Charleston Area Regional Transportation Authority

CARTA BOARD MEETING

May 25, 2022
1:00 PM

Barrett Lawrimore Conference Room
5790 Casper Padgett Way
North Charleston, SC 29406

AGENDA

1. Call to Order
2. Consideration of Board Minutes –April 27, 2022 Meeting
3. Financial Status Report – Robin Mitchum
4. FY22 Budget Revision – Request for Approval
5. Operations Contract Renewal – Request for Approval
    a) Fixed Route
    b) Paratransit
    c) Maintenance
6. 3664 Leeds Avenue Building Lease Renewal – Request for Approval
7. Digital Sign Contract Renewal – Request for Approval
8. Post Mounted Solar Lighting Contract Renewal – Request for Approval
9. Electric Bus Master Plan Presentation – Request for Approval – Jeff Burns
10. Electric Bus Master Plan Modification – Request for Approval
11. Battery Electric Infrastructure Contract Modification – Request for Approval
12. State Mass Transit Funds (SMTF) Application – Request for Approval
13. Climate Action Plan – Request for Approval – Sharon Hollis
14. Project Updates – Ron Mitchum/Staff
15. Ridership Report
16. Executive Director's Report – Ron Mitchum
17. Other Business, If Any
18. Public Comments, If Any
19. Board Comments, If Any

CHARLESTON AREA REGIONAL TRANSPORTATION AUTHORITY (CARTA)
BOARD OF DIRECTORS MEETING
April 27, 2022
Meeting Notes

A Charleston Area Regional Transportation Authority (CARTA) Board of Directors meeting was held at the Berkeley-Charleston-Dorchester Council of Governments in the Barrett Lawrimore Conference Room located at 5790 Casper Padgett Way in North Charleston, SC at 1:00 p.m. on Wednesday, April 27, 2022.

MEMBERSHIP: Mary Beth Berry; Ron Brinson; Mike Brown; Dwayne Green; Alfred Harrison; Will Haynie; Jenny Costa Honeycutt; John Iacofano; John Labriola; James Lewis; Pat O'Neil; Teddie Pryor; Christie Rainwater; Michael Seekings; Keith Summey; John Tecklenburg; Jimmy Ward; Robert Wehrman
MEMBERSHIP PRESENT: Ron Brinson; Dwayne Green; John Iacofano; James Lewis; Pat O'Neil; Michael Seekings; Jimmy Ward
PROXIES: Jerry Lahm for Teddie Pryor; Ray Anderson for Keith Summey; Robert Sommerville for John Tecklenburg; Lynn Christian for Alfred Harrison; Carter McMillan for Jenny Costa Honeycutt; Kristen Salisbury for Robert Wehrman
OTHERS PRESENT: Alisha Wigfall (Transdev); Scott Donahue (SCDOT); Chloe Field (BGRM); Charles Drayton (City of North Charleston); Joe Olson (HNTB); Shawn Epps (HDR); Samantha Dubay (HDR); Pastor Thomas Dixon (North Charleston Resident); William Hamilton (Best Friends of Lowcountry Transit); Tara Lazowski (Northwoods Estates)
STAFF PRESENT: Ron Mitchum; Andrea Kozloski; Robin Mitchum; Belen Vitello; Jon Dodson; John Lambert; Courtney Cherry; Michelle Emerson; Kim Coleman

1. **Call to Order**
   Chairman Seekings called the CARTA Board of Directors Meeting to order at 1:05 p.m. followed by a moment of silence and quorum determination.

2. **Consideration of Board Minutes: March 16, 2022 Meeting**

   Mr. Lahm made a motion to approve the March 16, 2022 Meeting Minutes as presented.
   Mr. Anderson seconded the motion. The motion was unanimously approved.

3. **Financial Status Report – Robin Mitchum**
   Robin Mitchum, Deputy Director of Finance and Administration, presented the financial status report for the period ending March 31, 2022. Ms. Mitchum noted that, overall, the agency remains in good shape and ended the month slightly over budget with unexpended funds of $68,638. She reviewed the following activities for FY22 thus far:

   Revenues:
   - Farebox is the fares collected on the revenue vehicles.
   - Passes are bus pass fares sold to customers.
   - Local contributions are funds received from local organizations for shelter and bench construction.
   - The Federal revenue includes operating for the year-to-date. Federal revenue is recorded as eligible expenditures are incurred.
   - Insurance proceeds are a result of accidents.
   - Sale of Assets is the proceeds from the sale of a support vehicle, a 2016 Goshen, a 1996 New Flyer and shelter scrap metal.

   Expenditures:
   - Staff Salaries & Benefits include the cost of retiree insurance.
   - Supplies include office, facility maintenance and PPE (masks) supplies.
   - Printing includes cost of printing route maps, brochures and passes.
   - Automotive is the cost of maintaining the administrative staff vehicle.
   - Dues/Membership is CARTA's membership with Transportation Association of South Carolina (TASC).
   - Office Equipment Rental includes the monthly battery lease for the electric buses and the postage meter.

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- Office Equipment Maintenance (OEM) includes the FY22 portion of the Swiftly Transit Time and Insights, Cradlepoint NetCloud Essentials for mobile routers and Zscaler internet security, in addition to IT services.
- Rent includes the Ashley Phosphate Park & Ride lot, Dorchester Village Shopping Center Park & Ride lot, Leeds Avenue lot lease from SCE&G, SC works Trident lease space and document storage.
- Communications is the cost of phone, internet and radio services at the facilities and on the buses.
- Utilities include electric and water at the SuperStop, Melnick Park & Ride, the Radio Shop at Leeds Avenue and the charging stations at Leeds Avenue.
- Auditing is the cost of the actuary valuation for GASB 75 and the annual audit.
- Custodial Services is the cost of janitorial services at the Melnick Park & Ride location.
- Pilot Ride Program is customer transportation cost for same-day service through independent rideshare.
- Other Professional Services include appraisal fees for the Ladson property and UST compliance inspections.
- Shared Contract Services (IGA & Management) is the extensive services the BCDCOG provides to CARTA.
- Fixed-Route Service is the cost of fixed and commuter service provided by Transdev.
- Money Transport is the cost of the armored guard service, Brinks, to pick up and transport cash deposits to the bank.
- Security Services is contracted security service provided at the SuperStop and the Leeds Avenue temporary bus parking lot by the City of North Charleston Police Department.
- Electric Bus Master Plan is the project to develop the necessary planning documents to transition CARTA's diesel bus fleet to all-electric buses.
- Vehicle Maintenance is the cost to maintain the fleet.
- Facility Repair & Maintenance is the cost to maintain the SuperStop facility and maintenance on the fare vault.
- Operating Fees & Licenses include credit card transaction fees, storm water fees, solid waste user fees and vehicle title and registration fees.
- Insurance includes the cost of liability insurance provided by the Insurance Reserve Fund. The Policy renewed January 1, 2022 and this is the majority of the expenditures for FY22.
- Paratransit is the cost of paratransit transportation provided by Transdev.
- Interest is the interest accrued on the Melnick Park & Ride Loan.
- Non-Capitalized Assets include the purchase of additional driver and side shields on the buses.

Capital Expenditures:

- Rolling Stock is the purchase of 3 New Flyer buses and 19 Proterra buses.
- Bus Shelter Construction/Bench is the purchase of shelters.
- Security/Cameras & Equipment is the purchase of cameras at the SuperStop and the upgrading of the access control system at the Leeds Avenue facility.
- Capital includes the purchase of two diesel fuel pumps.

Ms. Mitchum stated that the amount owed to Transdev as of March 31, 2022 is $1,463,289.23. Ms. Mitchum addressed questions and comments. The Board of Directors received the Financial Status Report as information.

4. Fare Free May – Request for Approval

Ron Mitchum, Executive Director, discussed the "No Pay May" initiative. He noted that the purpose of initiative is to encourage new ridership and to offer fare-free rides as a "thank you" to current riders. Mr. Mitchum stated that, if approved by the Board, system-wide services would run free of charge from May 1 until May 31, 2022. The Fare Free May initiative will exclude OnDemand rides as that service is under a separate contract. Mr. Mitchum addressed questions and comments.

Mr. Green made a motion to approve Fare Free May as presented.
Mr. Brinson seconded the motion. The motion was unanimously approved.

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5. Project Updates – Ron Mitchum/Staff

Mr. Mitchum delivered an update on the following projects, noting that progress is being made on all projects: Stop/Shelter Design Guidelines; Service Planning Initiatives; Electric Bus Master Plan; Shelter Improvement Program; Solar Lighting; Digital Signage; Shipwatch Square Transit Center; Vanpool Program; Leeds Avenue Facility Improvements; Lowcountry Rapid Transit. Mr. Mitchum briefly discussed each project, noting that a summary was distributed in the Board Meeting Agenda Packet in advance of the meeting and encouraged Board Members to contact him or the respective project manager regarding any specific concerns or questions. Mr. Mitchum addressed questions and comments. The Board of Directors received the Project Updates Report as information.

6. Ridership Report – Jon Dodson

Jon Dodson, Senior Transit Planner, presented the Ridership Report as of March 31, 2022. He noted there were 9.9 customers per hour totaling 180,613 customers in March and that the on-time across all timepoints was 85%. Mr. Dodson stated that overall ridership from February 2022 to March 2022 increased 18%. Overall ridership comparing March 2021 to March 2022 increased by 13%. Overall ridership comparing March 2020 to March 2022 decreased by 3%. Mr. Dodson discussed the riders per hour by route, noting the following: 211-Meeting/King DASH (24); 203-MUSC Shuttle (17); 213-Lockwood DASH (16); 20-King Street (15); 10-Rivers Avenue (14); and 210-Aquarium/College of Charleston (12). Mr. Dodson addressed questions and comments. The Board of Directors received the Ridership Report as information.

7. Executive Director's Report – Ron Mitchum

Mr. Mitchum discussed the Greenridge Road area and presented videos. The videos show the layout of the area and as well as the bus traveling Greenridge Road. Mr. Mitchum discussed the challenges in the area and explained that some of the challenges are highway-department related. The close proximity of the intersection on Rivers Avenue creates challenges with drivers turning onto Greenridge Road then making U-turns, etc. Several pedestrians, who are not CARTA riders, utilize the street to go to the grocery/convenient store from the apartment complex which creates difficult situations as far as safety due to a lack of crosswalks and additional sidewalks. Mr. Mitchum noted the Express bus remains in the right lane, turns right onto Antler Drive and proceeds to the Park & Ride location. The bus stops only when a rider pulls the cord indicating the rider needs to exit the bus at that location or if someone is waiting at the bus stop to get on the bus. Mr. Mitchum explained the stop was moved from across the street at Rivers Avenue due to safety concerns, as crossing multiple lanes of traffic without crosswalks or pedestrian-crossing indicator signs creates a very dangerous situation for CARTA riders. Mr. Mitchum further explained the route of the bus being in the right hand lane and that buses are prohibited from turning right on red. Mr. Mitchum noted that, from an operational standpoint, the bus route runs smoothly. He recognizes that safety is a major concern with connectivity of pedestrians, bicyclists and bus riders to and from the neighborhood and surrounding areas. Mr. Mitchum addressed questions and comments regarding the Greenridge Road area. Mr. Mitchum stated that, at their April 25, 2022 meeting, the BCDCOG Executive Committee approved Nelson/Nygaard Consulting Associates, Inc. for the Transit Planning Consultant. The Selection Committee received two proposals for the Transit Planning Consultant RFP and, based on the overall score sheet rankings, Nelson/Nygaard was selected. Nelson/Nygaard will provide transit planning consultation services on an as-needed basis. The consultants will be on-call to provide their services on a number of transit services projects. Mr. Mitchum addressed questions and comments. The Board of Directors received the Executive Director's Report as information.

8. Other Business, If Any

There was no other business to discuss.

9. Public Comments, If Any

There were three public comments:

- Tara Lazowski, of Northwoods Estates, expressed her concerns regarding the addition of bus stops, the bus stopping near the intersection and traffic safety matters in Northwoods Estates and encouraged attendance at Northwoods Estates' monthly meetings.
- Pastor Thomas Dixon of Antler Drive in North Charleston stated that CARTA provides an invaluable service to the residents of Northwoods Estates and should be able to utilize the tract of land and the Park & Ride area for a safe place to wait for the bus.

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- William Hamilton, Executive Director of Best Friends of Lowcountry Transit, discussed the Town of Mt. Pleasant's Hotel shuttle service to the Charleston Visitor's Center and its connections via the #40 Bus for the Reach the Beach shuttle service. He expressed his concerns regarding transit APP performance and lack of sidewalks on Meeting Street. Mr. Hamilton requested marketing material to distribute regarding the Beach Shuttle and the Fare Free May initiative.

10. Board Comments, If Any

- Mr. Lewis discussed the need for additional sidewalks on Meeting Street, near the Senior Citizens Center noting it is a safety hazard in that area for pedestrians and bus riders.
- Mr. Iacofano thanked Mr. Mitchum and staff for the opportunity to tour the Leeds Avenue facilities.

11. Adjourn

Chairman Seekings thanked Board Members for their service to the Board and the community. There being no further business before the Board, Chairman Seekings adjourned the meeting at 2:00 p.m.

Respectfully submitted,
Kim Coleman

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MEMORANDUM

TO: Board of Directors

FROM: Robin W. Mitchum, Deputy Director of Finance & Administration

SUBJECT: April 30, 2022 Financial Report Overview

DATE: May 12, 2022

Please find attached the April 30, 2022 Financial Report. Below is a brief overview of the activities for FY22.

Revenues

- Farebox is the fares collected on the revenue vehicles.
- Passes is bus pass fares sold to customers.
- Local contributions is funds received from local organizations for shelter and bench construction.
- The Federal revenue includes operating for the year to date. Federal revenue is recorded as eligible expenditures are incurred.
- Insurance proceeds are a result of accidents.
- Sale of Assets is the proceeds from the sale of a support vehicle, a 2016 Goshen, a 1996 New Flyer, and shelter scrap metal.

Expenditures

- Staff Salaries & Benefits includes the cost of retiree insurance.
- Supplies includes office, facility maintenance, and PPE (masks) supplies.
- Printing includes costs of printing route maps, brochures, and passes.
- Automotive is the cost of maintaining the administrative staff vehicle.
- Dues/Memberships is CARTA's membership with Transportation Association of South Carolina (TASC).
- Office Equipment Rental includes the monthly battery lease for the electric buses and the postage meter.
- Office Equipment Maintenance (OEM) includes the FY22 portion of the Swiftly Transit Time and Insights, Cradlepoint NetCloud Essentials for mobile routers and Zscaler internet security, in addition to IT services.
- Rent includes the Ashley Phosphate Park & Ride Lot, Dorchester Village Shopping Center Park & Ride Lot, Leeds Avenue lot lease from SCE&G, SC Works Trident lease space, and document storage.
- Communications is the cost of phone, internet, and radio services at the facilities and on the buses.
- Utilities includes electric and water at the Superstop, Melnick Park and Ride, the Radio Shop at Leeds Avenue, and the charging stations at Leeds Avenue.
- Auditing is the cost of the actuary valuation for GASB 75 and annual audit.
- Custodial services is the cost of janitorial services at the Melnick Park and Ride.
- Pilot Ride Program is customer transportation cost for same day service through independent rideshare.
- Other Professional Services includes appraisal fees for the Ladson property and UST compliance inspections.
- Shared Contract Services (IGA & Management) is the extensive services BCDCOG provides to CARTA.
- Fixed Route service is the cost of fixed and commuter service provided by Transdev.

- Money Transport is the cost of the armored guard service, Brinks, to pick up and transport cash deposits to the bank.
- Security Services is contracted security service provided at the Super Stop and the Leeds Avenue temporary bus parking lot by the City of North Charleston Police Dept.
- Electric Bus Master Plan is the project to develop the necessary planning documents to transition CARTA's diesel bus fleet to all-electric buses.
- Vehicle Maintenance is the cost to maintain the fleet.
- Facility Repair & Maintenance is the cost to maintain facilities and maintenance on the fare vault.
- Operating Fees & Licenses include credit card transaction fees, storm water fees, solid waste user fees and vehicle title & registration fees.
- Insurance includes the cost of liability insurance provided by the Insurance Reserve Fund. The policy renewed January 1 and this is the majority of the expenditures for FY22.
- Paratransit is the cost of paratransit transportation provided by Transdev.
- Interest is the interest accrued on the Melnick Park and Ride Loan.
- Non Capitalized assets include the purchase of additional driver and side shields on the buses.

Capital Expenditures

- Rolling Stock is the purchase of three (3) New Flyer buses and nineteen (19) Proterra buses.
- Bus Shelter Construction/Bench is the purchase of shelters.
- Security/Cameras & Equipment is the purchase of cameras at the Superstop and the upgrading of the access control system and cameras at the Leeds Avenue facility.
- Capital includes is the purchase of a two diesel fuel pumps.

Overall, the agency ended the month with excess of revenues of $639,417.

If you have any questions, please contact me at 843-529-2126 or robinm@bcdcog.com.

Amount owed to Transdev as of 4/30/2022 is $1,268,499.31.

CARTA

Statement of Revenues & Expenditures

For the Month Ending April 30, 2022

Time elapsed: **58%**

	FY22 Budget	Actual	% of Budget
Operating Revenues			
Farebox	1,840,925	804,325	44%
Passes	473,478	197,532	42%
COC Shuttle	417,104	238,615	57%
MUSC	951,364	417,813	44%
City of Charleston - DASH	640,492	373,620	58%
Local Contributions	-	77,565	N/A
Federal	11,601,438	7,815,469	67%
State Mass Transit Funds	475,794	-	0%
Sales Tax - Charleston County	6,658,003	3,808,494	57%
Advertising	700,000	368,034	53%
Insurance Proceeds	-	118,754	N/A
Sale of Assets	10,000	6,321	63%
Miscellaneous	-	64	N/A
TOTAL OPERATING REVENUES	23,768,598	14,226,606	**60%**
Operating Expenditures			
Staff Salaries & Benefits	8,334	4,687	56%
Supplies	151,670	48,319	32%
Printing	37,500	7,360	20%
Marketing	10,000	-	0%
Automotive	1,000	491	49%
Postage	2,900	1,042	36%
Dues/Memberships	1,513	1,000	66%
Office Equipment Rental	107,877	70,324	65%
Office Equipment Maintenance	1,101,938	144,898	13%
Rent	33,800	17,784	53%
Communications	170,561	85,856	50%
Utilities	205,674	61,447	30%
Advertising	58,500	-	0%
Professional Services			
Auditing	24,300	24,800	102%
Legal	7,500	266	4%
Custodial	23,220	11,610	50%
Pilot Ride Program	40,000	6,988	17%
Other	110,000	3,130	3%
Contract Services			
Shared Services - IGA	2,588,887	1,698,257	66%
Fixed Route	13,690,074	7,705,904	56%
Money Transport	7,500	3,867	52%
Security Services	96,191	94,035	98%
Electric Bus Master Plan	87,595	87,463	100%
Vehicle Maintenance	150,000	98,419	66%
Facility Repair & Maintenance	14,950	7,027	47%
Operating Fees & Licenses	25,000	14,363	57%

CARTA

Statement of Revenues & Expenditures

For the Month Ending April 30, 2022

Time elapsed: **58%**

	FY22 Budget	Actual	% of Budget
Insurance	832,399	934,814	112%
Fuel	1,065,531	1,014,842	95%
Paratransit	2,587,469	1,394,823	54%
Miscellaneous	5,500	2,959	54%
Interest	56,210	33,275	59%
Non-Capitalized Assets	465,005	7,139	2%
TOTAL OPERATING EXPENDITURES	23,768,598	13,587,189	**57%**
Excess (Deficit) of Revenues Over (Under) Expenditures		639,417	
Capital Revenues			
Rolling Stock	13,270,970	13,958,357	
Bus Facilities/Charging Stations	6,553,574	-	
Security/ Cameras & Equipment	80,097	18,143	
Park & Ride Construction/Leeds Ave.	2,800,000	-	
Sales Tax - Charleston County	6,222,247	3,638,923	
TOTAL CAPITAL REVENUES	28,926,888	17,615,423	**61%**
Capital Expenditures			
Rolling Stock	17,747,668	17,254,999	
Bus Facilities/Charging Stations	8,164,494	-	
Bus Shelter Construction/Bench Install	100,000	295,724	
Land	600,000	-	
HOP Lot Construction / Leeds Ave.	2,200,000	-	
Security/ Cameras & Equipment	97,440	47,414	
Capital (IT, Facility Repairs/Maint)	17,286	17,286	
TOTAL CAPITAL EXPENDITURES	28,926,888	17,615,423	**61%**

CARTA
BALANCE SHEET
4/30/2022

ASSETS

ASSETS	
GENERAL OPERATING (BB&T)	5,282,785.46
PETTY CASH	180.00
ACCOUNTS RECEIVABLE	7,178,409.94
PREPAID EXPENSES	255,389.61
INVENTORY - FUEL	32,099.08
DEFERRED OUTFLOWS: ER CONTR	2,409.00
LAND	4,623,977.25
VEHICLES	54,198,805.02
EQUIPMENT	2,227,538.43
FAREBOXES	1,170,017.00
SHELTERS	4,310,856.56
BUS SIGNAGE	238,290.32
FACILITIES	9,365,139.27
PARK & RIDE FACILITY	155,251.20
ACCUMULATED DEPRECIATION	(31,778,625.75)
TOTAL ASSETS	57,262,522.39

LIABILITIES & EQUITY

LIABILITIES	
ACCOUNTS PAYABLE	1,895,030.60
NOTE PAYABLE - BB&T	1,563,120.52
ACCRUED INTEREST	11,391.51
UNEARNED REVENUE	3,200.00
OPEB LIABILITY	173,017.00
DEFERRED INFLOWS: OPEB ASSUMP	24,581.00
TOTAL LIABILITIES	3,670,340.63
EQUITY	
CURRENT YEAR FUND BALANCE	639,416.98
INVEST IN CAPITAL ASSETS	42,829,588.32
FUND BALANCE	10,123,176.46
TOTAL EQUITY	53,592,181.76
TOTAL LIABILITIES & FUND EQUITY	57,262,522.39

MEMORANDUM

TO: Board of Directors

FROM: Robin W. Mitchum, Deputy Director of Finance and Administration

SUBJECT: FY21/22 Proposed Budget Revision

DATE: May 12, 2022

Please find attached the FY21/22 Proposed FY22 Budget Revision for your consideration.

