

STATE OF VERMONT
PUBLIC UTILITY COMMISSION

Petition of Otter Creek Solar LLC, pursuant to 30	)	Case No. 19-0516
V.S.A. § 248, for a certificate of public good	)	
authorizing the installation and operation of the	)	
“Warner Solar Project,” a 2.2 MW solar electric	)	
generation facility located off Rice Lane in	)	
Bennington, Vermont	)	

PREFILED TESTIMONY OF ROBERT POPP

**On Behalf of the Vermont Agency of Natural Resources,
Department of Fish & Wildlife**

January 30, 2020

Summary of Testimony

Mr. Popp is the Botanist for the Vermont Fish and Wildlife Department. He addresses the impacts of the proposed Warner Solar Project on Rare Plants. He provides the Agency’s review of these impacts and offers recommendations to avoid, minimize and mitigate impacts.

EXHIBITS

Exhibit ANR-RP-1	Resume of Robert Popp
Exhibit ANR-RP-2	Vermont Fish & Wildlife Department, Vermont Natural Heritage Inventory - Rare and Uncommon Native Vascular Plants of Vermont
Exhibit ANR-RP-3	Vermont Fish & Wildlife Department - Guidance for Conducting Rare, Threatened, and Endangered Plant Inventories in Connection with Section 248 Projects
Exhibit ANR-RP-4	Vermont Fish & Wildlife Department - Guidance for Non-Native Invasive Plant Species Monitoring and Control in Connection with Section 248 Projects
Exhibit ANR-RP-5	Petitioner's September 12, 2019 Aster Distribution Report
Exhibit ANR-RP-6	Petitioner's September 17, 2019 Aster Plant Location Plan

1 **Q1. Please state your name, place of employment and your position.**

2 A1. My name is Robert Popp. I am the Botanist for the Vermont Fish and Wildlife
3 Department (“Department”), Agency of Natural Resources (“Agency”). I am stationed in
4 Barre and am part of the Department’s Natural Heritage Program. Heritage programs
5 track and protect rare plants, animals, and significant natural communities in every state
6 and Canadian province.

7
8 **Q2. Please describe your tenure with the Department.**

9 A2. I have been employed as the Department Botanist for 30 years. I am responsible for
10 determining the status and distribution of Vermont’s rare flora and assessing impacts due
11 to proposed activities such as Act 250 and Section 248 projects.

12
13 **Q3. Please describe your educational background.**

14 A3. I hold a B.S. degree from, SUNY College of Environmental Science and Forestry at
15 Syracuse in Forest Biology with a major in Botany and an M.S. degree from Colorado
16 State University in Plant Ecology. I also successfully completed two years of course work
17 and research towards a Ph.D. in Botany at the University of Massachusetts. Prior to my
18 work with the state I worked as an ecological consultant for four years in New York and
19 Massachusetts, mapped wetlands for the National Wetland Inventory, and conducted
20 research in northern Kenya for a National Science Foundation funded project. I have
21 included a resume with my testimony as **Exhibit ANR-RP-1**.

22

1 **Q4. Describe your training and experience beyond your formal education.**

2 A4. During my employment with the Department, I have taken week-long courses in sedge
3 identification and ecology, bryophyte identification and ecology, and shorter courses in
4 willow identification, aquatic plant identification, mushroom identification, and Arc GIS.

5
6 My present position involves assessing the status and distribution of Vermont's rare flora.
7 This entails making recommendations to the Vermont Endangered Species Committee on
8 adding a species to the state endangered species list and also assigning rarity ranks to our
9 flora. These ranks are based on a combination of the number of known populations, the
10 size and vigor of the populations, and an assessment of threats facing them.

11
12 In addition to rare, threatened, and endangered plant monitoring I am currently working
13 with the major electric utilities in the state to develop Best Management Practices for
14 their ROWs and develop a general takings permit for incidental taking of a listed plant
15 while providing management to benefit the population. I also assist in natural community
16 inventories and research projects. This fall I participated in a study of wetlands associated
17 with both shores of Lake Champlain to assess the impact of potential hydrologic
18 manipulations. The Lake Champlain study entailed documenting significant natural
19 communities as well as previously known and new populations of state rare plants. I have
20 also assisted in all the Heritage Program's statewide natural community inventories. This
21 allows us to assess the significance of natural communities on a statewide basis as well as
22 affording us an opportunity to update known plant records and discover new populations.

1 I have contributed to the Vermont Conservation Design (VCD) which is a landscape level
2 approach to protecting and enhancing an ecologically functional landscape into the
3 future, by assessing the degree of protection afforded to each of the state's rare plants.
4 My work on natural community inventories has contributed to the recent edition of
5 Wetland Woodland, Wildland, the Department's recent book detailing all the natural
6 communities in the state. In the course of my work I routinely coordinate with state and
7 federal agencies as well as non-governmental conservation organizations to protect
8 Vermont's rare flora.

