DRAFT OF COMMITTEE REPORT
DISCUSSED IN MEETING OF SEPTEMBER 29, 2020,
AS CONTINUED ON OCTOBER 13, 2020

DRAFT OF OCTOBER 1, 2020
DRAFT OF OCTOBER 10, 2020

VTA CHURCH STREET REVIEW COMMITTEE
TOWN OF EDGARTOWN
REPORT
October ___, 2020

This committee recommends the installation of three inductive chargers under Church Street as previously approved and/or supported by the Edgartown Historic District Commission, the Edgartown Board of Trade, the Edgartown Energy Committee, the Edgartown Board of Selectmen, the Vineyard Trust (formerly the Preservation Trust), and the Martha's Vineyard Commission.

SHORT SUMMARY OF CRITICAL POINTS:

Why are inductive chargers needed? Diesel and hybrid (diesel/electric) buses do not work well on Martha's Vineyard because they need to run at 45 mph or more for substantial periods of time in order to clear their diesel particulate filters. Electric buses work well on Martha's Vineyard, but they currently do not have batteries that can power them for a full day without charging. On-route inductive charging for 7-10 minutes at the natural end point of a route, several times during the day, allows an electric bus to run for the whole day. If the VTA is to be all-electric in the foreseeable future, the buses must have on-route inductive charging.

Why are inductive chargers needed on Church Street in Edgartown? Church Street is now, and has been for many years, an end point for four bus routes (routes 1, 3-5-6, 8, and 13). Inductive chargers at Church Street will enable all four of these bus routes to be all-electric. No other location on Martha's Vineyard is an end point for four bus routes.

What are the impacts on Church Street?
The inductive chargers, themselves, will be unobtrusive, appearing as three flat rectangular plates set flush with the pavement in the bus stop lane and with minimal markings on the street. There will be two large electrical equipment cabinets near the sidewalk, which will be screened with fencing and/or decorated with informational graphics, as more specifically approved by the Edgartown Historic District Commission before installation.

Two (or possibly three) Norway maples that are not in good condition will be removed, and three new trees will be planted. The large linden tree and the large sycamore tree will remain.

The street will be widened by 2' for a distance of 55' immediately opposite the visitor center.

The project scope includes a much needed renovation of the Church Street passenger waiting area in front of the Visitor Center, including a covered shelter, new seating, and new signage to help visitors navigate downtown, in addition to the removal of most of the telephone poles on Church Street and the installation of eight old-fashioned street lanterns.

All of the costs of the project, including the renovation of the passenger waiting area in front of the Visitor Center, will be paid entirely with federal and state grants at no cost to Edgartown.

BACKGROUND:

The VTA Church Street Review Committee was formed by the Board of Selectmen pursuant to the 96 - 83 vote on Article 10 of the Warrant for the Special Town Meeting of June 13, 2020, which said, “Shall the installation of an electric-inducing bus-charging Terminal on Church Street, by the regional Vineyard Transit Authority (VTA), in the heart of the Edgartown Historic District, be reconsidered?” The committee was specifically charged not to look at locations other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses.

The committee met by Zoom on July 30, August 20, August 25, September 8, September 29, and _____ and had a site visit to Church Street on September 9. In all, the committee spent approximately __ hours listening to multiple presentations, questions, and answers and reviewing the history and details of the proposed project.

The committee consisted of the following participants:

Keith Chatinover, County Commissioner and Edgartown resident
Jane Chittick (resigned on September 7, 2020)
Angie Gompert, VTA Administrator (non-voting participant)
Julia Livingston, Committee Vice Chair and Clerk and Edgartown resident
Sara Piazza (resigned on September 7, 2020)
Mark Snider, Appointed Edgartown Representative to the VTA Board
Alan Strahler, Committee Chair and Edgartown resident
Bill Veno, MVC Planner and Edgartown resident
Doris Ward, Church Street resident

In 2018, with the support of the Edgartown Board of Selectmen and other Martha’s Vineyard authorities and boards, the VTA decided to convert to all electric buses and began acquiring electric buses to replace diesel buses as the diesel buses reached the end of their useful lives. The VTA’s current plan is to phase out its remaining diesel buses and have an all-electric fleet of buses by 2027.

The benefits of an all-electric fleet are numerous, including reduced air and noise pollution that will result in quality of life improvement for everyone in Edgartown and elsewhere on Martha’s Vineyard. The conversion is also expected to have economic benefits, primarily resulting from reduced maintenance and fuel costs for the VTA.

An all-electric fleet of buses will not be possible by 2027 without on-route inductive chargers.

On-route inductive charging allows electric buses to safely augment their batteries while stopped to drop off and pick up passengers. The small on-route supplement of power, repeated throughout the day, is enough to extend the service time of the bus for the whole day. Without inductive charging, the VTA will have to switch out buses mid-day for other buses, either diesel or electric, which would significantly increase the number of buses needed to

provide the current levels of service. Switching out buses would also require additional drivers and labor hours. On-route inductive charging allows the VTA to extend the range of electric buses in a cost effective and efficient manner.

Church Street was selected as a site for the installation of on-route inductive chargers because it serves four bus routes, each of which has a scheduled stop of 7-10 minutes at this location. No alternative location for the chargers would be as effective in providing on-route charging for the VTA bus system because there is no other location with scheduled 7-10 minute stops for four bus routes.

APPENDICES:

The following appendices are attached to this report:

Appendix I - Short Summary of Points
Appendix II - Images of the Visitor Center Before and After the Proposed Project
Appendix III -

DISCUSSION:

A. THE NEED FOR THE INDUCTIVE CHARGERS

The distance a fully charged electric bus can travel is not sufficient for the long hours and miles of VTA routes. The VTA currently has 20 diesel buses and 12 electric buses. Four of the electric buses are 30' x 96" with a range of approximately 130 miles, and eight of the electric buses are 35' x 102" with a range of approximately 160 miles. In order to run for a full day, a bus in the VTA system needs to go 300 - 350 miles. The difference between the 300 - 350 mile needed range and the 130 - 160 mile current range of the electric buses is the basic problem the VTA needs to solve in order to go all-electric. Several possible solutions have been considered, as described in the following paragraphs.

1. Taking the electric buses out of service for several hours when their batteries get low during the day and charging them at the airport VTA headquarters. To cover the gap in service while the spent bus batteries recharge would require the VTA to add 16 - 32 additional electric buses, for a total of 48 - 64 buses, as opposed to the 32 the VTA currently has. Alternatively, the VTA could retain diesel buses to cover the times when the electric buses are charging at the airport. These two possible solutions to the problem are not being pursued because the capital and operating costs of the extra electric buses would be unacceptable and the goal of an all-electric system would not be achieved by continuing to acquire and operate diesel buses.

2. Waiting until bus batteries and/or other technologies have improved to the point that all sizes of buses needed by the VTA would have a range of 300 - 350 miles without recharging during the day. This possible solution to the problem is not being pursued at this time because there is no way to know how long this will take, if it is ever achieved.

3. Installing overhead (conductive) chargers at locations where VTA bus routes have scheduled stops of up to 10 minutes to let off and take on passengers. This possible solution is not being pursued because overhead chargers require 500 kW of electricity, as opposed to the 150 kW of the proposed inductive chargers, and because overhead chargers are very large and industrial looking. On-route conductive chargers would not be compatible with the look of the Edgartown Historic District or any other location along the Martha's Vineyard bus routes.

