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ATTACHMENT B

April 4, 2022

Bill Dana
Chair, Brunswick Planning Board
85 Union Street
Brunswick, ME 04011

Re: Case No. 22-017 – Zoning Ordinance Text Amendment

Dear Mr. Dana:

The Brunswick & Topsham Water District is opposed to the proposed Zoning Ordinance Amendments and installation of a solar array at 165 Jordan Avenue. This property is adjacent to one of the District's sources of supply and falls entirely within the Aquifer Protection Overlay 1 (APO1) District. The District's concerns are outlined below. It is the District's opinion that the existing Brunswick Zoning Ordinance overlays (APO1, RPZ, and AAZ) prevents the installation of solar panels at this location and exceptions should not be made that allow for their use.

Aquifer Protection Overlay 1 (APO1) District

As stated in the Town of Brunswick Zoning Ordinance, "the purpose of the Aquifer Protection Overlay Districts is to protect the quality and quantity of Brunswick's present and future ground water resources by regulating activities and land use practices which are likely to affect those resources." Solar energy collection facilities are a permitted use in the APO1 district, but this allowance was determined prior to the U.S. Environmental Protection Agency confirming the use of PFAS compounds in the production of solar panels in 2018. Additional research published by the Royal Society of Chemistry in October 2020 confirmed the use of PFAS compounds in solar collectors and photovoltaic cells. PFAS (per- and polyfluoroalkyl substances) are manmade chemicals that are utilized for their non-stick and water-resistant properties. PFAS compounds are known to have potentially harmful health effects on humans. The Zoning Ordinance allowing the installation of solar arrays in the APO1 district was adopted in 2017, prior to these studies and before PFAS compounds were strictly regulated and tested for in drinking water. This is of great concern to the District because PFAS compounds could be released from the proposed solar array and leach into the groundwater that the District uses as it's Jordan Avenue source of supply. Solar energy collection facilities should not be an allowed use in the Aquifer Protection Overlays.

Solar Panels and PFAS

One of the District's concerns with the proposed installation is the introduction of PFAS and other unregulated contaminants into the aquifer used by BTWD. It is well known that the surface of solar

panels must be coated to allow them to be self-cleaning and shed any accumulated dust, dirt, pollen, snow, etc. Regardless of whether these coatings are made using PFAS compounds or other chemicals, as rain falls and runs across the surface of the panels and onto the ground, this coating leaches into the rain water, falls onto the ground and makes its way into the groundwater. Covering a large portion of the APO1 overlay with solar panels creates the unacceptable risk of PFAS or other chemicals with unknown health impacts making their way into the public water supply. It is irresponsible to install a solar array at a location that could adversely impact human health.

Research by Dr. Annick Anctil of Michigan State University states that "PFAS is not customarily used in solar panels." This claim, made in 2020, is contradicted in an August, 2021 Michigan State University write-up on Dr. Anctil's work where she is quoted as saying "solar energy is green, but not all green" and admitting some solar panels "might leach hazardous chemicals into the environment." The leaching of any hazardous chemical into the environment is extremely concerning to the District, particularly when those chemicals will make their way into one of the District's primary sources of supply.

Stormwater Management at Solar Sites

As more solar arrays are installed across the country, communities are getting a better understanding of how stormwater is impacted by these installations. According to guidance from the Connecticut Department of Energy and Environmental Protection, "stormwater discharged during and after the construction of solar arrays can be a significant source of pollution resulting from increased runoff, erosion and sedimentation, which can adversely impact wetlands or other natural resources." Emerging research shows solar panels drastically alter the way rain water and melting snow interact with the soil surface. When rain falls on an open field, it has the ability to infiltrate directly into the ground it falls on. As rain falls on solar panels, it runs down the panel and drips off the edge. All of the rain falling on a single panel falls onto one drip line below the edge of the panel instead of landing on a space on the ground equal to the size of the panel. When rain falls in this manner, it is more likely to become channelized flow than sheet flow. During heavy rains, erosion could occur as a result of the channelized flow, impacting how much water makes its way into the aquifer, and how the water reaches the aquifer. Soil compaction during construction and the installation of concrete footings to support the panels contribute to this issue. The installation of solar panels at 165 Jordan Avenue will impact the quantity and quality of the recharge in the aquifer.

