FAA OFFICE OF AIRPORTS FY2023 SUPPLEMENTAL DISCRETIONARY GRANT PROGRAM PROCUREMENT AND INSTALLATION OF GROUND SERVICE EQUIPMENT CHARGERS AT BALTIMORE/WASHINGTON INTERNATIONAL THURGOOD MARSHALL AIRPORT PROJECT NARRATIVE (VALE)

This Project Narrative is being submitted by the Maryland Department of Transportation (MDOT) Maryland Aviation Administration (MAA) to notify the Federal Aviation Administration (FAA) that MAA is requesting FAA Office of Airports Airport Improvement Program (AIP) fiscal year (FY) 2023 supplemental discretionary grant funding for the procurement and installation of up to 250 electric charging ports to support electric ground support equipment (eGSE) that airlines will purchase for use at Baltimore/Washington International Thurgood Marshall Airport (BWI Marshall or the Airport). This Project is offered in response to the FAA Airports Climate Challenge initiative in support of the current administration's goals to achieve net-zero emissions of greenhouse gases (GHG) economy-wide by 2050. The Project meets the eligibility criteria C.3.a.3 (i) contained in the Notice of Funding Opportunity (NoFO) and all provisions of the Voluntary Airport Low Emission (VALE) Program.

Figure 1: Example of eGSE Charger

Source: RoVolus, April 2024.

The procurement of these 250 chargers will support eGSE implementation by all operators at the Airport and will enable all GSE to be electrified. Currently, the Airport hosts more than 700 diesel- and gasoline-powered GSE vehicles which could be replaced by similar electric-powered equivalents if these 250 chargers are acquired. Reductions in the number of GSE vehicles using conventional fuels reduces fuel usage and local emissions, resulting in savings to operators and a reduction in the environmental impact of each aircraft operation. Additionally, the Project reflects a strong commitment to sustainability by MAA and supports the agency's Sustainability and Environmental Mission Statement, as well as Maryland's Climate Solutions Now Act of 2022 (CSNA) goal of a 60% GHG reduction (from 2006 levels) by 2031, and net-zero emissions by 2045.

SECTION 1: ELIGIBILITY

VALE Program funding, as specified in Section 1.6 of the VALE Technical Report, Version 7.0 (VTR7), is available for commercial service airports located in a United States Environmental Protection Agency (EPA) designated nonattainment or maintenance area for one or more criteria pollutants. The NoFO specifies that airports submitting a request for funding under the VALE Program are not required to be located in a designated nonattainment or maintenance area under the EPA National Ambient Air Quality Standards (NAAQS). However, BWI Marshall is located in Anne Arundel County, which is classified as a marginal nonattainment area for 8-hour ozone under both the 2008 and 2015 NAAQS, a designated nonattainment area under the 2010 NAAQS for sulfur dioxide (SO_2), and a designated maintenance area under the 1997 NAAQS for particulate matter with a diameter of 2.5 microns or less ($PM_{2.5}$). These criteria pollutants have been identified as potentially harmful to human health, and projects that contribute to limiting their prevalence have an outsized impact in areas that already have higher emissions than the EPA considers safe. Thus, MAA is eligible

to receive funding for BWI Marshall under both the standard VALE Program, as well as under the requirements associated with the NoFO.

This Project will result in the development of charging infrastructure within the Airport's boundaries and is not planned to be available for public use. The Project will comply with all requirements contained within Chapter 6 of VTR7.

1.1 Priority Project Category

The Project is eligible for the Emissions and Energy (EE) Priority Project Category, using the Expanded Emissions Eligibility (EEE) subcategory. Under 49 USC 40117 (a) (3) (G), a project for "converting vehicles and GSE at a commercial service airport to low-emission technology" qualifies as a funding eligible airport-related project.

SECTION 2: PROJECT DESCRIPTION

2.1 Project Purpose and Scope

MAA intends to pursue the purchase of 250 charging ports to serve all operators utilizing eGSE equipment at the Airport. MAA would own the chargers, and they will be permanently located and operated at the Airport. While the final configuration of chargers has not been determined, a mixture of controllers with two-, four-, and eight-charger ports will be deployed in strategic, accessible locations throughout the Airport. The Airport has several locations suitable for large-scale GSE charger deployments and the final locations chosen will be based on operator input, required infrastructure development, and other practical concerns.

