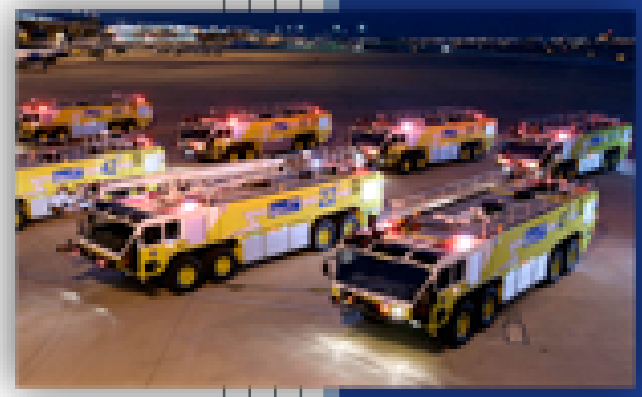


Dallas Fort Worth Airport Fire Services

Texas

EMERGENCY SERVICES MASTER PLAN

2017

ESCI
Emergency Services Consulting International

Table of Contents

Acknowledgments

Emergency Services Consulting International (ESCI) would like to acknowledge the considerable assistance and support of the senior staff and personnel of the DFW Airport Fire Services Fire Department, without which this project could not have been successfully completed.

Board of Directors

Sam Coats, Chair

William Meadows, Vice Chair

Regina Montoya, Secretary

Mayor Mike Rawlings, Board Member

Mayor Betsy Price, Board Member

Lillie M. Biggins, Board Member

Henry Borbolla III, Board Member

Bridget Moreno Lopes, Board Member

Matrice Ellis-Kirk, Board Member

Agency Staff

Alan Black, Director of Public Safety

Brian McKinney, Fire Chief

Todd Haines, Planning Chief/Fire Protection Engineer

Executive Summary

Emergency Services Consulting International (ESCI) was engaged by the Dallas Fort Worth Airport Fire Services (DFWAFS) to evaluate the service provided by the fire department. Specifically, the evaluation was to report on the level of services compared to standards and best practices, and provide recommendations for future service delivery system models. This Emergency Services Master Plan will assist the department in future planning and provision of comprehensive emergency services to the customers and community of the Dallas Fort Worth Airport (DFW). This report is organized as an organizational master plan that evaluates current conditions; projects future growth, development and service demand; and provides recommendations to enhance current services or to provide an equal level of service over the next 10 to 20 years.

ESCI thanks the DFW Board of Directors, Chief Executive Officer, Executive Vice President of Operations, Vice President of Public Safety, Fire Chief, and the staff of the DFWAFS for their outstanding cooperation in the preparation of this report. All involved were candid in their comments and provided a tremendous amount of essential information. Special appreciation is offered to the members of the DFWAFS executive management team in acknowledgement of the time, effort, and resources they provided for this plan.

This master plan is intended to integrate and work toward the completion of the "Ensuring a Safe and Secure Environment" initiatives in the DFW 2016–2020 Strategic Plan. The plan reads:

> Being safe and secure is critically important to DFW, therefore, we elevated Safe and Secure to a Key Result. It is our foundation and the basis for everything we do. Safe and Secure means more than the excellent police, fire, and security services provided by our Department of Public Safety. This Key Result encompasses emergency and pandemic preparedness, business continuity, and resiliency through and after an event or crisis, risk management, employee, passenger, and contractor safety, and information systems security and disaster recovery.

This organizational audit and master plan will serve as a road map to meet the established goals and objectives for the DFWAFS included in the Ensuring Safe and Secure Environment initiative. ESCI encourages the DFWAFS to cross reference each of the recommendations and tasks identified in the master plan to the appropriate initiative, goal, and objectives. The periodic reporting of progress on the master plan should be included as a part of DFW strategic planning progress reports as appropriate.

The audit and master plan begins with an evaluation of the current service delivery provided by the DFWAFS including its programs, administration, management, service delivery performance, and financial health. All areas are assessed and discussed in detail, and specific recommendations are provided where applicable.

EVALUATION OF CURRENT CONDITIONS

An analysis of current conditions is documented in survey sections, reviewing the DFWAFS administration, governance, staffing, personnel management, service delivery, planning, support programs, and capital assets. Each component of the evaluation includes an introductory explanation of the subject area and discussion of desirable outcomes and identified best practices.

Criteria used to evaluate the fire department has been developed over many years. These gauges include relevant guidelines from national accreditation criteria, Federal Aviation Administration (FAA), the National Fire Protection Association (NFPA) standards, federal and state mandates for fire and Emergency Medical Services (EMS) systems, and generally accepted best practices within the fire and EMS industry.

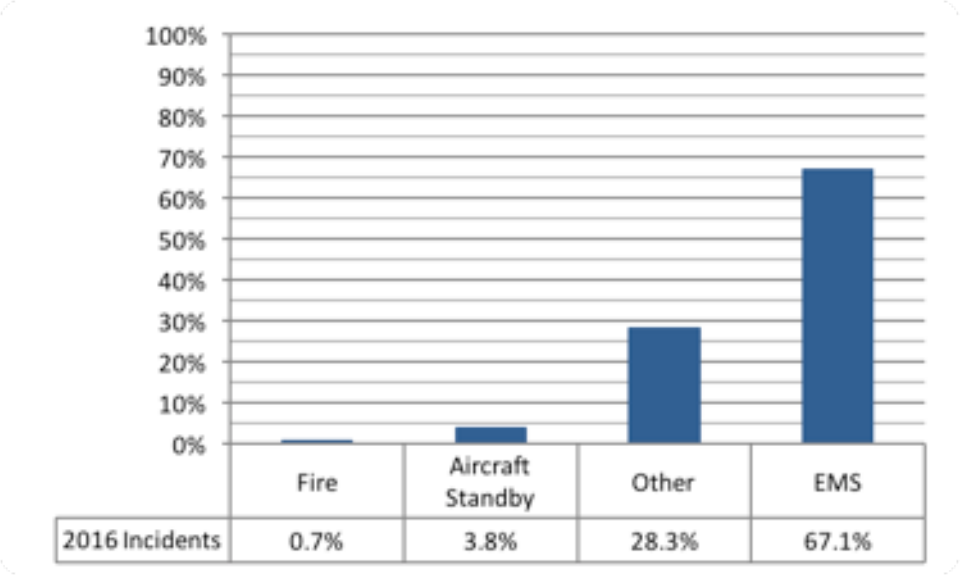
The evaluation of current conditions offers the DFWAFS a detailed assessment of existing fire department operations and also provides the ESCI project team with a snapshot in time, the basis from which the balance of the report is developed. ESCI has made over 50 key recommendations for consideration by the DFWAFS based on the current conditions evaluation.

There are additional key recommendations that address training, specialized services, and employment hiring, testing, and promotions included in the report. A full list of these key short-term recommendations is included in the Executive Summary, as well as the Recommendations and Future Strategies section of this report.

CURRENT SERVICE DEMAND

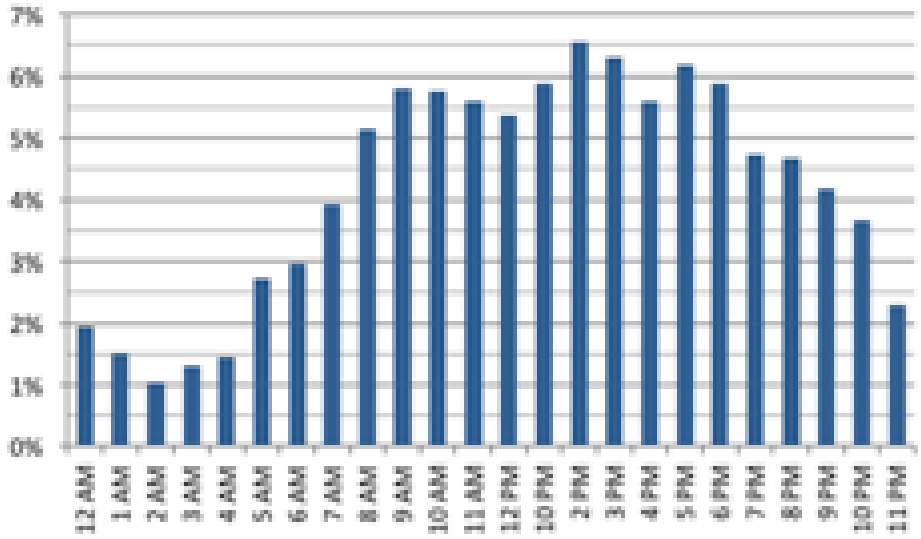
Current service demand was reviewed and analyzed. The types of service demand as a proportion of the total and the workload measurements are shown below:

Service Demand by Type



The EMS requests for service are considerably higher than the other types of calls. This is normal to most fire departments that respond to emergency medical calls. The temporal variation was studied to determine unusual patterns or trends that may be of importance to the department's planning. Geographical analysis of over five years of response experience was studied as well.

Service Demand by Hour of Day



DFWAFS service demand starts to increase between 5 AM and 7 AM. Incident activity is at its greatest between 8 AM and 8 PM; nearly 70 percent of service demand occurs during this period. DFWAFS has instituted a Fire Rescue Squad staffed with three personnel in the Central Terminal Area (CTA) during the hours of 8 AM to 6 PM. This unit's primary responsibility is to handle BLS (non-emergent) EMS calls in the CTA during the time with the highest number of passengers and service demand.

SERVICE DELIVERY AND RESPONSE PERFORMANCE

Response performance criteria and actual service delivery performance is analyzed in detail, providing information with which the department can develop future deployment methodologies and identify desired levels of response performance and staffing.

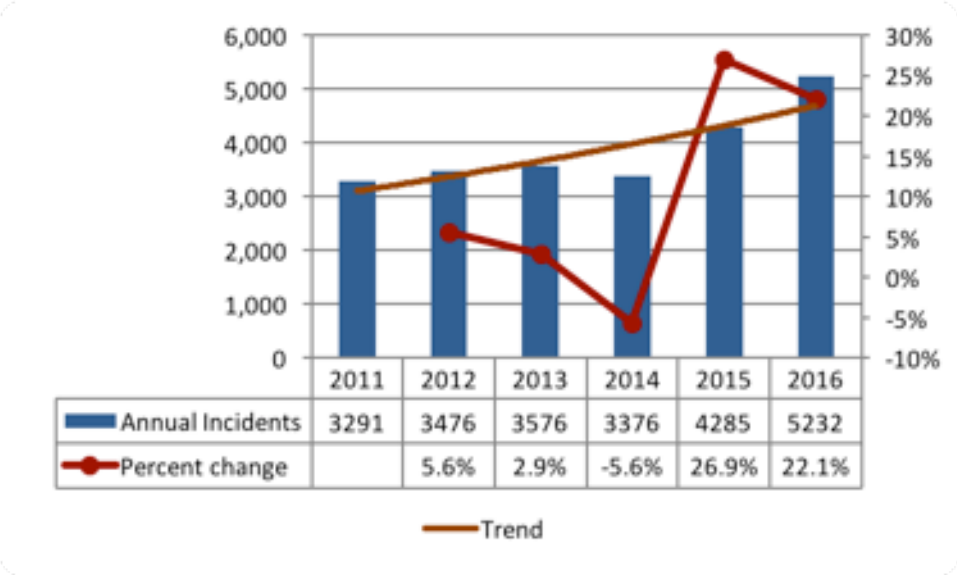
Of all incidents to which the department responded emergent in 2016, 90 percent were responded to in 6 minutes, 32 seconds or less.

Response Times by Type (90th Percentile), 2016

Incident Category	Total Response Time
Aircraft Standby	02:57
EMS	06:46
Fire	06:48
Other	07:01

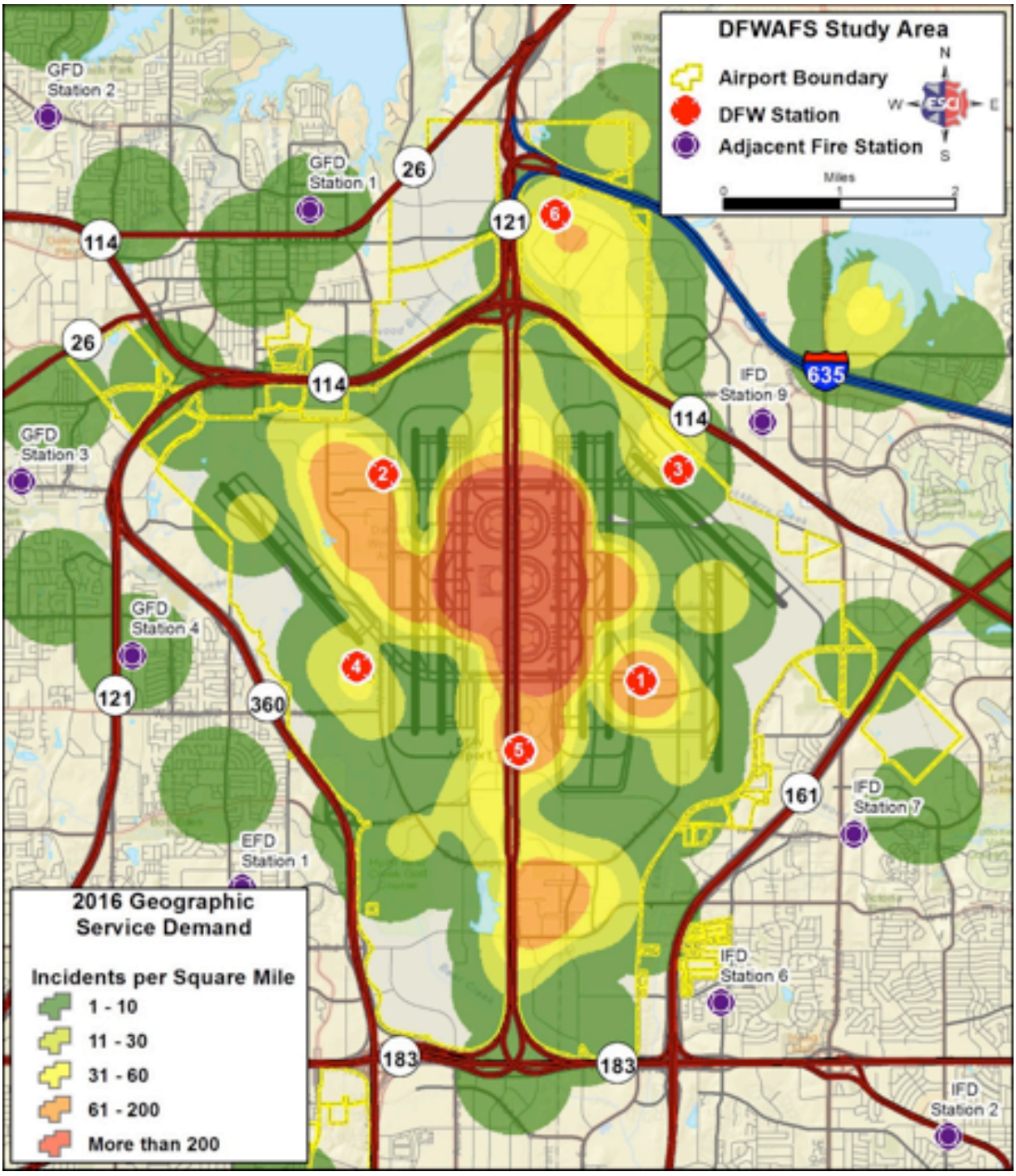
Overall, DFWAFS service demand increased by approximately 59 percent between 2011 through 2016. Although the increase in service demand varied year by year, service demand increased by an annual average rate of nearly 12 percent (11.8 percent) in the period displayed. EMS service is the primary driver of the increased service demand.

Service Demand by Year



DFWAFS has significant resources and is generally well located to respond to calls for service for the current DFW risk profile and service area. Geographic Information System (GIS) analysis indicates that over 90 percent of incidents occurring within the airport service delivery area are within 5 minutes, 37 seconds "travel" time from an existing fire station. Actual performance in 2016 was 6 minutes, 32 seconds 90 percent of the time. However, through the current service delivery analysis and future service delivery projections, ESCI has recommended several station, equipment, and personnel adjustments to maximize the efficiency and effectiveness of the DFWAFS response assets.

Not surprisingly, the terminal area—and the occupancies associated with the terminal area—displays the greatest incident density in the DFWAFS service area. Industrial and commercial areas south of Station 5 and around Station 6 also demonstrate higher incident density.



In accordance with adopted DFW established standards for response times and the components of response time, this report compared DFWAFS service delivery performance to FAA Airport Rescue Fire Fighting for aircraft emergencies and NFPA 1710 standard objectives for structural and medical emergencies. It is explained in the report that some aspects of response performance are based on dispatch time data that may not be totally complete. Recommendations are given to improve this data collection.

It is also important that DFWAFS develop and adopt response, performance, and staffing standards that best meet the airport's risk profile and needs of the airport community served. To meet the identified standards and/or improve upon current response times with anticipated growth, additional personnel and relocation/consolidation of fire stations is recommended for the future.

STAFFING

The staffing section of the report reviews both operational and administrative and support personnel deployment. In general terms, operational (emergency response) staffing of fire apparatus is found to be within acceptable parameters, although to meet the desired emergency response force levels while addressing the growth in commercial structures and passenger/customer airport utilization as well as reducing overtime utilization to meet established targets, DFWAFS will need to add additional personnel. Further, some administrative personnel are suggested to be reclassified or added to provide optimized performance and appropriate oversight and span of control.

ESCI has provided analysis and recommendations/options to address the staffing issues impacted by the identified drivers in the current conditions section of this report. ESCI has analyzed each staffing issue using the current 52-hour work week in addition to a 56-hour work week option for consideration.

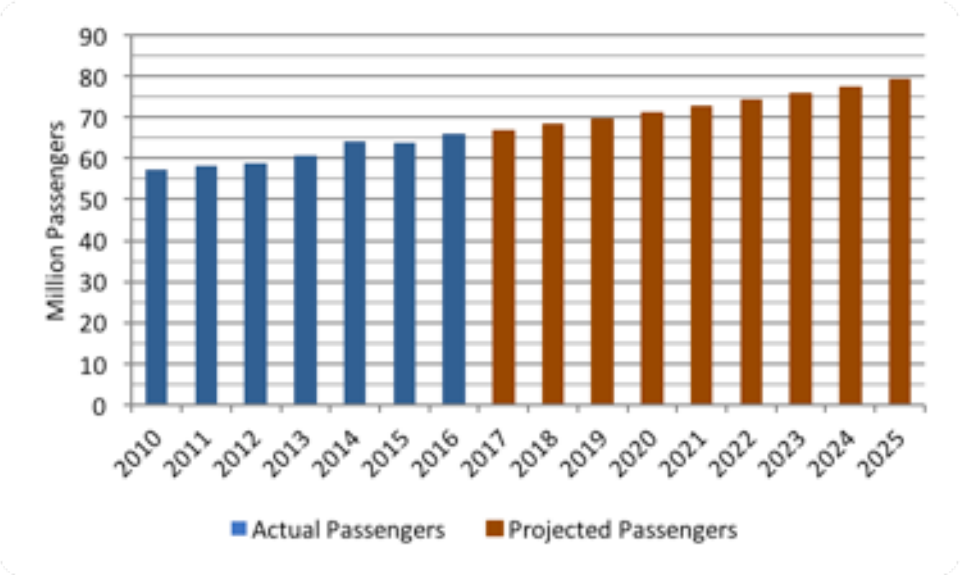
ESCI recommends the DFWAFS consider several presented options regarding staffing levels and shift schedules to address the identified staffing and FTE counts to ensure optimized efficiency and service delivery capabilities. In addition, ESCI has also provided short-term deployment and service delivery recommendations that will enhance current capabilities.

FUTURE SYSTEM DEMAND PROJECTIONS

In the Future System Demand analysis, ESCI examines future growth, development, and fire protection risk in the DFWAFS service area. Future service demand is largely dependent on changes over time to human activity (i.e. passengers and employees); growth and development; and the changing nature of the risks present in the service area. This analysis uses historical and projected DFW Airport passenger statistics, historical service demand data, and airport planning documents to provide an overview of future service demand in the DFWAFS service area.

The following figure displays the number of passengers that passed through DFW International Airport from 2010 through 2016. In addition, this figure displays the projected number of enplanements (passengers) through 2025. The data displayed is actual statistical data maintained by DFW International Airport; and a projection of future enplanements provided by the airport.

DFW Passenger Enplanements, Historical and Projected

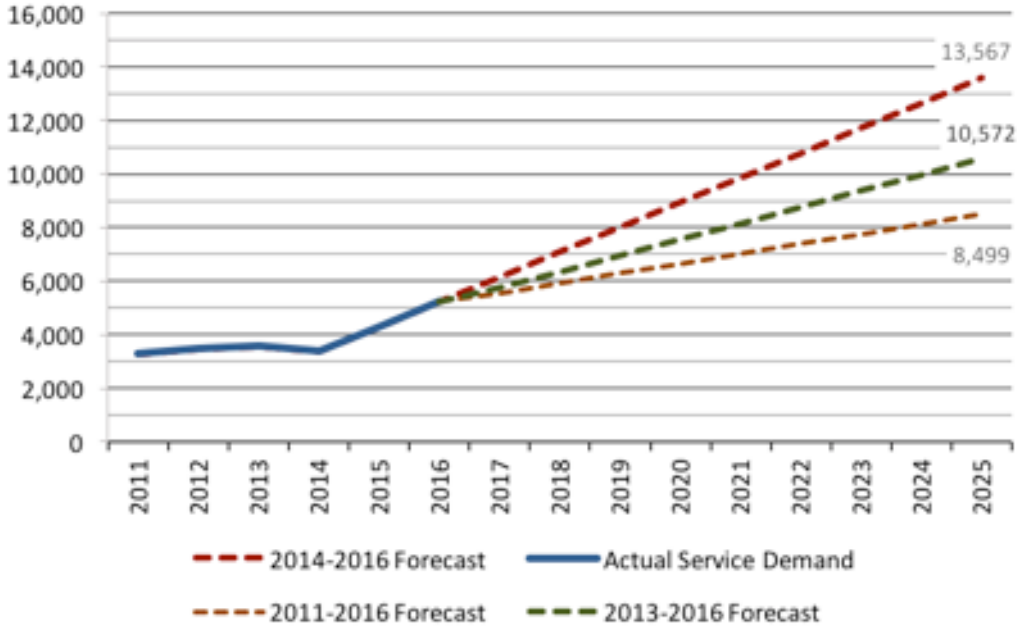


In 2016, over 65.5 million passengers passed through DFW Airport. This represents an average daily population of approximately 178,000 using the airport. The annual number of passengers is predicted to continue increasing at an average annual rate of approximately two percent during the period displayed.

FUTURE SERVICE DEMAND PROJECTIONS

In evaluating the deployment of facilities, resources, and staffing, it is imperative to consider potential changes. In the case of DFWAFS, increased activity in the terminal areas and the commercial area adjacent to the airfield in the recent past appears to be increasing service demand. Changes in service demand may require changes and adjustments in the deployment of staffing and capital assets in order to maintain acceptable levels of performance. For the purposes of this study, ESCI uses historical service demand from 2011 through 2016 to present a projection of future service demand in the DFWAFS service area.

DFWAFS Future Service Demand Projection, 2016–2025



The first projection in this figure uses historical service demand from 2011 through 2016 to forecast service demand through 2025. As displayed, service demand increases to approximately 8,500 incidents by 2025. This represents an increase of slightly over 62 percent over nine years.

Future Delivery System Models

The current conditions analysis and system demand projections form the foundation from which ESCI has developed strategies for the delivery of services at the DFW Airport for the future.

This report cites multiple future system model modifications, including both short-term and long-term initiatives that are identified in the interest of improving and maintaining future system integrity. Each initiative is discussed in detail, and guidance is provided.

The discussion of future delivery systems begins with an explanation of the importance of developing response time standards and targets. Guidance is offered regarding how the agency can assess critical tasking, risk analysis, and staffing performance from which response time performance objectives can be established.

Short and mid-term strategies and models are discussed next. The initiatives identified and explained include:

- Response performance reporting
- Response deployment
- Community Risk Reduction
- Emergency Medical Services (EMS)
- Personnel management
- Management, administration, and finance
- Training
- Organizational development

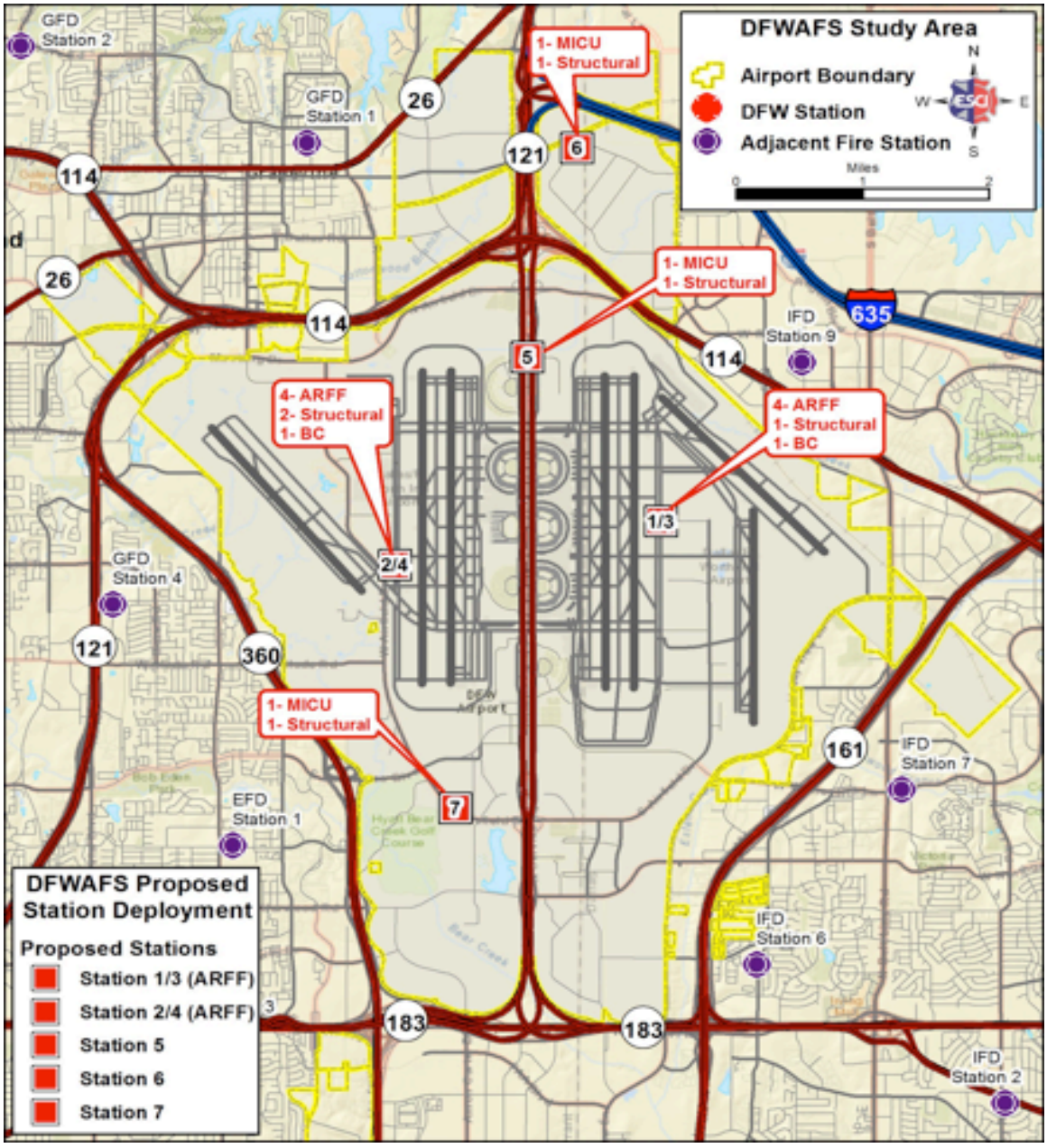
The report continues by discussing long-term strategies and needs, including:

- Future fire station relocation considerations
- Future personnel and equipment deployment
- EMS service delivery challenges and future considerations

FUTURE STATION DEPLOYMENT

The following section displays and describes a number of station deployment changes and elements that will assist with achieving the aforementioned response performance and ERF recommendations. These deployment models are also referenced in the recommendations section.

DFWAFS Proposed Station Deployment



This figure displays a proposed five-station deployment model for DFWAFS resources at DFW International Airport. In this deployment model, ARFF resources are moved from the current four ARFF stations into two ARFF super stations centrally located to serve the DFW airfield. Station 5 is relocated to the northern end of the terminal area from its current location south of the terminal area. A new station (Station 7) is located on Airfield Drive to the west of International Parkway. The current Station 6 remains in service on Regent Boulevard in the area of the International Commerce Park. The stations are labeled with the number and type of 24-hour staffed apparatus at each station. ARFF apparatus are currently staffed with one operator; minimum staffing for structural fire apparatus is four personnel, and MICUs are staffed with two personnel.

The strategies needed to meet future service demand do not come without cost. In the final discussion section of the report, ESCI provides information on the financial considerations that accompany system expansion and modified delivery models. Financial projections are offered regarding fire station construction costs as well as future personnel and fire apparatus expenses.

The attached recommendations table provides a consolidated view of the key short-term recommendations. The recommendations table can serve as a tracking and progress report for the recommendations submitted as part of the master plan.

SHORT-TERM KEY RECOMMENDATIONS

Key Recommendations	Status		
	Started	50%	Complete
1. It is recommended that the DFWAFS provide quarterly performance, fire department master plan progress, and outcome data elements for review by the DFW Board of Directors. This report should be in the form of a visual dashboard with supporting documentation and submitted to the Vice President of DPS for distribution or presentation to the CEO and Board of Directors.			
2. Consider developing a long-range apparatus replacement schedule based upon life expectancy and usage by apparatus type and then moving to a replacement schedule over time where a uniform amount (plus inflation) of funding is budgeted each year for this recurring expense.			
3. Consider formal adoption of this master plan and completion of a strategic plan.			
4. Consider annual review of fire service strategic planning elements and ensure complete DFWAFS plan is adopted and utilized.			
5. SOPs should be reviewed annually for accuracy and compliance with mandates.			
6. Maintain and distribute minutes for weekly staff meetings.			
7. Consider periodic newsletter for DFW airport-wide distribution of DFWAFS news, trends, and safety education materials.			
8. Develop customer satisfaction survey link that can be given to customers/passengers served by DFWAFS.			
9. Facilitate the updating of the DFW annual “Employee Engagement Survey” to be more applicable and measurable based on DFWAFS and DPS standards and services.			

Key Recommendations	Status		
	Started	50%	Complete
10. Review regulatory documents annually to ensure accuracy and compliance.			
11. Consider separation of policies and procedures (policies administratively based) and SOGs (evolution and procedurally based).			
12. Secure hard copy files and documents in locked cabinets when office is not staffed.			
13. Consider periodic reports of performance and outcome to Airport Authority Board.			
14. Further automate the utilization of Telestaff including integration with Kronos personnel and time card documentation (eliminate the hard copy time card system).			
15. Implement a fully integrated records management system to include, fire, EMS, ARFF, fire prevention, and training data and records.			
16. Restore dedicated IT services for the DFWAFS to ensure adequate maintenance and integration of hardware and software.			
17. Ensure adequate Wi-Fi services are available in all HazMat and other special operations vehicles to optimize functionality and effectiveness.			
18. Pursue CAD-to-CAD interface with automatic aid dispatch centers to implement seamless alarm dispatch procedures.			
19. Consolidate and redistribute stations, personnel, and apparatus to meet build out population, customer/client load, and commercial/warehouse risk profile.			
20. Increase relief factor to decrease overtime to below 5% DFW Airport target.			

Key Recommendations	Status		
	Started	50%	Complete
21. Increase staffing to a two-person minimum on all ARFF apparatus.			
22. Fully integrate fire and EMS operations to have a seamless cross trained, dual role organization.			
23. Have BLS squad at Station 5 and respond from station versus posting at terminals to reduce negative impacts to suppression capabilities and the effective response force.			
24. Consider alternative staffing model of BLS squad by Community Risk Reduction Personnel (Fire Prevention) and future location of unit at terminal with a CRR office.			
25. Consider modification of trade policy to make it more permissive to reduce PTO utilization.			
26. Establish task books to sign off on minimum qualification to act as drive operator and captain.			
27. Implement upgrade pay program consistent with promotional pay scale.			
28. Review and adjust position salaries and specialty pay (e.g. paramedic) to address compaction, regional practices, and incentivize promotional participation.			
29. Utilize established FD entry level and promotional testing company to ensure competency based testing is administered in a way that is relevant, consistent, and fair.			
30. Have CDD take the lead and establish a succession planning/leadership development committee to develop and implement a succession and leadership development plan.			

Key Recommendations	Status		
	Started	50%	Complete
31. Adopt and implement a wellness and fitness initiative utilizing CPAT entry level physical ability testing and annual incumbent physical ability testing and medical exams in compliance with NFPA 1582 standards.			
32. The DFWAFS Career Development Division (CDD) should conduct all training, education, certification and oversight of all DFWAS fire, EMS, and ARFF training.			
33. The Career Development Division should produce, distribute, and monitor all annual, quarterly, and monthly training plans and maintain records and tracking of mandates and topics.			
34. The Career Development Division should have designated suppression, EMS, and ARFF apparatus and equipment to limit the amount of in service equipment utilized during non DFWAFS training.			
35. Develop and implement a comprehensive EMS integration and training program.			
36. CDD to coordinate EMS training in coordination with the medical director.			
37. Conduct integrated fire and EMS training and combined ALS/BLS scenarios.			
38. Develop a functioning EMS training lab with computer and advanced mannequin training resources.			
39. Host suppression, HazMat, rescue, and other regional training classes in addition to ARFF training.			
40. Develop and deliver dual role cross training for all DFWAFS EMS personnel.			
41. Upon consolidation of ARFF stations, consider utilization of old Station 4 for training, housing, and 24/7 training capabilities for customers purchasing training from DFWAFS.			

Key Recommendations	Status		
	Started	50%	Complete
42. Develop a strategic plan during calendar year 2017.			
43. Establish a capital replacement schedule for fire apparatus and equipment.			
44. Cross train fire and EMS personnel for use in either discipline, as needed.			
45. Encourage the medical director to conduct periodic ride-alongs with EMS units.			
46. Conduct routine case reviews on a regular basis, randomly reviewing any cases, not limited to critical or problem incidents.			
47. Establish a routine practice of review of patient transport refusal reports.			
48. Consider including Advanced Cardiac Life Support (ACLS) training in continuing education			
49. Consider adding HazMat Safety Officer certification to special operations training.			
50. Establish standard operating guidelines for technical rescue disciplines.			
51. Establish defined response protocol for Technical Rescue Team deployment.			

Evaluation of Current Conditions

ORGANIZATIONAL OVERVIEW

DFW is the principal air carrier airport serving the Dallas–Fort Worth metropolitan area and North Central Texas. A population of 7.1 million makes the Dallas–Fort Worth–Arlington metropolitan statistical area (MSA) the fourth largest among United States MSAs, according to the U.S. Department of Commerce, Bureau of the Census.

DFW's central location, superior air service, and diverse economy are the major reasons that businesses relocate to the area, propelling the North Central Texas area to be one of the fastest-growing and most stable economies in the country. The Dallas–Fort Worth–Arlington MSA is home to 25 Fortune 500 headquarters, and over 10,000 corporate headquarters with more than 3.5 million employees. The region's diverse economy has enabled it to weather economic downturns in key industry sectors.

DFW is the third busiest airport in the world by aircraft movements and the eleventh busiest airport in the world by passenger traffic in 2016. It is the busiest airport in the State of Texas by both passenger enplanements and aircraft movement (takeoffs and landings). It is the tenth busiest international gateway in the United States and busiest in Texas. With nearly 1,900 daily flights, American Airlines at DFW is the second largest airline hub in the world and United States, only behind Delta's Atlanta hub. The DFW Airport is larger than the Manhattan Island and is second in acreage (17,207/26.9 miles) among U.S. airports, after Denver.

Since the opening of the DFW Airport in 1974, fire and EMS response have been provided by the DFW Department of Public Safety (DPS), and still are today. However, in the past, all DPS personnel were cross trained to provide law enforcement, fire, ARFF, and EMS response. In recent years, the approach has been modified by necessity to more appropriately allocate and deploy emergency responders. Today, fire and EMS services are provided by Dallas Fort Worth Airport Fire Service (DFWAFS), as a component of the DPS, and law enforcement is now assigned to the branch titled DPS Police Services.

The Organizational Overview component provides a summary of the agency's composition, discussing its configuration and the services that it provides. Data provided by DFWAFS senior staff, as well as both internal and external stakeholders, was combined with information collected during ESCI's fieldwork to develop the following overview.

ESCI utilized a number of standards and best practices to measure against the current DFWAFS programs and fire department functions. These measures and best practices are taken from National Fire Protection Association (NFPA), Center for Public Safety Excellence (CPSE), Commission on Fire Accreditation International (CFAI), and ESCI and International Association of Fire Chiefs (IAFC) best practices.

What is CFAI:

CFAI is a comprehensive self-assessment and quality improvement model that enables organizations to examine past, current, and future service levels and internal performance, and compare them to current research and industry best practices. This process leads to a more efficient and effective emergency service organization.

CFAI's accreditation allows fire and emergency service agencies to compare performance data to:

- Determine community risk and safety needs and develop community-specific Standards of Cover;
- Evaluate the performance of the department; and
- Establish a method for achieving continuous organizational improvement.

Fire service executives face increasing pressure to "do more with less" and justify their expenditures by demonstrating a direct link to improved or expanded services. Particularly for emergency services, local officials need criteria to assess professional performance and efficiency. The CFAI accreditation process provides a well-defined, internationally-recognized benchmark system to measure the quality of fire and emergency services.

What is NFPA:

NFPA is a global nonprofit organization devoted to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards. NFPA standards specify the minimum requirements for an occupational safety and health program for fire departments or organizations that provide public safety services.

The standard includes safety requirements for members involved in rescue, fire suppression, emergency medical services, hazardous materials operations, special operations, and related activities. Protocols cover firefighter training, apparatus, protective clothing and equipment, medical and physical requirements, and health and wellness programs.

Governance

The very basis of any service provided by governmental or quasi-governmental agencies lies within the policies that give that agency the responsibility and authority upon which to act. In most governmental or private emergency response agencies, including DFW Airport Fire Services, those policies lie within the charters, ordinances and/or corporate policies, and other governing documents adopted by the parent organization. The following figure provides a general overview of the DFWAFS governance and lines of authority elements.

Figure 1: Governance

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION
RESPONSIBILITIES & AUTHORITY	
Type of governing body?	DFW Board of Directors (appointed); both cities appoint members—mayor of each city, plus four appointees from Fort Worth and seven from Dallas. One non-voting member representing the cities of Irving, Coppell, Euless, and Grapevine on a rotating basis.
Head of governing body	11 voting members, equal authority (1 non-voting member)
Top appointed official	Chief Executive Officer, Sean Donohue
Meeting schedule	First Thursday of each month, 08:30
Is elected official authority defined?	N/A
Fire chief position	Assistant Director of Public Safety, Brian McKinney
Hired by contract?	No
Term of contract	N/A
Performance evaluations given?	Yes, Annually
Fire chief's authority defined?	DFW Airport HR, TCFP
Policy & administration roles defined? Where?	Yes
ATTRIBUTES OF A SUCCESSFUL ORGANIZATION	
Rules and regulations last reviewed/updated?	As needed; Just completed several policy reviews
Process for revision provided to line staff?	Yes
Legal counsel retained? (Name, specialty)	DFW Airport Legal
Consultation available to fire chief?	Yes
Labor counsel available to fire chief?	N/A
Governing body minutes maintained?	Posted on the DFW Airport website

Discussion

Unlike most fire and EMS agencies, DFW Airport Fire Services is not a special service district or municipal subdivision. Instead, it is a privately held component of the DFW Airport, operating under the oversight of the Chief Executive Officer (CEO) who reports to a governing board. The DFW Airport's Board of Directors is composed of 12 members, 11 of whom are appointed by the city councils of the cities of Dallas, Fort Worth, Irving, Grapevine, Euless, and Coppell; all of whom are owners of the DFW Airport.

Seven city council appointees represent the City of Dallas and four represent the City of Fort Worth, based on the proportion of those city's ownership. A 12th, non-voting, board position is in place and represents one of the airport's four smaller cities and is appointed on an annual, rotating basis.

The DFW Airport Board is the single body responsible for governing DFW International Airport business and may enter contracts on behalf of its owner cities' city councils. Each city votes (annually) to provide approval of the annual operating budget, bond sales, and related expenses.

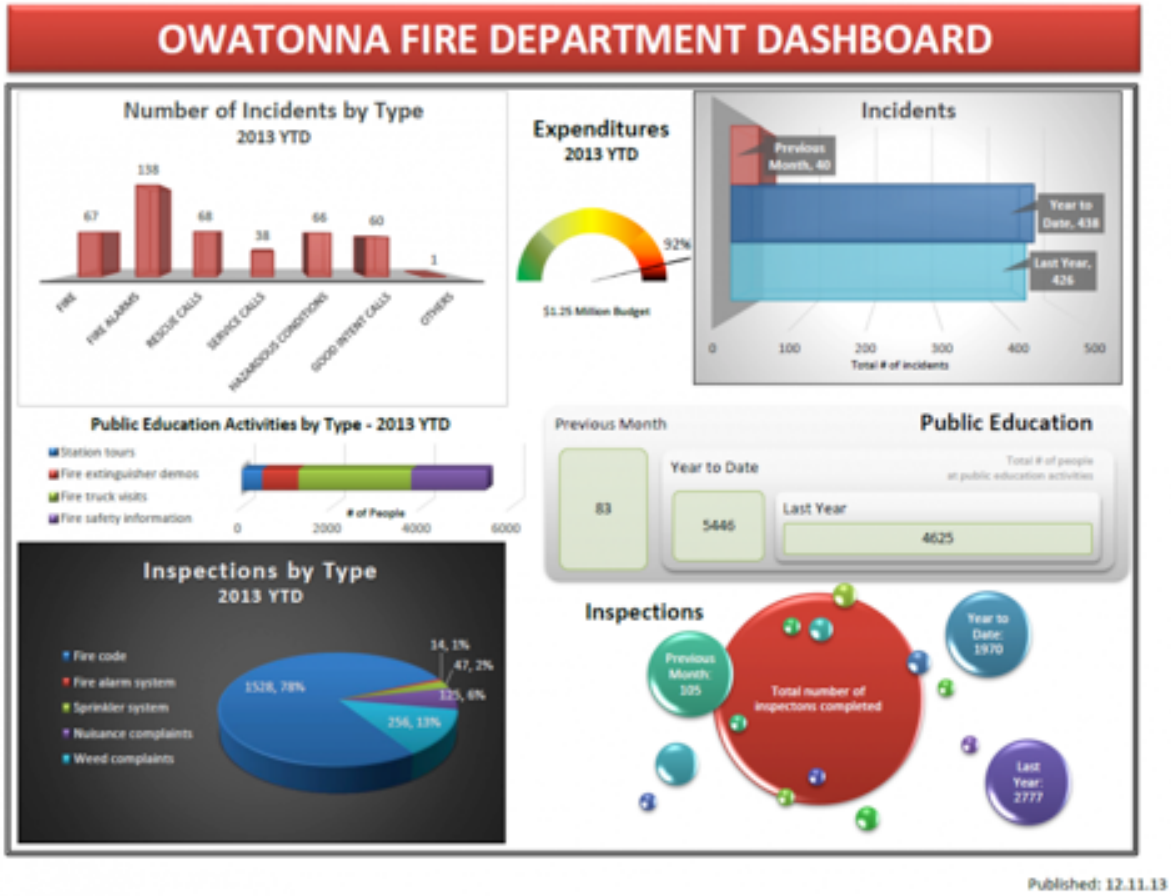
The Board of Directors appoints the airport's Chief Executive Officer (CEO) who manages the airport's operations. The CEO subsequently hires multiple Executive Vice Presidents and Vice Presidents. Airport Fire Services is under the guidance of an Executive Vice President of Operations. The fire chief, who holds the title of Assistant Director, reports to the Director/Vice President of the Department of Public Safety (DPS).