4. Installing inductive chargers at locations where VTA bus routes have scheduled stops of up to 10 minutes to let off and take on passengers. Inductive chargers involve an electric coil under the street and an electric coil on the underside of each bus. When the coil attached to the underside of the bus is directly above the coil under the street, the driver pushes a button on the dashboard, and the charge flows into the bus battery wirelessly. According to several published papers reviewed by the chair of this committee, inductive chargers are safe. They use a frequency that is different from the frequencies used by pacemakers and cell phones, so there is no interference. Also, the magnetic field that escapes from under the bus during charging is minimal and is within the relevant established international standards. The chargers have received UL (Underwriters Laboratories) certification.

Experience in Wenatchee, Washington

Ed Archer, the maintenance director for the Link transportation system in Wenatchee, Washington, told our committee that, without on-route inductive charging, an electric bus can run about 8 hours, but with on-route inductive charging it can run for a full, uninterrupted 14-16 hour day. The Link system's electric buses charge for 5 minutes every hour or half hour during their natural "dwell time" when they are letting off and taking on passengers. Ed sends out a bus in the morning with a 100% charge, and at the end of the day the charge is at 64%. The bus gains about 1% toward a full charge for every minute it is in place above an inductive charger. Ed said the Link system's experience with the "generation 1" Momentum Dynamics inductive charger was very successful, so the Link system is now installing three "generation 2" Momentum Dynamics inductive chargers. He said the "generation 1" charger transformed how they were able to function because they could keep an electric bus in service for 24 hours a day, seven days a week. He said that, if you don't have on-route charging, you will need one or two additional buses for each route, which is expensive. He said the chargers are unobtrusive, with only a 4 x 7 electrical cabinet nearby and no footprint in the street. He said there is very little maintenance. The coolant needs to be checked every 6 months, and Momentum Dynamics monitors the system remotely. A few times a year, a breaker needs to be reset. Once, his system needed a new fan, and it arrived and was installed within 24 hours. Ed said Momentum Dynamics was very reliable and very responsive. He said it was some of the best service he's ever seen in transit.

A member of this committee contacted several other users of Momentum Dynamics inductive chargers and was consistently told that the chargers are very reliable. Three transit systems logged 6 years of Momentum Dynamics inductive charger use with only one down-time repair reported. Service was rated highly.

5. Using "hybrid" buses to bridge the time until all-electric buses have better batteries with longer ranges. A hybrid bus has a full diesel system in addition to an electric system. Our committee heard that diesel only works well in places where the buses run at speeds over 45 mph for extended periods, generating enough heat to clean the particulate filters, which does not happen on Martha's Vineyard. Diesel maintenance is costly, for either pure or hybrid diesel, and the substantial maintenance cost savings from the conversion to an all-electric system would not be realized with hybrid buses. Also, the noise and fumes associated with diesel operation would remain. For these reasons, hybrid buses are not being pursued by the VTA.

B. OTHER ASPECTS OF THE INDUCTIVE CHARGERS

The three in-ground charger coils installed under the street in the bus stop lane will be served by two electrical cabinets located near the front corners of the Visitor Center property, near the sidewalk. Additional electrical cabinets, for Eversource transformers and switching equipment and a battery that will feed the inductive chargers, will be placed at the back of the parking area on the north side of the Visitor Center.

1. Inductive charger electrical cabinets. The three inductive chargers proposed by the VTA for Church Street require two electrical cabinets (one is 89"l x 36"w x 72"h and the other is 66"l x 36"w x 71"h). The larger (300 kW) cabinet is located on the north side of the property at the edge of the parking lot and will serve two of the inductive chargers. The smaller (150 kW) cabinet is located on the south side of the property nearer to the sidewalk and will serve the third inductive charger. At the Historic District Commission meeting on October 3, 2019, it was noted that these metal cabinets are the most unsightly part of the project, but that they could be wrapped with graphics printed on vinyl that would be of interest to bus riders and be attractive. The cabinets could also be screened with fencing. There will be cooling fans in these cabinets, and they will make some noise when buses are actually in place and being charged. The sound level is reported to be 70 dBA, a sonic level that various sources compare to air conditioners, vacuum cleaners, and office conversation. The sound will certainly be less than that of the diesel buses. Members of this committee said these cabinets could be regarded as an opportunity to provide useful information to visitors who now have to ask someone, for example, which way to walk to get to Main Street. The Historic District Commission Certificate of Appropriateness is explicitly conditioned on the cabinet "wrap" being approved by the Historic District Commission before it is installed. This committee agrees that these two cabinets will have a visual impact on Church Street, but on balance they are acceptable given the health, environmental, noise, cost, and other advantages of an all-electric bus system.

2. The inductive chargers. The three charger coils will be installed under Church Street in the bus stop lane. The only visible element will be three rectangular metal plates, each measuring 62" x 33" set flush into the roadway pavement in the bus stop lane, with minimal markings on the street. The visual impact of these plates will be similar to that of manhole covers. Snow plowing and street sweeping will be unaffected

3. Other electrical equipment. A battery will be installed in a cabinet at the back of the parking lot next to the Visitor Center. This will allow the VTA to store and supply electricity for the chargers, bought at off-peak hours when the electricity is less expensive. Also, three of the four telephone poles on Church Street will be removed, and the electric power for Church Street will be increased and put underground. To replace the equipment now on the three telephone poles, Eversource will install transformers and switching equipment in cabinets at the back of the parking lot next to the Visitor Center. None of the equipment at the back of the parking lot will be visible from the street. It will be screened with moveable plantings. No parking spaces for town employees will be lost. One VTA parking space will be lost.

4. Useful life. The useful life of the inductive chargers for purposes of financial accounting has been set at ___ years by experienced auditors. The technology is relatively new, so this may or may not prove to be correct, but inductive chargers do not have moving parts, so their useful life could be longer. In addition, a committee member reported that mini-buses with inductive charging from a different manufacturer, not Momentum Dynamics, were used in Genoa and Turin, Italy, for 15 years.

5. All of the costs of the proposed Church Street project will be funded by federal and state grants. The financial aspect of the Church Street project for the Martha's Vineyard towns will be the benefit of the reduced operating costs, both in maintenance costs and fuel costs, realized over time as the bus fleet transitions to a fully electric fleet

C. CHANGES ON CHURCH STREET NECESSITATED BY THE INDUCTIVE CHARGERS

Some changes on Church Street are necessary for the installation of the inductive chargers.

1. Two electrical cabinets near the sidewalk. These are discussed above.

2. Three underground conductive chargers. These are discussed above.

3. Electrical equipment at the back of the parking lot. This is discussed above.

4. Removal of telephone poles. Three telephone poles on Church Street will be removed, leaving only the telephone pole nearest to Main Street. Instead of the streetlights now on these poles, eight street lanterns, matching the style of those on Main Street and elsewhere in the Edgartown historic district, will be added. The new lanterns will light the whole length of Church Street, which is not the case currently with the existing streetlights. Also, six of the new lanterns will be placed outside of the sidewalk. This will improve the ADA accessibility along Church Street and in front of the Visitor Center, making the street more historic in

character, not less, and making the walk from the bus stop to Main Street or Pease's Point Way safer for all.

5. Removal and replacement of a Norway maple on the Visitor Center property. A Norway maple near the southwest corner of the Visitor Center property needs to be removed to make room for one of the new electrical cabinets. An arborist from Beetlebung Tree Care LLC found that this tree is not in good condition: the tree canopy is thinned and has some die back; the roots are restricted, compacted, and girdling; there is moderate decay in a 2' long trunk defect; and branches are resting on electrical, phone, and cable lines. A new tree to be chosen by the Edgartown tree warden will be planted slightly further back on the Visitor Center property.