As mentioned in Section 1, BWI Marshall is located in Anne Arundel County, which is classified as a marginal nonattainment area for 8-hour ozone under the EPA NAAQS (2008 standard and 2015 standard). Reductions in emissions attributable to the current fleet of diesel-powered GSE would reduce the emissions of oxides of nitrogen (NO_x), and volatile organic compounds (VOCs), which are precursors of ozone formation. Anne Arundel County is also classified as nonattainment under the 2010 SO_2 standard and maintenance under the 1997 standard for $PM_{2.5}$. As diesel engines emit both SO_2 and $PM_{2.5}$, a conversion to electric vehicles would decrease local emissions of these pollutants and contribute to improved local air quality.

MAA will be required to provide approximately 8.3 megawatts (MW) of new electrical capacity to support the 250 charger positions (i.e., 33 kilowatts (kW) per charging port). This new capacity is sized to allow the potential for all charger ports to be used simultaneously, if necessary. The need could arise due to the banked nature of both airline and cargo operations at the Airport during certain times of day, and the resultant fact that many GSE vehicles will have to be charged at the same time. The provision of this additional electric capacity, and on-Airport utility infrastructure development, is included in the scope of this funding request.

Electric GSE compatible with the chargers will be purchased and operated by the various GSE operators at the Airport. As a result, no VALE Program funding is being sought for vehicle purchases. MAA has already coordinated with the airlines on this project and the airlines are enthusiastic partners that have expressed a willingness to issue commitment letters for the purchase of at least 250 pieces of electric equipment.

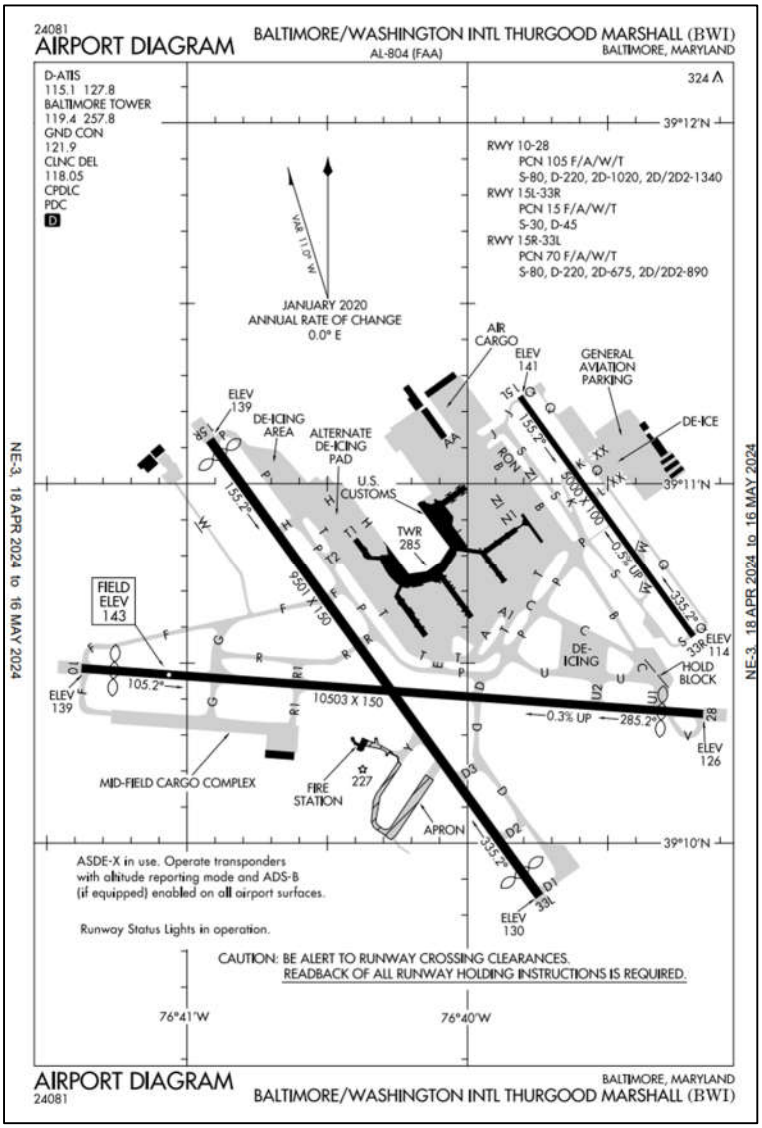
The purpose of the Project is to enable airlines to purchase and operate cleaner and more efficient ground support equipment. The electric charging infrastructure that will be purchased using VALE Program funding will allow significant progress to be made towards MAA's goal of 100% electrification for all on-Airport airside vehicles. Along with MAA initiatives to electrify additional vehicles, such as parking and employee shuttle buses, the Project presents an opportunity to leverage private capital from airlines and other operators to assist with emissions reductions at the Airport. As a result, the Project is an ideal candidate for the VALE Program and all emissions reductions would be eligible for the issuance of Airport Emission Reduction Credits (AERCs).