Key Recommendation:

- It is recommended that the DFWAFS provide quarterly performance, fire department master plan progress, and outcome data elements for review by the DFW Board of Directors. This report should be in the form of a visual dashboard with supporting documentation and submitted to the Vice President of DPS for distribution or presentation to the CEO and Board of Directors.

The following is an example of an all risk dashboard. This is intended to serve only as an example of the content, display, and layout of the reporting tool. This visual dashboard needs to be customized for the DFWAFS.

Figure 2: All Risk Dashboard Example



Organizational Design

The structural design of an emergency services agency is vitally important to its ability to deliver service in an efficient and timely manner while providing the necessary level of safety and security to the members of the organization, whether career, paid-on-call, or volunteer. During an emergency, an individual's ability to supervise multiple personnel is diminished thus industry standards recommend a span of control of four to six personnel/units under stressed situations. This is a recommendation carried forward from military history and has shown to be effective in emergency service situations.

In addition, employees tend to be more efficient when they know to whom they report and have a single point of contact for supervision and direction. A recent research project conducted by the Columbia University, Northwestern University, and University of Queensland, Australia, found that,

> …when there are tasks that require teamwork, people get more done when there are leaders and followers. Without a clear chain of command, members often become sidetracked with grabbing power and lose track of the task at hand.[1]

The following figure summarizes the organizational design components of the DFWAFS:

Figure 3: Organizational Design

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION
ORGANIZATIONAL STRUCTURE	
Structure type	Traditional top-down hierarchy
Descriptions of all jobs maintained?	Yes
Job descriptions last updated? (Date)	2015
Positions with employment agreements	0
CHAIN OF COMMAND	
Span of control (highest ratio in organization)	7:1
Hiring/Firing authority (describe)	Fire Chief via Human resources
FORMATION	
When was organization formed?	1973
Is FD history maintained?	No
Individual or group responsible	N/A

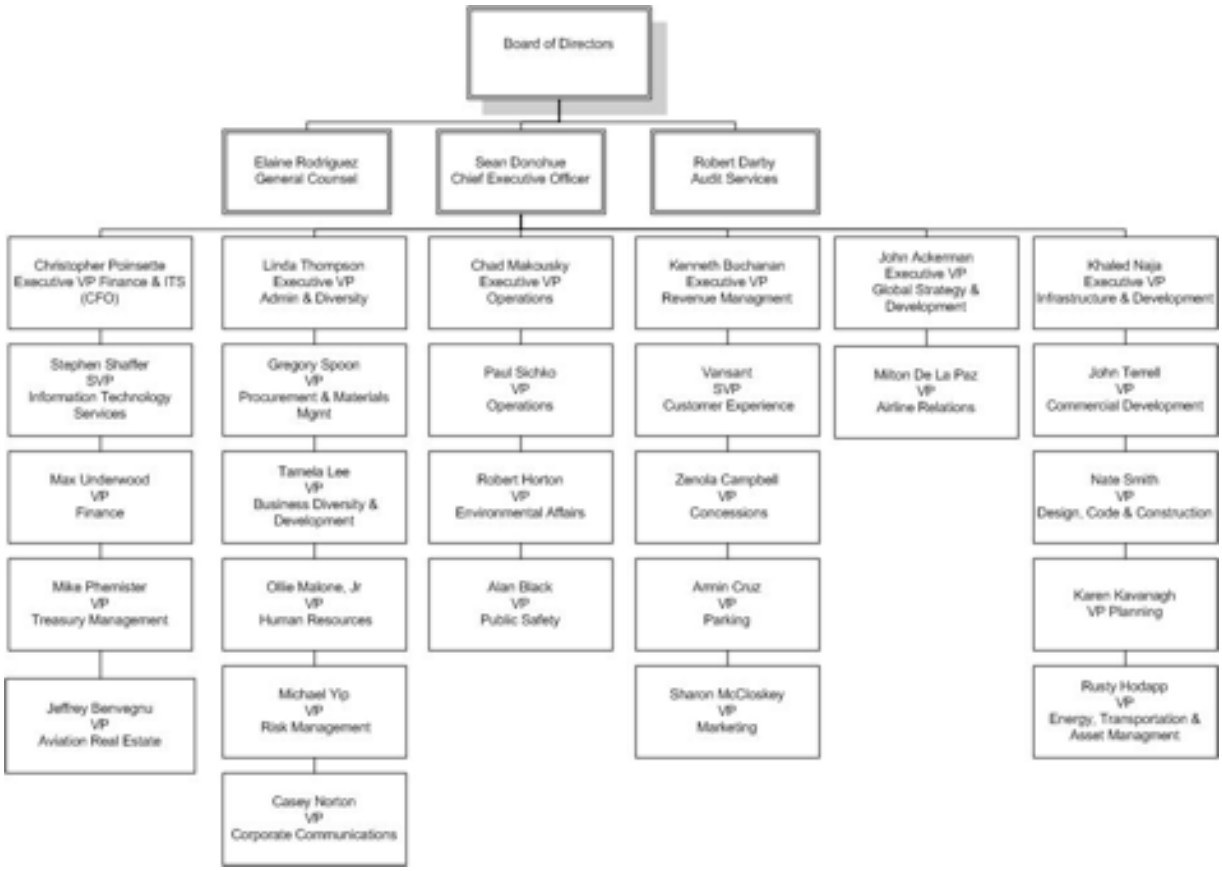
Organizational Structure

To operate effectively the structure of a fire department needs to be clearly defined in the form of an organizational chart. The chart institutionalizes the agency's hierarchy, identifies roles and, most importantly, reporting authority, and helps to assure that communication flows appropriately, as well as limiting opportunities to circumvent the reporting structure.

An organization chart for the DFW Airport Fire Services is reflected in Figure 4.

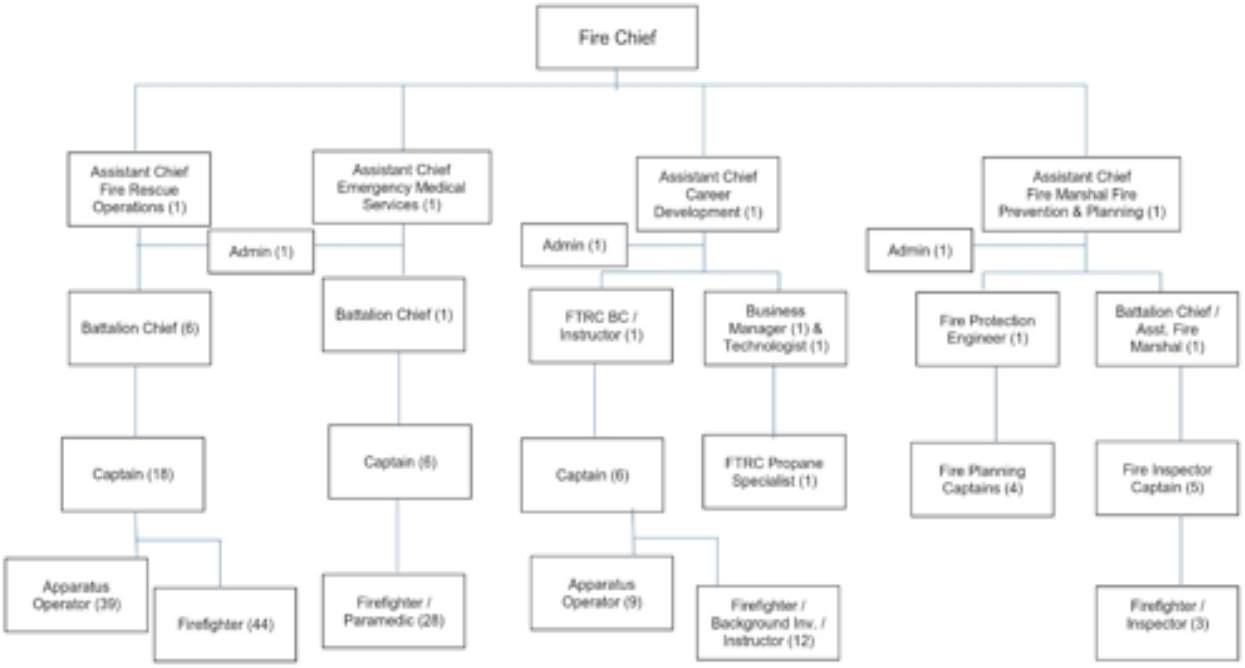
[1] "Why Hierarchies are Good for Productivity," *Inc*. September 2012, p 26.

Figure 4: DFW Airport Organizational Chart



In addition to the preceding chart, the Airport Fire Services operates under the organizational structure in the next figure.

Figure 5: DFW Airport Fire Services Organizational Chart



DFWAFS is configured in a top-down hierarchy, typical of most fire and EMS agencies. The fire chief operates with a 4 to 1 reporting ratio, which is within what is considered to be an acceptable span of control. The structure is reasonably balanced regarding the delegation of responsibilities and the hierarchy is charted clearly, allowing employees to understand to whom they report. However, ESCI has identified the potential to better define the structure, titles, and responsibilities among the chief officer ranks. This proposed reorganization will result in enhanced position clarity, better aligned responsibilities, and improved effectiveness of the chief officer positions within the department. These proposed organizational changes are detailed in the Staffing section of the report.

Service Area and Infrastructure

The size and composition of a fire department's service area affects the type and number of personnel, fire stations, and vehicles that are needed to provide services efficiently. Sometimes complex decisions need to be made regarding the deployment strategies employed to properly position resources based on land area, geography, risk, and similar factors. In the instance of an airport fire and rescue service, deployment complexity is increased and decisions need to be made with the added consideration of Federal Aviation Administration (FAA) requirements. Following is a summary of the DFWAFS service area and service infrastructure resources.

Figure 6: Service Area and Infrastructure

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION
AGENCY DESCRIPTION	
Agency type (district, municipality, etc.)	Private corporation operating under a Board of Directors consisting of publicly elected officials
Area in square miles	26.9
Headquarters location (physical address)	2900 East 28th Street, DFW Airport, Texas 75261
Number of fire stations	6
Other facilities	Headquarters
Emergency vehicles (number, type)	
Engine	2 Pierce
Engine, reserve	1 Pierce
Ladder truck	4 (2 105-foot quints, 2 100-foot aerials)
Ladder, reserve	0
EMS unit (ALS, BLS, 1st Responder)	4 (MICU)
EMS unit, reserve	1
Command Vehicles	2 Tahoe
Boat/Water craft	N/A
Tenders/Brush	N/A
Support Vehicles (not staff vehicles)	Mobile Ventilation Unit, HazMat Unit, Aircraft Interior Access vehicle, Mobile Command Post
ISO rating	N/A
Date of most recent rating	N/A

Discussion

DFWAFS has been able to deploy people and apparatus in strategically located fire stations, balancing the needs of providing effective coverage with the requirements in place in the Federal Aviation Administration (FAA) regulations contained in 14 CFR Part 139 and National Fire Protection Administration (NFPA) NFPA 403 standards relating to Aircraft Rescue Fire Fighting (ARFF) and structural firefighting standards NFPA 1710. Challenges are presented in the with regard to response performance as a result of the highly unique considerations of access, resource deployment, and risk exposure found in DFW's large airport setting—challenges that are not found in most fire, EMS, and other international airport agencies. With those factors in mind, a detailed assessment of current service delivery and effectiveness is provided in the Service Delivery and Performance section of this report.

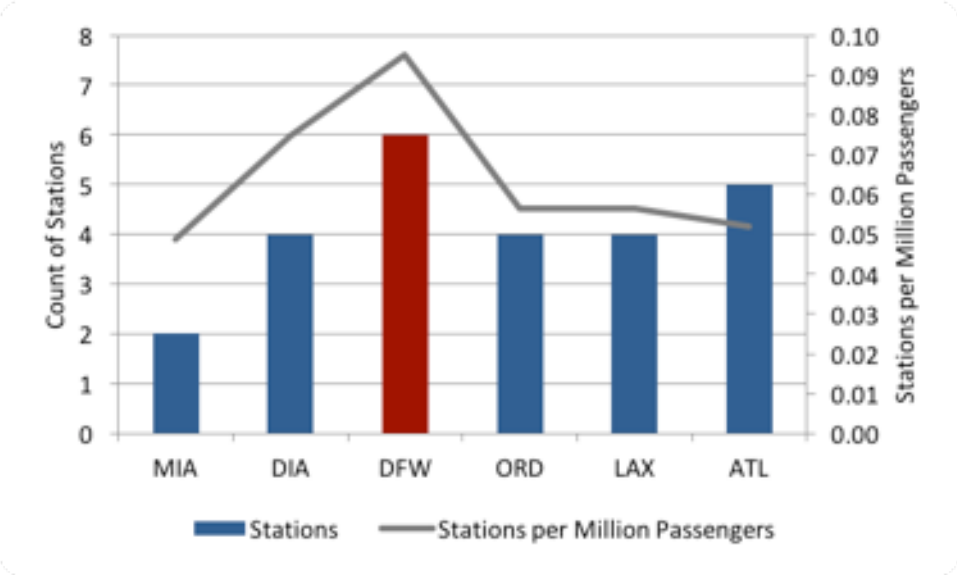
The continuing test facing DFWAFS will be that of making the most prudent staffing and facility placement decisions based on weighing the multiple and unique circumstances found. The fire chief has made multiple, commendable efforts to address the long-term needs and future challenges that can be expected at DFWAFS. That work, including the development of this long-range master plan, will prove invaluable in helping DFWAFS keep pace with increasing needs.

Capital Asset Comparison

In the following charts, a comparison of fire stations, pumpers (engines), and ARFF trucks is provided, mirrored against median data generated by comparison to similar elements in five airport fire departments of comparable size. The airports included are MIA (Miami), DIA (Denver), DFW (Dallas/Fort Worth, ORD (Chicago), LAX (Los Angeles), and ATL (Atlanta).

Typically, this kind of comparison is developed relative to the population served by a fire agency. However, service area population does not correlate to an airport. To provide a more appropriate comparison, ESCI has developed median numbers based instead on passenger count, calculated on a per-million passenger basis. In this application, "median" is not "average," but the value that falls exactly in the middle of the values used for the calculation. In other words, 50 percent of the numbers are below the median and 50 percent are above.

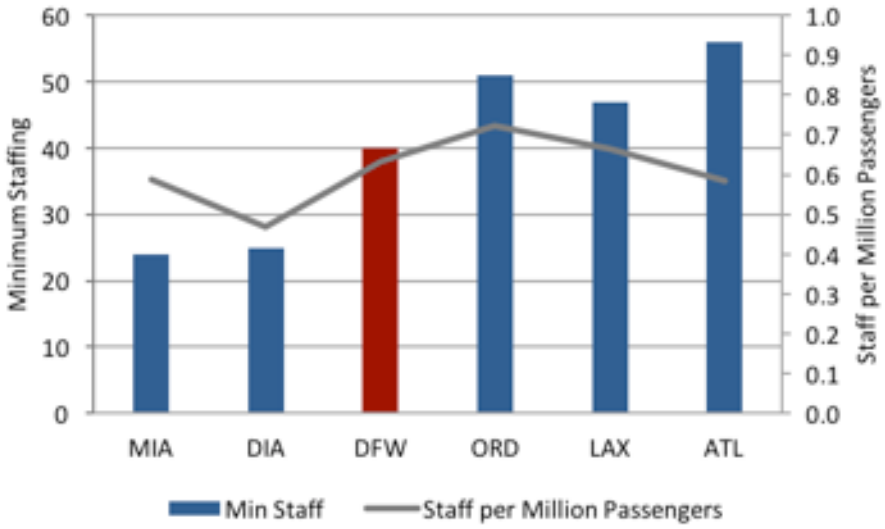
Figure 7: Stations per Million Passengers



DFWAFS has six stations currently, calculating to 0.10 per million passengers. In comparison, the median number as derived from the airports listed is 0.06 stations per million passengers. Based on this calculation, DFW's stations are slightly above the median, however, it is noted that stations located off the airfield are included in the calculation. It is also important to note that all Index E class benchmarking airports, except for Atlanta (ATL), have significant structural and all risk response resources available from adjacent stations as a part of a large metropolitan fire department. DFW is a stand-alone fire department charged with providing airport, aircraft emergency response, as well as a large commercial and warehouse response districts not covered by comparison departments from airport-based stations. If comparison agencies included off-site stations and resources in the benchmarking criteria, DFWAFS would be in-line or below the available resources seen in the Index E comparison jurisdictions.

The following figure displays the number of operational staff (minimum daily staffing) per million passengers.

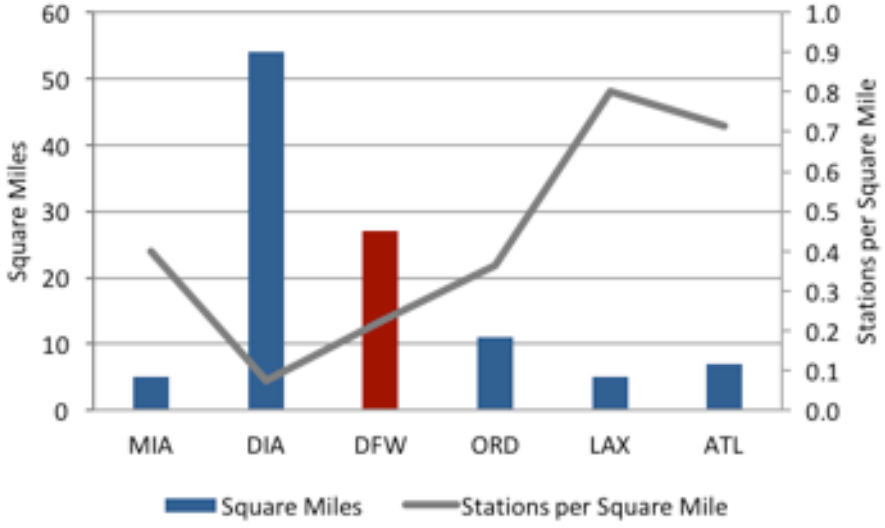
Figure 8: Minimum Staffing per Million Passengers



The median number of personnel on duty for the six airports displayed is 42 operational personnel. The daily minimum staffing level at DFW is 40 personnel. The median rate of personnel per million passengers is .58 personnel per million passengers. At DFW, the median rate of on duty personnel is .57 personnel per million passengers, which is slightly lower than the median.

The following figure compares the size of the service areas (square miles) of the five largest Index E airports and DFW International Airport; and the number of stations per square mile.

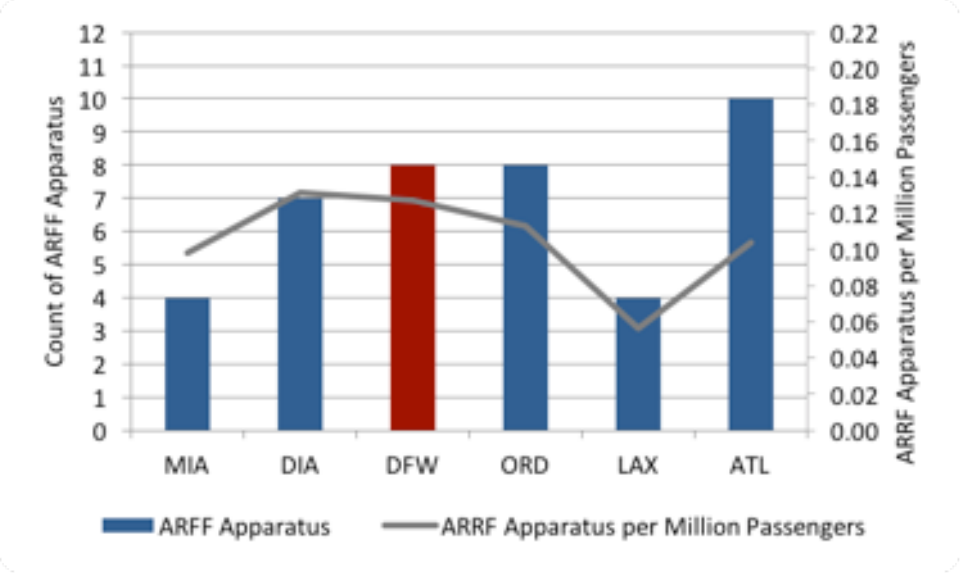
Figure 9: Stations Per Square Mile



Only Denver International Airport (DIA) covers a larger area than the nearly 27 square miles protected by DFWAFS. The median size of the airports displayed is nine square miles, which results in a median rate of .38 stations per square mile. DFWAFS utilizes six stations to serve the DFW Airport, or .20 stations per square mile. Except for DIA, this is the lowest rate of stations per square mile displayed in this figure.

The next comparison is that of ARRF apparatus on a per-million passenger basis.

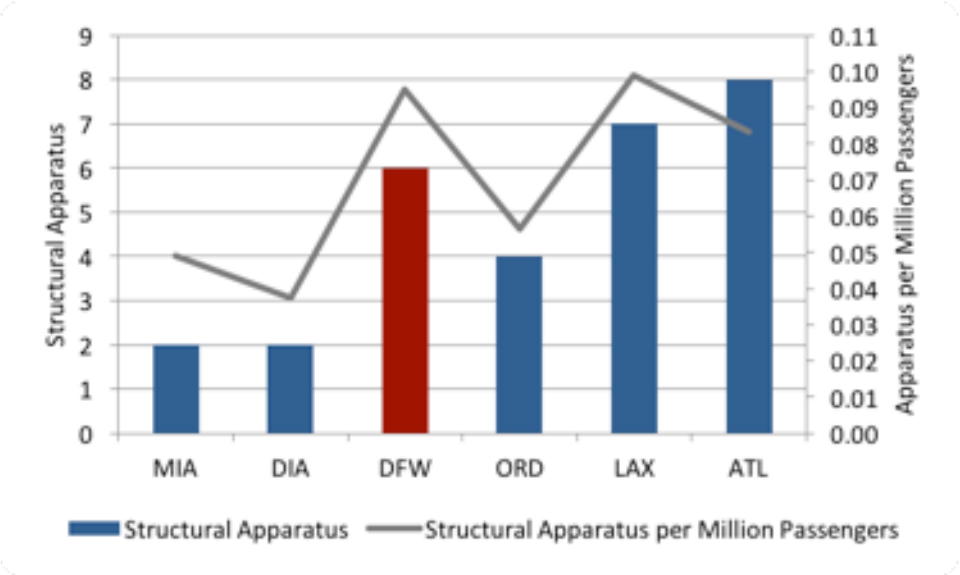
Figure 10: ARRF Apparatus per Million Passengers



Comparing the total number of ARFF apparatus per million passengers reveals a median of 0.11 units. DFWAFS ARRF apparatus are found to be slightly higher in the comparison, at 0.13 per million passengers. As previously stated in Index E comparison departments DFWAFS are protecting a much larger service area and risk profile than the comparison department's whose coverage responsibility is, for the most part, based on airport facilities, runways, terminals, aircraft, and passengers.

A similar comparison is offered, this time that of structural firefighting apparatus, with a rate of 0.10 in DFW, falling below the median of 0.07.

Figure 11: Structural Apparatus per Million Passengers



It is noted that the previous comparisons were made based on data available for Index E airports of comparable size and passenger count. The data does not provide delineation of finer detail including which airports provide structural fire protection to areas outside of the airfield, which may alter the comparative findings. It is noted that Atlanta, given the remote location of the airport in relation to the municipal fire department resources, most closely resembles the DFW risk profile and airport functions.

Emergency Response Type and Frequency

DFWAFS responded to 5,232 requests for assistance from the patrons of the airport and adjacent industrial areas that exist on the DFW property in the 2016 reporting year. As is typically found, the majority of incidents are of an emergency medical nature. The department's emergency calls for 2016 are listed in the following figure.

Figure 12: Emergency Response Type and Frequency

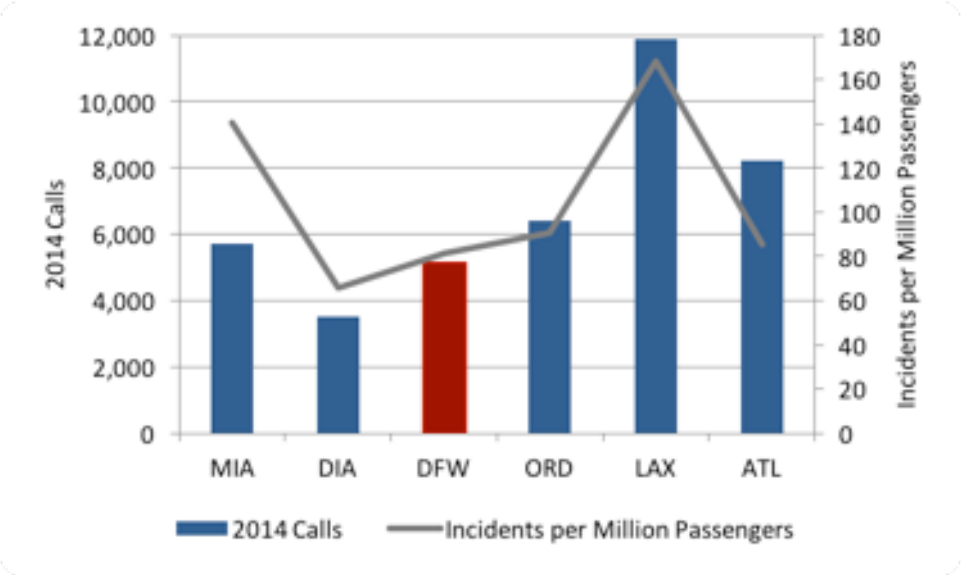
SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION
ALARMS	
Fires (most recent complete year)	39
Rupture or explosion	2
EMS/rescue	3,510
Number of EMS transports (if FD transports)	1,418
Hazardous condition	299 (includes 202 Aircraft Standbys)
Service call	83
Good intent call	679
False call	612
Severe weather	1
Other	7
Total	5,232
MUTUAL AID	
Given	32
Received	9

Discussion

Of the total of 5,232 emergency incidents to which DFWAFS responded in 2016, 3,510 were of an emergency medical nature, constituting approximately 67 percent of total responses. Note that DFWAFS reports that EMS incidents represent approximately 73 percent of service demand. Cancelled EMS incidents are categorized as "Good Intent Calls" in the NFIRS data used in the figure above. Regardless of the difference, EMS incidents represent the largest percentage of DFWAFS service demand. Fires, while representing a very small percentage of incidents, represent the highest risk of financial loss.

A comparison of incidents, relative to other Index E airports on a per million passenger basis is provided in the following figure.

Figure 13: Incidents Per Million Passengers



With 5,232 incidents in 2016, DFWAFS is calculated to have 81.1 incidents per million passengers. Comparing to the other Index E airports, a median is found to be 88.1 incidents per million passengers, slightly higher than DFW airport.

FISCAL ANALYSIS

Historical Revenue and Expense

No emergency services agency, whether city, county, fire protection district or private in nature can survive without adequate funding. This funding, which may come from a variety of sources (such as ad valorem taxes, assessments, fees, fund transfers, bonds, commercial loans, fundraisers, donations, etc.) forms the basis from which the agency is able to fund it operations and purchase the necessary equipment and facilities to fulfill its mission. Without adequate funding that is also sustainable, an organization is destined for failure.

In the current economy, most agencies and their governing bodies are searching for ways to reduce expenditures while still maintaining levels of service. Simultaneously, as service demand continues to increase, emergency services organizations are finding it increasingly difficult to deliver the services that their customers expect and are often asking for more funding; even after cutting expenses. However, it is important that agencies understand their revenue and expenditure history and adequately predict the trajectory of each with respect to the level of service that they will be expected to provide.

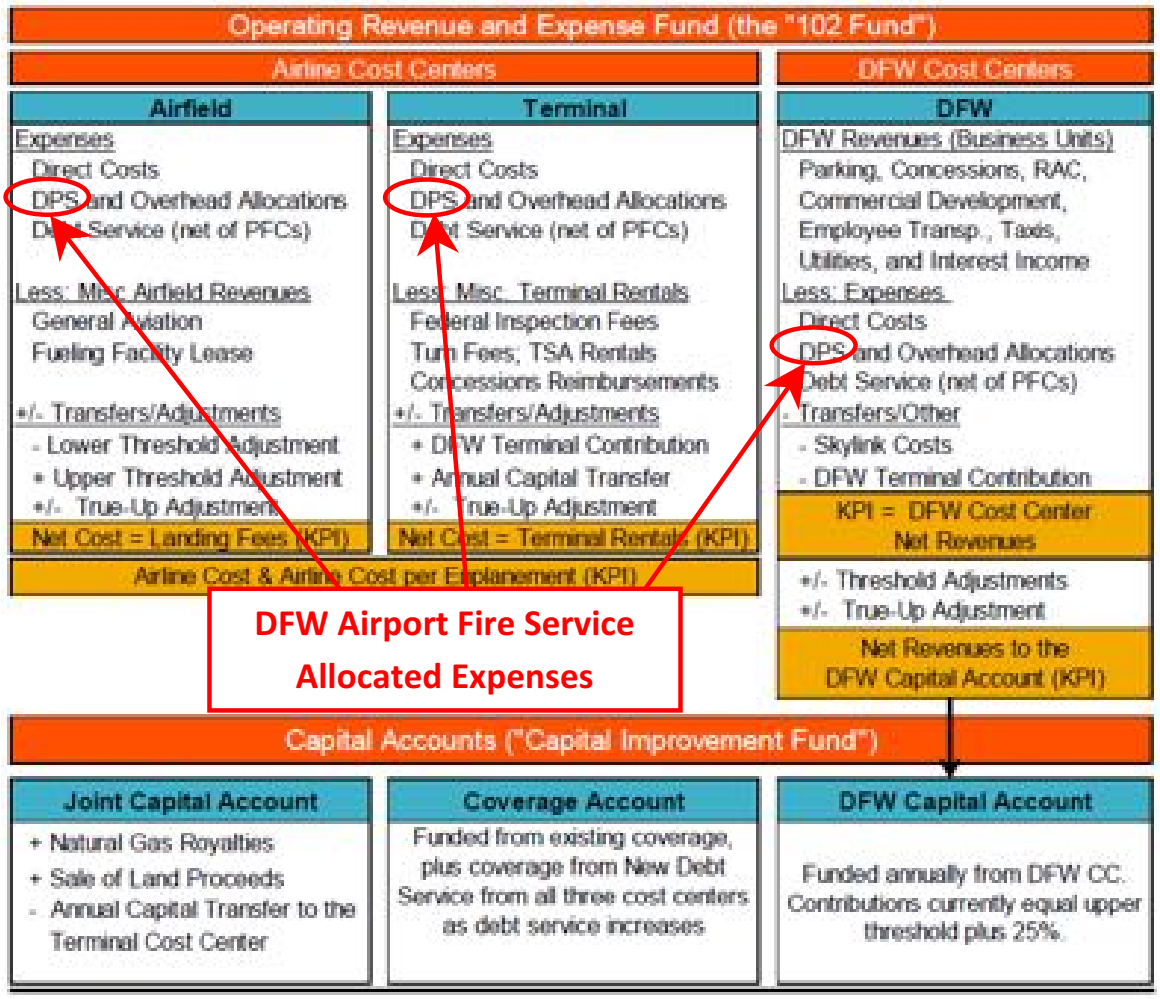
The Dallas/Fort Worth International Airport, more commonly known as DFW Airport, is a joint venture between the cities of Dallas and Fort Worth, Texas, was created in 1968 by a "Contract and Agreement," and operates as an enterprise fund. DFW is governed by a 12-member board; currently seven elected officials from the City of Dallas, four from the City of Fort Worth, and one from the City of Euless; one of the four cities within whose municipal limits the airport resides. The business affairs of the DFW Airport are guided by a set of documents collectively known as the "Controlling Documents." These documents include; the Master Bond Ordinance and the various Use Agreements between DFW and the Signatory Airlines.

Unlike a typical municipality, DFW does not utilize any local property tax revenue to fund its operations. Gross revenues of the airport are used as the principal source of operating funds and include all revenues and receipts of the airport with the exception of; bond proceeds, passenger facility charges that are used to fund capital projects, interest on unspent bond funds, proceeds in capital accounts (including capital grant funds), sale of land (surface and/or mineral rights) and natural gas royalties. Airport gross revenues and operating expenses of departments such as DFWAFS are found in the 102 Revenue and Expense Fund. The Controlling Documents require that DFWAFS manage its day-to-day operations through the 102 Fund. DFW reports financial statements covering all its respective funds in conformance with GAAP. The fiscal year runs from October 1 through September 30.

The following figure and much of the accompanying discussion is excerpted from the DFW 2017 Adopted Budget book. The figure shows the relationship between operating revenue and expense in the 102 Fund and capital accounts of the Capital Improvement Fund and the interplay of the contributions from the various cost centers. A cost allocation methodology is used to apportion DFWAFS expenses across the various cost centers in the 102 Fund (see call-outs in red in Figure 14).

The airlines pay landing and terminal rental fees based upon net cost to provide direct and indirect (allocated) services supporting operation of these costs centers (Airfield and Terminal) less certain cost center revenues and adjustments. DFW also obtains revenue from non-airline business units in the DFW cost center such as parking, concessions, and various others less direct and allocated expenses as well as any transfers (such as to the DFW capital account).

Figure 14: Operating and Capital Fund Revenue and Expense Relative to Various DFW Cost Centers



According the DFW FY 2017 Adopted Budget book:

> "The Airline Cost Centers are cost recovery in nature, such that the amount charged to the airlines equals the cost to provide services, after certain adjustments. Landing fees and terminal rental rates are based on the net costs to operate and maintain the airfield and terminals, respectively. DFW charges the direct operating and maintenance costs for the airfield and terminals, plus allocated Department of Public Safety (DPS) [which includes the Airport Fire Service department] and overhead costs, plus debt service, net of Passenger Facility Charges (PFCs), to each cost center [Airfield and Terminal]; then, subtracts ancillary revenues generated in these cost centers [such as General Aviation

> (GA) landing and other fees, fuel facility lease, Federal inspection fees, turn fees, TSA rentals and concession reimbursements]; and credits or charges certain transfers and/or adjustments [known as True-Up Adjustments]."

As mentioned, the DFW cost center represents all non-airline business units and all net revenues (net of direct and allocated costs, debt service, and transfers) derived from this cost center are deposited in the DFW Capital Account. The DFW cost center net revenue is an important key performance indicator (KPI) monitored by the board since this account is used for capital projects at the discretion of the board without the requirement for airline concurrence as required of the Joint Capital Account. This discretionary account is funded primarily with DFW cost center net revenue plus any interest income. Additional revenue in this account is derived from grants and the issuance of debt.

The DFW Airport Fire Service is a full-service fire department providing both more typical structural fire protection services as well more specialized Aircraft Rescue Firefighting (ARFF) capability at a very high level. In addition, the department also provides Advanced Life Support (ALS) Emergency Medical Services (EMS) including ambulance transport service, with Mobile Intensive Care Unit (MICU) service. The department is operated as one of a number of internal and external service departments within the DFW Operating Revenue and Expense Fund (the 102 Fund).

Capital expenditures, including facility, apparatus, and equipment expenses, are budgeted in other DFW funds as are debt service related to bonded expenditures on behalf of the department. In order to more readily understand direct costs of operating the fire department, capital expenses are also included in the analysis which follows. Typical supporting costs such as procurement services, fleet maintenance (including apparatus fuel costs), human resource, risk management, legal, finance, and other administrative overhead costs are accounted for elsewhere within the 102 Fund.

The following discussion addresses financial resources and expenditures within the fire department as a composite as mentioned. Actual annual revenues specific to the fire department are shown for the Fiscal Year (FY) 2012 through FY 2016 budgets and the FY 2017 budget, as adopted. The following revenue and expenditure data were provided by the department and supplemented with information from the DFW Comprehensive Annual Financial Reports (CAFR) from FY 2011 through FY 2015 as prepared by the DFW Finance Department with additional reports from independent auditors Deloitte and Touche, LLP. Additional budget detail was available from the DFW FY 2017 Adopted Budget book. Staff provided information about fire department-related current and future capital bonded debt service and historical capital expenditures.

Revenue

Figure 15 shows fire department-specific recurring and non-recurring revenue sources in Fund 102 and the Capital Fund used for annual operating and capital expenses; respectively. Debt service information was not available at the time of this report and, in any case, is handled outside of Fund 102 even though it is an operating expense that is related to bonded project expenditures.

Revenues classed as recurring are those reasonably expected to occur year-to-year with some degree of predictability, such as ambulance billing revenues and various other fees related to the ARFF Training Center. Third party ambulance billing expenses shown in the annual budget as a deduction from ambulance revenue are actually a recurring expense. Non-recurring revenue sources are those such as bond proceeds, grants, and other funds used for capital expenditures such as fire station construction and apparatus purchases. These non-recurring sources, while residing in funds other than the 102 Fund, are shown here since they offset known DFWAFS-related capital expenses reported and discussed later in this section.

Figure 15: DFWAFS 102 Fund Financial Resources FY 2012–2017

Financial Resources	FY 2012 Actuals	FY 2013 Actuals	FY 2014 Actuals	FY 2015 Actuals	FY 2016 Actuals	FY 2017 Budget
Emergency Medical Services	$991,841	$766,804	$691,037	$764,590	$1,069,410	$1,056,503
EMS Contractual	-$51,343	-$40,221	-$32,498	-$9,400	-$39,552	-$9,400
ARFF Training Center	$152,740	$280,920	$738,327	$559,172	$805,180	$991,580
Aircraft Rescue Training Course	*$152,740*	*$800*				
FTRC On Campus Training		*$280,120*	*$613,377*	*$627,422*	*$761,256*	*$850,000*
FTRC On-line Module Training					*$1,950*	*$40,900*
FTRC Off Campus Training			*$124,950*	*-$68,250*	*$38,335*	*$64,180*
FTRC Interactive Software					*$2,139*	*$35,000*
Miscellaneous–ARF Training Center					*$1,500*	*$1,500*
Recurring Revenue	$1,093,237	$1,007,503	$1,396,865	$1,314,361	$1,835,038	$2,038,684
Bond Proceeds/DFW Capital Fund	$20,773,993	$15,741,633	$4,099,922		$238,620	
Non-Recurring Revenue	$20,773,993	$15,741,633	$4,099,922		$238,620	
Financial Resources	**$21,867,230**	**$16,749,137**	**$5,496,788**	**$1,314,361**	**$2,073,658**	**$2,038,684**

Figure 16: DFWAFS Recurring Revenue Sources FY 2012–2017

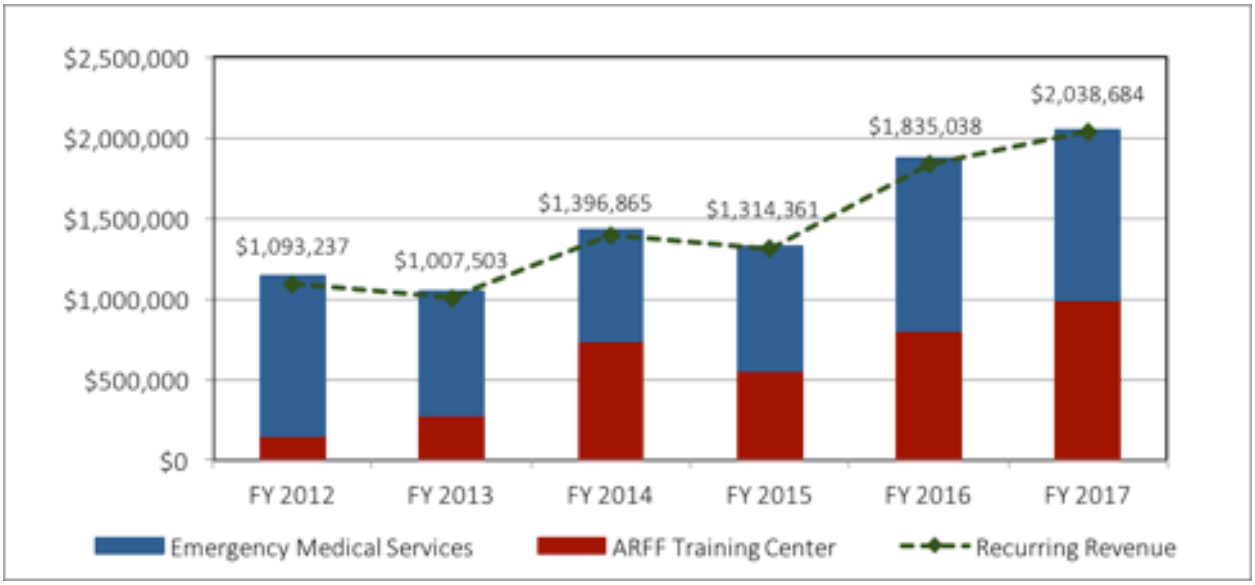


Figure 16 shows the two major classes of fire department-specific 102 Fund revenues available to offset operational expenditures from FY 2012 actual through FY 2017 adopted. These are ambulance billing fees and various fees associated with the ARFF Training Center. Total recurring revenues available each year are shown in orange and range from $1,093,237 in FY 2012 to a high, as budgeted, of $2,038,684 in FY 2017, with two slight dips; one in FY 2013 and one in FY 2015. DFWAFS recurring revenue has grown by $945,447 or 86.5 percent over five years. This represents an average annual growth rate of 15.1 percent for the period.