Revenues

A detailed explanation of line-item changes are as follows:

- Fare and contract revenues have been decreased based on average and estimated receipts.
- Contract Service revenues for MUSC have decreased based on average and estimated receipts due to the reduction in ridership.
- Local contributions are funds received from local organizations for shelter construction. These contributions are recorded as incurred.
- Federal revenue includes estimated 5307 Urban funds, 5310 Enhanced Mobility for Seniors & individuals with disabilities, and 5307 CARES Act and ARP Act funds. CARTA receives funds as a direct recipient from FTA and Pass-Through funds from the BCDCOG. Capital funds are reflected in the capital revenues budget. The increase in Federal funding is a reflection of the timing of expenditures and availability of funds.
- State Mass Transit Funds is operating funds as match to 5307 Urban funds. The increase is due to the increase in allocation.
- Sales Tax – Charleston County is the operating funds. The matching requirements for capital are reflected the capital revenues budget line item.
- Insurance proceeds is policy proceeds that are the result of accidents. Insurance is recorded as incurred.
- Sale of Assets is the proceeds from the sale of vehicles. As a result of the purchase of battery electric buses, we anticipate the sale of older rolling stock.

Expenditures

A detailed explanation of line-item changes are as follows:

- Staff Salaries & Benefits is the cost of Retiree Insurance.
- Supplies includes office and facility maintenance supplies. The decrease is due to anticipated timing of rebranding materials and signage.
- Printing is decreased due to the anticipated timing of rebranding materials.
- Marketing has been reduced to zero and the expenditure will be moved to advertising.
- Equipment rental is reduced by removal of the HOP Lot portable toilet rental and the fork list rental. The HOP Lot is closed and CARTA replaced the fork lift.
- Office Equipment Maintenance includes IT services (managed server services, email hosting, website management, and other general IT services), Camera system maintenance, and AVL software maintenance. The decrease moves the Mobile Ticketing Application to the BCDCOG IGA line item under contract services.
- Rent includes the Ashley Phosphate Park & Ride Lot, Dorchester Village Shopping Center Park & Ride Lot, Leeds Avenue lot lease from SCE&G, SC Works Trident lease space, and document storage. The decrease is a result of the average cost of document storage fees.
- Communications is decreased for the average cost of Radio usage with the Charleston Police Radios. CARTA pays a premium per radio to use their frequency.
- Utilities includes electric and water at the Superstop, Melnick Park and Ride, the Radio Shop at Leeds Avenue, and the charging stations at Leeds Avenue. Utilities is decreased for the estimated electricity needed for charging stations for this fiscal year.
- Advertising increased for marketing costs and decreased for anticipated costs related to replace advertising Bus wraps on the new rolling stock fleet as we transition to the new battery electric buses.
- Professional services are being decreased mostly due to the anticipated expenditures related to the Pilot Ride Program.
- Contract Services is increased for Shared IGA services that includes management, administrative, financial, customer service, cash counting, marketing, advertising, maintenance costs, engineering, and professional services. Fixed Route costs are forecasted to increase as a result of increased services, such as changes to Route 10 and Route 32. Security services increased to include the Leeds Avenue parking lot security. Rebranding services have been added and additional Electric Bus Master plan increases have been accounted for in the this increase.
- Vehicle maintenance is increased based on average and estimated expenditures.
- Facility maintenance is increased based on average and estimated expenditures to include gate and door repairs as we upgrade the access control system and security of the facility.
- Insurance is increased as a result of the addition of new shelters, buses, and charging stations.
- Fuel is increased as a result of the increase in services and the cost of fuel.
- Non-Capitalized assets include the purchase of security equipment including cameras, lighting, shelter panels/parts, driver safety barriers, COVID-19 PPE, air filtration systems, and radio equipment. The budget line item is decreased to estimated expenditures.

Capital Expenditures (Balance Sheet)

- Rolling Stock is increase to the amount of rolling stock that we anticipate receiving.
- Bus Facilities/Charging stations is decreased to anticipated expenditures for this fiscal year.
- Bus Shelter Construction/Bench Install is increased for the estimated installation of new bus shelters.
- Land was for the purchase of property for additional parking or service route needs. We do not anticipating acquiring additional land this fiscal year.
- HOP Lot Construction/Leeds Avenue was for the construction of the HOP Lot and upgrades at Leeds Avenue. We do not anticipate this to occur this fiscal year.
- Security Cameras and Equipment is funds available to purchase security equipment at our facilities and on rolling stock.
- Capital (IT, Facility Repairs/Maint) is for the facility upgrades or repairs. It includes the purchase of a replacement Fuel Pump.

We will continue to monitor the budget to ensure revenues and expenditure remain aligned and we will make recommended revisions as necessary.

If you have any questions, please contact me at 843-529-2126 or robinm@bcdcog.com.

CARTA
Proposed FY2022 Budget Revision

	Approved Budget FY 2022	Proposed Revision FY 2022	Variance
Revenues			
Farebox	1,840,925	1,264,265	(576,660)
Passes	473,478	451,134	(22,344)
COC Shuttle	417,104	417,104	-
MUSC	951,364	738,389	(212,975)
City of Charleston - DASH	640,492	640,492	-
Local Contributions	-	77,565	77,565
Federal	11,601,438	12,735,187	1,133,749
State Mass Transit Funds	475,794	563,757	87,963
Sales Tax - Charleston County	6,658,003	7,558,383	900,380
Advertising	700,000	700,000	-
Interest	-	-	-
Insurance Proceeds	-	118,754	118,754
Sale of Asset	10,000	10,000	-
Miscellaneous	-	64	64
TOTAL REVENUES	23,768,598	25,275,094	1,506,496
Expenditures			
Staff Salaries & Benefits	8,334	8,034	(300)
Supplies	151,670	100,000	(51,670)
Printing	37,500	20,000	(17,500)
Marketing	10,000	-	(10,000)
Automotive	1,000	1,000	-
Postage	2,900	2,085	(815)
Dues/Memberships	1,513	1,500	(13)
Office Equipment Rental	107,877	105,687	(2,190)
Office Equipment Maintenance	1,101,938	612,649	(489,289)
Rent	33,800	32,800	(1,000)
Communications	170,561	164,185	(6,376)
Utilities	205,674	180,674	(25,000)
Advertising	58,500	17,500	(41,000)
Professional Services			
Auditing	24,300	24,800	500
Legal	7,500	7,500	-
Custodial	23,220	23,480	260
Pilot Ride Program	40,000	25,000	(15,000)
Other	110,000	110,000	-
Contract Services			
Shared Services - IGA	2,588,887	3,306,116	717,229
Fixed Route	13,690,074	14,067,168	377,094
Money Transport	7,500	7,500	-

CARTA
Proposed FY2022 Budget Revision

	Approved Budget FY 2022	Proposed Revision FY 2022	Variance
Security Services	96,191	198,521	102,330
Rebranding	-	68,520	68,520
Electric Bus Master Plan	87,595	301,164	213,569
Vehicle Maintenance	150,000	170,000	20,000
Facility Repair & Maintenance	14,950	40,812	25,862
Operating Fees & Licenses	25,000	27,500	2,500
Insurance	832,399	998,340	165,941
Fuel	1,065,531	1,751,008	685,477
Paratransit	2,587,469	2,587,469	-
Miscellaneous	5,500	5,500	-
Interest	56,210	56,210	-
Non-Capitalized Assets	465,005	252,372	(212,633)
TOTAL EXPENDITURES	23,768,598	25,275,094	1,506,496
Excess (Deficit) of Revenues Over (Under) Expenditures	-	-	-
Capital Revenues			
Rolling Stock	13,270,970	15,112,124	1,841,154
Bus Facilities/Charging Stations	6,553,574	3,488,425	(3,065,149)
Bus Shelter Construction/Bench Install	-	-	-
Security Cameras/Equipment	80,097	176,225	96,128
Capital (IT, Facility Repairs/Maint)	-	-	-
Park & Ride Construction/Leeds Ave.	2,800,000	-	(2,800,000)
Sales Tax - Charleston County	6,222,247	5,321,867	(900,380)
TOTAL CAPITAL EXPENDITURES	28,926,888	24,098,641	(4,828,247)
Capital Expenditures			
Rolling Stock	17,747,668	19,036,032	1,288,364
Bus Facilities/Charging Stations	8,164,494	4,320,000	(3,844,494)
Bus Shelter Construction/Bench Install	100,000	500,000	400,000
Land	600,000	-	(600,000)
Park & Ride Construction/Leeds Ave.	2,200,000	-	(2,200,000)
Security Cameras/Equipment	97,440	225,323	127,883
Capital (IT, Facility Repairs/Maint)	17,286	17,286	-
TOTAL CAPITAL EXPENDITURES	28,926,888	24,098,641	(4,828,247)

CARTA
Proposed **Detailed Budgeted Expenditures**
FY 2021/2022

		Approved Budget FY 2022	*Proposed* Revision FY 2022	Increase (Decrease)
SALARIES & BENEFITS	Retiree Insurance	8,334	8,034	(300)
		8,334	8,034	(300)
SUPPLIES	Admin/Operations	151,470	100,000	(51,470)
	Supplies - HOP LOT	200	-	(200)
	Total	151,670	100,000	(51,670)
PRINTING	Printing	35,000	20,000	(15,000)
	Printing - HOP LOT	2,500	-	(2,500)
		37,500	20,000	(17,500)
MARKETING	Promotional	10,000	-	(10,000)
	Total	10,000	-	(10,000)
AUTOMOTIVE	Parking/Mileage/Service	1,000	1,000	-
	Total	1,000	1,000	-
POSTAGE		2,900	2,085	(815)
		2,900	2,085	(815)
DUES & MEMBERSHIPS	Metro Chamber	513	500	(13)
	TASC (SCAMI)	1,000	1,000	-
	Total	1,513	1,500	(13)
EQUIPMENT RENTAL	Portable Toilet Rental - HOP LOT	1,320	-	(1,320)
	Electric Bus Battery Lease	105,012	105,012	-
	Miscellaneous Equipment	1,545	675	(870)
	Total	107,877	105,687	(2,190)
OFFICE EQUIPMENT MAINTENANCE	IT	50,000	55,000	5,000
	Money Counting Equipment	2,000	2,000	-
	Super Stop Cameras	2,628	2,628	-
	AVL Cloud Manager	27,135	25,596	(1,539)
	CAD/ITS/AVL	527,425	527,425	-
	Mobile Ticketing Application	492,750	-	(492,750)
		1,101,938	612,649	(489,289)
RENT	Land	6,000	6,000	-
	Park & Ride	19,300	19,300	-
	Document Storage	2,500	1,500	(1,000)
	SC Works Charleston Center	6,000	6,000	-
		33,800	32,800	(1,000)

CARTA
***Proposed* Detailed Budgeted Expenditures**
FY 2021/2022

		Approved Budget FY 2022	*Proposed* Revision FY 2022	Increase (Decrease)
COMMUNICATIONS	Telephone/Internet	38,098	41,722	3,624
	Tablets - Buses	47,463	47,463	-
	Radios	85,000	75,000	(10,000)
	Total	170,561	164,185	(6,376)
UTILITIES	Electricity	12,849	12,849	-
	Electricity -Charging Stations	189,000	164,000	(25,000)
	Water	3,825	3,825	-
		205,674	180,674	(25,000)
ADVERTISING	ALL	5,000	10,000	5,000
	BUS WRAPS	53,500	7,500	(46,000)
		58,500	17,500	(41,000)
PROFESSIONAL SERVICES	Audit	24,300	24,800	500
	Legal	7,500	7,500	-
	Custodial	23,220	23,480	260
	Pilot Ride Program	40,000	25,000	(15,000)
	Other	110,000	110,000	-
		205,020	190,780	(14,240)
CONTRACT SERVICES	Management Services	75,000	75,000	-
	Shared Services (IGA)	2,413,887	2,868,851	454,964
	Parking Lot Expansion (IGA)	-	66,034	66,034
	Shelter/Bench Engineering (IGA)	100,000	100,000	-
	Mt. Pleasant St. Feasibility (IGA)	-	49,000	49,000
	ITS System (IGA)	-	133,731	133,731
	Mobile Ticketing (IGA)	-	13,500	13,500
	Fixed Route - Transdev	13,029,120	13,867,168	838,048
	Hop Lot - Transdev	460,954	-	(460,954)
	Demand Response Unique Trips	200,000	200,000	-
	Money Transport	7,500	7,500	-
	Leeds Ave. Security Services	-	82,455	82,455
	Super Stop Security Services	96,191	116,066	19,875
	Rebranding	-	68,520	68,520
	Electric Bus Master Plan	87,595	301,164	213,569
		16,470,247	17,948,989	1,478,742
VEHICLE MAINTENANCE		150,000	170,000	20,000
		150,000	170,000	20,000
FACILITY REPAIR	Facility Repair Misc	10,000	35,862	25,862

CARTA
***Proposed* Detailed Budgeted Expenditures**
FY 2021/2022

		Approved Budget FY 2022	*Proposed* Revision FY 2022	Increase (Decrease)
& MAINTENANCE	Bus Wash Inspection	4,950	4,950	-
		14,950	40,812	25,862
OPERATING FEES & LICENSES		25,000	27,500	2,500
		25,000	27,500	2,500
INSURANCE	Administration	15,810	16,203	393
	Operating	816,589	982,137	165,548
		832,399	998,340	165,941
FUEL	Fuel	1,042,048	1,751,008	708,960
	Fuel - HOP LOT	23,483	-	(23,483)
		1,065,531	1,751,008	685,477
PARATRANSIT	TRANSDEV	2,587,469	2,587,469	-
		2,587,469	2,587,469	-
MISCELLANEOUS	MISC	5,000	5,500	500
	MISC - HOP LOT	500	-	(500)
		5,500	5,500	-
INTEREST	BB&T - Melnick Property	56,210	56,210	-
		56,210	56,210	-
NON-CAPITALIZED ASSETS	Non-Capitalized Assets	465,005	252,372	(212,633)
		465,005	252,372	(212,633)
TOTAL OPERATING		**23,768,598**	**25,275,094**	**1,506,496**
CAPITAL				
	Rolling Stock/Fleet Repair	17,747,668	19,036,032	1,288,364
	Bus Facilities/Charging Stations	8,164,494	4,320,000	(3,844,494)
	Bus Shelter Construction/Bench	100,000	500,000	400,000
	Land	600,000	-	(600,000)
	HOP Lot Constuction/Leeds Ave.	2,200,000	-	(2,200,000)
	Security/Cameras	97,440	225,323	127,883
	Capital (IT, Facility Repairs/Maint)	17,286	17,286	-
	ITS System	-	-	-
TOTAL CAPITAL		**28,926,888**	**24,098,641**	**(4,828,247)**

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/12/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval – Fixed Route, Paratransit, and Maintenance Operation Services

Charleston Area Regional Transportation Authority (CARTA) is requesting approval to amend the Transdev Services– Fixed Route, Paratransit & Maintenance Services contract # CARTA2016-01 for an additional year pursuant to the renewal terms outlined in the contract.

The contract was awarded on July 1, 2016 as a three (3) year contract with seven (7) options to renew annually. This amendment will extend the contract through June 30, 2023.

	July 1, 2022 - June 30, 2023	July 1, 2022 - June 30, 2023
Hourly Rate - Fixed Route Service	$64.35	$65.93
Hourly Rate - Paratransit Service	$60.13	$61.60

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/12/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval - Building Lease Agreement – 3664 Leeds Ave.

Charleston Area Regional Transportation Authority (CARTA) is requesting approval to amend the Transdev Services– Building Lease Agreement contract for an additional year pursuant to the renewal terms outlined in the contract. This amendment will extend the contract through June 30, 2023.

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/18/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval – Digital Signage

Charleston Area Regional Transportation Authority (CARTA) is requesting approval to amend the GMV Syncromatics Digital Signage contract # CARTA2020-01 for an additional year pursuant to the renewal terms outlined in the contract.

The contract was awarded on June 5, 2020 as a two (2) year contract with three (3) options to renew annually. This amendment will extend the contract through June 4, 2023.

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/18/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval – Post Mounted Solar Lighting

Charleston Area Regional Transportation Authority (CARTA) is requesting approval to amend the Urban Solar Post Mounted Solar lighting contract # CARTA2020-04 for an additional year pursuant to the renewal terms outlined in the contract.

The contract was awarded on June 24, 2020 as a two (2) year contract with three (3) options to renew annually. This amendment will extend the contract through June 23, 2023.

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/18/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval – Electric Bus Master Plan

Charleston Area Regional Transportation Authority (CARTA) is requesting approval of the Electric Bus Master Plan and Roadmap. This document was prepared by Stantec Consulting Services Inc.

The files can be downloaded at:
https://www.bcdcog.com/wp-content/uploads/2022/05/CARTA-Electric-Bus-Master-Plan_Final-Draft_5.25.22.pdf
https://www.bcdcog.com/wp-content/uploads/2022/05/CARTA_Electric-Bus-Master-Plan_Existing-Conditions_Final-Draft_5.25.22.pdf

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/18/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval – Overhead Charging Station Design

Charleston Area Regional Transportation Authority (CARTA) is requesting approval to amend the Stantec Consulting Services Electric Bus Master Plan contract # CARTA2020-06 for development of an Overhead Charging Station Design and Construction Plans.

The cost shall not exceed $77,300.

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: 5/18/2022
To: CARTA Board of Directors
From: Ronald E. Mitchum, Executive Director
Subject: Request for Approval – Overhead Charging Station Design

Charleston Area Regional Transportation Authority (CARTA) is requesting approval to amend the Proterra Operating Company Electric Bus Charging Infrastructure contract # CARTA2021-01 for the addition of ten (10) make-ready charging stalls for future expansion.

The cost shall not exceed $130,490.63

DESCRIPTION OF CHANGE	DECREASE	INCREASE
1. Provide (10) Future Charging Stalls		$ 125,271.00
2. Project oversight and related administration.		$ 5,219.63
Total Cost of Change	$ -	$ 130,490.63

Reason For Change:

- This change is at the request of CARTA during the design phase to provide (10) make ready EV charing stalls.

Added Scope includes:
- Trenching
- Conduit
- Concrete
- Labor

RESOLUTION BY BOARD OF DIRECTORS TO APPLY FOR FUNDING

The Board of Directors of the Charleston Area Regional Transportation Authority (CARTA) is aware of the provisions of Federal Transit Administration (FTA) program fund requirements for each application it makes to the state of South Carolina for Federal and/or State funding and hereby authorizes Ronald E. Mitchum of CARTA to file applications with the South Carolina Department of Transportation (SCDOT) on behalf of CARTA for federal and/or state funding to assist in providing community and/or human services transportation services. If this application is approved:

(1) The Board resolves that CARTA will provide the required match for the capital, operations and administrative charges, the necessary insurance coverage as required under the agreement, and all necessary local match for operating losses; and

(2) The Board agrees to comply with all FTA and SCDOT Program statutes and regulations, directives, certifications and assurances to carry out the project as described in the application.

