

The scope of work for the BWI Marshall Airport Roadway, Multi-Modal, and Cargo Modernization Planning Study (Study) provided below details the technical and engineering aspects of the Study and includes work products to be developed. The Study does not have any separable components with independent utility. To fully realize the long-term benefit of coordinated and efficient implementation of improvements, the entire study area should be evaluated and planned for as one interconnected system.

PURPOSE OF THE STUDY

The BWI Marshall Airport Roadway, Multi-modal and Cargo Modernization Planning Study is needed for MDOT MAA to adapt and modernize the airport infrastructure and surrounding state and county roadways to the changing public ground transportation needs as well as the evolving local market and commercial development patterns particularly as it relates to air cargo and surface delivery logistics. The Study will address the following key items to ensure that BWI Marshall enhances economic opportunity and remains the “easy come, easy go” airport of choice in the Baltimore-Washington region:

1. Capacity and circulation along the inner loop roads including upper and lower levels of the terminal
 - Objective is to meet capacity, optimize passenger experience, enhance traffic safety and reduce greenhouse gas emissions from the mix of personal, commercial, transportation network company (TNC), and transit vehicles.
2. Capacity and circulation along the approach and outer Airport Loop roadways including I-195, Aviation Boulevard/MD-170 and Dorsey Road/MD-176
 - Objective is to meet the growing mix of personal and freight traffic to and through the communities surrounding BWI Marshall Airport and major local employers (e.g. Northrop Grumman and Amazon).
 - Roadway improvements are needed to rectify known level-of-service deficiencies, enhance traffic safety, and optimize access with consideration of latest local land use plans and strategic airfield development plans.
3. Cargo and support facility development in the southwest quadrant of the Airport
 - Currently undeveloped, the 400+ acre southwest quadrant of the airport campus has been held in reserve for future aeronautical and commercial development. Market and capacity demands are now triggering the need for the phased development of that area sooner than later. A flexible development roadmap that identifies carrying capacity and site constraints as well as utility and roadway access demands is needed to maximize employment potential and economic health of the region and the State of Maryland.

- The site planning will have to proactively balance the protection of environmental resources, particularly water quality, as streams and forest stands traverse the site and support nearby ecologically valuable Wetlands of Special State Concern.
- 4. Multi-modal connectivity, Ground Transportation Center, and public parking
 - Personal travel preferences and technology are changing. From connected and autonomous vehicles to TNC and shared vehicle platforms to high-speed trains; a modern parking plan for BWI Marshall to accommodate these changes is needed.
 - A multi-modal ground transportation center has been a longstanding objective for BWI Marshall. This facility will help segregate vehicle types to optimize safety, efficiency and capacity within the terminal area and allow for expanded connectivity through light rail improvements, automated people movers, and possibly the DC-Baltimore MAGLEV line currently being evaluated by the Federal Railroad Administration and MDOT.
 - Efficient and safe pedestrian/baggage connectivity between the Ground Transportation Center and the expanding terminal will need to be planned and programmed to enhance on-time performance and customer experience while meeting federal airport security and screening mandates.

Specific facilities that will be reviewed as part of the study include:

Roadway, Multi-Modal:

- Terminal area “gateway” access, circulation and capacity enhancements
 - Public and commercial roads
 - Rail rights-of-way (Maryland Transit Administration [MTA] Light Rail, Amtrak/Maryland Area Regional Commuter [MARC] Train, MAGLEV)
 - Fixed-or-dedicated guideway circulators including autonomous shuttles, automated people-movers, and their rights-of-way
 - BWI Hiker/Biker Trail access (pedestrian, bicycle, scooter) and connection to the Baltimore-Annapolis Trail which is part of the Eastern Greenway Trail
- Terminal curbside
- Commercial and public transportation facilities
 - Ground Transportation Center (future facility which may include several of the following)
 - Airport bus loading/unloading, staging, refueling, electric charging and maintenance
 - Fixed-or-dedicated guideway circulator docks or stations, power/refueling and maintenance
 - Taxi and TNC loading and staging
 - Commercial shuttle and charter bus loading and staging
 - Rental car ready/return, quick-turnaround service, and vehicle storage and maintenance

- Rail stations and rights-of-way (MTA Light Rail, Amtrak/MARC, MAGLEV)
- Bike lockers, shared bike/scooter docks
- Private vehicle facilities
 - Public parking (hourly, valet, daily, express, long term, off-airport operations)
 - Public vehicle staging (cell phone lots)
 - Employee parking

