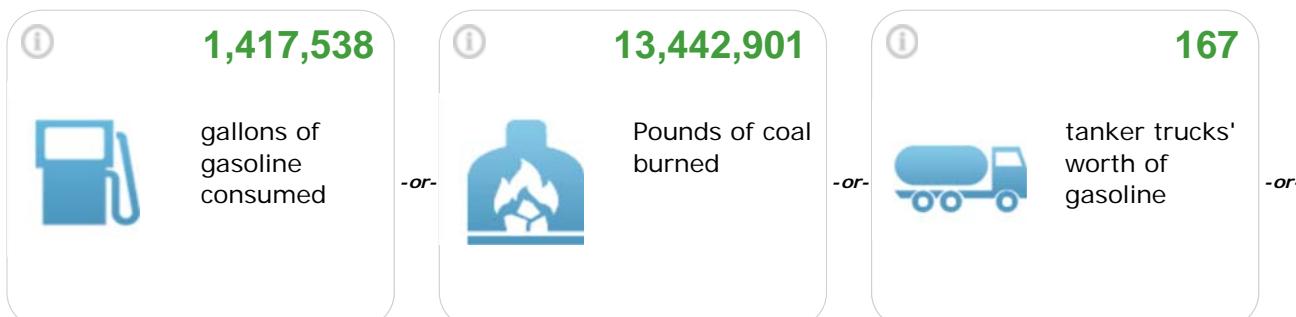
The sum of the greenhouse gas emissions you entered above is of Carbon Dioxide Equivalent. This is equivalent to:

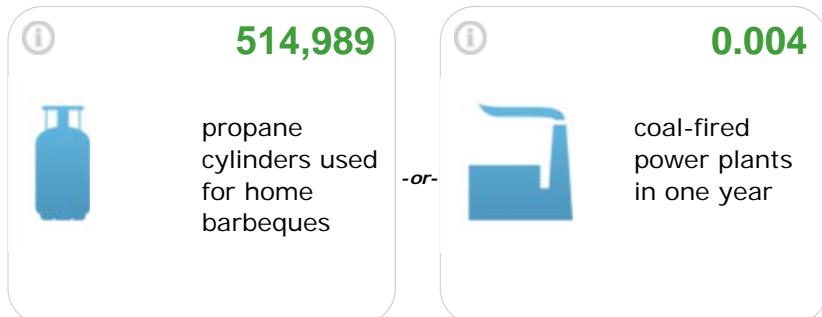
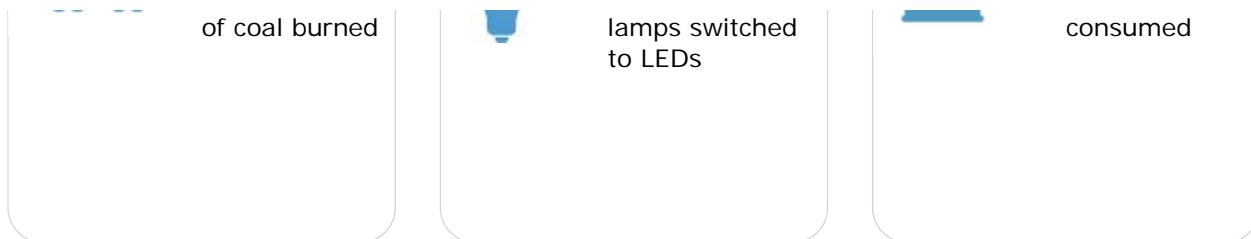
**12,598 Metric Tons**

### Greenhouse gas emissions from



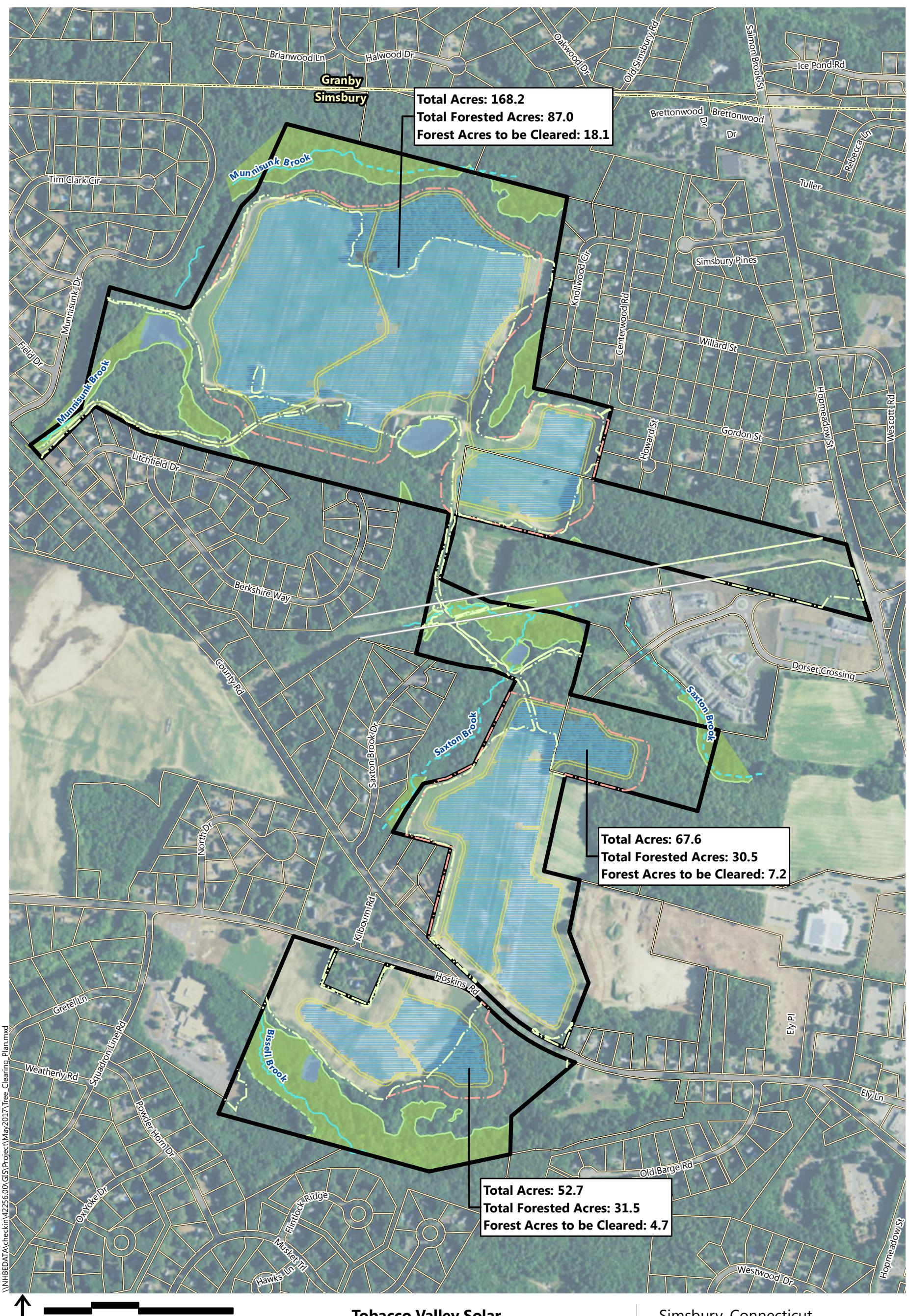
### CO<sub>2</sub> emissions from





### Carbon sequestered by





**Tree Clearing Map**

Source: VHB, CTDEEP, ESRI