Ongoing PFAS Investigation and Site Access Issues

In September, 2021, the District found elevated PFAS levels in a portion of the Jordan Avenue Wellfield. Since this discovery, the District has actively been working with the Maine DEP, Maine Drinking Water Program, US EPA, and US Department of the Navy to determine the source of the contaminant. Existing monitoring wells located within the 165 Jordan Avenue parcel are being used as part of this investigation, and the US Navy plans to install additional wells to further characterize the aquifer and its water quality. MRRA has already given the US DOD permission to install these additional wells on the property and planning for these wells is underway. The proposed solar array will interfere with the ongoing investigation as it does not account for all test well locations, both planned and existing. The District and the Navy must be able to access these wells and freely locate future wells as part of the ongoing investigation.

Runway Protection Zone (RPZ)

A portion of 165 Jordan Avenue, the site of the proposed solar array, falls within the Runway Protection Zone. A renewable energy generating facility as a principal use is prohibited by the Brunswick Zoning Ordinance. As stated in the Ordinance, this zone "includes those areas beyond the ends of airport runways where certain structures and other development could potentially obstruct or interfere with safe aircraft operations and/or are particularly vulnerable to aircraft landing and take-off accidents." A landing or take-off accident at the northern end of the runway would have significant impacts on the aquifer. These impacts would be more significant if solar panels were damaged as a result of the accident as this would allow for chemicals and rare earth metals used within the panels to reach the public water supply.

Airport Approach Zone (AAZ)

The portion of the 165 Jordan Avenue that is not within the RPZ is located within the Airport Approach Zone. A renewable energy generating facility as a principal use requires a Conditional Use Permit in this zone. Section 5.2.2.B.6 of the Brunswick Zoning Ordinance requires that a conditional use "shall not pose an unreasonable burden on, existing or planned municipal services, utilities, or other necessary facilities." Construction of the proposed solar array would create such a burden for the District, the aquifer, and the existing treatment plant by potentially introducing PFAS compounds or other chemicals into the environment. The existing Jordan Avenue treatment plant is not capable of removing PFAS from drinking water. An upgrade to add PFAS removal would cost the District's customers millions of dollars.

Land Ownership Transfer History

During the Naval Air Station closure, the District was actively trying to acquire the 165 Jordan Avenue parcel because of the impact this land has on the aquifer associated with it. The District was in line to receive this land from the Navy, but prior to the land transfer, it was determined that the land would be transferred to MRRA because of the importance of the RPZ and AAZ zones to airport operations. Now that MRRA owns the land, developers are proposing changes and waivers to the Zoning Ordinance that prior decisions were based upon. This is disingenuous to the land ownership transfer discussions and that decision. It is the District's opinion that the land remain completely undeveloped to meet the intent of the three overlay districts covering the parcel and the impact that this parcel has on the District's water source.

Summary

The District firmly believes that the installation of a solar array at 165 Jordan Avenue would adversely impact the public groundwater supply that is located adjacent to the parcel. The District is already dealing with unintended releases of materials within the aquifer protection overlay. The installation of a solar array will only further increase risks to the public water supply and human health. The additional surface water runoff created by solar panels will impact the amount of water available in the public supply. There is no unique circumstance that creates the need for 165 Jordan Avenue to be the site of the proposed development.

Existing zoning overlays do not allow the installation of solar panels over a portion of the property or require a Conditional Use Permit for the proposed project. Granting this permit will violate

section 5.2.2.B.6 of the Brunswick Zoning Ordinance and create a burden on the Brunswick & Topsham Water District, its customers and in turn, the community. The District does not recommend the proposed Zoning Ordinance Text Amendment related to the Runway Protection Zone, nor does it recommend granting a Conditional Use Permit to construct a solar array in the Airport Approach Zone.

Respectfully,

Craig Douglas, PE
General Manager

T.C. Schofield, PE
District Engineer

cc: Brunswick Staff Review Committee
James Cohen – Verrill Law
Seth Holbrook – 173 Jordan Avenue
Kristine Logan – MRRA
Dave Barney – Department of the Navy
Mike Daly – US EPA Region 1
Susan Breau – MEDWP
Iver McLeod – MEDEP
Finn Whiting – MEDEP

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Response to Water District Letter

We appreciate the Brunswick & Topsham Water District's dedication to protecting its resources, and we agree that any development within the Aquifer Protection Overlay (APO) should be held to high standards. Although we are still in the early stages of Project planning and have not yet defined many Project parameters, we have responded below to the Water District's April 4, 2022 letter in as much detail as possible.

