

## **9 APPENDIX B: System Design Document**

# **Aerium District Enhanced Aviation Safety Service Enablement (Aerium EASSE)**

Minimum Viable Infrastructure System Design Document

Prepared by ATA Aviation



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Prepared for Aerium by:

John S. Eberhardt, Managing Director, 415-254-7996, [jeberhardt@ataaviation.com](mailto:jeberhardt@ataaviation.com)

Scott Drew, Executive Director, 804-814-8148, [sdrew@ataaviation.com](mailto:sdrew@ataaviation.com)

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## 9.1 Overview and Executive Summary

The project focus is on deploying cost-effective solutions enabling near-term services and return on investment through “Flight Information Exchange” (FIX) and “Minimum Viable Infrastructure” (MVI). FIX-MVI creates Public Digital Services that support industry needs today and into the future. FIX is focused on cost-effective, secure mechanisms for data sharing to support Federal Aviation Administration (FAA) requirements for safe AAM integration as Public Digital Services. MVI is a risk-based approach to infrastructure resulting in cost-effective deployment of infrastructure enabling immediate next steps in AAM. The result is a return on investment and a path to financial sustainability within two-three years.

The *Emergency Life Saving through Multi-Modal Mobility* (ELSa-M3) project will demonstrate the of emergency drone delivery to underserved communities in the south western region of Pennsylvania, specifically Johnstown and environs. ELSa-M3 proposes, through the development of a cost-effective and affordable public network, to enable public emergency medical logistics via drone. The project involves nine partners including Southern Alleghenies Planning and Development Commission (SAP&DC), Cambria County Emergency Services, Somerset County Emergency Management, The Alaska Center for Uncrewed Aircraft Systems Integration, St. Francis University, Aerium, DroneUp, Aloft, OneSky, and ATA. The project lead, SAP&DC, serves six counties in southwestern Pennsylvania made up of urban, suburban, and rural communities in a mountainous region. This region experiences high vulnerability to climate risk and flooding, substantial low-income communities, and is historically medically underserved.

This document defines the Aerium District (Aerium) initial service area and the associated minimum viable infrastructure (MVI) system design document (SDD) supporting the Aerium/ELSa-M3 Enhanced Aviation Safety Service Enablement (EASSE) Area (AERIUM EASSE). It characterizes the types of operations that will be present, the risks associated with those operations, and the scale of MVI needed to safely execute those operations in the AERIUM EASSE. This document should be considered a foundation for the design and enablement of the AERIUM EASSE.

Successful implementation of MVI in the AERIUM EASSE will support the growth of the aviation industry, provide new goods and services for residents, and set the stage for advanced air mobility (AAM) by focusing on AAM capabilities that are ready now. MVI in the AERIUM EASSE will deliver functional Public Digital Services that support these and future capabilities—the concept is to realize benefits that are available now while paving the way for the future. An important and critical distinction is the role of the AERIUM EASSE in the Sense and Avoid / Detect and Avoid (DAA) problem – it is not the objective of the AERIUM EASSE to provide detect and

avoid services, but rather to provide ground based data services that providers of DAA can integrate into their solutions and use to provide compliant DAA services.

The AERIUM EASSE pilot project is intended to be “multi-use” infrastructure: supporting Public Safety missions, commercial AAM services, and airspace integration and safety research. As such, the AERIUM EASSE is intended to be long-term, potentially even permanent, infrastructure and is intended to support six discrete research goals:

1. Characterize airspace in a real-world environment over a longer (>12 months) period of time;
2. Characterize performance of Data Services within a multi-modal sensor approach in a real-world environment over a longer (>12 months) period of time;
3. Assess the performance and use of a multi-model approach supporting Beyond Visual Line of Sight (BVLOS) flight in support of the ELSa-M3 project;
4. Assess the usability of Public Digital Services in supporting DAA service for BVLOS flight;
5. Assess the performance and benefit of the multi-modal approach to support Public Safety missions, both Drone as a First Responder (DFR) and Counter-UAS (cUAS);
6. Assess the cost profile (both deployment and O&M) along with potential services and benefits to residents to develop real world costing and ROI models; and
7. Develop valued-added user fee discussions and design through USS integration to begin identifying and developing a model for supportable infrastructure.

## **9.2 Introduction and Approach to Advanced Aerial Mobility Infrastructure**

AAM is the combination of Uncrewed Aerial Systems (UAS) Traffic Management (UTM - sUAS, <55Lbs), Urban Air Mobility (UAM - large vehicles for transporting people and freight), Regional Air Mobility (RAM – electrification and autonomy), and traditional Air Traffic Management (ATM). The premise isn’t just about drones – it’s about enabling the next generation of aviation: remote, autonomous, accessible, and inexpensive. Doing this effectively requires a substantial expansion of capabilities – communications, planning, charting, airspace awareness and coordination, airspace management, and local zoning and planning.

An AAM Enhanced Aviation Safety Service Enablement (EASSE) needs to account for the development of infrastructure (physical, digital, policy, and configuration) while also charting a path that allows for the elements of infrastructure to be developed and deployed in a manner that is incremental and risk based. By charting a path for incremental roll-out of AAM infrastructure, we can manage the technical and performance risk of new infrastructure investments while also reducing total system cost by leveraging existing infrastructure and focusing new investment specifically where needed to address risk and demand. The result is a “MVI” approach to the roll-out of AAM focuses on the discovery of existing infrastructure that

can be repurposed for AAM; the hosting of basic public information services by State and Local agencies; and supporting basic, reusable integrations that scale across vehicles and across the different components of the AAM spectrum. The infrastructure for AAM (excluding vehicles) will likely fall into four key categories:

- **Physical infrastructure**, consisting of both public and private infrastructure, on- and off-airport, such as: take-off and landing areas; Vertiports; Delivery Hubs; transfer facilities; and maintenance and operations facilities.
- **Digital infrastructure** consisting of ground-based sensors for vehicle position and navigation, environmental and weather sensors, navigation and charting services, and vehicle communications.
- **Policy infrastructure** clarifying basic operating rules on the ground, schedules, allowable supplemental rules, and common standards of use.
- **Configuration infrastructure** that supports localities describing how physical infrastructure can be used in a manner consistent with policy infrastructure and provided through digital infrastructure.

Critically, *much of the infrastructure listed above already exists in some form today*. The key is to identify, organize, and publish it to the AAM industry. We can approach the development of an EASSE plan through the following steps:

- **Establish Asset Governance:** Establish a basic, minimum-necessary governance activity that supports state and local agencies in consistently discovering, describing, configuring, and publishing physical and digital assets into the AAM system;
- **Asset Discovery and Publication:** Through the Governance activity, work with state and local agencies to discovery AAM assets (e.g., take-off and landing areas, existing sensors) that can be properly and consistently described and published into the AAM system;
- **Asset Integration:** Conduct basic data integration and asset publication through digital infrastructure for use by AAM operators and vehicles; and
- **Plan and Pilot Investment:** Identify targeted opportunities to invest in specific physical, digital, policy, and configuration infrastructure through asset integration to demonstrate functionality and performance of the EASSE.

One key aspect of FIX-MVI AAM infrastructure is a commitment to infrastructure sustainability as a key driver of an economically viable AAM industry. Current models' costs are in the range of \$250,000 - \$1,500,000 per square mile. Experience in Virginia and in ongoing work in states with enablement using the hybrid model suggests initial enablement costs in the range of \$25,000 - \$50,000 per square mile with long-term costs in the range of \$1,500 - \$2,000 per square mile by leveraging existing infrastructure and using hybrid public-private services. Not only is a

lower cost model valuable in that it supports the ability to enable services over wider areas (especially for lower income and underserved communities), but it also results in lower long-term operations and maintenance costs, reducing the risk of under-maintained or abandoned infrastructure.

This initial roadmap for the AERIUM EASSE is intended to provide an initial assessment, design, and plan for an initial pilot rollout what is necessary to achieve “UTM 1.0” given the desired operations.

### **9.3 Summary Description of Proposed Concept of Operations**

The AERIUM EASSE pilot rollout is focused on demonstrating AAM infrastructure for the ELSa-M3 SMART demonstration project in Cambria County and laying the groundwork for further development within the county. The EASSE is focused initially on two main classes of operations: public safety operations to demonstrate clear public benefit in the county, and support for the emergency medical delivery operations proposed for the ELSa-M3 project in Johnstown and Westmont. In both cases, the objective is to demonstrate and measure public and commercial benefit and to collect the data necessary to support the case for additional public and private funding. This section provides details on specific operational types that could be supported under the AERIUM EASSE to support the identification of specific operating areas and assess the risk levels to determine the level of fidelity of surveillance and groundspace description necessary to address the operational-specific risk mitigations. Operational types are based upon specific UAV mission objectives. They include:

- Public Safety Drone as a First Responder (DFR) for incident response types such as search and rescue and crisis situations;
- Medical Delivery (small package), emergency and non-emergency;
- Detection of UAS incursions for both public safety and protection of airport operations in support of local policy, critical infrastructure protection, and general public safety; and
- Part 107 Commercial Survey / Videography.

Additional operational types will be included as the AERIUM EASSE MVI progresses through sensor deployment, gathering of operational data, and evidence-based awareness of needs identified through primary implementation. The efforts will commence with Part 135 Beyond Visual Line of Sight (BVLOS) or Extended visual line of sight (EVLOS) operations, defined as operations monitored visually by an external observer other than the pilot and exploring larger (Group 3 and above) UAS operations under waiver that will allow us to collect the operating data to file for an FAA waiver, COA, or exemption operations for sUAS under either the Public Safety or NTAP programs.

The following table describes the initial planned Operational Types, including equipment specifications, control modes, approximate ranges, examples of Takeoff and Landing areas (ToLa), and examples of payloads. Note the operation type identification number in the left column:

| # | Operation Type                                      | Equipment   | Control Mode       | Range  | ToLa Types          | Payload                               |
|---|-----------------------------------------------------|-------------|--------------------|--------|---------------------|---------------------------------------|
| 1 | Public safety response / event response             | sUAS <25Lbs | VLOS, EVLOS, BVLOS | 1-3 Mi | Public              | Imaging sensors                       |
| 2 | Emergency Medical delivery (NARCAN, AED, Epi, etc.) | sUAS <55Lbs | BVLOS, EVLOS       | 3-5 Mi | Public, and private | NARCAN, AED, EPI, Tour iquet, Glucose |
| 3 | Non-Emergency Medical Delivery                      | sUAS <55Lbs | VLOS, EVLOS, BVLOS | 3-5 Mi | Private             | Packages < 5Lbs (HAZMAT, Controlled)  |
| 4 | Retail delivery                                     | sUAS <55Lbs | VLOS, EVLOS, BVLOS | 3-5 Mi | Private             | Packages < 5Lbs                       |
| 5 | Survey / Videography                                | sUAS <5Lbs  | VLOS               | <1 Mi  | Private and Public  | Imaging sensors                       |

*Table 1: Operational Descriptions*

The summary operational description above is the basis used to develop an operation-specific risk level model. Operations are categorized into four levels of risk, with increasing levels of failure modes, effects, and criticality analysis, referred to as FMECA Risk Tiers:

- Class D: This risk category is never acceptable and must either be engineered out of the system or the operational category must be prohibited.
- Class C: This risk category constitutes outcomes where specific, demonstrable mitigations and redundancies must be engineered into the solution to effectively lower the Class.
- Class B: This risk category consists of those risks for which likelihood or severity are low enough to not warrant specific mitigation but do warrant alerting to the operator.
- Class A: This risk category consists of those risks that do not warrant further action.