2.2 Location of Project

The Project will be located airside at BWI Marshall (layout is depicted in Figure 2). While the final configuration of the 250 charger port installations has not been determined at this time, there are multiple on-Airport locations that could serve as GSE charger hubs. Given the geographic distribution of users across the Airport, as well as hub dynamics and corresponding scheduling peaks, spreading the charger installations across multiple Airport locations would allow GSE operators to conveniently access a charger without excessive crossings of active aircraft operational areas. All chargers will be located airside and no part of the Project involves off-Airport components. In addition to locations around the face of each of the Airport's five terminal concourses, potential charger hub locations include, but are not limited to the following:

- Midfield cargo ramp
- North cargo ramp (northwest of Runway 15L/33R)
- Runway 15R deicing pad (north of alternate deicing area)

Figure 2: BWI Airport Diagram



Source: FAA, Accessed April 2024[1]

2.3 Alignment with Administration Priorities

The Project is broadly compatible with several priorities of the current Presidential administration, including:

- Executive Order (EO) 13990, *Protecting Public Health and the Environment and Restoring Science To Tackle the Climate Crisis*, which advocates for better accounting of the social costs and impacts of gases associated with climate change, including carbon, nitrous oxide, and methane. Projects to replace conventionally-powered vehicles with electric equivalents directly reduce airport carbon emissions, which results in a corresponding reduction of social costs on affected communities.

- EO 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, which advocates for the Federal government to adopt improved practices that will encourage more fair treatment and better accounting of potential impacts in historically underserved communities. The Project supports the goals of this EO by reducing Airport-related climate change impacts to neighboring communities via electrification of the GSE fleet and the corresponding GHG reductions.

- EO 14008, *Tackling the Climate Crisis at Home and Abroad,* which sets out a series of tasks intended to reduce current and future climate-related impacts. These tasks include the development of sustainable infrastructure (Sec. 213) which, in the service of ensuring Federal infrastructure investments reduce climate pollution, considers the effects of GHG emissions and climate change in these decisions. The Project would result in the reduction of climate pollution by significantly reducing or eliminating tailpipe GHG emissions associated with GSE at the Airport and aligns well with the goals of this EO.

SECTION 3: COST ESTIMATE

MAA estimates implementation of the Project to cost approximately $21,675,000 based on consultation with potential vendors and the results of a recent procurement for similar equipment. This is broken down further into a cost of $14,652,000 to procure and install the chargers (i.e. $58,600 per charger), and $7,023,000 to support required utility relocations and upgrades. MAA anticipates that this entire cost would be deemed an AIP-eligible expense and with 75% VALE Program funding, MAA anticipates requesting a grant of $16,256,250. This would be matched locally with $5,418,750 of MAA funds.