9
10 **Q5. Have you previously testified before the Public Utility Commission, the**
11 **Environmental Court, or District Commissions?**

12 A5. Yes, I have testified before the Public Utility Commission on matters related to impacts
13 to rare, threatened, and endangered plants, significant natural communities, and
14 conditions for controlling non-native invasive plants. Proceedings before the
15 Commission where I have provided testimony include the VT Gas Addison County Phase
16 I and Phase II projects; VELCO's Southern Loop, Northwest Reliability, and East Ave.
17 Loop projects; the TDI project, Docket No. 8400; and the Green Line project, Docket No.
18 8847. I was also very much involved in the VT Gas investigation of the mowing of the
19 state threatened, Harsh Sunflower, Docket No. 8791, but did not provide testimony as
20 that matter was resolved through a stipulation.

21

1 I have also testified before the Vermont Environmental Board and to various District
2 Environmental Commissions on a variety of projects that posed impacts to rare,
3 threatened, and endangered plants or significant natural communities. It is a regular part
4 of my duties to provide comments on behalf of the Department regarding impacts to rare
5 plants and natural communities.
6

7 **Q6. What is the purpose of your testimony?**

8 A6. My testimony addresses the impacts of Otter Creek Solar LLC's proposed "Warner Solar
9 Project" ("Project") on white arrow-leaved aster (*Symphyotrichum urophyllum*), a plant
10 which is ranked S1 (very rare) in Vermont. In addition to the direct impacts of the solar
11 arrays and associated grading, it also includes impacts associated with the spread of non-
12 native invasive species (NNIS) and shading by the arrays. I provide my review and
13 conclusions concerning impacts based on the Project as presently proposed, and offer
14 recommendations for avoidance, minimization and mitigation measures which could be
15 taken to reduce impacts to an acceptable level (i.e., adverse as opposed to unduly
16 adverse).
17

18 **Q7. What materials have you reviewed while evaluating this Project?**

19 A7. Materials I have reviewed include the following:

- 20 i. Petitioner's June 2016 RTE Species Survey – Exhibit WS-JM-7.
- 21 ii. Petitioner's June 2016 Plant Community and Species List - Exhibit WS-JM-9.
- 22 iii. First Supplemental Prefiled Direct Testimony of Jim McClammer.

- iv. Petitioner's May 2019 Vegetation, Flora and Wetlands Report – Exhibit WS-JM-15.
- v. Second Supplemental Prefiled Testimony of Jim McClammer.
- vi. Petitioner's September 1, 2019 Aster Resurvey Report – Exhibit WS-JM-16.
- vii. Petitioner's September 18, 2019 Discovery Responses to the Agency's First Set of Information Requests.
- viii. Attachment 1 (Petitioner's September 12, 2019 Aster Distribution Report) to Petitioner's September 18, 2019 Discovery Responses.
- ix. Attachment 2 (Petitioner's September 17, 2019 Aster Plant Location Plan) to Petitioner's September 18, 2019 Discovery Responses.
- x. Vermont Fish & Wildlife Department, Vermont Natural Heritage Inventory - Rare and Uncommon Native Vascular Plants of Vermont.
- xi. Vermont Fish & Wildlife Department - Guidance for Conducting Rare, Threatened, and Endangered Plant Inventories in Connection with Section 248 Projects.
- xii. Vermont Fish & Wildlife Department - Guidance for Non-Native Invasive Plant Species Monitoring and Control in Connection with Section 248 Projects.
- xiii. NatureServe Explorer Website
- xiv. Flora of North America Volume 20
- xv. Flora NovaeAngliae: A Manual for the Identification of Native and Naturalized Higher Vascular Plants of New England.

Q8. Have you visited the Project site?

1 A8. Yes, I visited the Project site with Jim McClammer, the Petitioner's consultant, on
2 10/21/2019 to observe the site and the white arrow-leaved asters growing at the site.
3

4 **Q9. Has the Petitioner provided an adequate inventory of rare, threatened, and**
5 **endangered plants for the Project site?**

6 A9. Yes, but only after some initial uncertainty. The Petitioner's first plant survey which was
7 conducted primarily on 5/27/2016 (Exhibit WS-JM-7) reported no Rare, Threatened or
8 Endangered species or habitats at the Project site. In response to the Department's
9 request, Petitioner performed a second plant inventory on 5/11/2019 (Exhibit WS-JM-
10 15). At this time, Asters were found in two of the four natural community types observed
11 on the Project site, but these plants were not identified to species. It was necessary to
12 identify the plants at the species level because there are 27 different species of Asters in
13 Vermont, of which nine are either rare or very rare. Because of this the Department
14 requested that the plants be resurveyed between 15 August and 15 October when the
15 plants were likely to be in flower, specifically to identify to species the unknown Asters
16 that were previously observed.
17

18 During the Petitioner's resurvey on 9/01/2019 (Exhibit WS-JM-16) fifteen individuals of
19 the very rare white arrow-leaved aster were definitively identified. A subsequent
20 inventory performed by the Petitioner on 9/07/2019 located several hundred additional
21 white arrow-leaved asters at approximately 44 locations on and adjacent to the Project
22 site (Attachments 1 and 2 to Petitioner's September 18, 2019 discovery responses,

1 included as Exhibits 5 and 6 to my testimony). I have determined that the September 7,
2 2019 inventory is adequate for the purpose of documenting the existence of rare,
3 threatened and endangered plants at the Project site since the asters were in flower at this
4 time. However, the Petitioner has still not provided a precise count of the total number of
5 individuals in the population.
6