The operation specific risk breaks into categories of likelihood and severity per the FMECA matrix below. Based on the assessment of individual operations, the potential severity of the different risk categories can be assessed. This provides the ability to correlate across the proposed operations and the ground assessment to identify the level of service fidelity required for a given

operation. The FMECA matrix defines the statistical likelihood of an event cross referenced to the level of risk, and results in the FMECA risk level of the operation:

|                 |                                 |              |           |       |       |            |
|-----------------|---------------------------------|--------------|-----------|-------|-------|------------|
|                 |                                 | Severity →   |           |       |       |            |
| Likelihood<br>↓ |                                 | Catastrophic | Hazardous | Major | Minor | Negligible |
|                 | Likely<br>$P > 0.5$             | D            | D         | D     | C     | B          |
|                 | Possible<br>$0.1 \leq P < 0.5$  | D            | C         | C     | C     | B          |
|                 | Unlikely<br>$0.05 \leq P < 0.1$ | C            | C         | C     | B     | B          |
|                 | Rare<br>$0.00025 \leq P < 0.05$ | C            | B         | B     | B     | A          |
|                 | Nil<br>$0 \leq P < 0.00025$     | B            | B         | A     | A     | A          |

*Table 2: FMECA Characterization*

Based on the operational descriptions and the FMECA matrix above, the table below allows for a qualitative assessment of operational risk that allows us to describe specific risks and mitigations and place each expected operation type into a FMECA category that can then be used to plan the depth and fidelity of enablement coverage.

| #          | Complexity Elements                                                   | Specific Risks                                                                              | Specific Mitigations          | Risk Category                            |
|------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------|
| 1<br>(DFR) | Potential for intersecting flight paths; other public safety activity | Loss of separation between UAVs or Manned Aircraft; Vehicle Failure; Exhausted Power Supply | Route/Groundspace design; DAA | Category B; possible minor to negligible |

| #           | Complexity Elements                                                                                | Specific Risks                                                                                                                                                            | Specific Mitigations                                                                                | Risk Category                                |
|-------------|----------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|----------------------------------------------|
| 2/3/4 (Del) | Potential for intersecting flight paths; other public safety activity; lowering / delivering goods | Loss of separation between UAVs or Manned Aircraft; Vehicle Failure; Exhausted Power Supply; ensnaring delivery apparatus; potential loss of payload over populated areas | Route/Groundspace design; enhanced surveillance and awareness for route planning, deconfliction DAA | Category B/C; possible minor to major hazard |
| 5           | Potential for intersecting flight paths; vehicle malfunction                                       | Same as 1                                                                                                                                                                 | Route/Groundspace design; DAA; awareness                                                            | Category A                                   |

*Table 3: Operational Risk Characterization*

## 9.4 Service Volume Description

### 9.4.1 Ground Risk Tiers

The analysis of ground risk differs from overall operational risk in that we essentially only consider three factors and their interaction with the likelihood and severity of a ground impact: i) population density and exposure on the ground; ii) structures that either contribute to the likelihood of ground impact or mid-air collision or the severity of incident; and iii) topographical features that contribute to the likelihood of ground impact or mid-air collision. Further discussion about how to assess each of these factors follows:

- **Population Density and Exposure:** This risk considers ground population, population density, population activity, and the nature of structural cover to assess their contribution to the risk of mortality and morbidity in the event of a ground impact incident;
- **Air Traffic Density:** This risk considers the air traffic density of the specific service volume;

- Structure Risk: This risk considers degree to which ground based structures either contribute to the risk of a mid-air collision (in the case of cranes, towers, or RF interference) or the severity of a ground impact (as in the case of hazardous materials or flimsy cover;
- Climate Risk: This risk considers the region-specific weather patterns and microclimate risks associated with operational type, such as unpredictable winds and visibility due to topographical and structural features; and
- Topographical Risk: This risk considers specific topographical features that may contribute to challenging flight conditions (such as unpredictable winds), loss of communications (such as ridges), or navigational ambiguities (such as inability to assess terrain).

Within these factors, we can assess Low, Medium or High risk. Because these risks are difficult to quantify, the Low/Medium/High determination for a given factor within a service volume and the overall determination of ground risk for that volume should be narratively derived. That risk can then be matrixed against the operational risk analysis to derive an overall risk pairing, which will then provide a level of requirement enablement fidelity and currency.

In exploring how we segment a particular operational area into enabled volumes, the segmentation can be along topographical lines (because of natural communications barriers that will be required to treat the volumes separately), operational lines (because of the intended operating areas), or natural “risk” lines that divide a volume based on overall risk.

The risk analysis in the System Design document supports two key aspects of the enablement plan: Procedural Deconfliction and Systems and Sensor Integration Activities. The Systems and Sensor Integration components support real time event, environmental, and weather data advisories that support safe and compliant operations.

The premise in the Systems and Sensor integration activities is to focus on existing, functional systems and sensors that are currently available in the marketplace as the building blocks of FIX-MVI for the AERIUM EASSE. The key to FIX-MVI is to overlay “Tiers” of sensors to provide the right level of fidelity and currency relative to the combined operational / ground profile. The System Design Document will provide specific geospatial volumes for service enablement that represent the synthesis of operational goals, ground topography and assessment, and risk mitigations and tolerances.

The model assumes three Tiers of Performance Based Information provided by the sensor network:

- Tier 1 (Green) provides position, awareness and environmental services at the lowest Performance level, for a combination of lower risk, lower density service volumes and operations
- Tier 2 (Yellow) provides position, awareness and environmental services at a mid-Tier Performance level, for medium level risk, medium density service volumes and operations or for areas where a medium or high-risk operation occurs in a low risk service volume
- Tier 3 (Red) provides position, awareness, and environmental services at a high-performance level, commensurate with current General Aviation services, intended to support medium or low risk operations in a high-risk volume, such as adjacent to a General Aviation airport or over an urban core where the risk of injury is greater

Table 4 below provides examples of sensors, costs, and potential coverage areas by Tier. The intent is for Tier 1 to be implemented in Phase I, Tier 2 and Phase II, and Tier 3 in Phase III.

| Tier               | Example Sensors                                                                                                                                            | Cost Profile                            | Example Coverage Area Type(s)                                                                                                       |
|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Tier 1<br>(Green)  | Procedural deconfliction +<br><ul style="list-style-type: none"> <li>• RemoteID</li> <li>• ADS-B</li> <li>• Weather</li> <li>• GNSS RTK beacons</li> </ul> | Inexpensive<br><\$5,000 / sq mi         | Low Density Rural<br>sUAS operations at low weight / altitudes / Part 107<br>Procedurally deconflicted AAM at higher altitudes      |
| Tier 2<br>(Yellow) | Tier 1+<br><ul style="list-style-type: none"> <li>• Audio</li> <li>• Optical</li> <li>• RF / RDF</li> </ul>                                                | Mid-Cost<br>\$10,000 - \$25,000 / sq mi | Low Density Rural Cargo<br>Suburban Metro sUAS package delivery<br>Group 2 long distance / Group 3 UAS conducting survey activities |
| Tier 3<br>(Red)    | Tier 2+<br><ul style="list-style-type: none"> <li>• Radar/LIDAR</li> </ul>                                                                                 | Higher Cost<br>> \$50,000 / sq mi       | Major Urban Area, Airports<br>UAM Vehicle Vertiport Areas<br>sUAS package delivery at high weight                                   |

*Table 4: Examples of Tiered Sensor Infrastructure*

The AERIUM EASSE is focused on enabling detailed airspace characterization and supporting navigation and surveillance services initially for Group 1 / Group 2 sUAS, growing to Group 3 UAS,

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in selected identified service areas that can demonstrate clear public benefit and financial viability. The overall service area and the service volumes are described below. The AERIUM EASSE covers a set of high-benefit areas defined in Johnstown and Westmont by high dispatch volume, and demonstration services in South Fork to demonstrate and evaluate a potential regional rollout and support additional BVLOS infrastructure inspection services. Figure 1 below describes the final operating areas as deployed during the ELSa-M3 project.

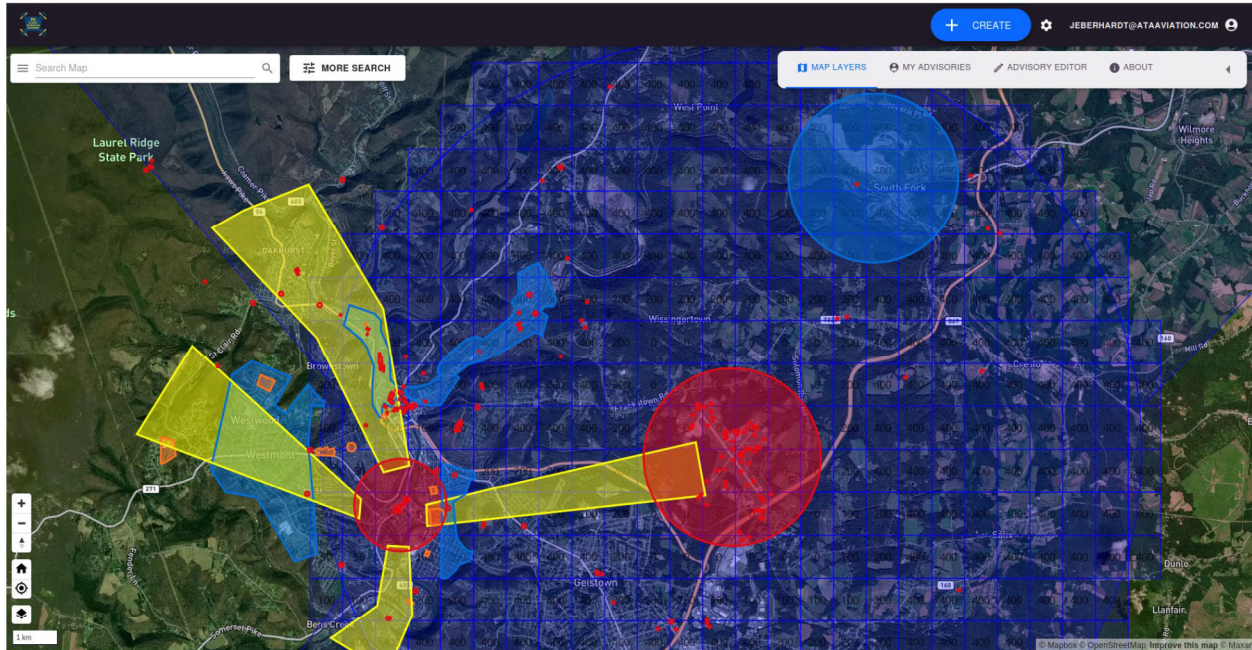


Figure 1: Deployed AERIUM EASSE

#### 9.4.2 Area of Enablement – Physical Volumes

To enable an area for service, we need to identify specific physical volumes for service enablement. Each volume may be bounded by i) topographical features, iii) desired area of service, iii) risk boundaries, or iv) a combination of the above. The basic proposed service area creates a set of discrete service volumes in the populated areas of the Johnstown Urbanized Area in Cambria County and test areas in South Fork and Altoona. The AERIUM EASSE contains seven distinct service volumes, each with specific risk characteristics:

- **Service Volume 1:** Service Volume 1 consists of the East End of Johnstown. It includes central Johnstown, Dale Borough, Moxham, and Ferndale as well as neighborhoods that extend east along the Johnstown Expressway and Conemaugh River. It consists of a plain between hills to the East, West, and North. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures with a few taller (5-10 story) buildings, however it is adjacent to, but excludes, Conemaugh Memorial Medical Center, which includes a heliport. This Service Volume is supported by Seventh Ward Ambulance/EMS as an ambulance site, and is intended to be serviced by a central

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drone hub site at the Central Park Complex at 110 Franklin St, Johnstown, PA 15901.

Service Volume 1 consists of Cambria County Census Tracts 1, 2, 3, 5, 6, 7, and 110 with a total population of 11,861 over 3 square miles for a mean population density of 3,594.2 persons per square mile.