Cargo Development (area could include a mix of cargo, airport support and commercial development):

- Cargo Buildings
- Ground Service Equipment facilities
- Cargo apron/ramp operations
- Airside access/taxiways and planned future runways
- Landside access/roadways
- Truck loading/staging
- Employee parking
- Utility infrastructure
- Stormwater management
- Environmental management area
- MDOT MAA Maintenance and Snow Removal Equipment Complex
- Future Materials Acquisition Center (MAC) Building
- Ancillary commercial development

Access and Circulation in the Airport Vicinity:

- Airport Loop circumferential (Airport Boulevard, Dorsey Road and their intersections/interchanges)
- Arterial entrances and connections including Elkridge Landing Road/Air Cargo Drive, South Camp Meade Road, Andover Road, Aaronson Drive, Allwood Drive, Digiulian Boulevard, Mathison Way, access to High Flyer Phase II site, Stoney Run Road/Hanover Road, New Ridge Road, Amtrak Way
- BWI Hiker/Biker Trail

Regional Access:

- Interstate and freeway access (I-195, I-97, Baltimore-Washington Parkway)
- Designated truck routes
- Rail services and rights-of-way (MTA Light Rail, Amtrak/MARC, MAGLEV)

New and/or Disruptive Technologies/Trends and Related Changes in Transportation Behaviors:

- Alternative energy sources including alternative fuels and electric including the use of photovoltaic (PV) solar panels
- Big data, big data analytics, and the use of artificial intelligence (AI) applications including collection of data through cell phone analytics to track traffic patterns and trip origins
- Connected and Autonomous Vehicle (CAV), autonomous shuttles, automated people movers, Shared Autonomous Electric Vehicle (SAEV) technologies and similar combinations
- Accommodation of future Urban Air Mobility such as electric vertical takeoff and landing (eVTOL) aircraft connecting to points within the Baltimore-Washington region
- Internet of Things (IoT) applications and businesses including TNCs and car/vehicle sharing
- Mobility as a Service (MaaS) trends
- Net-zero/net-positive technologies and strategies (including sustainability and resilience)
- Smart airports (smart cities)
- Smart mobility
- Vehicle-to-Infrastructure (V2I) technology and communication
- Emerging urban aerial mobility technologies

WORK TASKS

1. Project Initiation

1.1 Goals and Objectives Setting

- Define the program in terms of its purpose, perceived benefits and desired outcome, including optimized passenger experience, enhanced traffic safety, reduced greenhouse gas emissions, enhanced access to BWI, increased job opportunities, resource protection, operational reliability/resiliency, regional economic health/strength, and compatible land use.
- Identify and describe fundamental elements of the program, including roadway and ground access development opportunities, cargo complex, existing MDOT MAA facilities, stormwater management systems and environmental conservation areas.
- Prepare project-specific goals and objectives and Measures of Effectiveness (MOEs) and verify that goals are aligned with BWI Marshall's operational objectives in order to gain consensus and contribute to the overall MDOT MAA organizational strategy. Cross-

referencing and identification of potentially relevant MDOT, BMC-BRTB, other transportation agency and neighboring county high-level goals and objectives, (examples: MDOT's [Connecting our Future Regional Transit Plan](#) and [Maryland State Freight Plan](#))

1.2 Stakeholder Mobilization and Partnership

- Identification and decision on methods/forums for continuing involvement of stakeholders
- Conduct stakeholder interviews and gather input and consensus on the program including stakeholder concerns and suggestions
- Engage environmental regulatory agencies for early input on environmental impacts and potential mitigation strategies.

1.3 Project Kickoff Workshop

- Plan, coordinate, and conduct kickoff meeting(s) with MDOT MAA staff and stakeholders
 - Present project scope and develop specific goals and objectives with stakeholders
 - Establish working relationships with stakeholders
 - Given the wide array of stakeholders, multiple stakeholder kick-off meetings may be needed to focus on specific program elements (i.e., roadway, cargo facilities, environmental management)

Outcomes

- *Sufficient understanding of the project conditions and objectives*
- *Background information to shape the study and support the process*
- *Detailed information about the project's requirements*
- *Stakeholder input and consensus on the work to be performed*

2. Targeted Public Engagement

- Determine the transportation challenges and needs of Airport and nearby business employees, particularly from employees traveling from areas of persistent poverty (i.e., Baltimore City). Collaborate with MDOT Commuter Choice Program to identify employee travel needs.
- Perform targeted outreach to impacted populations with the assistance of business outreach partners (BWI Business Partnership, etc.) and MDOT's Commuter Choice Program. Outreach may include but is not limited to: surveying Airport employees (badge holders) and developing an interactive webpage for Airport and area employees to provide input on travel preferences, needs and obstacles they face as it relates to commuting.