7 **Q10. You have referenced past cases involving rare, threatened and endangered plants**
8 **which you have participated in and have also indicated that white arrow-leaved**
9 **aster, the subject of this case, is a very rare species. Please explain what a**
10 **designation of rare means.**

11 A10. Within the Agency, the Department determines which plants are rare in Vermont and
12 assigns ranks accordingly. Plants, animals, and natural communities are ranked S1
13 through S5. The ranks are based on the number of known populations or occurrences in
14 the state and the presence and severity of any threats.
15

16 Plants ranked **S4** and **S5** are common or very common, respectively. Those ranked as **S3**
17 are considered uncommon and typically have between 30 and 100 known populations in
18 the state. None of the species in these three categories are regulated by the state. The next
19 two categories include species that occur in low numbers throughout the state, either
20 intrinsically so or via some anthropogenic or natural process. Plants ranked as **S2** are
21 considered as **rare** and are typically known from between 6 and 20 populations. Plants
22 ranked as **S1** are considered **very rare** and typically occur at five or fewer locations

1 throughout the state or are facing a severe threat and/or a significant decline. Plants
2 ranked as S1 are at high risk of extirpation in the state. The Agency attempts to protect all
3 S1, and S2 species, although the level of protection varies between the categories.
4

5 Rare and very rare plants may also be listed as *endangered* or *threatened* by the
6 Secretary of the Agency in accordance with 10 V.S.A. § 5402. Endangered plants are
7 those for which continued existence as a sustainable component of the State's wild flora
8 is in jeopardy. Such plants are in immediate danger of becoming extirpated in the state.
9 Threatened plants are those with a high possibility of becoming endangered. Threatened
10 and endangered plants receive additional legal protection under Vermont's Endangered
11 Species Law (10 V.S.A. Chap. 123). Proposed or incidental impacts to any individual
12 endangered and threatened plant requires an Endangered Species Permit issued by the
13 Secretary of the Agency in accordance with 10 V.S.A. § 5408.
14

15 Other ranking categories utilized by the Department to designate a plant's status in the
16 state include the following. A rank of **SH** indicates that the species is possibly extirpated
17 from the state. In this case there are no recent records of the plant occurring in the wild,
18 only historical records, typically more than 25 years old. However, it is believed that
19 some unknown occurrences may exist so there is some potential for rediscovery. A rank
20 of **SX** signifies that a species is presumed extirpated in the state. These have not been
21 located despite intensive searches, and it is presumed there is little likelihood of their
22 rediscovery within the state. A rank of **SU** indicates that the taxon is currently

1 unrankable. This is most often the situation when there is a recent taxonomic change
2 where what was previously considered a single species is split into two or more species.
3 It can also occur when the only known occurrences are of questionably native origin and
4 are likely escapes from horticultural settings.

5
6 Note that all the above-mentioned ranks reflect the plant's status only in Vermont as
7 indicted by the "S" for state rank. A similar hierarchy exists to reflect the species status
8 throughout its entire range which is indicated by a "G" for global rank. A plant that is
9 very rare throughout its range would be ranked G1, etc. There is also a regional list of
10 rare plants in New England (*Flora Conservanda*) developed by the six state Heritage
11 Programs (VT, NH, ME, MA, CT and RI) in conjunction with the Native Plant Trust
12 (formerly The New England Wildflower Society), a non-profit organization founded in
13 1900 and whose mission is to conserve and promote New England's native plants to
14 ensure healthy, biologically diverse landscapes. This ranking hierarchy is as follows:

15 Division 1: Globally Rare Taxa (G1 or G2) occurring in New England

16 Division 2: Regionally Rare Taxa. Generally restricted to fewer than 20
17 occurrences observed within the last 25 years throughout New England.

18 Division 3: Locally Rare Taxa. Species that are declining throughout a portion of
19 their range in New England or populations that are widely disjunct, such as
20 coastal relicts on Lake Champlain beaches.

21

1 **Q11. You stated previously that white arrow-leaved aster (*Symphyotrichum urophyllum*)**
2 **is ranked S1 (very rare) in Vermont. Please explain why this ranking was**
3 **established and what is known about this plant species in Vermont and the greater**
4 **New England region.**

5 A11. White arrow-leaved aster (*Symphyotrichum urophyllum*) is currently ranked as S1 (very
6 rare) in Vermont. This is reflected in its inclusion on the Department's *Rare and*
7 *Uncommon Native Vascular Plants of Vermont* which was most recently revised in
8 August 2018, and which is attached as **Exhibit ANR-RP-2**.

9
10 White arrow-leaved aster is known from only three populations in the state, all in the
11 Town of Bennington. One of these was known to the Department since 1988 when the
12 species was named *Aster sagittifolius*. The second population was reported in 2014 by
13 consultants working on the Chelsea and Apple Hill solar project sites, which are
14 geographically in the vicinity of the Warner Project site but are separated from the
15 Warner site by Route 7. The presence of the aster nearby led to the Department's request
16 for a survey later in the year for this Project, specifically focused on asters when they
17 would be in flower. In a vegetative state, asters are very difficult to identify to species.