Cost estimates will be replaced with actual bids for an eventual VALE Program application submittal by May 31, 2025. Table 1 summarizes preliminary funding estimates for the Project. MAA has high confidence that all of FAA's expectations with respect to this grant application will be met upon submittal of the final application.

[1] *https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dtpp/search/results/?ident=bwi&state=&airport=&ver=2405&eff=04-18-2024&end=05-16-2024&diagrams=1&cycle=2404*

Table 1: Preliminary VALE Program Funding Estimates for Project Implementation

Cost Element	Estimated Cost	Description
Purchase and installation of 250 single-port electric chargers	$14,652,000	Purchase and installation of GSE chargers, including site preparation
Utility Relocation/Upgrades	$7,023,000	Electric utility and relocation work required to support the chargers
TOTAL COST	**$21,675,000**	

Source: RoVolus, April 2024.

SECTION 4: EMISSION REDUCTION AND COST EFFECTIVENESS ESTIMATE

Criteria pollutant emission reductions for the Project were calculated using emission factors provided in the VTR7. In calculating the reductions, a Baseline Scenario reflecting the current mix of GSE operating at the Airport was compared to a Low-Emissions Scenario that reflects the purchase of 250 eGSE chargers and subsequent conversion of 250 conventionally-fueled GSE with electric equivalents that have zero tailpipe emissions. It is important to note that this is a conservative approach since it is expected that the entire 700 vehicle fleet can be electrified with these chargers. The calculation of emissions reduction is based on only 250 pieces since that is what the airlines have offered for binding eGSE delivery commitments within 24 months of Project completion. The willingness to turn over 35% of their fleet in a two-year period is indicative of the strong airline support for the Project. These emissions estimates were estimated over the useful life of the beltloaders, cargo tractors, and pushback tractors, which is 11, 13, and 14 years, respectively, as shown in the VTR7. The emissions estimates are preliminary and will be further revised using more precise inputs upon the development of the final VALE Program application.

Carbon emission reductions were estimated based on 2022 and 2023 operator-provided fuel data to determine the average amount of fuel usage per piece of conventionally-powered GSE being used at the Airport. This operator-provided data included fuel usage for 360 units, which is more than half the fleet. Therefore, it was assumed that this was a representative sample, large enough to estimate the fuel use of an average piece of GSE. Carbon emissions factors for diesel fuel and gasoline from the US Energy Information Administration were used to estimate Carbon Dioxide (CO_2) reductions over the 11-year useful life of a beltloader—a conservative approach, as beltloaders are the equipment with the shortest useful life, as defined by the VTR7. The fuel reported, representing one year of fuel usage for 360 GSE, was 355,851 gallons of gasoline and 192,319 gallons of diesel fuel in 2023.

The preliminary emission reduction estimates and cost-effectiveness values over the useful life of the vehicles for CO_2, ozone precursors NO_x and VOC, and other criteria pollutants are provided in Table 2.

Table 2: Emission Reduction and Cost Effectiveness Estimate

	NO_x	VOC	NO_x + VOC	CO	PM	SO_2	CO_2
Emission Reduction (tons)	1436	177	16,13	2,158	24	6	42,800
Cost Effectiveness ($/ton)	$15,100	$122,600	$13,400	$10,042	$891,600	$3,466,000	$500

Source: RoVolus, April 2024 (cost effectiveness rounded to nearest $100)