- Create a demographic profile of Airport and area employees, including where they travel from.
- Utilize demographic profile and input from employees to inform the development of roadway and multi-modal concepts.

3. Data Collection/Existing Conditions

3.1 Inventory/Review Existing Studies/Data Collection

- Review adopted plans and agency guidance (internal: Airport Master Plan including Terminal Area Plans, Inbound Roadway Study, support area plans, Technology Master Plan, BWI Marshall business plans; external: County transportation and land use plans, Baltimore regional six-year Transportation Improvement Program [TIP] and Constrained Long-Range Transportation Plan [CLRP] MAGLEV Draft EIS, and Resource conservation and management plans
- Obtain the following data: CADD and GIS files of airfield, terminal, curbside, inbound roadway, ground transportation and parking infrastructure; trip and passenger demographics (Metropolitan Washington Council of Governments [MWCOG] Air Passenger Surveys, WBA Research Surveys); existing traffic studies and traffic counts; 2040 travel demand model from the Baltimore Metropolitan Council [BMC] Long Range Plan; the latest traffic counts from Anne Arundel County and MDOT; AVI/LPR data / Ground Transportation counts and fees/revenue ; TNC pick-up/drop-off and heat maps; Historical passenger activity; Aviation forecast (Origin and Destination [O&D] and connecting passenger and operations) and gated flight schedules recently developed for other studies; On-airport employee populations by airport sub-zone; Employee parking space count; Historic parking transactions by day/time and duration; Parking lot occupancies (peak and overnight); existing VISSIM traffic simulation models; facility condition assessments – especially garages, elevated curb, and the Central Utility Plant (CUP)

3.2 Traffic Data Collection

- 1. Baltimore Metropolitan Council (BMC) Long Range Transportation Plan:** Obtain the latest 2040 travel demand model.
- 2. Traffic Counts:** Obtain the latest traffic counts from Anne Arundel County and the MDOT State Highway Administration (SHA) Internet Traffic Monitoring System (1-TMS) website within the defined study area. The analysis will attempt to obtain anecdotal truck traffic demand from other airports where Amazon operates a robust air cargo operation. The Study will collaborate with potential cargo operators for truck traffic data. Cell phone “big data” may be utilized to collect traffic counts at intersections and trip origins.

3. **Complete Additional Traffic Counts:** Counts will be conducted at all study intersections (up to five counts), including Mathison Way and MD 170. All counts will include bicycles and pedestrians.
4. **Terminal Area Counts:** Using cell phone “big data” collect information on traffic counts, dwell times, vehicle travel times and trip origins. This data may be supplemented as necessary with manual traffic surveys.
5. **Model Calibration Field Reviews:** Conduct two (2) site visits to collect model calibration data, including but not limited to travel times, operational issues, queues and intersection operations.
6. **General Field Review:** Conduct one (1) field review for overall field conditions for existing conditions.
7. **Identify Background Developments and Roadway projects:** All approved background developments will be determined from MDOT SHA 05 traffic and Anne Arundel County. All roadway projects, which are expected to be complete by the assumed opening year, will be identified and confirmed.
8. **Review Latest MDOT MAA Plans:** Assemble and review all studies that include approved development in the Southwest Quadrant of BWI Marshall Airport and throughout the defined study area to confirm the latest plans are incorporated into this study.
9. Additional data collection effort as determined necessary to supplement existing data, may include:
 - Regional model
 - Roadway volumes (traffic counts for up to 5 additional intersections throughout the airport, site visits and field reviews)
 - Updated curbside vehicle classification, dwell and occupancy surveys
 - Cell phone and commercial vehicle hold lot occupancy and traffic volumes

3.3 Establish Existing Conditions

- Traffic Patterns and Existing Airport Access: Identify existing airport traffic patterns, on-Airport destinations, airport access routes, connections to regional roadways/transportation and access modes
- Roadway and Multi-modal Infrastructure: Develop a base map depicting the roadways, lanes, transit connections and terminal interface
- Cargo Development Location and Boundary: Identify and describe the proposed development site in relation to the terminal facilities, airfield, the airport boundary and surrounding environs.
- Cargo Site Elevations and Drainage: Develop a topographic base map showing, orientation of terrain features and surface water flow and distribution; and drainage divides.
- Land Use and Cover Types: Develop a land use map with corresponding acreages and hydrologic soil types; this map will be the basis for the preliminary hydrology analysis.