APPROVED AND ADOPTED

This 25th day of May, 2022.

_____	_____
Signature of Attesting Witness	***Signature of Chairperson***
_____	_____
Printed Name of Attesting Witness	***Printed Name of Chairperson***

Charleston Area Regional Transportation Authority

CLIMATE ACTION PLAN

May 2022

CARTA

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1 INTRODUCTION

PURPOSE

This Climate Action Plan sets the stage for the Charleston Area Regional Transportation Authority (CARTA) to electrify its transit fleet by 2045 and to reach net zero emissions agencywide by 2050. This Plan guides development of a policy framework and a fully integrated strategic plan in order achieve these two goals. It will be used to direct planning, programing and operating activities undertaken by CARTA to support a cleaner, healthier and more environmentally-sustainable transit system.

HISTORY

In 2018, CARTA passed a resolution to convert its entire fixed-route fleet to battery-electric buses. See Appendix 8.1: CARTA Resolution for more information. This Plan builds on the resolution by establishing a 2045 target year to complete the fleet transition; in addition, it expands CARTA's climate goal to include all vehicles and facilities agencywide.

CONTENTS

Components of the plan include an overview of the transit system and activities it has taken to-date to reduce its greenhouse gas emissions. Using a baseline year of 2018, this plan presents a baseline inventory of the agency's transit fleet emissions. This is followed by a policy statement to guide the next steps for developing a strategic action plan to support this policy.

Figure 1: CARTA Climate Action Plan Timeline

2 AGENCY OVERVIEW

ADMINISTRATION

CARTA's mission is to deliver high-quality, affordable transit service that efficiently links people to employment, education opportunities, and healthcare in the Charleston-North Charleston urbanized area. An 18-member board governs the agency, with members representing the following jurisdictions:

- Charleston County
- City of Charleston
- City of North Charleston
- City of Hanahan
- City of Isle of Palms
- Town of Kiawah Island
- Town of Mt. Pleasant,
- Town of Sullivan's Island.

Although CARTA has its own board, in July 2015, the Berkeley-Charleston-Dorchester Council of Governments (BCDCOG) and CARTA executed an agreement where BCDCOG provides management and supportive services for CARTA. BCDCOG's Executive Director provides management services to CARTA and makes all decisions related to personnel, budget, contracts, and any other needs as they arise.

Other supportive services provided by BCDCOG staff include accounting and financial management (budget analysis/preparation and grant compliance), transit planning services (developing, evaluating, and planning routes) and CARTA Board support services (preparing, scheduling, and hosting Board meetings and various committee meetings).

Further, CARA outsources the provision of fixed route and paratransit service, legal functions, public relations, maintenance oversight, facility maintenance functions and engineering services. CARTA is responsible for all contract administration duties related to the outsourced services and functions, and the contractor for paratransit and fixed-route services use a CARTA-owned operations and maintenance facility.

SERVICE AREA

CARTA provides fixed route transit service to the urbanized area of Charleston-North Charleston, SC, primarily in Charleston County. The population in CARTA's service area has grown rapidly over the last 10 years. According to the most recent 2019 estimates from the U.S. Census Bureau, approximately 628,000 people live in the Charleston-North Charleston urbanized area, a 35% increase from 2010.

The population within the urbanized area is expected to continue to grow, in large part due to the area's thriving student population, flourishing economic base, and growing retiree population. Educational institutions like the Medical University of South Carolina (MUSC), College of Charleston, the Citadel, Charleston Southern

University, and Trident Technical College anchor the area's economy.

In addition to students, a growing retiree population has been drawn to the area in part because the Charleston peninsula serves as a vital healthcare hub within the region and the state. The downtown Charleston medical district is home to MUSC, the Ralph H. Johnson Department of Veterans Affairs Medical Center, and Roper Hospital.

The area's economy is further rounded out by a strong port and manufacturing base, several IT headquarters, the presence of multiple military installations, and a tourism industry built around the area's cultural, historical, natural, and recreational resources.

CARTA SERVICES

To keep the urban area moving, CARTA operates South Carolina's largest public transportation provider, serving more than 11,000 passengers on a typical weekday and more than 3 million passengers per year. As shown in **Appendix 8.2: CARTA System Map**, CARTA services include a combination of express airport and commuter routes, free circulator routes, and fixed routes.

The agency operates an express shuttle between downtown Charleston and the Charleston International Airport, along with three express commuter routes during peak hours for workers traveling from park-and-ride lots to employment centers in downtown Charleston. Once on the peninsula, the free Downtown Area Shuttle (DASH) and Hospitality on Peninsula (HOP) circulators transport workers, students, tourists, and residents around downtown Charleston.

In addition, CARTA operates 18 fixed routes serving the municipalities of Charleston, North Charleston, James Island, and Mount Pleasant in Charleston County. Almost all of these routes connect to one of two transfer centers located in the cities of Charleston and North Charleston.

CARTA FACILITIES

To support its services, CARTA serves two major transfer centers that represent the most active bus stops in the entire system:

- Charleston Visitor Reception & Transportation Center (375 Meeting Street) in downtown Charleston
- The CARTA SuperStop (3376 Rivers Avenue) in North Charleston

CARTA owns the SuperStop facility, and current operations at the facility exceed its capacity. The SuperStop currently serves eight (8) routes, with 15 buses using the facility's two (2) bus bays every hour. The facility provides a small waiting area for passengers and restrooms for CARTA drivers.

In order to expand capacity, a new bus terminal near the SuperStop is under design and slated to include 10 bus bays designed in a sawtooth manner. Early concepts include dynamic assignments for bus routes to allow the bays to facilitate transfers and overhead battery-electric bus charging.

CARTA's 7.2-acre maintenance facility is located in North Charleston (3664 Leeds Avenue). CARTA leases an additional 0.8-acre portion of the adjacent parcel at 3680 Leeds Avenue from SCE&G / Dominion Energy for additional parking space. In addition to vehicle service, fueling (including a plug-in depot for battery-electric bus charging), and fleet parking, the facility provides offices for administrative staff and employee parking.

In 2019, BCDCOG complete a Park-&-Ride Study to identify opportunities for expanding the number of park-and-ride lots in Berkeley, Charleston, and Dorchester counties. Currently, CARTA owns two Park-&-Ride lots:

- North Charleston Rivers Avenue Park&-Ride lot (2150 Melnick Drive) with 200+ parking spaces
- A new Hospitality on Peninsula (HOP) lot under development in downtown Charleston

Six other park-and-ride lots throughout the service area exist through agreements with businesses. There are currently no fees for using these lots.

CARTA FLEET

To provide this wide-range of services, CARTA operates a mixed fleet of vehicles. CARTA's fleet includes four (4) cutaways for paratransit services, 20 vans/SUVs for paratransit services, sixteen (16) 30' buses for DASH/HOP/Airport service, thirty-six (36) 35' buses for fixed route local services, eight (8) 40 ft buses for fixed route and twenty-two (22) 40' commuter style buses. On the historic peninsula, a fleet of smaller 30-foot buses are used to navigate the narrow streets, while 40-foot commuter coaches are used on the express routes. The fixed-route services include line-haul routes, which operate 35- and 40-foot buses, and neighborhood circulators that use smaller 20- and 25-foot cutaway vehicles. CARTA's Tel-A-Ride service operates a fleet of smaller vans and cutaways used to provide complementary paratransit.

CARTA FUNDING

CARTA's operation budget for Fiscal Year (FY) 2021 was $23.4 million, and its capital budget was $20.3 million (including vehicles). These budgets are funded by a combination of federal and local sources. CARTA typically receives about $600,000 in state funds for operations, and federal funds make up approximately 30% of CARTA's operating budget.

A large portion of CARTA's funding comes from local sources. The primary source of local funds is provided from two half-cent sales tax programs from Charleston County. First in November 2004, Charleston County voters approved a half-cent Transportation Sales Tax on purchases over a 25-year period, or until $1.3 billion was collected. Charleston County allocates 18% of the revenues to CARTA and Tri-County Link, the rural service provider, to provide mass transit to the urban and rural areas of Charleston County. CARTA's share of the sales tax revenue is not restricted to specific categories and does not have limits on how the funds can be expended. A second Transportation Sales Tax program was approved by Charleston County voters by referendum in November 2016, providing additional transit funds over a

25-year period or until $2.1 billion was collected. The collection periods for the two programs overlap, and 29% of the second Transportation Sales Tax are dedicated to transit.

FLEET MODERNIZATION PROJECT

In 2014, CARTA identified a need for a large capital effort to replace its aging rolling stock as part of its **Fleet Modernization Project** to bring the agency's fleet to a state of good repair. To accomplish this, CARTA has decided to gradually transition to a battery-electric bus (BEB) fleet as part of this project. CARTA received its first BEB in 2019 and had six BEBs in operation by 2021. Twenty-seven more are scheduled for delivery by the end of 2022. Currently, the buses are powered with plug-in depot charging; however, the buses are programmed to include overhead on-route charging.

Funding for CARTA's Fleet Modernization Project has come from a range of local, state, and federal sources. CARTA has used both competitive and programmed funding, such as the South Carolina Volkswagen Settlement funds, Diesel Emissions Reduction Act (DERA) funds, FTA 5339 Program Funds (Bus and Bus Facilities and FTA Lo-No Program, and Annual Allocations), and state capital funds. For more information on the Fleet Modernization Project, see **Appendix 8.3: ZEB Transition Plan**.

In addition, the region is planning its first bus rapid transit (BRT) line, called Lowcountry Rapid Transit (LCRT). The intention is to operate LCRT entirely with 60' BEBs.

3 EMISSIONS INVENTORY

Table 1 presents the baseline emissions inventory for CARTA's fixed-route, diesel transit buses using a baseline year of 2018, which is consistent with the fleet emissions when CARTA resolved to transition its fleet to battery-electric buses. This also represents peak service levels prior to the 2020 COVID-19 Pandemic. In total 74 diesel vehicles emitted 36 short tons of Nitrous Oxides (NOx), less than 1 short ton of fine grain particulate matter ($PM_{2.5}$), 2 short tons of Hydrocarbons(HC), over 12 short tons of Carbon Monoxide (CO),and over 5,100 short tons of Carbon Dioxide (CO_2).

Table 1: 2018 CARTA Diesel Fleet Annual Emissions (Source: USEPA Diesel Emissions Quantifier 5/10/2022)

Number of Diesel Transit Buses in Service	**Model Year**	**Average Vehicle Miles Traveled (VMT)/ Vehicle/Year**	**Annual Baseline of Diesel Vehicles**				
			NOx, short tons	PM2.5, short tons	HC, short tons	CO, short tons	CO2, short tons
18	1994	19286	12.80050552	0.307748337	0.716210249	3.931978793	1241.5275
5	2003	31267	1.944320495	0.065594126	0.175102313	0.715414423	344.86875
3	2015	46139	0.370774261	0.000479207	0.007066084	0.279407856	206.92125
3	2014	22145	0.143894167	0.001236877	0.004286756	0.056841425	206.92125
7	2016	27826	0.341376151	0.003346423	0.007571042	0.153298521	482.81625
22	1996	19286	15.64506607	0.268669148	0.875367774	4.805757532	1517.4225
11	2010	59932	3.541772289	0.004117465	0.185101627	1.68506626	758.71125
5	2012	67491	1.357940356	0.001917661	0.042262738	1.065699807	344.86875
74			**36.14564931**	**0.653109243**	**2.012968582**	**12.69346462**	**5104.05750**

Future updates to this plan will incorporate the baseline for CARTA's gasoline fleet (paratransit, cutaways, and staff vehicles), facility operations, displaced emissions, and equity measures as data sources and availability are refined.

4 PAST AND CURRENT INITIATIVES

Following completion of a Comprehensive Operational Analysis (COA) and a five-year strategic plan in 2014, CARTA identified a $43 million fleet replacement need.

CARTA completed a full replacement of its DASH and Commuter fleets with diesel vehicles because reliable electric coach style buses and smaller shuttles were not available at the time for these specialized services. Although the Commuter and DASH fleets were replaced with diesel vehicles, it is expected that battery-electric or other zero emissions technology will be available for these specialized vehicles on the next replacement cycle starting in 2028.

In 2019, CARTA passed a resolution to convert its entire fixed-route fleet to battery-electric buses (see **Appendix 8.1: CARTA Resolution**). To further this goal, CARTA completed the agency's first **Zero Emissions Bus Transition Plan** in 2022 to support the agency's new and growing battery electric bus fleet. For CARTA's fixed-route fleet, which is comprised of 35- and 40-foot heavy-duty buses, CARTA purchased and received or is waiting to receive 33 BEBs, as shown in Table 2. Since adoption of the resolution, CARTA has replaced over 30 percent of its fixed-route fleet with battery-electric buses.

Table 2: Summary of CARTA's current BEB Fleet

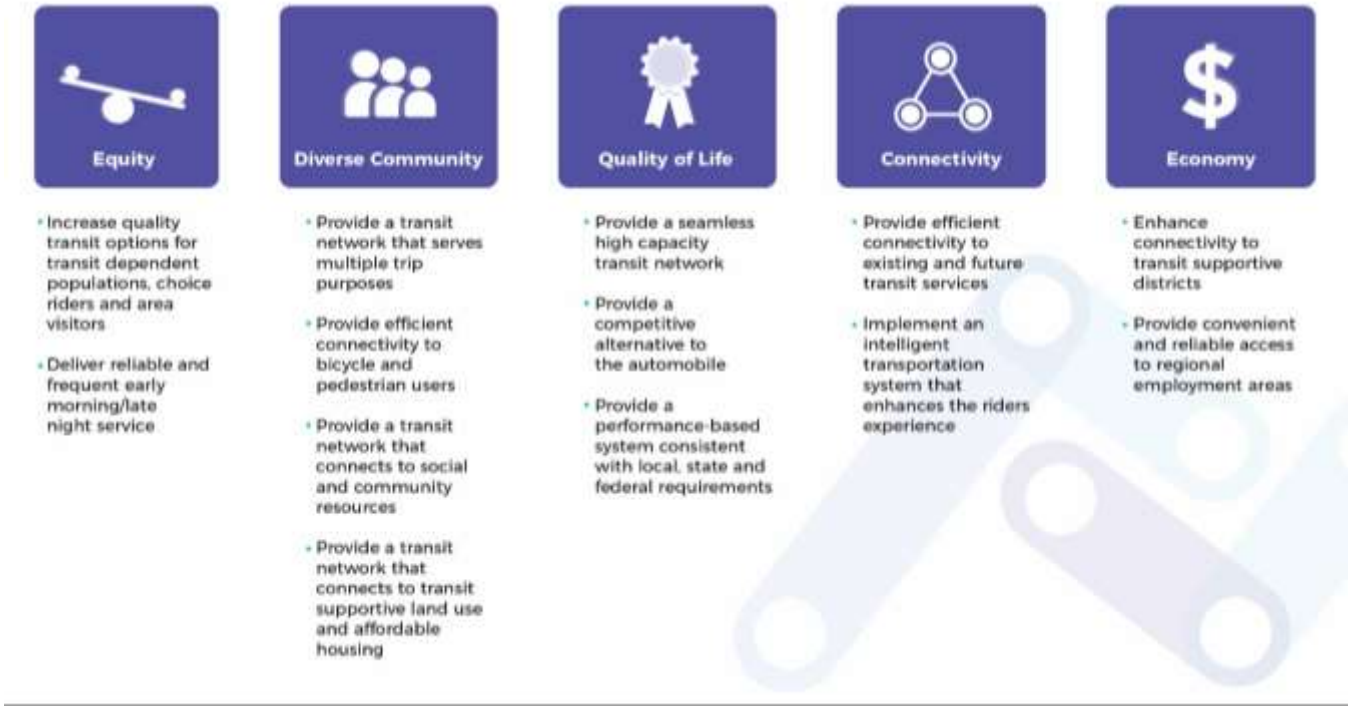
Bus type	Battery pack size	Bus length	Quantity	Schedule
Proterra E2 Catalyst	440 kWh	40'	3	In service since December 2019
Proterra ZX5	440 kWh	40'	3	In service since March 2021
New Flyer Xcelsior Charge	466 kWh	40'	7	In service since November 2021
Proterra ZX5	440 kWh	35'	20	Pending revenue service in July 2022
Total			**33**	

CARTA is currently updating and expanding its **maintenance facility** to support plug-in depot charging for its electric fleet, and the agency is programming its first on-route fast-charger to be added to the system. As part of a new transit center in North Charleston, currently in final design, CARTA will have the capacity to add four (4) more on-route fast chargers to support the battery electric bus fleet.

CARTA has also implemented **solar lighting** at shelters and transit stops throughout the system.

In 2018, BCDCOG in partnership with CARTA, developed a ***Regional Transit Framework Plan*** that identified a 20-year vision for transit in the region. This vision included a service area expansion and new services, such as a network of Bus Rapid Transit lines. **Figure 2Error! Reference source not found.** shows the objectives from the *Framework*.

Figure 2: Regional Transit Framework Plan Objectives



LOWCOUNTRY RAPID TRANSIT

Lowcountry Rapid Transit (LCRT) is a planned 21.5-mile bus rapid transit line that connects Charleston and North Charleston with fast, reliable, and modern bus service. The service includes over 11 miles of dedicated bus lanes, transit signal prioritization, and 60-foot BEBs. The project is currently transitioning to the engineering phase of the **Capital Investment Grant Program** as a New Starts Project. LCRT is scheduled to open in 2028, and although BCDCOG is the project sponsor, CARTA will operate, own, and maintain the transit buses and facilities.

In 2022, BCDCOG completed the first of several phases of a ***Transit-oriented Development Study*** to support land use policy, infrastructure investment, and corridor wide strategies for land use and transit at the regional level.

Rendering of a planned Lowcountry Rapid Transit Station

LONG RANGE TRANSPORTATION PLAN

The region's Metropolitan Planning Organization, **CHATS**, is currently updating its *Long-range Transportation Plan*, and CARTA is working closely with the long-range planning team to develop performance measures and initiatives to support its regional goals. As part of the update, climate change and resiliency will be integrated into the long-range plan.

MUNICIPAL CLIMATE ACTION PLANS

CARTA works closely with its regional partners, including local jurisdictions. The **City of Charleston** adopted a Climate Action Plan in May 2021, which identified several strategies that support CARTA's goals to increase the use of public transportation and increasing commuter options. The City's development ordinance requires new development to construct transit infrastructure and to coordinate with CARTA to support this goal.

Together, these past and current initiatives will support the mode shift from single-occupancy vehicles to transit and the reduction of greenhouse gas emissions.

This *Plan* sets the framework to ensure that the implementation of these connected initiatives support the CARTA's zero emissions goal.

5 EMISSIONS REDUCTIONS GOALS AND TARGETS

This plan identifies two primary goals and targets for CARTA:

Goal 1: Transition to a Fully Electric Transit Fleet by 2045: As of Summer 2022, over 30% of CARTA's transit fleet consists of zero-emissions BEBs. This Plan sets a target to transition CARTA's fixed-route, commuter, Downtown Area Shuttles, and Tel-A-Ride fleets, as well as any future fleets, such as Bus Rapid Transit or CARTA On Demand fleets to BEBs or other Zero-Emission Buses (ZEBs) and vehicles by 2045.

Goal 2: Achieve Net Zero Emissions Agencywide by 2050: In addition to its transit fleet, CARTA has the opportunity to achieve net zero emissions at its facilities by 2050. This is consistent with the current energy provider's goal to achieve net zero emissions by 2050.

6 STRATEGIES AND ACTIONS

To achieve a zero emissions fleet by 2045 and net zero emissions agency-wide by 2050, there are several near-term steps that CARTA must take. The strategies and actions identified in this Plan are designed to develop the tools that CARTA will need to reach these goals. It is anticipated that as data and resources become available, the agency will continue to refine these metrics to reach all facets of the organization from procurement to construction, employee habits, waste management, recycling and other activities. Recommended near-term policy and planning strategies are outlined below.