D. CHANGES ON CHURCH STREET NOT NECESSITATED BY THE INDUCTIVE CHARGERS

The proposed project includes other changes on Church Street that are not directly required to support inductive charging, but are included in the project to improve the function and appearance of the bus stop area and the Visitor Center.

1. Widening of the paved area of Church Street by 2' along a 55' strip. Widening the pavement by approximately 2' along a 55' strip on the west side of the street opposite the Visitor Center will make it easier and safer for parked buses to pull out and around each other. The widening begins at the 26 Church Street driveway and ends at a point opposite the Visitor Center parking lot. The strip of grass along the west side of the pavement is about 5' wide and 180' long. The widening is less than half of that width and less than a third of that length. A strip of grass about 3' x 55' will thus remain opposite the Visitor Center, and the remaining strip of grass of about 5' x 120' will be untouched.

2. Removal of a Norway maple across the street from the Visitor Center. This tree removal will make it easier and safer for parked buses to pull out and pass each other on Church Street. The arborist from Beetlebung Tree Care LLC found that this tree is in poor condition: it has multiple structural defects, multiple trunk and branch wounds, an extensive trunk wound from a large branch that recently broke off on the side away from Church Street, and the roots are girdling and heaving and breaking up the asphalt curb and surrounding ground. The branches overhanging the street show damage from multiple collisions of trucks and other tall vehicles, including buses. Two new trees to be chosen by the Vineyard Trust (formerly the Preservation Trust) will be planted slightly further back from Church Street on the Vineyard Trust property. The Vineyard Trust supports the inductive charger project and has given permission for the planting of these two new trees.

3. Optional removal of a Norway maple at the northwest corner of the Visitor Center building. The removal of this tree was suggested by the arborist who evaluated the other two Norway maples. He said this tree is not in good health and is too close to the Visitor Center building.

4. Linden tree and London plane tree (sycamore) to remain at Visitor Center. It should be noted that the two large shade trees at the Church Street Visitor Center that are not Norway maples (a linden and a London plane tree, otherwise known as a sycamore) will remain.

5. Renovation of passenger waiting area. The project includes funding for a complete overhaul of the Church Street passenger waiting area, including a covered shelter, new seating, new informational signs, new landscaping, and improved stormwater management. In addition, power lines along most of Church Street will be placed underground, resulting in the removal of three of the four telephone poles from the Church Street sidewalk and the installation of eight old-fashioned street lanterns – six of which will be placed outside of the sidewalk. This area now has two large areas of packed dirt, with very little space for people to sit or shelter from rain while waiting for buses. At the Historic District Commission meeting on December 5, 2019, it was noted that the designers struck a pretty good balance with the overall design, taking into account that the Visitor Center building is a 20th century building, the site gets extensive public use, and there is an obvious need for updating. This committee agrees and feels that the historic and visual benefits to the Edgartown downtown area are significant.

E. WHY CHURCH STREET?

If there are not going to be inductive chargers on Church Street, then bus routes 1, 3-5-6, and 8 (and possibly 13, depending on whether there is an inductive charger at Oak Bluffs) will have diesel buses for part of each day, after the electric buses have depleted their batteries. Said another way, in 2022 the VTA will have to stop buying electric buses to replace the diesel buses that reach the end of their 12 year useful lives, because the VTA will need to buy new diesel buses, instead, to substitute in for electric buses that can't operate for a full day on routes 1, 3-5-6, and 8 (and possibly 13, depending on whether there is an inductive charger at Oak Bluffs).

1. Inductive chargers on Church Street will enable route 3-5-6 to be fully electric. After stopping at Church Street, the 6 bus proceeds via the airport to West Tisbury, where it becomes the 5 bus to Aquinnah and back to West Tisbury. It then heads to Vineyard Haven as the 3 bus, returns to West Tisbury, and then becomes the 6 to the airport and Edgartown. The buses on this long route will likely charge at two inductive chargers to be installed in West Tisbury, but they will also need to charge in Edgartown because the "dwell time" in West Tisbury is only a few minutes and is somewhat unpredictable because of Vineyard Haven traffic, while the "dwell time" in Edgartown is 7-10 minutes and is more predictable. Note that passengers are likely to feel frustrated and inconvenienced by an extended "dwell time" for charging at a stop which is more of a "through stop" with fewer passengers getting off and on, while a longer "dwell time" will not inconvenience passengers at a stop which is more of an "end stop" with more passengers getting off and on. Church Street is more of an "end stop" in this sense than West Tisbury. In other words, at Church Street, the buses will be charging in between runs, and there will be no delay experienced by passengers.

2. Inductive chargers on Church Street will enable routes 1, 8, and 13 to be fully electric. Church Street is now, and has been for many years, an end point for four bus routes

(routes 1, 8, and 13, in addition to route 3-5-6 discussed above). Inductive chargers at Church Street will enable all four of these bus routes to be all-electric. No other location on Martha's Vineyard is an end point for four bus routes.

F. MATTERS OUTSIDE THE CHARGE GIVEN TO THIS COMMITTEE

As noted at the outset of this report, this committee was specifically charged not to consider locations for inductive chargers other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses. In practice, however, it proved impossible to avoid discussion of these issues, and it may be helpful to report those discussions.

1. The sizes of the buses. This committee was charged by the Board of Selectmen not to consider the sizes of the buses, but substantial concern was expressed in our committee meetings that the installation of inductive chargers would force the continued and increased use of larger buses. In fact, this is not the case. Passenger loads and efficiencies determine the bus sizes. The inductive chargers are needed no matter what sizes of buses are used. In fact, smaller electric buses carry smaller batteries, so smaller electric buses need on-route charging during the day more frequently than larger buses. Right now, all of the VTA's 30' buses (diesel and electric) are 96" wide. Some of the VTA's 35' and 40' buses (diesel and electric) are 96" wide and some are 102" wide. In general, the transit bus manufacturing industry is moving toward buses that are 102" wide. If the VTA were to buy new 30' diesel buses now, only 102" wide buses would be available, while new 30' electric buses are still available at 96" wide. Ed Archer of the Link system in Wenatchee, Washington, believes there are smaller electric buses in China, and a committee member reported that mini-buses with inductive charging were used in Genoa and Turin, Italy, for 15 years. Ed Archer said he has heard through the grapevine that smaller, truck-based buses (called "cutaways") compatible with Momentum Dynamics inductive chargers are likely to be available in the United States soon. The VTA needs to have a mix of different sizes of buses for efficiency in responding to variations in passenger loads. If the VTA uses larger buses, it will be for reasons other than the existence of inductive chargers. This committee was told that, at present, the VTA has no plans to change any routes or schedules or to increase the sizes or numbers of buses stopping on Church Street.

2. Inductive charging at Oak Bluffs. Inductive charging at Oak Bluffs is outside the charge given to this committee by the Board of Selectmen. Having said that, it seems worth noting that there was discussion of this suggestion at committee meetings, and this committee believes this suggestion should not be pursued because Oak Bluffs is a "through stop," not an "end stop" for the route 13 buses, which means less time for charging is available. Riders would be frustrated and inconvenienced if a 7-10 minute wait for charging at Oak Bluffs had to be built into this route. Also, an Oak Bluffs charger would not solve the on-route charging need for routes 1, 3-5-6, and 8. An Oak Bluffs charger would be inefficient because it would only serve the route 13 buses, as the 7 and 9 buses would continue to be charged at the airport VTA headquarters.