Outcomes

- *Preliminary site investigation of existing conditions*
- *Site, roadway and transportation base maps*
- *Existing baseline traffic and site conditions*

4. Forecasting and Airport Access Demand Scenarios

Using FAA approved forecasts of future aviation passenger and aircraft operations activity, an estimate of future vehicle volumes and transit ridership demand will be developed. This demand will be used to determine facilities needed to accommodate demand (e.g. roadway infrastructure, parking, transit facilities) or shift airport access modes.

- Using existing aviation passenger and aircraft operations forecasts, determine baseline forecasts to use for each landside facility for mid-range 2030 timeframe. Forecasts will be based on FAA approved forecast specific to BWI or FAA Terminal Area Forecast (TAF) as available and derivative forecasts will include gated flight schedules as available.
- Develop specific forecast components and growth assumptions for each landside component:
 - Curbside – Private, TNC, taxi and other commercial vehicles
 - Commercial vehicle holding lots
 - Access and circulation roadways
 - Public, employee parking and cell phone lots
- Conduct workshop with MDOT MAA and stakeholders to:
 - Determine/agree on level-of-service parameters for each landside facility, focusing on what is an acceptable level of service during peak periods and what that looks like (e.g. how much double parking)
 - Establish potential forecast scenarios; possibilities include:
 - Mode share variations based on the maturing or evolution of the TNC markets and related changes in rental car, taxi or private auto use
 - Changes in private car ownership and trip patterns based on emerging vehicle technologies
 - New or improved high-speed rail (MAGLEV)/transit services
 - New or emerging technologies or other disruptors such as Turo and CAVs
 - Impacts of transatlantic hub for Southwest Airlines (prepare a gated flight schedule forecast specific to this scenario as a strong transatlantic hub impacts peak hour traffic volumes)
 - A net-zero / net-plus airport landside, or other concept emphasizing sustainability

5. Site Development Planning Parameters

5.1 Proposed Development and Land Use Patterns

- Evaluate the project sites planned for the following facilities and identify development related issues or constraints, if any:
 - Terminal roadway projects
 - I-195 connection projects
 - Terminal complex connections, including MAGLEV and Ground Transportation Center
 - Parking facilities
 - Air Cargo Complex
 - MDOT MAA Maintenance and Snow Removal Equipment Complex
 - Materials Acquisition Center
 - Airfield Development, including taxiways proposed to support cargo complex and connection to future runway 10R-28L
 - Airfield Support Facilities: fuel, deicing, airfield lighting electrical vault, Air Navigational Aids (NAVAIDS)

5.2 Airfield Setbacks and Height Restrictions

- Evaluate proposed development areas for compatibility with the current Airport Layout Plan (ALP) including the following applicable airport design standards (i.e., design aircraft, FAA clearances, FAA Part 77/ Terminal Instrument Procedures [TERPS] airspace analysis, NAVAIDS, etc) and identify development-related issues or constraints, if any

5.3 Roadways and Traffic

- Evaluate the proposed development areas in terms of existing and potential roadway access to the site; identify development-related issues or constraints, if any. Initiate the traffic impact study (Task 7) with a focus on impacts on Dorsey Road, Aviation Boulevard loop, intersections and the BWI Hiker/Biker Trail.

5.4 Utilities and Infrastructure

- Research existing utilities and distribution systems needed to support the *landside* elements of the project, i.e., air cargo complex, MDOT MAA maintenance, MAC building, etc.; coordinate with local utility providers as needed to support the assessment; identify development-related issues or constraints, if any.
- Discuss the utilities and distribution systems required to support the *airside* elements of the project, i.e. electrical vault, navigational aids, fuel storage, deicing area, etc.; identify development-related issues or constraints, if any.

5.5 Environmental Conditions

- Compile existing published information, previous studies, and MDOT MAA GIS data related to the presence/absence of biotic resources, water resources, hazardous materials, and historic resources.
- Compile existing information on the *green infrastructure* system of interconnected hubs and corridors within the project areas and identify the ecosystem services provided by the various habitat communities represented within the hubs and corridors.
- Provide a recommendation for managing surface waters (including adjacent wetlands of special state concern) and groundwater and evaluate their compatibility with site development.
- Develop a stormwater management plan to capture and treat stormwater runoff on-site; a storm drain network will be designed to non-erosively convey runoff throughout the site to a stable outfall; this plan will include pollutant reduction and removal facilities with careful consideration for Nitrogen, Phosphorus, and Suspended Solids; this plan will incorporate considerations for hotspots and additional pollutants such as oil, petroleum, and heavy metals along with recommendations their reduction or removal.