STRATEGY	ACTION	METRIC	TIMEFRAME
1. ELECTRIFY BUS FLEET	• Adopt a ZEB Transition Plan and continue to expand as new fleet types become available • Incorporate the ZEB Transition Plan recommendations into 2045 LRTP • Develop North Charleston Transit Center with on-route charging capacity	• ZEB performance measures in LRTP • Number and percent of BEBs in fleet • Reduction in deadhead hours (for Charging) • Number of on route chargers	December 2023
2. DEVELOP PLAN TO ACHIVE NET ZERO EMISSIONS AGENCYWIDE BY 2050	• Work with partners to refine agency-wide emissions baseline and performance measures • Develop a Strategic Implementation Plan for Resiliency and Climate Action as part of systemwide COA/LCRT route review	• Agency-wide emissions baseline developed • Plan developed/ adopted	December 2024

STRATEGY	ACTION	METRIC	TIMEFRAME
3. INCREASE RIDERSHIP AND MODE SHIFT TO TRANSIT	• Implement recommendations from the Regional Transit Framework and other studies • Continue to develop park-and-ride facilities • Continue to coordinate with the Transit Oriented Development (TOD) Study team and local municipalities to encourage transit-oriented land use policy and transit design guidelines as part of new development • Continue to conduct outreach to community members and stakeholders to support transit initiatives	• Transit Ridership • Service area coverage • Mode share • New TOD ordinances/policies • Transit design guidelines/ordinances • Count of transit infrastructure improvements (park-and-rides, shelters, guideways, etc.)	Annually
4. CONTRIBUTE TO THE QUALITY OF LIFE, HEALTH AND RESILIENCY OF THE COMMUNITY CARTA SERVES	• Prioritize transit initiatives that support equitable development of services and facilities • Continue to implement solar lighting and renewable energy features to transit stops and facilities	• Percent of disadvantaged communities benefiting from transit investments • Title VI analysis with no adverse impacts • Number of solar powered lights	At start of planning and throughout project lifecycle

7 IMPLEMENTATION AND MONITORING

This Plan is a critical step for CARTA to realize its goal to fully electrify its transit fleet by 2045 and achieve net zero emissions by 2050. Working in partnership with BCDCOG and other stakeholders, CARTA will monitor the performance of this Plan and report annually on progress.

There are several challenges that CARTA must overcome to monitor progress. The first is developing and maintaining reliable data. Several tools and methodologies are available for calculating and measuring agency emissions. While this plan used one method to measure fleet emissions, it will be important for CARTA to develop performance measures that use reliable and consistent data sources. CARTA will work with BCDCOG and other partners with expertise, such as the State of SC Energy Office, to refine its methodology.

CARTA planning staff will work to ensure that future planning initiatives incorporate these targets and goals to ensure that implementation of this plan is consistent throughout the agency. As battery technology and electric fleet types expand, CARTA will need to continue to monitor and update this plan as well as its ZEB Transition Plan to ensure that technology assumptions, fleet replacement plans, and funding are consistent with the current state of practice. Additionally, the agency will continue to seek out grant funding and programs to support the development of this Plan and other zero emissions programs.

CARTA Solar-powered bus stop light

8 APPENDICES

8.1 CARTA RESOLUTION

RESOLUTION

RESOLUTION OF THE BOARD OF DIRECTORS OF THE CHARLESTON AREA REGIONAL TRANSPORTATION AUTHORITY (CARTA) AUTHORIZING THE FILING OF GRANT APPLICATIONS AND TO LEVERAGE LOCAL, STATE, AND FEDERAL TRANSIT FUNDS TO REPLACE ITS FIXED ROUTE FLEET OF MODEL YEAR 1996 DIESEL BUSES WITH ALL-ELECTRIC BUSES.

WHEREAS, CARTA has a need to replace its fixed route fleet of model year 1996 diesel buses that have exceeded their useful life of ten (10) years, and

WHEREAS, a typical diesel bus emits more than 300,000 lbs. of greenhouse gases annually, and particulate matter from diesel engines can contain numerous harmful gases and cancer-causing substances; and

WHEREAS, all-electric transit buses produce zero tailpipe emissions and can have a lower operating cost than diesel buses; and

WHEREAS, Proterra is a leader in the design and manufacture of zero-emission, all-electric, heavy duty transit buses with a manufacturing facility in Greenville, South Carolina; and

WHEREAS, certain discretionary grant programs allow transit agencies to partner with vehicle manufacturers to replace diesel buses with all-electric buses;

NOW, THEREFORE, BE IT RESOLVED, That CARTA will leverage transit revenues from the Charleston County half-cent sales tax, state and federal program funds to replace its fixed route fleet of model year 1996 diesel buses with twenty (20) all-electric buses; and

BE IT FURTHER RESOLVED, that CARTA will apply for discretionary grant funds including the Low or No Emission Vehicle Grant Program, VW Settlement Funds and other discretionary grant programs to replace the diesel fleet with all-electric buses; and

BE IT FURTHER RESOLVED, That CARTA will partner with Proterra on its application for the 2018 Low or No Emission Vehicle Grant Program.

Mike Seekings, Chairman

Certified true and correct copy of a resolution adopted by CARTA on May 16, 2018.

Ronald E. Mitchum

Executive Director
Title

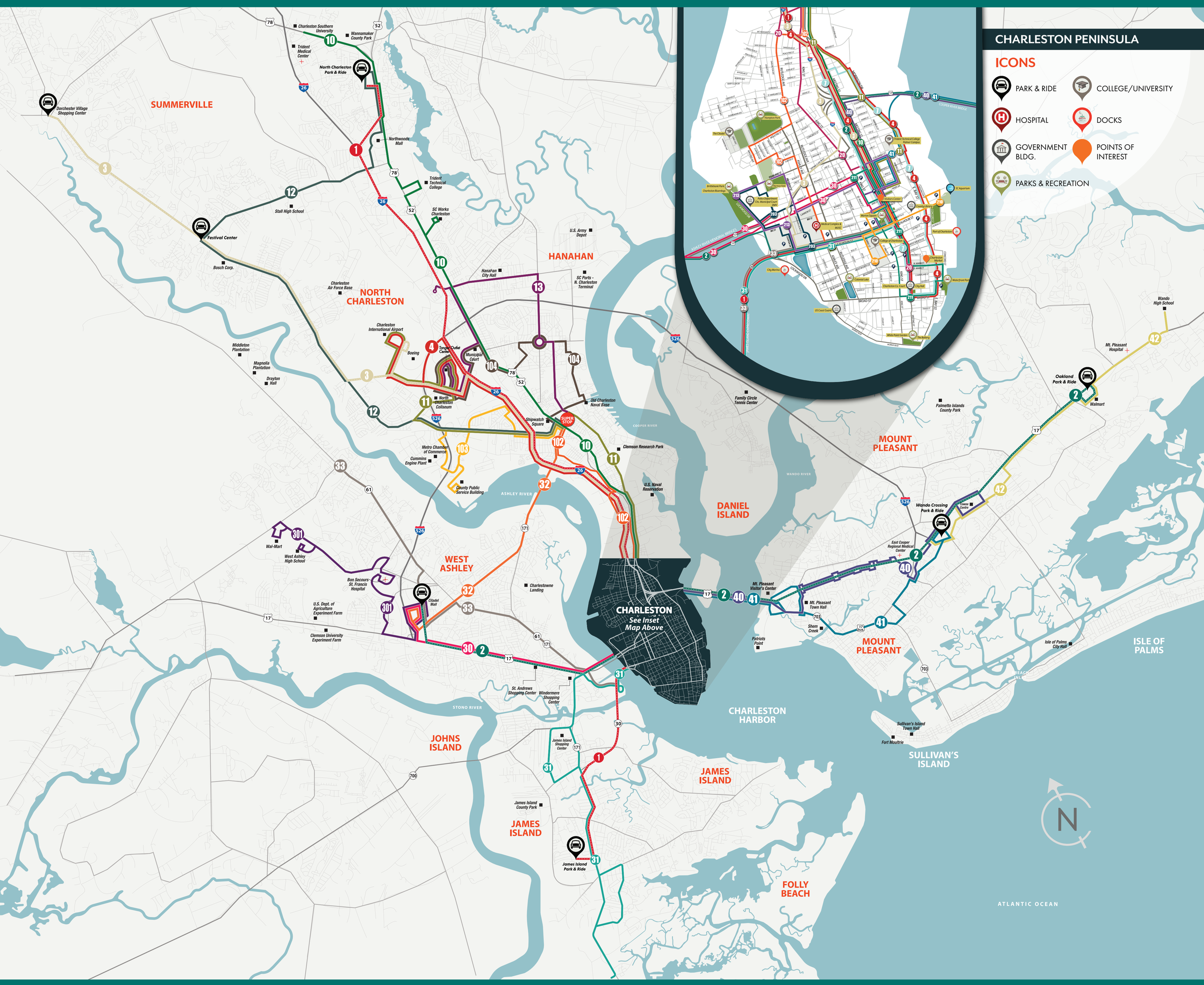
8.2 CARTA System Map

Text (Call) for Next CARTA Bus: 843.202.4410 or

Download the transit app and get route information and real time tracking on your phone!

ROUTES

- 1 2 3 EXPRESS (ROUTES 1/2/3)
- 4 AIRPORT EXPRESS (ROUTE 4)
- 7 HOP SHUTTLE (ROUTE 7)
- 10 RIVERS AVENUE (ROUTE 10)
- 11 DORCHESTER/AIRPORT (ROUTE 11)
- 12 UPPER DORCHESTER/ASHLEY PHOSPHATE (ROUTE 12)
- 13 REMOUNT ROAD (ROUTE 13)
- 20 KING STREET (ROUTE 20)
- 30 SAVANNAH HIGHWAY (ROUTE 30)
- 31 FOLLY ROAD (ROUTE 31)
- 32 NORTHBRIDGE (ROUTE 32)
- 33 ST ANDREWS/ASHLEY RIVER ROAD (ROUTE 33)
- 40 MT PLEASANT (ROUTE 40)
- 41 COLEMAN BOULEVARD (ROUTE 41)
- 42 WANDO CIRCULATOR (ROUTE 42)
- 102 NORTH NECK/RUTLEDGE (ROUTE 102)
- 103 LEEDS AVENUE (ROUTE 103)
- 104 MONTAGUE AVENUE (ROUTE 104)
- 203 MEDICAL SHUTTLE (ROUTE 203)
- 210 211 213 DASH (ROUTE 210/211/213)
- 301 GLENN McCONNELL CIRCULATOR (ROUTE 301)



CHARLESTON PENINSULA

ICONS

- PARK & RIDE
- HOSPITAL
- GOVERNMENT BLDG.
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- COLLEGE/UNIVERSITY
- DOCKS
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3664 Leeds Avenue
N. Charleston, SC 29405
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A Berkeley-Charleston-Dorchester Council of Governments Program

FTA Zero-Emission Fleet Transition Plan

Charleston Area Regional Transportation Authority

May 13, 2022

Prepared for:

Charleston Area Regional Transportation Authority

Prepared by:

Stantec Consulting Services Inc.

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INTRODUCTION AND BACKGROUND

The Charleston Area Regional Transportation Authority (CARTA) provides public transportation services to the residents and visitors of Charleston County via a combination of local routes, express routes, and Downtown Area Shuttle (DASH) routes, as well as demand-response paratransit service.

CARTA recently developed a battery-electric bus (BEB) Master Plan that provides a strategic roadmap for CARTA's deployment of BEBs over the next approximately20 years. To comply with the Federal Transit Administration's (FTA) requirements for Low-No Emission Vehicle Program and Bus and Bus Facility Grant Applications, CARTA has also developed an FTA-compliant Zero Emission (ZE) Transition Plan. This document—the ZE Transition Plan—leverages analysis, information, and strategies more fully described in the Battery Electric Bus Master Plan and Roadmap (BEB Master Plan), which is included as an Appendix A. FTA reviewers are encouraged to review the full plan for further context.

The FTA ZE Transition Plan in this document responds directly to the six elements as required through the Dear Colleague letter and the Notice of Funding Opportunity for the Low-No Emission competitive program:

1. Demonstrate a long-term fleet management plan with a strategy for how the applicant intends to use the current request for resources and future acquisitions;

2. Address the availability of current and future resources to meet costs for the transition and implementation;

3. Consider policy and legislation impacting relevant technologies;

4. Include an evaluation of existing and future facilities and their relationship to the technology transition;

5. Describe the partnership of the applicant with the utility or alternative fuel provider; and

6. Examine the impact of the transition on the applicant's current workforce by identifying skill gaps, training needs, and retraining needs of the existing workers of the applicant to operate and maintain zero emission vehicles and related infrastructure and avoid the displacement of the existing workforce.

In 2014, CARTA identified a need for a large capital effort to replace its aging rolling stock, and as part of its "Fleet Modernization Project", decided to gradually transition to a BEB fleet. CARTA received its first BEB in 2019, and currently operates six BEBs in revenue service, with twenty-seven (27) more scheduled for delivery by the end of 2021 or early 2022. In addition, the region is planning its first bus rapid transit (BRT) line, called Lowcountry Rapid Transit (LCRT), to operate entirely with BEBs. CARTA is also relocating a major bus transfer hub—the N. Charleston SuperStop on Rivers Avenue --to Shipwatch Square which will include the necessary infrastructure for on-route charging for the BEBs (as well as other passenger amenities and community facilities); this on-route charging location was analyzed as part of the BEB Master Plan. Taken together, CARTA and the Charleston region have demonstrated a long-term commitment to cleaner air and more sustainable public transportation options.

Table 1 provides an overview of CARTA's current BEB fleet and its pending deployments.

Table 1: Summary of CARTA's current BEB fleet

Bus type	Battery pack size	Bus length	Quantity	Schedule
Proterra E2 Catalyst	440 kWh	40'	3	In service since December 2019
Proterra ZX5	440 kWh	40'	3	In service since March 2021
New Flyer Xcelsior CHARGE	466 kWh	40'	7	In service since November 2021
Proterra ZX5	440 kWh	35'	20	Pending revenue service in July 2022

CARTA recently developed the BEB Master Plan that provides a roadmap for the acquisition and deployment of transit buses to achieve a goal of 100% zero-emission operations by 2045, starting with all fixed routes converted by 2040. This ambitious goal will help CARTA provide pollution-free public transportation, benefitting not only bus riders and operators, but the broader community too.

The BEB Master Plan provides much of the inputs for this FTA ZE Transition Plan, as required for Low-No Emission Vehicle Program and Bus and Bus Facility Grant Applications. As previously referenced, the full document is provided as Appendix A. The CARTA region's commitment to a greener transit future is evidenced by this BEB Master Plan which outlines the strategy for transition to zero-emission operations for CARTA's fixed-route services; CARTA will explore paratransit zero-emission vehicle conversion in more detail as zero-emission alternatives become more widely available with the goal to complete the complete zero-emission transition by 2045. As part of this commitment, CARTA plans to also implement zero-emission vehicles for its BRT service upon opening in 2028.[1]

[1] https://lowcountryrapidtransit.com/

CARTA's Current BEB Fleet

1 ELEMENT 1: LONG-TERM FLEET PLAN AND APPLICATION REQUEST

This element demonstrates a long-term fleet plan for the transition of fixed-routes services to 100% zero-emissions.

For the convenience of FTA reviewers, the long-term fleet replacement plan is provided in Table 2 and Figure 1 of this document; further information is provided in Appendix A. Additionally, **Error! Reference source not found.** provides details regarding the phasing of the charging infrastructure at the CARTA Maintenance Facility required to support operations of the BEBs as presented in the phasing plan. More detail can be found in the BEB Master Plan.

Based on the modeling results presented in the BEB Master Plan, in order to transition the fleet to a fully battery-electric fleet, charge "on-route" is required. On-route charging means either charging while in service operating with passengers, or during layovers.

CARTA has made the decision to relocate and redevelop their "SuperStop" (a major transfer center where seven bus routes converge) to Shipwatch Square from the intersection of Rivers Avenue and Cosgrove Avenue in North Charleston. The grant application is to complete the Shipwatch Square Transit Center including installing two of the overhead charging units required for the BEB transition.

As part of the BEB planning effort, Stantec examined the impacts that the relocation of Shipwatch Square will have on:

- Bus operations and service planning for seven CARTA routes that currently terminate at the SuperStop
- Considerations for on-route charging infrastructure and bus operations at the new Shipwatch Square

The Stantec project team examined each trip for each vehicle block of each route passing through the SuperStop that would be relocated to Shipwatch Square and then assessed the necessary charging time that would be needed during each layover for each cycle (a cycle consists of an inbound trip, inbound layover, an outbound trip, and an outbound layover). The analysis determined that only minimal adjustments to current layover scheduling of certain trips are needed to accommodate layover charging at Shipwatch Square. Furthermore, the detailed charging assessment showed that a total of four fast-charging stations, each with a pantograph arm, will be required at Shipwatch Square to support the full transition of the fixed-route fleet. Stantec also conducted a Title VI analysis. The outcome of that analysis related to minority and low income populations was that because the routing changes do not constitute a major service change and because the routing to Shipwatch Square will improve rider transfers and customer experience, there is no negative disproportionate burden due of the proposed changes.

Table 2: Fleet replacement schedule by year and by vehicle type.

FLEET FORECAST			2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Gasoline/Diesel 22-ft	New						10	1												
	Expansion																			
	Retire						(10)	(1)						(10)	(1)	-	-	-	-	-
Total 22-ft Diesel			11	11	11	11	11	11	11	11	11	11	11	1	-	-	-	-	-	-
ZEB 22-ft	New													10	1	-	-	-	-	-
	Expansion																			
	Retire													-	-	-	-	-	-	-
Total 22-ft ZEB			-	-	-	-	-	-	-	-	-	-	-	10	11	11	11	11	11	11
Diesel 30 & 35-ft	New			7	-		6	3	9											
	Expansion																			
	Retire		(27)	(7)			(6)	(3)	(9)						-	(7)	-	-	(6)	(3)
Total 30&35-ft Diesel			25	25	25	25	25	25	25	25	25	25	25	25	25	18	18	18	12	9
ZEBs 30 & 35-ft	New		14							-			-		20	7	-	-	6	3
	Expansion			4					6							2				
	Retire														(20)	-	-	-	-	-
Total 30&35-ft ZEBs			20	20	20	20	20	20	26	26	26	26	26	26	26	35	35	35	41	44
Diesel 40-ft	New						-	-												
	Expansion																			
	Retire				(2)				(3)		(1)	(15)	(3)							
Total 40-ft Diesel			24	24	22	22	22	22	19	19	18	3	-	-	-	-	-	-	-	-
ZEB 40-ft	New		7		2	-			3	-	1	15	9	-	7	4	2	-	-	-
	Expansion				4						6					4				
	Retire												(6)		(7)	(4)	(2)	-	-	-
Total 40-ft ZEB			13	13	19	19	19	19	22	22	29	44	47	47	47	51	51	51	51	51
Vehicles for Service Expansion			0	4	10	10	10	10	16	16	22	22	22	22	22	28	28	28	28	28
Total ZEB vehicles	Total		33	33	39	39	39	39	48	48	55	70	73	83	84	97	97	97	103	106
Total ZEB Percentage			35%	35%	40%	40%	40%	40%	47%	47%	50%	64%	67%	76%	77%	84%	84%	84%	90%	92%
ZEB purchase percentage	%ZEB		100%	0%	100%	0%	0%	0%	50%	0%	100%	100%	100%	100%	100%	100%	100 %	0%	100%	100%
Total Vehicles in Fleet			**93**	**93**	**97**	97	97	97	103	103	109	109	109	109	109	115	115	115	115	115

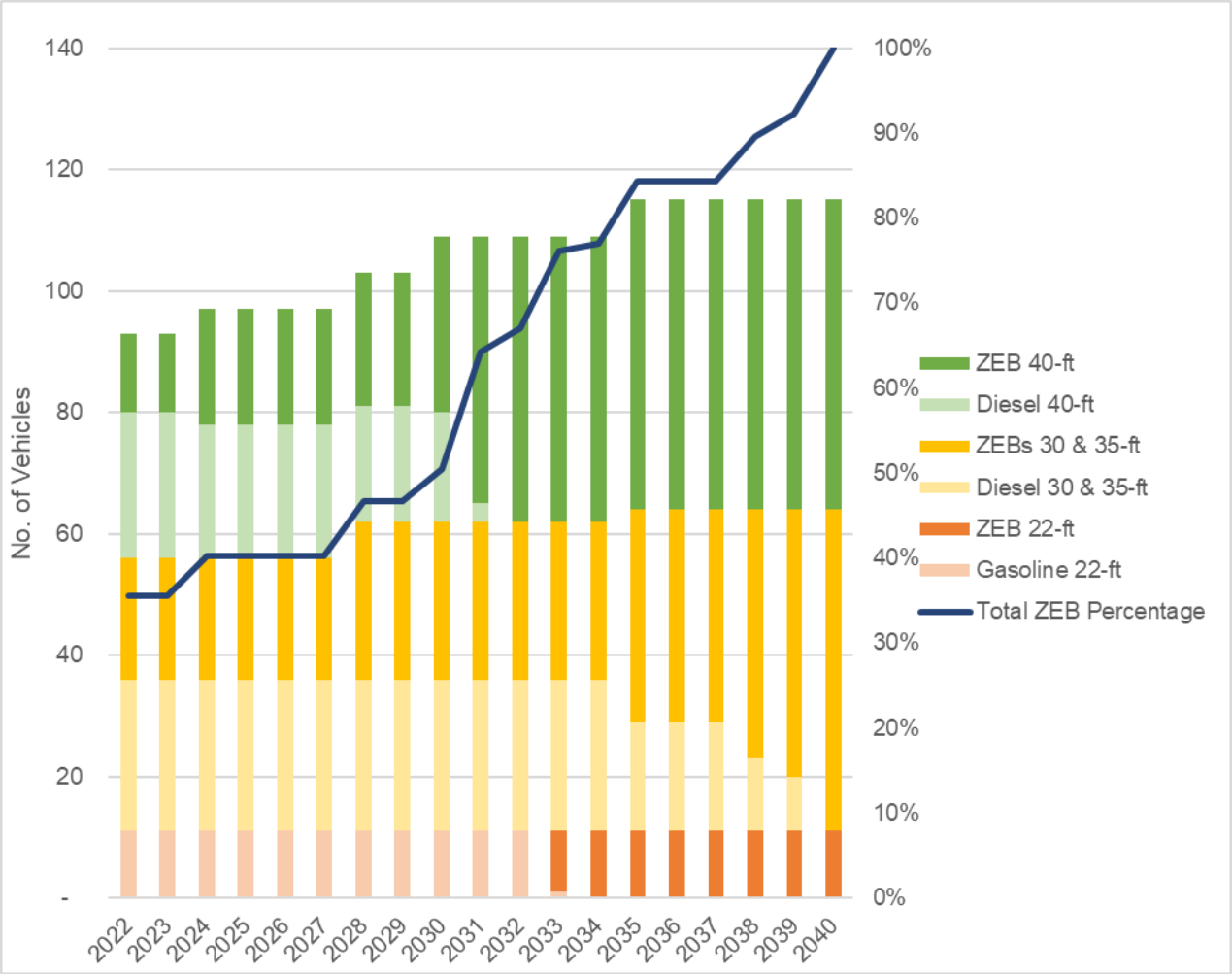


Figure 1: Proportion of the fleet as BEBs by year

Table 3: Infrastructure phasing—chargers and dispensers.