3. Inductive charging at the Edgartown park and ride. It was suggested in the meetings of this committee that an Edgartown "end stop" should be established at a location outside the historic district, possibly at the park and ride on Dark Woods Road, and inductive chargers should be installed at this new "end stop," instead of on Church Street. This suggestion is outside the charge given to this committee by the Board of Selectmen. Still, it seems worth noting that there was discussion of this suggestion at committee meetings, and this committee believes this suggestion should not be pursued for the following reasons:

a. This would require very substantial changes to the VTA's routes, schedules, and numbers and types of buses, including but not limited to (i) an increased number of "cutaways" or other small buses to shuttle passengers from the new "end stop" into the downtown area and (ii) rerouting the Up-Island (3-5-6) bus and the Katama (8) bus, which currently do not go past the Dark Woods park and ride.

b. If 11 large buses per hour now arrive at Church Street, transferring the passengers at Dark Woods to equivalent passenger capacity on smaller buses would require some significant number of additional smaller buses, along with additional drivers for these additional buses. These additional buses would add to the traffic congestion in the downtown area. Also, the additional buses and drivers would increase the VTA operating costs paid by the towns.

c. This change would not be good for the downtown business community because employees and visitors alike would be significantly inconvenienced by the need to transfer at Dark Woods from large buses to smaller buses. This would delay the passengers and make traveling into Edgartown by bus significantly more frustrating and inconvenient.

d. The traffic at the triangle would be much worse because larger and more numerous buses (all the 1, 3-5-6, 8, 11, and 13 buses, including the increased numbers of shuttle buses going downtown) would need to turn across traffic to get in and out of Dark Woods Road.

e. A bus shelter would need to be built at the Dark Woods park and ride. It would need to have restrooms for use by the passengers and bus drivers who now use the restrooms at the Church Street Visitor Center.

f. The current routes and schedules enable the VTA to operate the entire system with only 32 buses. It was reported to this committee that a Massachusetts Department of Transportation consultant looked at the VTA routes and schedules in 2015 and again in 2020 and found them to be very efficient. This may mean that there would not be federal and state grants available for the capital costs (acquiring additional shuttle buses and building a new passenger shelter with restrooms) of this very different, less efficient, and more expensive project.

4. Combining routes 1 and 13. It was suggested in the committee meetings that routes 1 and 13 might be combined to run in a loop with inductive chargers in Oak Bluffs, instead of at Church Street. This suggestion is outside the charge given to this committee by the Board of Selectmen. Still, it seems worth noting that this committee believes this suggestion should not be pursued because (a) it would not solve the problem for the 3-5-6 and 8 buses and (b) in the summer there are more buses on route 13 than route 1 and the reverse is true in the winter. To run these two routes as a loop would require more buses in the fleet and more wasteful extra trips on the quieter legs of the combined route.

The following members of the committee have approved this report and join in its recommendation:

[Names to be added]

APPENDIX I
SHORT SUMMARY OF POINTS
FROM THE REPORT OF THE EDGARTOWN VTA CHURCH STREET REVIEW COMMITTEE

	Question	Short Answer
1	What was this committee asked to do?	This committee was asked to take a fresh look at whether inductive chargers should be installed on Church Street to facilitate all-electric VTA bus service. The committee was specifically charged not to look at whether there should be changes to the VTA schedules, routes, or numbers or sizes of buses.
2	How many trees will be removed from Church Street?	Only one tree (a Norway maple which is not in good condition) will be removed because of the inductive chargers. The project also includes the removal of two other trees (also Norway maples which are not in good condition) and the addition of three new trees. The large linden tree and the large sycamore tree will remain.
3	How much will Church Street be widened?	Less than half of the width of the grass strip across from the Visitor Center will be paved for only one-third of its length. The new paving will be 2’ x 55’ and is unrelated to the inductive chargers.
4	How much noise will the inductive charger equipment make?	It will make a sound similar to that of an air conditioner and only while actually charging. There will be no fumes at all and far less noise than with the diesel buses.
5	How will Church Street look worse than it does now?	The main visible change will be two new metal electrical cabinets near the sidewalk. These will be decorated with informational graphics and maps, which are badly needed outside the Visitor Center, and/or possibly screened with movable fencing.
6	How will Church Street look better than it does now?	Along the sidewalk, three telephone poles will be taken out, and eight old-fashioned street lanterns will be put in. Also, the two large areas of packed dirt in front of the Visitor Center where passengers wait will be replaced with paving stones and granite topped walls for seating.
7	Will the sizes of the buses change?	The sizes of the buses are not expected to change. The sizes are determined by the variations in passenger loads, not whether the buses are charged inductively. The inductive chargers are needed no matter what sizes of buses are used.
8	Could a location for the chargers other than Church Street work?	No. Church Street is an end point, with a scheduled 7-10 minute stop for routes 1, 3-5-6, 8, and 13, so there must be inductive chargers on Church Street if the VTA is to be all-electric in the foreseeable future.

APPENDIX II
IMAGES OF THE VISITOR CENTER BEFORE AND AFTER THE PROPOSED PROJECT
FROM THE REPORT OF THE EDGARTOWN VTA CHURCH STREET REVIEW COMMITTEE

VTA CHURCH STREET REVIEW COMMITTEE
TOWN OF EDGARTOWN
REPORT
October ___, 2020

This committee strongly supports the installation of three inductive bus chargers under Church Street in Edgartown. The inductive charger project has no cost to the town, will have an overall positive impact on the attractiveness of Church Street, and is essential to achieving all-electric bus service for Martha's Vineyard.

SHORT SUMMARY OF CRITICAL POINTS:

Why is the Martha's Vineyard Transit Authority (VTA) going all-electric? An all-electric fleet of buses will eliminate the air pollution and noise pollution caused by diesel buses, which will benefit everybody on Martha's Vineyard. An all-electric fleet of buses will also result in reduced maintenance and fuel costs.

Why are inductive chargers needed? Electric buses currently do not have batteries that can power them for a full day without charging. On-route inductive charging for 7-10 minutes at the natural end point of a bus route, several times during the day, allows an electric bus to run for the whole day. Inductive bus chargers are installed under the street and charge a bus wirelessly when the bus is stopped over the charger. If the VTA is to be all-electric in the foreseeable future, the buses must have on-route inductive charging.

Why are inductive chargers needed on Church Street in Edgartown? The Church Street Visitor Center is now, and has been for many years, the primary bus stop for four bus routes. Inductive chargers at Church Street will enable all four of these bus routes to be all-electric.

What are the effects on Church Street?
There will be no change to the number of buses on Church Street or the amount of time each bus spends there. The inductive chargers, themselves, will be unobtrusive, appearing as three flat rectangular plates set flush with the pavement in the bus stop lane and with minimal markings on the street. There will be two large electrical equipment cabinets in front of the Visitor Center, screened with fencing and/or decorated with informational graphics which will be more specifically approved by the Edgartown Historic District Commission before installation.

Two (or possibly three) Norway maples that are in poor condition will be removed, and three new trees will be planted. The large linden tree and the large sycamore tree will remain.

The street will be widened by 2' for a distance of 55' immediately opposite the Visitor Center.

The project scope includes a much needed renovation of the Church Street passenger waiting area in front of the Visitor Center, including a covered shelter, new seating, and new signage to help visitors navigate downtown, in addition to the removal of most of the utility poles on Church Street and the installation of eight old-fashioned street lanterns.