Solar projects are a very low-impact form of development. They not only provide decades of clean power, but also can preserve many of the ecological functions and values of the land—including groundwater recharge and stormwater treatment. We hope we can work collaboratively with the Water District to facilitate the beneficial use of this land.

"Aquifer Protection Overlay 1 (APO1) District"

– No PFAS compounds will be used in Project solar panels –

As Mainers, we have followed the ongoing news about PFAS contamination due to sludge spreading with growing alarm, and we share the Water District's concern about any potential for aquifer contamination. However, this project does not pose such a threat.

PFAS is ***not*** commonly used in solar panels, and, more importantly, ***will not*** be used in the solar panels for this project, because safe and effective alternatives have already been developed and are commercially available. Please see **Attachment 2** for Dr. Annick Anctil's full description of the components of a solar panel and the readily available options that do not contain PFAS.

We have provided an example letter from Jinko Solar as **Attachment 3**, a large solar module manufacturer used by EDPR, stating that no PFAS is used within their panels. While it's too early to determine definitively which modules will be used at the time of construction, Jinko panels are a common option and have a similar makeup to other industry competitors. Although the project remains in its early stages and has not begun the conditional use application process yet, a potential solution for the planning board to address the Water District's concerns would be to implement a condition of approval requiring that the applicant submit project equipment specifications for Town review and approval prior to construction.

"Solar Panels and PFAS"

– Solar panels are constructed with stable, non-hazardous, non-leaching components –

We design projects with crystalline silicon (glass) solar modules and non-hazardous, non-PFAS-based coatings. Modules are sealed from the elements and remotely monitored 24/7/365.

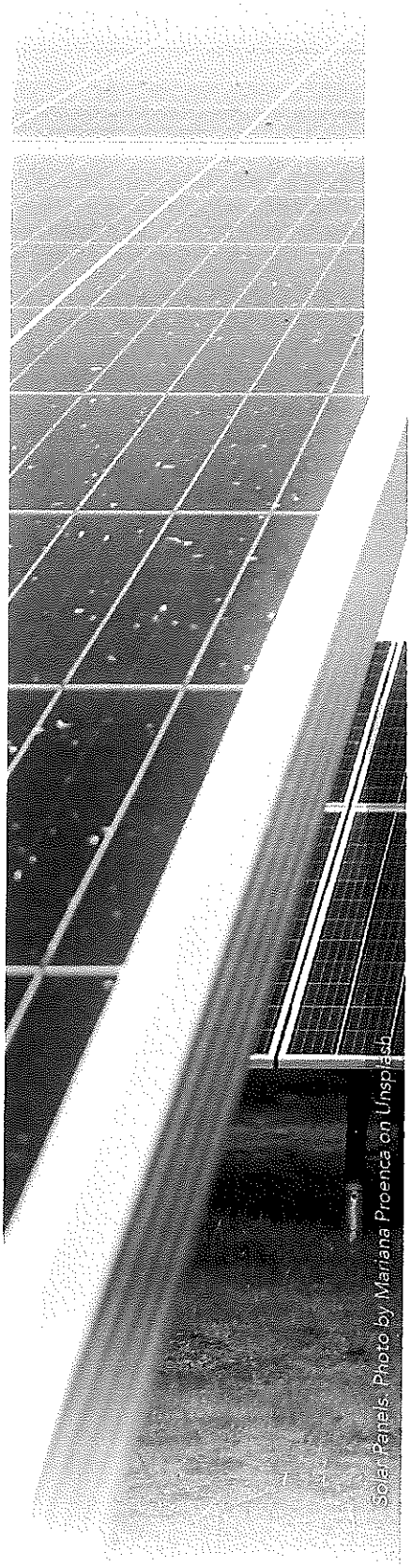
Research on these types of modules shows that they are safe. Dr. Anctil specifically notes that "no studies have shown the presence or leaching of PFAS from PV panels—either while they are in active use or at the end of their life."[1]

[1] See also Kernen, B. 2018. "Per- and Polyfluoroalkyl Substances (PFAS) in Groundwater." Conference Presentation: Connecticut Private Well Conference, April 11, 2018 (summarizing research from the New Hampshire Department of Environmental Services that found no evidence of PFAS leaching from solar panels into groundwater).