- Ambulance billing revenue (in blue) has varied over the period as shown in Figure 17, dropping from $991,841 in FY 2012 to a low of $691,037 in FY 2014 before climbing back to just over $1 million by FY 2016.
- Total annual EMS revenue is reduced by annual third-party billing costs ("EMS Contractual," shown in gray bars) which vary annually from a high of $51,343 in FY 2012 to a projected low of $9,400 in FY 2017. These expenses range from an average of 5 percent of revenue between FY 2012 and FY 2014 to an average of just under 2 percent for FY 2015 through FY 2017. This is relatively low for third party ambulance billing costs which typically average closer to 8 percent of total revenue.

Figure 17: DFWAFS Ambulance Billing and EMS Contractual FY 2012–2017

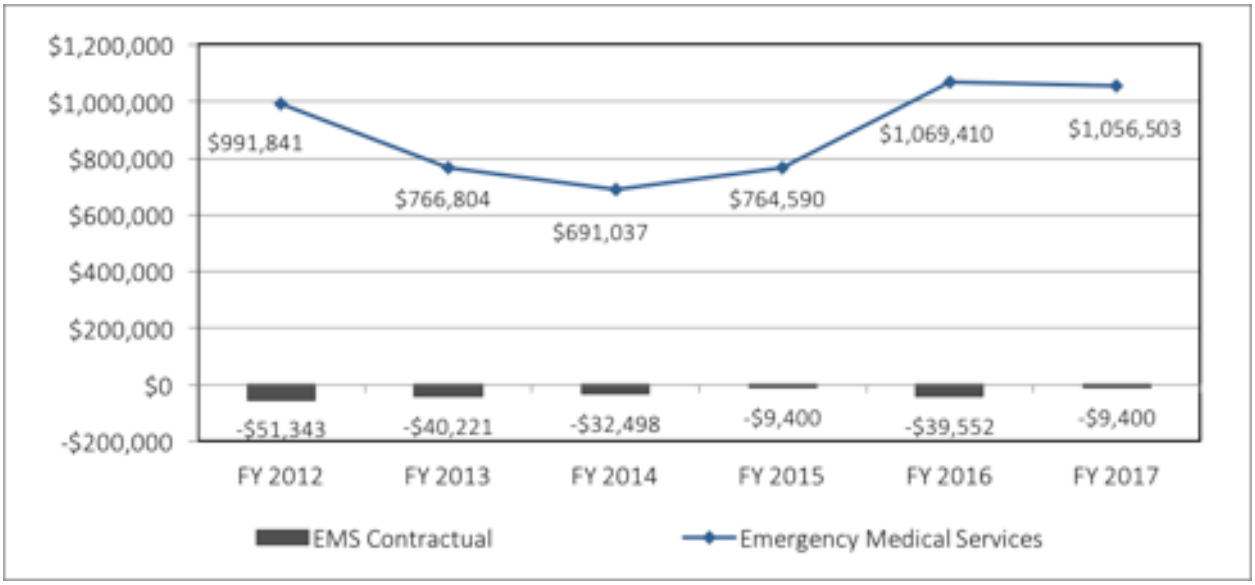
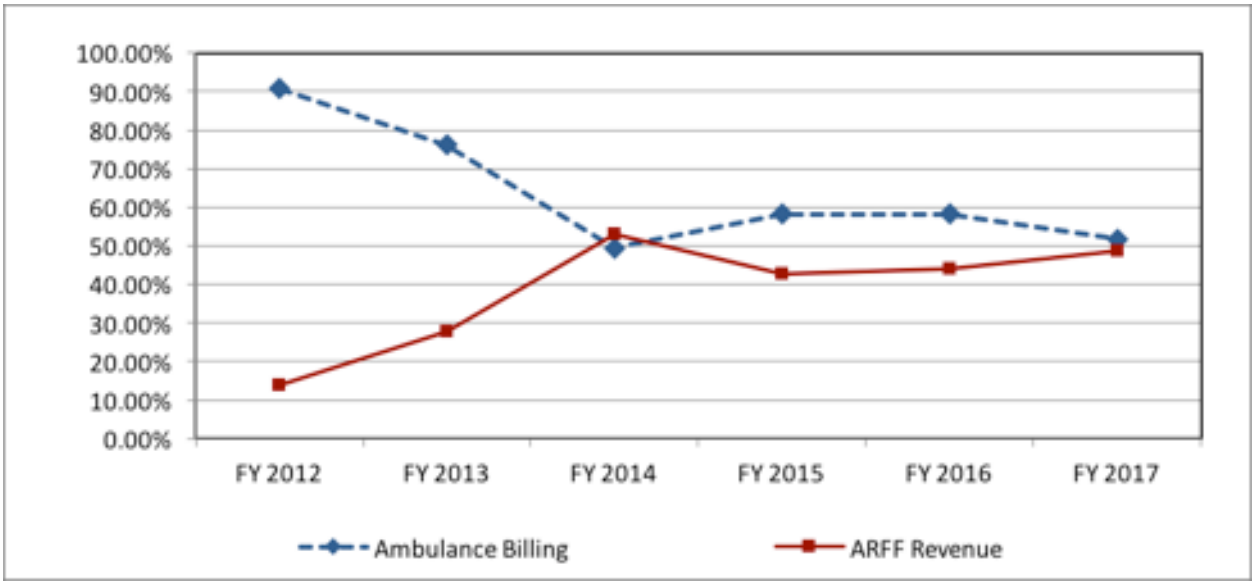


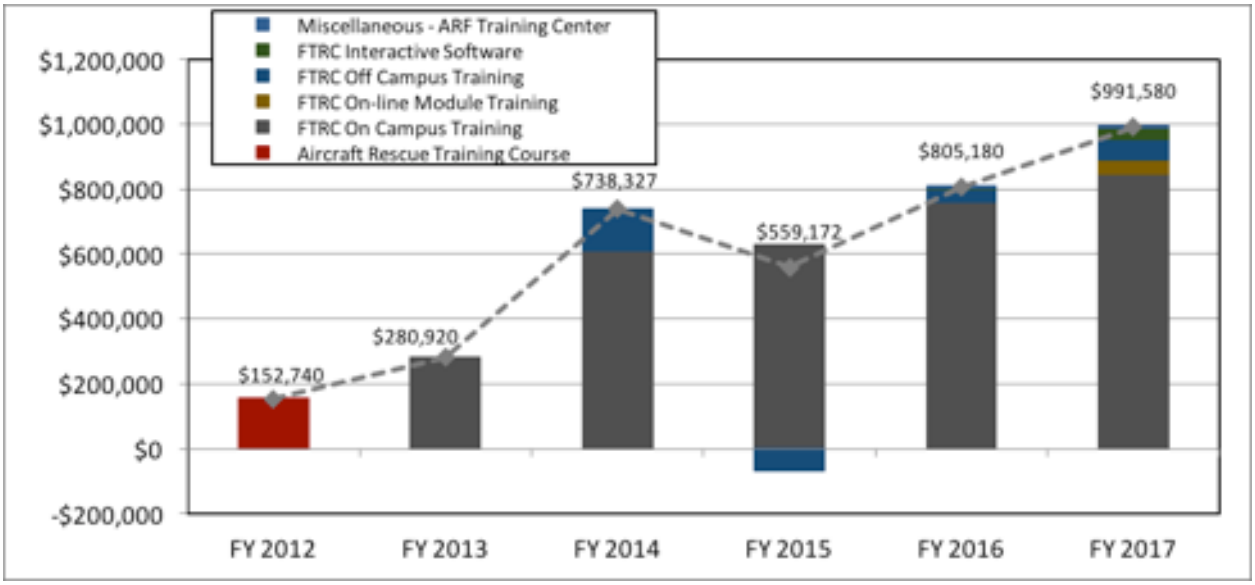
Figure 18: DFWAFS EMS and ARFFTC Revenue as Percent of Recurring Revenue FY 2012–2017



- Ambulance revenue as a percentage of recurring revenues as shown in Figure 18 declined steadily from just over 90 percent in FY 2012 to just over 50 percent in FY 2014. Although varying somewhat since then, it has averaged approximately 55 percent of the recurring revenue stream since then.

- The department has aggressively marketed its ARFF training center and various services offered from on-site training to on-line training and interactive software. This is readily apparent in Figure 19 which shows the overall growth of FTRC revenue from $152,740 in FY 2012 to $991,580 in FY 2017; an increase of $838,800 or 549 percent in five years. This represents an average annual increase of 57.9 percent and is the driver for DFWAFS recurring revenue increases over the period.

Figure 19: DFWAFS FTRC Revenue by Product Line FY 2012–2017



- The largest component and driver for the overall increase of FTRC revenue is the on-campus training program. Revenue from this product has increased from $152,740 in FY 2012 to $850,000 in FY 2017. This represents an average annual increase of 47.5 percent. The red bar representing Aircraft Rescue Training Course is on-campus training and is considered the equivalent of the gray bars (FTRC On-Campus Training).
- The largest source of non-recurring revenue comes from bond funding and, while not actually budgeted in the 102 Fund, it is shown in Figure 17 in order for the reader to understand the impact and magnitude of funding required to offset fire department capital expenditures.

Expense

The following table in Figure 20 shows total department actual expenditures for the period FY 2012 through FY 2016 and adopted for FY 2017. All fire department personal services and operating expenditures occur within the 102 Operating and Revenue Fund. All capital and debt service costs are accounted for separately within the Capital Fund and are combined here to show total impact of the fire department on the DFW budget. Actual debt service payment information for FY 2012 through FY 2016 was not available at the time of this report. Further, 2017 capital expenditure information was not available. Several costs of supporting the fire department are budgeted elsewhere such as fleet maintenance (including apparatus fuel costs), utilities, budget and finance, procurement services, legal, risk management, administration, and other overhead costs associated with supporting the department.

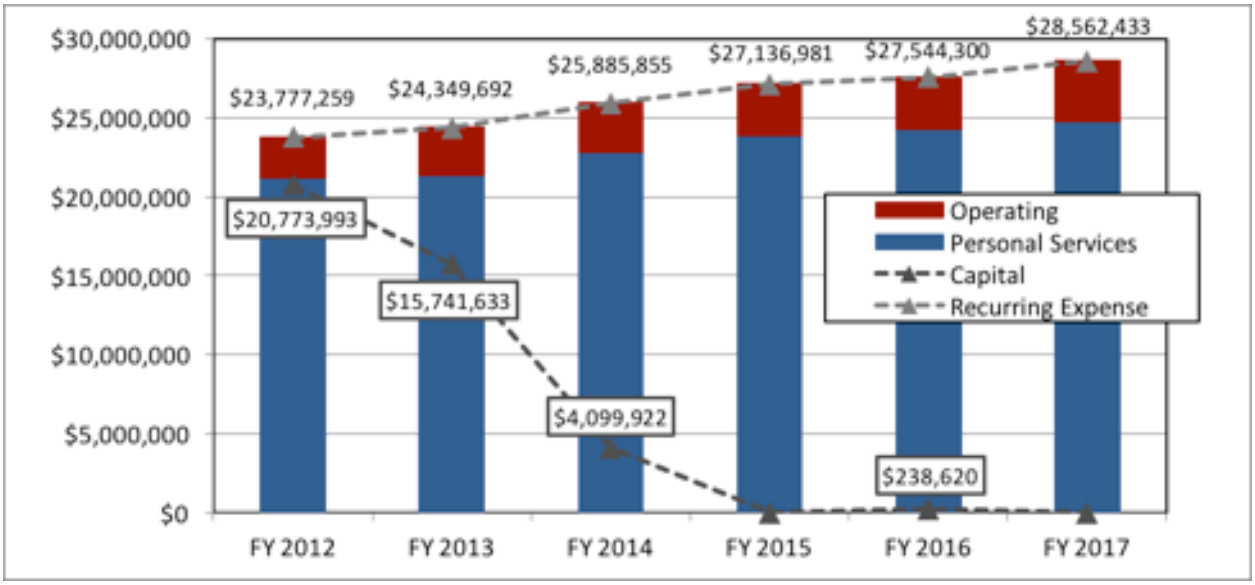
Figure 20: DFWAFS 102 Fund Expenditures FY 2012–2017

Expense	FY 2012 Actual	FY 2013 Actual	FY 2014 Actual	FY 2015 Actual	FY 2016 Actual	FY 2017 Adopted
Salaries and Wages	$13,494,309	$13,781,114	$14,130,855	$14,862,231	$15,293,889	$15,368,614
Overtime	$954,424	$963,290	$1,141,973	$1,216,144	$1,285,356	$1,441,935
Salaries and Wages Subtotal	$14,448,733	$14,744,403	$15,272,829	$16,078,375	$16,579,245	$16,810,549
Social Security	$882,806	$891,878	$918,867	$950,469	$976,732	$985,340
Medicare	$206,730	$208,890	$215,205	$222,925	$229,765	$231,017
Retirement	$3,085,867	$3,235,265	$3,962,837	$4,057,899	$4,024,129	$4,214,146
Other Employee Benefits	$2,636,953	$2,328,963	$2,452,748	$2,554,571	$2,493,848	$2,550,954
Benefits Subtotal	$6,812,356	$6,664,996	$7,549,658	$7,785,864	$7,724,474	$7,981,456
Personal Services – Subtotal	**$21,261,090**	**$21,409,399**	**$22,822,486**	**$23,864,239**	**$24,303,719**	**$24,792,005**
Facility Maintenance Contracts	$73,562	$71,391	$101,268	$148,640	$150,422	$220,082
Other Contract Services	$260,647	$166,731	$253,453	$321,686	$397,705	$450,242
Utilities					$905	
Equipment and Other Supplies	$627,909	$830,611	$621,129	$744,875	$656,554	$725,196
Fuels	$15,359	$276,422	$374,765	$310,788	$291,102	$407,292
General, Admin. and Other	$165,458	$174,342	$228,541	$193,368	$233,780	$150,241
Communications Expense	$1,373,234	$1,420,795	$1,484,212	$1,553,385	$1,510,112	$1,817,375
Operating Expense – Subtotal	**$2,516,169**	**$2,940,292**	**$3,063,369**	**$3,272,742**	**$3,240,581**	**$3,770,428**
Buildings	$17,139,802	$8,171,909	$113,131			
Improvements Other than Bldgs	$172,360	$1,404,875	$66,324			
Apparatus Replacement	$3,461,831	$6,164,849	$3,920,467		$238,620	
ARFF	*$230,914*	*$6,164,849*	*$3,920,467*			
Structural	*$3,230,917*				*$238,620*	
Capital Expense – Subtotal	**$20,773,993**	**$15,741,633**	**$4,099,922**	**$0**	**$238,620**	**$0**
Principal						$0
Interest						$346,416
Debt Service – Subtotal	**$0**	**$0**	**$0**	**$0**	**$0**	**$346,416**
Expense Total	**$44,551,252**	**$40,091,325**	**$29,985,777**	**$27,136,981**	**$27,782,920**	**$28,908,849**

Figure 21 shows the major budget expenditure categories for DFWAFS in the 102 Fund (Personal Services and Operating Expenses) and their relative contributions to the fire department recurring expenditures through time as well as the non-recurring capital expenditures (Facilities and Apparatus). Recurring expenses have increased annually over the period from $23,777,259 in FY 2012 to $28,562,433 as projected in FY 2017; an increase of $4,785,174 or 20.1 percent over five years. This represents an average annual increase of 3.8 percent.

However, as of FY 2017 the department is not fully funding all allotted (budgeted) positions and is deducting a certain percentage of wages ($588,840), Social Security ($36,403), and Medicare Tax ($8,538) to account for the vacancy rate within the department. If the department were fully staffed in all allotted positions, the FY 2017 total recurring cost would be increased by $633,781. If the department has experienced vacancy rates similar to that projected for FY 2017, then the FY 2017 personal services budget will be a more accurate reflection of actual expenses.

Figure 21: DFWAFS Recurring and Non-Recurring (Capital) Expenditures FY 2012–2017



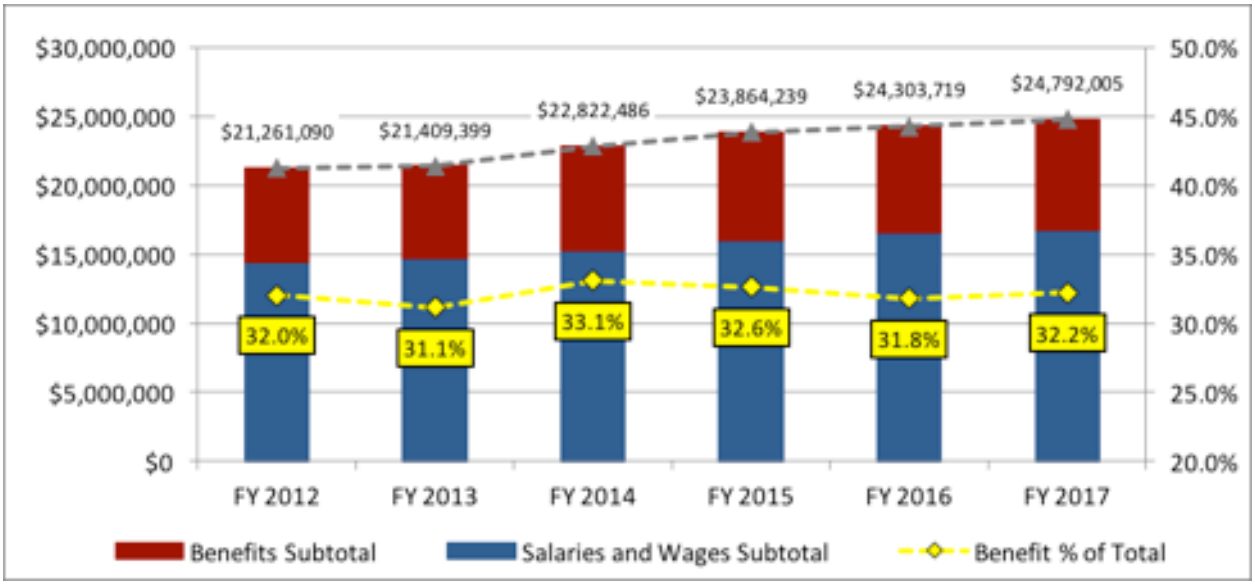
- Personal Services have increased from $21,261,090 in FY 2012 actual to $24,792,005 as projected in FY 2017, an increase of $3,530,915 or 16.6 percent in five years. In general, the increase in personal services has been gradual with an average annual increase of 3.1 percent.

- Personal Services as a percentage of the total recurring fire department budget have very slightly declined each year from 89.4 percent in FY 2012 to 86.8 percent as projected in FY 2017. It is not uncommon for fully career-staffed departments to find that personnel costs consume as much as 95 percent of their annual operating budgets; therefore, DFWAFS is slightly better than what is typically the case.

- As shown in Figure 24, benefits as a percentage of the total compensation package have remained relatively steady, averaging 32.1 percent annually. They have increased from $6,812,356 in FY 2012 to $7,981,456 as projected in FY 2017; an increase of $1,169,100 or 17.2 percent over five years. This represents an average annual increase of 3.4 percent.

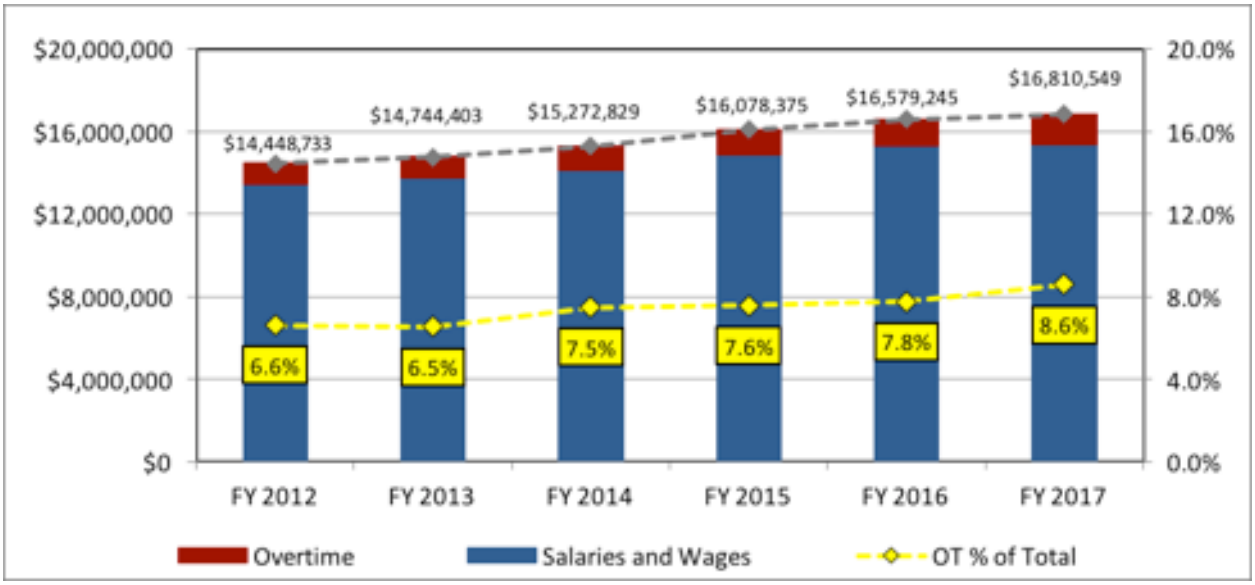
- This increase in benefit costs has been driven primarily by an increase in retirement benefit costs (including OPEB and employee plan contributions) which have risen from $3,085,867 in FY 2012 to $4,214,146 as projected for FY 2017; an increase of $1,128,279 or 36.6 percent in five years. This equates to an average annual increase of 6.7 percent or, almost twice the rate of benefits as a whole. The bulk of this increased cost ($890,905) is due to the DPS plan contribution.

Figure 22: DFWAFS Salary/Wages and Benefits Expenditures FY 2012–2017



- Salaries and Wages have risen at a relatively slow, albeit steady, rate over the period from $14,448,733 in FY 2012 to $16,810,549 as projected for FY 2017; an increase of $2,361,816 or 16.3 percent over the period. This represents an average annual increase of 3.1 percent.

Figure 23: DFWAFS Regular Salary/Wages versus Overtime Wages FY 2012–2017



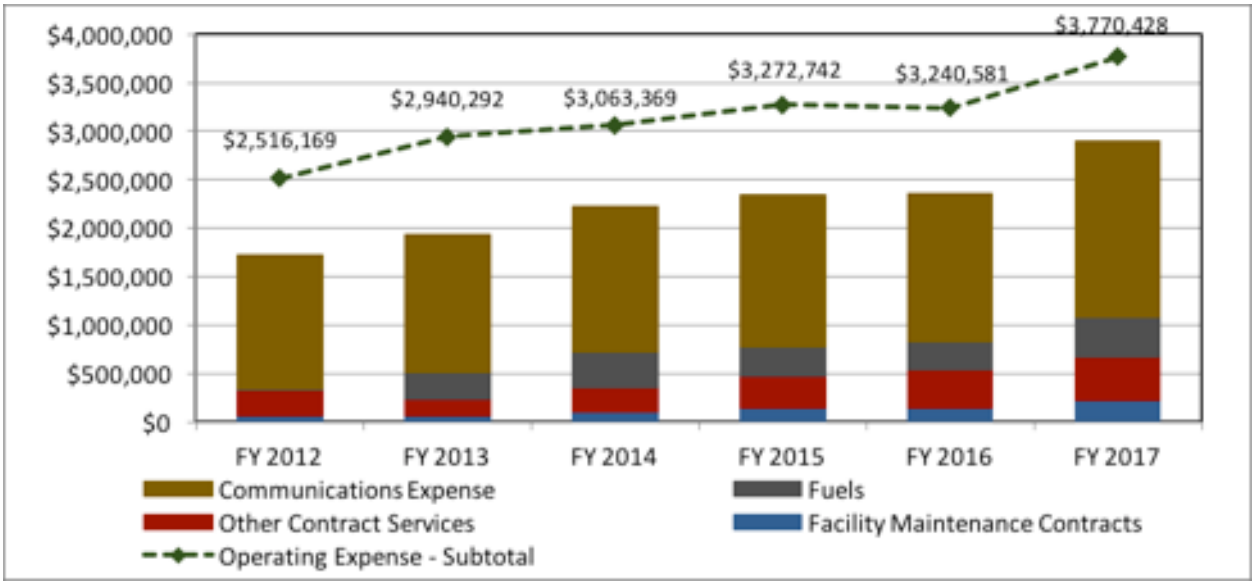
- Figure 23 shows the relationship between overtime and regular salaries and wages and degree to which overtime affects the total salary and wages line item. Regular wages have risen from $13,494,309 in FY 2012 to $15,368,614 as adopted in FY 2017; an increase of $1,874,305 or 13.9 percent in five years. Regular wages increased at an average annual rate of 2.7 percent.

- Overtime as a percentage of total salaries and wages (Figure 23) has increased each year from 6.6 percent of the total in FY 2012 to 8.6 percent as expected in FY 2017. Actual cost has risen from $954,424 to $1,441,935 during the same period; an increase of $487,511 or 51.1 percent. This represents an average annual increase of 8.8 percent; six times the rate of increase in regular salaries and wages. This may be reflective of vacancy rate in budgeted positions among other causal factors.

- Figure 24 illustrates the trend of various major DFWAFS operating expense items relative to total operating expenses. Operating expenses have increased from $2,516,169 in FY 2012 to an expected $3,770,428 in FY 2017; an increase of $1,254,259 or 49.8 percent for the study period. This represents an average annual increase of 8.7 percent.

- A large contributor to operating expense is the General Administrative and Other category. However, this line item has fluctuated from $165,458 in FY 2012 to a high of $233,780 in FY 2016 but is expected to be only $150,241 in FY 2017. Annually, this category averages $190,955.

Figure 24: DFWAFS Major Operating Expense Increase Trends FY 2012–2017



- After decreasing from $260,647 in FY 2012 to $166,731 in FY 2013, Other Contract Services have steadily increased to a projected $450,242 in FY 2017; an increase of $189,595 since FY 2012 or 72.7 percent. The average annual increase since FY 2012 has been 16 percent.

- Facilities Maintenance Contracts have increased from $73,562 in FY 2012 to $220,082 as anticipated in FY 2017; an increase of $146,520 or approximately 200 percent. However, an additional station has come fully on line during that time frame which may account for some increased costs. The average annual increase is 26.6 percent.

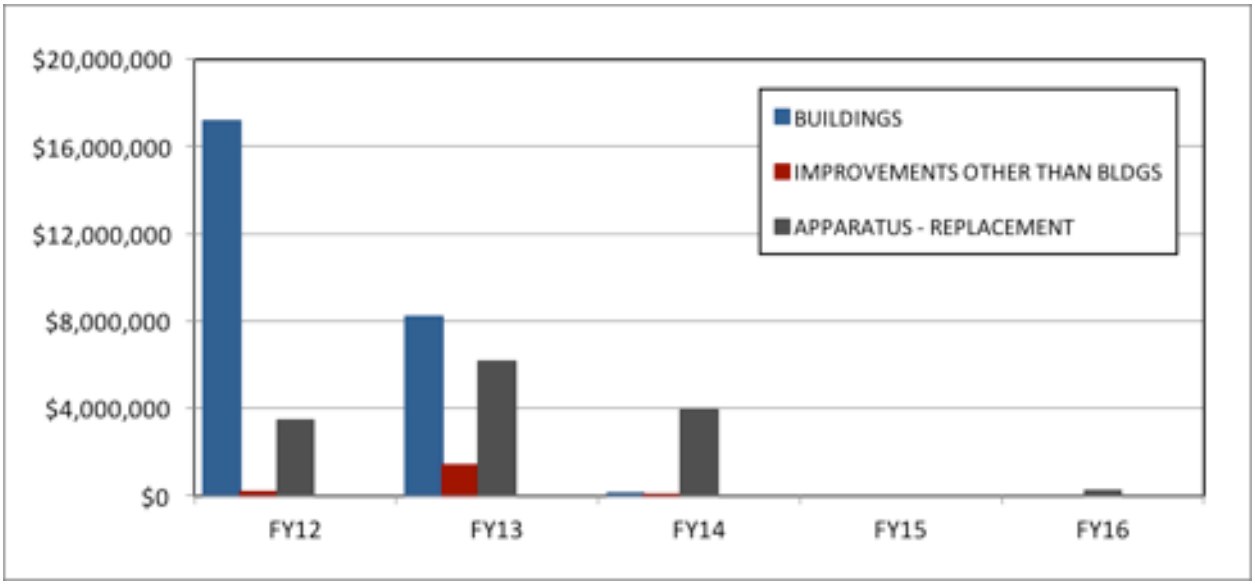
- After a large jump from $15,359 in FY 2012 to $276,422 in FY 2013, Fuel costs associated with the training facility have steadily increased to a projected $407,292 in FY 2017; an increase of $130,870 or 47.3 percent in the four years between FY 2013 and FY 2017. This represents an average annual increase for that period of 13 percent. It should be noted that apparatus fuel costs associated with departmental operations are budgeted elsewhere and not included here.

- The DFW Department of Public Safety (DPS) 911 Dispatch Center is collocated with the DFW Airport Operations Center/Emergency Operations Center and handles emergency and non-emergency communications for law enforcement, fire rescue, and EMS calls. The center uses an allocation methodology to charge the DFWAFS for fire rescue and EMS calls that it handles. Figure 26 shows the allocated charge for E911 communication services provided to DFWAFS. This charge has risen from $1,373,234 in FY 2012 to $1,817,375 as anticipated in FY 2017; an increase of $444,141 or 32.3 percent over the five-year period. The average annual increase is 6.7 percent.

- Many municipal departments bond for capital facility and apparatus purchases as non-recurring expenses and DFWAFS is no different. Figure 27 shows the breakdown of capital expenditures from FY 2012 through FY 2016 actual by major category; buildings, improvements other than buildings, and apparatus replacement. More and more departments are starting to fund a fixed amount each year for capital apparatus replacement and considering this as a recurring expenditure rather than bonding at one time when the need arises to replace equipment and considering that cost as a non-recurring expense. This requires a detailed long-range apparatus replacement plan and allows departments to avoid finance charges.

- Building costs represent final charges for the completion of Fire Station #6 and the majority of the costs associated with the training center construction project. The Improvements Other than Buildings line item represents the cost of constructing the ARFF road.

Figure 25: DFWAFS Capital Expenses FY 2012–2016



- The Apparatus Replacement line item represents both the replacement of ARFF and structural apparatus, of which the former is quite a bit more costly.
- To better understand how the department funds capital projects and the cyclical nature of apparatus replacement, Figure 26 and Figure 27 are provided which detail DFWAFS actual capital expenditures for the period FY 1999 through FY 2016.
- The Building expenditure spike peaking in FY 2003 represents construction of Fire Station #5 while the larger and broader spike in FY 2011–2012 represents an overlap of the Fire Station #6 and ARFF Training Center construction projects.
- New apparatus acquired to equip the two new fire stations are shown as dotted red bars, while replacement ARFF and structural apparatus are shown in solid red bars in Figure 26.

Figure 26: DFWAFS Capital Expenses FY 1999–2016

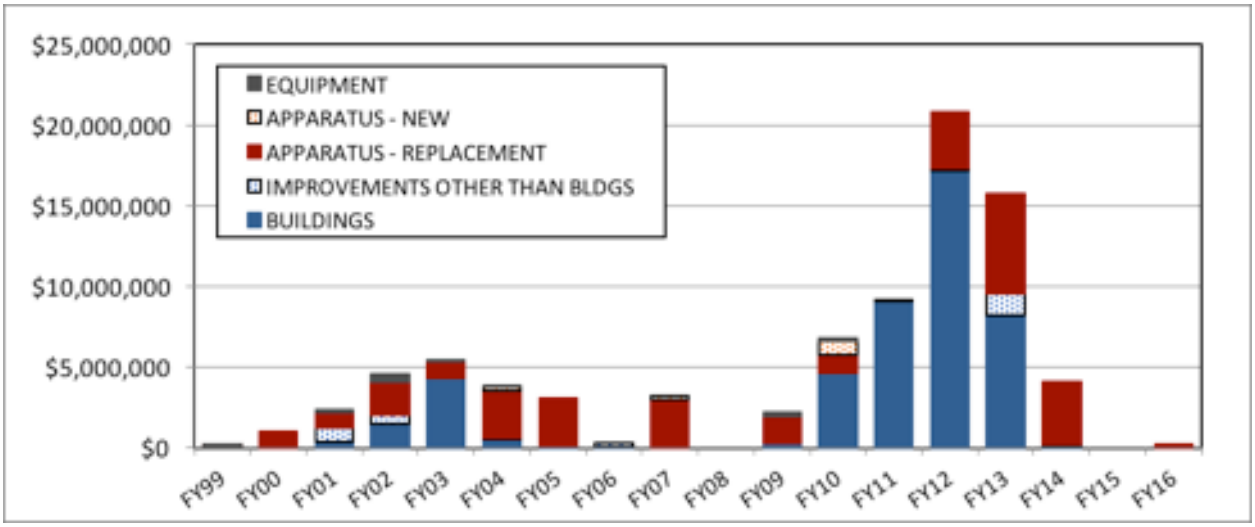
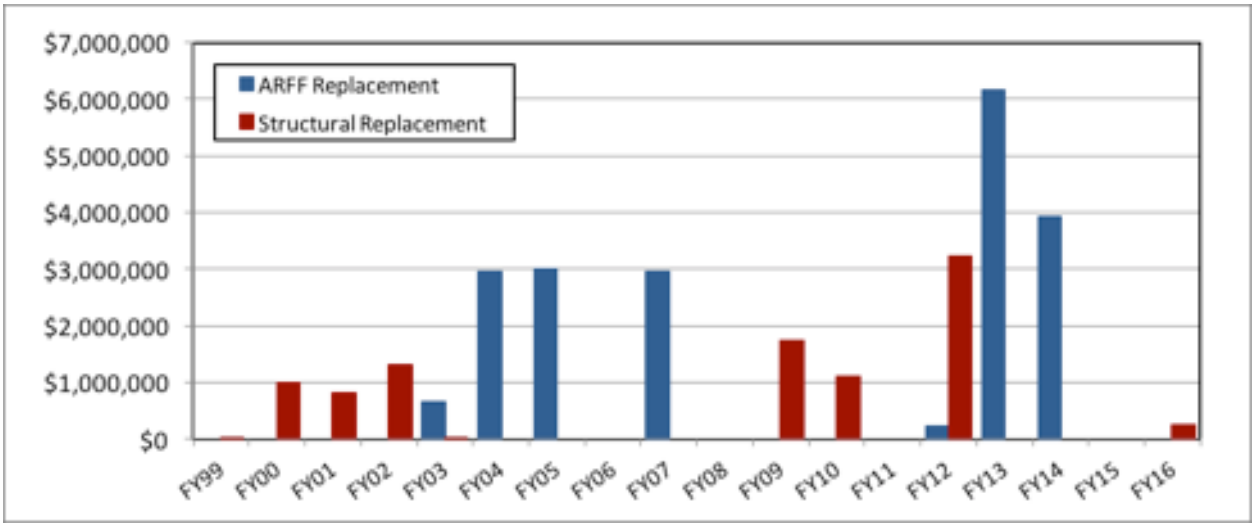


Figure 27: DFWAFS ARFF and Structural Apparatus Replacement FY 1999–2016



- Figure 27 shows ARFF and structural apparatus replacement since FY 1999. This figure shows that the department tends to replace its structural fleet on roughly a ten-year cycle and generally within a 3–4-year period. ARFF apparatus are replaced on a cycle slightly more frequently; about every eight years and over a period of about 3–5 years. The replacement cycles are offset from each other.

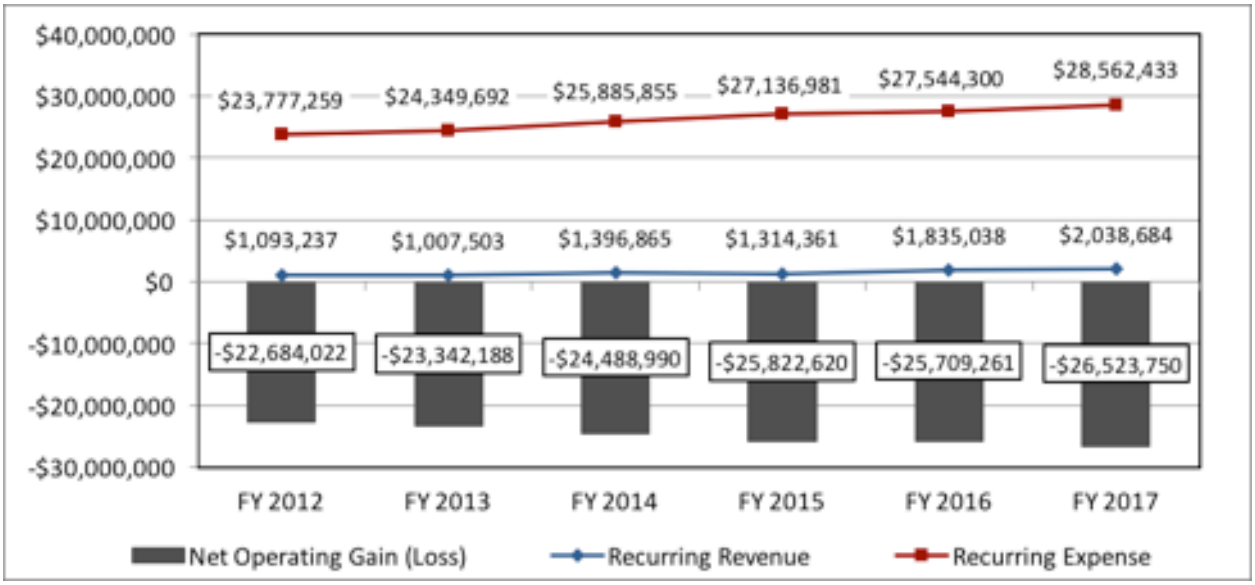
- While it does appear that the department has an operational replacement plan for both apparatus types, it may want to consider initially adjusting its plan over several years which would at least save finance charges. By staggering apparatus in a more uniform manner, the department could equalize apparatus replacement costs year-to-year and schedule a certain number of replacements every year or so. In this manner, they could even pre-pay for apparatus and save some cost up front on these purchases. Several companies offer this option.

- DFWAFS and other departments currently utilize bond proceeds and other revenues from the DFW cost center net revenue to fund capital projects and major purchases as needed on a cyclical basis. Historical debt service information for the DFWAFS was not available; however, current year and future debt service data is available. For FY 2017, allocated interest payments on several bond series amounts to $346,416. Future payments will be shown as recurring expense in the forecast discussion later in this report.

Net Income/Deficit

The following figure shows the relationship between recurring, fire department-related revenue and expense (exclusive of FY 2017 debt service which is considered a recurring expense) of the DFW Airport Fire Services Department for the period FY 2012 actual through FY 2017 as budgeted. If revenue (shown in blue) exceeds expenses (shown in red) in any given year, then there is an operating surplus (shown in gray bars). Conversely, if expenses exceed revenues as is typical with departments residing within the DFW 102 (Operating) Fund, then there is an operating deficit and unallocated general revenues must be used to cover the operating deficit.

Figure 28: DFW Fire Department Revenue vs Expense FY 2012–2017



Although fire department-specific revenue continues to grow each year, expenses are growing at a faster rate. Therefore, the fire department is becoming increasingly dependent upon unallocated DFW operating fund revenue to offset recurring expenses. The operating deficit has grown from $22,684,022 in FY 2012 to $26,523,750 in FY 2017; an increase of $3,839,728 or 16.9 percent over five years. This represents an average annual increase of 3.3 percent.

Key Recommendations:

- Consider developing a long-range apparatus replacement schedule based upon life expectancy and usage by apparatus type and then moving to a replacement schedule over time where a uniform amount (plus inflation) of funding is budgeted each year for this recurring expense.
- Consider budgeting third party ambulance billing costs as an operating expense rather than a deduction to revenue.
- Consider budgeting apparatus fuel costs as part of the department budget to show clearer picture of department cost.
- Consider budgeting other direct departmental operating expenses (insurances, fleet maintenance, utilities, etc.) as part of the department budget to show clearer picture of total department cost.
- Consider tracking indirect overhead costs (HR, risk management, legal, budget and finance, administration, etc.) as part of cost allocation program.

MANAGEMENT COMPONENTS

Effective fire department management is a common challenge for fire service leaders. Today's fire department must address management complexities that include an effective organizational structure, adequacy of response, maintenance of competencies, a qualified work force, and financial sustainability for the future.

To be effective, the management of a fire department needs to be based on a number of components. The initial elements have been accomplished by the DFWAFS by completing a strategic plan that has institutionalized the organization's mission, vision, and values. This process needs to be built upon to ensure that essential foundational elements such as policy and operational documents, development of internal and external communication practices, recordkeeping, and sustainable financial practices are implemented and maintained.

A key management tool to ensure these foundational elements are in place is the creation of a master plan. This plan is a roadmap for the future. It helps to decide where the department desires to be in the long term. It is a strategic view that must be accepted and approved by DFW Airport management and airport authority board members. This study gives the DFWAFS information and options that can be used to decide the direction the fire department should take for the future.

In the following report section, ESCI examines DFWAFS current efforts to manage the organization, and identifies measures and best practices recommended for the future.

Foundational Management Documents and Processes

The development of baseline management components in an organization enables it to move forward in a systematized and effective manner. In the absence of foundational management elements, the organization will tend to operate in a random and generally ineffective manner.

Similarly, an organization should establish appropriate documentation, policies, procedures, and identification of internal and external issues that affect the agency. Processes must also be established to address the flow of information and communication within the DFWAFS as well as with its constituents. The following figure reviews best practice baseline management components.