SHORT LIST OF QUESTIONS AND ANSWERS:

	Question	Short Answer
1	What was this committee asked to do?	This committee was asked to take a fresh look at whether inductive chargers should be installed on Church Street to facilitate all-electric VTA bus service. The committee was specifically charged not to look at whether there should be changes to the VTA schedules, routes, or numbers or sizes of buses.
2	How many trees will be removed from Church Street?	Only one tree (a Norway maple which is in poor condition) will be removed because of the inductive chargers. The project also includes the removal of two other trees (also Norway maples which are in poor condition) and the addition of three new trees. The large linden tree and the large sycamore tree will remain as is.
3	How much will Church Street be widened?	Less than half of the width of the grass strip across from the Visitor Center will be paved for only one-third of its length. The new paving will be 2' x 55' and is unrelated to the inductive chargers.
4	How will Church Street look worse than it does now?	The main visible change will be two new metal electrical cabinets in front of the Visitor Center. These will be decorated with informational graphics and maps, which are badly needed outside the Visitor Center, and/or possibly screened with movable fencing.
5	How will Church Street look better than it does now?	Along the sidewalk, three utility poles will be taken out, and eight old-fashioned street lanterns will be put in. Also, the two large areas of packed dirt in front of the Visitor Center where passengers wait will be replaced with paving stones and granite topped walls for seating.
6	How much noise will the inductive charger equipment make?	The cooling fans in the two electrical cabinets in front of the Visitor Center will make some noise when a charger is actually charging. There will be no fumes at all and far less noise than with the diesel buses.
7	Will the sizes of the buses change?	The sizes of the buses are not expected to change. The sizes are determined by the variations in passenger loads, which are mostly seasonal, not whether the buses are charged inductively. The inductive chargers are needed no matter what sizes of buses are used.
8	Could a location for the chargers other than Church Street work?	No. Church Street is the primary bus stop, with a scheduled 7-10 minute stop, for four bus routes, so there must be inductive chargers on Church Street if the VTA is to be all-electric in the foreseeable future.

IMAGES OF THE VISITOR CENTER BEFORE AND AFTER THE PROJECT:

Artist's rendering showing electrical cabinets at the front corners of the property and a new tree at the far right.

This photo was taken in early October 2020. The trees at the left and in the center would remain as is. Note the large packed dirt areas.

BACKGROUND:

Since 2017, with the approval and/or support of the Edgartown Historic District Commission, the Edgartown Board of Trade, the Edgartown Energy Committee, the Edgartown Board of Selectmen, the Boards of Selectmen of the other five Martha's Vineyard towns, the Vineyard Trust (formerly the Preservation Trust), and the Martha's Vineyard Commission, the VTA has been steadily working to implement a plan to become all-electric.

The Church Street part of the VTA plan took shape, in part, based on the discussions of a "stakeholder group" convened by the Edgartown Board of Selectmen at the request of the VTA. The "stakeholder group" consisted of a member of the Edgartown planning board, a member of the Edgartown Historic District Commission, a member of the Edgartown beautification committee, a representative of the 19 Church Street property, Doris Ward (who lives immediately across Church Street from the Visitor Center and is also a member of this committee), a landscape architect, James Hagerty (the Edgartown town administrator), the superintendent of the highway department, the superintendents of the water and wastewater departments, and Paul Pimentel representing the Edgartown energy committee.

In 2018, the VTA began acquiring electric buses to replace diesel buses as the diesel buses reached the end of their useful lives. The VTA now has 12 electric buses out of a total of 32 buses.

In the summer of 2021, the VTA will have 16 electric buses. The VTA's plan is to phase out its remaining diesel buses and have an all-electric fleet of buses by 2027.

The benefits of an all-electric fleet are numerous, including reduced air and noise pollution that will result in quality of life improvement for everyone in Edgartown and elsewhere on Martha's Vineyard. The conversion is also expected to have economic benefits resulting from reduced maintenance and fuel costs for the VTA.

The VTA fleet of buses will not be all-electric by 2027 without on-route inductive chargers.

On-route inductive charging allows electric buses to safely augment their batteries while stopped to drop off and pick up passengers. The small on-route supplement of power, repeated throughout the day, is enough to extend the service time of the bus for the whole day. Without inductive charging, the VTA will have to switch out buses mid-day for other buses, either diesel or electric, which would significantly increase the number of buses needed to provide the current levels of service. Switching out buses would also require additional drivers and labor hours. On-route inductive charging allows the VTA to extend the range of electric buses in a cost effective and efficient manner.

Church Street was selected as a site for the installation of on-route inductive chargers because it serves four bus routes, each of which has a scheduled stop of 7-10 minutes at this location. No alternative location for the chargers would be as effective in providing on-route charging for the VTA bus system because there is no other location with scheduled 7-10 minute stops for these four bus routes.

In 2020, a citizen petition resulted in the inclusion of Article 10 in the Warrant for the Special Town Meeting of June 13, 2020. This article asked, "Shall the installation of an electric-inducing bus-charging Terminal on Church Street, by the regional Vineyard Transit Authority (VTA), in the heart of the Edgartown Historic District, be reconsidered?" The vote was 96 - 83 in favor of the reconsideration, and the Board of Selectmen formed this committee to undertake the reconsideration. The Board of Selectmen specifically charged this committee not to look at locations other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses.

The committee met by Zoom on July 30, August 20, August 25, September 8, September 29, October 5, and _____ and had a site visit to Church Street on September 9. The committee listened to multiple presentations, questions, and answers in reviewing the history and details of the proposed project.

The committee consisted of the following participants:

Keith Chatinover, County Commissioner and Edgartown Historic District resident
Jane Chittick, Edgartown Historic District resident (resigned on September 7, 2020)
Angie Gompert, VTA Administrator (non-voting participant)
Julia Livingston, Committee Vice Chair and Clerk and Edgartown village resident
Sara Piazza, Edgartown Historic District resident (resigned on September 7, 2020)
Mark Snider, Appointed Edgartown Representative to the VTA Board and Edgartown resident
Alan Strahler, Committee Chair and Edgartown resident
Bill Veno, MVC Planner and Edgartown resident
Doris Ward, Church Street resident immediately across from the Visitor Center

DISCUSSION:

A. THE NEED FOR THE INDUCTIVE CHARGERS

The distance a fully charged electric bus can travel is not sufficient for the long hours and miles of VTA routes. The VTA currently has 20 diesel buses and 12 electric buses. Four of the electric buses are 30' x 96" with an effective range of approximately 130 miles, and eight of the electric buses are 35' x 102" with an effective range of approximately 160 miles. In order to run for a full day, a bus in the VTA system needs to go 300 - 350 miles. The difference between the 300 - 350 mile needed range and the 130 - 160 mile current range of the electric buses is the basic problem the VTA needs to solve in order to go all-electric. Several possible solutions have been considered, as described in the following paragraphs.

1. Possible solutions that would not require on-route charging. This committee discussed three possible solutions that would not require the installation of on-route chargers or any other construction on Church Street, as follows:

a. Taking the electric buses out of service for several hours when their batteries get low during the day and charging them at the airport VTA headquarters. In an all-electric system, to cover the gap in service, while buses with spent batteries recharge, would require the VTA to add 24 - 32 additional electric buses, for a total of 56 - 64 buses, as opposed to the 32 the VTA currently has. This possible solution to the problem is not being pursued because the capital and operating costs of the extra buses would be unacceptable.

b. Using "hybrid" buses, instead of electric buses, until all-electric buses have better batteries with longer ranges. A hybrid bus has a full diesel system in addition to an electric system. Our committee heard that diesel only works well in places where the buses run at speeds over 45 mph for extended periods, generating enough heat to clean the particulate filters, which does not happen on Martha's Vineyard. Diesel maintenance is costly, for either pure or hybrid diesel, and the substantial maintenance cost savings from

the conversion to an all-electric system would not be realized with hybrid buses. Also, the noise and fumes associated with diesel operation would remain. For these reasons, hybrid buses are not being pursued by the VTA.

c. Continuing to operate with diesel buses and a smaller number of electric buses until bus batteries and/or other technologies have improved to the point that all sizes of buses needed by the VTA would have a range of 300 - 350 miles without recharging during the day. This possible solution to the problem is not being pursued at this time because there is no way to know how long this will take, if it is ever achieved.