- Will be operated as a contiguous service area with Service Volumes 2 and 3 with a total population of 24,334 over 9 square miles, with a mean population density of 2674.1 persons per square mile.
- Service Volume 2: Service Volume 2 consists of the West End of Johnstown. It includes central Johnstown, Cambria City, Minersville, Morrellville, Oakhurst, and Coopersdale as well as neighborhoods that extend west along PA-56 and the Conemaugh River. It consists of a plain between hills to the South and North. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures with a few taller (5-10 story) buildings. This Service Volume is supported by West End Ambulance/EMS as an ambulance site, and is intended to be serviced by a central drone hub site at the Central Park Complex at 110 Franklin St, Johnstown, PA 15901. Service Volume 2 consists of Cambria County Census Tracts 1, 12, 134, and 136 with a total population of 7,914 over 3 square miles for a mean population density of 2,729.0 persons per square mile.
  - Will be operated as a contiguous service area with Service Volumes 1 and 3 with a total population of 24,334 over 9 square miles, with a mean population density of 2674.1 persons per square mile.
- Service Volume 3: Service Volume 3 consists of the population centers along the Little Conemaugh river in the North End of Johnstown. It includes central Johnstown, Prospect, Woodvale, Franklin, and East Conemaugh. It consists of a plain between hills to the East and West. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures with a few taller (5-10 story) buildings. This Service Volume is supported by East Conemaugh Fire/EMS as an ambulance site, and is intended to be serviced by a central drone hub site at the Central Park Complex at 110 Franklin St, Johnstown, PA 15901. Service Volume 3 consists of Cambria County Census Tracts 102 and 134 with a total population of 3,365 over 3 square miles for a mean population density of 1,246.3 persons per square mile.
  - Will be operated as a contiguous service area with Service Volumes 1 and 2 with a total population of 24,334 over 9 square miles, with a mean population density of 2674.1 persons per square mile.
- Service Volume 4: Service Volume 4 consists of the suburbs of Westmont and Southmont. It consists of a plain and hills west of a large ridgeline to the East. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures. This Service Volume is supported by West Hills Fire / Hilltop EMS as an

ambulance site, and is intended to be serviced by a central drone hub site at the Hiram G Andrews Center, 727 Goucher St. Johnstown, PA 15905. Service Volume 4 consists of Cambria County Census Tracts 112 and 134 with a total population of 3,365 over 3 square miles for a mean population density of 1,246.3 persons per square mile.

- Service Volume 5: Service Volume 5 consists of the immediate environs of John Murtha Johnstown-Cambria County Airport. It is not intended to be an immediately serviced volume, but will be enabled for data collection purposes for establishing safety baselines. Service Volume 5 consists of Cambria County Census Tract 107 with a total population of 3,122 over 9.3 square miles for a mean population density of 336.8 persons per square mile.
- Service Volume 6: Service Volume 6 consists of the immediate environs of South Fork, PA. It is intended to be enabled for demonstration of infrastructure inspection as part of a regional rollout and will be enabled for data collection purposes for establishing safety baselines. Service Volume 6 consists of Cambria County Census Tract 132 with a total population of 3,943 over 19.6 square miles for a mean population density of 201.6 persons per square mile.

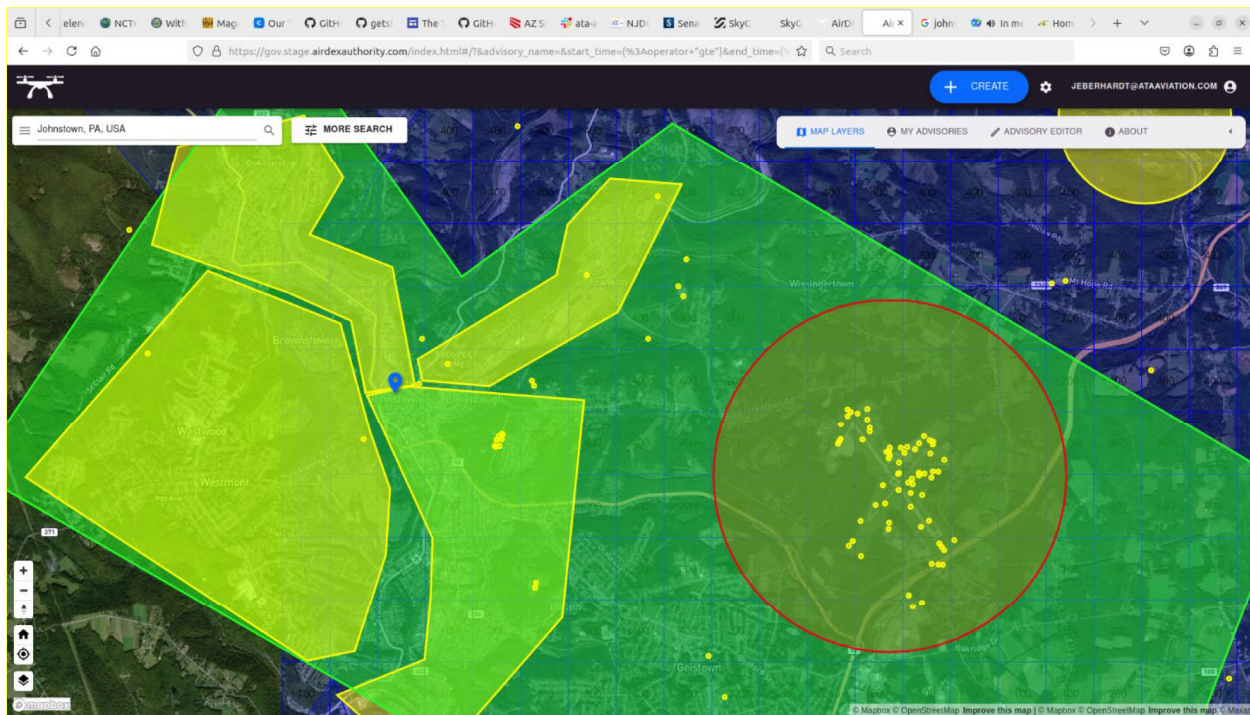


Figure 2: AERIUM EASSE Service Volumes 1 (Yellow, Southeast), 2 (Yellow, Northwest), 3 (Yellow, Northeast), 4 (Yellow, Southwest) and 5 (Red Circle)

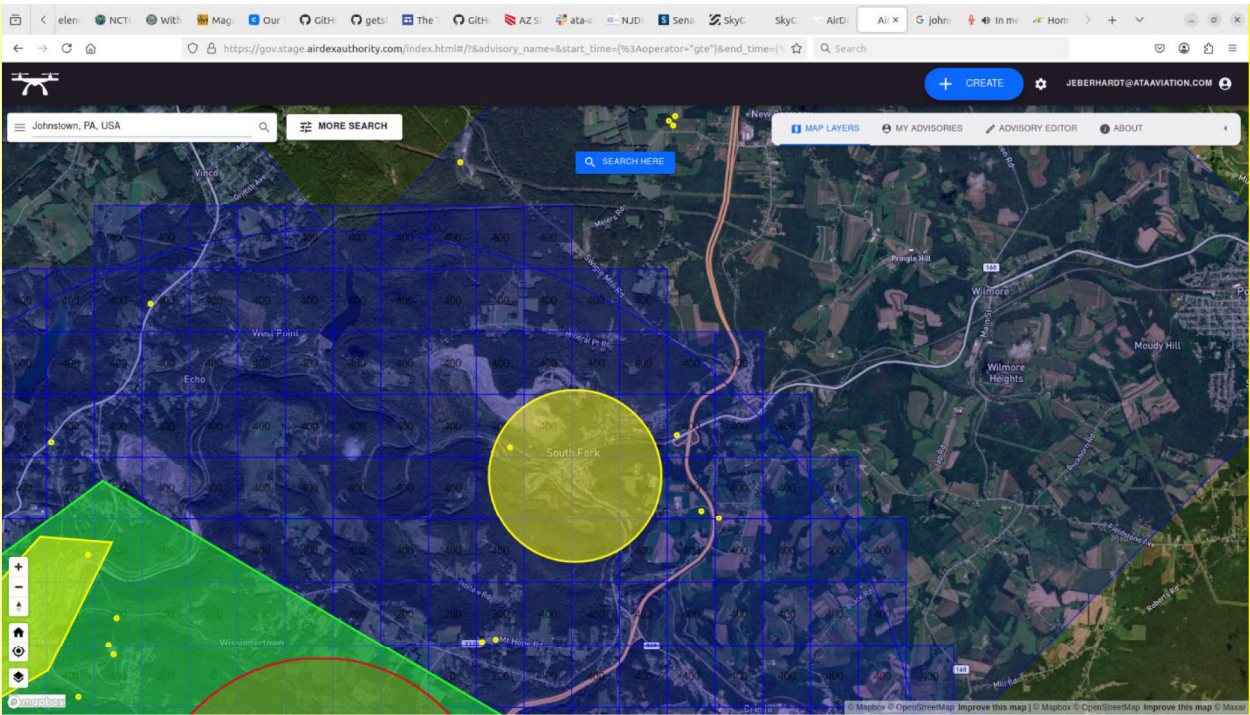


Figure 3: AERIUM EASSE Service Volume 6 (Yellow)

The service volumes and their characteristics are risk assessed and Tiered in the table below.

| Volume | Population Risk | Air Density | Traffic | Structure Risk | Topography Risk | Climate Risk | Class |
|--------|-----------------|-------------|---------|----------------|-----------------|--------------|-------|
| 1      | H               | M           |         | M              | M               | M            | H     |
| 2      | H               | M           |         | M              | M               | M            | H     |
| 3      | M               | M           |         | M              | M               | M            | M     |
| 4      | M               | M           |         | L              | M               | M            | M     |
| 5      | M               | H           |         | L              | L               | M            | H     |
| 6      | M               | M           |         | L              | L               | M            | M     |

Table 5: Service Volume Risk Characterization

### 9.4.3 Operational and Ground Risk Matrix (Volume-Operational Risk Mapping)

This section describes the Operations Risk by Service Volume risk to create an overall risk assessment. This risk assessment then maps to the General Enablement Model to identify the specific enablement actions that need to be taken. The table below cross references the proposed operation types against the service volumes – the aggregate risk is then mapped to the general risk matrix and used to scope services for enablement to mitigate risks as described in a standard way.

| Volume x Operation | 1   | 2   | 3   | 4   | 5   | Overall |
|--------------------|-----|-----|-----|-----|-----|---------|
| 1                  | B/H | C/H | C/H | C/H | A/H | Tier 3  |
| 2                  | B/H | C/H | C/H | C/H | A/H | Tier 3  |
| 3                  | B/M | C/M | C/M | C/M | A/M | Tier 2  |
| 4                  | B/M | C/M | C/M | C/M | A/M | Tier 2  |
| 5                  | B/H | C/H | C/H | C/H | A/H | Tier 2* |
| 6                  | A/M | A/M | A/M | A/M | A/M | Tier 2  |

*Table 6: Operational-Service Volume Risk Matrix and Tiering*

*\* Tier 3 procedurally mitigated by not currently conducting non-VLOS operations*

## 9.5 General Enablement Model

### 9.5.1 Overview of Conceptual Standard Deconfliction and xTM Model

Conceptually we can leverage operating lessons learned from traditional Air Traffic Management, the FAA's UTM concept, ASTM UTM, and U-Space standards development work to develop a general model for integration of UAS operations, risk management, and most importantly, risk mitigation through the design and emplacement of infrastructure at the local level. Our conceptual model for deconfliction is a layered approach consisting of four principal layers:

- Procedural Deconfliction – Configuration of the groundspace and airspace constraints, potential fixed hazards, and operational design to procedurally reduce the potential for conflict and loss of separation;

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- Surveillance / Situational Awareness / Conformance – Provide digital services that allow pilots to be aware of transient hazards (weather, ground incidents and condition) and surveillance of and awareness of position of craft in the airspace;
- Operational Deconfliction – Common situational awareness of planned operations and operational intent for vehicles operating in proximate airspace; and
- Onboard Systems – Vehicle designs, piloting procedures, sensors, and detect and avoid systems to act as a definitive failsafe if the other three layers fail.