5.6 Preliminary Engineering

- Research and compile information related to the overall site development including existing and future facilities depicted on the ALP that are potentially affected by the program.
- Identify green technologies that could influence planning decisions, including opportunities for solar and geothermal as well as identification of target Leadership in Energy and Environmental Design (LEED) standards and opportunities.
- List and summarize factors determined above that could limit the range of planning/design solutions.

Outcomes

- *Thorough review and assessment of the land for development*
- *Value of the site is expressed in terms of development potential*
- *Challenges are identified in as much detail as possible during the early stages of the program*

6. Planning Parameters and Future Requirements

- Calculate demand and associated transportation infrastructure requirement for each roadway and multi-modal facility (e.g. loop roadways, intersections, interchanges, curbsides, parking, rental car, transit infrastructure) based on baseline forecast and forecast scenario(s) determined in Task 4.
- Conduct demand-capacity analysis for existing transportation infrastructure and determine associated operational level-of-service projections. Identified deficiencies will inform the future concept development in Task 8.
- Review existing VISSIM traffic model for the terminal roadways and update with current passenger forecast projections and current operations (e.g. TNC activity). If determined necessary during stakeholder coordination, update VISSIM model for one or more forecast scenario.
- Meetings with the relevant agencies to establish their perspectives on airport access, projects or challenges that can affect airport access, and the agencies' views where partnership with MDOT MAA for advocacy (advocacy for any of specific projects, funding/financing legislation, technology adoption, etc.) would be meaningful.
- Meetings with the relevant economic development groups such as the BWI Partnership to understand the development communities' views on successes, challenges, and priorities for regional access to BWI.
- Identify the full build-out capacity of the airport terminal area, access and Southwest Quadrant site, including the maximum development potential.
- Identification of proposed projects in the airport's strategic interests, or unsolved constraints and congestion that threaten growth of the airport.
- Identify the general location and space requirements for the major elements of the cargo complex: Airfield Access and Taxiways; Aircraft Parking and Cargo Apron; Cargo Terminal Buildings; GSE Facility Maintenance; Truck Docking; Truck Staging; Vehicle Access/Egress; and Employee Parking.
- Using information from the Master Plan/ALP and previous planning studies, identify the general location and space requirements for the MDOT MAA maintenance complex, materials acquisition center, and airfield support facilities (deicing area, electrical vault, NAVAIDS)
- Identify airside/landside transition areas, security fence lines and Security Identification Display Area (SIDA) requirements.

Outcomes

- *Basic building elements, locations and functional relationships to the site*

7. Traffic Impact Study for Cargo Development

Prepare a traffic impact study for anticipated development in the Southwest Quadrant of the Airport, also considering the expected increase in truck and auto traffic generated by the ongoing expansion at the mid-field cargo complex, and the anticipated transit oriented and mixed-use development in the corporate area along Corporate Center Drive. Anticipated traffic will be mixing with the traffic from the patrons at the Consolidated Rental Car Facility (CRCF) and will stress the roadway system in that area to the extent that roadway system improvements may be necessary in the near-term for safety and to ease congestion. The traffic impact study will analyze adjacent, off-airport roadways and intersections to plan for an increase in cargo traffic associated with the cargo development.

7.1 Develop Existing Conditions, Volumes and Conduct Capacity Analyses

- Based on data collected in Task 3, develop existing traffic volumes for the study area.
- A high-level site plan will be developed showing proposed access points, and the size and shape of the site pad, based on data provided by the MDOT MAA.
- Capacity analyses will be conducted for the study area using Synchro for all signalized intersections and VISSIM for freeways for the AM and PM weekday peak hours. The Synchro model will be calibrated based on performance data and field calibration data. Highway Capacity Manual (HCM) output for the study area intersection Levels of Service (LOS) and delays will be summarized.

7.2 Develop Opening Year Background Volumes and Conduct Capacity Analysis

- Determine the background growth rate from the latest BMC model, determine trip generation for approved developments in the vicinity, and determine the background traffic for the study area. Conduct capacity analyses for this condition and include any approved roadway improvements.

7.3 Site Trip Generation and Opening Year Total Traffic Conditions

- For the development of the Southwest Quadrant, trip generation rates will be obtained from the ITE Trip Generation Manual (10th Edition).
- Estimate total traffic volumes for the study area and conduct a capacity analysis.