18
19 White arrow-leaved aster is ranked as G4G5 and *Flora Conservanda* Division 2
20 (regionally rare). The global rank indicates that the aster is globally secure. Its range
21 extends from the Midwest: Ontario to Arkansas and east to the Carolinas, Pennsylvania,
22 and New York. The *Flora Conservanda* rank was developed by the botanists from each
23 New England state and coordinated by staff of the Native Plant Trust. It is published as

1 *Flora Conservanda: New England Plant Conservation Program list of plants in need of*
2 *conservation* in Rhodora. 2013. At the time of the publication only the one population
3 was known from Vermont for all of New England. There were reports in literature of
4 populations in other New England states, but no specimens are known. Because botanical
5 distribution is based entirely on collected specimens in repositories that can be viewed
6 and verified, the reports lacking specimens are discounted. The center of the white arrow-
7 leaves aster's range is in the Midwest. It is at the edge of its range in New England where
8 it occurs only in Vermont. This is discussed further below in my responses to Questions
9 14 – 16.

10
11 **Q12. Please describe the process utilized by the Department for ranking plants in**
12 **Vermont and explain your role in that process.**

13 A12. As Botanist for the Department I convene a meeting of state experts, generally every
14 three years who review the Department's list of *Rare and Uncommon Native Vascular*
15 *Plants of Vermont* and revise the state ranks as warranted. The experts are all members of
16 the Scientific Advisory Group on Flora which advises the state Endangered Species
17 Committee on rare plant issues. The review incorporates all new information regarding
18 the number and size of populations, their distribution, threats, and any other relevant
19 information. The list is then reviewed by the entire Scientific Advisory Group on Flora
20 as well as by experts within the Agency and in neighboring states before being accepted
21 by the Department.

22

1 The Department's Heritage Program is the repository for information on rare plants,
2 animals, and natural communities for the state. The ranking methodology is employed
3 nationwide by each state's heritage program and is coordinated by NatureServe, a
4 national network of state and provincial heritage programs. I regularly update our plant
5 information by monitoring many rare plant populations, either myself or with the
6 assistance of conservation volunteers organized by the Native Plant Trust. In addition, the
7 Department obtains information from various partners, especially the Vermont
8 Department of Environmental Conservation Lakes and Ponds and Wetlands Programs,
9 Green Mt. National Forest, The Nature Conservancy, Vermont Land Trust, and from
10 consultants and various volunteers. We also have older records from plant collections
11 housed at all the major herbariums in the northeast. All results from monitoring surveys
12 including population size, vigor, threats, and any management needs are entered into the
13 Heritage Program's Biological Conservation Database (BCD). The database currently
14 has over 4,200 rare plant records that are used to inform conservation planning, land
15 management, and development review decisions and recommendations, such the ones I
16 am offering in this Section 248 proceeding.

17
18 **Q13. Is the Natural Heritage Program unique to the State of Vermont?**

19 A13. No. The Nature Conservancy began establishing natural heritage programs in each state
20 in 1974 and completed this effort in the U.S. in 1989, the same year it began programs in
21 Canada. The Vermont Natural Heritage Program was established in 1984 and became
22 part of state government in 1989. I began as the Botanist for the program when it was

1 assimilated into the Department. About two-thirds of state or provincial natural heritage
2 programs are now part of state or provincial government. The Heritage Network has
3 recently been expanded into some Central and South American nations. Regardless of
4 their location, all programs follow the Heritage Methodology which is coordinated by
5 NatureServe. NatureServe is a nonprofit which serves as a unifying network for all the
6 various state, provincial, and national Heritage Programs. NatureServe also maintains and
7 updates the Biological Conservation Database on a regular basis to incorporate new data
8 collection techniques and ensure standardization among the programs.

9
10 **Q14. Describe generally the range of plant species which presently exist in Vermont.**

11 A14. Vermont is home to over 2,600 plant species. Most of these are flowering plants, but this
12 also includes conifers, ferns, clubmosses, horsetails, and bryophytes—mosses, liverworts,
13 and hornworts. The Vermont flora is comprised of approximately 1,600 species of native
14 vascular plants and about 600 bryophyte species. The remainder is composed of species
15 that are not native to Vermont, but now exist in the wild (outside of cultivation) in
16 Vermont.

17
18 About 500 native plant taxa are considered rare in the state including 150 species which
19 are listed as threatened or endangered. Because of the relatively recent glaciation of the
20 northeast and comparatively less landscape diversity than some other areas of the
21 country, about three-quarters of our listed plant taxa are at or near their edge of range.
22 Since the Department's responsibility is to assess rarity and threats within the state

1 boundaries, this is reflected in the S Rank. However, many of these plants are secure on a
2 global level since their main distribution lies outside of Vermont. This is reflected in their
3 G or Global Rank which I referenced earlier.
4

5 **Q15. You indicated that most Vermont rare plants are at or near the edge of their range.**
6 **Please explain what this means.**

7 A15. All plants have a range in which they occur naturally, i.e. outside of cultivation. They are
8 typically most abundant in the center portion of that range. Correspondingly they
9 generally become less abundant at the edge of their range. This is because the habitat
10 conditions at the center are generally more favorable for the plant and less so at the
11 edges. This may be due to temperature regimes, amount of precipitation, presence of
12 certain soils or bedrock types or a number of other factors. In many cases plants at the
13 edge of range are or become genetically distinct from those at the center of the range
14 because they are growing under different conditions to which they become adapted over
15 time.
16

17 **Q16. Explain why it is important to protect regionally rare, edge of range plants.**

18 A16. Most scientists agree that plant populations at the periphery of their range are generally
19 more genetically and morphologically diverse than those at the center of the species
20 range. Peripheral populations are expected to diverge from those at the center as a result
21 of their isolation, but also a number of other factors such as growing under different

1 temperature and/or precipitation regimes, differences in soils and/or bedrock, adaptation
2 to different pollinators, etc.