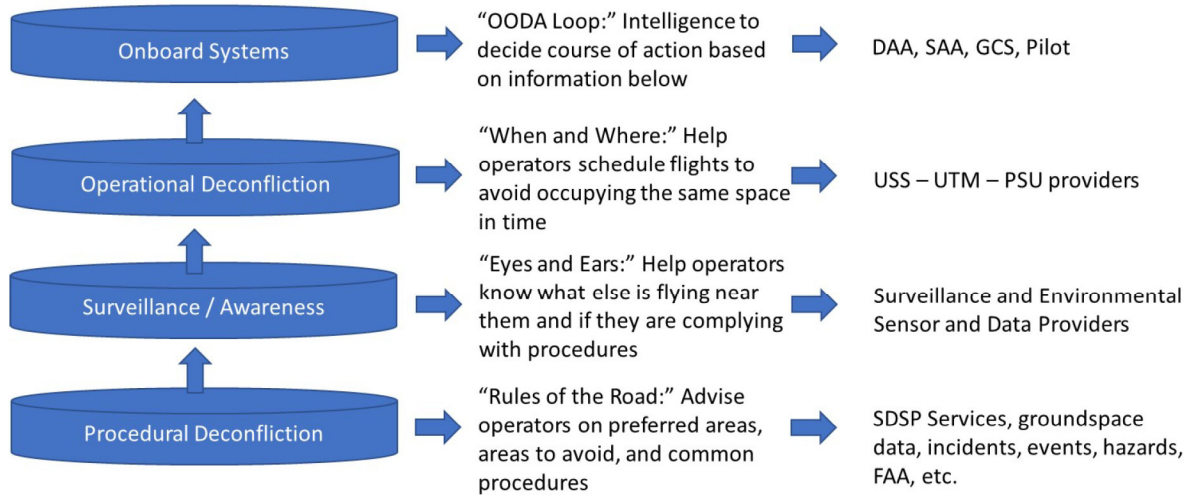


Figure 5: Layered Risk Mitigation Model – Conceptual Diagram

### 9.5.2 Discussion of Modalities and Components

This section discusses the potential components and modalities for Procedural Deconfliction, Operational Deconfliction, and Surveillance / Awareness. Table 7 below details different potential mitigations that can be applied within each layer of the four-layer model described in Figure 7. These can be used as specific proposed, planned mitigations in the overall EASSE Plan.

| Safety Layer                    | Specific Examples                                               |
|---------------------------------|-----------------------------------------------------------------|
| <b>Procedural Deconfliction</b> | State or Local Government Information Advisory                  |
|                                 | State or Local Government Supplemental Rule Advisory            |
|                                 | Ground Operations Prohibited                                    |
|                                 | Hazard / Obstruction                                            |
|                                 | Take Off and Landing Area (Hobbyist, Public Safety, Commercial) |

| Safety Layer                     | Specific Examples                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Operational Deconfliction</b> | <p>Sharing of Flight Intent / UTM Services</p> <p>Public Safety First Responder Emergency Incident Activity</p> <p>State or Local Agency Site Data Collection</p> <p>Public Safety Large Audience Event</p> <p>Public Safety Hazardous Materials Incident</p> <p>Public Safety Disaster Management</p> <p>Flight Operations / Operating Area (Hobbyist, Public Safety, Commercial)</p> |
| <b>Surveillance / Awareness</b>  | <p>Weather, Visibility, Environmental Conditions</p> <p>Ground Environmental Conditions</p> <p>Detection and Position of Crewed Aircraft (ADS-B, Passive Detection, Active Detection)</p> <p>Detection and Position of Uncrewed Aircraft (RemoteID, Passive Detection, Active Detection)</p>                                                                                           |

*Table 7: Examples of Layered Mitigations*

Table 8 below details some of the specific modalities for Surveillance and Awareness that are available, including some of the characteristics of each mode, for consideration in the EASSE Plan.

| Modality                                            | Pros                                                                                                             | Cons                                                                                         | Range*                                                        |
|-----------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| <b>Passive – RemoteID (UAS only, participatory)</b> | Very inexpensive and FAA mandated, decent range; strong position accuracy; no RF interference; no privacy issues | Not implemented yet, requires participation, not clear what / when compliance will look like | 1 – 5 miles, depending on topography, RF conditions, and unit |

| Modality                                            | Pros                                                                                                                                                                                                     | Cons                                                                                                                                                                                              | Range*                                                                                                               |
|-----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| <b>Passive - ADS-B (Manned only, participatory)</b> | Manned aircraft, already universally available; FAA mandated; strong position accuracy; inexpensive; no RF interference; no privacy issues                                                               | Compliance is not universal, doesn't work for UAS; requires participation which is not universal                                                                                                  | 20-200 miles, depending on aircraft altitude and receiver                                                            |
| <b>Passive – Decoding (UAS only)</b>                | Leverages existing comms on the vehicle; many provide information on operator as well; strong accuracy; can be inexpensive; no RF interference; does not require participation; strong position accuracy | Totally vehicle dependent, may not provide operator information, mixed performance, malicious actors can easily engineer around; cost profiles vary; privacy issues                               | 1-5 miles, depending on quality of receiving unit, topography, and RF conditions                                     |
| <b>Passive – Audio (UAS and manned)</b>             | Audio signature detection; no RF interference, no privacy issues; relatively inexpensive; doesn't require participation                                                                                  | Lower detection rate and positional accuracy than participatory, decoding, or radar methods; need more than one sensor to really calculate location, bearing and heading; cost profiles mixed     | 2-5 miles, depending on quality of receiving unit, topography, unit positioning, and vehicle altitude and trajectory |
| <b>Passive – Optical (UAS and manned)</b>           | Optical signature detection; no RF interference, no privacy issues; relatively inexpensive; doesn't require participation                                                                                | Lower detection rate and positional accuracy than participatory, decoding, or radar methods; need more than one sensor to accurately calculate location, bearing and heading; cost profiles mixed | 2-5 miles, depending on quality of receiving unit, topography, unit positioning, and vehicle altitude and trajectory |

| Modality                                     | Pros                                                                                                                                                                                  | Cons                                                                                                                                                                                                    | Range*                                                                           |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>Passive – RF (UAS only)</b>               | Triangulate RF signals; no RF interference, no privacy issues; relatively inexpensive; doesn't require participation                                                                  | Lower detection rate and positional accuracy than participatory, decoding, or radar methods; need more than one sensor to accurately calculate location, bearing and heading; no current COTS solutions | 1-10 miles, depending on quality of receiving unit, topography and RF conditions |
| <b>Active – Small Radar (UAS and manned)</b> | Detects all vehicles, participating or not; unlikely that a malicious actor can engineer around; no privacy issues; doesn't require participation; can achieve high rates of accuracy | Expensive; limited coverage area; dependent on line of sight; achieving accuracy requires siting and tuning; training                                                                                   | 1-3 miles dependent on topography, conditions, siting and tuning                 |
| <b>Active – Large Radar (UAS and manned)</b> | Detects all vehicles, participating or not; unlikely that a malicious actor can engineer around; no privacy issues; doesn't require participation; can achieve high rates of accuracy | Very Expensive; dependent on line of sight; achieving accuracy requires siting and tuning; training                                                                                                     | 5-15 miles dependent on topography, conditions, siting and tuning                |

*Table 8: Discussion of Potential Sensor Modalities in the Surveillance / Awareness Layer*

### 9.5.3 General Enablement Performance Based Information Template by Risk

A key concept of the FIX-MVI model is to use shared services and data to create a “multi-modal” overlay that will provide a public MVI data stream through the FIX that can then be used by experts and various actors to conduct “track fusion” modeling and the development and provision of DAA services. It is important to note that the AERIUM EASSE is not intended to provide DAA services in its own right. The multi-model aspect of the overlay is critical, as the different surveillance modalities complement each other, and voting network and filtering

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techniques can be used to create an overall Service Volume detection performance that exceeds the performance of any one sensor modality. Finally, the use of physically and logically distributed, multi-modal sensors reduces the risk of catastrophic failure where all surveillance is down – instead this allows for graceful service degradation that can then be addressed procedurally through operational mitigations.

The overall performance baseline for the Service Volume must consider relevant performance standards such that DAA and USS providers can, together with the characterization of the Operational and Service Volume risk (see Table 6), provide an overall mitigation strategy and performance statement to pursue approvals from the FAA for operations. Explicitly relevant standards include the ASTM UTM Standard (ASTM F3548-21), ASTM DAA Standard (ASTM F3442/F3442M-23), and the ASTM SDSP Standard (ASTM F3623-23), which were considered in developing the baseline performance metrics below.

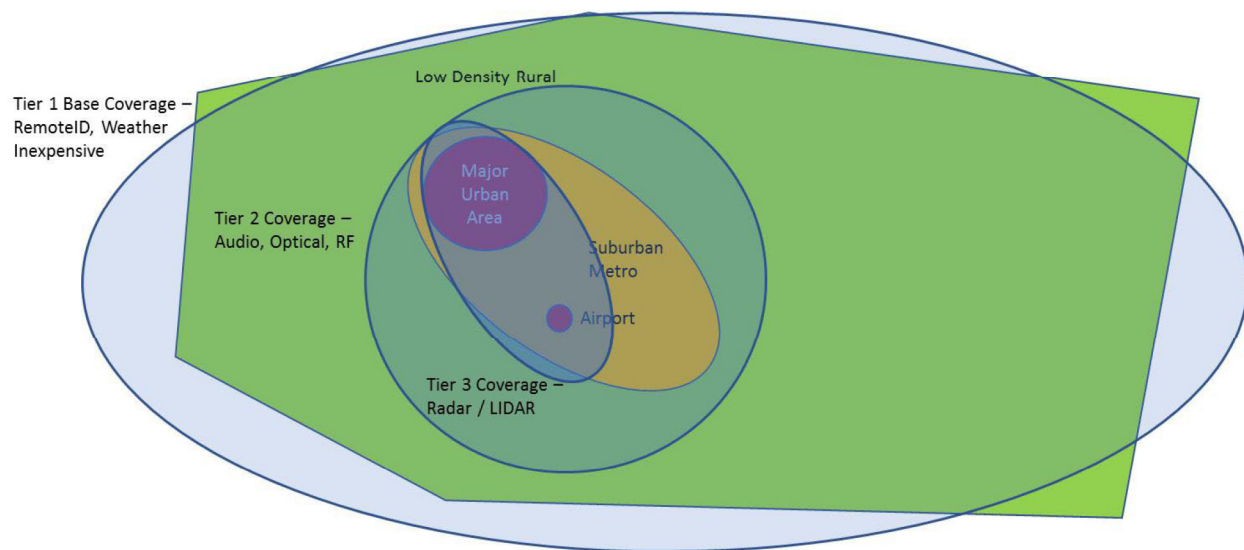


*Figure 6: Tiered Performance Overlay Model – Conceptual Diagram*

A key aspect of achieving the targeted level of risk mitigation is to establish a measurable performance baseline. Along with the expected performance baseline for the enablement services, we also need to develop a performance baseline for the data services themselves. Table 9 below discusses data service performance characterization metrics that can be built in and collected to characterize compliance to the proposed Service Performance Baseline.

| Metric                                | Surveillance / Telemetry                                                                                                                                                            | Procedural / Configuration |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>Message Technical Latency</b>      | Metric: Milliseconds<br>Evaluation: Elapsed milliseconds between relevant time stamps -- Are deviations within tolerance for the service?                                           |                            |
| <b>Message Completeness</b>           | Metric: Potential data elements<br>Evaluation: Proportion of messages with fully reported elements                                                                                  |                            |
| <b>Message Integrity</b>              | Metric: Expected message format<br>Evaluation: messages validated for format -- What proportion of messages are malformed?                                                          |                            |
| <b>Frequency / Refresh</b>            | Metric: Milliseconds frequency for the source service<br>Evaluation: deviation in frequency delta between transmission timestamps and comparison to expected service level          | NA                         |
| <b>Message Precision / Confidence</b> | Metric: Meters<br>Evaluation: Underlying error of the source data -- Does the source data service report (decimal) at the expected level of precision? Are errors within tolerance? |                            |
| <b>Geographic Availability</b>        | Metric: Geographic coverage<br>Evaluation: Is the data service available for the geography -- Are messages generated within the geography for known characterized services?         |                            |