Attachment 2

Facts about solar panels: PFAS contamination

by Dr. Annick Anctil


Solar panels. Photo by Mariana Proença on Unsplash

"Clean Energy in Michigan" Series, Number 12

Facts about solar panels: PFAS contamination

By Dr. Annick Anctil, Michigan State University

Q: Do solar panels contribute to PFAS contamination?

Multiple states have raised concerns about PFAS contamination from solar farms, largely citing academic research on how PFAS could *potentially* be used in photovoltaic (PV) solar panels.[1] The fact is that PFAS is *not* customarily used in solar panels because safer, effective alternatives have already been developed and commercialized. Moreover, no studies have shown the presence or leaching of PFAS from PV panels—either while they are in active use or at the end of their life (e.g., in a landfill).

Anatomy of a solar panel

These three parts of a solar panel cause confusion about the presence of PFAS.

Self-Cleaning Coat

A self-cleaning coating on the top of a solar panel helps reduce dust, pollen, and snow adhesion, extending both the power output and the lifetime of the panel.[2] Multiple self-cleaning coating options are available on the market, many of which make use of non-hazardous silicon-based chemistry.[3] Confusion comes from the fact that some other commercialized self-cleaning coating options do make use of PFAS-based chemicals, although even those do not degrade under normal use.

Adhesives

PV panels are sealed from the elements to maximize power output and lifetime. While PFAS chemicals are found in certain adhesives, such as carpentry glues, they are not typically used in sealant adhesives for solar panels.[4] Instead, solar adhesives are based on silicone polymers, which are well known for their lack of negative health impacts and remarkable stability.[5]

Substrate

PV modules are housed in a weather-resistant substrate that offers additional protection from the elements. Thin-film PV units use glass as the substrate, while crystalline silicon PV units use a polymer substrate, which has led to the rumors of

EGLE
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GRAHAM SUSTAINABILITY INSTITUTE
UNIVERSITY OF MICHIGAN

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The Clean Energy in Michigan series provides case studies and fact sheets answering common questions about clean energy projects in Michigan.

Find this document and more about the project online at graham.umich.edu/climate-energy/energy-futures.

potential PFAS use in solar panels. The most common polymer used in silicon PV units is Tedlar, a weather resistant polymer that is *not* a PFAS compound itself and makes no use of PFAS during its manufacturing process.[6] Far more common materials, like those used in construction projects and weather resistant fabrics, present a higher risk of PFAS exposure than PV. In fact, a recent study found that these more common materials release PFAS under conditions where solar panels do not, indicating that PFAS exposure risk may be higher sitting on outdoor furniture, for example, than living next to a solar farm.[7]

What is PFAS anyway?

Per/Poly Fluoro-Alkyl Substances, PFAS for short, are a class of chemical compounds. PFAS are used in several industries for their unique properties, notably their ability to create coatings that are highly water repellent.

PFAS are extremely persistent within the environment, not breaking down over time. Certain PFAS compounds have been linked to human health issues–notably low infant birth weights, increased risk of certain cancers, and thyroid issues. As a result of their persistence and toxicity, those PFAS compounds that pose a significant risk have been banned from use and production, and subsequently replaced with safer alternatives.

It's important to note that not all PFAS compounds are dangerous. Some PFAS compounds, such as Teflon, are much more stable and present no risk to human health under normal conditions of use.[8]

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1 S. Maharjan *et al.*, "Self-cleaning hydrophobic nanocoating on glass: A scalable manufacturing process," Mater. Chem. Phys., vol. 239, Jan. 2020.; . Son *et al.*, "A practical superhydrophilic self cleaning and antireflective surface for outdoor photovoltaic applications," *Sol. Energy Mater. Sol. Cells*, 2012.; H. C. Han *et al.*, "Enhancing efficiency with fluorinated interlayers in small molecule organic solar cells," *J. Mater. Chem.*, vol. 22, no. 43, 2012.