2. Two different kinds of on-route charging. As noted above, on-route charging allows electric buses to safely augment their batteries, while stopped to drop off and pick up passengers, with small supplements of power, repeated throughout the day. This committee discussed two kinds of on-route charging, as follows:

a. Conductive chargers at locations where VTA bus routes have scheduled stops of up to 10 minutes to drop off and take on passengers. This possible solution is not being pursued because conductive chargers require 500 kW of electricity, as opposed to the 150 kW of the proposed inductive chargers, and because conductive chargers are installed on cranes and charge the buses from overhead. Conductive chargers are very visible and industrial looking. This kind of charger would not be compatible with the look of the Edgartown Historic District or any other location along the Martha's Vineyard bus routes.

b. Inductive chargers at locations where VTA bus routes have scheduled stops of up to 10 minutes to drop off and take on passengers. Inductive chargers involve an electric coil under the street and an electric coil on the underside of each bus. When the coil attached to the underside of the bus is directly above the coil under the street, the driver pushes a button on the dashboard, and the charge flows into the bus battery wirelessly. The VTA conducted an RFP process following Massachusetts RFP guidelines for transit agencies. Two companies submitted proposals, and a company called Momentum Dynamics received the higher scores from all reviewers and was selected to provide inductive chargers for Martha's Vineyard.

Experience in Wenatchee, Washington with Momentum Dynamics Inductive Chargers:

Ed Archer, the maintenance director for the Link transportation system in Wenatchee, Washington, told our committee that, without on-route inductive charging, an electric bus can run about 8 hours, but with on-route inductive charging it can run for a full, uninterrupted 14-16 hour day. The Link system's electric buses charge for 5 minutes every hour or half hour during their natural "dwell time" when they are letting off and taking on passengers. Ed sends out a bus in the

morning with a 100% charge, and at the end of the day the charge is at 64%. The bus gains about 1% toward a full charge for every minute it is in place above an inductive charger. Ed said the Link system's experience with the "generation 1" Momentum Dynamics inductive charger was very successful, so the Link system is now installing three "generation 2" Momentum Dynamics inductive chargers. He said the "generation 1" charger transformed how they were able to function because they could keep an electric bus in service for 24 hours a day, seven days a week. He said that, if you don't have on-route charging, you will need one or two additional buses for each route, which is expensive. He said the chargers are unobtrusive, with only a 4 x 7 electrical cabinet nearby and no footprint in the street. He said there is very little maintenance. The coolant needs to be checked every 6 months, and Momentum Dynamics monitors the system remotely. A few times a year, a circuit breaker needs to be reset. Once, his system needed a new fan, and it arrived and was installed within 24 hours. Ed said Momentum Dynamics was very reliable and very responsive. He said it was some of the best service he's ever seen in transit.

B. CHANGES ON CHURCH STREET NECESSITATED BY THE INDUCTIVE CHARGERS

The three in-ground charger coils installed under the street in the bus stop lane on Church Street will be served by two electrical cabinets located near the front corners of the Visitor Center property. Additional electrical cabinets, for an Eversource transformer and switching equipment and a battery that will feed the inductive chargers, will be placed at the back of the parking area on the north side of the Visitor Center.

1. Inductive charger electrical cabinets. The three inductive chargers proposed by the VTA for Church Street require two electrical cabinets (one is 89"l x 36"w x 72"h and the other is 66"l x 36"w x 71"h). The larger (300 kW) cabinet is located near the the northwest corner of the property at the edge of the parking lot and will serve two of the inductive chargers. The smaller (150 kW) cabinet is located near the southwest corner of the property and will serve the third inductive charger. At the Historic District Commission meeting on October 3, 2019, it was noted that these metal cabinets are the most unsightly part of the project, but that they could be wrapped with graphics printed on vinyl that could be attractive and of interest to bus riders. The cabinets could also be screened with fencing. There will be cooling fans in these cabinets, and they will make some noise when buses are actually in place and being charged. The sound level is reported to be 70 dBA, a sonic level that various sources compare to air conditioners, vacuum cleaners, and office conversation. The sound will certainly be less than that of the diesel buses. Members of this committee said these cabinets could be regarded as an opportunity to provide useful information to visitors who now have to ask someone, for example, which way to walk to get to Main Street. The Historic District Commission Certificate of Appropriateness for the Church Street inductive charger project is explicitly conditioned on the cabinet "wrap" being approved by the

Historic District Commission before it is installed. This committee agrees that these two cabinets will have a visual impact on Church Street, but on balance they are acceptable given the health, environmental, noise, cost, and other advantages of an all-electric bus system.

2. The inductive chargers. The three charger coils will be installed under Church Street in the bus stop lane. The only visible element will be three rectangular metal plates, each measuring 62" x 33" set flush into the roadway pavement in the bus stop lane, with minimal markings on the street. The visual impact of these plates will be similar to that of manhole covers. Snow plowing and street sweeping will be unaffected.

3. Removal of utility poles. Because the project requires the relocation of the 100 year old water line under Church Street and also requires increased electric power on Church Street, the plans include upgrading the water line, putting the electric power lines underground, and removing three utility poles on Church Street, leaving only the utility pole nearest to Main Street. Instead of the streetlights now on the three utility poles, eight old-fashioned street lanterns, matching the style of those on Main Street and elsewhere in the Edgartown Historic District, will be added. The new lanterns will light the whole length of Church Street, which is not the case currently with the existing streetlights. Also, six of the new lanterns will be placed outside of the sidewalk. This will improve the ADA accessibility along Church Street and in front of the Visitor Center, making the street more historic in character, not less, and making the walk from the bus stop to Main Street or Pease's Point Way safer for all.

4. Other electrical equipment. A battery will be installed in a cabinet at the back of the parking lot next to the Visitor Center. This will allow the VTA to store and supply electricity for the chargers, bought at off-peak hours when the electricity is less expensive. Also, to replace the equipment now on the three utility poles being removed as described above, Eversource will install a transformer and switching equipment in cabinets at the back of the parking lot next to the Visitor Center. None of the equipment at the back of the parking lot will be visible from the street. It will be screened with moveable plantings. No parking spaces for town employees will be lost. One VTA parking space will be lost.

5. Removal and replacement of a Norway maple on the Visitor Center property. A Norway maple near the southwest corner of the Visitor Center property needs to be removed to make room for one of the new electrical cabinets. An arborist from Beetlebung Tree Care LLC found that this tree is in poor condition: the tree canopy is thinned and has some die back; the roots are restricted, compacted, and girdling; there is moderate decay in a 2' long trunk defect; and branches are resting on electrical, phone, and cable lines. A new tree to be chosen by the Edgartown tree warden will be planted slightly further back on the Visitor Center property.

C. CHANGES ON CHURCH STREET NOT NECESSITATED BY THE INDUCTIVE CHARGERS

The proposed project includes other changes on Church Street that are not necessitated by the inductive chargers, but are included in the project to improve the function and appearance of the bus stop area and the Visitor Center.