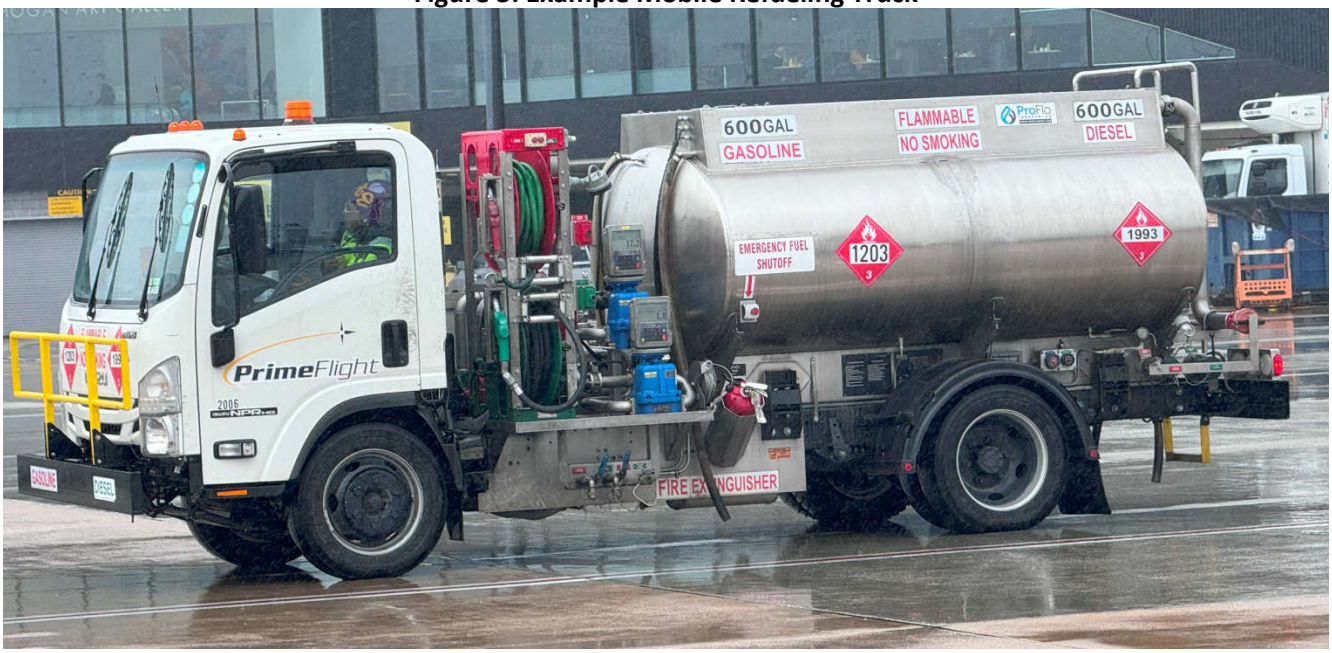
SECTION 5: OTHER SUSTAINABILITY BENEFITS

The Project aligns with several sustainability goals specified by Federal, state, and local agencies. These include, but are not limited to the following:

- Maryland's CSNA, which establishes a 60% GHG reduction target (from 2006 levels) by 2031, and net-zero emissions by 2045. The GHG reductions associated with the Project align its goals well with those of the CSNA.
- MDOT 2023 Climate Reduction Plan (CRP), which supports the requirements of the Maryland Climate Solutions Now Act of 2022 by outlining four pillars of planned emission reductions, transportation technology, vehicle miles traveled (VMT) reduction, congestion mitigation, and sustainable design, materials, and practices. The Project aligns well with the CRP's transportation technology pillar by using advanced, zero-emission technologies to reduce emissions in the transportation sector.
- The US DOT 2022-2026 Strategic Framework, which specifies that DOT intends to tackle the climate crisis by ensuring that transportation plays a central role in the solution by substantially reducing GHG emissions and transportation-related pollution, while building more resilient and sustainable transportation systems to benefit and protect communities. The Project supports this goal by reducing tailpipe emissions at the Airport and thus reducing the production of onsite GHGs.

A secondary benefit of the Project is the reduction of uncontained fuel spills. Nearly all GSE at the Airport is refueled by mobile tank trucks (i.e., wet-hosing). Figure 3 shows a mobile refueling truck at an Airport. Under current regulations, wet-hosing does not require the application of physical barriers for spill prevention, control, and containment (SPCC). GSE electrification completely eliminates this environmental risk.