7.4 Develop Improvement Alternatives

- Roadway deficiencies (fatal flaws) will be identified.
- Develop and analyze intersection improvements to mitigate traffic operations per Anne Arundel County APFO requirements.
- Determine roadway improvements to mitigate future conditions of roadway congestion.

Outcomes

- *Three (3) traffic volume data sets - existing, background, and total traffic*
- *Three (3) traffic modeling simulations - existing, background, and total traffic*
- *Preliminary concepts for each of the areas for opening day*
- *Data collection, Concept Evaluation and Final TIS memo documenting recommendations*

8. Concept Development and Screening/Refinement

8.1 Concept Development

Terminal Area Facilities

- Identify currently-accepted long-range landside concepts (ground transportation center, automated people-mover, MAGLEV station, etc.) and ensure these long-range concepts are not blocked or hindered by the bridging concepts; rather, the bridging concepts as a phase or a maintenance-of-traffic step should support realizing these long-term options. Concepts will review opportunities by with and without the proposed MAGLEV.
- Develop terminal landside concepts addressing each of the subject facilities (up to 12 total) and optimization of each; may include operational alternatives.
- Conduct workshop to review potential concepts and develop new concepts.
- Evaluate concepts utilizing screening criteria (using MOEs and evaluation criteria), may include:
 - Passenger and vehicle safety, including reducing opportunities for vehicle-vehicle or vehicle-pedestrian conflicts
 - Passenger experience including wayfinding/orientation
 - Terminal interface (curb access, baggage handling, security, skywalks, tunnels, airline amenities including baggage check, ticketing and security at de-centralized locations such as the ground transportation center)
 - Adaptive re-use of new garages and ground transportation center when transportation needs change and new technologies, such as autonomous vehicles become common, considerations may include storage for future autonomous vehicle fleets or higher floor-to-floor heights in garages to accommodate commercial uses
 - Ability to offer interim and long-term benefits
 - Resiliency/flexibility (cross-testing against the assumptions of the various strategic scenarios)
 - Sustainable infrastructure and development practices (phased re-use of infrastructure and incorporation of green transportation options such as EV charging, bicycle connections)
 - Revenue generation/grant/P3 potential
 - Phasing/constructability

Regional Access

- Develop four-to-five terminal gateway approach alternatives (organized around alternative alignments for I-195 east of Route 295/BW Parkway and including arterial and local streets in an approximate 1/2-mile wide corridor including Aviation Boulevard, Terminal Road, Elkridge Landing Road and Elm Road). Alternatives will review:
 - Alternative road, intersection and interchange improvements needed to meet forecasted demand at appropriate levels-of-service.
 - Road and transit re-alignments triggered by airfield expansions or safety improvement requirements.
 - New or realigned connections from the local network to the Airport Loop (such as Hanover Road).
- Consideration of plans and predictions for the future of major highway and rail access from the major interstate corridors that serve the airport.
- Review of current MDOT, BMC-BRTB, and Anne Arundel County transportation plans to identify goals, objectives, capacity constraints and future improvements that are relevant for BWI Marshall access.
- Development of sub-variant options of the emerging recommended terminal landside and regional access concept (selection of specific options such as light rail transit (LRT) station location, garage size and function, landside circulator alignment and/or technology, MAGLEV station) to identify features that protect flexibility or to establish a decision-tree of cross-road events and trade-offs for choosing among the sub-variants.

Cargo Development Facilities

- General Arrangement of the Buildings: Establish the building footprint/functional area plan for the proposed cargo building(s) and support facilities (provided by the MDOT MAA). Site adapt existing building footprints for MDOT MAA maintenance and the MAC facilities; determine whether the proposed location is a viable alternative. Review options to provide the maximum carrying capacity of the site with flexibility in usage, growth and development phasing to accommodate differential growth of operators and stay nimble to accommodate real-time needs.
- General Arrangement of the Site: Provide a generalized site plan for the cargo terminal area, MDOT MAA maintenance, MAC building, and ancillary commercial development. Identify potential locations for stormwater management facilities to capture localized runoff to the maximum extent practicable. Define the extents of the Environmental Resources identified under Task 5.5 and use the information to develop a comprehensive electronic file (CADD or GIS).
- Incorporate proposed and future airfield taxiway improvements and locations for support facilities including the deicing area, NAVAIDS relocation, and the airfield lighting/electrical vault.