Figure 29: Foundational Elements

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
STRATEGIC PLANNING		
Mission statement adopted?	Yes	
Displayed?	All stations and online	
Vision established & communicated?	Yes	
Values of staff established?	Yes	
Strategic or master plan?	A DFW Airport Strategic Plan is in place, however there is not one specific to DFWAFS.	
Adopted by elected officials?	No	Consider formal adoption of this master plan and completion of a DFWAFS strategic plan.
Published and available?	No/Fire Service Yes/Airport	
Periodic review?	No/Fire Service Yes/Airport	Consider annual review of fire service strategic planning elements and ensure complete DFWAFS plan is adopted and utilized.
Agency goals & objectives established?	Yes	
Date developed?	Annually in October	
Periodic review?	Yes, annually	
Code of ethics/conduct established?	Yes	
REGULATORY DOCUMENTS		
Rules available for review during site visit?	Yes	
Last date reviewed?	Unknown	
SOPs available for review during site visit?	Yes	
Regularly updated?	No	SOPs should be reviewed annually for accuracy and compliance with mandates.
SOGs used in training evolutions?	SOPs used	
Policies available for review during site visit?	Yes	
Internally reviewed for consistency?	Yes	
Internally reviewed for legal mandates?	Yes	
Training on policies provided?	Yes	
INTERNAL ASSESSMENT OF CRITICAL ISSUES		
Critical issues from fire chief's perspective		
First critical issue	Population growth and developing a sustainable fire service to support DFW Airport Strategic Plan.	

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
Second critical issue	Full cross training and integration of fire and EMS resources.	
Third critical issue	Facility upgrades and optimized locations.	
COMMUNICATIONS		
Internal Communications		
Regularly scheduled FD staff meetings?	Yes, Mondays	
Written staff meeting minutes?	No	Maintain and distribute minutes for weekly staff meetings.
Memos used?	Yes	
Member newsletters?	No	Consider periodic newsletter for DFW-wide distribution of DFWAFS news, trends, and safety education materials.
Member forums (all hands meetings)?	Yes	
Open door policy?	Yes	
Vertical communication path clearly identified (Chain of Command)?	Yes	
External Communications		
Community newsletter issued?	No, we have an internal website	
Department website?	Yes	
Advisory committee(s) used?	No	
Formal complaint process in place?	Yes	
Community survey used?	No	Develop customer satisfaction survey link that can be given to customers/passengers served by DFWAFS.

Discussion

DFWAFS, as a career emergency response organization, by necessity and its mission must function in a paramilitary manner. Consistent service delivery is dependent on standardized rules, regulations, and policies that guide appropriate behavior and accountability in emergency and non-emergency situations. In addition, the DFWAFS is in the unique position of operating in a private for-profit business model that requires extensive understanding and compliance with rules, regulations and policies of the DFW Airport Authority, FAA, and other regulating agencies. These guiding documents are vital for success in providing services that meet the expectations of the customers served by the DFWAFS.

DFWAFS should consider new mechanisms of communication and outreach such as periodic newsletters and simple and quick survey instruments to reach out to passengers and system stakeholders. This type of information, and survey tools available to stakeholders and clients, can serve as real-time feedback and trending instrument.

In addition, a formalization of agendum, minutes, and operational plans for internal meetings and committees should be made available to DFWAFS personnel. Utilizing these tools will increase communication, better align expectations, and provide for participation and active support by members on issues of importance and operational significance. Policies and procedures should be reviewed annually for operational, administrative, and regulatory/statutory compliance. Involving line personnel and established committees in this process will contribute to greater policy familiarization and compliance, as well as ensuring policies and procedures are sustainable and enforceable.

Annually, the DFW Airport Administration conducts a system-wide employee engagement survey. These types of surveys are commonly used by large organizations to measure job, team, supervision, and organizational opinions/perspectives and employee engagement. The DFW Employee Engagement Survey uses a standard set of questions and responses for all DFW employees and classifications. Survey participation is strongly encouraged and considered a high priority by the DFW senior administration. It is used by the DFW administration to set goals and measure employee satisfaction and engagement within the organization.

When conducting shift interviews one of the common themes was the perceived pressure and subsequent resistance to participate in the DFW Annual Engagement Survey. There is concern that the survey is not relevant to the DFWAFS mission and the results are never reported or addressed in a manner that has significant application or benefit the DFWAFS. ESCI recommends that DFWAFS administration work with the DPS administration to explore opportunities to modify the annual employment engagement survey to have more significant and meaningful relevance to DPS fire and law enforcement services. Survey topics and results that can be related to the DPS mission will increase participation, utilization, and buy-in by public safety employees participating in the survey and resulting initiatives.

As this master plan is adopted, it will provide a long-range road map for the DFWAFS to meet the current and anticipated future emergency service demands of the DFW Airport. While this road map is an effective guide forward, it would be optimized if it is accompanied by a strategic plan which will provide a three-to-five year living document that serves as the implementation plan for the short, mid, and long-range recommendations of the fire department master plan. It is often said that the strategic plan is the arrow that moves toward the target in the year-to-year realities to implement the recommendations, findings, and projections of the master plan.

Key Recommendations:

- Consider formal adoption of this master plan and completion of a strategic plan.
- Consider annual review of fire service strategic planning elements and ensure complete DFWAFS plan is adopted and utilized.
- SOPs should be reviewed annually for accuracy and compliance with mandates.
- Maintain and distribute minutes for weekly staff meetings.
- Consider periodic newsletter for DFW Airport-wide distribution of DFWAFS news, trends, and safety education materials.
- Develop customer satisfaction survey link that can be given to customers/passengers served by DFWAFS.
- Facilitate the updating of the DFW annual "Employee Engagement Survey" to be more applicable and measurable based on DFWAFS and DPS standards and services.

Record Keeping and Documentation

In any organization, documentation of activities is of paramount concern. The following figure reviews the practices that are in place in the DFWAFS.

Figure 30: Record Keeping and Documentation

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
REGULATORY DOCUMENTS		
Rules available for review during site visit?	Yes	
Last date reviewed?	Unknown	Review regulatory documents annually to ensure accuracy and compliance.
SOPs available for review during site visit?	Yes	
Regularly updated?	No	
SOGs used in training evolutions?	SOPs used	Consider separation of policies and procedures (policies administratively-based) and SOGs (evolution and procedurally based).
Policies available for review during site visit?	Yes	
Internally reviewed for consistency?	Yes	

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
Internally reviewed for legal mandates?	Yes	
Training on policies provided?	Yes	
DOCUMENT CONTROL		
Process for public records access in place?	Yes	
Hard copy files protected? (How?)	No	Secure hard copy files and documents in locked cabinets when office is not staffed.
Computer files backed up (on site/off site)?	Yes, DFW ITS, onsite and offsite	
SECURITY		
How are FD buildings secured?	Combination & key locks	
How are FD offices secured?	Keys	
How are FD computers secured?	Personal password	
How are FD vehicles secured?	Yes, secured in apparatus bays or by firefighters	
Is capital inventory maintained?	Yes	
Asset security system used? (Describe)	Key and Lock / Access Control	
How often is a capital inventory performed?	Annually	
Monetary controls used	DFW Airport Finance Policy and Procedures	
Cash access controls in place? (Describe)	We do not charge for any services	
Credit card controls in place? (Describe)	We do not charge for any services	
Purchasing controls in place? (Describe)	Yes, requires approval from Assistant Chief or above	
REPORTING & RECORDS		
Records kept by computer?	Yes	
What operating system?	Windows 7 or 10	
Periodic reports to elected officials	No elected officials	Consider periodic reports of performance and outcome to Airport Authority Board.
Financial reports?	N/A	
Management reports?	N/A	
Operational reports?	N/A	
Annual report produced?	Yes	
Distributed to others?	Yes	
Analysis of data provided in report?	Yes	
Required records maintained?	Yes	
Incident reports?	Yes	
Patient care reports?	Yes	

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
Exposure records?	Yes	
SCBA testing? (internally or contracted?)	Yes, internal	
Hose testing? (internally or contracted?)	Yes, contracted	
Ladder testing? (internally or contracted?)	Yes, contracted	
Pump testing? (internally or contracted?)	Yes, contracted	
Breathing air testing? (Who tests?)	Yes, August Industries	
Vehicle maintenance records (who keeps?)	Yes, Fleet Management/Fire Truck Maintenance	
Gas monitors calibrated (who performs?)	Yes, Spec. Ops. Technician	

Discussion

DFWAFS reports and records practices are generally appropriate, with a few recommendations noted above. The importance of effective record keeping cannot be overstated and it was apparent from the data provided to ESCI during this project, that the agency has effective records management practices in place.

DFWAFS issues policies in the form of a general order from the fire chief to make a new policy or change an existing one. Standard operating guidelines (SOGs evolution/procedural based) and policies and procedures (administratively based) should be ordered in a way that they can be easily referenced for review. Further, it is recommended that there be a process of periodic review and changes. A good way to assure this review is to have a committee of fire department members review one-third of the guidelines each year and recommend changes. There should also be a process to trigger update of a guideline that has be modified due to a new method or a technology change.

DFWAFS, by necessity and its mission, must function in a paramilitary manner. Consistent service delivery is dependent on standardized rules, regulations, and policies that guide appropriate behavior and accountability. Personnel should be expected to read and know these, but it is more effective to incorporate the SOGs and Policies and Procedures into periodic training. This will assure that everyone understands and that the entire department functions in a uniform way. Without understanding of standardized policies, the department will operate in different ways, depending on the understanding and desire of each shift commander, or worse, every company officer decides how to operate. When there are different ways of operating, it becomes a safety issue, particularly when an individual works overtime on a different shift. These guiding documents are vital for success and meeting the expectations of the citizens served by the DFWAFS. ESCI recommends that DFWAFS initiate training on both SOGs and Policies and Procedures.

It was noted that most Information Technology (IT) services in the fire department are provided by multiple DFW IT staff. Historically, DFWAFS has had dedicated IT staff assigned to the DFWAFS by the IT department. ESCI received feedback and observed IT inconsistences and delays in receiving services and expertise in a timely manner. Additionally, there is concern that there is a lack of software and hardware integration of: dispatch, RMS systems, human resources (HR), Payroll, and operational IT components. As a result, the significant investment made by the DFWAFS in state of the art IT hardware and software is not currently optimized or properly integrated.

Significant operational impact was noted because of a lack dedicated and focused IT support and technology system integration. The current system of transporting time cards using emergency response vehicles when DFWAFS staffing and payroll software are both run by Kronos software misses a substantial opportunity for increased efficiency and accuracy. In addition, a lengthy amount of time is spent on staffing and call back procedures that can be automated by updating staffing and back fill policies that can be programmed and automated using the Telestaff program.

Another noted IT deficiency impacts operations in not utilizing the complete capabilities of the mobile data computers and Tri Data Computer Aided Dispatch System (CAD) for closest unit dispatch, pre-fire plans, and response and building information/design plans. In addition, DFWAFS would benefit greatly from enhanced automatic aid and seamless alarm responses that require CAD-to-CAD interface with surrounding participating agencies. ESCI also noted that there was no Wi-Fi service available for the HazMat response unit requiring personnel to do emergency response and hazardous material identification functions by using private phones and or electronic devices. This capability is essential for effective HazMat team response and incident management and should be corrected as soon as possible.

Key Recommendations:

- Review regulatory documents annually to ensure accuracy and compliance.
- Consider separation of Policies and Procedures (policies administratively-based) and SOGs (evolution and procedurally based).
- Secure hard copy files and documents in locked cabinets when office is not staffed.
- Consider periodic reports of performance and outcome to Airport Authority Board.
- Further automate the utilization of Telestaff including integration with Kronos personnel and time card documentation (eliminate the hard copy time card system).
- Implement a fully integrated records management system to include, fire, EMS, ARFF, fire prevention, and training data and records.
- Restore dedicated IT services for the DFWAFS to ensure adequate maintenance and integration of hardware and software.
- Ensure adequate Wi-Fi services are available in all HazMat and other special operations vehicles to optimize functionality and effectiveness.
- Pursue CAD-to-CAD interface with automatic aid dispatch centers to implement seamless alarm dispatch procedures.

STAFFING

An organization's most valuable asset is its people. It is important that special attention be paid to managing human resources in a manner that achieves maximum productivity while ensuring a high level of job satisfaction for the individual. Consistent management practices combined with a safe working environment, fair treatment, opportunity for input, and recognition of the workforce's commitment and sacrifice are key components impacting job satisfaction. This section provides an overview of the DFWAFS staffing configuration and management practices.

Administrative and Support Staffing

One of the primary responsibilities of a fire department's administration is to ensure that the operational segment of the organization has the ability and means to respond to and mitigate emergencies in a safe and efficient manner. An effective administration and support services system is critical to the success of a fire agency.

Like any other part of a municipal fire department, administration and support need appropriate resources to function properly. By analyzing the administrative and support positions within an organization we can create a common understanding of the relative resources committed to this function compared to industry best practices and similar organizations. The appropriate balance of administration and support compared to operational resources and service levels is critical to the success of the department in accomplishing its mission and responsibilities.

The following figure reviews the administration and support organizational structure of the DFWAFS.

Figure 31: Administrative and Support Staffing

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION
ADMINISTRATION & OTHER SUPPORT STAFF	
Fire chief	1
Deputy chief	0
Asst. chief	4
Admin. B/C	3
Admin. Capt.	15
Firefighter	5
Administrative assistant	3
Civilian	4
Total administrative & support staff (Number)	35
Percent administrative & support to total FD	**17.9%**

Discussion

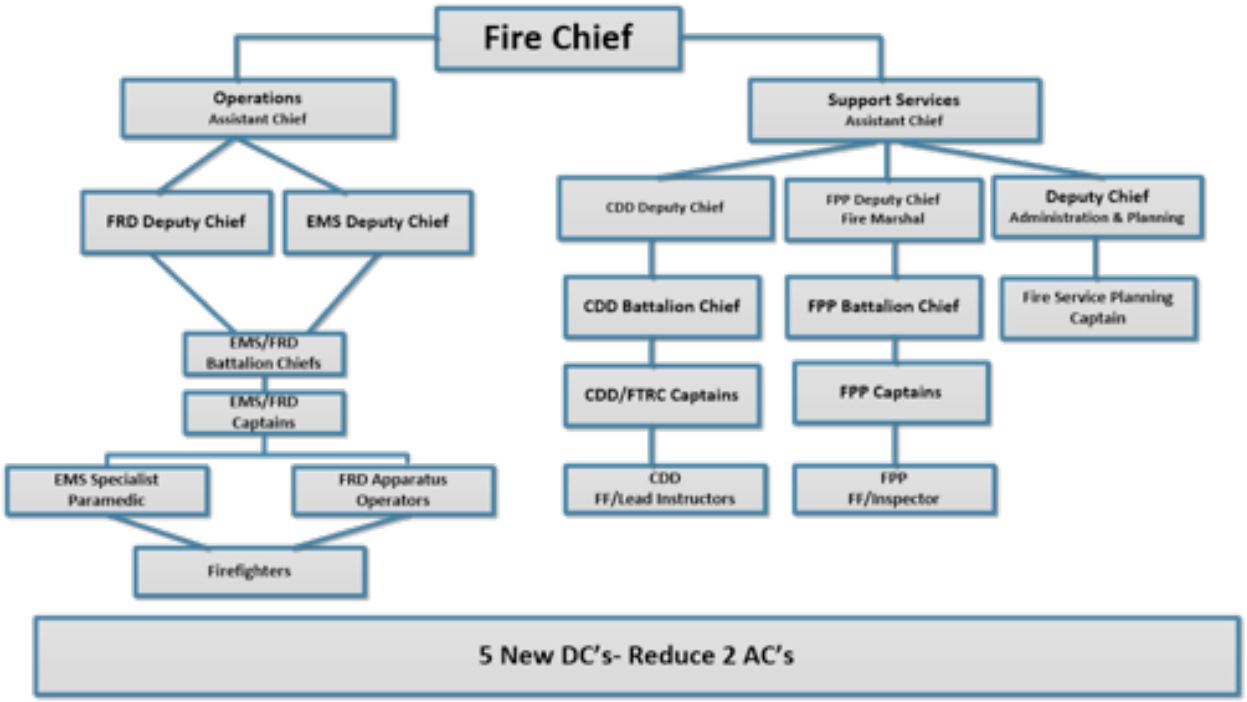
ESCI notes that currently the level of administrative and support staffing represents 17.9 percent of DFWAFS total membership. It is our experience that typically effective administrative staffing totals range from 10 percent to 15 percent of agency totals. After reviewing the functions and responsibilities assigned to the work group, and the divisions they support, ESCI concludes that the current ratio of administrative/support to operational FTEs assigned is appropriate for the department. ESCI has evaluated and made a number of recommendations that would realign and reclassify some administrative support positions to better accomplish the responsibilities and anticipated workload of these positions.

A key component of this conclusion relates to assistant fire chiefs' positions. There are currently four divisions/functions overseen by an assistant chief; Operations, EMS, Career Development, Fire Marshall, and Planning. Based on ESCI history and best practices, it appears the current assistant chief count and structure is top heavy with too many direct reports to the fire chief. These direct reporting relationships by their nature cause operational and mid-level management issues to be directed to the fire administration executive staff and fire chief. ESCI has observed that these mid-level management issues have impacted the executive management and fire chief's time and ability to focus on policy oversight, development, and executive management functions.

ESCI recommends a modified fire executive administration structure that eliminates two assistant chief positions and utilizes one operations and one supportive service assistant chief that report directly to the fire chief. ESCI recommends utilizing a mid-management level deputy chief position to oversee the division/functional elements of the fire department administration.

To accommodate this new assistant chief model, a sample organizational chart has been developed as an example of how a new deputy fire chief classification would report to the two assistant chiefs. ESCI recommends the deputy fire chief classification be established to provide primary administrative oversight and functional responsibility for Fire Rescue Operations, EMS Operations, Career Development/Training, Fire Prevention, and Administration/Planning. The costs of adding the new deputy chief positions would be partially offset by the reduction of two assistant chief positions. This transition and development of the recommended chief officer positions should take place over an adequate period of time to allow for the attrition and reasonable transition of existing chief officers. It is not recommended that changes be made in a manner that results in demotions or loss of an existing position. The timing and implementation of this organizational structure should be paired with current needs, funding, attrition, and the future administrative and operational needs based on the growth, service delivery demands, and changing risk profile of the DFWAFS.

Figure 32: DFWAFS Optional Organizational Structure



Administrative Support Staffing

DFWAFS currently employs four administrative support personnel assigned to the fire chief and assistant chiefs. ESCI feels this level of administrative support will be adequate for the recommended organizational structure. Having an administrative support position assigned to the fire chief, one position for the assistant chiefs, one position to support the career development/training division, and one position for the fire prevention and administrative/planning divisions would be an efficient and appropriate level of support. It would be beneficial and important to have all administrative support staff cross-trained to fill in and cover for each other and any work assignments.

Emergency Response Staffing

It takes an adequate and properly trained staff of emergency responders to put the appropriate emergency apparatus and equipment to its best use in mitigating incidents. Insufficient staffing at an operational scene decreases the effectiveness of the response and increases the risk of injury to all individuals involved. Based on increasing passenger volume, commercial and warehouse growth, and increased service demand, the Dallas Fort Worth Airport Fire Services is at a point where the ability to assemble the necessary number of personnel to meet the growing EMS and fire/rescue call volume may be impacted by the availability of DFWAFS resources and fire/EMS resources from surrounding communities.

Tasks that must be performed at a fire can be broken down into two key components—life safety and fire flow. Life safety tasks are based on the number of building/aircraft occupants, their location, status, and ability to take self-preservation action. Life safety-related tasks involve search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water/foam agent to extinguish the fire and create an environment within the building/aircraft that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent action, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Hazard control
- Mass casualty actions
- Water supply
- Pump operation
- Ventilation
- Back-up/rapid intervention
- ARFF actions
- Airport notifications and access control

The first 15 minutes is the most crucial period in the suppression of a fire. How effectively and efficiently firefighters perform during this period has a significant impact on the overall outcome of the event. This general concept is applicable to fire, rescue, and medical situations. Critical tasks must be conducted in a timely manner to control a fire or to treat a patient. DFWAFS is responsible for assuring that responding companies can perform the described tasks in a prompt, efficient, and safe manner.

The following figure lists DFWAFS emergency response staffing configuration.

Figure 33: Emergency Response Staffing

SURVEY COMPONENT	DFW AIRPORT FIRE DEPARTMENT INFORMATION
EMERGENCY SERVICE STAFF	
Battalion chief	6
Captain	24
Apparatus Operator	48
Firefighter, paramedic	28
Firefighter I and II	57
Total operational staff	**163**
Fire department total	195
Percent of operational officers to firefighters	**20%**
USE OF CAREER & VOLUNTEER PERSONNEL	
Career schedule	
Length of normal duty period (length of shift)	24 hours
FLSA period	208 / month
Duty hours per week (average)	52
Normal shift begins (time)	0700
Call-back requirements?	On-call
Residency requirements?	None
Standby duty requirements?	None
Operational career services	
Fire suppression	Yes
EMS/rescue, first response	Yes
EMS, advanced life support	Yes
Specialized rescue	Yes
Fire prevention inspections/code enforcement	Yes
Emergency management	Yes
Public education	Yes
Hazardous materials response (level)	Yes
Volunteer services	
Chaplain	Yes
Civilian administrative volunteer	No
RESPONSIBILITIES & ACTIVITY LEVELS OF PERSONNEL	
Committees and work groups	
EMS quality management	Yes
Chaplain	Yes
Training	Yes
Safety	Yes

Discussion

A baseline overview of the staffing model, staffing levels, and relief factors provides an opportunity to review and analyze the current staffing patterns, shifts, and options to increase efficiency, effectiveness, and capabilities. The following figure prepared by the DFWAFS shows the daily fire operations and EMS staffing utilized by the DFWAFS. The DFWAFS has a minimum daily staffing for fire and EMS operations of 40 personnel that provide 24/7 staffing for eight ARFF units, two engines, two quint ladder/pumper apparatus, two ladder trucks, three (will reduce to two) ambulances, and two battalion chiefs (will reduce to one). In addition, there is cross staffing of several pieces of equipment that includes the EMS squad, HazMat, mass casualty, and other specialty equipment.

Figure 34: Current Daily Fire and EMS Staffing

ADMINISTRATIVE STAFFING	STATION	STATION	STATION
9 ADMIN **132 SHIFT**	**STATION 1** **RW 35R-C-L / 31R**	**STATION 2** **RW 36R-L / 31L**	**STATION 3** **RW 35R-C-L / 31R**
Fire Chief Asst. Ch. Ops Asst. Ch. EMS Asst. Ch. Training Asst. Ch. Prevention Admin Aide (4)	ARFF AO ARFF AO Quint Capt./1AO/2FF Command BC	ARFF AO ARFF AO Quint* Capt./1AO/2FF Command BC *Cross Staff HazMat	ARFF AO ARFF AO Truck Capt./1AO/2FF *Cross Staff Vent Unit
	STATION 4 **RW 36R-L / 31L**	**STATION 5** **LANDSIDE TERMINAL**	**STATION 6** **WAREHOUSE AREA**
3 Shifts of 51 **Minimum Staffing of 40** Battalion Chief (1) Captain (7) Apparatus Operators (14) Firefighter (18)	ARFF AO ARFF AO Truck Capt./1AO/2FF *Cross Staff Airstairs	EMS Capt. Engine* Capt./1AO/2FF 2 Ambulances** 2FF *Cross Staff Mobile Command **Cross Staff Mass Casualty	 EMS 2FF Engine Capt./1AO/2FF

Fire and EMS Operations Staffing

The DFWAFS is facing three service delivery elements and cost drivers impacting fire and EMS operations. These elements consist of increased passenger counts and growth, staffing, and overtime use and the staffing of all ARFF response units with one person. To adequately address these three drivers there will be impacts to current and future staffing, equipment, and facility needs. ESCI has conducted an extensive review and analysis of the following elements and the impacts and options for future staffing and resource distribution in the future strategies section of the report.

- Future increased passenger counts/terminal expansion combined with a significant increase in warehouse and commercial development will create a need for a redistribution of resources and adding new resources for the future. This impact is extensively analyzed and displayed in the Service Delivery portion of this report.

- DFWAFS current shift schedule has a number of complex administrative issues relating to the current fifty-two-hour shift schedule Kelley days, short shifts, and Fair Labor Standard Act (FLSA) pay period hourly tracking. These issues have contributed to increased leave utilization and overtime costs. The current overtime costs are approximately eight percent of the fire department budget. While this is not out of line with similar 24/7 fire department's working 24-hour shifts, it is in excess of the DFW administrative target threshold of five percent.
- As part of the current service delivery analysis, ESCI has identified a significant safety issue with the staffing of ARFF vehicles during emergency response with one person. Based on the need to conduct over 15 individual tasks, many of which happen simultaneously during an aircraft emergency response and subsequent fire suppression activities, a second firefighter on all ARFF units is recommended.

In 2000, DFWAFS combined fire and EMS services into one organization. Since the consolidation of services has occurred, some efforts have been made to integrate these services into a single cross-trained dual role system. While these efforts have been well intentioned and made incremental progress, the two functions still operate in many aspects as separate entities or service delivery providers. Currently, advanced life support services are not provided on first responder vehicles (engines, trucks) and individuals working on ambulances are not eligible to work on engines, trucks, or ARFF units, despite staff being cross-trained and therefore certified to perform multiple functions.

ESCI feels that a complete integration of EMS and fire rescue operations will significantly benefit the DFWAFS and enhance the capabilities and services provided for fire rescue, EMS, and ARFF operations. This will allow for enhanced first responder ALS (FRALS) services to be available to the service area and will enhance the functionality and effectiveness of ambulance personnel as part of a fire rescue or ARFF effective response force.

ESCI has included a more detailed recommendation on the integration of EMS and fire rescue services in the short-term strategies and recommendations.

EMS Peak Demand BLS Squad

DFWAFS currently staffs a BLS non-transport squad to handle non-emergency medical calls for assistance in the terminal areas. This squad is staffed on a rotating basis by three stations and provides for two fire personnel on the squad with two remaining on the suppression equipment. This staffing and rotation model can have significant impacts on the suppression capabilities and efficient assembly of an effective response force.

DFWAFS sees this unit as an essential non-emergency response vehicle and also a visible unit for customer service and interaction with the clients/customers utilizing the DFW Airport. ESCI agrees that both the reduction of unnecessary utilization of ALS ambulances and interaction and visibility with clients/customers is beneficial and appropriate. These types of responses and public relation services should be continued as much as possible without negatively impacting emergency response capabilities.

ESCI recommends that consideration be given to not separating suppression crews for posting on the BLS squad at a terminal. The negative impacts to suppression response in varying areas of the response service area, assembling an effective fire fighting force, and delayed response from one terminal to another are not beneficial. Until a new response strategy can be implemented, it is recommended that the BLS squad be permanently located at Station 5 and crews respond from the station minimizing the splitting of the suppression resources.

ESCI has made a detailed recommendation in the long-term strategies and recommendations to utilize community risk reduction personnel (Fire Prevention) to staff the non-emergency response unit within the terminal area. These personnel need continual access to the terminals, are certified at the EMT level, and are best suited to provide community education and risk reduction programs. It is further recommended that any future terminal be built with a CRR office and non-emergency response unit bay/garage at the terminal.

Trades

ESCI noted concerns over trading privileges being too restrictive resulting in a lack of use of trades for time off and contributing to increased PTO utilization. ESCI has observed that permissive trade policies can be adequately monitored and result in less use of short notice PTO for desired time off. DFWAFS should consider a more permissive and user-friendly trade policy to ensure staffing requirements are met while reducing unnecessary PTO utilization that contributes to increased overtime costs.

Having a trade policy with expanded privileges can be provided without concern or impact on FLSA hours worked and increased overtime liability. In 2005 the Department of Labor issued a letter of clarification specifically related to fire service trade (shift swap) policies that stated the following:

> *"Section 7(p)(3) of the FLSA provides that two individuals employed in the same capacity by the same public agency may agree, solely at their option and with the approval of the public agency, to substitute [swap] for one another during scheduled work hours. 29 USC 207(p)(3). It further states that the hours worked by the substituting employee shall be excluded by the public agency in the calculation of the hours for which the substituting employee is entitled to overtime compensation under the Act. The implementing regulations provide that when 'one employee substitutes for another, each employee will be credited as if he or she had worked his or her normal work schedule for that shift.' 29 CFR 553.31(a)."*

Position Upgrades and Testing

DFWAFS has good job descriptions for all positions with roles, responsibilities, and minimum qualifications documented. However, upgrading of personnel on a temporary basis has been somewhat inconsistent and lacking standardized minimum qualifications and demonstrated competencies. It is recommended that position task books with demonstrated competencies be initiated and completed by personnel prior to upgrading into an acting position or being eligible for promotional testing processes. These task books and minimum qualifications should be developed in conjunction with existing job descriptions, policies, procedures, and established DFWAFS service delivery standards.

Current promotional exams are administered by the DFW Human Resource Department. The amount of involvement of the fire chief and DFWAFS personnel has varied and been reduced on recent examination processes. There have been multiple issues documented regarding exam content, administration, and scoring inconsistencies and errors. It is recommended that the DFWAFS in conjunction with DFW Human Resources utilize a credible fire department based testing company to assist with the development, administration, and scoring of entry level and promotional exams. These examination processes should be competency based utilizing industry best practices and customized for DFWAFS policies, procedures, and service delivery methods.

Special Operations and Automatic Aid

DFWAFS offers a wide variety of specialized operations and capabilities from its existing service delivery model. In Tarrant County, several fire departments including the Grapevine and Euless fire departments participate in the Northeast Fire Department Association (NEFDA). This local government based corporation offers a regional approach to many special operations such as; HazMat, Technical Rescue, Mass Casualty, and Bomb Squad services. Many of these programs are in proximity to DFW and there would benefit from DFWAFS participating in this regional special operations association. It would provide the opportunity to offset costs and exchange services on a regional level that would enhance capabilities and share costs for equipment, training, and certifications.

To optimize the assembly of an effective response force and the special operation services needed by the DFW footprint and risk profile, DFWAFS would benefit from enhanced automatic aid agreements with the adjacent jurisdictions to the DFW Airport. To have these automatic aid agreements work as designed—dispatching of multiple jurisdictions must happen seamlessly and without delay—there will need to be a fully integrated computer aided dispatch line between all the represented dispatch centers. While these CAD links can be costly, they will provide real time unit availability and allow the region to dispatch and respond as single jurisdiction without delay or multiple points of communication and coordination failure. ESCI recommends DFWAFS pursue these automatic aid agreements and CAD interfaces to ensure a seamless alarm response within the region.

Leadership Development and Succession Planning

As with most fire departments, leadership training and succession planning is a high priority and very difficult to quantify and implement. DFWAFS provides a variety of leadership training and succession planning activities at all levels of the organization, but lacks an adopted, consistent succession planning/leadership development program.

Succession management is a process that is unique to each agency and is not a one-time event. ESCI recommends that CDD take the lead in the development of a leadership and succession planning committee with representation from each rank and relevant stakeholders. It is recommended that DFWAFS committee contact the International Association of Fire Chiefs Company Officers Section for a succession plan and leadership/professional development program template. The established committee can customize the template, implement the program, and track the results and outcomes.

Physical Ability Screening

Currently, DFWAFS uses an internally designed physical standard screening process with internal validation. ESCI recommends DFWAFS explore adoption of an established and widely validated program.

The International Association of Fire Fighters (IAFF) and the International Association of Fire Chiefs (IAFC) teamed up through the Fire Service Joint Labor Management Wellness/Fitness Initiative to develop the IAFF/IAFC *Candidate Physical Ability Test* (CPAT).[2] The Task Force successfully developed the Fire Service Joint Labor-Management Wellness-Fitness Initiative in 1997 to address the wellness and fitness needs in the fire service. In conjunction with this effort, the Task Force discovered that people were hired who would not be physically capable of a successful career in the fire service. The Task Force proceeded to develop the CPAT, resulting in a more consistent and valid test for hiring of candidate firefighters.

By the CPAT design and the agreements negotiated in its development, the CPAT is not authorized for use in the testing/screening of incumbent firefighting personnel. ESCI recommends DFWAFS conduct annual physical fitness competency testing and develop a physical ability screening process to ensure responder fitness and career longevity. In addition, ESCI recommends DFWAFS conduct annual medical health screenings in accordance with *NFPA 1582*.

[2] http://www.iaff.org/hs/CPAT/cpat_index.html.

Key Recommendations:

- Consolidate and redistribute stations, personnel, and apparatus to meet build out population, customer/client load, and commercial/warehouse risk profile.
- Increase relief factor to decrease overtime to below the five percent DFW Airport target.
- Increase staffing to a two-person minimum on all ARFF apparatus.
- Fully integrate fire and EMS operations to have a seamless cross trained, dual role organization.
- Have BLS squad stationed at Station 5 and respond from station versus posting at terminals to reduce negative impacts to suppression capabilities and the effective response force.
- Consider alternative staffing model of BLS Squad by community risk reduction personnel (Fire Prevention) and future location of unit at terminal with a CRR office.
- Consider modification of trade policy to make it more permissive to reduce PTO utilization.
- Establish task books to sign off on minimum qualification to act as drive operator and captain.
- Implement upgrade pay program consistent with promotional pay scale.
- Review and adjust position salaries and specialty pay (e.g. paramedic) to address compaction, regional practices, and incentivize promotional participation.
- Utilize established fire department entry level and promotional testing company to ensure competency-based testing is administered in a way that is relevant, consistent, and fair.
- Have CDD take the lead and establish a succession planning/leadership development committee to develop a succession and leadership development plan.
- Adopt and implement a wellness and fitness initiative utilizing CPAT entry level physical ability testing and annual incumbent physical ability testing and medical exams in compliance with NFPA 1582 standards.

FIRE AND EMS TRAINING DELIVERY

Providing safe and effective fire and emergency services requires a well-trained workforce. Training and education of personnel are critical functions for each fire and emergency services agency. Without quality, comprehensive training programs, emergency outcomes are compromised and emergency personnel are at risk.

> One of the most important jobs in any department is the thorough training of personnel. The personnel have the right to demand good training and the department has the obligation to provide it.[3]

Initial training of newly hired firefighters is essential, requiring a structured recruit training and testing process. Beyond introductory training, personnel need to be actively engaged on a regular basis and tested regularly to ensure skills and knowledge are maintained. To accomplish this task, agencies must either have a sufficient number of instructors within their own organization or be able to obtain those resources elsewhere. Training sessions should be formal and follow a prescribed lesson plan that meets specific objectives. In addition, a safety officer should be dedicated to all training sessions that involve manipulative exercises.

DFWAFS operates the DFW Fire Training Research Center (FTRC). The center is a world class training facility that trains airport emergency responders from throughout the world in modern best practices for ARFF services. A combination of state of the art digital training technology, highly qualified instructors, and multiple large-scale training props are used, reportedly training 30,000 students from 45 countries since the center's inception in 1995.

The FTRC is operated independently from the DFWAFS fire and EMS programs and the department's responder training is conducted not via the center, but through the DFW Career Development Division (CDD). However, the resources that are available at the FTRC are valuable assets to the CDD in conducting ongoing fire and EMS training. The training review completed below is that of the CDD training program, and not the FTRC program.

Unlike most fire departments, DFWAFS is required by law to meet specific requirements for training as promulgated by the Federal Aviation Administration (FAA). In 2004, the FAA issued a final rule that revised the federal airport certification regulation [Title 14, Code of Federal Regulations (CFR), Part 139 (14 CFR Part 139)] and established certification requirements for airports serving scheduled air carrier operations. Subsequently, the FAA has issued specific direction regarding the guidelines and standards for aircraft rescue and firefighting training programs in Advisory Circulars (AC). Airports that are certified under 14 CFR Part 139 are required to meet these standards. Specifically, 14 CFR § 139.319 further defines the standards that apply to an airport's ARFF training program.

[3] Klinoff, Robert. Introduction to Fire Protection, Delmar Publishers, 1997. New York, NY.

At DFW Airport Fire Services, the training program is operated by the Career Development Division, CDD. The CDD is analogous to what many fire departments title a training division.

In the following pages, ESCI reviews DFWAFS training practices, compares them to national standards and best practices, and recommends modifications, where deemed appropriate.

General Training Competencies

For training to be fully effective, it should be based on established standards. There are a variety of sources for training standards. DFWAFS uses the National Fire Protection Association (NFPA), International Fire Service Training Association (IFSTA), Texas Commission on Fire Protection certification, and state-established job performance requirements (JPRs) as the basis for its fire suppression training practices. National Emergency Medical Services standards are used as the baseline for medical training coursework.

Figure 35: General Training Competencies

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION
GENERAL TRAINING COMPETENCY	
Incident command system?	Yes, NIMS[4] based
Accountability procedures in place?	Accountability system is in place
Policy and procedures on training in place?	Yes
Safety procedures in place?	Yes
Recruit academy	Recruit training is provided by DFWAFS and includes partnering with Tarrant County College
Special rescue	Yes, DFWAFS training
Hazardous materials, certification level?	Texas Commission on Fire Protection certifications
Wildland firefighter	Texas Commission on Fire Protection certifications
Vehicle extrication?	Yes, DFWAFS training
Defensive driving? (program used, frequency?)	Yes, DFWAFS training
Use, safety, and care of small tools?	Yes, DFWAFS training
Use, safety, and care of power equipment?	Yes, DFWAFS training
Radio communications & dispatch protocols?	Yes, DFWAFS training
EMS skills & protocols?	Yes, DFWAFS training and state/federal continuing education requirements

Discussion

A review of the general training competencies that are included in DFWAFS Career Development Division program reveals that the necessary baseline subject areas are addressed by the division. Following is additional discussion related to the training program's foundational configuration.

[4] NIMS – National Incident Management System.

Fire response training, including Aircraft Rescue and Fire Fighting (ARRF), is completed by the CDD based on the agency training program and training standards of the Texas Commission on Fire Protection (TCFP). Those standards address all aspects of structural fire suppression. In Texas, to be consistent with the FAA requirements for ARFF, an airport firefighter is required to be certified under the TCFP curriculum. That curriculum consists of 120 contact hours and mirrors and exceeds the minimum requirements of ARFF training established by the FAA. FAA inspectors are aware of this standard in Texas and specifically look for the TCFP certification status as verification of the FAA Part 139 initial training.

This applies only to initial fire and ARRF training. However, continuing and/or recertification training is also essential. The recurrent training differs from the FAA initial requirements and is accomplished on an ongoing basis via the CCD. Using an annual training program planning process, every firefighter receives continuing education that is based on the FAA's "Programs for Training of Aircraft Rescue and Firefighting Personnel," as defined in AC150/5210-17C.

EMS Training and Continuing Education

In Texas, the Texas Department of State Health establishes requirements for certification, licensure, and continuing education for EMS personnel. Depending on an individual's level of certification, requirements are defined and must be met for certification to be continued. The DFWAFS program is based on the state standards appropriately.

Training at DFWAFS related to emergency medical patient treatment is addressed separately from that of fire and ARRF skills. The fire and EMS programs are independent of each other, lacking consistency and coordination between the two. The initial training, as well as continuing education, would be more effectively managed and administered as combined programs. The EMS component should be managed under the CDD, coordinated with the medical director as well as designed to meet the continuing education requirements of the State of Texas.

Fire and EMS training should include both disciplines in shared activities. Training should integrate scenarios in all aspects of Advanced Life Support, Basic Life Support, vehicle extrication, and related subjects. Finally, given the technical resources available in the CDD and FTRC, ESCI finds that an opportunity exists to expand the use of those resources. It is recommended that an EMS training lab with computer based and advanced mannequin training technologies be developed.

Training Program Management and Administration

To function effectively, a training program needs to be managed. Administrative program support is important, though frequently weakly addressed. An additional element of effective administration is the development of program guidance in the form of training planning, goals, and defined objectives.

The next table reviews the DFWAFS Training Program administration and management practices.

Figure 36: Training Program Administration and Management

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
TRAINING ADMINISTRATION & BUDGET		
Director of training program	Randal Rhodes, Assistant Chief	
Training goals & objectives identified?	Yes	
Certified instructors used? (Qualifications)	Yes / Texas Commission on Fire Protection Certifications	
Annual training report produced?	Company level training plan established and monitored by battalion chiefs, but not by the Career Development Division.	The Career Development Division should produce, distribute, and monitor annual, quarterly, and monthly training plans and maintain records and tracking of mandates and topics.
Priority by management toward training?	High	
Budget allocated to training?	$2,826,591	
Condition of capital facilities for training admin.?	Excellent	
Adequate office space, equipment, supplies?	Yes	
Current annual operating budget?	$2,826,591	
Clerical staff support assigned to training admin?	DFW Career Development Division. One support position.	

Discussion

The DFWAFS training program operates under the oversight of the Career Development Division (CDD), led by Assistant Chief Randal Rhodes. Chief Rhodes is well qualified, with multiple years of experience and appropriate background for training program management. He is assisted by a single administrative support position.

At the fire company level, annual training planning is limited to a training plan this is administered and monitored by the battalion chiefs, but is not directly under the oversight of the CDD. A higher degree of oversight, planning, and reporting is necessary to assure that the training program is fully effective. For this reason, ESCI recommends that the CDD produce annual, quarterly, and monthly training plans and reports as well administering, monitoring, and tracking all DFWAFS training.

Training Resources and Methodology

To be able to deliver effective training to fire and EMS personnel, some resources are necessary to arm the trainer with the tools needed to provide adequate educational content. In addition to tools, effective methodologies must be employed for delivery to sufficiently meet needs.

Figure 37: Training Resources and Methodology

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
TRAINING METHODOLOGY		
Manipulative skills?	Included in ongoing internal training planning	
Task performances/frequency?	Conducted annually	
Annual training hour requirements?	Based on Texas Commission on Fire Protection and FAA requirements	
Night drills? (Frequency?)	Yes, annually	
Multi-agency drills? (Frequency? Agencies involved?)	Semi-annually including all neighboring fire agencies	
Inter-station drills? (Frequency?)	Yes, quarterly	
Disaster drills conducted? (Frequency?)	Yes, quarterly	
Pre-fire planning included in training?	Yes	
TRAINING OPERATION & PERFORMANCE		
Attention to safety? Incorporated in training?	Incorporated into ongoing internal training	
Post-incident analysis conducted? (circumstances?)	Incorporated into ongoing internal training	
Training procedures manual developed & used?	Yes	
TRAINING FACILITIES & RESOURCES		
Adequate training ground space/equipment?	Yes	
Describe training facilities (tower, props, pits)	Structural, ARFF, vehicles, aircraft flashover	Provide fire and ARFF apparatus that is dedicated to training to avoid use of in-service vehicles.
Live fire props?	Multiple live fire aircraft and fuel spill props	
Fire and driving grounds?	Yes	
Maintenance of training facilities adequate?	Yes	
Classroom facilities adequate?	Yes	
Video, computer simulations available?	Yes	
Instructional materials available?	Yes	
RECORDKEEPING		
Individual training files maintained?	Yes	
Records & files computerized?	Yes	
Daily training records kept?	Yes	
Company training records kept?	Yes	
Responsibility for training records?	Assistant Chief—CDD	
Training equipment inventoried? (Frequency?)	Monthly	

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
PERSONNEL TRAINED		
Number of personnel trained (latest full year)?	450 internally; 2,500 externally via the Airport Fire Training Research Center	
Total training hours delivered (latest full year)?	3,600 hours internal training	
Fire-related training hours?	2,700 hours internal training	
EMS-related training hours?	900 hours internal training	
Other training hours?	100 internally	

Discussion

DFWAFS has made a strong commitment to training in all regards and is commended for the evident dedication to assuring that department personnel are trained to operate safely on the emergency scene.