*Table 9: Data Service Performance Characteristics*

The matrix below leverages these concepts and describes potential surveillance / awareness performance benchmarks based on the overall Volume – Operational risk level (see matrix in Table 9 above). Procedural and Operational deconfliction are not listed generally, as these are general UTM foundational capabilities that cover the enabled area regardless of surveillance modality; however, specific requirements are discussed in the sections below. It is important to note that the initial proposed service performance baseline is notional and will need to be refined together with industry and the FAA. It is the goal of this notional performance baseline to meet

or exceed the requirements for these types of ground-based data services as described in the reference standards. *Components that are not referenced in the standards or diverge are noted as such.*

| Risk:              | C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | A                                                                                                                                                                                                                                                                                                                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Volume x Operation |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                               |
| <b>L</b>           | TIER 3<br>- Special procedural considerations such as no-go and ditch areas<br>- Coverage ceiling 1,200 Ft<br>- Availability: 99.9%<br>- Message Integrity: 99.9%<br>- Maximum latency to syndication: 200ms<br>- Message refresh/heartbeat: 1s<br>- Scan Rate / Coasting Threshold: 4s<br>- Published sensor SLA including scan, vertical accuracy, and EPU<br>- MTTR: TBD<br>- MTBF >500 hrs<br>- Data Retention: 30 days<br>- Vehicle On-Board PNT with high frequency (<1s) and accuracy (<3m)<br>- Detailed microweather | TIER 2<br>- Procedural and NAVAID considerations<br>- Coverage ceiling 1,000 Ft<br>- Availability: 99.9%<br>- Message Integrity: 99.9%<br>- Maximum latency to syndication: 200ms<br>- Message refresh/heartbeat: 1s<br>- Scan Rate / Coasting Threshold: 4s<br>- Published sensor SLA including scan, vertical accuracy, and EPU<br>- MTTR: TBD<br>- MTBF >500 hrs<br>- Data Retention: >30 days<br>- Data Retention: 30 days<br>- Vehicle On-Board PNT with minimum frequency (<5s) and accuracy (<10m)<br>- Basic weather conditions | TIER 1<br>- Procedural and NAVAID considerations<br>- Coverage ceiling 1,000 Ft<br>- Availability: 99.9%<br>- Message Integrity: 99.9%<br>- Maximum latency to syndication: 200ms<br>- Message refresh/heartbeat: 1s<br>- Data Retention: >30 days<br>- Vehicle On-Board PNT with minimum frequency (<5s) and accuracy (<10m) |
| <b>M</b>           | TIER 3<br>- Special procedural considerations such as no-go and ditch areas<br>- Coverage ceiling 1,200 Ft<br>- Availability: 99.9%<br>- Message Integrity: 99.9%                                                                                                                                                                                                                                                                                                                                                             | TIER 2<br>- Procedural and NAVAID considerations<br>- Coverage ceiling 1,000 Ft<br>- Availability: 99.9%<br>- Message Integrity: 99.9%<br>- Maximum latency to                                                                                                                                                                                                                                                                                                                                                                          | TIER 2<br>- Procedural and NAVAID considerations<br>- Coverage ceiling 1,000 Ft<br>- Availability: 99.9%<br>- Message Integrity: 99.9%<br>- Maximum latency to                                                                                                                                                                |

| Risk:                 | C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Volume x<br>Operation | <ul style="list-style-type: none"> <li>- Maximum latency to syndication: 200ms</li> <li>- Message refresh/heartbeat: 1s</li> <li>- Scan Rate / Coasting Threshold: 4s</li> <li>- Published sensor SLA including scan, vertical accuracy, and EPU</li> <li>- Published service volume with sensitivity and specificity</li> <li>- MTTR: TBD</li> <li>- MTBF &gt;500 hrs</li> <li>- Data Retention: 30 days</li> <li>- Vehicle On-Board PNT with high frequency (&lt;1s) and accuracy (&lt;3m)</li> <li>- Detailed microweather</li> </ul> | <ul style="list-style-type: none"> <li>syndication: 200ms</li> <li>- Message refresh/heartbeat: 1s</li> <li>- Scan Rate / Coasting Threshold: 4s</li> <li>- Published sensor SLA including scan, vertical accuracy, and EPU</li> <li>- Published service volume with sensitivity and specificity</li> <li>- MTTR: TBD</li> <li>- MTBF &gt;500 hrs</li> <li>- Data Retention: &gt;30 days</li> <li>- Data Retention: 30 days</li> <li>- Vehicle On-Board PNT with minimum frequency (&lt;5s) and accuracy (&lt;10m)</li> <li>- Basic weather conditions</li> </ul> | <ul style="list-style-type: none"> <li>syndication: 200ms</li> <li>- Message refresh/heartbeat: 1s</li> <li>- Data Retention: &gt;30 days</li> <li>- Vehicle On-Board PNT with minimum frequency (&lt;5s) and accuracy (&lt;10m)</li> </ul>                                                                                                                                                                                            |
| H                     | <p>TIER 3</p> <ul style="list-style-type: none"> <li>- Special procedural considerations such as no-go and ditch areas</li> <li>- Coverage ceiling 1,200 Ft</li> <li>- Availability: 99.9%</li> <li>- Message Integrity: 99.9%</li> <li>- Maximum latency to syndication: 200ms</li> <li>- Message refresh/heartbeat: 1s</li> <li>- Scan Rate / Coasting Threshold: 4s</li> <li>- Published sensor SLA including scan, vertical accuracy, and EPU</li> </ul>                                                                             | <p>TIER 3</p> <ul style="list-style-type: none"> <li>- Procedural and NAVAID considerations</li> <li>- Coverage ceiling 1,000 Ft</li> <li>- Availability: 99.9%</li> <li>- Message Integrity: 99.9%</li> <li>- Maximum latency to syndication: 200ms</li> <li>- Message refresh/heartbeat: 1s</li> <li>- Scan Rate / Coasting Threshold: 4s</li> <li>- Published sensor SLA including scan, vertical accuracy, and EPU</li> <li>- Published service volume</li> </ul>                                                                                             | <p>TIER 2</p> <ul style="list-style-type: none"> <li>- Procedural and NAVAID considerations</li> <li>- Coverage ceiling 1,000 Ft</li> <li>- Availability: 99.9%</li> <li>- Message Integrity: 99.9%</li> <li>- Maximum latency to syndication: 200ms</li> <li>- Message refresh/heartbeat: 1s</li> <li>- Data Retention: &gt;30 days</li> <li>- Vehicle On-Board PNT with minimum frequency (&lt;5s) and accuracy (&lt;10m)</li> </ul> |

| Risk:<br>Volume x<br>Operation | C                                                                                                                                                                                                                                                                                                                     | B                                                                                                                                                                                                                                                                                                                                        | A |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
|                                | <ul style="list-style-type: none"> <li>- Published service volume with sensitivity and specificity</li> <li>- MTTR: TBD</li> <li>- MTBF &gt;500 hrs</li> <li>- Data Retention: 30 days</li> <li>- Vehicle On-Board PNT with high frequency (&lt;1s) and accuracy (&lt;3m)</li> <li>- Detailed microweather</li> </ul> | <ul style="list-style-type: none"> <li>with sensitivity and specificity</li> <li>- MTTR: TBD</li> <li>- MTBF &gt;500 hrs</li> <li>- Data Retention: &gt;30 days</li> <li>- Data Retention: 30 days</li> <li>- Vehicle On-Board PNT with minimum frequency (&lt;5s) and accuracy (&lt;10m)</li> <li>- Basic weather conditions</li> </ul> |   |

*Table 10: Notional Performance Baseline – Overall Service Volume Performance*

Note that the table above is intended to be a starting point, and that specific mitigation strategies in each of the layers should be refined based upon knowledge of the terrain and specific operational risk. This should involve specific considerations of frequency and accuracy based upon assessment of risk and knowledge of vehicle types and operators. We may install sensors below the standards for accuracy, range, and performance for use in an advisory (non-DAA) capacity if they are additive to airspace awareness.

## 9.6 Enablement of Deconfliction and Awareness Services

This section details our understanding of the current state of readiness in the proposed service volumes and identifies applicable integration requirements and regulatory requirements that may apply to the contemplated operations as understood at this time.

### 9.6.1 Assessment of Current Enablement Readiness

This section applies the risk assessments and system design discussed above to the individual service volumes, and provides the current baseline of service coverage by Service Volume as of April 2026, assessed at one of five statuses, as described in Table 11 below:

- Sufficient: There is sufficient service coverage within the Service Volume to meet the Performance Baseline;
- In Process: Currently in deployment;
- Incomplete: Some level of service coverage exists; additional existing local assets may be able to bring service coverage up to the Performance Baseline;

- Not Available: No existing service coverage or local assets, need to build from scratch;
- Unknown: Not known to exist, local assets may exist, further investigation needed; and
- Not Applicable: This particular service is not applicable to the Service Volume given the risk assessment.

| Service Mitigation        | Volume / Current State of Services / Gaps | Available Assets                                                | Targets                                                                    |
|---------------------------|-------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------|
| <b>Service Volume 1</b>   |                                           |                                                                 |                                                                            |
| Groundspace Configuration | Sufficient                                | Cambria County has mapped relevant data, loaded in Keystone FIX | Continue to add / refresh configuration data                               |
| GNSS RTK / Nav            | Not applicable                            | Not applicable                                                  | Not applicable at this time                                                |
| Weather Services          | Sufficient                                | Use AWOS, TAFS, METAR from KJST                                 | Reports from KJST                                                          |
| Surv. – ADS-B             | Sufficient                                | ADS-B mounted in service volume sensor install                  | Leverage SV-2 ADS-B Receiver                                               |
| Surv. – RemoteID          | Sufficient                                | RID received install in service volume sensor install           | Finish install, acquire and install 1 additional sensor centered in volume |
| Surv. – RF                | Not applicable                            | Not applicable                                                  | Not applicable at this time                                                |
| Surv. – Optical           | Sufficient                                | Optical sensor install in service volume sensor install         | Optical assets cover central service volume                                |
| Surv. – Audio             | Not applicable                            | Not applicable                                                  | Not applicable at this time                                                |

| Service Mitigation        | Volume / Current State of Services / Gaps | Available Assets                                                                                     | Targets                                                                        |
|---------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Surv. – Radar             | Sufficient                                | Radar assets install in service volume                                                               | Radar assets installed to cover Conemaugh Memorial heliport                    |
| USS-UTM Services          | Sufficient                                | Integrated Aloft, OneSky, DroneUp                                                                    | Integrated USS providers                                                       |
| <b>Service Volume 2</b>   |                                           |                                                                                                      |                                                                                |
| Groundspace Configuration | Sufficient                                | Cambria County has mapped relevant data, loaded in Keystone FIX                                      | Continue to add / refresh configuration data                                   |
| GNSS RTK / Nav            | Not applicable                            | Not applicable                                                                                       | Not applicable                                                                 |
| Weather Services          | Sufficient                                | Use AWOS, TAFS, METAR from KJST                                                                      | Reports from KJST                                                              |
| Surv. – ADS-B             | Sufficient                                | Services by ADS-B units in Service Volumes 3, 4, and 5                                               | ADS-B available                                                                |
| Surv. – RemoteID          | Incomplete                                | RID units in Service Volumes 3, 4 provide some level of coverage, incomplete for this service volume | Need to identify additional future installation location for RemoteID receiver |
| Surv. – RF                | Not applicable                            | Not applicable                                                                                       | Not applicable at this time                                                    |
| Surv. – Optical           | Incomplete                                | Optical units in Service Volumes 3, 4 provide some level of coverage,                                | Need to identify additional future installation location for Optical receiver  |

| Service Mitigation        | Volume / Current State of Services / Gaps | Available Assets                                                | Targets                                      |
|---------------------------|-------------------------------------------|-----------------------------------------------------------------|----------------------------------------------|
|                           |                                           | incomplete for this service volume                              |                                              |
| Surv. – Audio             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Surv. – Radar             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| USS-UTM Services          | Sufficient                                | Integrated Aloft, OneSky, DroneUp                               | Integrated USS providers                     |
| <b>Service Volume 3</b>   |                                           |                                                                 |                                              |
| Groundspace Configuration | Sufficient                                | Cambria County has mapped relevant data, loaded in Keystone FIX | Continue to add / refresh configuration data |
| GNSS RTK / Nav            | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Weather Services          | Sufficient                                | Use AWOS, TAFS, METAR from KJST                                 | Reports from KJST                            |
| Surv. – ADS-B             | Sufficient                                | Two units installed at north and south end of Service Volume    | Two units in SV plus KJST unit               |
| Surv. – RemotelD          | Sufficient                                | Two units installed at north and south end of Service Volume    | Two units in SV                              |
| Surv. – RF                | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Surv. – Optical           | Sufficient                                | Two units installed at north and south end of Service Volume    | Two units in SV                              |