1. Widening of the paved area of Church Street by 2' along a 55' strip. Widening the pavement by approximately 2' along a 55' strip on the west side of the street opposite the Visitor Center will make it easier and safer for parked buses to pull out and around each other. The widening begins at the 26 Church Street driveway and ends at a point opposite the Visitor Center parking lot. The strip of grass along the west side of the pavement is about 5' wide and 180' long. The widening is less than half of that width and less than a third of that length. A strip of grass about 3' x 55' will thus remain opposite the Visitor Center, and the remaining strip of grass of about 5' x 120' will be untouched.

2. Removal of a Norway maple across the street from the Visitor Center. This tree removal will make it easier and safer for parked buses to pull out and pass each other on Church Street. The arborist from Beetlebung Tree Care LLC found that this tree is in poor condition: it has multiple structural defects, multiple trunk and branch wounds, an extensive trunk wound from a large branch that recently broke off on the side away from Church Street, and the roots are girdling and heaving and breaking up the asphalt curb and surrounding ground. The branches overhanging the street show damage from multiple collisions of trucks and other tall vehicles, including buses. Two new trees to be chosen by the Vineyard Trust (formerly the Preservation Trust) will be planted slightly further back from Church Street on the Vineyard Trust property. The Vineyard Trust supports the inductive charger project and has given permission for the planting of these two new trees.

3. Optional removal of a Norway maple at the northwest corner of the Visitor Center building. The removal of this tree was suggested by the arborist who evaluated the other two Norway maples. He said this tree is not in good health and is too close to the Visitor Center building.

4. Linden tree and London plane tree (sycamore) to remain at Visitor Center. It should be noted that the two large shade trees at the Church Street Visitor Center that are not Norway maples (a linden and a London plane tree, otherwise known as a sycamore) will remain as is.

5. Renovation of passenger waiting area. The project includes funding for a complete overhaul of the Church Street passenger waiting area, including a covered shelter, new seating, new informational signs, new landscaping, and improved stormwater management. In addition, power lines along most of Church Street will be placed underground, resulting in the removal of three of the four utility poles from the Church Street sidewalk and the installation of eight old-fashioned street lanterns – six of which will be placed outside of the sidewalk. This area now has two large areas of packed dirt, with very little space for people to sit or shelter from rain while

waiting for buses. At the Historic District Commission meeting on December 5, 2019, it was noted that the designers struck a pretty good balance with the overall design, taking into account that the Visitor Center building is a 20th century building, the site gets extensive public use, and there is an obvious need for updating. This committee agrees and feels that the historic and visual benefits to the Edgartown downtown area are significant.

D. WHY CHURCH STREET?

Because the water table at the Vineyard Haven Steamship Authority bus stop is too high for the installation of underground inductive chargers, there is simply no place on Martha's Vineyard where inductive chargers can serve as many bus routes as Church Street.

1. Inductive chargers on Church Street will enable route 3-5-6 to be fully electric. After stopping at Church Street, the 6 bus proceeds via the airport to West Tisbury, where it becomes the 5 bus to Aquinnah and back to West Tisbury. It then heads to Vineyard Haven as the 3 bus, returns to West Tisbury, and then becomes the 6 to the airport and Edgartown. The buses on this long route will likely charge at two inductive chargers to be installed in West Tisbury, but they will also need to charge in Edgartown because the "dwell time" in West Tisbury is only a few minutes and is somewhat unpredictable because of Vineyard Haven traffic, while the "dwell time" in Edgartown is 7-10 minutes and is more predictable. Note that passengers are likely to feel frustrated and inconvenienced by an extended "dwell time" for charging at a stop which is more of a "through stop" with fewer passengers getting off and on, while a longer "dwell time" will not inconvenience passengers at a stop which is more of an "end stop" with more passengers getting off and on. Church Street is more of an "end stop" in this sense than West Tisbury. In other words, at Church Street, the buses will be charging in between runs, and there will be no delay experienced by passengers. If there are not going to be inductive chargers on Church Street, then the 3-5-6 bus route will have diesel buses for part of each day, after the electric buses have depleted their batteries.

2. Inductive chargers on Church Street will enable routes 1, 8, 11 and 13 to be fully electric. Church Street is now, and has been for many years, an end point for four bus routes (routes 1, 8, and 13, in addition to route 3-5-6 discussed above). In addition, route 11 will be able to charge at Church Street because the route 8 buses can become route 11 buses, and vice versa, so that both can charge at Church Street. Inductive chargers at Church Street will enable all of these bus routes to be all-electric. No other location on Martha's Vineyard is an end point for as many bus routes. If there are not going to be inductive chargers on Church Street, then, in addition to route 3-5-6 discussed above, bus routes 1, 8 and 11 (and possibly 13, depending on whether there is an inductive charger at Oak Bluffs) will have diesel buses for part of each day, after the electric buses have depleted their batteries.

E. MOMENTUM DYNAMICS EQUIPMENT

1. Inductive chargers are safe. Momentum Dynamics charging systems include all the elements needed for safe operation:[1] detection of objects under the bus in the charging zone, sensing of misalignment of the bus and charger coil, measured exposure to magnetic and electric fields,[2] and an on-board vehicle system to sense and control the charging. The magnetic field that escapes from under the bus during charging is minimal and is within the relevant established international standards. The chargers have received UL (Underwriters Laboratories) certification. Also, inductive vehicle charging uses a very different frequency from inductive chargers for mobile phones, medical devices, and other consumer products.[3] This means these small appliances can be safely operated on or around the buses and inductive charging equipment.

2. Momentum Dynamics chargers are reliable. Momentum Dynamics monitors every charger remotely. Their system alerts users of any problems by text and email and dispatches a repair technician when needed. A member of our committee contacted maintenance supervisors at three bus systems using Momentum Dynamics chargers. In Howard County, MD, a charger serving 3 electric buses functioned without issue for 3+ years, then needed one repair. In Chattanooga, TN, a charger was used for 3+ years with 4 electric buses, and the report was that it "worked great" with "excellent tech support." In Wenatchee, WA, Ed Archer (see section A.2.b above) reported a charger in operation for over a year serving 3 electric buses with no significant issues. Ed Archer remarked that the Momentum Dynamics service was very good, the best he had seen in his experience in transit.

3. The useful life of the inductive chargers for purposes of financial accounting has been set at 12 years by experienced accountants. The technology is relatively new, so this 12 year useful life may or may not prove to be correct, but inductive chargers do not have many moving parts (only fans and switches and only in the above-ground cabinets where they are relatively easy to replace), so their useful life could be longer. A committee member reported that mini-buses with inductive charging from a different manufacturer, not Momentum Dynamics, were used in Genoa and Turin, Italy, for 15 years

F. COSTS

1. All of the costs of the proposed Church Street project will be funded by federal and state grants. The sole financial aspect of the Church Street project for the Martha's Vineyard

[1] Bablo, J., K. Boyce, and H. Jiang, 2014, *The unique safety concerns of wireless charging*, IEEE Transportation Electrification eNewsletter, September/October 2014, 3 pp.
[2] Mohamed, A. A. S., A. Meintz, P. Schrafel, A. Calabro, 2018, *In-vehicle assessment of human exposure to EMFs from 25-kW WPT system based on near-field analysis*, National Renewable Energy Laboratory, NREL/CP-5400-71710, 8 pp.
[3] Zhang, Z., H. Pang, A. Georgiadis, and C. Cecati, 2019, *Wireless power – An overview, IEEE Transactions on Industrial Electronics*, vol. 66, no. 2, pp. 1044-1068.

towns will be the benefit of the reduced operating costs, both in maintenance costs and fuel costs, realized over time as the bus fleet transitions to a fully electric fleet.