The agency is challenged to a higher degree than most fire departments, because of multiple standards and certification requirements that need to be addressed. DFWAFS must comply with the multiple requirements of the FAA Part 139 content, as well as those of the TCFP. Further, emergency medical training and certification requirements are in place for EMS responders. The agency's training efforts are complex and appear to effectively address the multiple considerations involved.

For training facilities and equipment, the department is fortunate to have access to the considerable training resources of the FTRC, which functions as a stand-alone entity. At the same time, the FTRC is able to make use of DFWAFS equipment including structural fire and ARFF vehicles.

A byproduct of the complexity and special capabilities of the Fire Training Research Center, is that it operates as a stand-alone revenue center that is similar to a municipal enterprise (cost recovery) fund. While this is important to maximize the revenue and impacts of the training center, it has resulted in a reduced role in internal training and education. ESCI recommends that all training, education, certification, and oversight for DFWAFS training be conducted and managed by the Career Development Division. This will increase consistency, competency, and access to essential training for fire, EMS, and ARFF operations.

Currently, when conducting training, whether for DFWAFS personnel or external trainees, the department's fire, ARFF, and EMS vehicles are used. When engaged in training activities, those units are out of service for response. They also undergo active use that contributes to wear and tear on the vehicles. Having equipment that is dedicated to the CDD for training will result in expense, however, given the high volume of use, some of the cost is likely to be offset by reduced maintenance resulting from heavy training use. ESCI recommends that the Career Development Division have designated suppression, EMS, and ARFF apparatus and equipment to limit the amount of in-service equipment utilized during both DFWAFS training and that of the FTRC.

Assuming that both CDD training and activity of the FTRC will increase in the future, planning for apparatus and equipment use moving forward is warranted. Further, training facility needs are likely to grow with the programs. The current Station 4 is adjacent to the FTRC. In long range plans, if Station 4 is to be closed to consolidate the other facilities, it should be retained for use by both the CDD and FTRC. This resource would allow for unique training capabilities and scenarios that will allow for 24/7 simulated responses from an existing ARFF fire station; including daytime, after-hours, and nighttime response simulations. These living quarters can also be made available for utilization by participating fire agencies contracting for ARFF training, creating a new and enhanced revenue source.

Key Recommendations:

- The DFWAFS Career Development Division should conduct all training, education, certification, and oversight of all DFWAS fire, EMS, and ARFF training.
- The Career Development Division should produce, distribute, and monitor all annual, quarterly, and monthly training plans and maintain records and tracking of mandates and topics.
- The Career Development Division should have designated suppression, EMS, and ARFF apparatus and equipment to limit the amount of in-service equipment utilized during non DFWAFS training.
- Develop and implement a comprehensive EMS integration and training program.
- CDD to coordinate EMS training in synchronization with the medical director.
- Conduct integrated fire and EMS training and combined ALS/BLS scenarios.
- Develop a functioning EMS training lab with computer and advanced mannequin training resources.
- Host suppression, HazMat, rescue, and other regional training classes in addition to ARFF training.
- Develop and deliver dual role cross training for all DFWAFS EMS personnel.
- Upon consolidation of ARFF stations 2 and 4, consider utilization of old Station 4 for training, housing, and 24/7 training capabilities for customers purchasing training from DFWAFS.

SERVICE DELIVERY AND PERFORMANCE

The most important aspect of any emergency services agency is its ability to deliver services when requested. This section of the report provides an overview of the current service delivery components of the DFW Airport Fire Services:

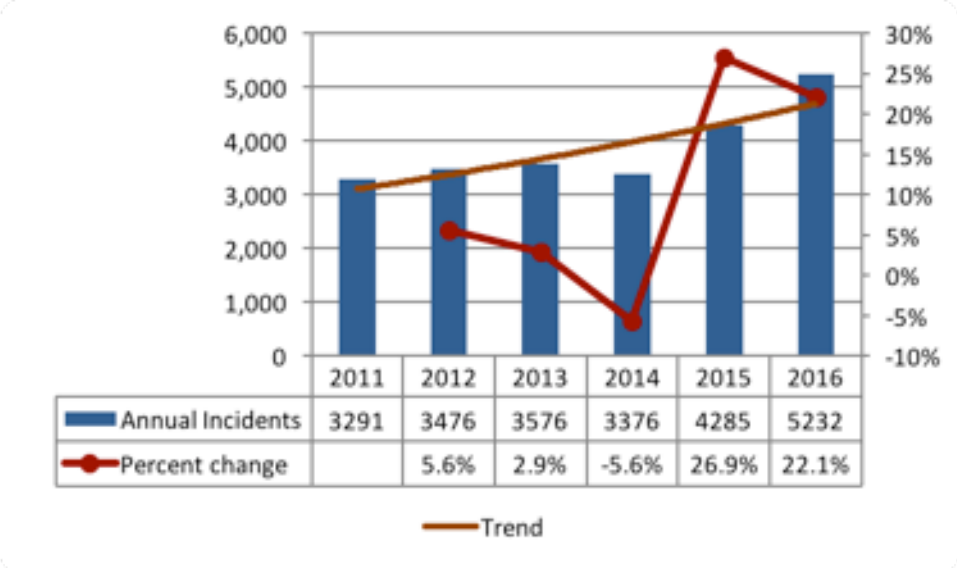
- Service Demand
- Resource Distribution
- Resource Concentration
- Response Reliability
- Response Performance
- Mutual and Automatic Aid Systems

The delivery of fire suppression, rescue, and emergency medical services is no more effective than the sum of its parts. It requires efficient notification of an emergency and rapid response from well-located facilities in appropriate apparatus with a sufficient number of well-trained personnel following a well-practiced plan of action.

Service Demand Analysis

The data used in the following figure is derived from DFWAFS data presented in the Fiscal Year 2017 Staffing Request.

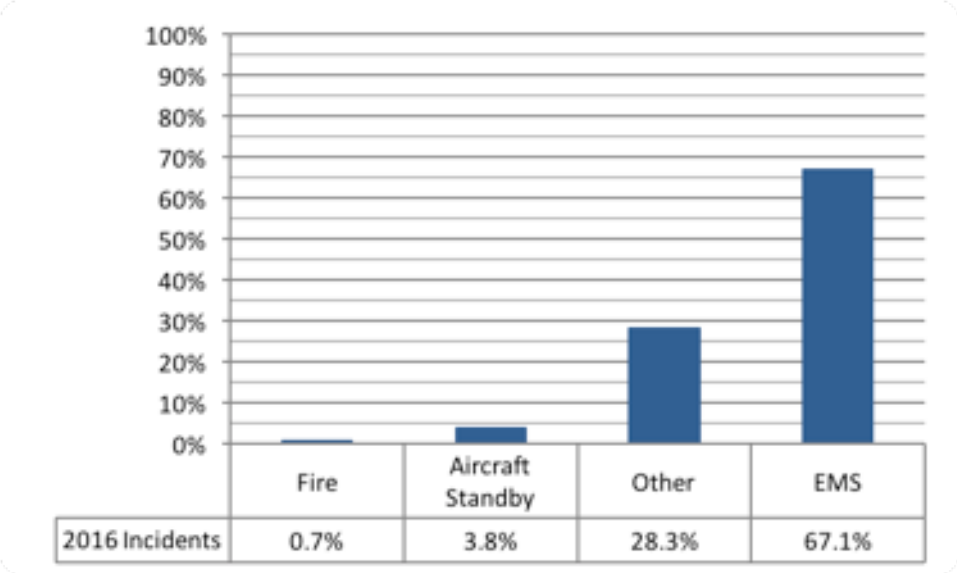
Figure 38: DFWAFS Annual Service Demand, 2011–2016



Overall, DFWAFS service demand increased by approximately 59 percent between 2011 through 2016. Although the increase in service demand varied year by year, service demand increased by an annual rate of nearly 12 percent (11.8 percent) in the period displayed. EMS service is the primary driver of the increased service demand.

The following figure uses DFWAFS 2016 National Fire Incident Reporting System (NFIRS) data to demonstrate the nature of service demand in 2016. Using NFIRS incident type definitions, ESCI categorized incidents as "Fires" (structures, vehicle, brush, any 100 series incident in NFIRS), "EMS" (all calls for medical service including MVAs and rescues, any 300 series incident in NFIRS), and "Other" (false alarms, hazmat incidents, service calls, all other NFIRS incident series). In addition, "Aircraft Standbys" (NFIRS incident type 462) are identified.

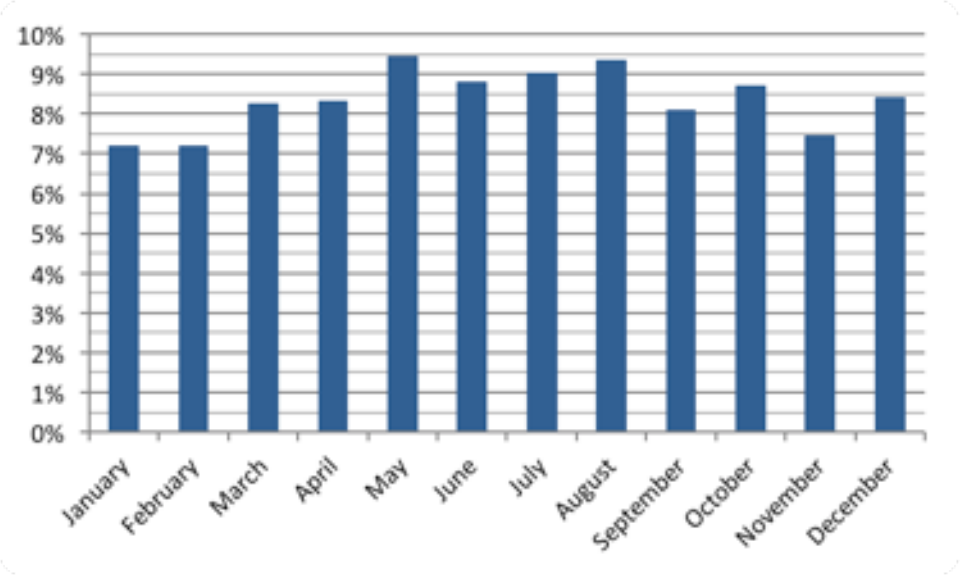
Figure 39: Service Demand by Incident Category, 2016



EMS incidents represent the largest portion (67.1 percent) of 2016 service demand. Slightly less than one percent of 2016 incidents were actual fires. Nearly four percent (3.8 percent) of DFWAFS incidents were aircraft standbys in 2016. Note that DFWAFS reports that EMS incidents represent approximately 73 percent of 2016 service demand. ESCI believes the discrepancy can be attributed to EMS incidents cancelled prior to arrival, which are categorized as a good intent call (NFIRS 600 series) in the NFIRS data.

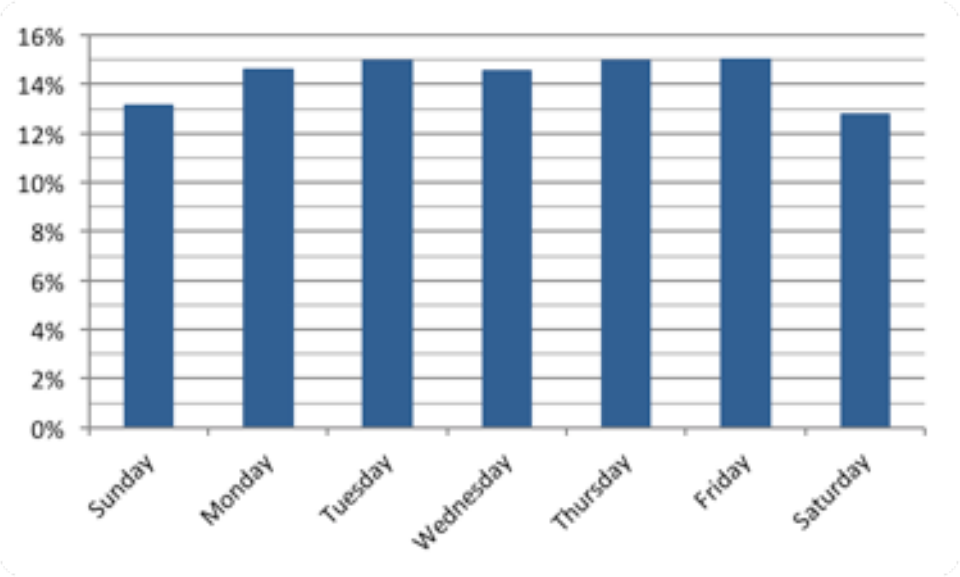
Temporal Variation

Figure 40: Service Demand by Month of the Year, 2016



Service demand varies throughout the year; with May through August demonstrating the highest demand for DFWAFS services. Service demand was lowest in January, February, and November in 2016. Note that the increase in service demand in the period from May through August, also represents the period with the highest rate of paid time off for DFWAFS.

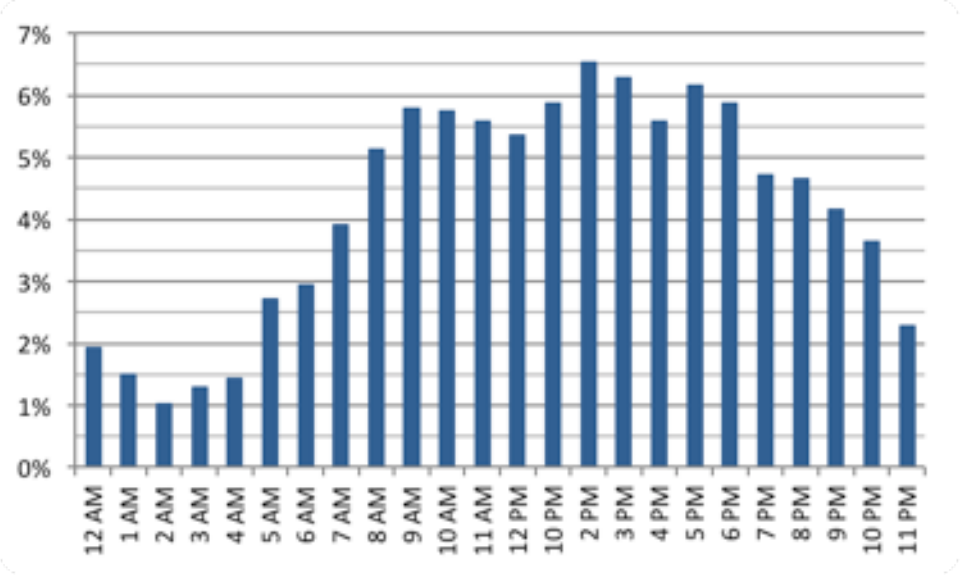
Figure 41: Service Demand by Day of the Week, 2016



As with monthly service demand, service demand varies throughout the week. The range is relatively narrow (approximately two percent).

At DFWAFS service demand directly correlates with the increase in passengers during the day. Workload increases during daytime hours and decreases in the evening and early morning hours as the number of passengers through the airport fluctuates.

Figure 42: Service Demand by Hour of the Day, 2016

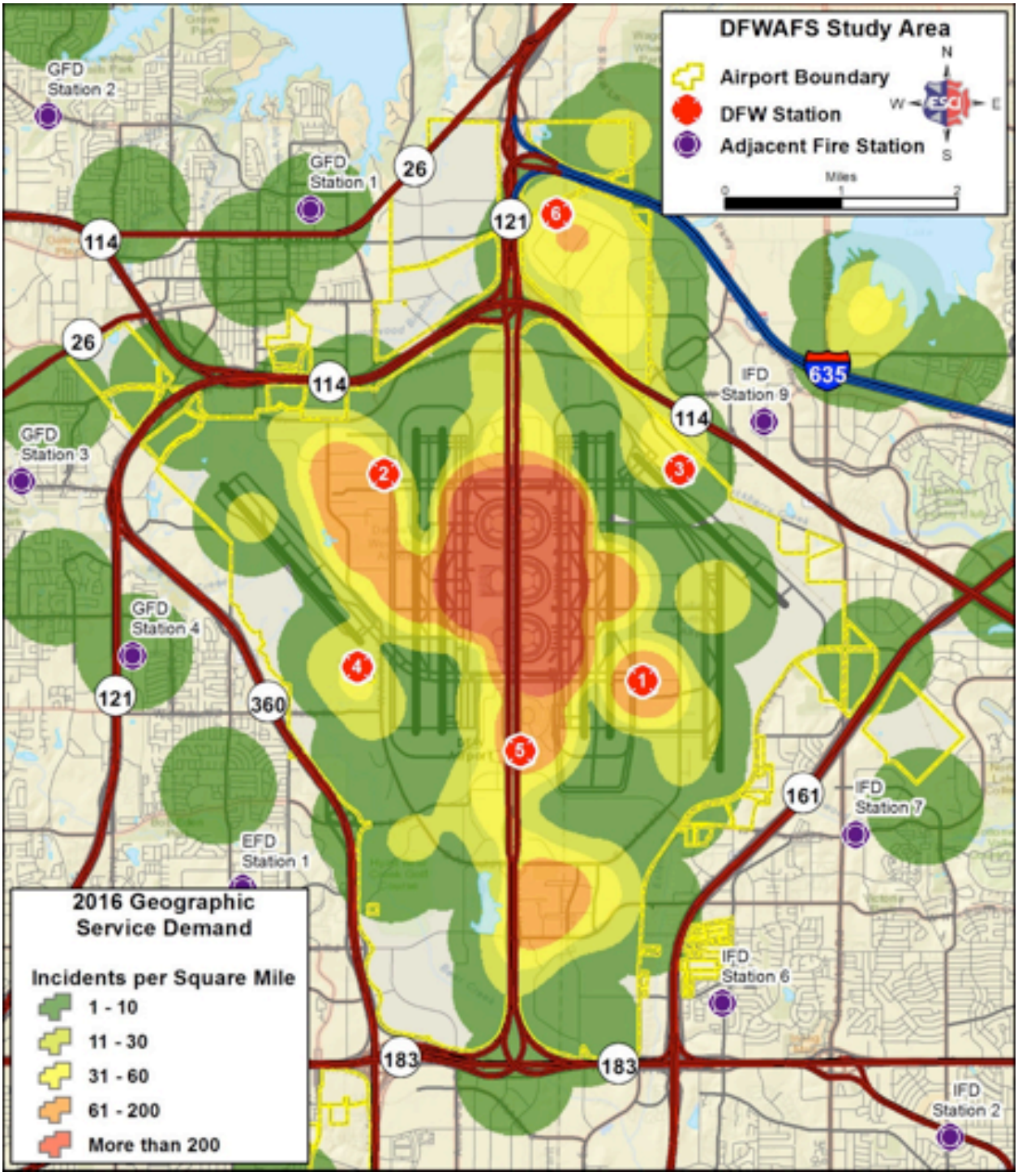


DFWAFS service demand starts to increase between 5 AM and 7 AM. Incident activity is at its greatest between 8 AM and 8 PM; nearly 70 percent of service demand occurs during this period. DFWAFS has instituted a Fire Rescue Squad staffed with three personnel in the Central Terminal Area (CTA) during the hours of 8 AM to 6 PM. This unit's primary responsibility is to handle BLS EMS calls in the CTA during the time with the highest number of passengers and service demand.

Geographic Service Demand

In addition to the temporal analysis, it is useful to examine the geographic distribution of service demand. Using dispatch center incident location data, ESCI plots incident locations and calculates the mathematical density of 2016 service demand in the DFWAFS service area.

Figure 43: Geographic Service Demand, 2016

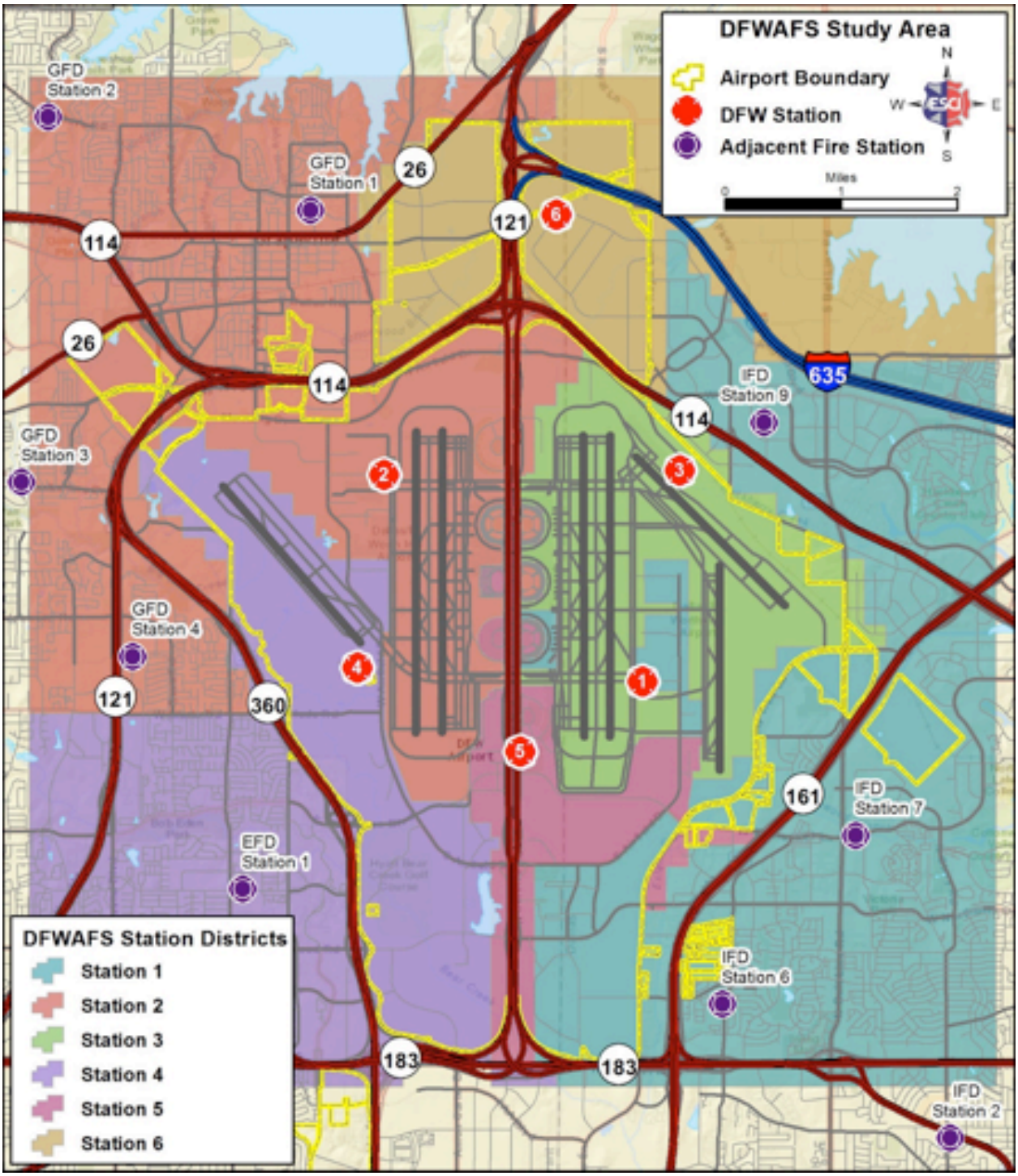


Not surprisingly, the terminal area and the occupancies associated with the terminal area displays the greatest incident density in the DFWAFS service area. Industrial and commercial areas south of Station 5 and around Station 6 also demonstrate higher incident density.

Resource Distribution

The distribution analysis presents an overview of the current deployment of fire department facilities, apparatus, and personnel within the DFWAFS service area.

Figure 44: DFWAFS Study Area

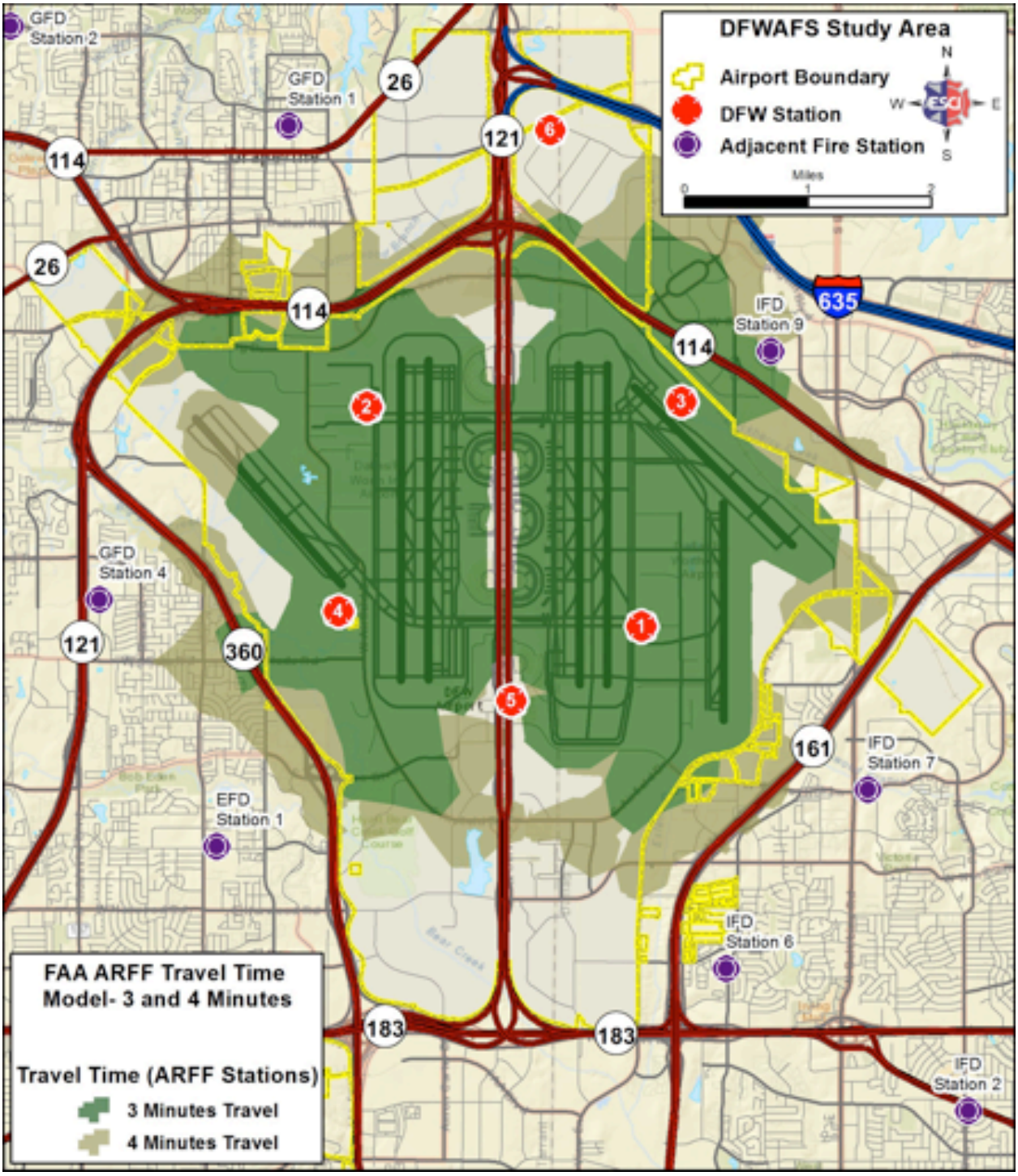


DFWAFS service area encompasses approximately 27 square miles. DFWAFS provides ARFF, fire protection, emergency medical aid and transport, rescue, and HazMat services from six stations located within the boundaries of the DFW Airport. Stations 1, 2, 3, and 4 house ARFF and structural apparatus. Stations 5 and 6 primarily staff DFWAFS mobile intensive care units (MICU) and structural apparatus.

DFWAFS provides ARFF service to the DFW Airport (Index E airport); and structural fire protection and EMS to the airport and adjacent off-airport properties. The FAA specifies that the first ARFF apparatus must reach the midpoint of the farthest runway in three minutes' total response time; additionally, the last ARFF apparatus must arrive in four minutes.

In the following figure, ESCI uses GIS data provided by DFWAFS to display a travel time model from the current DFWAFS fire stations based on the FAA travel time criteria for ARFF apparatus.

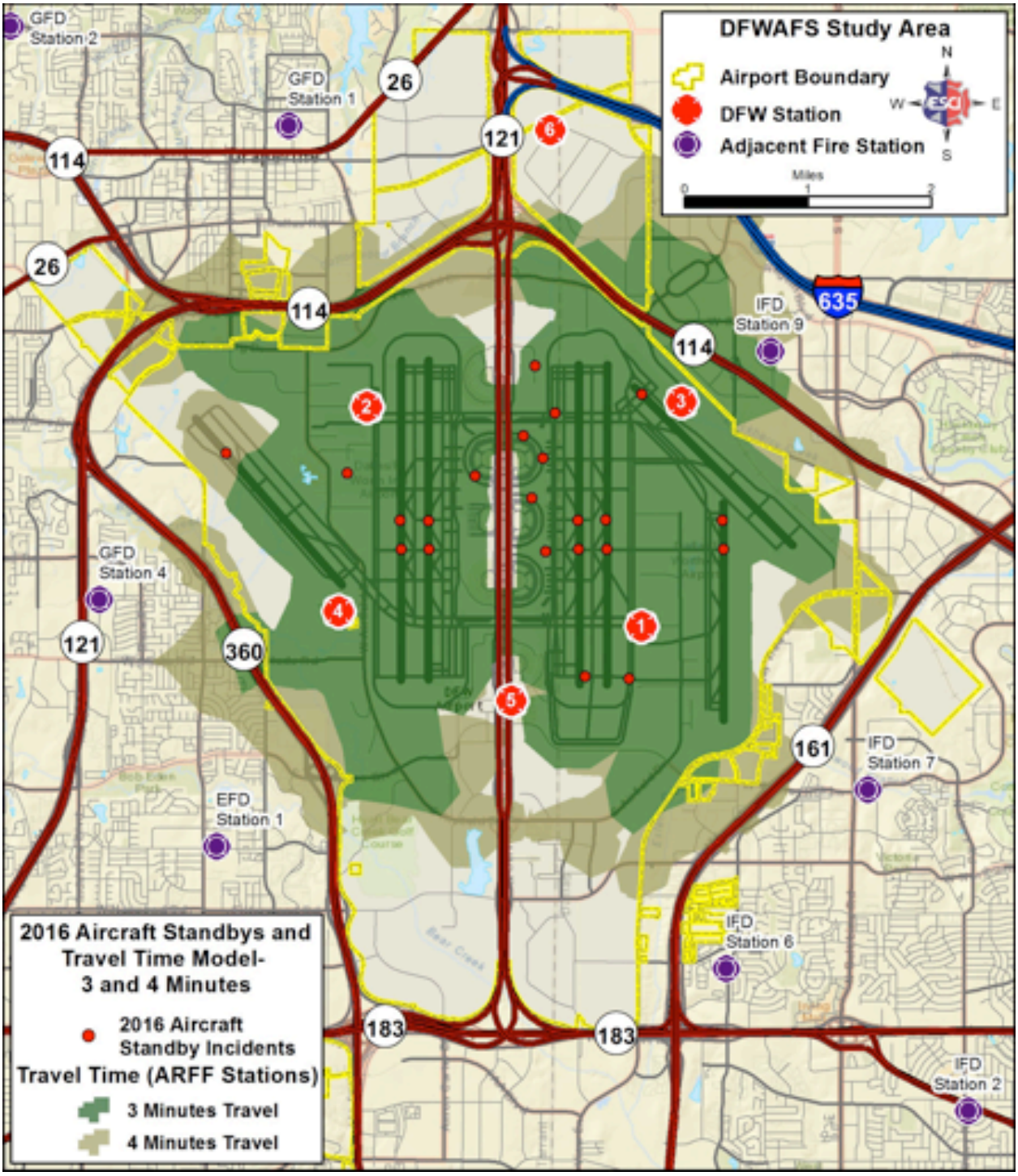
Figure 45: Travel Time Model, FAA ARFF Criteria



The midpoints of all seven DFW runways are within three minutes' travel of an ARFF station (stations 1 through 4). All of the runways are within four minutes' travel of an ARFF apparatus.

The next figure displays 2016 aircraft standby incidents and the FAA criteria travel time model.

Figure 46: 2016 Aircraft Standby Incidents and Travel Time Model

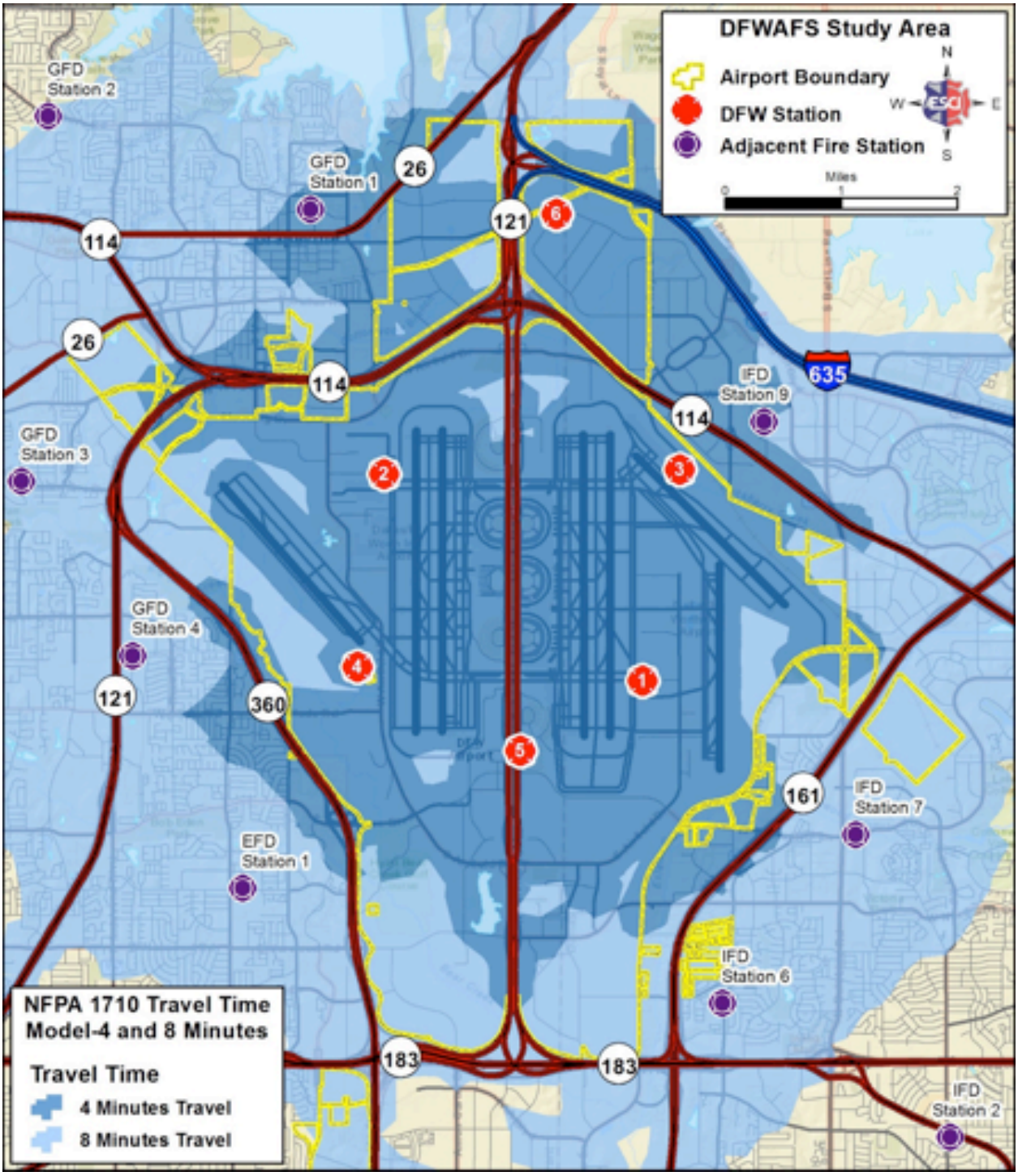


Ninety-six (96) percent of the approximately 200 aircraft standby incidents in 2016 are within three minutes of an ARFF station. The aircraft standby location displayed on western runway (31L/13R) is slightly beyond three minutes' travel of an ARFF station, but well within four minutes' travel.

The next set of figures uses the same road network data to model travel time based on the National Fire Protection Association (NFPA) 1710 standard for structural fire protection.[5] The NFPA 1710 standard recommends that the first fire department apparatus arrive in four minutes' travel time for fire and EMS emergencies. Additionally, NFPA 1710 specifies that the full first alarm assignment arrive at a fire suppression incident in eight minutes' travel or less. The NFPA standard states that an advanced life support (ALS) unit should arrive in eight minutes at the scene of an EMS emergency, when ALS service is provided by the fire department. Note that in all of the travel time models, the potential travel time service area for the stations located on the airfield (stations 1 through 4) has been adjusted to reflect the time required for apparatus to open and close the airfield security gates. This only affects travel time off the airfield (structural apparatus housed at stations 1 through 4).

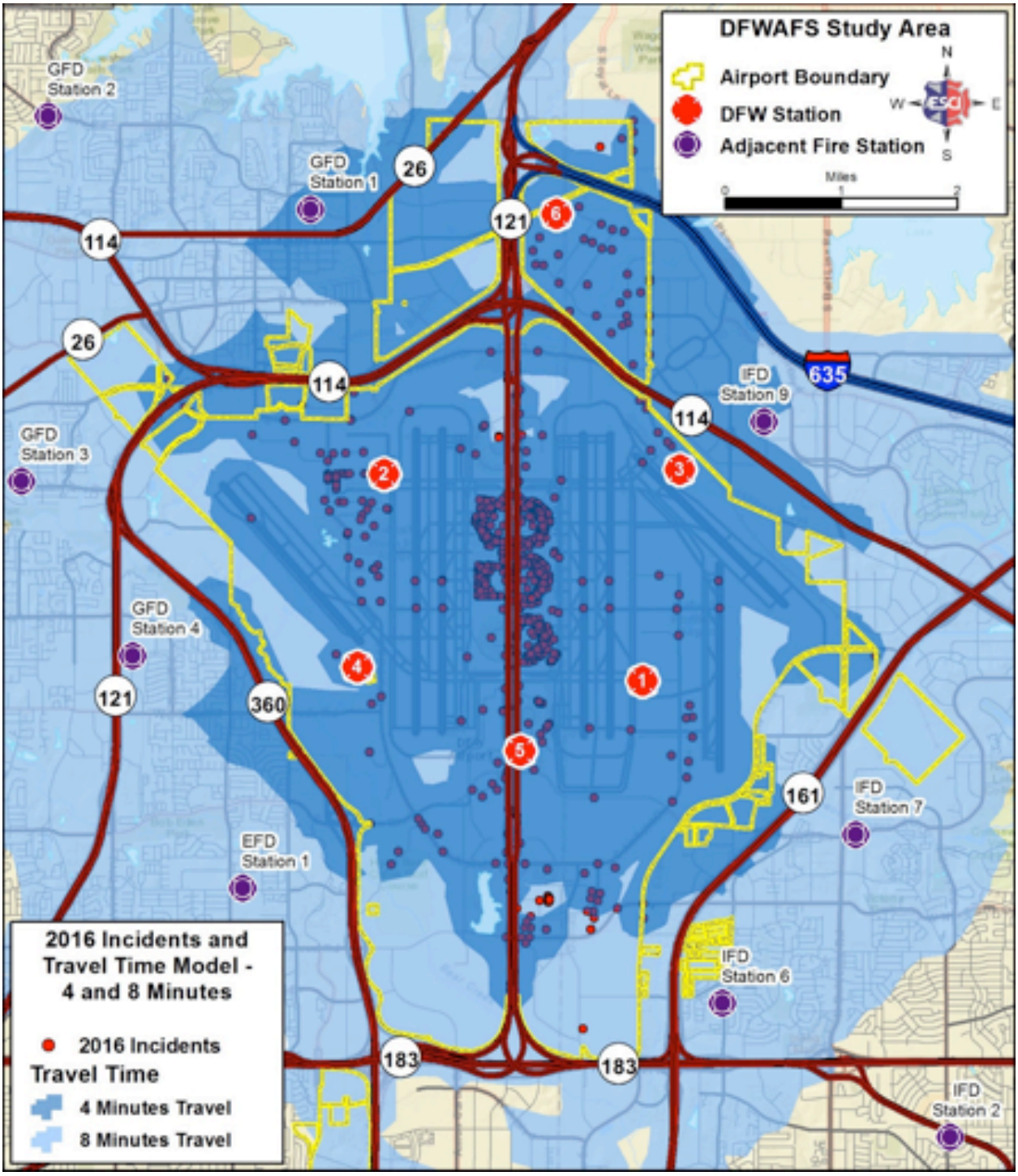
[5] *NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, National Fire Protection Association, 2010.

Figure 47: Travel Time Model, NFPA 1710 Criteria



All of the central terminal area which demonstrated the highest service demand in Figure 43, is within four minutes' travel of one of the six DFWAFS stations. Some portions of the off-airport areas inside the service area are beyond four minutes of a fire station. At eight minutes' travel time, the entire service area is within eight minutes' travel of DFWAFS ALS resources at Station 5 and Station 6. The following figure displays 2016 service demand and the NFPA 1710 criteria travel time model.

Figure 48: 2016 Incidents and Travel Time Model



Ninety-seven (97) percent of 2016 DFWAFS service demand within the DFW boundary, occurred within four minutes' travel or less of a fire station. NFPA 1710 recommends that stations are distributed so that at least 90 percent of emergency service demand occurs within four minutes' travel of a fire station.