3
4 It is also widely accepted by biologists that the evolution of new species typically
5 happens on the periphery. Therefore, the long-term conservation of a species is even
6 more likely now to depend upon the protection of these genetically distinct edge of range
7 populations. This is largely because such populations are likely key in providing
8 adaptations to novel environmental extremes expected to occur during rapid climate
9 shifts. Plant populations at the northern edge of their range are thought to be especially
10 important to provide a source for colonization northward, but also to provide plants with
11 a unique genetic composition that is more closely adapted to local conditions. Although
12 these plants are by definition rare, they may also provide as yet unknown ecological
13 functions that include a possible nectar or food source for insects or animals.

14
15 We know that the white leaved arrow-aster is at the northeast edge of its range in
16 Vermont. It is also certain that it is growing under very different climatic conditions than
17 in the center of its range in the Midwest prairies. Moreover, its habitat in the Midwest is
18 described as being rather broad, ranging from sandy soils and stabilized dunes to open
19 oak-pine woods and limestone barrens. In Vermont populations occur on calcareous
20 bedrock which indicates that the plants require the extra nutrients to compete here. It is
21 typical that edge of range species require more specialized growing conditions which
22 partly explains their inherent rarity.

1
2 There are additional justifications for protecting peripheral populations. All plants native
3 to Vermont are part of the state's natural heritage, and it would be shameful from a
4 cultural and social perspective to lose any of these from the state. The state has
5 jurisdiction only over those species that occur within our boundaries and any declines
6 elsewhere in the species range are beyond our control. Protecting peripheral populations
7 is one way of ensuring that a given species does not become endangered as its core
8 populations experience pressures brought about by land use changes and the uncertainties
9 presented by climate change.
10

11 **Q17. Please identify known stressors and threats affecting plants in Vermont.**

12 A17. Two major threats facing plants in Vermont include loss and fragmentation of habitat and
13 invasive species. Habitat loss and fragmentation are considered two of the major factors
14 driving loss of biological diversity and ecosystem degradation. Loss of natural habitat is
15 primarily a result of development, especially for commercial purposes, but also housing,
16 agriculture, energy, and associated infrastructure, such as roads, driveways, powerlines,
17 and trails. As discussed in the 2015 Vermont Forest Fragmentation Report (VT Dept. of
18 FPR) while Vermont is approximately 78% forested, the Vermont Forum on Sprawl
19 reported that the rate of development is 2.5 times greater than our population growth.
20

21 Besides a loss of diversity due to direct impacts, development ultimately shrinks the
22 amount of available habitat available to the surviving species. Perhaps more insidious is

1 the fragmentation of what was previously intact habitat. While this is a major factor
2 inhibiting animal movement, it can also impede plant colonization. However, its primary
3 impact is through the introduction of non-native invasive plants (NNIS) and herbivores.
4 Non-native invasive plants can over time spread extensively and shade and out compete
5 many of our native plants. This can result in a monoculture of mostly a single or a few
6 species which provides less habitat, food and shelter for pollinators and animals as well
7 as eliminating native plants.

8
9 NNIS typically don't compete well in intact natural communities, but they thrive in
10 disturbed areas. Any fragmenting feature or disturbance within an otherwise intact
11 landscape is rapidly colonized by NNIS unless stringent controls are undertaken. Even
12 with such controls, the Department has recently found that NNIS often spread into an
13 area where they previously were not present. This is the situation with Kingdom
14 Community Wind where five NNIS now occur at the turbine sites along the ridgeline.
15 None of these were present prior to the construction and all have increased despite
16 attempts to control them.

17
18 Many herbivorous animals thrive on the forest edge and creating openings in the forest
19 allows them easy access. Deer and rabbits can have a serious detrimental impact to native
20 plants, and they have been implicated in some local extirpations. Under lower browse
21 pressure herbivores will often focus on flowers and upper, more tender shoots of plants.
22 But with greater densities, entire plants may be browsed.

