APPENDIX X

EMERALD ASH BORER MITIGATION RESPONSE PLAN

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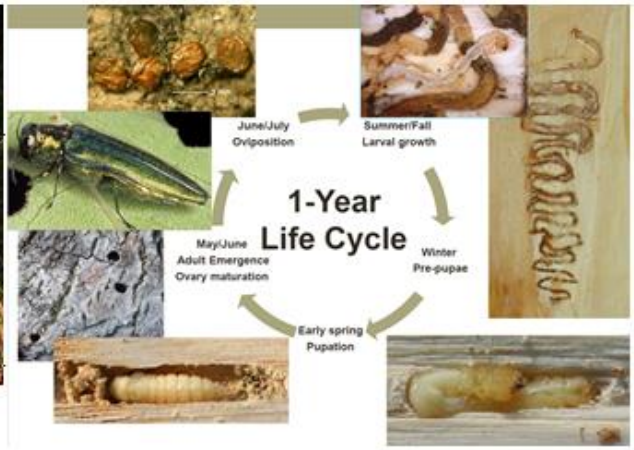
Background: Vermont has confirmed the emerald ash borer (EAB), Agrilus planipennis Fairmaire, a beetle that has devastated ash trees in states across the U.S. and five Canadian provinces, costing communities millions of dollars, within its borders. This half-inch long metallic green beetle originally from Asia, was discovered in southeastern Michigan near Detroit in 2002 and first found in Vermont in February 2018. The destructive, exotic insect is believed to have entered the country on solid wood packing material carried in cargo ships. Since its arrival in the U.S., the invasive beetle has destroyed over 100 million ash trees.



EAB has been confirmed in ten of Vermont's fourteen counties and will continue to spread over time, as there is no known treatment or cure. A single EAB can travel a half mile per year, with the potential to expand the range of an infestation up to several miles per year during the adult beetles' June to August flight period. However, human transport, has led to the spread of EAB over much greater distances.

While the adult beetles feed on ash foliage, causing minimal long-term damage, the larvae overwinter under the bark of ash trees, where they feed on the inner bark tissue, disrupting the tree's ability to transport water and nutrients. EAB attacks all species of North American ash from as small as one-inch in diameter to large mature trees. Infested trees rapidly decline and die within 3-5 years.

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In addition to the threat to Vermont's electric grid, due to the severe influx of potential hazard trees within striking distance to power lines, EAB and the death of Vermont's ash trees will have a variety of adverse

impacts. The presence of so many dead and dying ash trees will be aesthetically damaging to a state known for the beauty of its forests and wooded hillsides. The dead trees tend to rapidly deteriorate and pose a safety threat to Vermont residents and tourists, most especially, those who work in and/or around trees. EAB will affect every type of utility and public infrastructure to some degree and the simultaneous death of multiple trees will compound the safety and cost of preemptive measures.

Vermont Electric Cooperative (VEC) faces a severe risk from a sudden wave of hazard trees along electric utility lines. Ash trees account for approximately 5% of all trees in Vermont or approximately 150 million ash trees across the state. Based on this, VEC estimates there are approximately 750,000 ash trees within potential striking distance of VEC's overhead transmission and distribution electrical power lines.

Mitigation Plan: With EAB confirmed in 35 states across the U.S. and dead ash trees falling on to power lines on blue-sky days, some electric utilities are learning the cost of not taking a proactive approach to EAB mitigation. Utilities where EAB was detected earliest are sharing these insights:

- Proactive ash tree removal has proven to be significantly cheaper than dealing with removals of dead and dying ash trees and the outages and damages caused by failing ash trees.
- Dead/dying ash tree removal costs are reported to be 2 to 7 times higher for infected trees than living trees.
- While un-infected dead ash trees typically tend to fall down in pieces over time once they die, ash trees which have been killed by EAB are failing in a much different manner, where large limbs and whole trees are breaking and shattering, under little to no load or stress.
- The wood of infected ash trees dries out rapidly, becoming very brittle and massive, unpredictable structural failures occur frequently.
- There is excessive shattering of wood upon failure, which results in a significant increase in clean-up time/cost, safety hazards, and specialized equipment needs.
- Data from the Davey Institute's Research Lab in Ohio shows that limb fractures occur very close (<24") to the stem and the force typically needed to break a healthy 1" limb now breaks a 5" dead limb.
- Infected ash trees have an increased risk of failure during weather events involving wind, snow, and/or ice.
- Whole stem failures can be catastrophic, typically <24" above grade and often under no load.
- Storm events where dead ash trees are involved now yield more significant debris and damages.
- It is no longer safe to climb a dying ash tree and the industry is facing new challenges and added costs for worker safety.

EAB confirmed infested areas currently include 10 towns served by VEC (red center of circles on location map). Infestation is suspected and considered high risk in an additional 13 towns (yellow circles around the red centers on location map). There are approximately 239 linear miles of VEC overhead electric lines within the EAB confirmed infested area. The first location to be confirmed within VEC territory was in South Hero in the fall of 2018.