2 "How a solar cell works – American Chemical Society." [Online]; H. C. Han *et al.*, "Enhancing efficiency with fluorinated interlayers in small molecule organic solar cells," *J. Mater. Chem.*, vol. 22, no. 43, 2012.; M. Simon and E. L. Meyer, "Detection and analysis of hot-spot formation in solar cells," Solar Energy Materials and Solar Cells. pp. 106–113, 2010.

3 "Say Goodbye To Solar Panel Cleaning | Ultimate Efficiency | Solar Sharc®." [Online].

4 "Electronics Product Catalog | Dow Inc." [Online]; B. J. Henry *et al.*, "A critical review of the application of polymer of low concern and regulatory criteria to fluoropolymers," Integrated Environmental Assessment and Management, vol. 14, no. 3. pp. 316–334, May-2018.

5 "Electronics Product Catalog | Dow Inc."; "Properties of Silicones." [Online]; A. M. Bueche, "The curing of silicone rubber with benzoyl peroxide," *J. Polym. Sci.*, vol. 15, no. 79, pp. 105–120, Jan. 1955.

6 M. H. Alaaeddin, S. M. Sapuan, M. Y. . Zuhri, E. . Zainudin, and F. M. AL-Oqla, "Polyvinyl fluoride (PVF); Its Properties, Applications, and Manufacturing Prospects," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 538, p. 012010, Jun. 2019.

7 R. M. Janousek, S. Lebertz, and T. P. Knepper, "Previously unidentified sources of perfluoroalkyl and polyfluoroalkyl substances from building materials and industrial fabrics," *Environ. Sci. Process. Impacts*, vol. 21, no. 11, pp. 1936–1945, Nov. 2019.

8 "Per- and Polyfluoroalkyl Substances (PFAS) | US EPA." [Online].; B. J. Henry *et al.*, "A critical review of the application of polymer of low concern and regulatory criteria to fluoropolymers"

Attachment 3

Jinko Solar Letter

I/A

April 4, 2018

Paul Thienpont
Manager, Renewable Engineering
Invenergy
One South Wacker Drive, Suite 1800, Chicago, IL 60606

RE: Jinko Solar Photovoltaic Modules and Dupont GenX chemical

Dear Mr. Paul Thienpont,

Jinko Solar, a solar panel manufacturer and part of the Jinko Solar Holding Co., Ltd. (NYSE: JKS), a vertically-integrated solar power solar photovoltaic module manufacturer, hereby confirms that neither the Gen X or PFAS chemical compounds are used in any of the materials used to manufacturer Jinko Solar photovoltaic modules. The Gen X and PFAS compound is not used in any of the Dupont supplied materials for the Jinko Solar photovoltaic module and the letter attached from Dupont can provide further confirmation.

We at Jinko Solar are committed to the highest standards of business ethics and always conduct business in accordance with applicable laws, rules and regulations. Jinko Solar's corporate governance policies are designed to protect the interests of its shareholders, and promote responsible business practices and corporate citizenship.

Sincerely,

Daniel Chang
Technical Director – North America
Jinko Solar U.S. Inc
595 Market St. ST 2200
San Francisco, CA 94105

Statement

WILMINGTON, Delaware, April 4, 2018 – As the industry leader in solar solutions that delivers proven power and lasting value for the solar industry, DuPont Photovoltaic Solutions does not use Gen X or PFAS compounds in the production or processing of Tedlar® polyvinyl fluoride films, which are widely used in backsheets for solar panels.

Teflon® PTFE is not sold into PV module applications. DuPont does not currently market or sell FEP for PV applications, and has not marketed or sold FEP in the past three years. JinkoSolar is only a customer for Tedlar®.

DuPont Photovoltaic Solutions (DPVS) is the leading supplier of specialty materials to the solar energy industry. Since 1975 more than half of the world's 900 million installed solar panels contain DuPont materials. The DPVS portfolio, including Solamet® photovoltaic metallization pastes and DuPont™ Tedlar® polyvinyl fluoride films, is the established benchmark of the industry, delivering lifelong value through proven performance, reliability, efficiency and best return on investment. To learn more, please visit http://photovoltaics.dupont.com.

# # #

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