1
2 Another major threat is climate change. Plants have adapted over thousands of years to
3 climatic changes, shifting their ranges with glaciation and other cataclysmic events. But
4 those happened over thousands of years unlike our present situation where species must
5 respond within a generation or two to major climatic shift. The results will favor more
6 weedy, disturbance adapted species, mostly NNIS at the expense of locally adapted
7 native flora.
8

9 **Q18. Has the Department adopted any written guidance to addressing the identification**
10 **and management of RTE plants in connection with Section 248 projects?**

11 A18. Yes. In 2016 the Department adopted two documents which are intended to provide
12 Section 248 project developers with guidance for identifying rare, threatened and
13 endangered plants and appropriately managing risks to these important resources.
14

15 One entitled, *Guidance for Conducting Rare, Threatened, and Endangered Plant*
16 *Inventories in Connection with Section 248 Projects*, attached as **Exhibit ANR-RP-3**,
17 discusses when an inventory for rare, threatened, or endangered plants is warranted and
18 provides guidance on the timing and methodology of an inventory. The document
19 provides an outline of site features, such as presence of nearby rare plants, certain
20 bedrock or habitat features, soils, and landscape setting that increase the likelihood of
21 rare plants being present. Some consultants contact me for a waiver if they believe no
22 inventory is warranted or if there is uncertainty.

1
2 The document also provides an outline of what information the inventory should provide.
3 This includes a description and photos of the site, a species list that identifies at least the
4 more common plants on the site, date and name of person conducting the inventory. The
5 document also provides a window for when plant inventories are acceptable. This
6 window is from 15 June through 30 September. There is no one perfect time to conduct
7 an inventory, and ideally it would be done over two or more visits throughout the
8 growing season. However, these dates were chosen as the best window in which to
9 identify most of the rare plants in the state. That said, the potential presence of a very
10 early or late maturing plant, may warrant an additional visit outside this window.

11
12 The Aster group in general are late flowering species, typically beginning to flower in
13 August or even September. Because of the similarity of the basal and stem leaves among
14 many of the species, flowers or fruiting plants are required for positive identification. It
15 comes as no surprise that the project's consultant was unable to identify any of the asters
16 on his first two inventories of the site in May.

17
18 The guidance document also identifies the thresholds utilized by the Department for
19 determining when impacts to rare and very rare plants are considered unduly adverse, and
20 discusses the need for avoidance, minimization and mitigation of adverse impacts.
21

1 The second document, *Guidance for Non-Native Invasive Plant Species Monitoring and*
2 *Control in Connection with Section 248 Projects*, attached as **Exhibit ANR-RP-4**,
3 provides best management practices for preventing the introduction and spread of NNIS.
4 This includes cleaning construction equipment prior to entering the site, approving seed
5 mixes, and control of pre-existing NNIS in proximity of any rare plants that are present
6 on the site.

7
8 **Q19. Please describe how the Project will impact white arrow-leaved asters.**

9 A19. As proposed, the Project would have a direct impact on the very rare asters by clearing
10 vegetation, operating heavy machinery, grading soil and placing solar racking posts in the
11 areas where these plants are growing. All of these activities would result in direct
12 mortality of plants. Direct impacts would also result from the proposed methods of
13 ongoing vegetation management performed by grazing sheep. Sheep are notoriously
14 omnivorous and would likely devour any remaining aster plants. Although this might not
15 result in direct mortality, browsing the tops would prevent flowering and seed set, and
16 continual browsing would likely result in the demise of the entire plant. Additional
17 impacts would possibly result from shading of the plants that do survive the construction
18 phase where these plants are growing in locations which would be under the rows of solar
19 panels. Being a plant more adapted to Midwest prairies, it is unknown how they might
20 adapt to shaded conditions. The Project also presents the risk of introduction and spread
21 on NNIS and the harmful effects these would have on the asters by overtopping and
22 outcompeting them. NNIS are commonly transported on construction equipment where

1 root and rhizome material frequently get lodged in treads, buckets, and topsoil. Finally,
2 decommissioning of the Project, if it is built, would present the risk of harm to any asters
3 that survive the construction and operational phases due to the decommissioning activity
4 and machinery on the site.

5
6 **Q20. What is your conclusion concerning the Project's effect on white arrow-leaved**
7 **asters.**

8 A20. Without implementation of appropriate measures to avoid, minimize and mitigate, the
9 impact of the Project on the white arrow-leaved aster would be unduly adverse. The
10 Department has adopted a threshold of less than 10% impact to an S1 plant population
11 and less than 20% impact to an S2 plant population. If the impact exceeds this threshold,
12 the impact is considered undue and the Department requires some combination of
13 avoidance, minimization, and mitigation. Because the white arrow-leaved aster is ranked
14 as S1 (very rare), the Department protocol warrants measures to reduce the Project's
15 impact to less than 10% of the plant population.

16
17 On the second of his follow-up inventories, conducted on September 7, 2019, the
18 Petitioner's consultant identified several hundred plants at approximately 44 new
19 locations at the Project site, each of which was marked with a pink flag. This inventory
20 was summarized in a report which Petitioner produced on September 18, 2019 in its
21 discovery responses. A copy of the report is attached as **Exhibit ANR-RP-5**. While most

1 flags indicate the number of individual plants in the cluster, the flags marking the clusters
2 adjacent to the railroad ROW were not counted. So, the exact number of asters at the site
3 is not known. I visited the site with the consultant on 10/21/19 and verified that the white
4 arrow-leaved aster was correctly identified at a number of the flagged sites. We did not
5 locate every flag, nor did we count the number of plants as most flags marked a cluster of
6 plants.

7
8 Based on the Petitioner's September 12, 2019 Aster Distribution Report, the white arrow-
9 leaved aster overall plant number totals approximately 208. Based on this number, the
10 Project would need to reduce its impact to fewer than 21 individual plants to meet the
11 Department's less than 10% threshold.