2. Possible Impacts of a delay in the project. The construction of the project has been planned for the winter of 2020-2021. Delaying the project until the winter of 2021-2022 will result in increased costs which are difficult to estimate. At a minimum, the VTA will need to delay the retirement of the four diesel buses it planned to retire in 2021 so that they can be used to to cover the times when the electric buses with spent batteries are charging at the airport. This would mean that the bus fleet in 2021 would have 16 electric buses and 20 diesel buses, for a total of 36 buses, instead of the currently budgeted 32. This increase in the number of buses would require additional maintenance and labor costs. Also, the VTA will need to ask the Federal Transit Administration (FTA) to move various costs from earlier grants to later grants and vice versa in order not to lose the funding for the project. Currently, it is not known whether these adjustments will be permitted by the FTA. A delay of longer than a year would require the VTA to buy new diesel buses, and stop buying new electric buses, starting in 2022 as the existing diesel buses reach the end of their useful lives. It would also likely require the VTA to have a fleet larger than 36 buses in future years, in order to have enough diesel buses to substitute in for electric buses with spent batteries when VTA ridership levels recover from their COVID-19 levels. As noted above, increased numbers of buses will mean increased labor costs, and increased diesel buses will mean increased maintenance and fuel costs, in addition to the continued noise and air pollution caused by the diesel buses.

G. MATTERS OUTSIDE THE CHARGE GIVEN TO THIS COMMITTEE

As noted at the outset of this report, this committee was specifically charged not to consider locations for inductive chargers other than Church Street or changes to the VTA schedules, routes, or numbers or sizes of buses. In practice, however, it proved impossible to avoid discussion of these issues, and it may be helpful to report those discussions in this report.

1. The sizes of the buses. This committee was charged by the Board of Selectmen not to consider the sizes of the buses, but substantial concern was expressed in our committee meetings that the installation of inductive chargers would force the continued and increased use of larger buses. In fact, this is not the case. Passenger loads and efficiencies determine the bus sizes. The inductive chargers are needed no matter what sizes of buses are used. Smaller electric buses have smaller batteries, so smaller electric buses need on-route charging more frequently during the day than larger buses. Right now, all of the VTA's 30’ buses (diesel and electric) are 96” wide. Some of the VTA’s 35’ and 40’ buses (diesel and electric) are 96” wide and some are 102” wide. In general, the transit bus manufacturing industry is now only making buses that are 102” wide, and it should be noted that 102” wide buses are more comfortable for passengers, especially passengers using electric mobility devices and especially in times that require social distancing. As of now, the only transit bus manufacturer that makes a 96” wide bus is the manufacturer (BYD)

whose buses are compatible with the Momentum Dynamics inductive chargers. BYD is the bus manufacturer from which the VTA has been acquiring and is continuing to acquire its electric buses. These 96" wide buses are 30' long, and they are electric, not diesel. If the VTA were to buy new 30' diesel buses now, only 102" wide buses would be available, while new 30' electric buses are still available from BYD at 96" wide. Ed Archer of the Link system in Wenatchee, Washington, believes there are smaller electric buses in China, and a committee member reported that mini-buses with inductive charging were used in Genoa and Turin, Italy, for 15 years. Ed Archer said he has heard through the grapevine that smaller, truck-based buses (called "cutaways") compatible with Momentum Dynamics inductive chargers are likely to be available in the United States soon. The VTA needs to have a mix of different sizes of buses for efficiency in responding to the variations, mostly seasonal, in passenger loads. If the VTA uses larger buses, it will be for reasons other than the existence of inductive chargers. This committee was told that, at present, the VTA has no plans to change any routes or schedules or to increase the sizes or numbers of buses stopping on Church Street.

2. Inductive charging at Oak Bluffs. Inductive charging at Oak Bluffs is outside the charge given to this committee by the Board of Selectmen. Having said that, it seems worth noting that there was discussion of this suggestion at committee meetings, and this committee believes this suggestion should not be pursued because Oak Bluffs is a "through stop," not an "end stop" for the route 13 buses, which means less time for charging is available. Riders would be frustrated and inconvenienced if a 7-10 minute wait for charging at Oak Bluffs had to be built into this route. Also, an inductive charger at Oak Bluffs would not solve the on-route charging need for routes 1, 3-5-6, 8, and 11. An Oak Bluffs charger would be inefficient because, although it could serve routes 7, 9 and 13, inductive chargers on Church Street would serve more routes.

3. Combining routes 1 and 13. It was suggested in the committee meetings that routes 1 and 13 might be combined to run in a loop with inductive chargers in Oak Bluffs, instead of at Church Street. This suggestion is outside the charge given to this committee by the Board of Selectmen. Still, it seems worth noting that this committee believes this suggestion should not be pursued because (a) it would not solve the problem for the 3-5-6, 8 and 11 buses and (b) in the summer there are more buses on route 13 than route 1 and the reverse is true in the winter. To run these two routes as a loop would require more buses in the fleet and more wasteful extra trips on the quieter legs of the combined route.

4. Inductive charging at the Edgartown park and ride. It was suggested in the meetings of this committee that an Edgartown "end stop" should be established at a location outside the Historic District, possibly at the park and ride on Dark Woods Road, and inductive chargers should be installed at this new "end stop," instead of on Church Street. This suggestion is outside the charge given to this committee by the Board of Selectmen. Still, it seems worth noting that there was discussion of this suggestion at committee meetings, and this committee believes this suggestion should not be pursued for the following reasons:

a. This would require very substantial changes to the VTA's routes, schedules, and numbers and types of buses, including but not limited to (i) an increased number of "cutaways" or other small buses to shuttle passengers from the new "end stop" into the downtown area and (ii) rerouting the Up-Island (3-5-6) bus and the Katama (8) bus, which currently do not go past the Dark Woods park and ride.

b. If 11 large buses per hour now arrive at Church Street, transferring the passengers at Dark Woods to equivalent passenger capacity on smaller buses would require some significant number of additional smaller buses, along with additional drivers for these additional buses. These additional buses would add to the traffic congestion in the downtown area. Also, the additional buses and drivers would increase the VTA operating costs paid by the towns.

c. This change would not be good for the downtown business community because employees and visitors alike would be significantly inconvenienced by the need to transfer at Dark Woods from large buses to smaller buses. This would delay the passengers and make traveling into Edgartown by bus significantly more frustrating and inconvenient.

d. The traffic at the triangle would be much worse because larger and more numerous buses (all the 1, 3-5-6, 8, 11, and 13 buses, including the increased numbers of shuttle buses going downtown) would need to turn across traffic to get in and out of Dark Woods Road.

e. The bus shelter at the Dark Woods park and ride would need to be substantially enlarged and improved. It would need to have restrooms for use by the passengers and bus drivers who now use the restrooms at the Church Street Visitor Center.

f. The current routes and schedules enable the VTA to operate the entire system with only 32 buses. It was reported to this committee that a Massachusetts Department of Transportation consultant looked at the VTA routes and schedules in 2015 and again in 2020 and found them to be very efficient. This may mean that there would not be federal and state grants available for the capital costs (acquiring additional shuttle buses and building a new passenger shelter with restrooms) of this very different, less efficient, and more expensive project.

The following members of the committee have approved this report and join in its recommendation:

Keith Chatinover
Julia Livingston
Mark Snider
Alan Strahler

Bill Veno
Doris Ward