	Infrastructure				
	2021	**2022**	**2030**	**2033**	**2039**
No. of Units (125 kW)	**6**		**7**		
Cumulative	6	6	13	13	13
Centralized Units (1.2 MW)		**2**		**1**	**1**
Cumulative		2	2	3	4
Cumulative Plug-in Dispensers	**6**	**46**	**60**	**80**	**100**
Min. Power Requirement (kW)	750	1,800		3,600	4,800
Max. Power per installed equipment (kW)	750	3,150	4,025	5,225	6,425
Required/Recommended Installed Capacity (kW)	**750**	**2,750**	**5,750**	**5,750**	**5,750**

2 ELEMENT 2: CURRENT AND FUTURE RESOURCES TO MEET TRANSITION

This element addresses the availability of current and future resources to meet costs for the BEB transition and implementation.

For their purchase of BEBs and associated charging infrastructure to date, CARTA has mainly relied on federal funding sources with a local match. The only state funding, the Volkswagen Environmental Mitigation Trust fund, has been fully expended and will not be available for CARTA to use in the future. A summary of past funding sources and how they were utilized is shown in Table 4.

Table 4: Historic funding sources for BEBs

Primary Funding source	Total amount received	BEB units procured	Notes
Volkswagen Environmental Mitigation Trust	$1,386,950	(3) Proterra BEBs (3) depot chargers	Local match of $576,064 (29%) for total budget of $1,963,014. The fund is currently fully expended for South Carolina and will not be an available future funding source.
FTA Section 5339(a) Bus and Bus Facilities Grants	$4,650,194	(6) New Flyer BEBs (6) depot chargers	Local match of $871,556 (14%) and state match of $578,250 (9.5%) for total budget of $6,100,000.
FTA Section 5339(a) Bus and Bus Facilities Grants	$1,840,000	(29) depot chargers	Local match of $460,000 (20%) for a total budget of $2,300,000.
FTA Section 5339(b) Bus and Bus Facilities Competitive Discretionary Grant	$8,321,700	(14) Proterra BEBs (12) depot chargers	Local match of $2,080,425 (20%) for total budget of $10,402,125.
FTA Section 5339(c) Low or No Emission Vehicle Program	$1,500,000	(3) Proterra BEBs	Local match of $375,000 (20%) for total budget of $1,875,000.
FTA 5307 CARES Act Allocation	$4,173,000	(4) Proterra BEBs (1) New Flyer BEB	The CARES Act was passed in response to the COVID-19 pandemic and will not be an available funding source in the future. There was no local match required.
EPA Diesel Emissions Reduction Act grant	$805,500	(2) Proterra BEBs (1) on route charger	Local match of $1,026,321 (56%) for total budget of $1,831,821.

To achieve its goal of a full BEB transition by 2040, CARTA has identified the following capital funding needs consisting of fleet acquisition, extended vehicle warranties, vehicle charging infrastructure, vehicle overhauls and battery replacement costs.

Q

Table 5: Required capital expenses by year for BEB transition

Year	Capital expenses (2022$)	Local match at 20%
2023	$18,703,000	$3,740,600
2024	$5,262,000	$1,052,400
2025	$-	$0
2026	$3,818,000	$763,600
2027	$1,890,000	$378,000
2028	$11,004,000	$2,200,800
2029	$3,968,000	$793,600
2030	$10,252,000	$2,050,400
2031	$13,071,000	$2,614,200
2032	$7,822,000	$1,564,400
2033	$10,743,000	$2,148,600
2034	$23,429,000	$4,685,800
2035	$16,120,000	$3,224,000
2036	$1,879,000	$375,800
2037	$578,000	$115,600
2038	$6,524,000	$1,304,800
2039	$7,548,000	$1,509,600
2040	$19,287,000	$3,857,400

Table 5 shows that if a 20% local match is assumed, and that 80% of capital expenses required to support the BEB transition are acquired, CARTA will be responsible for the amount shown in the third column. Currently, CARTA's main source of local funding is in the form of a sales tax. CARTA can use the Charleston County local sales tax to help fund capital expenses. The half-cent sales tax has been in effect since 2004 and generates an estimated **$6.4 million** annually which can be used as the agency deems best meets their needs.

If a circumstance should arise where this local tax is not sufficient to meet the local match required to support the BEB transition, CARTA is prepared to explore a variety of different options to generate sufficient local funding. These include:

- **Tax Increment Financing Districts (TIF):** TIFs involve the creation of a special taxing district that captures incremental changes in property tax revenues usually as the result of specific infrastructure improvements. TIF revenues are small initially, but grow over time as the related development increases in value. TIFs are generally created for a set period of time, such as 20 or 30 years. South Carolina's TIF law was authorized in 1984 and has been used on a number of redevelopment projects; TIFs have been used in other locations to support major capital transit projects, such as in Chicago. While CARTA does not have authority to create a TIF, its member jurisdictions do and can explore this option further should the need arise for more local funding.

- **Municipal Improvement District (MID):** An MID is an area where the businesses are required to pay an additional tax or fee to fund projects within that district's boundaries. MIDs were authorized in South Carolina in 1999, and transit agencies can partner with MIDs to help fund transit projects. For example, the Kansas City Streetcar Project in Missouri saw the creation of the Kansas City Downtown Streetcar Transportation Development District to provide local match funding for

construction and operation of a 2.2-mile long streetcar through a 30-year, 1% sales tax within the district.

- **Joint Development:** Joint development entails a partnership between a public entity and private developer; and to meet the FTA criteria, the development and the property must have a physical and functional relationship. One example of a joint development approach is when an agency owns land that can be leased to a developer for an extended period of time, enabling the developer to build revenue-generating investments on that land with a low risk of losing the capital investment. In exchange, rents can be paid to the agency, creating a revenue stream that the agency bond against to support development of transit improvements. Joint development can also take the form of the sale of development rights for upfront capital funding.

Finally, in addition to the direct funding sources CARTA has already used to procure BEBs and charging infrastructure, CARTA can also explore a range of other options such as those listed here:

Congestion Mitigation and Air Quality Improvement Program (CMAQ): The Congestion Mitigation and Air Quality Improvement (CMAQ) Program provides funds for transportation projects designed to reduce traffic congestion and improve air quality in areas of the country that do not attain national air quality standards. Should the region become eligible, CMAQ is a categorical federal-aid funding program which directs funding to projects that contribute to meeting national air quality standards. CMAQ funds are distributed through the region's MPO. Funding is available for projects that reduce criteria air pollutants regulation from transportation-related sources, including ZEBs. Typical awards range from $300,000 to approximately $2 million.

FWHA Formula Funds: FWHA formula funds include sources that are eligible to be transferred to the FTA to support the implementation of transit projects. These funds are programmed by BCDCOG and would require adoption in both BCDCOG's (Long-Range Transportation Plan) LRTP and Transportation Improvement Plan (TIP). These funds can be pulled from various sources, including the Surface Transportation Program (STP) and the Transportation Alternatives Program (TAP).

ConserFund Loans (South Carolina Energy Office): This loan program, currently offering a 1.5% interest rate, can be used for capital projects that promote energy efficiency. Fleet conversions are eligible projects if the project will result in overall energy savings. A 'Technical Analysis' prepared by a licensed professional must accompany the loan application and demonstrate the energy savings of the project. Borrowers are eligible to borrow between $25,000 and $500,000 per fiscal year, and government borrowers do not have to initiate repayment until one year after the completion of the project.

3 ELEMENT 3: POLICY AND LEGISLATIVE IMPACTS

This element considers policy and legislative impacts to a BEB deployment. A review of state and local policies was conducted to the understand the potential impacts on ZE technology adoption.

3.1 State Support

The State of South Carolina does not have any explicit policy or legislation mandating the transition to or acquisition of ZEBs.

Nonetheless, there are several policies and actions on behalf of the State of South Carolina (State) demonstrating its support of cleaner and ZE transportation, and thus showing—at least indirectly—its support for CARTA's BEB adoption.

The State is supporting the development of a new battery production plant in Greer, South Carolina. This plant—from a leading American manufacturer of batteries and BEBs, Proterra, will increase battery production, increase local job opportunities, and importantly, support the electric bus industry throughout the United States.[2] Notably, Proterra also has a bus manufacturing plant in Greenville, South Carolina.[3] CARTA's existing Proterra buses were manufactured in the Palmetto State. Taken together, the electric bus and vehicle industries are well represented in the State.

In keeping with the State's support of cleaner transportation, the State's FY 2022-23 budget identified $24 million for the purchase of low- and zero-emission school buses.[4] Furthermore, the State's Department of Insurance awarded CARTA Volkswagen Mitigation Trust fund awards in both rounds; in 2020, CARTA received over $700,000 in the first round and in 2021, during the second round, CARTA was awarded over $600,000 for the purchase of a BEB.[5]

Other State agencies and departments also have established sustainable transportation priorities. For example, the South Carolina Energy Office promotes electric vehicle adoption through its Plug In SC Incentive Program incentivizing standardized electric vehicle signage[6] and the Energy Office has also previously provided letters of support for CARTA's prior Low-No Grant applications. Other key State departments that have and continue to voice support for CARTA's mission to improve air quality through its deployment of ZEBs include:

- The State Department of Health and Environmental Control, which notes that operating battery-electric buses "… in the urbanized area also supports our priority of helping those communities with disproportionate exposure to air pollution."
- The State Department of Transportation, which notes its support of "efforts […] to improve transportation efficiency and multimodal improvements for communities in our State."

[2] https://www.proterra.com/press-release/proterra-sc-battery-factory/
[3] https://hypepotamus.com/feature/proterra-south-carolina/
[4] https://ltgov.sc.gov/news/2022-01/gov-henry-mcmaster-announces-fiscal-year-2022-2023-executive-budget-arpa
[5] https://governor.sc.gov/news/2021-04/gov-mcmaster-superintendent-spearman-scdoi-director-farmer-announce-2454-million
[6] https://energy.sc.gov/transport

Finally, the state's utility, Dominion Energy, has been a partner with CARTA throughout its adoption of BEBs; more information around the involvement of Dominion Energy is found in Section 5.

3.2 Regional and Local Support

Regionally, the One Region group is a coalition of business, government, academic, nonprofit, and community leaders focused on developing strategies to strength the global competitiveness of the Berkeley-Charleston-Dorchester region. Part of the One Region strategy is the development of clusters to underpin a strengthened economy, and one of the clusters identified is an automotive cluster. This cluster includes supporting industries and activities around manufacturer support, parts manufacturing, information technology and research and development.[7]

The Charleston Regional Development Alliance, one of the key stakeholders of the One Region group, is also supporting the development of the automotive cluster, particularly around the development of electric/zero-emission mobility through the development of skilled labor and expertise in battery development.[8] Interestingly, as part of the automotive cluster, Mercedes-Benz is working on developing battery-electric powered Sprinter vans in the Charleston region; these passenger vans may eventually serve as potential electric paratransit vehicles for CARTA.[9] By supporting the automotive cluster in this manner, the region is clearly fostering the development and deployment of electric and zero-emission vehicles.

The City of Charleston (City) is strongly supporting efforts to decrease harmful greenhouse gas emissions and their negative impacts on the City and region. In 2018, the City established a Mayor's Office of Resilience and Sustainability with the ultimate goal of shaping solutions for a "stronger and more resilient Charleston from both chronic and acute shocks."[10] In addition, in 2021, the City adopted a Climate Action Plan as a framework geared to reducing carbon pollution. More specifically, through this action plan, the City looks to reduce emissions 56% by 2030 and to net zero by 2035.[11] Among key actions to achieve these ambitious goals are the adoption of zero-emission vehicles in the City's fleet, and developing policies and strategies aimed at increasing CARTA's ridership. Moreover, by pursuing a ZEB fleet, CARTA will be an active contributor to lowering carbon emissions in the City and region as a whole. Indeed, in May 2022, CARTA adopted, along with the BEB Master Plan, a Climate Action Plan striving to adopt a fully electric fleet by 2045 and achieve net zero emissions agencywide by 2050.

In essence, there is broad State and local support for CARTA's push to a ZEB fleet; CARTA's transition to a ZEB fleet will help achieve State and local goals. Finally, by already operating BEBs in revenue service and continuing to adopt ZEBs while receiving broad support from leaders and agencies at all levels of government, it is clear that CARTA does not face any active barriers or hurdles that would inhibit its adoption of a ZEB fleet.

[7] https://oneregionstrategy.com/wp-content/uploads/2017/04/High-Impact-Clusters-Executive-Summary.pdf
[8] https://www.crda.org/automotive/
[9] https://www.crda.org/news/local_news/with-demand-on-the-rise-north-charleston-sprinter-factory-to-build-electric-van/
[10] https://www.charleston-sc.gov/1931/Mayors-Office-of-Resilience-and-Sustaina
[11] https://www.charleston-sc.gov/904/Climate-Action-Plan

4 ELEMENT 4: FACILITY EVALUATION AND NEEDS FOR TECHNOLOGY TRANSITION

This element provides an assessment of CARTA's current facility conditions with respect to BEB technologies. Proposed modifications and upgrades to support the implementation of a BEB fleet is described fully in the BEB Master Plan.

A site visit of CARTA's bus operating and maintenance facility was conducted on June 24, 2021. The site visit included discussions with fleet staff, operations staff, and facility staff to understand current practices for diesel buses and CARTA's BEBs. Section 4.1 describes the assessment based on the site visit.

4.1 Existing Conditions Assessment

4.1.1 General Site Information

CARTA's facility is located at 3664 Leeds Avenue in the City of North Charleston (Figure 2). The site is approximately 7.2 acres. CARTA is currently leasing a portion of the adjacent parcel at 3680 Leeds Avenue from SCE&G / Dominion Energy for additional parking space. There is a currently a large photovoltaic array located within a fenced enclosure that occupies the majority of the adjacent parcel to the south. CARTA also leases a portion of the Dominion Energy property for bus storage - this area is contiguous to the bus parking and drive area on the southwest corner of the site and can only be accessed via the parking (there is no direct access from Leeds Avenue). Including the leased parking, the total site area currently used by CARTA is estimated to be approximately eight acres. The facility includes areas for administration, operations, vehicle service, vehicle fueling, minimal employee parking, and fleet parking.

Figure 2: Aerial view of site showing CARTA property bound in red and leased Dominion Energy-property bound in green (source: Google Maps)

4.1.2 Architectural & Maintenance Equipment

4.1.2.1 Summary

In general, the facilities appear to be in average condition for buildings of their age. No obvious issues with building envelope were visible and the employees present did not indicate any issues with existing building systems. Over time, several of the maintenance bays throughout the facility have been converted to storage areas or other uses; as a result the facility no longer provides drive through capability as originally intended, limiting circulation and functionality of the site in certain areas.

The existing facility is approximately 60,000 square foot (sq. ft.) total, including a two-story 27,000 sq. ft. administrative and operations component. The lobby of the administrative facility includes a retail fare store for the sale of passes, which is the only public area of the facility. The administrative area includes offices, meeting spaces, dispatching, a lounge, and a parts room, as well as employee locker rooms and parts storage for vehicle maintenance.

Figure 3: Facility main visitor entry

Limited employee parking is located on the north portion of the site in a fenced lot accessed from Dorchester Road (and not accessible by automobile from any entrance on Leeds Avenue or from within the bus parking and servicing area). There is pedestrian access between the Dorchester Road employee parking and the main facility.

Within the employee parking area, there is a 1,400-sq. ft. building that is occupied by CARTA's sign and bus stop maintenance group (Figure 4). This "sign shop" is not associated with fleet maintenance activities at the main facility.

Figure 4: Sign and bus stop maintenance facility

Located between the employee parking area and the main facility is a farebox storage and collection building which directly faces the fueling station and canopy, and is accessed from the main bus operations yard (Figure 5). The pedestrian entrance to the employee parking area is adjacent to the fare collection building.

Figure 5: Farebox storage and collection building, with employee parking beyond

There are approximately sixteen (16) angled automobile parking spaces on the east side of the administration building along Leeds Avenue; these appear to be intended for visitors, but they are also utilized by employees due to limited parking availability. Ad hoc parking in adjacent grass areas in non-marked spaces was also observed during the site visit.

The maintenance facility includes a wash bay with covered exterior steam cleaning bay, a paint shop, tire facility, body shop, and maintenance bays. There are multiple detached structures, including the vehicle fueling station which is protected by a canopy.

The maintenance wing of the building has ten maintenance bays, grouped into the main service area (six bays), and the paint shop and tire area (four bays). Within the paint/tire area, one bay is used for tire storages. Only the westernmost two bays within the paint/tire area (one of which is adjacent to the tire storage bay) can work as drive-through pair, but they are currently not used for this purpose. None of the bays within the paint/tire area contain lifts.