- Develop options for access roadways to/from proposed facilities and options for airside and landside utility connections and alignments.
- Provide a conceptual layout of stormwater management practices that are compatible with the goals of the project; *identify means/measures to achieve sustainable site design through Low Impact Development (LID) practices.*
- Provide a conceptual layout for the environmental management/mitigation area. Continue coordination with environmental regulatory agencies for buy in and input on conceptual stormwater management and mitigation areas.

Roadway Intersections

- Develop two (2) concepts in CADD for mitigation improvements to the study intersections. Concepts will be coordinated with the overall site plan to ensure that access points and improvements will complement the overall function and functionality of the site.

MDOT MAA and Stakeholder Workshop

- Conduct a one-day workshop with MDOT MAA staff and stakeholders to review concept plans and alternatives and to gain consensus on preferred concepts. Refine concepts and their preliminary evaluations based on MDOT MAA and stakeholder review. Select 4-5 concepts or concept families to carry forward, focusing on optimization of facilities.
- Present the short-listed alternatives and concept recommended by the project team to MDOT MAA and MDOT executive management for selection and eventual adoption

8.2 Refinement and Evaluation of Concepts

Terminal Area Facilities and Regional Access

- Further detail and refine selected short-list alternatives. Provide technical options to preserve and protect for future major projects with minimal up-front investments.
- Analyze short-listed alternatives, update review of screening criteria and additional analysis which may include: VISSIM traffic modeling for roadway and curbside concepts; high-level environmental assessment; and cost estimates.

Cargo Development Facilities

- Assess the general arrangement of the buildings and the site; adjust the planning as needed to improve relationships, resolve potential conflicts to achieve an optimal layout plan; note: site analysis takes priority with the facility as the best-fit template.
- Evaluate the site layout/options for connecting to utility services.
- Develop and analyze intersection improvements to mitigate traffic operations.

- Evaluate all available approved stormwater practices and provide justification for the stormwater management layout chosen; comparable alternatives will be provided where present.
- Incorporate the Environmental Resource file into the preliminary site/sketch plan and identify the impacts to the environmental resources.

Roadway Intersections

- Compile and evaluate the preliminary concepts for opening day including a concept level cost estimate intersection mitigation improvements. Summarize the potential environmental impacts from prior and/or ongoing environmental studies by MDOT MAA.

Refined Concepts

- Prepare a sketch plan depicting the major elements of the project in relation to the site boundary and to the airport
- Review the general arrangement of proposed facilities for compatibility with phased development, future proposed facilities and expansion areas.
- Discuss the engineering feasibility of development concepts for the airside, cargo terminal and landside elements of the program
- Identify and evaluate locations for the airside elements including runways, aprons, taxiways, support facilities and relocating FAA infrastructure necessitated by the program

Outcomes

- *Site/sketch plan depicting the general arrangement of the airside, terminal, and landside elements of the program including stormwater management/BMPs and environmental management/mitigation areas*
- *MDOT MAA/stakeholder input, general consensus and buy-in on the Site/Sketch plan for detailed analysis/preliminary engineering*

9. Preferred Concept and Cost Estimate

9.1 Preferred Concept

- Develop detailed layout depicting the preferred terminal access and regional roadway connections to improve airport access and connection to the regional roadway network and adjacent communities.
- Documentation and graphics of the recommended terminal area alternative by phases and demonstrate flexibility with the strategic scenarios.