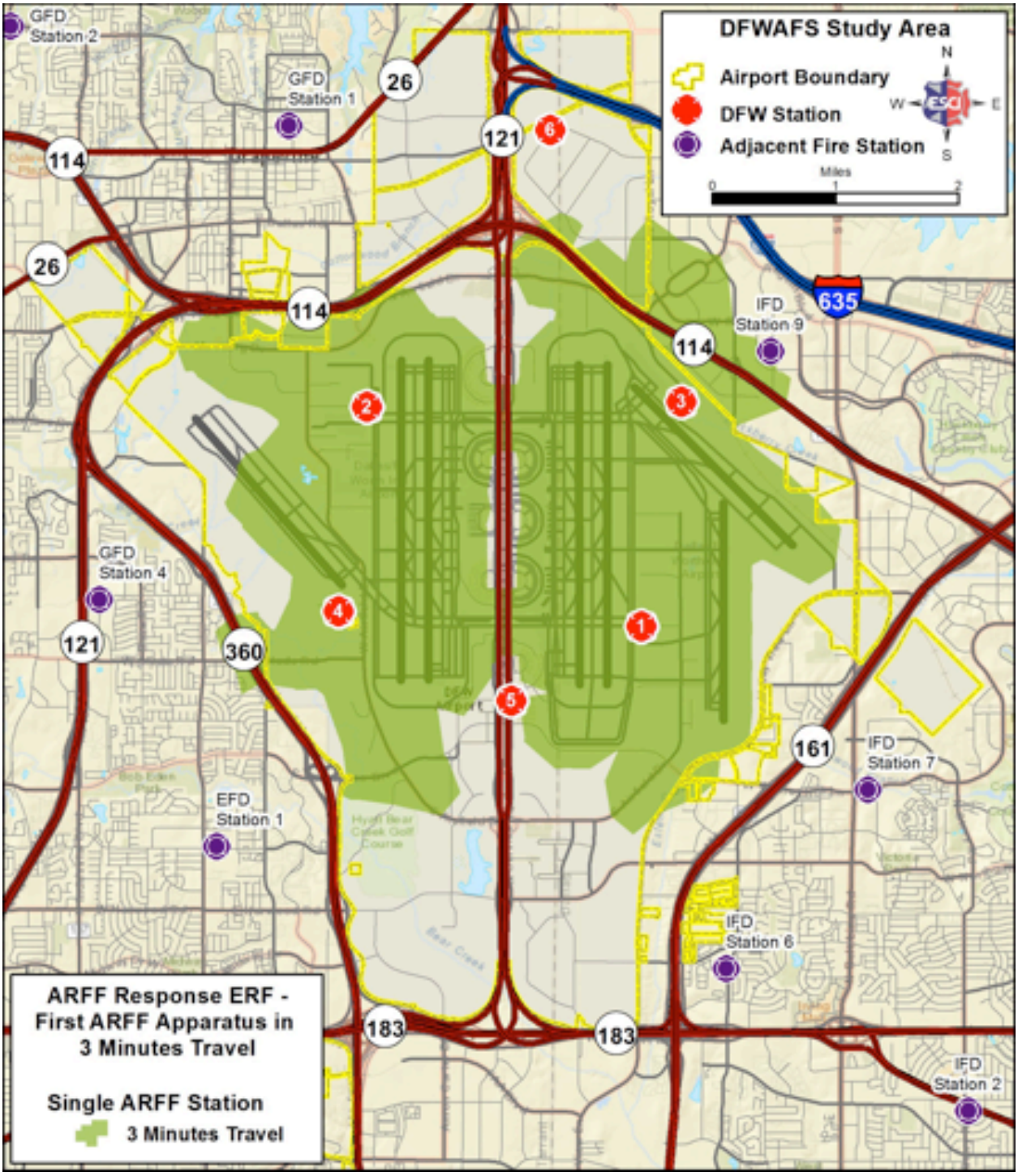
Resource Concentration

In the concentration analysis, ESCI examines the ability of DFWAFS to assemble multiple resources across the service area, based on the type of emergency incident. Both the FAA criteria for ARFF responses and the NFPA 1710 standard for career fire departments, stipulate that the entire initial assignment (effective response force) arrive within a certain amount of time. This is to ensure that sufficient apparatus and personnel arrive soon enough to safely and effectively mitigate an emergency before there is substantial damage or injury.

As previously discussed, the FAA criteria for an ARFF response requires arrival of the first ARFF apparatus in three minutes at the midpoint of the furthest runway; and the last ARFF apparatus in four minutes. Additionally, the FAA standard calls for at least three ARFF apparatus. Given the current distribution and staffing of DFWAFS apparatus; ARFF apparatus from two different stations are required to arrive at the runway midpoint in four minutes' travel or less to assemble three ARFF apparatus on any DFW runway.

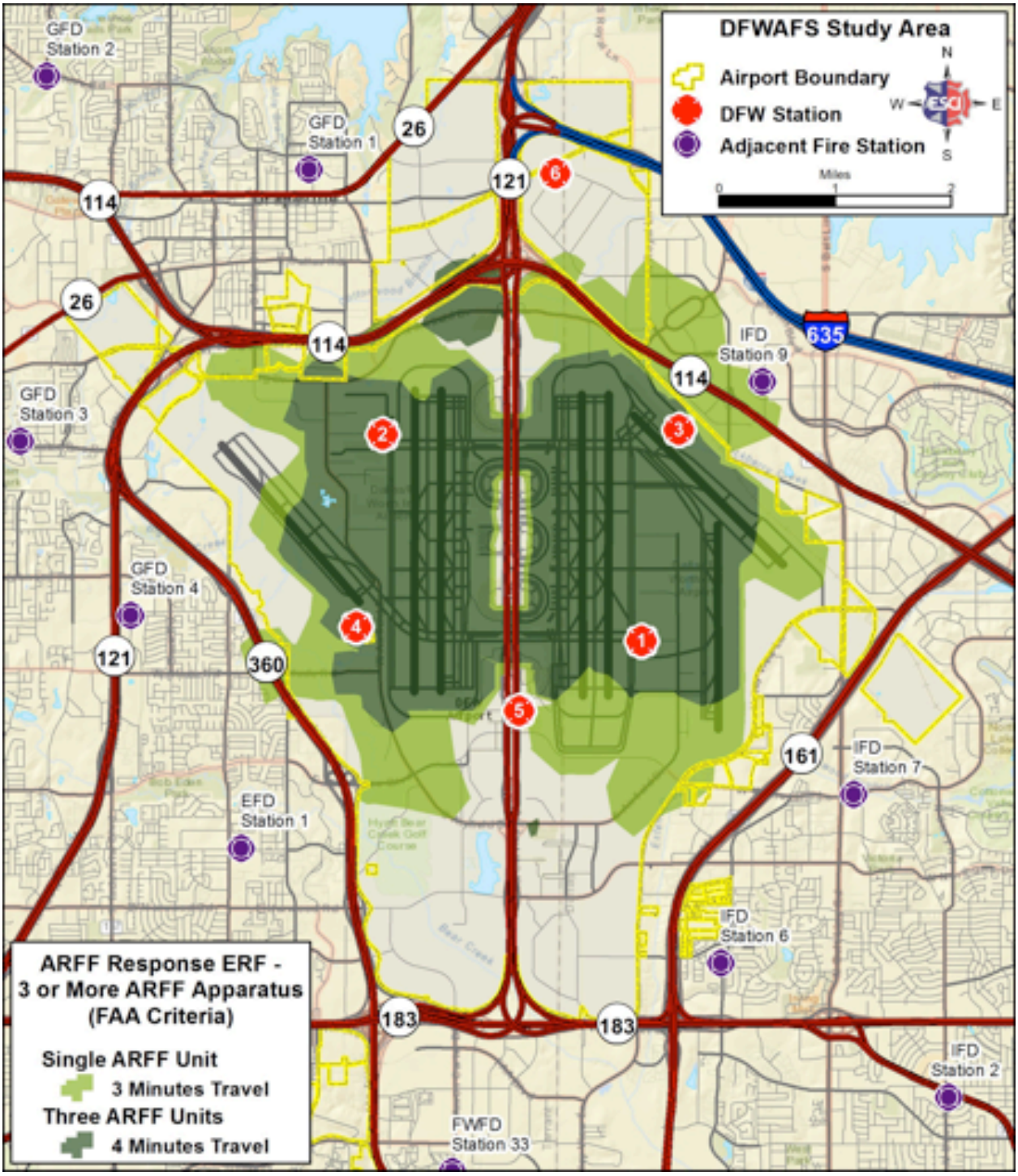
In the following figure, ESCI displays the three-minute travel time model for the four DFWAFS ARFF stations.

Figure 49: DFWAFS ARFF Service Area, First ARFF Apparatus in Three Minutes



The following figure demonstrates the concentration of ARFF resources available within four minutes of a DFWAFS ARFF station.

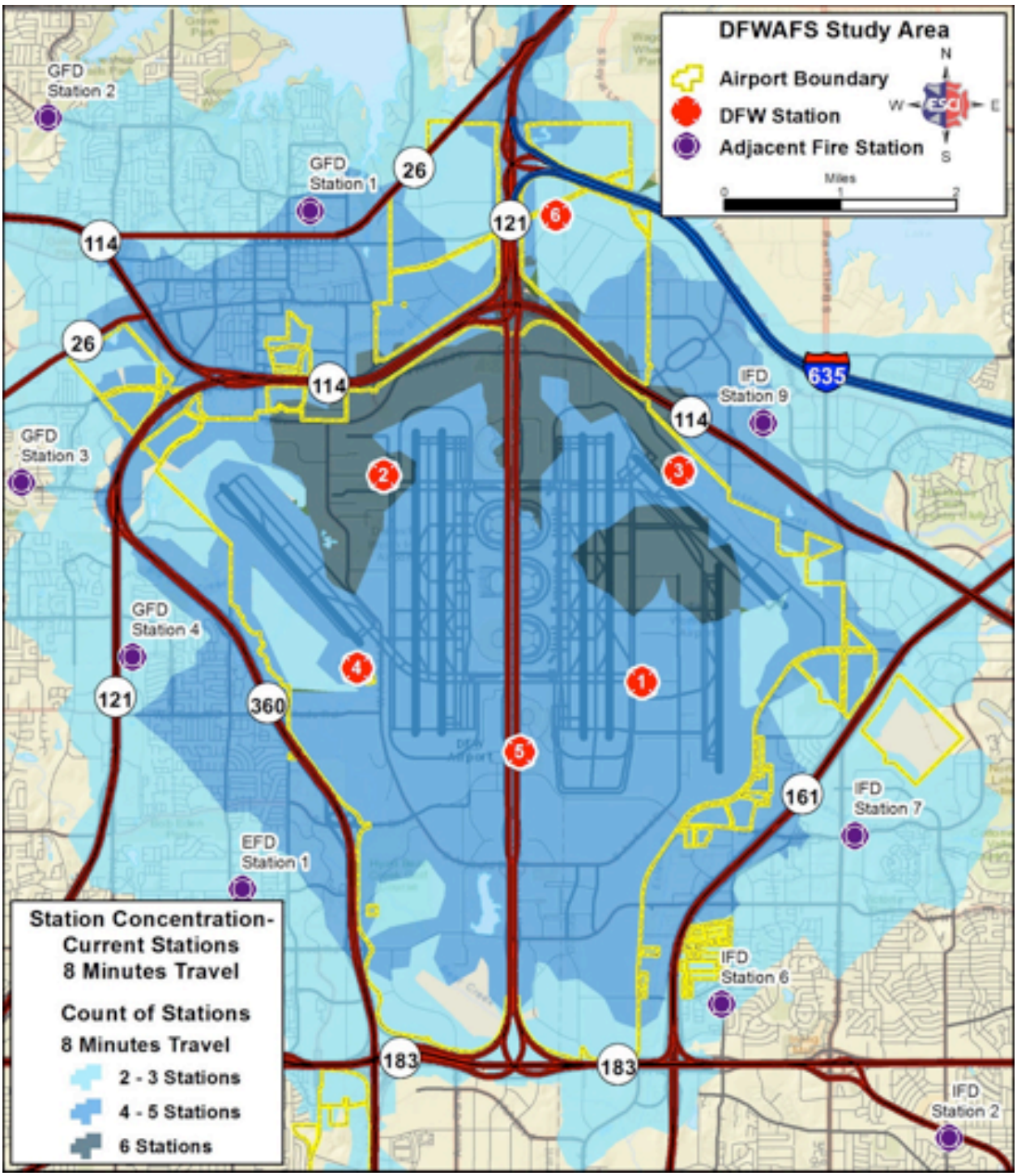
Figure 50: DFWAFS ARFF Response (Three ARFF Apparatus), FAA Criteria



As previously discussed, ARFF apparatus from two stations are required to meet the FAA operational guideline of at least three apparatus in four minutes. This figure demonstrates that DFWAFS ARFF apparatus are distributed to provide a full initial response for an ARFF response within the time parameters (three and four minutes) of the FAA Index E airport criteria for ARFF responses.

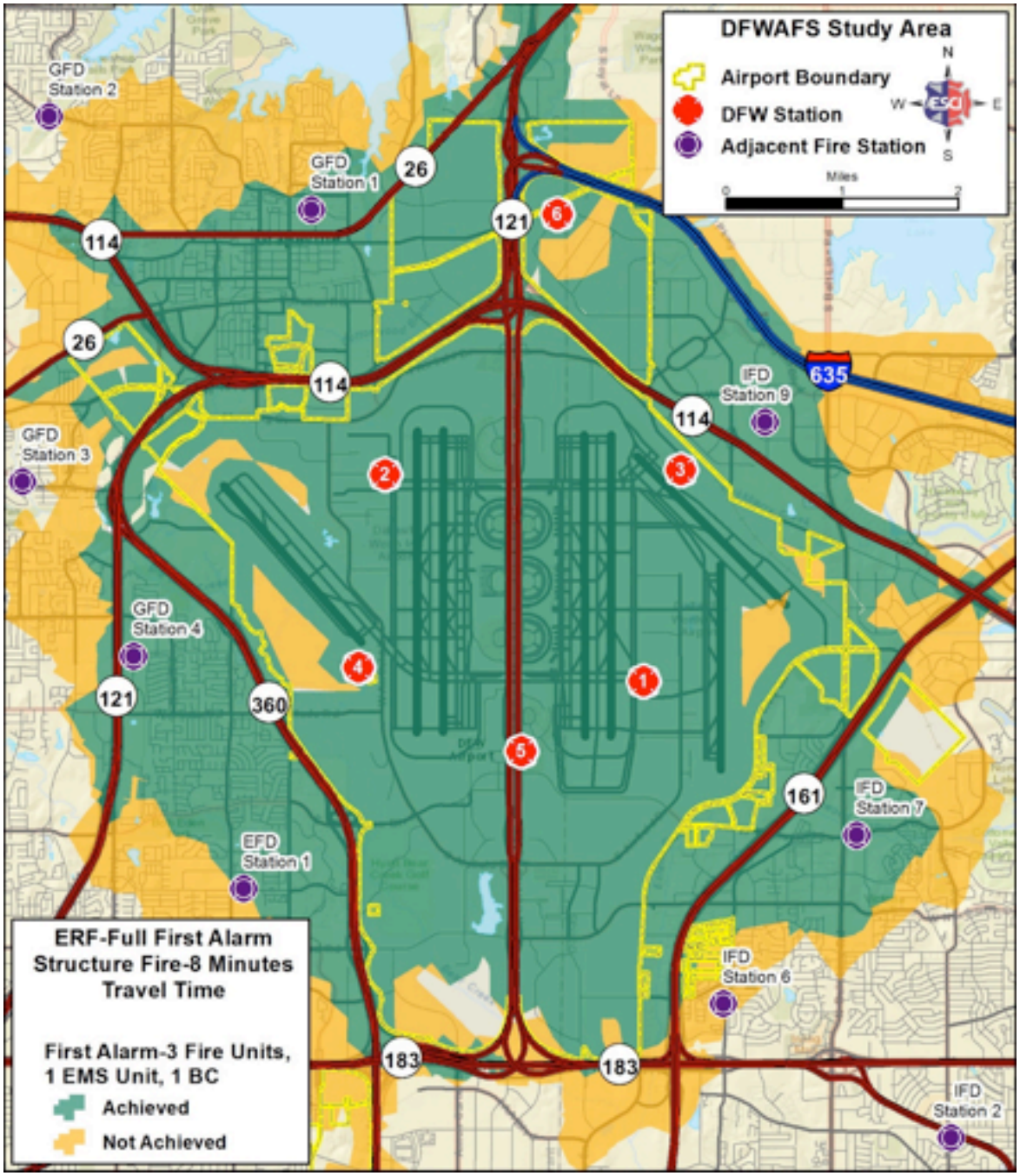
The NFPA 1710 standard calls for the full first alarm assignment to arrive in eight minutes' travel time or less for at least 90 percent of fire suppression events. The following figure demonstrates the concentration of structural fire resources available within eight minutes' travel of a DFWAFS fire station, based on the NFPA 1710 response performance goals.

Figure 51: DFWAFS Station Concentration, Eight Minutes' Travel Time



The preceding figure demonstrates that the entire service area is within eight minutes' travel or less of at least two of the DFWAFS fire stations. All of the airport area, including runways, terminals, and most of the associated properties are within eight minutes' travel of four or five fire stations. There are some portions of the service area can be reached by all six DFWAFS fire stations in eight minutes' travel or less. The full first alarm assignment for a structure fire calls for three fire apparatus, one EMS unit, and a battalion chief (BC). The following figure demonstrates the portions of the DFWAFS service area within eight minutes' travel of a full first alarm assignment.

Figure 52: DFWAFS Full First Alarm (Structure Fire), Eight Minutes' Travel Time



The majority of the currently developed portions of DFW are within eight minutes' travel of a first alarm assignment for DFWAFS. The first alarm assignment of three fire apparatus, one EMS unit, and a BC brings a total of 16 personnel to the scene of a fire emergency. Fire service industry best practices generally regard 14 to 16 personnel as the minimum effective response force (ERF) for a moderate risk structure fire (single story 2,000 square foot residential occupancy). Note that the majority of risk in the DFWAFS service area is composed of large single and multi-story buildings with high fire flow requirements.

Utilizing NFPA 1710 definitions and standards, the types of structures and potential fire loads in the DFWAFS service area are considered a "significant risk" response. These types of buildings will require a larger effective response force of 23 that can expand to a need for 37–39 in a large fire incident. DFWAFS should adopt a response standard that delineates the standard response of 14 to 16 and escalate the response with two additional DFWAFS or automatic aid units (8 additional personnel) when appropriate. DFWAFS should consider an additional two structural (engine or truck) apparatus assignment to first alarms with credible information of a fire incident.

Response Reliability

The workload of emergency response units can be a factor in response time performance. Concurrent incidents, or the amount of time individual units are committed to an incident, can affect a jurisdiction's ability to muster sufficient resources to respond to additional emergencies. The following figure displays the percentage of concurrent incidents experienced by DFWAFS in 2016.

Figure 53: DFWAFS Concurrent Incidents, 2016

Concurrent Incidents	Percentage
Single Incident	57.48%
2	30.63%
3	9.53%
4 or More	2.35%

In 2016, over 57 percent of service demand occurred singly; meaning no other incidents were in progress at the same time. Over 42 percent of DFWAFS occurred while at least one other incident was in progress. The percentage of concurrent incidents is slightly higher than that usually experienced by similarly sized fire departments. However, with six staffed stations, concurrent incidents do not appear to negatively affect DFWAFS response time performance.

Unit hour utilization (UHU) describes the amount of time that a unit is not available for response because it is already committed to another incident. The larger the percentage, the greater its utilization and the less available it is for assignment to subsequent calls for service. The following figure analyzes the time DFWAFS primary response apparatus were committed to an incident in 2016 and expresses this as a percentage of the total hours in a year.

Figure 54: DFWAFS Unit Hour Utilization (UHU), 2016

Apparatus ID	Type	Average Time Committed	UHU
10	BC-Command	25:35	2.11%
12	MAV	16:33	0.56%
15	Quint	18:38	2.79%
19	RIV	27:30	0.67%
20	BC-Command	29:02	1.91%
22	MAV	16:04	0.09%
25	Quint	21:42	0.19%
29	RIV	24:29	4.42%
31	MAV	26:04	0.54%
32	MAV	18:22	0.69%
33	Engine	20:57	0.44%
34	Truck	22:14	0.35%
37	BLS Squad/QRU	25:28	3.18%
38	MVU	16:54	4.88%
41	MAV	19:11	0.43%
42	MAV	15:01	0.41%
44	Truck	21:37	0.14%
48	Stair Unit	19:36	1.71%
53	Engine	18:20	0.65%
63	Engine	29:03	10.61%
601	MICU	39:32	1.33%
602	MICU	40:14	15.29%
603	MICU	33:40	14.46%
606	MICU	45:36	2.11%
615	EMS Command	33:50	3.35%
HM1	HazMat	34:10	2.39%

Not surprisingly, the DFWAFS transport medics (MICU) display the highest UHU rates. These units respond to approximately 70 percent of the current service demand. Transport time to the hospital, patient handoff, and report writing increases the time medic units are unavailable. The figure also displays the average time committed to an incident per apparatus during 2016. This figure also displays the average time each apparatus was committed to an incident in 2016. In general, ARFF apparatus are committed 16 to 26 minutes to an incident. Structural fire units are committed 18 to 29 minutes. The average time committed for MICUs is approximately 40 minutes. Note that the BLS Quick Response Unit (QRU) which was put into service in April of 2015 was committed to incidents on average approximately 25 minutes.

Industry best practices suggest that UHU rates in the range of 25 to 30 percent for fixed fire and EMS units can negatively station and unit reliability. Currently DFWAFS UHU rates do not exceed these levels. Note that as unit hour utilization increases, not only are units less available for emergency responses; but also less likely to complete other duties, such as inspections, training, public education, and station duties and maintenance.

Response Performance Summary

In the response performance summary, ESCI reviews current DFWAFS response performance. The data for this analysis is derived from 2016 incident and apparatus response data recorded and stored in the DFWAFS records management system. Non-emergency incidents, mutual or auto aid incidents outside of the DFWAFS service area, data outliers, and invalid data points are removed from the data set whenever possible.

As previously discussed, DFWAFS provides ARFF services on the DFW airfield; and structural fire protection and EMS services in the approximately 27 square miles inside the airport service area. There are two response performance standards that DFWAFS uses to measure response performance for emergency incidents. The following figure displays the FAA operational requirements for aircraft rescue and firefighting for Index E airports.

Figure 55: FAA ARFF Response Performance Recommendations – Index E Airports

139.319 Aircraft rescue and firefighting: Operational requirements

- Three to four-minute response to midpoint of furthest runway with 6,000 gallons and three units.
- Within three minutes from the time of the alarm, at least one required aircraft rescue and firefighting vehicle must reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post or reach any other specified point of comparable distance on the movement area that is available to air carriers, and begin application of extinguishing agent.
- Within four minutes from the time of alarm, all other required vehicles must reach the point specified in paragraph.

DFWAFS performs monthly time trials to confirm that the department can meet the requirements listed in Figure 55. In the following figure, ESCI examines actual response performance for emergency aircraft standby incidents during 2016.

Figure 56: ARFF Response Performance – Aircraft Incidents, 2016

Arrival Order	Travel Time 90th Percentile	Response Time 90th Percentile
First	02:18	02:57
Second	02:30	03:21
Third	03:03	04:03

In 2016, the first ARFF apparatus reached the scene of an aircraft emergency incident in 2 minutes, 57 seconds, 90 percent of the time. The second ARFF apparatus arrived 24 seconds after the first; and the third ARFF apparatus, which represents the last required unit for an ARFF response, arrived in 4 minutes, 3 seconds.

As discussed, DFWAFS regularly validates their ability to meet the FAA 139 operational requirements. In addition, actual response performance demonstrates that the department meets or exceeds the FAA standard for ARFF operations.

The following figure displays the emergency response performance recommendations from the NFPA 1710 standard.[6]

Figure 57: NFPA 1710 Response Performance Recommendations

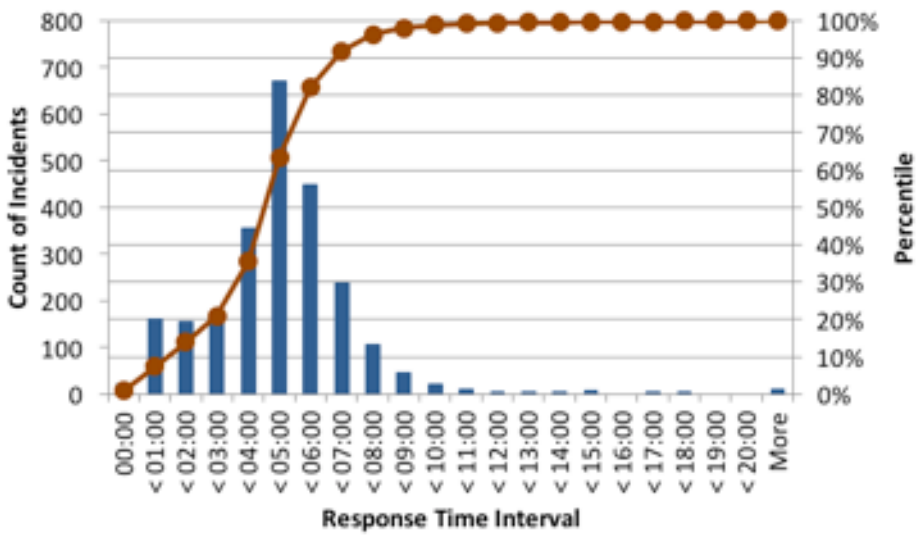
Response Element	NFPA Recommendation
Call Processing	60 Seconds @ 90th Percentile
Turnout Time	60 Seconds @ 90th Percentile for EMS 80 Seconds @ 90th Percentile for Fire
Travel Time (First unit on scene-Fire or EMS)	4 Minutes @ 90th Percentile
Travel Time (First arriving ALS unit)	8 Minutes @ 90th Percentile
Travel Time-Full First Alarm (Fire Suppression Incident)	8 Minutes @ 90th Percentile

NFPA 1710 is a national consensus standard for career staffed fire departments. The standard is not mandated or codified; however, this NFPA standard is industry best practice that is based on current research and data that is periodically reviewed and updated. DFWAFS utilizes the NFPA 1710 guidelines as performance goals for fire and EMS operations not affected by the FAA ARFF guidelines.

The following figure displays the frequency of emergency response times within one-minute increments and the cumulative percentage (percentile measurement) of response times.

[6] *NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, National Fire Protection Association, 2010.

Figure 58: DFWAFS Overall Response Performance, 2016



The most frequently recorded emergency response time occurs between four and five minutes. The first DFWAFS apparatus arrived on the scene of 90 percent of emergency incidents in 6 minutes, 32 seconds or less. The first apparatus arrived in less than five minutes at over 63 percent of emergencies.

The emergency response time performance displayed in the preceding figure is composed of the following components:

- Call Processing Time – The amount of time between when a dispatcher answers the 911 call and resources are dispatched.
- Turnout Time – The time interval between when units are notified of the incident and when the apparatus are enroute.
- Travel Time – The amount of time the responding unit actually spends travelling to the incident.
- Response Time – Response Time equals the combination of "Processing Time," "Turnout Time," and "Travel Time."

DFWAFS appropriately incorporates and tracks all the components listed above in their response performance measures. Tracking the individual pieces of total response time enables jurisdictions to identify deficiencies and areas for improvement. In addition, knowledge of current performance for the components listed is an essential element for developing response goals and standards that are relevant and achievable. The following figure displays DFWAFS emergency response performance (first apparatus on scene) for the various components of total response time.

Figure 59: Components of Response Performance, 2016

	Turnout Time	Travel Time	Response Time
2016 Overall (90th Percentile)	1:21	5:37	6:32

Note that call processing time is not included in this figure. DFWAFS reports that call processing time is included in department's overall response time. However, ESCI was unable to reliably calculate call processing time from the dispatch center data provided. ESCI encourages DFWAFS to continue working with the DFW Department of Public Safety Dispatch Center to monitor and report call processing time as a component of overall response time performance. NFPA 1710 recommends that call processing time not exceed 60 seconds for 90 percent of emergency incidents.

Turnout Time

As displayed in Figure 57, NFPA 1710 calls for turnout times of 60 seconds for EMS emergencies and 80 seconds for fire emergencies. Overall, DFWAFS apparatus were enroute to 90 percent of emergency incidents in 81 seconds (01:21). The following figure displays DFWAFS turnout time performance summarized by incident category.

Figure 60: Turnout Time Performance by Incident Category, 2016

Incident Category	Turnout Time (90th Percentile)
Aircraft Standby	00:47
EMS	01:20
Fire	01:51
Other	01:43

DFWAFS turnout time performance ranges from 00:47 for aircraft incidents to 01:51 for fire responses. Turnout time performance is slightly longer than NFPA recommendations for fire and EMS responses. However, ESCI finds that DFWAFS turnout time compares favorably to similar fire jurisdictions.

Turnout time is one area of the overall response performance that field personnel have at least some ability to control; given good training, information concerning current performance, and facilities that allow for rapid and efficient movement of personnel. DFWAFS should continue to monitor turnout time performance.

Travel Time

The NFPA 1710 standard specifies a travel time of four minutes or less for the arrival of the first unit on scene at fire or EMS emergencies. Overall in 2016, the first DFWAFS apparatus on scene required 5 minutes, 27 seconds to travel to 90 percent of emergency incidents. ESCI displays DFWAFS travel time performance summarized by incident category in the following figure.

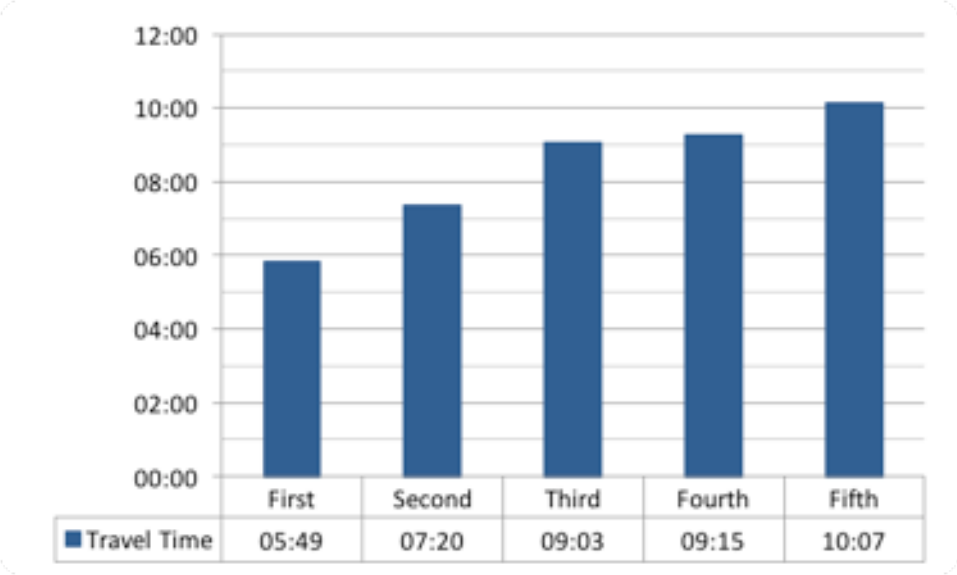
Figure 61: Travel Time Performance by Incident Category, 2016

Incident Category	Travel Time (90th Percentile)
Aircraft Standby	02:18
EMS	05:57
Fire	05:49
Other	06:23

DFWAFS emergency travel time does not meet the NFPA 1710 criteria for travel time performance; nor does actual travel time performance match the predicted travel time demonstrated in the model displayed in Figure 47 (97 percent of incidents within four minutes' travel of a fire station). This may be attributed to difficulty accessing patients inside the central terminal area (CTA) in the case of EMS incidents. Additionally, the structural apparatus at the four ARFF stations located on the airfield are not well located to respond to incidents in the commercial/industrial areas that are part of the DFWAFS service area. Another issue affecting travel time performance for structural apparatus at the ARFF stations, is the approximately 30 to 60 second delay experienced waiting for the runway security gates to open and close. Additionally, DFWAFS responds to numerous emergency incidents that involve waiting for an aircraft to land. While these incidents are categorized as a priority (emergent) response, units appropriately respond non-emergency to the terminal or standby point. DFWAFS should consider developing a methodology to filter these responses out of the emergency incident data set, for the purpose of calculating emergency travel time and response performance.

In addition to guidelines for the arrival of the first unit on scene, the NFPA 1710 standard recommends that the full first alarm assignment for a fire suppression incident arrives within eight minutes' travel time (measured at the 90th percentile). The following figure displays travel time performance for incidents coded as a fire in the 2016 DFWAFS data; summarized by arrival order.

Figure 62: Travel Time Performance by Order of Arrival-Fire Incidents, 2016



The DFWAFS full first alarm assignment for a fire incident calls for three suppression apparatus, one EMS Unit, and a battalion chief. In general, there is a time differential of over four minutes (04:17) between the arrival of the first unit on scene and the fifth unit to arrive. Slightly over 10 minutes' travel time is required for the arrival of a full first alarm assignment to arrive at the scene of a fire incident. This exceeds the recommendation of the NFPA 1710 standard. Note that data for mutual or automatic aid resources was not available to be included in this analysis.

Total Response Time

The following figure displays DFWAFS total response time performance for emergency incidents, summarized by incident category.

Figure 63: Total Response Time Performance by Incident Category (90th Percentile), 2016

Incident Category	Total Response Time
Aircraft Standby	02:57
EMS	06:46
Fire	06:48
Other	07:01

This figure displays overall emergency response performance calculated from the NFIRS incident data provided by DFWAFS. As previously discussed, ESCI categorizes incidents as "Fires" (structures, vehicle, brush, any 100 series incident in NFIRS), "EMS" (all calls for medical service including MVA's and rescues, any 300 series incident in NFIRS), and "Other" (false alarms, hazmat incidents, service calls, all other NFIRS incident series). "Aircraft Standby" incidents (NFIRS incident type 462) are identified.

DFWAFS performance does not meet all of the performance goals for the various components of the NFPA 1710 standard. This does not mean that DFWAFS is performing poorly. It is imperative that fire department leaders to be aware of the jurisdiction's current performance. As previously discussed, the NFPA standard is not a mandate. However, it is an industry best practice and consensus standard and should be regard as a desirable goal.

Mutual and Automatic Aid Systems

There are numerous mutual aid agreements, formal and informal, in place between fire, police, and emergency medical agencies in the Dallas Fort Worth Metroplex. Mutual aid is typically employed on an "as needed" basis where units are called for and specified one by one through an incident commander.

Automatic aid agreements differ from mutual aid agreements in that under certain mutually agreed upon criteria, resources from the assisting agency are automatically dispatched as part of the initial response. These agreements facilitate closest unit dispatch to emergencies in boundary areas and allow for the dispatch of additional apparatus and personnel to specific predefined emergencies.

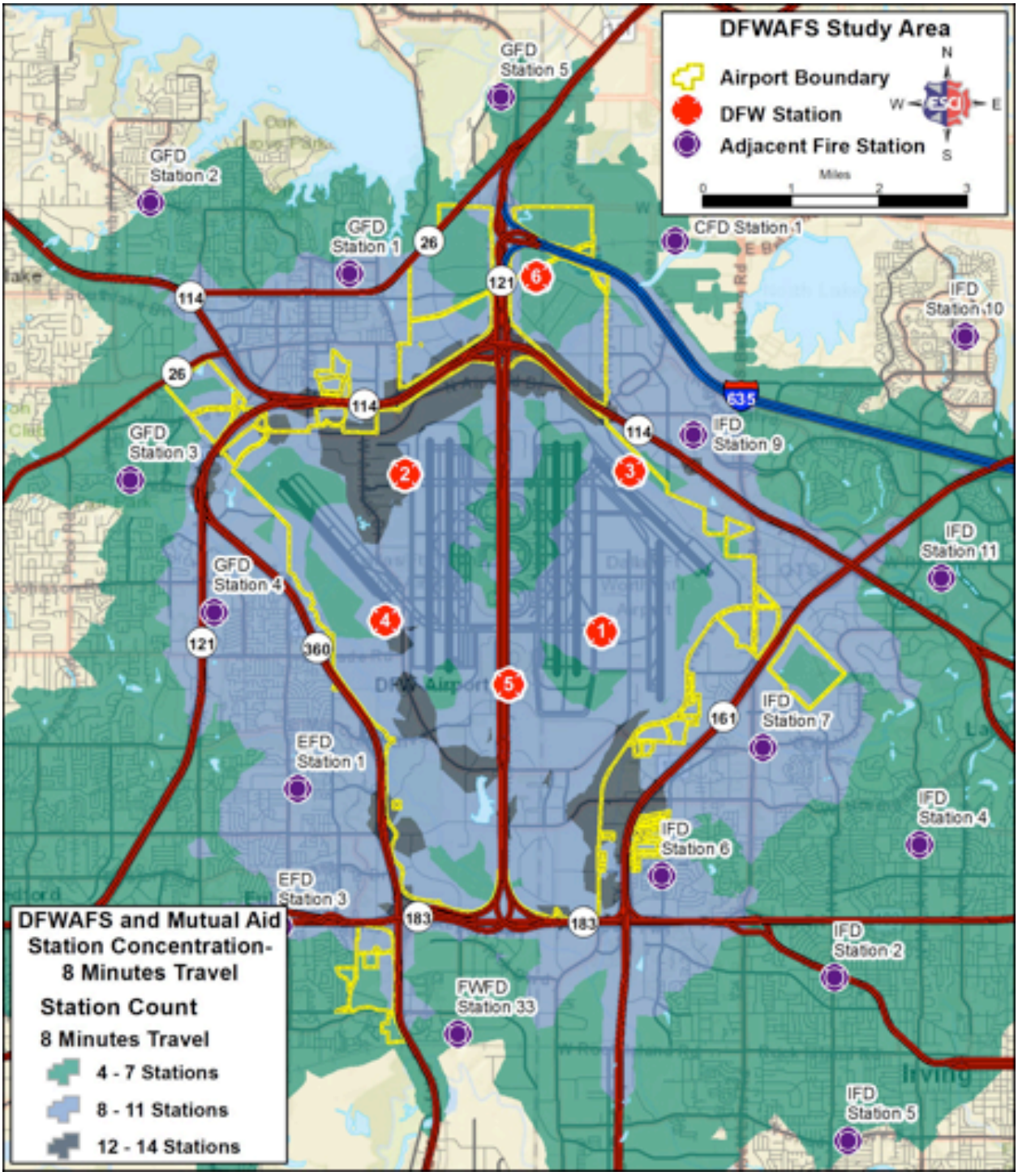
DFWAFS participates in mutual and automatic aid agreements with adjacent fire jurisdictions, local, state, and federal emergency services providers. Automatic aid from neighboring fire jurisdictions are included in DFWAFS dispatch procedures for aircraft emergencies and mass causality incidents. Interestingly, automatic aid resources are not included as part of structural responses in the commercial/industrial areas in the airport service area. Mutual aid resources are requested as needed in these areas. This may negatively affect the assembly of an effective response force for incidents in these areas.

The implementation of automatic mutual aid, or Automatic Aid, increases the efficiency of response and decreases the time that is needed to get an appropriate number, and type, of response units on the way to a fire or other emergency that requires multiple resources. Automatic Aid is developed by agreement between response agencies, identifying the resources that are needed in response to defined incident types. Once defined, the Automatic Aid is initiated by the dispatch center using pre-defined response protocols, referred to as "run cards" that specify which units are to be dispatched automatically, eliminating the need for the incident commander to request additional resources incrementally.

It is recommended that an Automatic Aid system be established and that run cards be created for dispatcher use based on geographical response zones. Further, in doing so, a "dropped boundary" approach is recommended, under which, rather that dispatching resources based on their defined geographic service area, the closest resource(s) is assigned to respond.

In the following figure, ESCI uses GIS analysis to display the concentration of DFWAFS and adjacent fire stations within eight minutes' travel of some portion of the DFWAFS service area.

Figure 64: DFWAFS and Adjacent Fire Jurisdictions Station Concentration, Eight Minutes' Travel



As discussed in the Concentration analysis, DFWAFS stations are distributed so that most of the service area is within eight minutes' travel of four to five fire stations. Note that some portions of the Passport Park and Bear Creek commercial areas, are within eight minutes' travel of two to three stations. Figure 64 demonstrates that resources from adjacent fire jurisdictions (Grapevine, Euless, Irving, and Fort Worth) increase the concentration of fire resources available from four to five stations; to eight to eleven stations throughout the majority of the DFWAFS service area.

During 2016, DFWAFS received mutual or automatic aid nine times; the department provided aid to adjacent fire jurisdictions 32 times. There is an opportunity to increase the use of automatic aid in the boundary areas of the airport, especially in the Passport Park and Bear Creek areas. Growth and development will increase and change the nature of the risk present in these areas. It is ESCI's experience that the use of enhanced mutual and automatic aid provides a higher level of service to the constituents of all jurisdictions involved and is a fiscally responsible method to improve the level of service provided.

Key Recommendations:

- Evaluate and expand the use of Mutual and Automatic Aid practices.
- Develop an Automatic Aid system.
- Establish run cards that define automated response based on geographic response zones.

CAPITAL ASSETS AND ASSESSMENT OF CURRENT INFRASTRUCTURE

Regardless of an emergency service agency's financing, if appropriate capital equipment is not available for the use by responders, it is impossible for a fire department to deliver services effectively. DFWAFS maintains a balance of three basic resources that are needed to carry out its emergency mission: People, equipment, and facilities. Because firefighting is an extremely physical pursuit, the adequacy of personnel resources is a primary concern; but no matter how competent or numerous the firefighters are, the department will fail to execute its mission if it lacks sufficient fire apparatus distributed in an efficient manner.

The department maintains six fire stations and millions of dollars' worth of capital assets. These assets are necessary to provide service and must be maintained and replaced as needed. A comparison of major capital assets, including fire engines, aerial ladder trucks, and fire stations is provided in the following figures.

Facilities

Appropriately designed and maintained facilities are critical to a fire department's ability to provide services in a timely manner and with appropriate deployment of assets. ESCI observed and reviewed the fire stations operated by DFWAFS. The findings are summarized in the following pages and areas of concern are identified.

Figure 65: DFW Airport Fire Services Fire Department Station 1

Station 1 is a facility consisting of seven apparatus bays, all of which are single depth with a drive-through configuration. The station houses one ARFF truck, one Rapid Intervention Vehicle, a "Quint" aerial apparatus, and a battalion chief.

The station design is repeated in stations 2, 3, and 4. Station 1 and 3 are 44 years of age and Station 4 is 31 years old. All four facilities are clearly aging.

SURVEY COMPONENT	OBSERVATIONS
STRUCTURE	
Physical address	2900 E 28th Street
Construction type	Type II
Date of construction	Bays constructed in 1973, remainder of the building in 2001
Seismic protection/energy audits	None
Auxiliary power	None
Condition	Fair to poor
Special considerations (ADA, mixed gender appropriate, storage, etc.)	Yes
Square footage	13,950
FACILITIES AVAILABLE	
Exercise/workout	Yes (annexed with P.D.)
Kitchen/dormitory	Yes
Lockers/showers	Yes
Training/meetings	No
Washer/dryer	Yes
SAFETY AND SECURITY	
Sprinkler system	Yes
Smoke detection	Yes
Security	Yes – badge reader through police station
Apparatus exhaust system	No
Units/staffing levels assigned	4 apparatus / 7 personnel

Figure 66: DFW Airport Fire Services Fire Department Station 2

Station 2 is designed with the same floor plan as stations 1, 3, and 4. Its seven apparatus bays house an aerial apparatus, an ARFF unit, one Rapid Intervention Unit, a HazMat response vehicle, and a battalion chief.