| Service Mitigation        | Volume / Current State of Services / Gaps | Available Assets                                                | Targets                                                 |
|---------------------------|-------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------|
| Surv. – Audio             | Not applicable                            | Not applicable                                                  | Not applicable at this time                             |
| Surv. – Radar             | Incomplete                                | Two radar panels slated for installation in SV3                 | Need to complete installation at SV 3, Inclined Plane   |
| USS-UTM Services          | Sufficient                                | Integrated Aloft, OneSky, DroneUp                               | Integrated USS providers                                |
| <b>Service Volume 4</b>   |                                           |                                                                 |                                                         |
| Groundspace Configuration | Sufficient                                | Cambria County has mapped relevant data, loaded in Keystone FIX | Continue to add / refresh configuration data            |
| GNSS RTK / Nav            | Not applicable                            | Not applicable                                                  | Not applicable                                          |
| Weather Services          | Sufficient                                | Use AWOS, TAFS, METAR from KJST                                 | Reports from KJST                                       |
| Surv. – ADS-B             | Sufficient                                | Three units in Service Volume plus KJST                         | Two fixed installs plus mobile unit available in volume |
| Surv. – RemotID           | Sufficient                                | Three units in Service Volume                                   | Two fixed installs plus mobile unit available in volume |
| Surv. – RF                | Not applicable                            | Not applicable                                                  | Not applicable at this time                             |
| Surv. – Optical           | Sufficient                                | Three units in Service Volume                                   | Two fixed installs plus mobile unit available in volume |

| Service Mitigation        | Volume / Current State of Services / Gaps | Available Assets                                                | Targets                                      |
|---------------------------|-------------------------------------------|-----------------------------------------------------------------|----------------------------------------------|
| Surv. – Audio             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Surv. – Radar             | Not available                             | Not applicable                                                  | Not applicable at this time                  |
| USS-UTM Services          | Sufficient                                | Integrated Aloft, OneSky, DroneUp                               | Integrated USS providers                     |
| <b>Service Volume 5</b>   |                                           |                                                                 |                                              |
| Groundspace Configuration | Sufficient                                | Cambria County has mapped relevant data, loaded in Keystone FIX | Continue to add / refresh configuration data |
| GNSS RTK / Nav            | Not applicable                            | Not applicable                                                  | Not applicable                               |
| Weather Services          | Sufficient                                | Use AWOS, TAFS, METAR from KJST                                 | Reports from KJST                            |
| Surv. – ADS-B             | Sufficient                                | ADS-B unit in place at KJST                                     | Leverage unit for adjacent SVs               |
| Surv. – RemoteID          | Incomplete                                | Need to complete installation of RemoteID unit at KJST          | Unit in inventory, pending approvals         |
| Surv. – RF                | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Surv. – Optical           | Incomplete                                | Need to complete installation of optical unit at KJST           | Unit in inventory, pending approvals         |
| Surv. – Audio             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Surv. – Radar             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |

| Service Mitigation        | Volume / Current State of Services / Gaps | Available Assets                                                | Targets                                      |
|---------------------------|-------------------------------------------|-----------------------------------------------------------------|----------------------------------------------|
| USS-UTM Services          | Sufficient                                | Integrated Aloft, OneSky, DroneUp                               | Integrated USS providers                     |
| <b>Service Volume 6</b>   |                                           |                                                                 |                                              |
| Groundspace Configuration | Sufficient                                | Cambria County has mapped relevant data, loaded in Keystone FIX | Continue to add / refresh configuration data |
| GNSS RTK / Nav            | Not applicable                            | Not applicable                                                  | Not applicable                               |
| Weather Services          | Sufficient                                | Use AWOS, TAFS, METAR from KJST                                 | Reports from KJST                            |
| Surv. – ADS-B             | Sufficient                                | ADS-B unit installed, plus service from unit at KJST            | Units complete                               |
| Surv. – RemoteID          | Sufficient                                | RID unit installed                                              | Units complete                               |
| Surv. – RF                | Not applicable                            | Not applicable                                                  | Not applicable                               |
| Surv. – Optical           | Sufficient                                | Optical unit installed                                          | Units complete                               |
| Surv. – Audio             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| Surv. – Radar             | Not applicable                            | Not applicable                                                  | Not applicable at this time                  |
| USS-UTM Services          | Sufficient                                | Integrated Aloft, OneSky, DroneUp                               | Integrated USS providers                     |

*Table 11: Baseline by Service Volume*

### 9.6.2 Manned Integration Requirements

While no specific integrations with manned aviation have been identified at this time, conversation with industry and FAA have identified both the potential risks associated with uncrewed operations in the proximity of primary/reliever and general aviation airports (hence why the three service volumes containing these airports are considered high risk) as well as the potential to use the surveillance / awareness sensors to develop additional notification and potentially safety enhancing services for general aviation pilots.

### 9.6.3 Applicable FAA and Industry Requirements

Based on the contemplated operations and initial risk characterization, the Performance Baseline and final design of the AERIUM EASSE should reflect requirements and performance parameters identified in the following rules and standards:

- FAA Part 107, regulating commercial small UAS operations;
- FAA Part 135, regulating charter operations, under which certain commercial package delivery operations will take place;
- FAA Part 44807 for general waivers;
- FAA guidance and approvals to date of EVLOS / BVLOS under waiver and COA;
- ASTM F3623-23 Surveillance SDSP Standard
- Operational Risk Assessment, ASTM F3178-16;
- Detect and Avoid ASTM F3442/F3442M-23;
- UAS Traffic Management ASTM F3548-21;
- Current FAA indications given by the current BVLOS NPRM / FAA Part “108”, a notional regulation pertaining to extended commercial deliveries under a modified small UAS rule; and
- RTCA DO-365C, Minimum Operational Performance Standards (MOPS) for Detect and Avoid (DAA) Systems.

## 9.7 Enablement Plan and Implementation Schedule

### 9.7.1 Referenced Risk Matrix Enablement Requirements

The risk analysis and preliminary design approach described in this document have identified two risk categories of initially contemplated operations (A and B) and three levels Service Volume risk (Low, Medium, and High). Based on this analysis, the matrixed risk levels (A/L, B/L, A/M, B/M, A/H, B/H) translate into three logical infrastructure rollout tiers (Tier 1, Tier 2, and Tier 3). Table 12, maps the matrixed risk levels, tiers, and proposed Performance Baseline. *(Note: The Performance Baseline is notional and will be refined within the construct of the Regulatory Plan.)*

| Tier          | Matrixed Risk      | Proposed Notional Performance Baseline                                                                                                                                                                                                                                                                                                   |
|---------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Tier 1</b> | A/L, B/L           | <ul style="list-style-type: none"> <li>- Basic surveillance / awareness with minimum frequency (&lt;1s) and accuracy (&lt;50m)</li> <li>- Basic weather conditions</li> </ul>                                                                                                                                                            |
| <b>Tier 2</b> | A/M, B/M, C/L      | <ul style="list-style-type: none"> <li>- Special procedural considerations such as no-go and ditch areas</li> <li>- Vehicle On-Board PNT with medium frequency (&lt;30s) and accuracy (&lt;10m)</li> <li>- Environmental surveillance with medium frequency (&lt;30s) and accuracy (&lt;10m)</li> <li>- Detailed microweather</li> </ul> |
| <b>Tier 3</b> | A/H, B/H, C/M, C/H | <ul style="list-style-type: none"> <li>- Special procedural considerations such as no-go and ditch areas</li> <li>- Vehicle On-Board PNT with high frequency (&lt;1s) and accuracy (&lt;3m)</li> <li>- Environmental surveillance with high frequency (&lt;1s) and accuracy (&lt;3m)</li> <li>- Detailed microweather</li> </ul>         |

*Table 12: Risk Assessment and Performance Baseline*

The Enablement Plan that follows focuses on building out each of the Service Volumes to achieve the proposed Performance Baseline.

### 9.7.2 Regulatory Plan UAS Traffic Management (UTM) and Operator Services

Given the stated goals of the project, key aspects of the AERIUM EASSE are to support the development of UTM integration, approvals, and performance characterization for the FAA. The FAA is very interested in developing a more structured UTM policy, including requirements and mechanisms for approval – and the timing of the AERIUM EASSE is ideally suited to support this. Given this context, it is our intent to engage with staff at KJST, local government, local residents, USS providers, and local UAS Operators to develop specific operational ConOps, specific safety mitigation plans, and specific research data proposals for the FAA in the context of the AERIUM EASSE, including, but not limited to:

- Identified 3 USS partners (OneSky, Aloft, DroneUp) for direct bi-directional integration into Keystone FIX and the Public Digital Services developed in the AERIUM EASSE;
- Identified 2-3 Public Safety operators within the AERIUM EASSE, along with DRONERESPONDERS, to partner with the team to further develop the Public Safety /

Drone as a First Responder ConOps, develop Drone as a First Responder (DFR) capabilities and assess performance of the EASSE as well as further develop concepts that Public Safety agencies can include in FAA COAs;

- Identified Commercial operators (DroneUp, Horizon) to partner with to further develop commercial ConOps within the AERIUM EASSE, especially in support of Group 1/2 BVLOS operations; and
- In conjunction with the identified Commercial and Public Safety operators, developed and proposed AERIUM EASSE COAs waivers to the FAA, and developing additional waivers and COAs.

The Local Engagement plan included dedicated meetings with KJST Airport Management, the KJST Air Traffic Control Tower, Cambria County Board of Supervisors, Johnstown City Manager, Johnstown City Council, a dedicate local press and outreach campaign, and two dedicated local open houses to educate residents about services and gain feedback.

### **9.7.3 Service Volume Specific Enablement Plans**

In developing the rollout plans for each of the Service Volumes, each Volume's Performance Baseline was considered, as was the current baseline for each Volume. As each Service Volume was planned, overlapped coverage areas were deconflicted in order to develop a set of specific roll-outs that account for overlapping coverage that may be provided by other already enabled, or to be enabled, Service Volumes. Each plan considers the Service Volume Size, notional Performance Baseline, Matrixed Risk, and service requirements relative to the current baseline. Service volume 7 is not included at this time, as we plan no specific work for that Service Volume.

### 9.7.3.1 Service Volume 1

Service Volume 1, The Tier 3 service volume servicing the East End of Johnstown, includes central Johnstown, Dale Borough, Moxham, and Ferndale as well as neighborhoods that extend east along the Johnstown Expressway and Conemaugh River. It consists of a plain between hills to the East, West, and North. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures with a few taller (5-10 story) buildings. This Service Volume is supported by Seventh Ward Ambulance/EMS as an ambulance site, and is intended to be serviced by a central drone hub site at the Central Park Complex at 110 Franklin St, Johnstown, PA 15901. Service Volume 1 consists of Cambria County Census Tracts 1, 2, 3, 5, 6, 7, and 110 with a total population of 11,861 over 3 square miles for a mean population density of 3,594.2 persons per square mile.