- Documentation and graphics of the recommended vicinity and regional access projects including advocacy positions, and a strategy and plan for interagency coordination and partnering that builds/maintains wider support and commitment to implementing projects outside of MDOT MAA's property or control.
- Develop preliminary engineering information (graphics, CADD, possible 3D renderings of the terminal area) of the preferred concept to support the cost estimate; assessment of environmental feasibility and future permitting; and for use in revising the ALP and to submit to FAA for federal approval, as needed. Present the recommended concept to MDOT MAA.
- Due to the complexity, scale of the cargo development project, and associated stormwater management requirements, preliminary design will be developed to a 15 percent design document level. Finalize the functional plan for the below elements and identify any outstanding or unresolved issues or concerns related to the planning, engineering, design, permitting, or installation of elements required to implement the project.
 - Site Grading and Drainage: develop a rough grading and drainage plan for the buildings and the site; estimate finished floor elevations; estimate runway/taxiway pavement elevations; estimate the limits of disturbance and the quantity earthwork required to implement the project.
 - Stormwater Management: finalize the functional plan for site drainage and control measures that can be taken to mitigate changes to the quantity and quality of storm runoff caused by the project; due to the presence of wetlands of special concern and the need to assess project-related permit load/feasibility; the project team will prepare hydrologic analyses for the site, identifying points of study, compute required stormwater treatment volumes and proposed specific stormwater features for the proposed development; it is likely that numerous BMPs will be proposed, such as sand filters, gravel wetlands, infiltration facilities, and proprietary devices; for the purpose of this task, stormwater management devices will be designed to an approximate 15 percent level; this will include site grading, BMP sizing, hydrologic and hydraulic (H&H) modeling, and required computations; Low Impact Development practices will be identified and incorporated to the degree practicable.
 - Utilities Assessment: Finalize the utilities analysis and refine the proposed layouts for electricity, gas, water, sewer, and communications lines; revise the plan set of drawings accordingly.
 - Roadways & Traffic: Finalize the traffic study and refine the proposed layouts for improvements to Dorsey Road, Aviation Boulevard Loop, intersections and the BWI Hiker/Biker Trail.
 - Environmental Management and Mitigation Measures: Analyze the effects of the site development plan on the environmental resource information compiled under Task 3; identify the primary environmental regulatory agency responsible for managing each

resource; identify avoidance and minimization measures, BMPs and mitigation measures for unavoidable impacts.

9.2 Preliminary Cost Estimate

- Develop an order of magnitude cost estimate (up to 15 percent) for recommended roadway and cargo concept plan, including requisite airfield improvements and support facilities required to implement cargo development concepts; i.e., estimate the cost to provide a "pad-ready site" for building construction.

Outcomes

- *Final concept layout/ development plan*
- *Estimated earthwork and quantifies*
- *H&H analysis/stormwater management plan/Low Impact Design measures*
- *Utilities layouts*
- *Traffic Impact Study/recommendations*
- *Environmental impact analysis/mitigation measures*
- *Updated project feasibility based on preliminary engineering information*

10. Implementation and Impact Analyses

10.1 Implementation: Recommended Capital Actions/Program

- Recommended capital actions/program for 0-5 years, 5-10 years, and 10+ years
- Financial feasibility summary showing expected costs, revenue gains, grants and potential P3 or third-party investments.
- Description of high-level environmental consequences with recommendations for NEPA approach in terms of bundled projects by priority for FAA review if needed.
- Identification of any follow-on project-specific detailed planning studies and project definition programs or open issues.
- Generate a phased development plan for landside and cargo project sites; break the projects into logical work tasks, identify critical path items, and calculate the project duration.
- Post-study actions for interagency coordination of jointly-sponsored projects.

10.2 Impact Analysis

- Fiscal: Complete a financial feasibility analysis with expected capital and operating costs, and potential revenue gains for landside improvements and cargo development. Evaluate proposed development with regard to life cycle cost implications and options to optimize

the phasing of recommended improvements to cost effectively replace aging infrastructure and maximize the useful life of Airport investments.

- **Economic:** Complete an economic impact evaluation, including assessing potential job growth resulting from the construction of airport projects and operation of a large cargo complex, as well as the growth of local businesses to support an increase in employees (i.e., restaurants, gas stations, shops, etc).
- **Environmental:** Using information collected and developed under Task 5.5 and Task 8, summarize potential environmental impacts and recommendations for stormwater management and environmental management areas set-aside to protect natural resources. Provide an assessment of programs and technologies to reduce greenhouse gas emissions. Provide an overview of potential environmental impacts, determine likely level of NEPA review, summarize recommended mitigation strategies, and necessary permits, approvals and reviews necessary for development.

Outcome

- *Project schedule, phasing and a program cost*
- *Fiscal, economic and environmental impact analysis report*

11. Final Report and Deliverables

11.1 Narrative Report and Executive Summary

- Prepare and submit a draft and final report and executive summary to MDOT MAA for review and comment.

11.2 Plan Sheets/CADD Drawings and Traffic VISSIM files

- Develop plan sheets that can be used ALP updates, future environment scoping and review, and as a transitioning document for a potential design team. Provide updated VISSIM traffic files

11.3 3D Renderings and Animation of Development

- Use 3D modeling software to develop an aerial perspective visualization of the roadway and cargo development.

11.4 Briefing Presentation and Leave behinds for officials and the public

- Present the final report and renderings to MDOT MAA staff. Make presentation and 3D renderings available to elected officials and the public.
- Provide user-friendly materials for ongoing outreach with Airport and area employees, and coordination with agencies and the public (handouts, planning study website, etc).