12
13 **Q21. Do you believe that it would be possible for the Project to reduce its impacts on**
14 **white arrow-leaved aster to the point where they would be less than undue?**

15 A21. Yes. However, this would necessitate Project modifications designed to avoid and
16 minimize impacts, as well as measures to mitigate the extent of the remaining impacts so
17 that, overall, impacts are below 10%.

18
19 **Q22. What avoidance and minimization measures do you recommend and why?**

20 A22. I recommend the southernmost row of solar panels and the nearby soil stockpile be
21 removed from the Project. Doing so would avoid direct impacts to the plants at locations
22 6 and 30 which are depicted on the 9/17/2019 Aster Plant Location Plan produced by

1 Petitioner in response to discovery and attached here as **Exhibit ANR-RP-6**. Elimination
2 of this row of panels would protect a number of asters and also provide a seed bank. Seed
3 banks are areas where seeds have dropped and are buried in the soil to possibly germinate
4 at a later date. Conserving this area will protect only a small percentage of the population;
5 the remaining plants will either be directly impacted by vegetation clearing, grading,
6 equipment movement, and placement of panels or by the sheep grazing proposed as
7 vegetation management by the Petitioner. Therefore, I also recommend that all of the
8 plants within the proposed array area be transplanted under proper conditions and timing
9 to a conservation area that the Petitioner establishes on site.

10
11 Establishment of a rare plant conservation area where the southern-most row of panels is
12 presently proposed and extending to the southern limits of clearing would ensure
13 protection of the plants which exist at the south end of the array and provide a place to
14 accept transplants from the array area. The conservation area should also include a strip
15 of land at least 15-feet wide beginning at the southern-most clearing limit and extending
16 northward along the Project's western boundary and clearing limits to a point beyond
17 plant location 38 as depicted on Petitioner's 9/17/2019 Aster Plant Location Plan. This
18 would ensure there is sufficient area to accept transplants and would also provide a level
19 of protection for the plants which are located either within or beyond the western edge of
20 the Project site near the railroad. This conservation area would not only protect a
21 percentage of the plants in situ, but also provide a suitable repository for the transplanted
22 individuals as well as protecting a portion of the seed bank. The conservation area should

1 be bounded by permanent fencing and would require a management plan with
2 prescriptive regimes for both clearing and preparing the area, as well as ongoing
3 vegetation management during the operational life of the Project.
4

5 In order to prepare the conservation area prior to any Project site preparation and
6 construction, trees within it shall be preferably felled in winter, but regardless of timing,
7 using only hand tools and felling towards the outside of the area. Trees will need to be
8 removed with care, without the use a heavy machinery within the conservation area, to
9 avoid impacting any aster plants and compacting the soil. The tree stumps shall be cut
10 between flush and three feet from ground level. Shrub vegetation within the conservation
11 area shall be cut by hand at ground level and removed by hand from this area. Heavy
12 equipment shall not enter this area and there shall be no grading or soil disturbance
13 within this area other than weeding and hand digging for purposes of transplanting asters
14 and other activities reasonably necessary to accomplish the preparation and establishment
15 of the rare plant conservation area.
16

17 Petitioner shall also use reasonable efforts to remove all non-native invasive species
18 (“NNIS”) which are growing in the rare plant conservation area at the time of preparation
19 of the area. NNIS will need to be removed by hand, bagged, and disposed of at a landfill.
20 Herbicides shall not be used without written authorization from the Agency. Petitioner
21 shall use reasonable efforts to weed by hand the locations within the rare plant
22 conservation area that will receive transplanted asters in advance of transplantation.

1
2 All white arrow-leaved aster plants within the area of the proposed arrays shall be
3 transplanted to the conservation area. This will need to happen only during the periods of
4 1 October – 15 December or 1 March – 15 June. This timing is intended to avoid moving
5 plants during the hottest part of the summer and when the plants are flowering and in
6 winter when ground is frozen or likely to soon freeze which would result in frost heaving.
7 Moving the plants during the dormant season would necessitate accurately marking the
8 locations of all individual plants, as well as the boundaries of all clusters of plants, during
9 the prior growing season when the plants are identifiable at the species level, and
10 ensuring that the marking remained to the time of transplanting.

11
12 All transplanted plants shall be watered the same day they are transplanted and then
13 throughout the first growing season following transplantation as follows. Plants shall be
14 adequately watered one time per week, every week, unless it has rained one-half inch, or
15 more, during the preceding week and up until there is a killing frost.

16
17 Prior to commencement of site preparation and construction, the entirety of the rare plant
18 conservation area shall be demarcated and surrounded by reinforced silt fence and
19 construction limits barrier tape. Prior to commencement of site preparation and
20 construction, a qualified botanist shall inspect this area to confirm it has been established
21 and a qualified engineer shall confirm that the entire area is surrounded by silt fence and
22 construction barrier tape which are installed correctly, secured and clearly visible.

1 Petitioner shall brief all contractors on the location of, and need for avoidance of, this
2 area prior to commencement of any site preparation and construction activities.