Figure 3: Example Mobile Refueling Truck



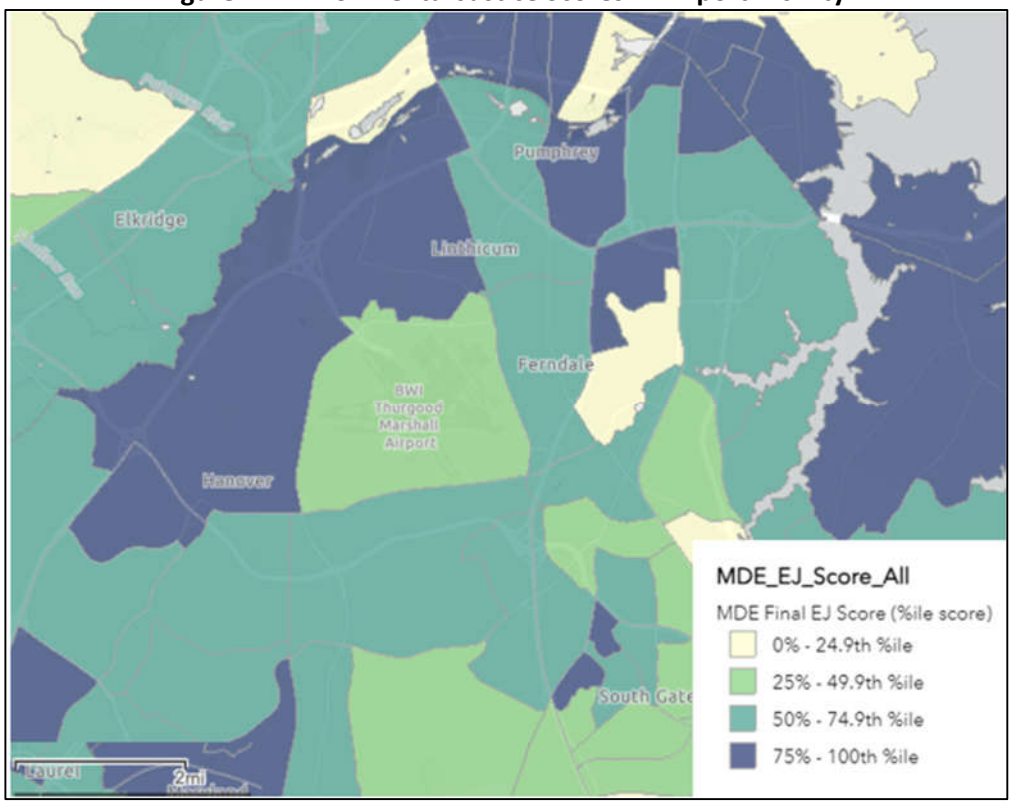
Source: RoVolus 2024

SECTION 6: BENEFITS TO DISADVANTAGED COMMUNITIES

The Airport is located in unincorporated Anne Arundel County, surrounded by several communities, including Linthicum Heights, Hanover, Ferndale, Severn and Glen Burnie. This area of the Baltimore Metropolitan Area is fairly prosperous overall, and includes a lower-than-average concentration of disadvantaged communities when compared with the metro area as a whole. The area includes only a single Census block group that is below the Federal median income level, and low proportions of historically disadvantaged populations and non-English speakers. While areas in close proximity to the Airport would largely not be considered disadvantaged, these neighborhoods do bear a disproportionate amount of environmental impact associated with the Airport, including exposure to increased noise and pollutants, such as SO_2 and $PM_{2.5}$.

As many adverse environmental impacts are borne by disadvantaged communities, the project will indirectly address the disproportionate negative environmental impacts of fossil fuel combustion on disadvantaged communities, consistent with environmental justice and civil rights authorities. Figure 4 below (from Maryland Department of the Environment's Environmental Justice (EJ) Screening Tool) shows areas of overburdened populations in the vicinity of the Airport (defined by the minority population exceeding 50%, the poverty rate exceeding 25%, and the limited English proficiency population exceeding 15%, and environmental burdens of pollution and hazardous exposures).