VEC plans proactive ash tree removal within the confirmed infested areas (red circles on location map) across its service territory, beginning with South Hero Substation #29, in accordance with the following guidelines:

- Conduct member notification prior to all ash tree removals (within or beyond the established edge of the right-of-way) and address any member concerns.
- Conduct appropriate outreach to VEC members explaining the threat to safety and reliability and importance of slowing the spread (i.e. not moving wood left on site).
- Conduct a thorough hazard tree evaluation before working on dead or dying ash trees and use extreme caution when operating in and around all ash trees.
- Prioritize ash tree removal targeting
    - transmission lines
    - 3-phase distribution
    - distribution main feeders
- Remove all ash trees (white, green and black) on the edge of established rights-of-way.
- Remove all ash trees (white, green and black) beyond the edge of established rights-of-way, which are within striking distance of the primary overhead lines and:
    - exhibit visible signs and symptoms of decline
    - have co-dominant stems.
    - are located on the prevailing wind side of the primary line in a location prone to high winds.
    - are located in an area where equipment access is limited and/or would be very costly to access.
- Chip as much visibly infested ash material as possible and leave chips on site where feasible or dump locally.
- Do not move chips outside confirmed infested area(s).
- Leave all round wood on-site (conduct member outreach regarding the importance of not moving potentially infested wood outside of confirmed infested areas).
- Do not move wood outside of confirmed infested area(s).

- Minimize the risk of wood theft and possible movement outside of confirmed infested area by leaving wood in larger sizes that make it difficult to move (coordinate/communicate with landowners).

- All vegetation maintenance activities conducted in response to EAB mitigation are to be recorded and tracked separately from routine vegetation maintenance activities. There will also be many ash trees removed during routine vegetation maintenance activities to meet VEC's vegetation management specifications. Ash trees that would have been removed to protect the safety and reliability of the electric facilities, regardless of the presence of EAB, will be included in routine vegetation maintenance and shall not be tracked separately.

Although this mitigation plan takes a proactive approach, due to budgetary constraints and the high cost associated with addressing the excessive numbers of potential hazard trees, it is in fact, the more conservative of the proactive alternatives considered. VEC's current mitigation plan calls for the proactive removal of ash trees only within the confirmed infested areas (red circles on location map) and offers specific guidelines under which ash are to be removed, rather than calling for the removal of all ash within striking distance, regardless of specific location or condition. While other more aggressive alternatives in terms of which ash trees would be removed (all within striking distance vs. specific guidelines for removal) and which areas the plan would be implemented in (confirmed infested, high risk, scheduled maintenance) were considered, ultimately, the mitigation plan outlined above was determined to be the most cost effective approach.

Alternatives Considered:

- Take a reactive approach and wait to remove ash trees until they are infected and begin to fail.
    - Not cost effective – cost to remove infected dead/dying ash trees is significantly greater (up to 7 times greater) than cost to remove living ash trees.
    - Negative impact on reliability – experienced utilities report ash mortality in EAB affected areas occurs on a fast curve and outages increase rapidly as trees begin to fail in proximity to power lines.
    - Safety Hazard - an overwhelming abundance of dead/dying ash trees presents a serious safety threat to workers and the general public.
- Conduct a comprehensive ash inventory across the VEC service territory identifying the number of ash trees within striking distance, current strike capability, tree condition, location, mapping, etc. prior to conducting
    - High cost and would postpone proactive removals, while EAB continues to spread across the State.
    - Thorough documentation and record keeping during proactive ash tree removal within the confirmed infested areas will provide data on representative ash stocking levels in VEC's service territory, which can be used for planning/budgeting decisions in future years and serve as a proxy for a more exhaustive advanced inventory.
- Remove all ash trees within striking distance of VEC primary overhead lines, regardless of specific location or condition within all confirmed infested and high risk areas (red and yellow circles on the location map).
    - Cost prohibitive

- Remove all ash trees within striking distance of VEC primary overhead lines, regardless of specific location or condition within the confirmed infested areas (red circles on location map). Remove all ash trees in accordance with the guidelines listed in the proposed mitigation above within the high risk areas (yellow circles on the location map).
    - Cost prohibitive
- Remove all ash trees in accordance with the guidelines listed in the proposed mitigation above, within the confirmed infested and high risk areas (red and yellow circles on the location map).
    - Cost prohibitive
- Remove all ash trees in accordance with the guidelines listed in the proposed mitigation above along the transmission and distribution rights of way that are scheduled for routine vegetation maintenance activities during the year that they are scheduled for maintenance, in addition to, within the confirmed infested and high risk areas (red and yellow circles on the location map).
    - Cost prohibitive

Estimate of Work

150,000,000 ash trees in VT /9,620 square miles = 15, 593 ash trees/square mile in VT

Area of Confirmed EAB infestation within VEC service territory = 239 linear miles

25 foot wide strip outside each side of R-O-W (50 ft.) = area of trees within striking distance (conservatively)

50 ft./5280ft. in a mile = 0.009 * 239 = 2.15 square miles Confirmed EAB infested area within VEC service territory

15,593 ash trees/sq. mi. * 2 sq. mi. = 31,186 ash trees in Confirmed EAB infested area in VEC service territory

50 ft. * 5280 ft. = 264,000 sq. ft. = 0.0095 square miles = area within striking distance in a linear mile

0.0095 sq. mi. * 15,593 ash trees/sq. mi. = 148 ash trees within striking distance in a linear mile

Estimated ash tree removal based on guidelines listed in proposed mitigation above is 50% (.50 * 148) = 74 ash/linear mi. * $165 (VEC 2019 YTD Avg. cost/tree) = **$12,210/linear mile**

74 ash trees /linear mi. * 239 linear mi. = 17,686 ash trees * $165/tree = **$2,918,190**

Note: Cost estimate is solely for ash tree removal and does not include the cost of safety training or public outreach/education, which will be necessary to implement a successful EAB Response Plan.

Map of EAB Confirmed Infested and High Risk Areas in VEC Service Territory