3
4 Site clearing activities for the remainder of the Project site shall not take place until all
5 white arrow-leaved asters are transplanted to the conservation area. Site clearing will
6 need to avoid any impacts to the conservation area. Once construction is completed
7 permanent fencing sufficient to exclude grazing sheep from the rare plant conservation
8 area shall be erected. The Petitioner shall also post permanent warning signs along the
9 boundary of this area to limit access only to authorized people and only for authorized
10 activities.

11
12 Within the Conservation Area mowing shall occur once every four years and will occur
13 only prior to July 1 or after 30 October to allow asters to flower and set seed. All visible
14 soil and plant material shall be removed from all equipment prior to entry into the
15 conservation area at all times (site preparation, construction and maintenance)

16
17 **Q23. What mitigation measures do you recommend and why?**

18 A23. The Department has requested that the Petitioner collect seeds from the asters on the
19 Project site and provide the seeds to the Native Plant Trust for safe storage. These seeds
20 would be utilized to re-establish the aster population if it declines, otherwise they will be
21 stored indefinitely by the Native Plant Trust as part of their seed banking efforts.
22 Monitoring of the aster population at the Project site by a qualified consultant paid for by

1 the Petitioner will need to occur annually during the growing season, for a minimum of
2 three years. Monitoring reports are to be submitted to the Agency by 31 January. Should
3 there be a decline in the number of transplanted white arrow-leaved asters within the
4 conservation area which equals or exceeds ten percent, the Petitioner shall perform
5 additional mitigation which shall consist of germinating and growing seedlings from the
6 previously collected seeds and transplanting these plants to the conservation area or
7 another location approved by the Department. The germination and growing of seeds
8 shall be done by staff at The Native Plant Trust with the seeds provided to them, and at
9 the expense of the Petitioner.

10
11 Petitioner shall also annually monitor the rare plant conservation area for the presence of
12 non-native invasive species (NNIS) for a period of five years, commencing upon the
13 completion of construction and site stabilization. Petitioner shall control NNIS in
14 accordance with a Management Plan approved by the Department's Natural Heritage
15 Inventory program. Annual monitoring for NNIS shall be conducted before September
16 15 each year and a monitoring report shall be submitted to the Agency by January 31 of
17 the following year.

18
19 **Q24. What additional measures, if any, do you recommend?**

20 A24. The Department accepts rare plant inventory results for up to three years. This is because
21 plant populations can increase, decrease, or move around. Asters have seeds with tufts of
22 hairs that can be transported locally by animals or wind. If construction of the Project has

1 not commenced prior to the fourth growing season (which begins April 30) following the
2 September 2019 survey, another rare plant inventory would be necessary to identify
3 plants which exist at that time. Plants would be marked and those likely to be impacted
4 would also need to be moved to the rare plant conservation area.

5
6 Prior to the project decommissioning the Petitioner would also need to perform an
7 inventory for the white arrow-leaved aster during the growing season and submit the
8 inventory to the Department. If the aster is found within the array area at that time, plants
9 would need to be transplanted to the rare plant conservation area prior to commencement
10 of any decommissioning activities. The rare plant conservation area will also need to be
11 clearly flagged and surrounded by silt fence prior to commencement of any
12 decommissioning activities.

13
14 **Q25. Please respond to the following statements contained in the Petitioner's September**
15 **12, 2019 Aster Distribution Report. "We believe the plant is a "weedy" species in**
16 **the project area and will be recruited to, and thrive in, the edge of the visual buffer**
17 **areas around the perimeter of the Project site (Photograph 3, Distribution Map). It**
18 **is also likely that the species will find suitable habitat under the racks of solar panels**
19 **(Photograph 7) if vegetation is controlled. In summary, we believe that the**
20 **construction of the solar array will not have a significant adverse effect on the aster**
21 **species but may, in fact, create habitat that is beneficial to its survival.**
22 **Transplantation of any of the plants is not recommended."**

1 A25. The white arrow-leaved aster is apparently doing well at the Project site currently and is
2 locally common there. This does not detract from the fact that it is still very rare in the
3 state with only three known populations. Even plants that are rare at the state level can be
4 locally common in certain situations when conditions are favorable. The presence of
5 carbonate rich bedrock is certainly an asset to the aster, but the previous land use history
6 of the site is also likely responsible for its abundance.

7
8 The buffer area on the east side will remain largely forested and the aster is unlikely to
9 persist beneath a closed canopy. Beneath the racks of the solar panels, the plants would
10 also not benefit as a result of being shaded, but more importantly they would be browsed
11 by sheep which over time would likely result in their demise. For these reasons the solar
12 array will not create habitat beneficial to the aster's survival, and I remain convinced that
13 protection of plants within a conservation area, including transplantation of those from
14 the array area, is warranted to ensure the survival of the population at the site.

15
16 **Q26. Until the steps you have outlined are taken, can Petitioner demonstrate that the**
17 **Project will not have an undue adverse impact on white arrow-leaved aster, a very**
18 **rare (S1) plant?**

19 A26. No, as currently proposed the Project's impacts on the white arrow-leaved asters would
20 exceed the very rare plant 10% mortality threshold allowed by the Agency.

21
22 **Q27. Does this conclude your testimony?**

1 A27. Yes, for now. Thank you for the opportunity to present this information.