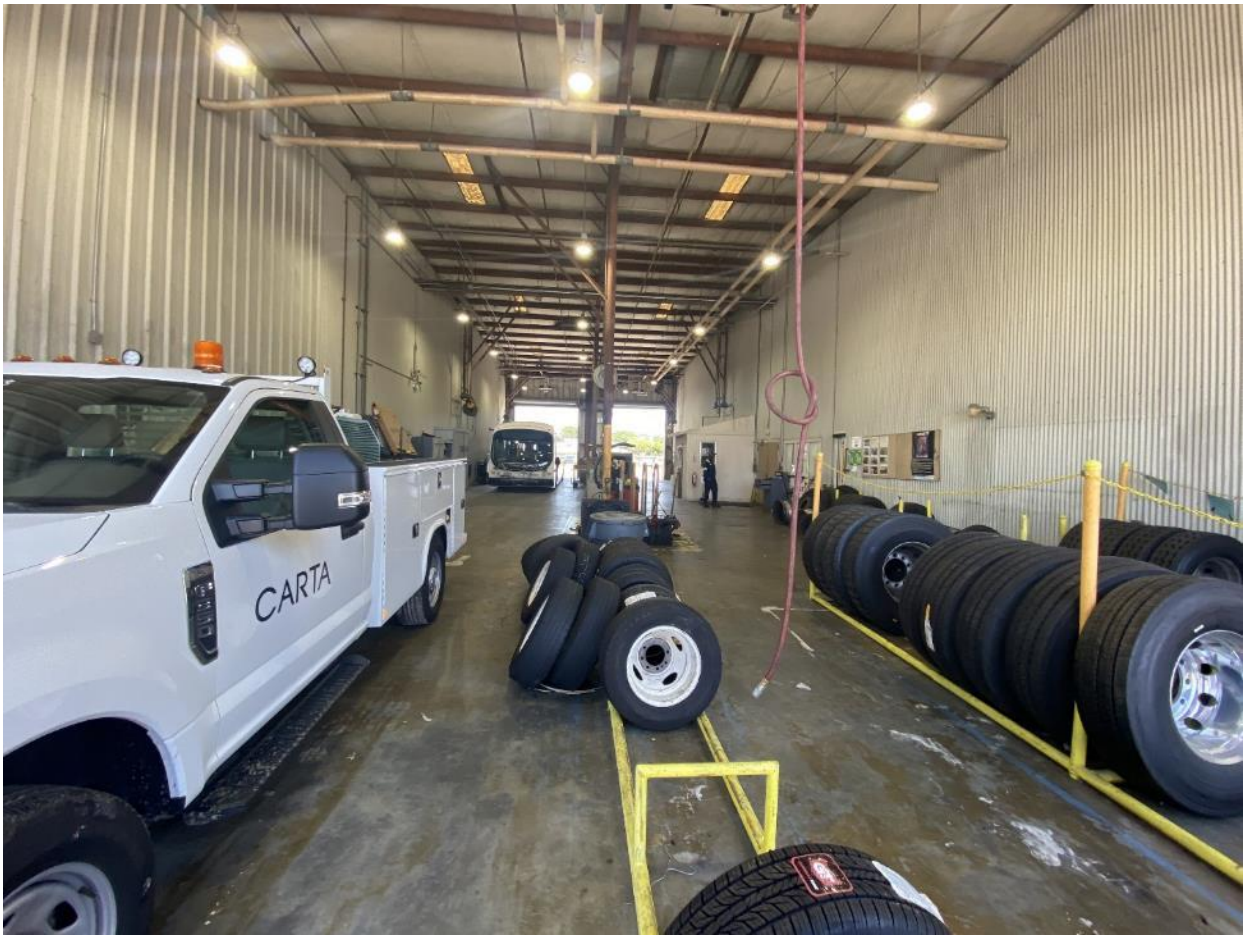


Figure 6: Tire Area and Storage (two bays in forefront) and Paint Shop (two bays at far end)

The space between the six bays of the main service area is used for storage of various equipment, including oil and mobile lifts. Vehicle exhaust reels and other typical vehicle maintenance equipment was generally observed at the facility but was not assessed as a part of this study.

Figure 7: Main Service Area (three of six bays visible)

There are twelve (12) bays located within portion of the building which houses the administrative offices, six located on the south side, and six on the north side. Three bays on the south end of the admin building function as the bus body shop, and these are accessible through the garage doors on the west side. The three bays which exit to the east act as a storage area for equipment and supplies and are not available for buses or bus maintenance.

Figure 8: Body shop exterior (three bays)

Figure 9: Body shop interior area (three bays)

Similarly, the six bays on the north end of the building are not currently used for servicing of buses or vehicles. This area is utilized as a large all-purpose room for storage of equipment and supplies, operator assembly area and training[12], etc. Much of the stored equipment could be moved or consolidated if CARTA found it necessary to make some of these bays available for the use of vehicles.

[12] Operator training will return to the conference room after COVID-19.

Figure 10: "All-purpose" room

4.1.2.2 Conditions

The facility and associated maintenance equipment appear to be in good working condition. CARTA staff had no statements regarding inoperable or failing maintenance equipment.

There is one bus maintenance bay which offers fall protection. As the BEB fleet grows in the future, additional fall protection may be required for the safety of those working on batteries located on the tops of BEB vehicles. See Section 5.2.3, below.

4.1.2.3 Preliminary Considerations

CARTA has already begun the transition to ZEB vehicles and has six BEBs in operation as part of their initial procurement, with additional vehicles arriving shortly. These vehicles are serviced in the maintenance building, and CARTA has staff trained for the proper maintenance and repair of BEBs.

4.1.3 Vehicle Service Cycle

4.1.3.1 Summary

There are two vehicular entry / exit points along Leeds Avenue that are shared by the fleet and employee or visitor's vehicles. Fleet parking is located on the western side of the site within a secure perimeter.

Access to the secure bus area is controlled by gates situated approximately the same distance from Leeds Avenue as the face of the main building. Due to space constraints the size of the bus determines the gate used to enter and exit the site at the beginning and end of a trip – for example, paratransit buses use only gate 2 (north entrance) for both ingress and egress. The property is fenced/gated beyond the employee parking such that the entire bus storage area and maintenance buildings are fenced-in while the office building and all of the employee parking is open to the street.

The property provides service for a fleet of 121 buses, with designated (striped) parking for forty (40) full size (44' x 12') bus stalls, six full sized BEBs (44' x 12') bus stalls, fifteen (15) medium (30' x 12') bus stalls, and approximately thirty (30) standard (9' x 18') stalls. There are additional open areas (unstriped) to accommodate the remaining vehicles not assigned to a designated space. All overnight vehicle storage is outdoors.

There are currently six bus parking spaces with power dispensers for electric buses located on the southwest corner of the site, adjacent to the leased overflow bus parking leased from SCE&G / Dominion Energy.

Vehicles are washed and cleaned typically three to four times per week, depending on the weather (less frequently in dry conditions). The bus wash and adjacent steam cleaning bay are located at the end of the maintenance building on the west side.

4.1.3.2 Conditions

The current service cycle facilities and functions appear to be in good working condition and are suitable for CARTA's current operations on the property. The ages of the existing equipment and facilities were not assessed but should be assumed to need replacement during the normal life cycle of such equipment and could be considered for optimization during the course of BEB implementation at the facility.

4.1.3.3 Preliminary Considerations

CARTA's affirmative steps toward transition of their rolling stock to BEB vehicles along with extensive planning with their stakeholder partners, has moved forward their implementation of a ZEB fleet. The initial procurement of six BEB buses has established a charging station and six charging dispensers installed by Proterra for the use of the pilot BEB fleet.

CARTA is also working with Proterra and Dominion Energy to install an additional forty (40) charging dispensers, one at every striped full-sized 40-ft bus parking space on the south side of the facility. These would be supplied by two 1.2-MW charging stations to be situated on what is now the fenced concrete dumpster pad. Slight modifications to the current plan for forty (40) more charging dispensers may be required for successful operations (for example, the dispensers will require the protection of bollards capable of protecting from full-sized buses), but these infrastructure improvements are unlikely to require changes to the current service cycle.

4.1.4 Fueling Infrastructure

CARTA's fleet include gasoline- and diesel-powered vehicles, which are fueled onsite at a fueling station protected by a 1,300-sq. ft. canopy located on the north side of the maintenance building (see Figure 11). There is a pump for standard gasoline and a pump for diesel fuel.

Figure 11: Fueling station and canopy (gasoline and diesel)

Located at the southwest corner of the property are the six charging dispensers and the charging station array (Figure 12 and Figure 13). The electrical service for the charging station is supplied by Dominion Energy from Dorchester Road and is routed along the west property line of the facility. This service is independent of the electrical supply for the administration and maintenance building.

Figure 12: Electrical charging dispensers (five of six total dispensers visible)

Figure 13: Electrical charging station array (six units - 125 kW per unit)

4.1.5 Electrical

Dominion Energy is the electrical utility serving North Charleston including the CARTA offices and bus facility. Electrical power is supplied to the CARTA offices and bus yard complex from a pad mounted transformer located along the east face of the building between the main entrance and the north garage doors. The service connection is from overhead power lines that run along Leeds Avenue. An electrical substation is located approximately 0.25 miles south of the CARTA facility on the west side of the Leeds Avenue right-of-way.

As noted in the section above, the existing electrical service for the six existing charging dispensers and associated charging station is supplied by an independent connection from Dorchester Road. The future 1.2-MW charging station will also be a new, independent service line originating from Leeds Avenue and running along the south property line until it is bored under the bus apron concrete to the location of the charging station at the dumpster pad.

4.1.5.1 Conditions

The existing electrical distribution system is sufficient for the current operations of CARTA, and there are no reports of failure or degradation of the infrastructure serving the administration or maintenance wings of the building. The system appears to be satisfactory for the current, non-BEB demands of the CARTA operations. Primary electrical demands in the administration building are lighting, HVAC, and typical office support loads. The bus maintenance building has air compressors, portable bus lifts, bus wash and steam cleaning stations, lighting, and HVAC loads.

The procurement of CARTA's first six BEBs has been accompanied by the construction of independent charging infrastructure for the vehicles, with a service connection from Dorchester Road. There is no net increase in electrical demand to the established electrical service connection for the facility from Leeds Avenue, and no operations within the building will be negatively impacted by the electrical service demands of the BEBs.

4.1.5.2 Preliminary Considerations

As CARTA is already well along with its plans for a future BEB fleet, the necessary planning for additional electrical infrastructure has already taken place with partner stakeholders Proterra and Dominion Energy. Plans for an additional forty (40) charging dispensers and two 1.2-MW charging stations have been prepared, with a service connection independent of both the administration and maintenance building and the existing six BEB chargers. Transition of more of the fleet from carbon-based fuels to BEBs and full buildout of charging infrastructure will not cause any negative impacts to the existing service loads.

4.1.6 Fire Protection Considerations

With the implementation of BEBs, fire protection and life-safety concerns can be significant. However, due to the relatively new advent of these technologies, building and fire protection codes have not yet been modified to specifically address BEBs. The National Fire Protection Association 855 'Standard for the Installation of Stationary Energy Storage Systems' is a standard that could potentially be applied to BEB storage, but this particular standard is excessive relative to the capacity of the batteries onboard buses and is more applicable for an indoor application/storage of batteries. The need for enhanced fire protection systems has not been determined as a baseline requirement for BEB implementation and would be left up to the discretion of the local fire marshal and the local building officials. Early coordination with the local building authorities is highly recommended to understand their requirements and concerns.

4.1.7 Fall Protection and Safety Infrastructure Considerations

Safety is of paramount importance at all bus maintenance facilities and should be assessed at a very detailed level for any future facility modifications. CARTA, as it increases its acquisition of BEBs and increases its maintenance of BEBs, will require addition fall protection systems beyond the equipment currently located at one maintenance bay to access rooftop-mounted batteries and other systems.

4.2 Proposed Maintenance Facility Modifications

This section outlines the proposed facility modifications for BEB implementation to CARTA's bus operations and maintenance facility. The BEB Master Plan has been developed proposing additional ground-mounted dispensers, to match the current charging infrastructure approach. With the potential future acquisition of the Dominion Energy property immediately south of the Leeds Avenue facility, there is sufficient space opportunity for additional bus stalls equipped with ground-mounted dispensers.

When the procurement of the forty (40) Proterra-supplied-and-installed charging dispensers was developed, an overhead canopy approach was considered. Although structural canopies can reduce required space for each bus stall and present an opportunity to implement photovoltaic (PV) systems to generate electricity, the additional costs of the canopy structure exceeded the project budget and was not the option selected by CARTA. A possible solar PV system limited to installation on the roof structure of the current O&M building is discussed in Section 2.

Since the facility will require new electrical service connections from Dominion Energy to serve the future phases of the fleet transition, Dominion Energy may require that a service study be performed to identify any transmission or distribution system upgrades that may be needed to support the additional power demands. The power supply upgrades needed to provide charging for the initial two 1.2 MW chargers and forty (40) dispensers has already been designed by CARTA and Dominion Energy. While the additional electric demand due to the Phase II BEB fleet deployment of an additional seventy-seven (77) buses is not large relative to what is often experienced at larger transit agencies, it will be up to Dominion Energy to determine if the local power distribution system has the capacity to serve CARTA's additional new charging loads as well as any other planned loads in the area. The recommendations below are focused on those infrastructure upgrades that are to be located on the agency's property and do not include any system upgrades that the service study may identify. The extent and timing of the system upgrades will determine the net cost to the agency.

4.3 Proposed Facility Modifications

The following summarizes the proposed improvements for the proposed BEB Master Plan for Phase II (Figure 14):

- A new 3,000 kVA transformer and 4,000 A switchboard to provide adequate additional power to the facility, along with associated equipment pads and bollards. The new transformer will provide power to the Phase II chargers and will provide a means to partially charge the fleet in the event that there is a failure on one of the main power transformers. With the existing utility transformer of 750 kVA, in addition to the transformers to be installed in Phase I and Phase II, the total installed power capacity at the facility will be 5.75 kVA
- A new 5,000 kW generator with 2,200 gallons of onsite diesel fuel storage (or 5,500 gallons of Liquid petroleum gas) in order to support 100% bus service for one day[13]. The quantity of fuel

[13] Details on the generator size calculations are described in Section 10.1

maintained on site will depend on the anticipated utility outage duration and the availability of fuel deliveries. The current calculation assumes fuel needed for one day of outage. Alternatively, the generator could be fueled using pipeline natural gas if infrastructure is readily available near the facility.

- An expanded bus parking yard is required to accommodate the evolving fleet due to the addition space and movement constraints of BEB infrastructure and equipment. Per direction from CARTA, the Dominion Energy property to the south of the Leeds Avenue facility is a likely opportunity for the agency to expand operations. Within this adjacent property the following improvements and modifications are proposed:
    a. Approximately 62,000 sq. ft. of site improvements for additional bus parking (about 56 35' bus parking spaces) and charging equipment.
        i. Electrical infrastructure (conduit, duct banks, and in-ground pull boxes) should be installed during site improvement work to minimize future trenching and re-work of the hardscape areas and to facilitate installation of future charging equipment as it required.
    b. Two new 1.2 MW charging stations with about twenty (20) dispensers each. This will be an addition to the two 1.2 MW charging stations that are being installed by Proterra this year.
    c. The six existing 125 kW chargers and their single-port dispensers along the west property edge will be removed and reinstalled to serve vehicles in this area.
    d. Approximately 50,000 sq. ft. of site improvements for a new employee parking lot with about 105 parking spaces. The existing employee parking at the facility is already very constrained and not ideal with some employees parking within the bus yard and in the adjacent property.
    e. New site lighting for the expanded parking areas, both bus and employee.
    f. New perimeter security fencing will be required in this area as well.

2. Seven new 125 kW, each with dual dispenser chargers – shown on the BEB Master Plan for the charging of the cutaway vehicle fleet.
3. For all new charging equipment:
    a. Equipment pads and associated bollard protection around chargers and dispensers
    b. Power main feeder and sub feeders
    c. Communication system panel/distribution cabinet and conduits to each charger
    d. Underground service conduit connecting the power cabinets to the dispensers.
4. Pavement replacement/repair for trenching associated with electrical distribution for dispensers and connections to new electrical service and switchboard.
5. The removal and reinstallation of six dispensers from the Phase I implementation.
6. New pavement markings/striping as required for parking reconfigurations.
7. No proposed modifications to the buildings other than potential bus charging within the maintenance bays as discussed in Section 4.3.4 below.
8. Following complete transition to electric vehicles CARTA can remove all facilities and equipment associated with diesel/gasoline fueling and internal combustion engines.

a. The above-ground storage fuel tanks can be decommissioned and removed, providing additional space for parking or other uses. The fueling dispensers can also be removed from the service lanes freeing up space for other service needs.
b. Diesel tanks could be left onsite for fuel storage needed by the generators
c. The equipment and infrastructure throughout the facility for engine oil can be decommissioned and removed.

All the above-describe items are described in detail in Figure 14. Given that the charging equipment needs to be in place prior to the arrival of the buses as proposed in the Fleet Replacement Plan (Section 7.0), a specific phasing plan for infrastructure upgrades was developed. Table 6 shows what infrastructure needs to be in place at each year between now and 2040[14], assuming that all charging infrastructure for the first thirty-three (33) BEBs (Phase I) will be completed by the end of 2022. The infrastructure implementation plan for on-route charging equipment is not considered in the table below.

Table 6: Infrastructure Requirements per Year for Phase I and Phase II

	Equipment	2021	2022	2030	2033	2039	2040
Dispensers	Installation of single-port plug-in dispensers		40	14	20	20	
	Cumulative single-port plug-in dispensers	6	46	60	80	100	100
Individual Charging Units	Installation of individual units (125 kW each)	6		7			
	Cumulative single units	6	6	13	13	13	13
Centralized Charging Units	No. of centralized units (1.2 MW)		2		1	1	
	Cumulative centralized units (1.2 MW)		2	2	3	4	4
Transformer	Installed Power Capacity (MW)	0.75	2.0	3.0			
	Cumulative Power Capacity (MW)	0.75	2.75	5.75	5.75	5.75	5.75

[14] Installation of charging equipment should be planned 12 to 18 months in advance of the year that is describe in Table 6.

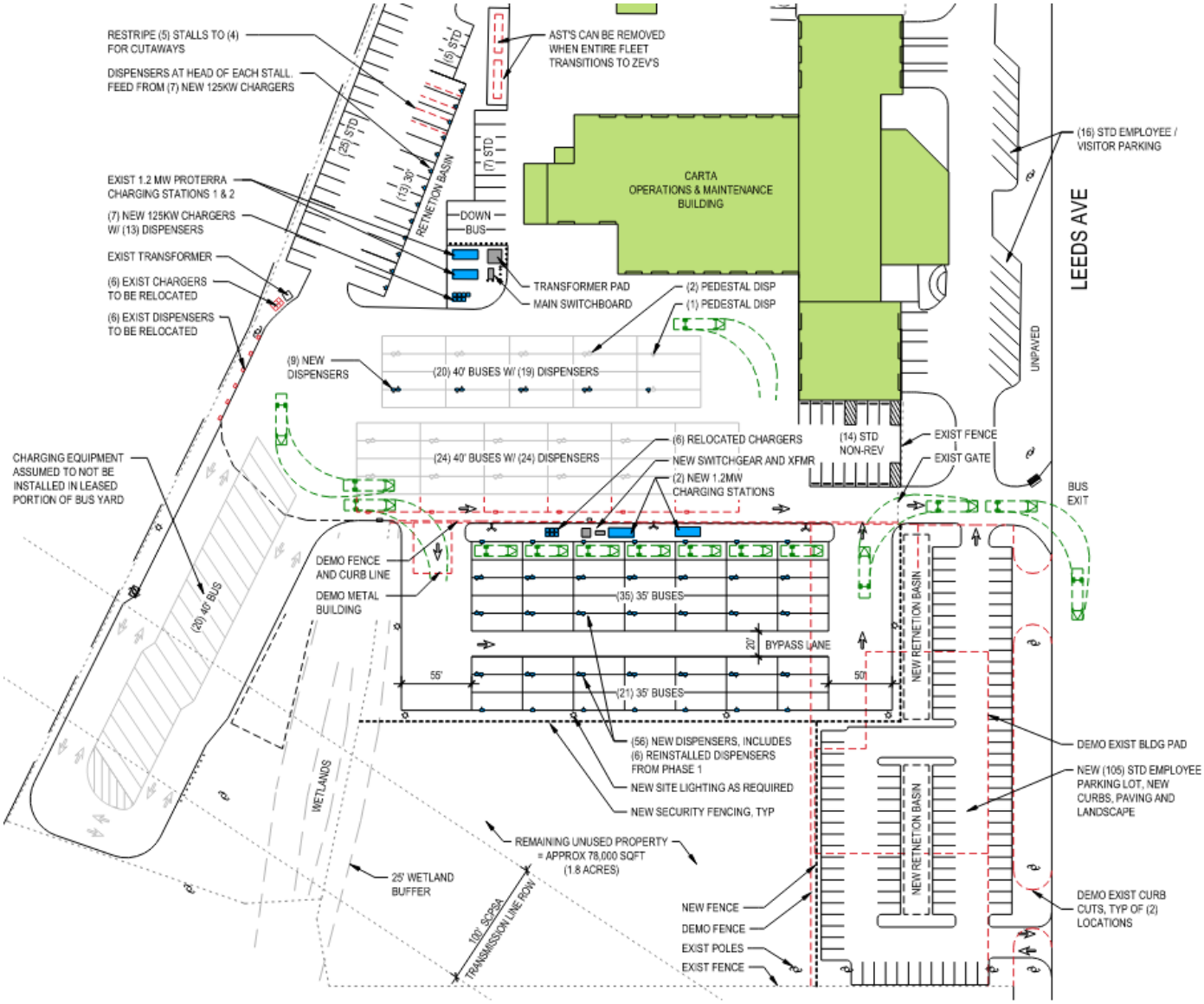


Figure 14: CARTA BEB Site Conceptual Master Plan for Phase II

4.3.1 Grid Connection Upgrades

The primary service conduit included in the BEB Master Plan options and estimate extends from the utility point of connection (meter) to the main distribution panel on the site. The extent of upgrades that will be necessary on Dominion Energy's side of the meter will need to be determined by the utility based on an analysis of the local power distribution system. Since the CARTA facility is in a commercial area, we anticipate that the utility system upgrades would not be significant. If upgrades to the Dominion system are necessary, the cost may be covered by Dominion Energy based on the additional electricity that they will be selling to CARTA for BEB charging. However, Dominion Energy could expect CARTA to pay for the required utility upgrades either through a direct fee or through a monthly facility services charge.