Additional considerations for Service Volume 1 are that it sits on a plain between hills and is adjacent to, but excludes, Conemaugh Memorial Medical Center, which includes a heliport. The table below details key aspects of the enablement plan for the Service Volume.

| Service Volume 1: East End             |                                           |              |             |              |
|----------------------------------------|-------------------------------------------|--------------|-------------|--------------|
| <b>Size: ~3-5 square Miles</b>         |                                           |              |             |              |
| <b>Matrixed Risk Assessment Score:</b> | B/H, C/H, C/H, C/H, A/H – Tier 3          |              |             |              |
| <b>Proposed Performance Baseline:</b>  | Tier 3                                    |              |             |              |
| <b>Groundspace Configuration</b>       | Very high groundspace configuration level |              |             |              |
| <b>Required Build Components</b>       | <b>Coverage</b>                           | <b>Units</b> | <b>Cost</b> | <b>Total</b> |
| GNSS RTK / Nav                         | NA                                        | NA           | \$3,500     | \$0          |
| Weather Services                       | Available                                 | Available    | \$1,500     | \$0          |
| Surv. – ADS-B                          | Available                                 | SV-2 shared  | \$1,500     | \$0          |
| Surv. – RemotelD                       | 3 sq mi                                   | 1            | \$2,200     | \$2,200      |
| Surv. – RF                             | 10 sq mi                                  | NA           | \$10,000    | \$0          |

|                                            |                                                                                                                                           |               |          |           |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|-----------|
| Surv. – Optical                            | 4 sq mi                                                                                                                                   | Add +1 units  | \$20,000 | \$20,000  |
| Surv. – Audio                              | 10 sq mi                                                                                                                                  | NA            | \$50,000 | \$0       |
| Surv. – Radar                              | 2 sq mi                                                                                                                                   | Add +2 Panels | \$40,000 | \$80,000  |
| Other Costs (Site, Consumables, Bandwidth) | NA                                                                                                                                        | 2             | \$5,000  | \$10,000  |
| <b>Total Estimated Cost</b>                |                                                                                                                                           |               |          | \$109,700 |
| <b>Rationale / Notes</b>                   | Leverage existing and in process services at SV-2, cover south end especially around curve of hill, procedurally deconflict from heliport |               |          |           |

### 9.7.3.2 Service Volume 2

Service Volume 2 represents a Tier 3 West End service volume servicing central Johnstown, Cambria City, Minersville, Morrellville, Oakhurst, and Coopersdale as well as neighborhoods that extend west along PA-56 and the Conemaugh River. It consists of a plain between hills to the South and North. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures with a few taller (5-10 story) buildings. This Service Volume is supported by West End Ambulance/EMS as an ambulance site, and is intended to be serviced by a central drone hub site at the Central Park Complex at 110 Franklin St, Johnstown, PA 15901. Service Volume 2 consists of Cambria County Census Tracts 1, 12, 134, and 136 with a total population of 7,914 over 3 square miles for a mean population density of 2,729.0 persons per square mile.

| Service Volume 2: West End and Central |                                           |                                        |             |              |
|----------------------------------------|-------------------------------------------|----------------------------------------|-------------|--------------|
| <b>Size: Approx. ~3-5 Square Miles</b> |                                           |                                        |             |              |
| <b>Matrixed Risk Assessment Score:</b> | B/H, C/H, C/H, C/H, A/H – Tier 3          |                                        |             |              |
| <b>Proposed Performance Baseline:</b>  | Tier 3                                    |                                        |             |              |
| <b>Groundspace Configuration</b>       | Very high groundspace configuration level |                                        |             |              |
| <b>Required Build Components</b>       | <b>Coverage</b>                           | <b>Units</b>                           | <b>Cost</b> | <b>Total</b> |
| GNSS RTK / Nav                         | NA                                        | NA                                     | \$3,500     | \$0          |
| Weather Services                       | Available                                 | Available                              | \$1,500     | \$0          |
| Surv. – ADS-B                          | 25 sq mi                                  | Add single unit to cover SV-1, 2, 3, 4 | \$3,000     | \$3,000      |
| Surv. – RemoteID                       | 3 sq mi                                   | Add +1 RID units                       | \$2,200     | \$2,200      |
| Surv. – RF                             | 10 sq mi                                  | NA                                     | \$10,000    | \$0          |
| Surv. – Optical                        | 4 sq mi                                   | Add +1 EO/IR                           | \$20,000    | \$20,000     |

|                                            |                                                                                                                                                                                |               |          |           |
|--------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|-----------|
| Surv. – Audio                              | 10 sq mi                                                                                                                                                                       | NA            | \$50,000 | \$0       |
| Surv. – Radar                              | 2 sq mi                                                                                                                                                                        | Add +2 Panels | \$40,000 | \$80,000  |
| Other Costs (Site, Consumables, Bandwidth) | NA                                                                                                                                                                             | 1             | \$5,000  | \$5,000   |
| <b>Total Estimated Cost</b>                |                                                                                                                                                                                |               |          | \$110,200 |
| <b>Rationale / Notes</b>                   | Mount Southern site at Incline Plane and cover Southern SV 2, Central Johnstown SV-3, and part of SV-1; Optical will support SV 1, 2, 3, and 4; ADS-B will serve SV-1, 2, 3, 4 |               |          |           |

### 9.7.3.3 Service Volume 3

Service Volume 3 represents a Tier 2 North End service volume servicing central Johnstown, Prospect, Woodvale, Franklin, and East Conemaugh. It consists of a plain between hills to the East and West. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures with a few taller (5-10 story) buildings. This Service Volume is supported by East Conemaugh Fire/EMS as an ambulance site, and is intended to be serviced by a central drone hub site at the Central Park Complex at 110 Franklin St, Johnstown, PA 15901. Service Volume 3 consists of Cambria County Census Tracts 102 and 134 with a total population of 3,365 over 3 square miles for a mean population density of 1,246.3 persons per square mile.

| Service Volume 3 – North End and Central |                                           |              |          |          |
|------------------------------------------|-------------------------------------------|--------------|----------|----------|
| <b>Size: ~3-5 Square Miles</b>           |                                           |              |          |          |
| <b>Matrixed Risk Assessment Score:</b>   | B/M, C/M, C/M, C/M, A/M – Tier 2          |              |          |          |
| <b>Proposed Performance Baseline:</b>    | Tier 2                                    |              |          |          |
| <b>Groundspace Configuration</b>         | Very high groundspace configuration level |              |          |          |
| Required Build Components                | Coverage                                  | Units        | Cost     | Total    |
| GNSS RTK / Nav                           | 25 sq mi                                  | NA           | \$2,500  | \$0      |
| Weather Services                         | Available                                 | Available    | \$1,500  | \$0      |
| Surv. – ADS-B                            | 25 sq mi                                  | Available    | \$3,000  | \$0      |
| Surv. – RemoteID                         | 3 sq mi                                   | Add +2 RID   | \$2,200  | \$4,400  |
| Surv. – RF                               | 10 sq mi                                  | NA           | \$10,000 | \$0      |
| Surv. – Optical                          | 4 sq mi                                   | Add +1 EO/IR | \$20,000 | \$20,000 |
| Surv. – Audio                            | 10 sq mi                                  | NA           | \$50,000 | \$0      |

|                               |                                                                     |    |          |          |
|-------------------------------|---------------------------------------------------------------------|----|----------|----------|
| Surv. – Radar                 | 2 sq mi                                                             | NA | \$40,000 | \$0      |
| Other Costs (Site, Bandwidth) | NA                                                                  | 1  | \$5,000  | \$5,000  |
| <b>Total Estimated Cost</b>   |                                                                     |    |          | \$29,400 |
| <b>Rationale / Notes</b>      | Will leverage SV-2 coverage, focused on extending to East Conemaugh |    |          |          |

#### 9.7.3.4 Service Volume 4

Service Volume 4 represents a Tier 2 suburban service volume servicing the suburbs of Westmont and Southmont. It consists of a plain and hills west of a large ridgeline to the East. It constitutes a medium-density residential-commercial area consisting of primarily low-rise structures. This Service Volume is supported by West Hills Fire / Hilltop EMS as an ambulance site, and is intended to be serviced by a central drone hub site at the Hiram G Andrews Center, 727 Goucher St. Johnstown, PA 15905. Service Volume 4 consists of Cambria County Census Tracts 112 and 134 with a total population of 3,365 over 3 square miles for a mean population density of 1,246.3 persons per square mile.

| Service Volume 4 - Westmont            |                                           |              |             |              |
|----------------------------------------|-------------------------------------------|--------------|-------------|--------------|
| <b>Size: ~4-6 Square Miles</b>         |                                           |              |             |              |
| <b>Matrixed Risk Assessment Score:</b> | B/M, C/M, C/M, C/M, A/M – Tier 2          |              |             |              |
| <b>Proposed Performance Baseline:</b>  | Tier 2                                    |              |             |              |
| <b>Groundspace Configuration</b>       | Very high groundspace configuration level |              |             |              |
| <b>Required Build Components</b>       | <b>Coverage</b>                           | <b>Units</b> | <b>Cost</b> | <b>Total</b> |
| GNSS RTK / Nav                         | 25 sq mi                                  | NA           | \$2,500     | \$0          |
| Weather Services                       | Available                                 | Available    | \$1,500     | \$0          |
| Surv. – ADS-B                          | 25 sq mi                                  | Available    | \$3,000     | \$0          |
| Surv. – RemotelD                       | 3 sq mi                                   | Add +2 RID   | \$2,200     | \$4,400      |
| Surv. – RF                             | 10 sq mi                                  | NA           | \$10,000    | \$0          |
| Surv. – Optical                        | 4 sq mi                                   | Add +2 EO/IR | \$20,000    | \$40,000     |
| Surv. – Audio                          | 10 sq mi                                  | NA           | \$50,000    | \$0          |
| Surv. – Radar                          | 2 sq mi                                   | NA           | \$40,000    | \$0          |

|                               |                                                                                                             |   |         |          |
|-------------------------------|-------------------------------------------------------------------------------------------------------------|---|---------|----------|
| Other Costs (Site, Bandwidth) | NA                                                                                                          | 2 | \$5,000 | \$10,000 |
| <b>Total Estimated Cost</b>   |                                                                                                             |   |         | \$54,400 |
| <b>Rationale / Notes</b>      | Can leverage ADS-B, RID, and Optical coverage from SV-2 south site, will add 1 fixed site and 1 mobile site |   |         |          |

### 9.7.3.5 Service Volume 5

Service Volume 5 consists of the immediate environs of John Murtha Johnstown-Cambria County Airport. It is not intended to be an immediately serviced volume, but will be enabled for data collection purposes for establishing safety baselines. Service Volume 5 consists of Cambria County Census Tract 107 with a total population of 3,122 over 9.3 square miles for a mean population density of 336.8 persons per square mile.

| Service Volume 5 - KJST                |                                            |              |             |              |
|----------------------------------------|--------------------------------------------|--------------|-------------|--------------|
| <b>Size: Approx. ~5 Square Miles</b>   |                                            |              |             |              |
| <b>Matrixed Risk Assessment Score:</b> | B/H, C/H, C/H, C/H, A/H – Tier 2           |              |             |              |
| <b>Proposed Performance Baseline:</b>  | Tier 3 (procedurally downgraded to Tier 2) |              |             |              |
| <b>Groundspace Configuration</b>       | Very high groundspace configuration level  |              |             |              |
| <b>Required Build Components</b>       | <b>Coverage</b>                            | <b>Units</b> | <b>Cost</b> | <b>Total</b> |
| GNSS RTK / Nav                         | 25 sq mi                                   | NA           | \$2,500     | \$0          |
| Weather Services                       | Available                                  | Available    | \$1,500     | \$0          |
| Surv. – ADS-B                          | 25 sq mi                                   | Available    | \$3,000     | \$0          |
| Surv. – RemotelD                       | 3 sq mi                                    | Add +1 RID   | \$2,200     | \$2,200      |
| Surv. – RF                             | 10 sq mi                                   | NA           | \$10,000    | \$0          |
| Surv. – Optical                        | 4 sq mi                                    | Add +1 EO/IR | \$20,000    | \$20,000     |
| Surv. – Audio                          | 10 sq mi                                   | NA           | \$50,000    | \$0          |
| Surv. – Radar                          | 2 sq mi                                    | NA           | \$40,000    | \$0          |
| Other Costs (Site, Bandwidth)          | NA                                         | 1            | \$5,000     | \$5,000      |

|                             |                                                                                          |  |  |          |
|-----------------------------|------------------------------------------------------------------------------------------|--|--|----------|
| <b>Total Estimated Cost</b> |                                                                                          |  |  | \$27,200 |
| <b>Rationale / Notes</b>    | Collect UAS data and non-ADS-B compliant data; pending install on the education building |  |  |          |

### 9.7.3.6 Service Volume 6

Service Volume 6 consists of the immediate environs of South Fork, PA. It is intended to be enabled for demonstration of infrastructure inspection as part of a regional rollout and will be enabled for data collection purposes for establishing safety baselines. Service Volume 6 consists of Cambria County Census Tract 132 with a total population of 3,943 over 19.6 square miles for a mean population density of 201.6 persons per square mile.