Figure 4: Environmental Justice Scores in Airport Vicinity

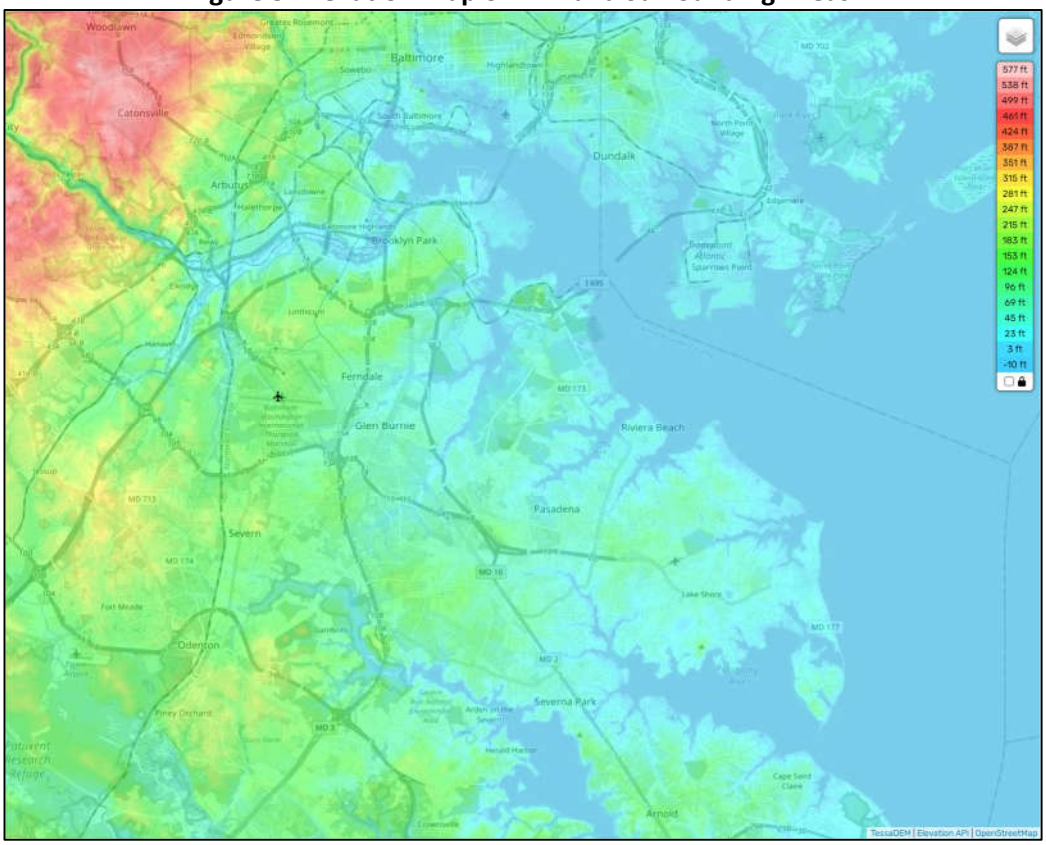


Source: Plotted from Maryland Department of the Environment's EJ Tool, Accessed 2024[2]

Additionally, these communities (as well as much of the metropolitan area as a whole) are low-lying and closely located to the Chesapeake Bay, as shown in Figure 5, resulting in additional exposure to potentially devastating natural disasters, such as floods and hurricanes. While the majority of emissions associated with the Airport take place as a direct result of aircraft operations, a noteworthy amount of these emissions are associated with on-Airport vehicle use. The replacement of conventional GSE with eGSE would result in a significant reduction of on-Airport vehicle emissions and would represent progress toward the region attaining compliance with the NAAQS.

[2] *https://mdewin64.mde.state.md.us/EJ/*

Figure 5: Elevation Map of BWI and Surrounding Areas



Source: Plotted from Topographic-Map, Accessed 2024[3]

The conversion to eGSE would also assist disadvantaged communities more distant from the Airport by lowering regional emissions and resulting in better regional air quality. In an airport ramp environment, workers are regularly exposed to a variety of fumes associated with fossil fuel combustion such as jet fuel, gasoline, and diesel. Many of these airport workers live in these more distant communities, and they would benefit by reduced exposure to harmful diesel and gasoline fumes associated with GSE.