Typically, CARTA will perform a service study 12-18 months prior to the new service start so they can include the most up to date information on anticipated new loads from all their customers in the area. The extent and timing of the system upgrades will determine the net cost to the agency.

4.3.2 Communication Infrastructure

Infrastructure for data communications within the charging management system will include Industrial Protocol Ethernet wiring between each charger and its associated dispensers, as well as between each charger and a local data switch. The actual wiring will be conventional Cat 5E or Cat 6 Ethernet cable between devices. As the maximum length allowed for Ethernet is 100 meters or 328 ft., the dispensers cannot be too far from their respective charger. And though longer distances are possible with fiberoptic cable, the direct current (DC) power cables that need to run parallel with the Ethernet cables begin to have problems with voltage drop at this distance, so 328 ft. is a recommended limit.

Once the Ethernet lines from each charger are routed back to the facility's data switch, the data can be contained within CARTA's local network and managed directly by the agency. Alternately, the data can be routed to a cloud-based system—as needed to provide smart-charging and data aggregation—that is managed by a third party and/or is provided by the charger manufacturer. However, this would likely require coordination and approval of security and access, as it would necessitate outside entities operating within CARTA's local network, at least at some level.

4.3.3 Fire Protection Considerations

With the implementation of BEBs, fire protection and life-safety concerns can be significant. However, due to the relatively new advent of these associated technologies, building and fire protection codes have not specifically addressed most of these concerns. National Fire Protection Association (NFPA) 855 'Standard for the Installation of Stationary Energy Storage Systems' is a standard that can potentially be applied to BEB storage, but this particular standard is excessive relative to the capacity of the batteries onboard buses and considering all of CARTA's buses are stored outside. The need for enhanced fire protection systems has not been determined as a baseline requirement for BEB implementation and would be left up to the discretion of the local fire marshal and the local building officials. The need for additional fire lanes or fire 'breaks' within long continuous rows of bus parking may also need to be discussed with the local fire department.

If CARTA decides to install PV panels in the future above the buses' parking stalls, an NFPA 13 compliant automatic sprinkler system could be required because the canopy has a 'use' underneath it as defined by the California Fire Code. Again, this would be at the discretion of the local Authorities Having Jurisdiction's (AHJ's) interpretation of the code.

Furthermore, all modifications to the facility should be reviewed with the local AHJs, in particular the fire marshal. Fire truck access to the site and hydrant access will need to be reviewed and approved by the pertinent AHJs prior to implementation of any additional infrastructure for charging equipment or significant

modifications to site circulation and fire track access. However, since the site is designed for bus movements, fire truck access is relatively straightforward and should be accommodated without significant changes to the facility.

4.3.4 Maintenance Bay Chargers

The biggest impact to the actual maintenance building would be the installation of at least one charger within the maintenance bays upon further implementation of electric vehicles. For routine service, diagnostics, and to recharge a bus in the event the batteries are depleted during maintenance, a minimum 25-kW charger is recommended to be installed within the building. At full fleet conversion to BEB, a charging dispenser is recommended for at least every other repair bay. One high-capacity charger with multiple dispensers or individual relatively low wattage charging cabinets for each bay could be implemented depending on budget and phasing constraints. Alternatively, mobile charging equipment could also be implemented to use in the repair bays as the technology becomes more readily available. Like the charging equipment in the yard, the charging cabinets should be remotely located from the dispensers so as not to take away from the functional space in the repair bays. Remote dispensers could easily be located throughout the bays, mounted to columns or walls as needed to reach the appropriate charge ports on the various fleet of vehicles.

These chargers could likely be operated on the existing electrical service in the building due to the limited charging demand. However, to take advantage of lower electric vehicle electrical utility rates, the chargers could also be connected to the charging infrastructure serving the bus parking to ensure all vehicle charging is connected through one meter.

Figure 15: Charging cabinet and dispenser within maintenance bay

4.4 Proposed Shipwatch Square SuperStop Transit Center Relocation

The current SuperStop at the intersection of Rivers Avenue and Cosgrove Avenue in North Charleston has limited room for growth and has outlived its useful life span. CARTA has decided to relocate to Shipwatch Square; this will not only provide connections to the region's future zero-emission BRT line and upgrade the passenger waiting experience but will also provide convenient access for CARTA riders to the multiple

county social services organizations also relocating to Shipwatch Square. Of critical importance, the new transit center construction allows CARTA to provide necessary on-route/opportunity charging of BEBs at Shipwatch Square. For this application, the transit center will include two on-route fast charging stations.

In the BEB Master Plan, the Stantec analysis assumes that the on-route charging will begin to be available in Shipwatch Square starting in Phase I – C with thirty-thirty-three (33) BEBs.

Also included in the BEB Master Plan is an appendix providing additional information on the outreach that was conducted around the relocation of Shipwatch Square and the associated Title VI analysis.

4.4.1 Shipwatch Square Transit Center

The I-26ALT study conducted in 2016 for the future BRT line identified a hub or station for the BRT alignment in the vicinity of the intersection of Rivers Avenue and Dorchester Road. Since 2018, CARTA, BCDCOG, and partner agencies have been in the planning and development process for the new transit center at Shipwatch Square.

The project site is approximately 1 million square feet and is located about 1/3 mile west of the current SuperStop at Rivers Ave. and Cosgrove Ave. The site is currently under construction and expected to become operational in 2023. The adjacent social services hub (orange in Figure 16) will include a substance abuse prevention, intervention, education and treatment center; Dept of Social Services; Dept of Health and Human Services; Guardian Ad Litem; and DHEC Administration, Clinics and Vital Records. A county library is also planned (red in Figure 16). By providing a bus transfer center (light blue in Figure 16) adjacent to these important destinations, CARTA is ensuring that bus customers will have easy access to these valued opportunities.

Figure 16: Shipwatch Square site plan

The Shipwatch Square transit center is slated to have 10 sawtooth bus bays. The plan is to dynamically assign bus routes to different bus bays to facilitate passenger transfers and BEB charging. The site plan design document has additional details from Figure 16 above and can be accessed below.

5 ELEMENT 5: UTILITY PARTNERSHIP

This element describes the partnership between CARTA and local electrical utility, Dominion Energy.

Given CARTA's operation of BEBs since 2019, CARTA has cultivated a strong ongoing relationship with its utility Dominion Energy. CARTA and Dominion Energy worked closely to plan site improvements and prioritize transformer acquisitions to support the initial rollout of CARTA's six BEBs.

Dominion Energy and CARTA have strong historical ties—the predecessor of Dominion Energy, South Carolina Electric & Gas Company (SCE&G)—operated public transit until 1997, when CARTA and BCDCOG assumed operating and planning responsibilities. Physically, Dominion Energy is located adjacent to CARTA's operating and maintenance facility on Leeds Avenue; further strengthening the relationship. Finally, CARTA's mechanics belong to the same union local as Dominion Energy's electricians, the International Association of Machinists and Aerospace Workers.

Ongoing activities of joint partnership and cooperation between CARTA and Dominion Energy include:

- The planning of site improvements and electrical upgrades necessary to support the twenty-seven (27) newly acquired BEBs;
- Developing electricity rates that will help CARTA contain costs for charging as well as potentially provide cost savings compared to diesel-powered transit buses; and
- Developing and implementing smart charging practices that can reduce electricity costs to CARTA, while mitigating peak demand charging and grid use that can reduce electrical demand for Dominion Energy.

Dominion Energy is committed to achieving zero emissions by 2050, providing clean and renewable energy as the backbone of electric 'fuel'. Additionally, Dominion Energy is a strong believer and supporter of sustainable transportation. For instance, Dominion Energy has supported, since 2019, school districts across Virginia to buy and operate electric school buses. Dominion Energy is also exploring ways to use electric school buses as portable batteries.[15] CARTA and Dominion Energy plan to continue working together to support CARTA's BEB transition and the improvement of local air quality. CARTA has attached a letter of support from Dominion Energy as Appendix B.

[15] https://www.dominionenergy.com/our-stories/electric-school-buses

6 ELEMENT 6: WORKFORCE TRAINING AND TRANSITION

This element examines the impacts of the transition to BEB's on CARTA's workforce and training. For the convenience of the reviewers, Section 12 Workforce Training and Transition of the Appendix A, the CARTA BEB Master Plan is copied below in its entirely.

Ensuring CARTA's workforce is sufficiently prepared for the full transition to BEBs is of vital importance to assure that service continues to operate smoothly and without interruption. This section addresses the requirements of the FTA's Zero-Emission Fleet Transition Plan related to the impact of BEBs on the workforce.

6.1 Background

CARTA contracts with Transdev North America (Operator) to provide operations and maintenance. All Fixed Route (currently 128 full-time plus six part-time) and Paratransit (currently 26 full-time) operators are provided as part of their turnkey transit operations and maintenance (O&M) contract as well as all mechanics (currently twelve full-time) and bodyman staff (currently two full-time). The mechanics are Automotive Service Excellent (ASE) I, II, and III level certified mechanics whose job description includes full-service vehicle maintenance excluding only full engine overhauls.

The staff belong to the following unions: bus operators are part of the Amalgamated Transit Union (Local 610), and the mechanics are part of the International Association of Machinists and Aerospace Workers (the same union as the electricians of Dominion Energy).

As part of their turnkey service, the Operator has in-house human resource staff including a trainer. Workers are paid for all training, and it is conducted during regular work hours; the costs are part of the O&M contract. Promotions are both tenure and certification based.

As an early adopter of BEBs, CARTA has three 40-foot Proterra E2 Catalysts that have been in service since December 2019, an additional three 40-foot Proterra ZX5s in service since March 2021 plus seven 40-foot New Flyer Xcelsiors that have been in-service since November 2021.

CARTA has included training in all BEB procurements and will continue to make training a priority through investment and policy.

6.2 Required Skill Sets to Operate and Maintain BEBs

With CARTA's commitment to move to a 100% zero-emission fleet by 2045, there are additional skill sets required to assure that the staff is fully trained on the unique aspects of BEBs and associated charging equipment. It is intended that OEM training be sufficiently comprehensive to the point where the maintenance staff are qualified to perform warranty work in-house when the warranty expires and that their repair proficiency is on par with the OEM's expertise.

For all staff, it will be critical to assure that this training includes safety protocols. Maintenance staff will need to be provided with all of the appropriate equipment including items such as fall protection when working at heights, for roof-mounted equipment (e.g. batteries) and with overhead charging.

As the fleet is transitioned to BEBs, the Operator, with CARTA oversight, will be responsible for the following:

- Ensure all staff standard operating procedures/policies are updated and fully document the current equipment and procedures; that all staff have relevant manuals and other necessary documentation; and assure procedure handbooks are readily available at work stations.
- Confirm, document in standard operating procedures/policies as well as provide and mandate use of appropriate personal protection equipment associated both with an industrial work place and with handling high voltage components;
- Arrange for courses on basic electricity fundamentals for any non-BEB shop staff that may be in work area; and
- Post illustrated warning signage at entrances to shop areas and enforce the safety policies on visitors. Warning signs include the federally or state mandated workplace requirements as well as anything related to high voltage electrical equipment; for instance, personal protective equipment must be worn when handling high voltage vehicle components.

6.2.1 Required BEB Skill Sets

The required overall skill sets/knowledge areas on BEBs by category of personnel include:

- **Maintenance Staff**
    - Safety protocols for high-voltage, batteries and chargers
    - Preventative maintenance – buses
    - Onboard diagnostic systems
    - Multiplexing
    - HVAC
    - Brake systems
    - Energy Storage System, lithium-ion battery and energy management hardware and software
    - Electric propulsion
    - Monitoring alerts and necessary updates maintenance management software
    - Charging dispensers – both depot and on-route (pantographs)
        - Preventative maintenance
        - Charger diagnosis and repair
        - Smart Charger software
- **Bus Operators**
    - BEB driving techniques , including methods to maximize range and battery life
    - BEB vehicle and associated systems orientation including onboard diagnostics
    - Safety protocols

- Proper use of on-route pantograph chargers for proper alignment/docking and recharging

- **First Responders**
  - Training on layout, componentry, safety devices, and other BEB features
- **Planning/Scheduling/Dispatching Staff**
  - Training on BEB-specific features that impact operating parameters
- **Towing Staff/Contractors**
  - Schedule and test towing training with staff and any contractors who will tow the BEBs for each type of BEBs.

6.2.2 Maintenance Staff Skills – Additional Details

All existing maintenance staff have the foundational skills, including the ability to read basic wiring diagrams, safely handle low-voltage batteries, troubleshoot and repair basic circuit faults, inspect and test relays, demonstrate proficient use of digital multi-meters, and repair wiring and terminals among other tasks.

Once the basic electrical skills have been mastered, the next set of skills address the basic aspects of multiplexing, a more advanced and streamlined structure that controls the vehicle's electrical system, replacing an extensive system of electrical hard wiring.

Multiplexing skills include the ability to:

- read and interpret ladder logic diagrams,
- use LED indicator lights to troubleshoot the system, and
- identify symbols used for input and output electrical signals.

The next set of skills pertains to electronics dealing with solid state devices using transistors, microchips, and other such components. Virtually every bus system is controlled by electronic devices, which has increased significantly with the introduction of BEBs.

Electronic skills include:

- ability to inspect and test capacitors, diodes, capacitors, and other electronic modules;
- differentiate between analog and digital signals;
- the ability to describe the purpose of data communication protocols CAN/SAE J1939 and SAE J1708;
- differentiate between direct current and alternating current;
- demonstrate use of an oscilloscope and a graphing multimeter; and
- inspect and troubleshoot gateway modules.

6.3 Gaps and Additional Training Needs

With thirteen BEBs in place and an additional twenty 35-foot Proterra ZX5 expected by July 2022, CARTA already has staff with BEB training as further described below. As CARTA transitions to a 100% zero

emission fleet, it is expected that all technicians will eventually require an acceptable electrical/electronic (E/E) level of proficiency or will require training related specifically to BEBs. These training demands will be higher on the front end and decrease over time as skills are developed. Currently six of the maintenance staff have gone through the training program offered by Proterra as well as relevant operators; courses offered by New Flyer are now being conducted.

For all relevant CARTA staff, the evaluation approach is to prepare a skills gap survey identifying each employee's current skill sets and comparing them against the relevant Required BEB Skills Sets in section 12.2.1. The outcome will be to produce a skills gap inventory that identifies specific weaknesses and/or across-the board training needs for each individual. Formalized certification programs, such as those shown in section 12.3.2.1.1 APTA Standard for Training on Electrical and Electronic Systems, will be particularly useful in making these assessments for the maintenance personnel. After completion of the assessment, since the transition to a fully BEB fleet will occur over time, a schedule is then developed to determine when specific staff members need to have their training completed.

6.3.1 Overall Training – All Personnel Categories

The primary source of training for all categories will be two-fold: (1) training by OEMs, which will be specified as part of the purchase contracts and will include "train the trainer" which can then be followed by (2) training provided by the "trainers" and the Operator who has their own training lead. For very specific details, on-the-job training will be provided by the more experienced staff or by observation for maintenance services provided under by the OEM under warranty As needed this will be supplemented with online courses, technical schools and community colleges. Once staff has received baseline BEB training, ongoing training addressing both new required skills and refreshing knowledge will be programmed for relevant staff

Plans are also underway to work with local secondary schools and/or technical colleges to formalize training on BEBs (or all such vehicles using battery electric technology) to ensure there is a continuity of capable and credentialled skilled personnel for succession planning. The approach will be to present the occupation as "upmarket" because of the electrical, electronic and computer based diagnostic process in addition to the more physical routines such as replacing a blown suspension air bag.

In addition, CARTA and/or their Operator will continue to communicate with peer agencies who are entering into BEB operations and maintenance and compare practices. This includes interactions with peers at the shop management level to seek support on emerging issues as well as approaches such as informal borrowing of parts in emergencies to keep the buses on the road.

6.3.1.1 Maintenance

As previously mentioned, for the maintenance staff, skills are first assessed using the ASE transit bus certifications for H6 E/E Systems (as described below). Technicians with similar ASE electrical certifications from the automobile and heavy-truck sector will also be considered and classified. These ASE certifications tests are widely regarded in the ground transportation industry as a standardized way to classify those with requisite job skills.

This systematic assessment approach involves participation from both labor and management using the various training resources and partners described here to close the skills gap. The training will be directed into two areas, one to achieve a higher level of foundational E/E skills, the other to build BEB specific skills.

Training will be provided to ensure that maintenance technicians understand how to service and troubleshoot all-electric propulsion, balance of plant for BEBs, and auxiliary systems. They will also be trained on onboard diagnostic systems, and safe work practices for high-voltage systems, to include the handling, storage, and disposal of batteries. Finally, training will be required on maintaining and repairing

bus chargers. The training will be ongoing as new skills are required with periodic refresher training across critical topics, as well as necessary maintenance of certifications.

Once the vehicles are out of general warranty, servicing, inspection and repair procedures will be documented by the Operator as necessary to supplement manuals. In addition, it will be important to both incorporate the OEM- recommended preventative maintenance intervals as well as monitor observed work routines for necessary changes based on the different characteristics of BEBs. For example, due to regenerative braking brake pad or shoe/lining wear will decrease and the mileage interval will be two to three times greater.

6.3.1.1.1 12.3.2.1.1 APTA Standard for Training on Electrical and Electronic Systems

The APTA Standard for Training on Electrical and Electronic Systems covers the information to instruct and prepare transit bus technicians and mechanics for the ASE H6 Transit Bus E/E certifications and to evaluate, develop or enhance current training programs for the diagnosis, repair and maintenance of transit bus electrical/electronic systems. The stated criteria in this program or an approved equal we used as the basis to evaluate skills sets.

The details of the APTA curriculum are as provided below:

The APTA learning objective levels represent 100 (introductory), 200 (intermediate) and 300 (advanced). When a transit bus mechanic demonstrates proficiency in the learning objectives, that individual should be capable of attaining the corresponding ASE Transit Bus Technician Certification. CARTA maintenance staff are reimbursed for certification costs and receive annual bonuses for maintaining certifications.

Module A1: General Electrical Safety and Electrical Theory 101: The objective of these courses is to familiarize the employee with electrical hazards, safety precautions, critical safety procedures and the fundamentals of basic electrical theories and laws, schematic reading and circuit protection.

Module A2: Wiring, Connections and Connectors 102: Participants will receive classroom instruction in which a qualified instructor will review the basics of wiring, connections and connectors as it relates to gauges, warning devices, horns, wipers and HVAC components. Participants will receive instruction on related wiring schematics and how to solder and splice connections. More advanced aspects are covered in the 201 level courses, where emphasis is placed on advanced electrical theories; testing equipment; advanced schematic reading; ladder logic diagrams; multiplexing systems; and circuits, solenoids, diodes, resistors and capacitors (OSHA.gov 29 CFR 1910 Subpart S and NFPA 70F-2012).

Module A3: General Electrical Theory and Diagnosis 103: The objective of these courses is to familiarize the employee with the basics of electrical diagnosis, including pertinent electrical theories and laws, schematic reading, safety issues, applicable tools/equipment and circuit protection. More advanced aspects are covered in the 201 level course, where emphasis is placed on advanced electrical theories; testing equipment; advanced schematic reading; ladder logic diagrams; multiplexing systems; and circuits, solenoids, diodes, resistors and capacitors.

Module A4: Vehicle Systems 201: The objective of these courses is to familiarize the employee with the basics of electrical diagnosis, including pertinent electrical theories and laws, schematic reading, safety issues, applicable tools/equipment and circuit protection.

Module B1: Battery 101: The objective of this course is to familiarize the employee with bus battery basics, including safety, testing, cleaning and inspection, replacement, charging, and jump-starting a bus. Employees will be taught to restore battery and related components to OEM specifications.

Module C1, C2: Starting Systems 101, 201: The objective of these courses is to familiarize the employee with the starting system diagnosis and repair and to improve employee skills with regards to advanced repairs. Emphasis will be placed on inspection, component identification, circuit component replacement, starter circuit wiring, distinguishing between mechanical and electrical causes of starter problems, and restoring starting systems to OEM specifications.

Module D1, D2: Charging Systems 101, 201: The objective of these courses is to familiarize the employee with the basics of charging systems, component identification, diagnosis, inspection, testing, and troubleshooting. Focus will be placed on adjusting, replacing and removing alternators and checking, adjusting and replacing voltage regulators, as well as proper testing and inspection procedures for diagnosis and repair.

Module E1: Lighting Systems 101: The objective of this course is to instruct the employee how to read wiring diagrams, perform visual inspections, and replace various interior and exterior lights and lighting circuits. Emphasis is placed on restoring lighting systems to OEM specifications.