| Service Volume 6 – South Fork          |                                           |              |             |              |
|----------------------------------------|-------------------------------------------|--------------|-------------|--------------|
| <b>Size: Approx. ~3 Square Miles</b>   |                                           |              |             |              |
| <b>Matrixed Risk Assessment Score:</b> | A/M, A/M, A/M, A/M, A/M – Tier 2          |              |             |              |
| <b>Proposed Performance Baseline:</b>  | Tier 2                                    |              |             |              |
| <b>Groundspace Configuration</b>       | Very high groundspace configuration level |              |             |              |
| <b>Required Build Components</b>       | <b>Coverage</b>                           | <b>Units</b> | <b>Cost</b> | <b>Total</b> |
| GNSS RTK / Nav                         | 25 sq mi                                  | NA           | \$2,500     | \$0          |
| Weather Services                       | Available                                 | Available    | \$1,500     | \$0          |
| Surv. – ADS-B                          | 25 sq mi                                  | Add 1 unit   | \$3,000     | \$3,000      |
| Surv. – RemotelD                       | 3 sq mi                                   | Add +1 RID   | \$2,200     | \$2,200      |
| Surv. – RF                             | 10 sq mi                                  | NA           | \$10,000    | \$0          |
| Surv. – Optical                        | 4 sq mi                                   | Add +1 EO/IR | \$20,000    | \$20,000     |
| Surv. – Audio                          | 10 sq mi                                  | NA           | \$50,000    | \$0          |
| Surv. – Radar                          | 2 sq mi                                   | NA           | \$40,000    | \$0          |
| Other Costs (Site, Bandwidth)          | NA                                        | 1            | \$5,000     | \$5,000      |

|                             |                                        |  |  |          |
|-----------------------------|----------------------------------------|--|--|----------|
| <b>Total Estimated Cost</b> |                                        |  |  | \$30,200 |
| <b>Rationale / Notes</b>    | Support basic, lower risk ISR missions |  |  |          |

### 9.7.3.7 Service Volume 7 – Future Planned

Service Volume 7 consists of the immediate environs of the Norfolk Southern Rail Yard in Altoona, PA. It is intended to be enabled for demonstration of infrastructure inspection as part of a regional rollout and will be enabled for data collection purposes for establishing safety baselines. Service Volume 7 consists of Blair County Census Tract 107.01 with a total population of 3,490 over 5.1 square miles for a mean population density of 684.1 persons per square mile.

| Service Volume 7 – Altoona             |                                           |              |             |              |
|----------------------------------------|-------------------------------------------|--------------|-------------|--------------|
| <b>Size: Approx. ~3 Square Miles</b>   |                                           |              |             |              |
| <b>Matrixed Risk Assessment Score:</b> | A/M, A/M, A/M, A/M, A/M – Tier 2          |              |             |              |
| <b>Proposed Performance Baseline:</b>  | Tier 2                                    |              |             |              |
| <b>Groundspace Configuration</b>       | Very high groundspace configuration level |              |             |              |
| <b>Required Build Components</b>       | <b>Coverage</b>                           | <b>Units</b> | <b>Cost</b> | <b>Total</b> |
| GNSS RTK / Nav                         | 25 sq mi                                  | NA           | \$2,500     | \$0          |
| Weather Services                       | Available                                 | Available    | \$1,500     | \$0          |
| Surv. – ADS-B                          | 25 sq mi                                  | Add 1 unit   | \$3,000     | \$3,000      |
| Surv. – RemotelD                       | 3 sq mi                                   | Add +1 RID   | \$2,200     | \$2,200      |
| Surv. – RF                             | 10 sq mi                                  | NA           | \$10,000    | \$0          |
| Surv. – Optical                        | 4 sq mi                                   | Add +1 EO/IR | \$20,000    | \$20,000     |
| Surv. – Audio                          | 10 sq mi                                  | NA           | \$50,000    | \$0          |
| Surv. – Radar                          | 2 sq mi                                   | NA           | \$40,000    | \$0          |
| Other Costs (Site, Bandwidth)          | NA                                        | 1            | \$5,000     | \$5,000      |

|                                    |                                                   |            |              |          |
|------------------------------------|---------------------------------------------------|------------|--------------|----------|
| <b>Total Estimated Cost</b>        |                                                   |            |              | \$30,200 |
| <b>Rationale / Notes</b>           | Planned future deployment for inspection missions |            |              |          |
| <b>Proposed Roll Out Window(s)</b> | <b>Start</b>                                      | <b>End</b> | <b>Notes</b> |          |
|                                    |                                                   |            |              |          |
|                                    |                                                   |            |              |          |

Total coverage area 24-27 square miles covering three regional localities covering 40,722 lives. Total estimated sensor and installation consumables budget, excluding install and integration labor costs, is \$441,000, or \$17,640 per square mile / \$10.83 per covered life.

## 9.8 Service Volume Census Tracts and Population Data

| Service Volume | Census Tract(s) | Population   | Size       | Density        |
|----------------|-----------------|--------------|------------|----------------|
| 1              | 3/42021000300   | 1,554        | 0.4        | 4,214.6        |
| 1              | 135/42021013500 | 2,727        | 0.7        | 3,846.8        |
| 1              | 5/42021000500   | 1,488        | 0.3        | 4,280.6        |
| 1              | 2/42021000200   | 604          | 0.4        | 1,502.4        |
| 1              | 6/42021000600   | 1,606        | 0.3        | 4,726.2        |
| 1              | 110/42021011000 | 1,547        | 0.4        | 3,979.0        |
| 1              | 7/42021000700   | <u>2,335</u> | <u>0.8</u> | <u>3,109.7</u> |
|                | Total           | 11,861       | 3          | 3,594.2        |
|                |                 |              |            |                |
| 2              | 1/42021000100   | 1,194        | 0.2        | 5,322.6        |
| 2              | 134/42021013400 | 2,005        | 1.8        | 1,097.2        |
| 2              | 12/42021001200  | 2,795        | 0.4        | 6,773.8        |
| 2              | 136/42021013600 | <u>3,114</u> | <u>0.7</u> | <u>4,275.2</u> |
|                | Total           | 7,914        | 3          | 2,729.0        |
|                |                 |              |            |                |
| 3              | 134/42021013400 | 2,005        | 1.8        | 1,097.2        |

*This document contains information that is ATA Aviation Proprietary.*

|          |                               |              |            |                |
|----------|-------------------------------|--------------|------------|----------------|
| <b>3</b> | 102/42021010200               | <u>1,360</u> | 0.9        | 1,557.3        |
|          | Total                         | 3,365        | 3          | 1,246.3        |
|          | Total SV 1, 2, 3              | 23,140       | 9          | 2,674.1        |
|          |                               |              |            |                |
| <b>4</b> | 112/42021011200               | 2,045        | 1.1        | 1,943.1        |
| <b>4</b> | 113/42021011300               | <u>4,982</u> | <u>2.4</u> | <u>2,106.5</u> |
|          | Total                         | 7,027        | 4          | 2,007.7        |
| <b>5</b> | 107/42021010700               | 3,122        | 9.3        | 336.8          |
| <b>6</b> | 132/42021013200               | 3,943        | 19.6       | 201.6          |
| <b>7</b> | Blair 107.01 /<br>42013010701 | 3,490        | 5.1        | 684.1          |

## 9.9 Site Deployment Plan

The table below provides the final listing of sensor sites and deployed equipment.

| Service Volume | Site #         | Site                                   | ADS-B | RID | Optical | Radar |
|----------------|----------------|----------------------------------------|-------|-----|---------|-------|
| 1              | 1 – Center     | Greater Johnstown High School          | 0     | 1   | 1       | 0     |
| 1              | 2 – South      | Ferndale Junior/Senior High            | 0     | 0   | 0       | 1     |
| 2              | 3 – South      | Incline Plane                          | 1     | 1   | 1       | 2     |
| 3              | 4 – Center     | CamTran                                | 0     | 1   | 1       | 1     |
| 3              | 5 – Northeast  | Franklin Borough Municipal Building    | 0     | 1   | 1       | 0     |
| 4              | 6 – North      | Johnstown Elementary School            | 0     | 1   | 1       | 0     |
| 4              | 7 – South      | Mobile Unit (not permanently deployed) | 0     | 1   | 1       | 0     |
| 5              | 8 – East       | KJST                                   | 0     | 1   | 1       | 0     |
| 6              | 9 – South Fork | South Fork                             | 1     | 1   | 1       | 0     |

In addition to the 8 deployed sites, an additional three sites were evaluated and deemed unsuitable due to obstructions, structure, or lack of approvals from the structure owner. Figure 7 below details the final site deployments, as denoted by pink rings for RemoteID/ADS-B/Optical deployments, and yellow cones to represent radar coverage.

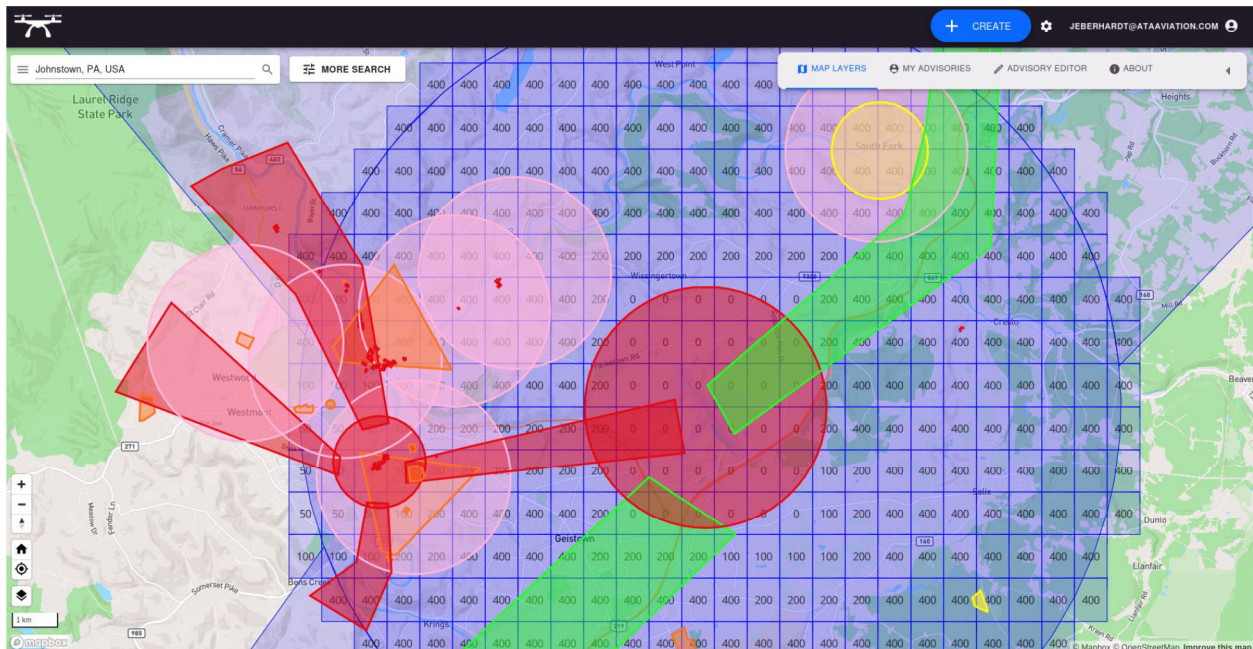


Figure 7: Equipment Deployments, Aerium EASSE

## ELSa-M3 Sensor, Drone Deployment, and EMS Locations

Version 1.0, 24 April 2025

**Final EMS Sites (Ambulance Services Affected)**

| Site                      | Location                                             |
|---------------------------|------------------------------------------------------|
| <b>Seventh Ward EMS /</b> | 314 Cedar St, Johnstown (Dale Borough)               |
| <b>West End EMS</b>       | 175 Garfield St, Johnstown (Oakhurst - Morrellville) |
| <b>Hilltop EMS</b>        | 1000 Luzern St, Johnstown                            |
| <b>Upper Yoder EMS</b>    | 320 Warren St, Johnstown                             |

**Final Drone Deployment Sites**

| Site                                              | Location                            |
|---------------------------------------------------|-------------------------------------|
| <b>Dale Borough Fire Co<br/>(Arthur Street)</b>   | 810 Bedford St, Johnstown, PA 15902 |
| <b>Hiram G Andrews Center<br/>(West Suburban)</b> | 727 Goucher St; Johnstown           |
| <b>CamTran Bus Depot</b>                          | 502 Maple Ave, Johnstown            |