Constructed in 1973, Station 2 is in fair to poor condition.

SURVEY COMPONENT	OBSERVATIONS
STRUCTURE	
Physical address	1700 West 18th
Construction type	Type II
Date of construction	1973
Seismic protection/energy audits	No
Auxiliary power	No
Condition	Fair to poor
Special considerations (ADA, mixed gender appropriate, storage, etc.)	Yes
Square footage	11,248
FACILITIES AVAILABLE	
Exercise/workout	Yes
Kitchen/dormitory	Yes
Lockers/showers	Yes
Training/meetings	Yes
Washer/dryer	Yes
SAFETY AND SECURITY	
Sprinkler system	Yes
Smoke detection	Yes
Security	No – cypher locks
Apparatus exhaust system	No
Units/staffing levels assigned	5 apparatus / 8 personnel

Figure 67: DFW Airport Fire Services Fire Department Station 3

Station 3 houses an aerial ladder truck, two larger ARFF units in front line service, and another in reserve. In addition, a large air fan vehicle is housed here and a reserve structural engine.

Constructed with the same design as the other original facilities, Station 3 is approaching its maximum service life.

SURVEY COMPONENT	OBSERVATIONS
STRUCTURE	
Physical address	3131 North Airfield Dr.
Construction type	Type II
Date of construction	1973
Seismic protection/energy audits	No
Auxiliary power	No
Condition	Fair to poor
Special considerations (ADA, mixed gender appropriate, storage, etc.)	Yes
Square footage	11,248
FACILITIES AVAILABLE	
Exercise/workout	Yes
Kitchen/dormitory	Yes
Lockers/showers	Yes
Training/meetings	Yes
Washer/dryer	Yes
SAFETY AND SECURITY	
Sprinkler system	Yes
Smoke detection	Yes
Security	No – cypher locks
Apparatus exhaust system	No
Units/staffing levels assigned	4 apparatus / 6 personnel

Figure 68: DFW Airport Fire Services Fire Department Station 4

The fourth of the original airport fire stations that were constructed using essentially the same floor plan, Station 4 is home to an aerial truck, a specialized stair unit, two MAV ARFF trucks, and an additional reserve ARFF vehicle.

Station 4's age and condition are consistent with stations 1, 2, and 3.

SURVEY COMPONENT	OBSERVATIONS
STRUCTURE	
Physical address	1500 W 27th Street
Construction type	Type II
Date of construction	1986
Seismic protection/energy audits	No
Auxiliary power	No
Condition	Fair to poor
Special considerations (ADA, mixed gender appropriate, storage, etc.)	Yes
Square footage	11,248
FACILITIES AVAILABLE	
Exercise/workout	Yes
Kitchen/dormitory	Yes
Lockers/showers	Yes
Training/meetings	Yes
Washer/dryer	Yes
SAFETY AND SECURITY	
Sprinkler system	Yes
Smoke detection	Yes
Security	No – cypher locks
Apparatus exhaust system	No
Units/staffing levels assigned	4 apparatus / 6 personnel

Figure 69: DFW Airport Fire Services Fire Department Station 5

Station 5 is a newer, modern facility, constructed in 2003 and consisting of three, double depth apparatus bays of drive-through configuration on one side of the station and another three bays of similar type on the other side, which is dedicated to EMS response apparatus.

Only one structural fire engine and crew is housed here, and three ambulances and their two-person crews. The station is newer and in good condition.

SURVEY COMPONENT	OBSERVATIONS
STRUCTURE	
Physical address	3150 N Service Road
Construction type	Type II
Date of construction	2003
Seismic protection/energy audits	No
Auxiliary power	Yes
Condition	Good
Special considerations (ADA, mixed gender appropriate, storage, etc.)	Yes
Square footage	23,281
FACILITIES AVAILABLE	
Exercise/workout	Yes
Kitchen/dormitory	Yes
Lockers/showers	Yes
Training/meetings	Yes
Washer/dryer	Yes
SAFETY AND SECURITY	
Sprinkler system	Yes
Smoke detection	Yes
Security	No – cypher locks
Apparatus exhaust system	No
Units/staffing levels assigned	5 apparatus / 9 personnel

Figure 70: DFW Airport Fire Services Fire Department Station 6

Station 6 is the newest of DFWAFS facilities, constructed in 2010. It has three bays, all double depth and of back-in design. In the station is a single structural engine and crew, and one ambulance with a crew of two.

Station 6 is in good condition.

SURVEY COMPONENT	OBSERVATIONS
STRUCTURE	
Physical address	711 Regent Blvd
Construction type	Masonry and steel frame
Date of construction	2010
Seismic protection/energy audits	No
Auxiliary power	Yes
Condition	Good
Special considerations (ADA, mixed gender appropriate, storage, etc.)	Yes
Square footage	18,425
FACILITIES AVAILABLE	
Exercise/workout	Yes
Kitchen/dormitory	Yes
Lockers/showers	Yes
Training/meetings	Yes
Washer/dryer	Yes
SAFETY AND SECURITY	
Sprinkler system	Yes
Smoke detection	Yes
Security	Yes – badge reader
Apparatus exhaust system	No
Units/staffing levels assigned	2 apparatus / 6 personnel

Discussion

The DFWAFS fixed facilities vary in condition and functionality. As detailed in the preceding tables, Stations 1, 2, 3, were all constructed at the same time, in 1973 and Station 4 in 1986. At 44 and 31 years of age, the stations are aging and their condition is declining, representing a substantial cost to DFW in the form of either increased maintenance and repair, or replacement. The condition of these facilities will need to be addressed in the near future.

Stations 5 and 6 are newer, constructed in 2003 and 2010, respectively. Both are in good condition and were designed to current standards. The stations will continue remain functional for some time.

Apparatus

DFWAFS maintains a sizeable fleet of response vehicles that are generally newer and clearly well maintained. The overall condition of the fleet was found to be very good to excellent generally. An inventory of fire apparatus, configuration, and condition is provided in the following figure.

Figure 71: DFWAFS Apparatus Inventory

Station 1							
Apparatus Designation	Type	Year	Make and Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Battalion 10	SUV	2012	Chevy Tahoe	Operational	1	N/A	N/A
Quint 15	Quint	2011	Pierce Velocity	Operational	4	2250	450
EZ 19	RIV	2013	International	Operational	1	250	500
EZ 12	MAV	2015	Oshkosh Striker	Operational	1	1950	4500
MCP	Bus		Prevost	Operational	0	N/A	N/A

Station 2							
Apparatus Designation	Type	Year	Make and Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Quint 25	Quint	2009	Pierce Velocity	Operational	4	2250	450
EZ 29	RIV	2013	International	Operational	1	250	500
EZ 22	MAV	2015	Oshkosh Striker	Operational	1	1950	4500
HazMat 1	Spec	2004	Pierce Velocity	Operational	0	N/A	N/A

Station 3							
Apparatus Designation	Type	Year	Make and Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Truck 34	Tower	2008	Pierce Velocity	Operational	4	2250	300
Fan 38	MVU	2004	Peterbilt	Operational	0	N/A	N/A
EZ 31	MAV	2013	Oshkosh Striker	Operational	1	1950	4500
EZ 32	MAV	2013	Oshkosh Striker	Operational	1	1950	4500
R-3	MAV	2013	Oshkosh Striker	Reserve	0	1950	4500
Reserve Engine	Pumper	2008	Pierce Velocity	Reserve	0	1500	750

Station 4							
Apparatus Designation	Type	Year	Make and Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Truck 44	Tower	2011	Pierce Velocity	Operational	4	2250	300
Stair 48	Spec	2007	Ford F-550	Operational	0	N/A	N/A
EZ 41	MAV	2013	Oshkosh Striker	Operational	1	1950	4500
EZ 42	MAV	2013	Oshkosh Striker	Operational	1	1950	4500
R-4	MAV	2013	Oshkosh Striker	Reserve	0	1950	4500

Station 5							
Apparatus Designation	Type	Year	Make and Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Engine 53	Pumper	2011	Pierce Velocity	Operational	4	1500	750
Trauma 611	Spec	2003	Pierce Contender	Operational	0	N/A	N/A
Medic 601	Ambulance	2013	Ford F-450	Operational	2	N/A	N/A
Medic 602	Ambulance	2016	Ford F-450	Operational	2	N/A	N/A
EMS 615	SUV	2012	Chevy Tahoe	Operational	1	N/A	N/A
Medic 603	Ambulance	2010	Ford F-350	Reserve	0	N/A	N/A
Medic 604	Ambulance	2006	Ford F-350	Reserve	0	N/A	N/A

Station 6							
Apparatus Designation	Type	Year	Make and Model	Condition	Minimum Staffing	Pump Capacity	Tank Capacity
Engine 63	Pumper	2010	Pierce Velocity	Operational	4	1500	750
Medic 606	Ambulance	2006	Ford F-350	Operational	2	N/A	N/A

Discussion

ESCI observed the DFWAFS vehicles to be well maintained and in good to excellent condition generally. The department is fortunate to have a dedicated mechanic that services all of the emergency apparatus and a separate shop that services ARFF vehicles specifically.

Long range capital replacement planning is always a challenge, and one that DFWAFS has addressed by processing apparatus replacement via the DFW Capital Improvement Program. Replacement planning is discussed in further in the following discussion.

Apparatus Replacement Planning

Fire apparatus are typically unique pieces of equipment, often very customized to operate efficiently in a narrowly defined mission. A pumper may be designed such that the compartments fit specific equipment and tools, with virtually every space on the truck designated in advance for functionality. This same vehicle, with its specialized design, cannot be expected to function in a completely different capacity, such as a hazardous materials unit or a rescue squad. For this reason, fire apparatus is very expensive and offers little flexibility in use and reassignment. As a result, communities across the country have sought to achieve the longest life span possible for these vehicles.

Unfortunately, no mechanical piece of equipment can be expected to last forever. As a vehicle ages, repairs tend to become more frequent, parts more difficult to obtain, and downtime for repair increases. Given the emergency mission that is so critical to the community, this factor of downtime is one of the most frequently identified reasons for apparatus replacement.

Because of the large expense of fire apparatus, most communities find the need to plan for the cost of replacement. To properly do so, agencies often turn to the long-accepted practice of establishing a life cycle for the apparatus which results in a replacement date being anticipated well in advance. Forward thinking organizations then set aside incremental funds during the life of the vehicle so replacement dollars are ready when needed.

Figure 72: Capital Replacement Planning

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
FIRE STATIONS/STRUCTURES		
Capital Improvement Plan maintained?	AVP Glenn Miyashita maintains a Capital Improvement Program (CIP)	
Period of plan (from–to)	Five-year ongoing CIP	
Funding mechanism identified?	DFW Capital Improvement Program	
APPARATUS		
Apparatus Replacement Plan maintained?	By Robbie White (ARFF maintenance)	
Period of plan (from–to)	Structural vehicles on a 10-year rotation. ARFF vehicles on an 8-year rotation.	Establish a replacement schedule considering condition, estimated service life, and reserve status.
Funding mechanism identified?	DFW Capital Improvement Program	
SUPPORT EQUIPMENT (MOUNTED FIREFIGHTING TOOLS)		
Equipment Replacement Plan maintained?	Maintained by Dave Carpenter (Station 1)	
Period of plan (from–to)	All support equipment 5-year replacement	
Funding mechanism identified?	Fire Department Budget and Capital Improvement Program	

Discussion

DFWAFS does not maintain a formal schedule that places all facilities on a specified replacement cycle, which is not uncommon due to the cost and lifecycle of a typical fire station. However, DFW does maintain an active and funded Capital Improvement Program (CIP) that is designed to meet future facility needs.

Fire and ARFF apparatus are replaced on the basis of a ten-year replacement cycle for structural fire response vehicles and an eight-year cycle for ARFF vehicles. 188 The agency has identified replacement criteria as listed below:

Structural Fire Apparatus

- Total life cycle—10 years or 75,000 miles
- Maintenance cost exceed 25% of residual value
- Down time exceeds 600 hours/annually

ARFF Mass Application Vehicle (MAV) Apparatus

- Life cycle—8 years or 6,000 miles
- Maintenance cost exceed 25% of residual value
- Down time exceeds 500 hours/annually

These criteria have been developed by DFWAFS staff based on benchmarking studies that the agency completed. Commendably, it is developed not only with consideration to age and mileage, but also accounting for maintenance cost factors and out of service time. The criteria are appropriate for use in replacement planning.

The following figure lists equipment that was scheduled to be replaced based on a replacement plan provided to ESCI from 2009.

Replacement Year 2009 (2010 delivery)					
Unit	Age (years)	Mileage	Replacement Price	Trade in Value	Total Cost
Pierce Platform	9	40,000	1,346,113	187,210	1, 158,903
Pierce Ladder	10	>75,000	1,205,391	127,235	1,078,156
Replacement Year 2012 (2013 delivery)					
Unit	Age (years)	Mileage	Replacement Price	Trade in Value	Total Cost
Striker 1	8	21,388	1,361,4412	62,000	1,299,441
Striker 2	8	28,460	1,361,4412	62,000	1,299,441
Striker 5	8	21,734	1,361,4412	62,000	1,299,441
Striker 6	7	20,740	1,361,4412	62,000	1,299,441
RIV 1	12	74,297	600,000	5,500	594,500
RIV 2	12	78,659	600,000	5,500	594,500
Replacement Year 2013 (2014 delivery)					
Unit	Age (years)	Mileage	Replacement Price	Trade in Value	Total Cost
Striker 3	8	21,128	1,443,127	55,800	1,385,127
Striker 4	8	21,407	1,443,127	65,800	1,385,127
Replacement Year 2014 (2015 delivery)					
Unit	Age (years)	Mileage	Replacement Price	Trade in Value	Total Cost
Striker 7	5	12,697	1,529,714	54,800	1,475,714
Striker 8	5	15,2318	1,529,714	54,800	1,475,714

This replacement plan was implemented and completed as listed in the figure.

The fixed cycle replacement approach is appropriate; however, a more structured replacement schedule may be advantageous. Using a fixed cycle does not account for replacement timing that is based on vehicle use frequency or condition at the time of replacement. Further, the approach may not account for a unit that is removed from front line service and placed in reserve status, which will extend its service life and potentially reduce costs.

ESCI recommends that the department develop a vehicle replacement schedule that details the following:

- Estimated total service life based on:
  - Front line service
  - Reserve status service
- Year of replacement based on the projected service life;
- Estimated replacement cost, including inflation;
- Calculation of total annual replacement cost; and
- Calculation of annual reserve funding contribution, if not included in the DFW CIP.

Additional detail on apparatus replacement planning is provided later in this report.

Key Recommendation:

- Develop a vehicle replacement schedule and funding calculation.

PLANNING FOR FIRE AND EMERGENCY SERVICES

The emergency services exist in a rapidly changing environment. Along with improvements in tools and methods used to provide service comes increased regulation of activities, new risks to protect, and other challenges that can quickly catch the unwary off guard. Only through continuous internal and external environmental awareness and periodic course corrections can an organization stay on the leading edge.

DFWAFS performs fundamental, short-term planning in the form of the annual budget development process, which is used to define the activities and priorities identified for the upcoming year. Establishing a long-term planning perspective for the fire department is important as well, and is being addressed by the completion of this master planning process.

ESCI completed a review of the planning efforts that are typically expected to be found in a progressive fire and EMS agency. The following figure details the current planning efforts in place at DFWAFS.

Figure 73: Planning for Fire and Emergency Medical Services

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
ORGANIZING FOR THE PLANNING PROCESS		
Adopted planning process?	Planning Section under the fire marshal addresses strategic planning and initiatives to support fire service executive staff and projects.	
LONG-RANGE PLANNING		
Master planning completed	Currently under way	Upon completion of the master plan, have the DFW organization formally adopt the plan.
Strategic plan in place, current	A DFW Airport Strategic Plan is in place. There is not a stand-alone fire department plan.	In addition to the DFW Airport strategic plan, undertake a strategic planning process specific to DFWAFS.
Capital improvement planning	In place via DFW Airport	Complete an apparatus replacement schedule to enhance the existing Capital Improvement Plan.
Financial planning	In place via DFW Airport	
OPERATIONAL PLANNING		
Response planning (Run cards, fire management zones)	Dispatch criteria and response recommendations are configured within the Computer Aided Dispatch system.	
Regional incident command	Mutual Aid and Unified Command is in place.	
Mutual aid planning	Planning and exercises are completed with neighboring cities and Dallas County. Automatic Mutual Aid is not in place.	Expand existing Mutual Aid agreements to include Automatic Mutual Aid practices.

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
TACTICAL PLANNING		
Pre-fire planning	Completed by both Fire Rescue Division (FRD) and Fire Prevention and Planning (FPP) personnel. At least two per quarter.	At least two per quarter.
Specific hazard plans	Completed by FPP.	Assure that specific hazard plans are identify and communicated to personnel during prevention inspections.
Hazardous materials planning	Completed by both Fire Rescue Division (FRD) and Fire Prevention and Planning (FPP) personnel. At least two per quarter. Tier II reporting is completed.	Assure that hazardous materials information is identified and incorporated into prevention inspection processes.
CURRENT PLANNING PROCESS		
Planning group established	Assigned to FPP personnel	
Mission statement developed	Fire Service Mission Statement is in place	
Strategies formulated (goals)	Fire Service Executive Staff, completed yearly	
Benchmarks (performance objectives)	Identified	
monitored	No	
used in performance evaluations	No	Align assignment of identified goals and performance objectives with annual performance evaluations.
Schedule for periodic evaluation and revision	Ongoing	
EMERGENCY PREPAREDNESS PLANNING		
Preparedness and response (EOP,[7] EAP,[8] RMP,[9] radiological preparedness)	FRD, CDD, and Emergency Management	Fire service personnel trained in all current aspects of emergency response.
plans/documents	SOPs and Airport Emergency Plan	
date developed	Continuous	
adopted by elected officials	Yes, Fire Service Executive Staff or Airport Executive Staff	
published and available	Yes, intranet	
periodic review	Yes	

[7] Emergency Operations Plan.
[8] Emergency Action Plan.
[9] Risk Management Plan.

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
EMERGENCY MANAGEMENT RESOURCES		
Internal personnel resources	Office of Emergency Management and Fire Service Personnel	Continuous training and response.
External personnel resources	All DFW Airport Departments, Airlines, federal/state agencies	
professional organizations	Active membership in numerous national and international organizations	
community notification system	Airport Operations Center and Emergency Operations Center via Everbridge system, Public Address, email notifications	

Discussion

DFWAFS has initiated planning activities including the annual budget process, and this study itself is an important step toward long range planning efforts. Undertaking the study process represents a positive commitment on the part of the department's leadership to take a critical look toward the future.

Planning Process

The DFW Airport as a whole actively plans for future needs and the Fire Rescue Division addressed plans associated with its mission in emergency preparation and response. A planning section is identified under the DFWAFS fire marshal and additional planning takes place at the corporate level. Appropriately, planning for the future is viewed by the organization as an ongoing process.

Long Range Planning

The fire department has not undertaken a master planning process in the past, but is doing so with this planning initiative. Long range master planning is focused on big picture, distant future needs of the fire rescue service and is particularly important in an agency that is experiencing substantial growth, like DFW.

A strategic plan is a three to five year, facilitated process, in which an organization first develops or updates its mission, vision, and core values statements, some of which has been achieved at DFWAFS. A strategic plan is in place for the DFW Airport organization, however a specific plan for the Airport Fire Services is not in place, and is recommended.

A mission statement has been developed stating:

> "It is the mission of the DFW International Airport Department of Public Safety to ensure the protection of life and property through the effective and efficient delivery of professional police, fire rescue, security, and emergency medical services to the airport community."

The completion of a strategic plan continues to establish goals for the three to five-year planning period, identify objectives with which to achieve the goals, and assign responsibility and a timeline for completion. The result is a well thought out road map for the organization to follow moving forward. ESCI can assist with this process, or it may be done internally, but either way, it is recommended.

Capital replacement planning is something that few fire agencies do effectively. DFW has, commendably, established a process of setting aside funds for this purpose in the form of a Capital Improvement Program, as is detailed in this report. However, what has not been included is a specific listing of capital assets, their projected service lives, and their replacement cost. It is recommended that the department establish a structured capital replacement schedule.

Emergency Planning

Emergency planning and management is of special importance in DFW due to the risks associated with aircraft arrivals and departures. However, DFWAFS also protects high value properties outside of the airfield, for which emergency management planning is equally important.

The airport maintains an Office of Emergency Management which assumes overall responsibility for planning. In addition, Airport Fire Services is actively engaged with the airport, airlines, and state and federal agencies in preparing for emergencies.

Key Recommendations:

- Develop a strategic plan during calendar year 2017.
- Establish a capital replacement schedule for fire apparatus and equipment.

EMERGENCY MEDICAL SERVICES SYSTEM—SUPPORT AND OVERSIGHT

EMS incidents constitute 64 percent of all responses for DFWAFS. Fire responders serve as the primary first responding teams on the airport property, providing Basic and Advanced Life Support. Ambulances are also staffed and respond to continue care and transport patients to a definitive care facility.

This integrated first responder and ambulance transportation system represents a large and vital component of the overall emergency services provided to the DFW Airport. The following figure details the DFWAFS EMS program management, quality, and integration of system components.

Figure 74: EMS Program Management System Components

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
MEDICAL DIRECTION & CONTROL		
Written patient care protocols adopted?	Yes	
MPD/Phys. Advisor board-certified in EM?	No. Board eligible did not renew in 2012 due to illness. Has all required qualifications and is eligible to re-test in Sept. 2017.	
Participated in National Association of EMS Physicians fellowship?	Yes	
Assistant medical directors appointed?	No	
Frequency of medical director crew interaction?	Varies. Quarterly visits are most common. Medical director personally available for phone consults 24/7. When unavailable, back up medical director available.	
Field response or ride-along by medical director?	No	Encourage the medical director to conduct periodic ride-alongs with EMS units.
QUALITY ASSURANCE/QUALITY IMPROVEMENT		
Internal quality assurance/quality improvement committee?	Yes	
Lessons learned are shared?	Yes	
Case reviews conducted regularly? Frequency?	No set time frame. Typically, case reviews or peer reviews are conducted on: Critical responses, unusual patients, protocol violations, or medical director's request.	Conduct routine case reviews on a regular basis, randomly reviewing any cases, not limited to critical or problem incidents.
Case reviews conducted by (who conducts?)	Completed by field training officers, shift commanders, training coordinator, and medical director.	
Medical director participation in reviews?	When requested	

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
Feedback given to individual providers?	Yes	
PCRs spot-evaluated for accuracy? By whom?	Yes. By another provider that was part of the patient care team. Typically, the partner of the lead medic. Specified in the Quality Assurance Manual.	
Annual or regular reports on QA/QI results?	Yes	
Key performance indicators identified?	Yes	
Targeted case studies performed?	Yes	
Episodic case reviews?	Yes	
Patient refusals reviewed & what percentage?	Not specifically. Minimum 20% of calls are reviewed.	Establish a routine practice of review of patient transport refusal reports.
Cardiac arrest outcomes monitored?	Yes	
Method(s) of determining outcomes	Feedback from receiving hospital	
Post-arrest event review	Yes	
CLINICAL SKILLS & CONTINUING EDUCATION		
Clinical skills documented for each member?	Yes	
Documentation method (electronic, paper)	Electronic / Paper	
Intubation/airway success rates	73%	
IV/vascular access success rates	82%	
CONTINUING MEDICAL EDUCATION		
State & local CE requirements met regularly?	Yes	
Training requirements monitored for compliance?	Yes	
Attend ACLS during recertification period?	No	Consider including Advanced Cardiac Life Support (ACLS) training in continuing education.
Attend PHTLS/BTLS during recertification period?	PHTLS every 4 years for the EMS Division	
Attend PALS or equivalent?	No	
Attend CPR training/refresher?	With AHA updates	
Basic clinical skills assessment/validation?	Initial for release from training program	
Advanced/intermediate skills assessment?	Initial for release form training program	
In-service EMS training/CME by medical director?	With protocol updates	
EMS officer/other conducts in-services?	Yes, in-house training program	

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
Field Training & Evaluation Program (FTEP) established?	Yes	
Designated Field Training Officers (FTO)?	Three positions currently with a fourth vacant	
Other CME methods? (list)	Computer CE program (CE Solution) Outside Training Cadaver lab Advanced cardiac training	
EMS INCIDENT/PATIENT DOCUMENTATION		
Electronic patient care reports (ePCR) utilized	Yes	
Software integrated with fire RMS?	Yes	
NEMSIS-compliant record-keeping?	Yes, NEMSIS 3	
NFIRS compliant?	Yes	
HIPAA compliant?	Yes	
HIPAA compliance officer (name – in writing or policy?)	Yes. Title / Position only. Not specific name. EMS Battalion Chief.	
EMS ADMINISTRATION		
EMS administrator (full-time; part-time, none)	Full time	
Rank and/or title	Battalion Chief	
Other staff assigned to EMS administration	2 Training Coordinators (Paramedic Captains) One concentrates on EMS Division, Police, and Security Services. The second concentrates on the department EMTs and outside organizations. Logistics Coordinator (Paramedic Captain) Concentrates on supplies, medications, select equipment maintenance, ePCR, and special projects.	

Discussion

The DFWAFS has an established history as an excellent EMS first responder and transport agency. An effective and adequate response program is in place.

Historically, EMS programs and services have been addressed as a separate service, one that is not closely associated with fire and ARFF operations. That separation, while reduced, remains in place today with EMS personnel trained only in emergency medical care and transportation, and not responding as firefighters. ESCI finds that a more effective use of EMS and fire personnel would be to cross train both disciplines to allow for more flexible deployment and assignment of personnel.

EMS Medical Control and Quality Assurance

DFWAFS has established appropriate mechanisms to review EMS functional performance. The department provides Quality Assurance (QA—finding the issue) and Quality Improvement (QI—addressing the issue) on an irregular basis, absent an established schedule and time frame, as is recommended. Appropriately, the program is operated in concert with the agency's medical director. The agency is encouraged to involve the medical director as actively as possible in QA/QI activities.

Certification and Continuing Education

The agency requires the appropriate levels of certification for EMS responders. In addition, the correct continuing education and recertification steps are taken, which are based on State of Texas requirements for EMS certification and skills maintenance. ESCI suggests that DFWAFS consider adding Advanced Cardiac Life Support certification to ongoing training.

Key Recommendations:

- Cross train fire and EMS personnel for use in either discipline, as needed.
- Encourage the medical director to conduct periodic ride-alongs with EMS units.
- Conduct routine case reviews on a regular basis, randomly reviewing any cases, not limited to critical or problem incidents.
- Establish a routine practice of review of patient transport refusal reports.
- Consider including Advanced Cardiac Life Support (ACLS) training in continuing education.

HAZMAT SERVICES SUPPORT AND RESPONSE CAPABILITY

Hazardous materials (HazMat) are defined as any item or agent (biological, chemical, radiological, and/or physical), which has the potential to cause harm to people or the environment. In a location like DFW, hazardous materials may be present in the industrial warehousing facilities on the property, on the transportation routes adjacent to the airport and in aircraft arriving and departing.

In Figure 75, ESCI reviews the DFWAFS Hazardous Materials, or HazMat, response capabilities.

Figure 75: HazMat Support and Response Capability

SURVEY COMPONENT	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
PHYSICAL RESOURCES/RESPONSE LEVELS PROVIDED		
Apparatus	HM-1 (cross staffed)	
Equipment for Level B	Yes	
Equipment for Level A	Yes	
Equipment for decontamination	Yes	
Equipment for plume modeling/spot weather analysis	No	
Equipment for plugging/diking/spill containment	Yes	
Gas monitoring for concurrent red zone and perimeter analysis	Yes	
STAFF RESOURCES		
Awareness certified personnel	N/A	
Operations certified personnel	All department personnel per TCFP[10]	
Technician certified personnel	31 Technician level personnel assigned to Special Operations, additional department members as well	
WMD certified personnel	31 Technician level personnel assigned to Special Operations, additional department members as well	
HazMat Incident Command certified personnel	3	
HazMat Safety Officer certified personnel	No	Certify personnel at the HazMat Safety Officer level.
MISCELLANEOUS		
Mutual aid partners/Regional Team Participant	Yes	
Team assembly time for offensive Level A entry	10–15 minutes	
Team certified to which level?	Technician	
Training frequency?	Monthly	

[10] TCFP – Texas Commission on Fire Protection.

Discussion

Given the significant risk of a hazardous materials incident that is presented to DFW by a combination if aircraft, highway, and industrial warehousing activity, DFWAFS has appropriately prioritized the ability to manage an incident of this nature. A hazardous materials response unit, HM-1 is staffed by department personnel. HM-1 is a "level A" resource, the highest level of HazMat response capability. To achieve level A capability, a combination of highly technical equipment is necessary, along with appropriately trained personnel.

HazMat certification levels are defined by the Occupational Safety and Health Administration (OSHA) in CFR 1920.120. The highest level of certification for responders is the "Technician" level. Of the personnel in DFWAFS, 31 are certified at the Technician level, resulting in a considerable response capability. In addition, there are three personnel certified as Hazardous Materials Incident Commanders.

The National Fire Protection Association (NFPA) defines a Hazardous Materials Safety Officer certification level in standard NFPA 472. DFWAFS has not trained personnel in this certification, which is recommended.

Key Recommendation:

- Consider adding HazMat Safety Officer certification to special operations training.

TECHNICAL RESCUE SERVICES SUPPORT AND RESPONSE CAPABILITY

Much like hazardous materials incidents, DFWAFS needs to be prepared for technical rescue emergencies. Technical rescue includes high angle rope rescue, along with confined space, water, and trench collapse rescue categories.

The department's technical rescue practices are summarized in the following figure.

Figure 76: Technical Rescue Services

SURVEY COMPONENTS	DFW AIRPORT FIRE SERVICES INFORMATION	OBSERVATIONS AND RECOMMENDATIONS
SPECIALIZED SERVICES PROVIDED		
Services provided		
Confined Space Rescue	Yes	
Rope (High Angle) Rescue	Yes	
Trench Collapse Rescue	No – Mutual Aid	
Structural Collapse Rescue	No – Mutual Aid	
Vehicle/Machinery Rescue	Limited	
Surface Water Rescue	Yes – Operations level	
Organizational structure		
Internal or Partnership	Internal	
Authorized staffing	Fire Special Operations Team 1 BC, 10 per shift total of 31 (part-time)	
Minimum staffing Policy	No	
TRT ADMINISTRATION		
Budget for TRT services	$65,000 combined Rescue and HazMat	
How is training certification obtained?	Tarrant County College	
Standard operating guidelines in place for each discipline?	Pending	Establish standard operating guidelines for technical rescue disciplines.
Agency has a Response SOG for TRT?	Pending	Establish defined response protocol for Technical Rescue Team deployment.
The agency maintains accurate records for all life safety rope?	Yes	
Documents annual confined space entries made per 1910.146?	Per incident	
TRT OPERATIONS		
Agency maintains a TRT specific resource list to support operations?	No	
Agency maintains an equipment inventory consistent with their stated level of service delivery?	Yes	
A periodic appraisal made of the technical rescue program?	Monthly training	

Discussion

The Airport Fire Services include a Special Operations Team that is in place to respond to hazardous materials as well as Technical Rescue Team (TRT). The disciplines for which the agency is prepared include confined space rescue, rope (high angle) rescue, and, to a lesser degree, vehicle/machinery rescue and surface water rescue. DFWAFS does not staff resources for trench collapse or structural collapse rescue, but uses mutual aid resources to address those disciplines.

The technical rescue operations are well structured and appropriate training is in place. Standard operating guidelines are neither currently in place for the listed disciplines, nor is there a clearly established protocol for dispatch and response of TRT resources. Both are reported to be in the process of development. Completion of that undertaking is important, and recommended.

Key Recommendations:

- Establish standard operating guidelines (SOGs) for technical rescue disciplines.
- Establish defined response protocol for Technical Rescue Team deployment.

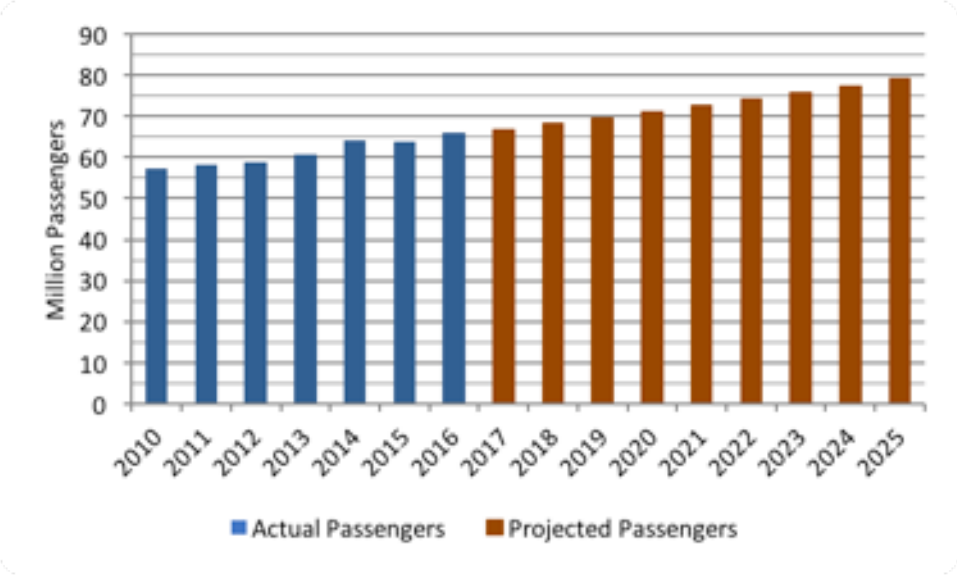
Future System Demand Projections

In the Future System Demand analysis ESCI examines future growth, development, and fire protection risk in the DFWAFS service area. Future service demand is largely dependent on changes over time to human activity (i.e. passengers and employees); growth and development; and the changing nature of the risks present in the service area. This analysis uses historical and projected DFW Airport passenger statistics, historical service demand data, and airport planning documents to provide an overview of future service demand in the DFWAFS service area.

AIRPORT GROWTH PROJECTIONS

The following figure displays the number of passengers that passed through DFW International Airport from 2010 through 2016. In addition, this figure displays the projected number of enplanements (passengers) through 2025. The data displayed is actual statistical data maintained by DFW International Airport; and a projection of future enplanements provided by the airport.

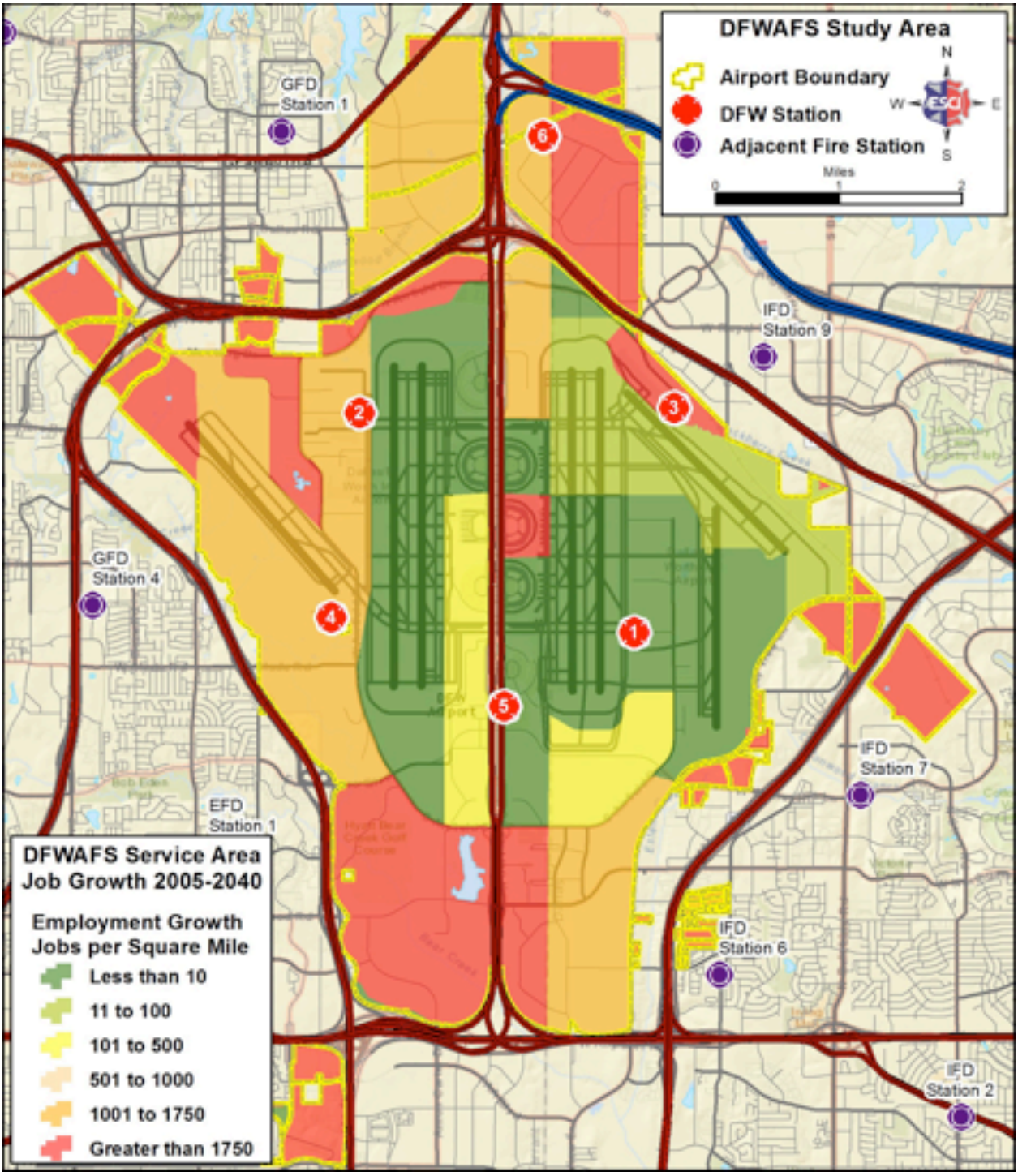
Figure 77: DFW Passenger Enplanements, Historical and Projected



In 2016, over 65.5 million passengers passed through DFW Airport. This represents an average daily population of approximately 178,000 using the airport. The annual number of passengers is predicted to continue increasing at average annual rate of approximately two percent during the period displayed.

In addition to passengers, activity in the terminal areas of the airport and the commercial/retail properties located around the airfield affects DFWAFS service demand. The following figure uses North Central Texas Council of Governments (NCTCOG) demographic data and traffic survey zone GIS data to display future employment growth in the DFWAFS service area.

Figure 78: DFWAFS Service Area Job Growth, 2005 to 2040



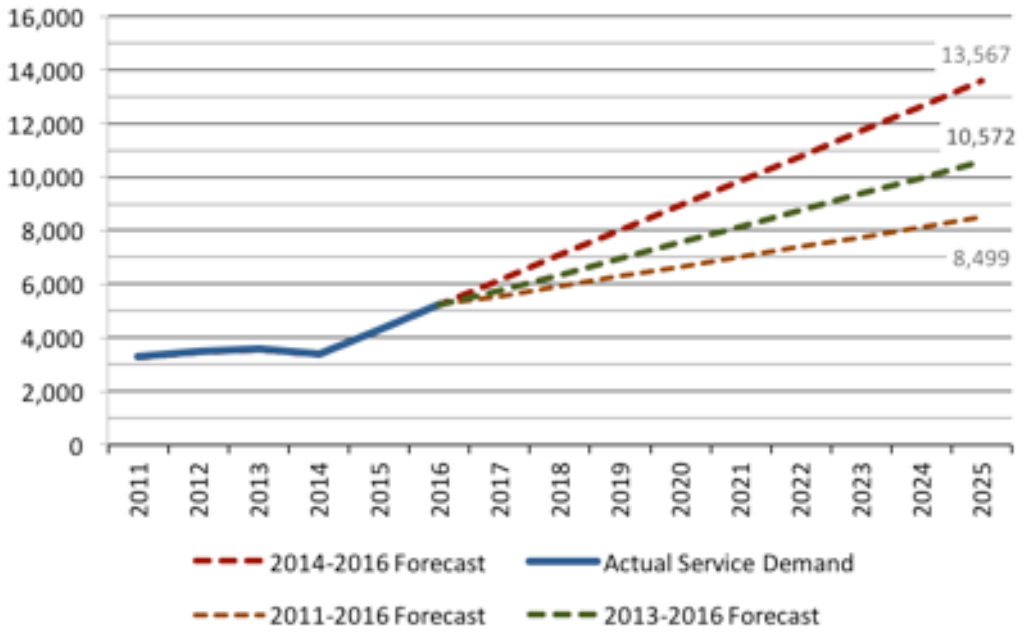
DFW Airport estimates that there are approximately 60,000 on site jobs inside the boundaries of the airport. These jobs include airport and airline employees, retail employees, and maintenance workers, as well as hospitality and tourism employees. Figure 78 demonstrates the projected increase in jobs between 2005 and 2040; based on a 2015 update of the NCTCOG demographic data.

Approximately 50,000 jobs are predicted to be added inside the DFWAFS service area by 2040. Much of the anticipated increase in employment occurs in the commercial and mixed-use areas adjacent to the airfield. Future commercial growth and development is discussed in the Risk Assessment later in this report.

SERVICE DEMAND PROJECTIONS

In evaluating the deployment of facilities, resources, and staffing, it is imperative to consider potential changes. In the case of DFWAFS, increased activity in the terminal areas and the commercial area adjacent to the airfield in the recent past appears to be increasing service demand. Changes in service demand may require changes and adjustments in the deployment of staffing and capital assets in order to maintain acceptable levels of performance. For the purposes of this study, ESCI uses historical service demand from 2011 through 2016 to present a projection of future service demand in the DFWAFS service area.