Module F1: Fire Suppression 301: Participants will receive classroom instruction in which a qualified instructor will review the basics of wiring, connections and connectors as they relate to gauges, warning devices, horns, wipers and HVAC components. Participants will receive instruction on related wiring schematics and how to solder and splice connections.

Module G1, G2, G3: Multiplexing 101, 201, 301: The objective of these courses is to familiarize the employee with how to use wiring diagrams to troubleshoot, diagnose, inspect and repair/replace complex electrical circuits, how to properly use test equipment and how to maintain various switches. Emphasis is placed on developing a high understanding of data communications and multiplex systems. The 301 level course is focused on multiplexing system troubleshooting, inspection and maintenance.

6.3.1.2 BEB Operators

The approach for BEB operators will be to train them to understand and use readings such as the battery SOC, remaining operating time, estimated range, and other system notifications that may occur during operation. This will equip them to identify the notifications that require immediate action as opposed to ones that are noting items for diagnostic purposes and/or system upgrades.

As CARTA implements on-route charging, the appropriate markings will be put in place to assist the drivers in the proper alignment of each type/model of BEB. This will be accompanied by training to assure that the BEB operators can efficiently park the BEBs in the proper location for charging without needing to repark thus both assuring charging and avoiding any delays in the schedule; particularly if other buses are queuing for a recharge. BEB operators will also be informed/trained on their order of charging among other BEBs at the on-route location(s) based on the route schedule criteria.

As driving habits can significantly affect BEB efficiency and performance, the curriculum will also address training drivers on optimal driving habits, such as the recommended levels of acceleration and deceleration to maximize efficiency and battery life.

As recommended by the FTA, in addition to the physical components of the bus, the bus operators will also be trained on concepts, working principles, and details of regenerative braking, mechanical braking, hill holding, and roll back. Other areas to address include the dangers of silent operation to avoid risks to pedestrians and the importance of turning off the BEBs when parked.

6.3.1.3 First Responders

With a focus on safety, CARTA intends to provide local fire and emergency response departments with training as to the layout, componentry, safety devices, and other features on the new technology. This training will be held regularly as equipment changes and staff turns over.

CARTA will also work with the Dominion Energy and local fire departments to gain the benefit of their experience, training, and best practices around high-voltage and battery safety.

6.3.1.4 Other

It will also be important to provide training for the planning, operations, and dispatching staff so they understand BEB constraints and may properly adjust schedules. For instance, the differences in battery life based on vehicle types (e.g., 35-foot and 40-foot). In tandem, based on having several vehicle types, instructions must also be provided on parking routines to ensure that vehicles are not blocked from accessing the appropriate charging locations.

6.3.2 Example OEM Training: Proterra

6.3.2.1 Driver Training

ON-SITE DRIVER TRAINING (16 hours) Includes both classroom instruction with test for driver qualification, and "in the seat" instruction for hands-on training and familiarization of the bus and charging systems

(1) Operator Orientation Training
- Informal overview of the vehicle including operator controls, vehicle performance, plugging in procedures.

6.3.2.2 Maintenance Staff Training

ON-SITE MAINTENANCE TRAINING (48hrs standard) Includes both classroom instruction with test for maintenance qualification and "on the job" instruction for hands-on maintenance and key troubleshooting techniques.

(1) Vehicle Maintenance I - One (1), sixteen (16) hour class within two (2) days
Included Modules:
- Introduction and Component Identification
- HV Safety and Lock-out Tag-out
- Preventative Maintenance

(2) Vehicle Maintenance II - One (1), sixteen (16) hour class within two (2) days
Included Modules:
- Introduction to Diagnostics
- Introduction to Schematics
- Preventative Maintenance Refresher

(3) Advanced Diagnostics and Troubleshooting - One (1), sixteen (16) hour class within two (2) days

Included Modules:

- Multiplexing
- CAN Diagnostics
- Advanced DVOM
- Situational Diagnostic Exercises

6.3.2.3 *Other Training*

PCS CHARGER TRAINING - One (1), eight (8) hour class within a one (1) day period
Intended for facilities maintenance technicians

Included Modules:
- Component ID
- Powerflow
- HV Safety / LOTO
- PMI / Troubleshooting

FIRST RESPONDER TRAINING - One (1), 2 - 4hr class for local emergency personnel

Included Modules:
- BEB Overview
- Controls and Shutdown Procedures
- Areas of HV
- Locations for Emergency Egress
- Emergency Response Procedures

INSTRUCTIONAL VIDEOS - Provide refresher training through a convenient technological format

6.4 Opportunities/Displacement Avoidance Strategies

All of the workers will have the opportunities to be trained in any required skills necessary to retain their positions with a program that will upskill and reskill the existing staff; enhancing their value not only to CARTA but within the overall workforce. CARTA and the Operator place a high value on providing a broad range of training options combined with open communications to ensure employee retention.

There will be also opportunities to strengthen and diversify the technical workforce by offering in-house training programs for workers in other job categories who may want to move into skilled technician positions. In addition, industry experience has demonstrated that some of the most effective recruiters are current workers who know the work and come from the communities that agencies are targeting. Finally, incumbent workers' experience and skills make them excellent candidates to be mentors (trainers) for newly hired staff. It is important to note that all of the approaches discussed will assure that all employees have equitable access to training.

CARTA's approach includes the use of strong labor management partnerships as part of the training process. As part of this, discussions are regularly held with the contracted operator and the Union representatives to discuss the needs of the workforce including this training. As part of the Collective Bargaining Agreement the following reoccurring meetings that address the topic of training:

- Quarterly meeting between the Union representatives and management where staffing, training, and workforce needs are discussed
- Monthly safety meetings where training is offered.

In addition, the maintenance staff are regularly asked to provide their training needs with open dialogue; especially as new equipment is brought into service. As previous stated, maintenance staff are also reimbursed for certification costs and receive annual bonuses for maintaining certifications.

In addition, specifically for the maintenance staff, to the extent that the BEBs may require less traditional maintenance and effort after the initial new skill learning curve, CARTA's plan includes expansions of the overall fleet by 20% and the development of a new BRT line by 2028 which will provide sufficient opportunities for existing staff to avoid any displacements. Further, staff with diesel engine expertise will still be required until 2045 as CARTA transitions to a 100% BEB fleet.

As part of this, there are significant advantages to involving the frontline workers directly and early. The approach has been to assure the workers have a clear understanding that the agency intends to rely on OEMs to work together with them on the skills transfer. There is significant opportunity for OEM's, knowledgeable technical staff, and frontline technicians to work collaboratively on solutions that meet CARTA's needs.

Charleston Area Regional Transportation Authority

MEMORANDUM

Date: May 17, 2022
To: CARTA Board of Directors
From: Ron Mitchum, Executive Director
Subject: Transit Planning Project Updates

Please find the progress reports for transit planning projects.

1. Stop/shelter Design Guidelines (Project Manager: Jon Dodson)
2. Service Planning Initiatives (Project Manager: Jon Dodson)
3. CARTA On-Demand (TNC Pilot Program) (Project Manager: John Lambert)
4. Shelter Improvement Program (Project Manager: Belen Vitello)
5. Solar Lighting Installation (Project Manager: Belen Vitello)
6. Digital signage (Project Manager: Belen Vitello)
7. Shipwatch Square Transit Center (Project Manager: Sharon Hollis)
8. Vanpool Program (Project Manager: John Lambert)
9. Lowcountry Rapid Transit (Project Manager: Sharon Hollis)

Staff will be available at the Board Meeting to answer any questions you may have regarding the projects.

1. Transit and Bus Stop Guidelines

Staff is continuing to work with area municipal partners for their recognition of the Guidelines.

Staff is validating the Automatic Passenger Counters (APCs) on the buses to work toward building out the Transit Amenities rankings.

Staff presented the Guidelines to City of Charleston Design Review Committee 4/21/22 and City of Charleston Traffic and Transportation Committee on 5/10/22 as information.

2. Service Planning Initiatives:

- Route 12 Scheduling adjustments made to improve the overall customer experience for Route 12 customers.
- Beach Reach is launching Memorial Day Weekend
- Grants: Submitting Grant Applications for Shipwatch Square Transit Center to both Lo-No and Bus and Bus Facilities. Last years grant received a highly recommended rating in all six area; however, there was not enough funding for all project. Tie Breaker was Cities in Non-Attainment. This year that has been changed to Climate Change.
- Climate Action Plan: Developed Climate Action Plan Targets consistent with FTA guidelines. This will set the framework for calculating and reporting emissions reductions resulting from the electrification of the fleet, as well asl support new grant requirements related to Climate Change.

3. CARTA OnDemand (TNC Pilot)

CARTA OnDemand

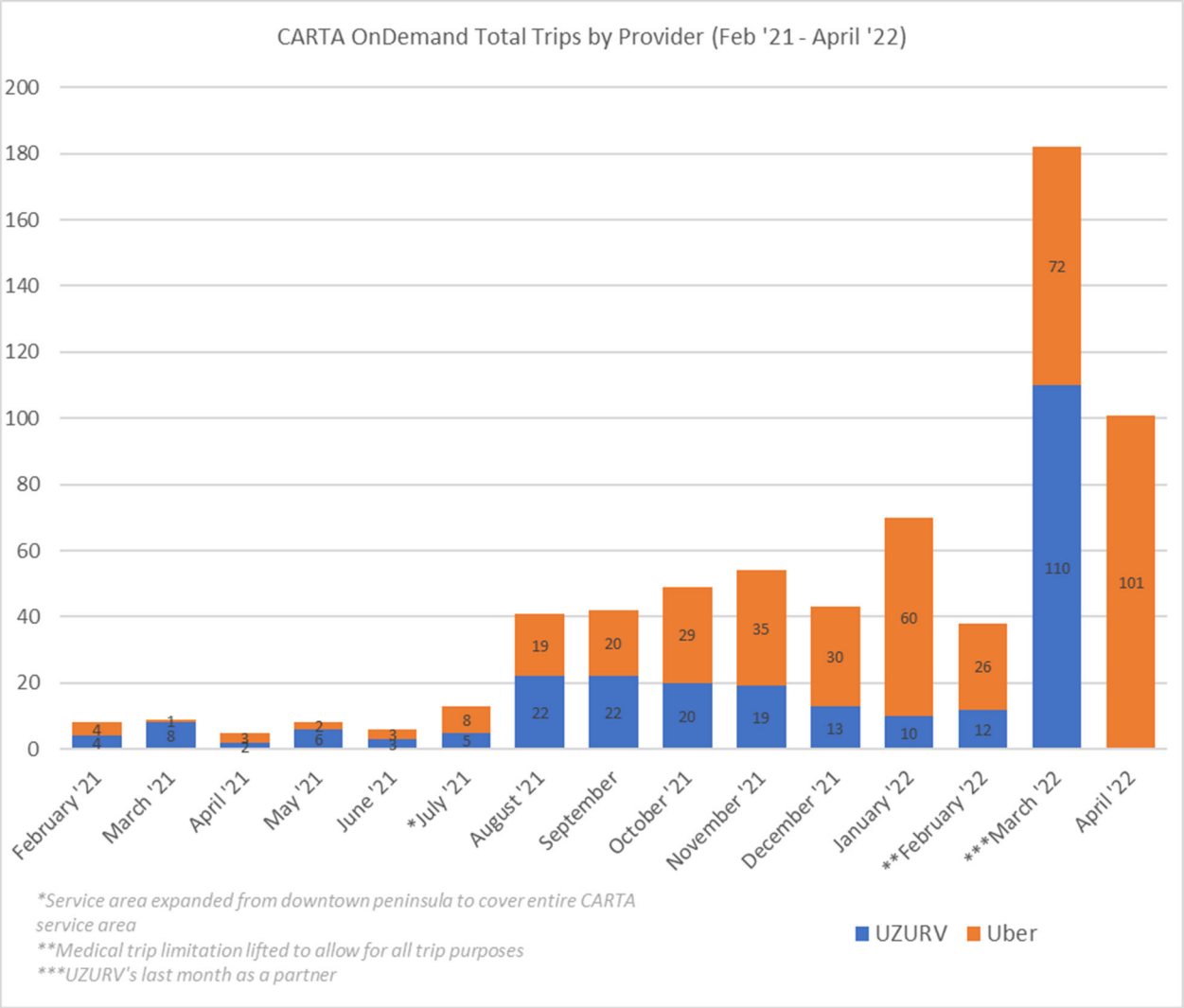
BCDCOG staff has continued promoting the OnDemand program through outreach directed towards regional senior centers, assisted living communities, housing developments, and medical facilities. Feedback from users regarding the service has generally been positive and several riders use the service regularly every month. Eighty-two (86) seniors have been approved to use the service and seven (7) Tel-a-Ride customers have taken advantage of the service as well. CARTA OnDemand has provided an average of 44.6 total trips per month since the program began.

In February 2022, the CARTA board approved lifting the medical appointment trip limitation and instead allowing CARTA OnDemand to serve all trip purposes within the CARTA service area. Ridership is expected to continue to increase as existing and prospective users learn about the program's new parameters.

As of March 22, 2022, UZURV is no longer a CARTA OnDemand partner, temporarily making Uber the program's sole provider. The agency will be releasing a new Request for Proposals to solicit new bids

from transportation networks companies and enlist a new wheelchair accessible vehicle provider in coming weeks. The agency is also considering options for call-in ride scheduling to accommodate customers that wish to use the OnDemand service but do not have the ability to use the Uber app.

In April there were 101 Uber rides at an average cost of $10.92 per trip. Over the program lifetime, Uber trips have cost an average of $9.77. To date (February 2021 – present), CARTA has spent a total of $15,210.02 on the CARTA OnDemand program which includes trips costs and marketing expenses.



4. CARTA Shelter Improvement Program (SIP)

CARTA Shelter Improvement Program (SIP)

Bus stops play an important role in how our riders experience transit. CARTA is working to continuously improve our bus stops by providing the best amenities for riders as they board and depart the bus.

Shelters/Benches in development:

- 371 Dorchester Rd/Patriot Blvd SB- Construction Completed. Marketing is scheduling a ribbon cutting ceremony
- Glenn McConnell Widening- Working with Charleston County on bike rack details for planned shelters.
- 713 Houston Northcutt Blvd/ Ann Edwards Ln- Construction almost complete. Waiting on SCDOT.
- Historical Benches- Wildwood construction is working on a quote to recycle benches we have at Leeds.
- 330 America St./ Reid St. (Bench) Construction Drawings Completed. Wildwood is working on using a bench at Leeds.
- 112 Meeting St./ Woolfe St. Construction Drawings Completed. Wildwood is working on using a bench at Leeds.
- 741 Meeting Street Project- Working with developer for new location and shelter for BSID 30 Meeting/Brigade St
- Maybank Hwy and Produce Lane- Developers have agreed to install a bench
- Re-Think Folly- 677 Walmart at Folly- New shelter has been added to the Re-think Folly Plans for this bus stop.

New Designs:

- 547 Calhoun St / St Philip St (Shelter) Coordinating and working with the College of Charleston on an additional shelter project, waiting on BAR approval
- 5600 Craig Rd- New Development in North Charleston. Working on a pad for a future shelter for Route 13.
- 578 Savannah Hwy/Stinson- Fee-in-lieu
- 68 Rivers Ave / Hawthorne Dr- Working with developers to have a pad installed
- 826 Sycamore Ave & St Andrews Blvd- New apartments going in. Working with a developers on exact placement of shelter.

- 72 Medical Plaza Drive / Trident Medical Arts Center- Teaming up with Trident Medical to install a new pad. CARTA will install the shelter.
- 102 Trident Medical Center - 9279 Medical Plaza Dr- Teaming up with Trident Medical to install a new pad. CARTA will install the shelter.
- 3894 Savannah Highway- Pad will be installed from development review.
- 3492 Maybank Highway- Pad will be installed from development review.

5. Solar Lighting Project

Solar lighting systems provide security and illumination in needed areas when grid power is unattainable or costly to bring to a site. CARTA has invested $178,180 into solar lights for the region. To date 147 have been installed. We have three spare lights to replace any damaged items.

We are ready to move forward with more solar lights. Working with bus drivers and a new priority list to make recommendations for new solar light locations.

6. Digital Signage

Strategically-located displays enable the transit signage system to inform the public, minimize wait times, and enhance the overall traveler's experience. The methodology selected priorities based on ridership, quantity of connecting routes, existing shelters, and stop closures due to flooding.

The City of Charleston's Design Review Committee (DRC) approved 9 locations within existing shelters. CARTA is currently working on the inspection and review of Phase 1 of this project. Phase 1 will have a total of 14 locations.

We are working with Synchromatics, Way Sign and Swiftly to refine the digital sign readouts. The digital signs that were malfunctioning have been identified and replaced.

Progress has been made with the accuracy of the digital signs. The reads are now synced with Swiftly. Inspected three locations and have verified the read outs.

Locations:

502 Calhoun St / Jonathan Lucas St (near side)

790 Visitors Center on John St

539 Aquarium (Concord St)

461 Visitors Center / Charleston Museum

486 Spring St / Hagood Ave

114 Meeting St / Johnson St NB

565 Bee St / VA Hospital

611 Citadel Mall

787 Dorchester Village Shopping Center (Park & Ride)

17 Rivers Ave./ Remount Rd.

296 Dorchester Rd / Leeds Ave SB (at Shelter)

782 Rivers Ave Park & Ride

137 N. Charleston SuperStop

103 N. Charleston SuperStop on Rivers Ave

7. Shipwatch Square/Transit Hub

Final Design is pending funding grant award. Title VI analysis on reroutes was completed as part of ZEB Plan. Developing NEPA checklist for transit center, NEPA Analysis to begin Summer 2022, with an anticipated nine-month timeline. Submitting grant application to FTA Bus and Bus Facilities Grant Program and Lo No Program. Grant is due end of May.

8. Lowcountry Go Vanpool

BCDCOG staff continues to promote the Lowcountry Go Vanpool program through employer outreach, printed marketing materials, outreach events, and virtual presentations. Outreach is still focused on large regional employers however, as the region prepares for an influx of summer travelling, coordinating with and recruiting local employers with parking difficulties has been a large objective. BCDCOG staff is offering virtual and in-person presentations to provide individuals with an overview of how the vanpool service operates. The Lowcountry Go Vanpool Coordinator attended multiple outreach events to market the program including the College of Charleston's Sustainability Awareness Event. As a result of the promoted efforts, **the Lowcountry Go Vanpool Program has signed on two new vanpools that are currently in operation.**

BCDCOG Staff continues to promote the vanpool program's pilot period, the monthly fare is $30 per rider regardless of trip distance. Lowcountry Go's fleet of 11 vehicles (four 7-passenger and seven 15-passenger) are leased on a first come, first serve basis. The vans are branded with decals containing the

Lowcountry Go Vanpool logo and telephone number. The service is able to accommodate riders in the rural and urban areas of the region as long as one leg of the commute is in the urban area.

9. Lowcountry Rapid Transit

A&E Design: 30% design submittals, project scope, schedule and budget were submitted to FTA, and have been accepted through the PMOC review process. The team continues to coordinate design with other concurrent projects being completed by SCDOT and jurisdictions.

Key Stakeholder Coordination: BCDCOG/County/SCDOT/ interagency agreements discussions are being finalized. Project team has been meeting with key stakeholders and providing presentations to neighborhoods and organizations as requested.

FTA Coordination: Monthly meetings are held with FTA. FTA's Project Management Oversight Consultant (PMOC) has completed their review of our project documents and the project is currently being reviewed for a rating and entry into engineering approval. A decision is anticipated in May/June 2022.

NEPA: Documented Categorical Exclusion was approved by FTA in July 2021.

Maintenance Facility: A new maintenance facility/storage yard near the fairgrounds for LCRT buses has been included in the project. Design to be advanced to 30% level in Fall 2022.

Transit Signal Prioritization: Transit signal prioritization at intersections is part of the LCRT project definition. A demonstration project of the TSP on Dorchester Road was initiated in March 2021 to develop the technology and infrastructure on a smaller scale corridor to advance that technology on CARTA transit buses traveling on Dorchester Road. This will provide the framework for the LCRT TSP technology which can be expanded to the remainder of the corridor. Phase 1 is complete, and scope for second phase is being finalized with an anticipated start of Spring 2022.

TOD Study: The TOD study Final Report was adopted by BCDCOG Board in February 2022. Presentations to stakeholders are ongoing. FTA grant award for Phase 2 being programmed, anticipated start in Summer 2022.

Public Involvement: Stakeholder and neighborhood meetings are ongoing. Morgan Grimes, LCRT's communications specialist, has been visiting businesses along the corridor and reaching out to neighborhoods and community organizations. She has had direct communications with over 700 businesses and community members along the corridor, and that number continues to grow. Morgan held office hours and will continued to do so in 2022.