SECTION 7: PROPOSED SCHEDULE

MAA intends to pursue an aggressive procurement schedule to ensure that the agency is prepared to execute a grant prior to the deadline of May 31, 2025. Table 3 shows each proposed milestone associated with the Project, including both pre-and post-grant execution activities. As shown in Table 3, MAA is currently developing the scope requirements to proceed with project design-bid-build delivery process to implement this project as per the project schedule above.

Execution of electric enabling and charger procurement activities will begin no later than 15 days following selection of the firm. This will allow MAA a year to receive all of the chargers as well as giving the agency approximately 18 months to complete all required enabling activities and prepare the areas of the airfield to accommodate the installation of the chargers. Chargers would begin to be installed no later than December 2025, but could begin to be installed earlier with proper staging of electric enabling and expansion work. Specific times and dates of charger installations on the Airport would be coordinated based on operational

[3] *https://en-us.topographic-map.com/map-vcf1h/Anne-Arundel-County/?center=39.1717%2C-76.62487&zoom=12*

requirements. MAA will ensure, via contractual language, that the winning firm completes all installation and replacement activities by May 31, 2027.

Table 3: Proposed Schedule

Schedule Element/Milestone	Estimated Start Date	Estimated Finish Date
Preliminary data collection	May 1, 2024	July 31, 2024
Design Engineering	August 1, 2024	January 1, 2025
Procurement	January 1, 2025	May 1, 2025
Review of bids, execute grant agreement with FAA and selection of firm(s)	May 1, 2025	May 31, 2025
Purchase and delivery of chargers procurement	June 1, 2025	May 31, 2026
Complete electrical capacity/enabling projects	June 1, 2025	May 31, 2026
Complete charger installations	May 31, 2026	December 31, 2026

Source: RoVolus, April 2024.

SECTION 8: REGULATORY REVIEWS

No changes to the Airport Layout Plan or airspace reviews are required. National Environmental Policy Act (NEPA) review is expected to be addressed with a Categorical Exclusion as specified by FAA Order 1050.1F.

SECTION 9: FINANCIAL PLAN

There are two components to the financial plan - capital cost and ongoing operational costs.

The capital cost covers the cost of purchasing and installing the chargers, as well as associated electrical upgrades required to support the on-Airport charging network. It requires a 25% local match to support the FAA grant and MAA will use local funds to provide that match. All capital expenses associated with the acquisition of eGSE will be borne by airlines.

The eGSE fleet will result in a higher level of Airport electricity usage and the charging ports will require routine maintenance. These costs will be including in the Airport's operational budget and will be recovered directly from the airlines using the chargers. This will be enabled by the inclusion of electronic monitoring equipment that reports on the electric consumption of each individual piece of eGSE.

While the eGSE fleet will result in a higher level of Airport electricity usage than would be expected with the current conventionally-fueled GSE fleet, the overall cost of operating eGSE over the life cycle of the equipment is expected to be lower than conventionally-fueled GSE. Additionally, eGSE engines tend to have less complexity and moving parts than diesel- and gasoline-powered engines, and the reliability of eGSE has been found to be at least as reliable as conventional GSE. This is reflected by the eagerness of airlines to shift to eGSE, as well as the corresponding willingness of these airlines to absorb the capital costs associated with switching over to eGSE. These costs not only include the equipment itself, but also additional training and

procedures that must be developed to ensure that the eGSE fleet is accessible and chargers are utilized in a way that guarantees eGSE will be available when needed.

SECTION 10: PROJECT FLEXIBILITY

The scope and potential cost of the Project has been developed based on the most current information available. However, neither a request for information on equipment and vendors, nor any formal construction bids have been solicited for this work. In the current environment of price instability in some sectors, it is possible that the total cost of 250 chargers could be higher or lower than anticipated. As a result, the Project has been designed to be scalable to match actual bids and/or available funding. However, given that there are approximately 700 pieces of GSE that could be converted to eGSE at the Airport, a marked decrease in the number of chargers funded would slow eGSE uptake among Airport operators and correspondingly result in an elongated timeframe of elevated local emissions in an area that does not meet the NAAQS for multiple pollutants. It could also result in a delay in meeting Federal, state, local, and agency goals concerning climate change and sustainability.