Figure 79: DFWAFS Future Service Demand Projection, 2016–2025



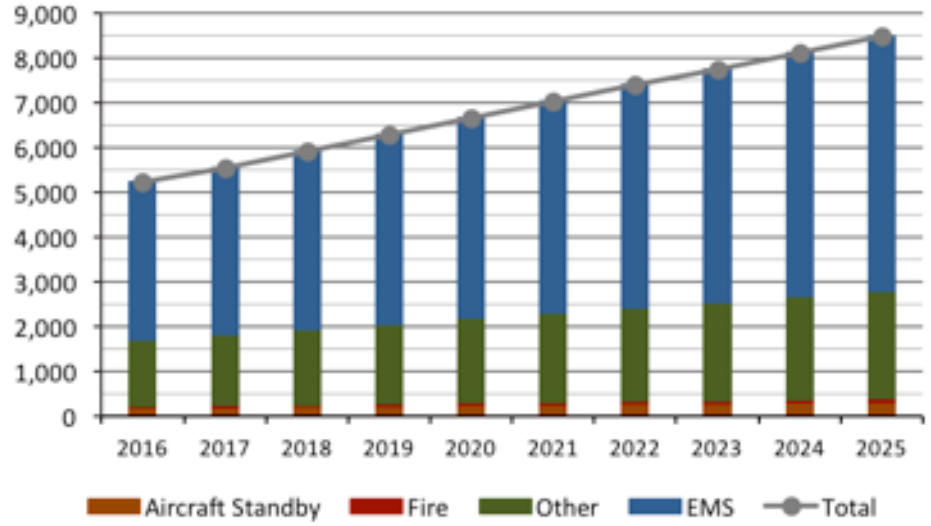
The first projection in this figure uses historical service demand from 2011 through 2016 to forecast service demand through 2025. As displayed, service demand increases to approximately 8,500 incidents by 2025. This represents an increase of slightly over 62 percent over nine years.

Note that between 2011 and 2014, service demand was relatively flat within a range of approximately 300 incidents annually. DFWAFS service demand grew at an average annual growth rate (AAGR) of approximately 1 percent during this period (including a decrease of -5.6 percent between 2013 and 2014). Between the end of 2014 and the end of 2016 service demand increased at an average annual rate of over 24 percent; increasing by nearly 1,000 incidents per year.

Based on the historical data for 2014 through 2016, the model in Figure 79 predicts that service demand will increase by at an average annual rate of approximately 17.5 percent, to over 13,500 incidents by the end of 2025. A third projection (2013–2016 Forecast), demonstrates service demand increasing to over 10,500 incidents (11.3 percent AAGR) by 2025.

The following figure examines the nature of future service demand in the DFWAFS service area, based on the 2011 through 2016 service demand forecast.

Figure 80: Future Service Demand by Incident Category



As with most fire jurisdictions that provide EMS first responder and transport service, EMS incidents are expected to continue to represent the majority of DFWAFS service demand. Aircraft Standbys and Fires (all types) represent less than 5 percent of DFWAFS service demand. However, as the number of airport operations rises and development increases on airport property; DFWAFS can expect the number of these incidents to increase. Other emergency service calls not involving actual fires are predicted to increase in part due to the use of automatic alarm systems; which decrease the number of actual fires, but increase service demand.

It is not the intent of this study to be a definitive authority for the projection of future growth in the service area but rather to base recommendations for future fire protection needs on a reasonable association with projected service demand. As discussed, human activity in the terminals and activity and development on airport property are primary drivers of emergency service demand. It is important to have a projection of future activity that will affect service demand. Although projections of growth and service demand can vary and may change over time; DFWAFS will continue to be an emergency service provider to a growing service area. Planning should begin now to maintain the resources to meet the continuing and increasing demand for DFWAFS services.

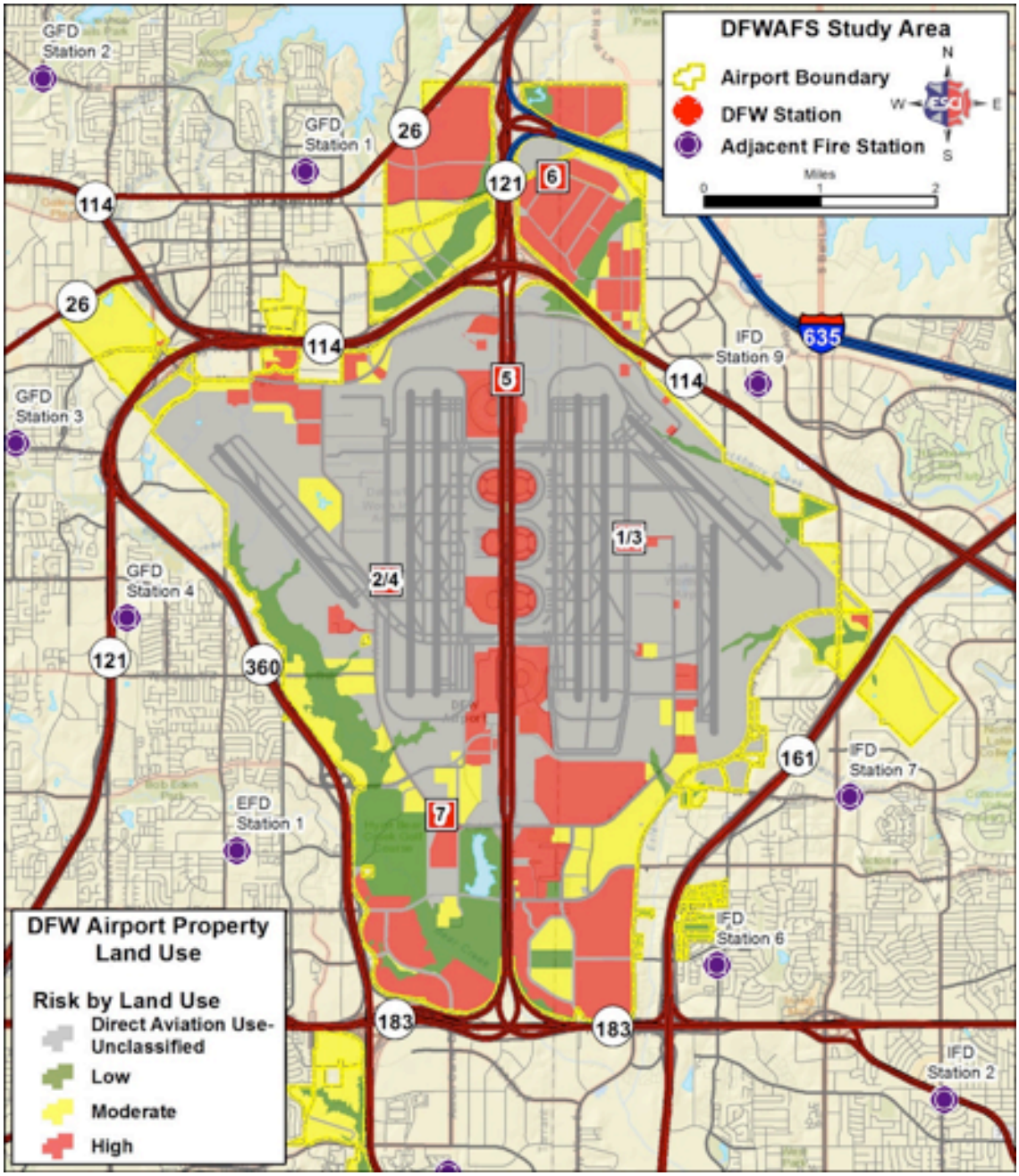
RISK ANALYSIS

The fire service assesses the relative risk of properties based on a number of factors. Properties with high fire and life risk often require greater numbers of personnel and apparatus to effectively mitigate a fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk within geographic sub-areas of a community. Using risk categories from the NFPA Fire Protection Handbook and land use data provided by DFWAFS, ESCI translates land use (potential scale and type of development) into the following categories of relative fire and life safety risk:

- **Low Risk** – Areas zoned and used for agricultural purposes, open space, low-density residential and other low intensity uses.
- **Moderate Risk** – Areas zoned for medium-density single family properties, small commercial and office uses, low-intensity retail sales, and equivalently sized business activities.
- **High Risk** – Higher-intensity business districts, mixed use areas, high-density residential, industrial, warehousing, and large mercantile centers.

The following figure displays relative risk within the DFWAFS service area based on the criteria listed.

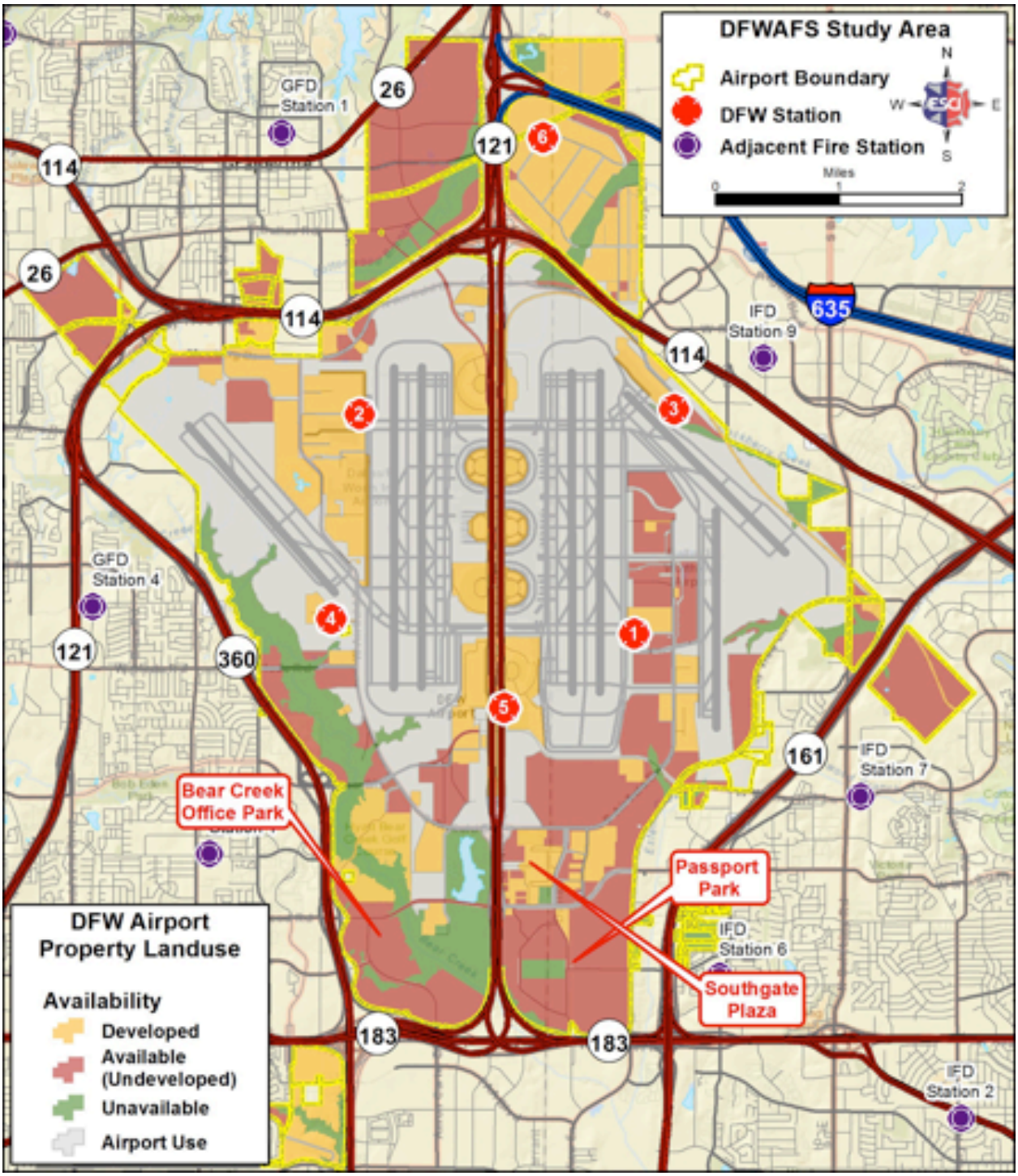
Figure 81: DFWAFS Relative Risk by Land Use



Low risk properties are primarily land designated as open space, flood plain, wetlands, or otherwise not suitable for development. The central terminal area is categorized as high risk, due to the density of retail tenants and passengers in the CTA. The remainder of the areas categorized as moderate risk, are primarily designated for commercial or office/corporate land use. Some areas designated for industrial/flex or high density mixed use that are not currently developed are included in the moderate risk category. The properties identified as high risk have a land use designation of industrial/flex or mixed-use commercial. As development continues in the DFWAFS service area, the nature and amount of risk present will change.

The DFW Airport Land Use Plan for commercial development identifies approximately 4,000 acres (6.25 square miles) of land that is available for development within the boundary of the airport. The following figure displays land available for development using DFW Airport land use data.

Figure 82: DFWAFS Property Status



Land available for development is distributed throughout the airport property. The DFW Airport Commercial Development Land Use Plan identifies strategies for developing available commercial land. These include aviation related facilities, industrial/warehouse structures, and cargo/distribution facilities. Additionally, new mixed-use office, retail, and hospitality space opportunities are identified in the land use plan. DFW is actively pursuing development opportunities for undeveloped parcels in the areas displayed in the preceding figure. Passport Park, Bear Creek Office Park, and Southgate Plaza are examples of areas currently being developed or scheduled for development in the near future.

In ESCI's experience, most typical urban fire jurisdictions are comprised of 60 to 75 percent single family residential dwellings; which are usually categorized as low or low–moderate risk, depending on density. The DFWAFS service area off the airfield is designated for moderate or high-risk properties, consisting of multi-story structures; large square footage warehousing structures; and mixed used retail, commercial, and restaurant space. While much of this property is currently undeveloped, future development increase the structural risk level present in the DFWAFS service area. ESCI encourages DFWAFS leaders to continue working with DFW Airport leaders and planners to ensure that the fire department is prepared to meet the future needs of the airport.

Future Delivery System Models

Although the foregoing sections of this report focused primarily on the conditions that currently exist within the DFWAFS, the intent of this study is to combine that evaluation with a look into the future and provide policy makers with information necessary to carry the system forward over the next 10 to 20 years. This portion of the report provides recommendations related to the deployment of facilities, apparatus, and personnel with a focus on future service delivery and an improvement in overall efficiency within the system.

DEVELOPMENT OF RESPONSE STANDARDS AND TARGETS

ESCI emphasizes the importance of the establishment of response performance metrics by the DFWAFS. Once established, these standards establish measurable goals for service delivery which then form the baseline upon which planning for deployment of resources is based. Absent these processes, the organization is not able to determine where it needs to go, nor is it able to know when it is achieving its goals and meeting its community's expectations.

In the DFWAFS instance, response planning and targeting takes place from two distinctly different perspectives—one being the FAA mandated response targets which are clearly defined, and the other being that which applies to the off-airfield locations that are recipients of DFW fire protection but independent of airport related FAA response considerations.

As stated earlier, as an Index E airport, the FAA specifies that the first ARFF apparatus must reach the midpoint of any runway in three minutes' travel time; additionally, the last ARFF apparatus must arrive in four minutes' travel time. The response standards are clear and adherence to them is consistently assured by way of regular testing and inspection practices.

Given that the above requirements are in place and addressed by DFWAFS, the balance of this discussion will be in the context of structural fire protection response standards, applicable to the areas outside of the DFW airfield. This will include the multiple commercial facilities and warehouses, terminal buildings, and highways adjacent to the airport.

Structural Fire Protection and EMS Response Time Standards and Targets

While DFWAFS refers to the NFPA 1710 standard for career fire departments as their desired level of response performance for fire and EMS emergency incidents; the department has not identified or adopted response time standards and targets. Response standards must be developed by the individual jurisdiction, based on the expectations of elected or appointed officials, customers, and—in the case of DFW—property lease holders. Service delivery need is balanced against the financial aspect of what an agency is able and willing to afford. For this reason, ESCI cannot establish these standards for DFWAFS, but rather will provide guidance and examples of what we consider to be acceptable metrics.

Critical Tasks, Risk, and Staffing Performance

As explained earlier, tasks that must be performed at a fire can be broken down into two key components: life safety and fire flow. Life safety tasks are based on the number of building occupants, and their location, status, and ability to take self-preservation actions. Life safety-related tasks involve search, rescue, and evacuation of victims. The fire flow component involves delivering sufficient water to extinguish the fire and create an environment within the building that allows entry by firefighters.

The number and types of tasks needing simultaneous action will dictate the minimum number of firefighters required to combat different types of fires. In the absence of adequate personnel to perform concurrent actions, the command officer must prioritize the tasks and complete some in chronological order, rather than concurrently. These tasks include:

- Command
- Scene safety
- Search and rescue
- Fire attack
- Water supply
- Pump operation
- Ventilation
- Back-up/rapid intervention

The fire service assesses the relative risk of properties and occurrences based on a number of factors. Properties with high fire risk often require greater numbers of personnel and apparatus to effectively mitigate the fire emergency. Staffing and deployment decisions should be made with consideration of the level of risk involved. The level of risk categories used by Commission for Public Safety Excellence (CPSE) relate as follows:

- Low Risk – Areas and properties used for agricultural purposes, open space, low-density single family residential and other low intensity uses (fire flow less than 300 gpm); single patient non-life threatening medical incidents, minor rescues, small fuel spills, and small wildland fires without unusual weather or fire behavior.
- Moderate Risk – Moderate risk incidents involving fires in properties used for medium density residential or apartments, small commercial and offices uses, low intensity retail sales and equivalently sized business activities; life threatening medical emergencies, hazardous materials emergencies requiring specialized skills and equipment, rescues involving specialized skills and equipment.
- High Risk – High risk incidents involving fires in larger commercial structures, warehousing properties, high rise buildings with sustained attack (fire flows more than 1,000 gallons per minute), multiple patient medical incidents, major releases of hazardous materials, high risk rescues.

The CPSE has a sample critical tasking analysis for the number of personnel required on scene for various levels of risk. This information is illustrated in the following figure as an example of critical tasking only and is not intended to conclusively define the actual personnel necessary based on risk.[11]

Figure 83: Sample of Critical Task Staffing by Risk

Sample Critical Tasking Analysis Firefighter Personnel Needed Based On Level of Risk				
	Structural Maximum Risk	**Structure Significant Risk**	**Structure Moderate Risk**	**Non-Structure Low Risk**
Attack line	4	4	2	2
Back-up line	4	2	2	(2)
Support for hose lines	4	3	2	
Search and rescue	4	4	2	
Ventilation	4	2	2	
Rapid intervention team	4	4	2	
Pump Operator	2	1	1	1
2nd apparatus/ladder operator	1	1	(1)	
Command	2	1	1	1#
Safety	2	1	1#	
Salvage	4			
Rehabilitation	2			
Division/group supervisors	(2)			
Total	**37–39**	**23**	**14-16**	**3-6**

() indicates tasks may not be required at all such incident.

 # indicates task may, at times, be completed concurrently with other position.

ESCI notes once again, that Figure 83 represents an example of critical tasking; that may not reflect the risks present in the DFWAFS service area. The first 15 minutes is the most crucial period in the suppression of a fire. How effectively and efficiently firefighters perform during this period has a significant impact on the overall outcome of the event. This general concept is applicable to fire, rescue, and medical situations.

Critical tasks must be conducted in a timely manner to control a fire or to treat a patient. Three scenarios of commonly encountered emergencies are routinely utilized by fire departments when conducting field validation and critical tasking: a moderate risk structure fire, a traffic collision with a trapped victim, and a cardiac arrest. Each scenario is conducted using standard operating procedures and realistic response times based on actual system performance. Each scenario is normally run multiple times with a variety of fire companies to validate and verify observations and times.

[11] Note: Based on examples provided in the publication Commission on Fire Accreditation International, Inc. (now Center for Public Safety Excellence), *Creating and Evaluating Standards of Response Coverage for Fire Departments*, 4th edition.

To further validate the analysis process, results are compared with records from actual working fires and similar incidents from previous years. Overall results are reviewed to determine if the actions taken within the early minutes of an incident resulted in a stop loss or not, and if additional resources were required. The critical task analysis process demonstrates the rate in which the current deployment plan results in stopping loss a high percentage of time within initial critical time goals.

Again, critical tasks are those activities that must be conducted in a timely manner by firefighters at emergency incidents in order to control the situation, stop loss, and to perform necessary tasks required for a medical emergency. DFWAFS is responsible for assuring that responding companies are capable of performing all of the described tasks in a prompt, efficient, and safe manner.

All Risk Critical Resource Tasking

Fire departments respond to many incidents other than structure fires, including hazardous materials (dangerous goods) releases, motor vehicle collisions, basic and advanced life support medical emergencies, and non-structural fires and ARFF incidents for airport fire departments. Personnel responding to these types of incidents should be assigned tasks similar to structure fires.

The following figures are provided as examples for these types of incidents, although ESCI recommends DFWAFS conduct field validation exercises with its crews to verify the critical tasking analysis provided. After field validation is complete, the department may find that the critical tasking can be adjusted appropriately upward or downward for each incident type.

Figure 84: Aircraft Emergency (Alert 1)

Task	Personnel
Command/Safety	1
Aircraft Fire Suppression	6
Pump Operations	2
Attack Line	2
Back-up Line	2
Rescue	4
Emergency Medical Care	2
Water Supply	1
Total	**20**

Figure 85: Non-Structure Fire Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Total	**4**

Figure 86: Hazardous Materials Incident Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Back-up Line	2
Support Personnel	7
Total	**13**

Figure 87: Motor Vehicle Collision with Entrapment Critical Tasking

Task	Personnel
Command	1
Pump Operator	1
Primary Attack Line	2
Extrication	3
Patient Care	2
Total	**9**

Figure 88: Emergency Medical Incident Critical Tasking

Task	Personnel
Ambulance Transport	2
First Responder	4
Total	**6**

The aforementioned minimum staffing criteria should be used in setting specific service level objectives for each of the incident types.

Response Time Performance Objectives

The process of setting response time performance objectives will include two sets of questions:

- What are the expectations of the patrons of DFW International Airport, lease holders, and the appointed Board of Directors regarding initial response times of the fire department to an emergency incident? What are the stakeholders' perceptions of quality emergency services where response time is concerned?
- What response time performance would be reasonable and effective in containing fire, stopping the loss, and saving lives when considering the common types of incidents and fire risks faced by DFWAFS?

When considering the expectations of the customer, travel time and loss histories need to be examined. Then, historical service levels are compared to known and anticipated service demand and community growth projections. Considering these projections, suggested response time standards are created to ensure DFWAFS is meeting local service demand expectations in accordance with relevant industry standards and best practices.

DFWAFS is a fully career department, providing ARFF services on the DFW Airport airfield; and all hazard fire protection and EMS service inside the airport boundary. The department references the FAA 139.319 Operational requirements for ARFF responses; and the NFPA 1710 performance measures for fire and EMS emergencies. These response time measures are displayed in the following two figures:

Figure 89: FAA ARFF Response Performance Recommendations – Index E Airports

139.319 Aircraft rescue and firefighting: Operational requirements

- Three to four-minute response to midpoint of furthest runway with 6,000 gallons and three units.
- Within three minutes from the time of the alarm, at least one required aircraft rescue and firefighting vehicle must reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post or reach any other specified point of comparable distance on the movement area that is available to air carriers, and begin application of extinguishing agent.
- Within four minutes from the time of alarm, all other required vehicles must reach the point specified in paragraph.

DFWAFS regularly performs time trials to confirm that the department can meet the requirements listed in Figure 89. The following is an example of a response time goal for the full first alarm for an aircraft emergency incident (Alert 1).

Aircraft Emergency (Alert 1)—Response Time Performance Goal[12]

For all aircraft emergency incidents, the first ARFF apparatus staffed with a minimum of two personnel shall arrive at the midpoint of the designated runway within in 3:00 minutes from the time of the alarm. The remainder of the required ARFF apparatus shall arrive within 4:00 minutes from the time of the alarm. The full first alarm shall include a battalion chief, four ARFF apparatus (one of which may be a RIV), one aircraft interior access vehicle (AIAV), one mobile ventilation unit (MVU), one truck company, two structural apparatus, and one MICU. The full first alarm assignment shall be capable of establishing command, applying extinguishing agent, initiating victim evacuation and rescue, establishing fire attack and back up lines, ventilation, and patient care.

[12] Note that the Response Time Performance Goal provided is presented as an example of the elements of a response time goal.

Figure 90: NFPA 1710 Performance Measurement Recommendations

Response Element Call Processing[13]	NFPA Recommendation 60 Seconds @ 90th Percentile
Turnout Time	60 Seconds @ 90th Percentile for EMS 80 Seconds @ 90th Percentile for Fire
Travel Time (First unit on scene-Fire or EMS)	4 Minutes @ 90th Percentile
Travel Time-Full First Alarm (Fire Suppression Incident) Travel Time-First ALS unit on scene – EMS Incident	8 Minutes @ 90th Percentile

Although NFPA performance recommendations are considered an industry standard, fire jurisdictions working with their governing bodies have the authority to implement performance measures that are better suited to their service areas. The following figure displays DFWAFS emergency response performance during 2016.

Figure 91: DFWAFS Emergency Response Performance, 2016

90TH Percentile Performance—First Unit on Scene, 2016			
	Turnout Time	Travel Time	Response Time
Aircraft Standby Incidents	00:47	02:18	02:57
Fire Suppression Incident	01:51	05:49	06:48
EMS Incident	01:20	05:57	06:46
Other Incident	01:43	06:23	07:01

As discussed in the Service Delivery Analysis, ESCI was unable to identify or calculate call processing time from the data provided by DFWAFS. Response time in this figure is calculated from the time units are notified of an emergency to the arrival of the first unit on scene. This is a commonly accepted measure of emergency response performance for fire jurisdictions. Although NFPA performance recommendations are considered an industry standard, departments working with their governing bodies (Authority Having Jurisdiction) have the authority to implement performance measures that are better suited to their service areas. DFWAFS performance does not meet the NFPA 1710 recommendations. However, performance compares favorably to that of similar fire jurisdictions nationally and regionally. ESCI recommends that DFWAFS continue to monitor and report the components of response time performance listed in the NFPA standard; and adopt performance measures that, for the most part, adhere to the NFPA 1710 recommendations. To that end ESCI provides the following examples of response time goals for the arrival of the first unit on the scene of an emergency incident.

[13] *NFPA 1221: Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems*.

All Emergency Incidents—Response Performance Goal

For 90 percent of all emergency incidents, the first apparatus shall arrive within six minutes' response time (fire department notified by dispatch to first unit on scene). The first apparatus on scene shall be capable of establishing command, providing for scene safety, or initiating basic life support (BLS) or advanced life support (ALS) patient care.

Fire Suppression Incidents—Response Performance Standard

For 90 percent of all emergency fire suppression incidents, the first fire apparatus staffed with a minimum of four personnel shall arrive within six minutes' response time (fire department notified by dispatch to first unit on scene). The first fire apparatus on scene shall be capable of establishing command, initiating scene size-up, and initiating a defensive fire attack operation.

All EMS Incidents—Response Performance Goal

For 90 percent of all emergency EMS incidents, the first on scene apparatus shall arrive within six minutes (fire department notified by dispatch to first unit on scene). The first on scene unit shall be capable of performing patient assessment, determining life-threatening conditions, and initiating patient care.

Advanced Life Support EMS Incidents—Response Performance Goals

For 90 percent of all emergency Advanced Life Support (ALS) EMS incidents, the first on scene apparatus shall arrive within six minutes (fire department notified by dispatch to first unit on scene). The first on scene ALS equipped unit shall be staffed with a minimum of two personnel, at least one of which must be certified to provide an ALS level of patient care.

Full First Alarm and Effective Response Force (ERF) Response Performance Goals

As discussed in the Risk Analysis, the DFWAFS service area off the airfield is primarily designated for moderate or high risk properties. Some of these properties are currently developed; and more are in the planning process or under construction. The current DFWAFS first alarm assignment for a structural fire incident calls for three fire suppression apparatus, one EMS unit, and a battalion chief. This brings 15 personnel to the scene of a fire suppression event. An ERF of 14–16 personnel is considered adequate for fires in a moderate risk, 2,000 square foot single story residence. As discussed previously, higher risk incidents require more personnel and apparatus to effectively mitigate an emergency. Alarm assignments should be made with consideration to the level of risk involved.

Fire incidents are a low frequency occurrence in the DFWAFS service area. However, given the nature of the risk present; there is a high potential for life safety and property loss. ESCI provides the following example of a first alarm assignment to fire suppression incident which more adequately addresses the risk present in the DFWAFS service area.

Moderate Risk Structure Fire—Full First Alarm-Effective Response Force (ERF) Response Performance Goal

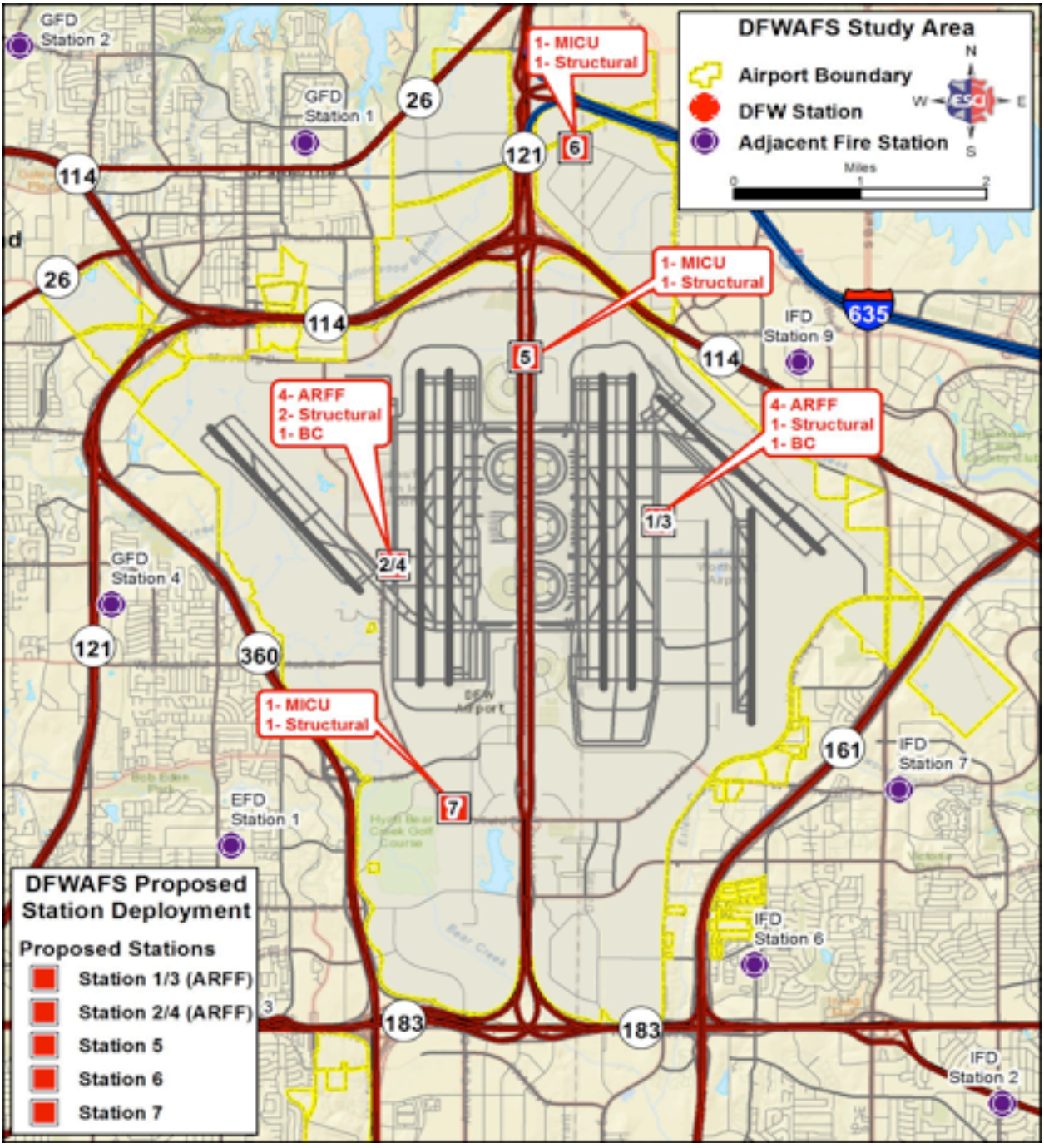
For 90 percent of emergency structure fire incidents, the full first alarm assignment consisting of an ERF of 19 personnel, a minimum of four fire apparatus (at least one of which is an aerial apparatus), one EMS unit (staffed with firefighting personnel), and one battalion chief shall arrive in 10 minutes (fire department notified by dispatch to first unit on scene). The full first alarm shall be capable of establishing incident command, maintaining a sustained fire flow, advancing fire attack and back-up lines, aerial master stream operations, initiating victim search and rescue, ventilation, and controlling utilities.

Note that the effective response force may include mutual or automatic aid resources. If aid from adjacent agencies is required to achieve the first alarm assignment, it is essential that these resources be included in the initial dispatch. This reduces the response time necessary to assemble adequate resources to mitigate the emergency. This initial ERF does not necessarily represent the entire alarm assignment, as additional units may be assigned based on long-term incident needs and risks. Additional engines, ladders, or other specialty companies are assigned to higher risk responses to accomplish additional critical tasks that are necessary beyond the initial attack. This discussion is intended to provide the DFWAFS with the information necessary to begin the process of establishing response standards and targets. The department is encouraged to begin the process as soon as possible, especially in light of the potential for the addition of a fire station and personnel in the future.

Future Station Deployment

The following section displays and describes a number of station deployment changes and elements that will assist with achieving the aforementioned response performance and ERF recommendations. These deployment models are also referenced in the recommendations section.

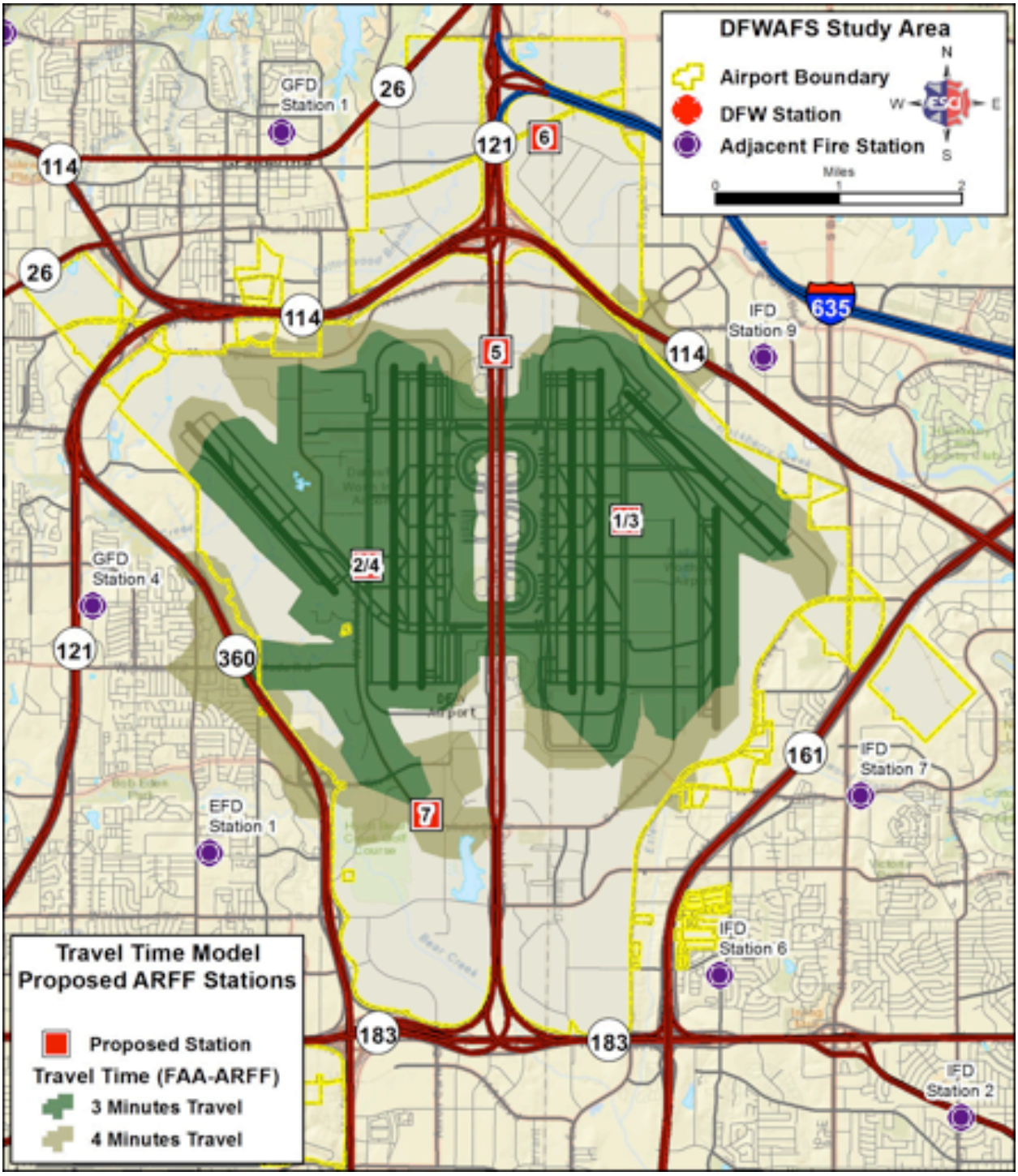
Figure 92: DFWAFS Proposed Station Deployment



This figure displays a proposed five-station deployment model for DFWAFS resources at DFW International Airport. In this deployment model, ARFF resources are moved from the current four ARFF stations into two ARFF super stations centrally located to serve the DFW airfield. Station 5 is relocated to the northern end of the terminal area from its current location south of the terminal area. A new station (Station 7) is located on Airfield Drive to the west of International Parkway. The current Station 6 remains in service on Regent Boulevard in the area of the International Commerce Park. The stations are labeled with the number and type of 24-hour staffed apparatus at each station. ARFF apparatus are currently staffed with one operator; minimum staffing for structural fire apparatus is four personnel, and MICUs are staffed with two personnel.

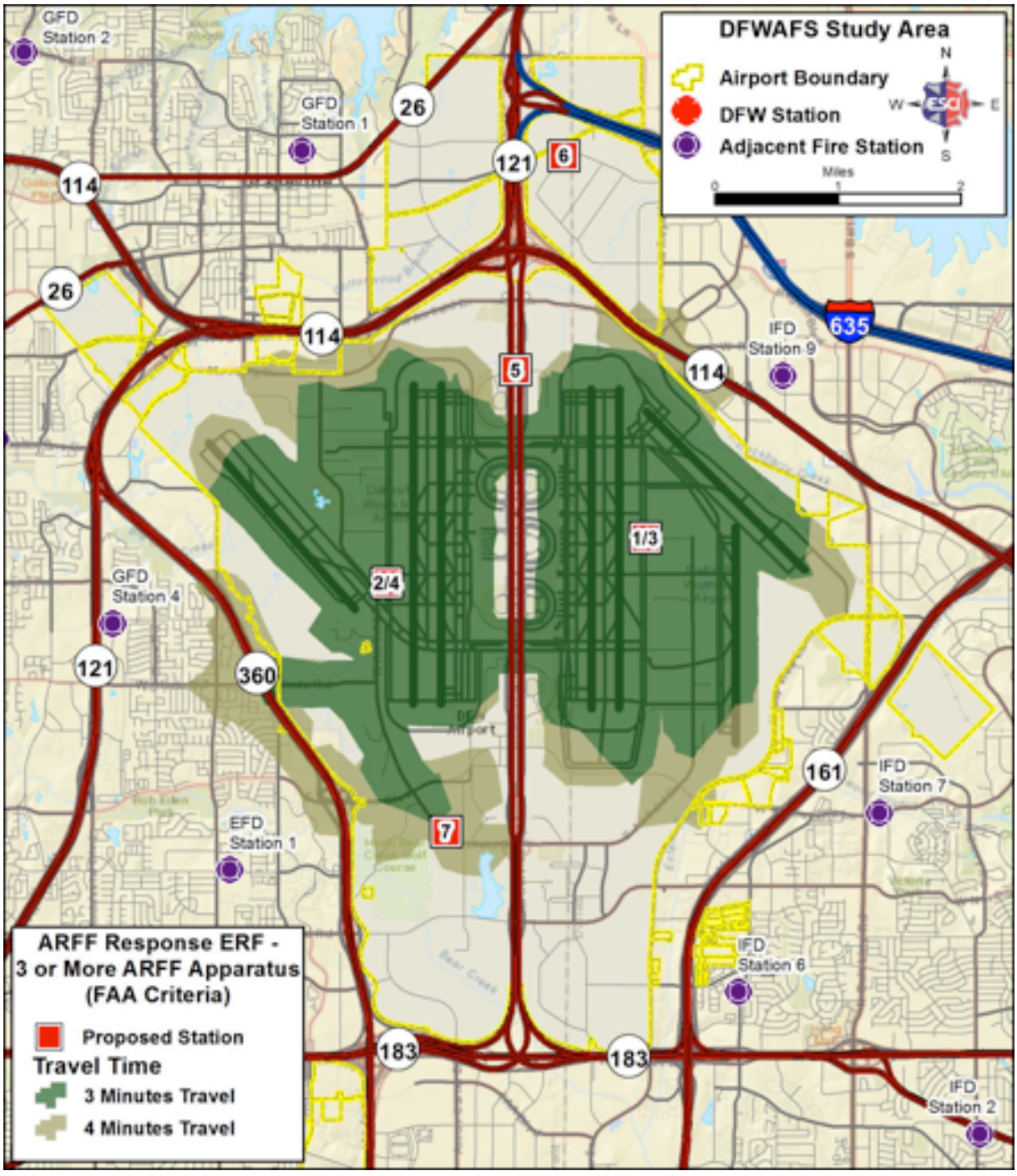
The FAA specifies that the first ARFF apparatus must reach the midpoint of any runway in three minutes' travel time; additionally, the last ARFF apparatus must arrive in four minutes' travel time. The following figure displays travel time capabilities from the relocated ARFF stations, based on the FAA travel time criteria for ARFF apparatus.

Figure 93: Proposed Stations Travel Time Model, FAA ARFF Criteria



As with the current station deployment, the midpoints of all seven DFW runways are within three minutes' travel of an ARRF apparatus. All of the runways are within four minutes' travel of an ARFF apparatus. Examination of the 2016 incident data shows that all of the aircraft standby incidents occurred within three minutes' travel of at least one of the combined ARFF stations. Using the same travel time model as the previous figure, ESCI examines the ability of DFWAFS to assemble a full ARFF response based on the FAA criteria of three ARFF apparatus in four minutes.

Figure 94: Proposed Stations ARFF Response Effective Response Force (ERF)

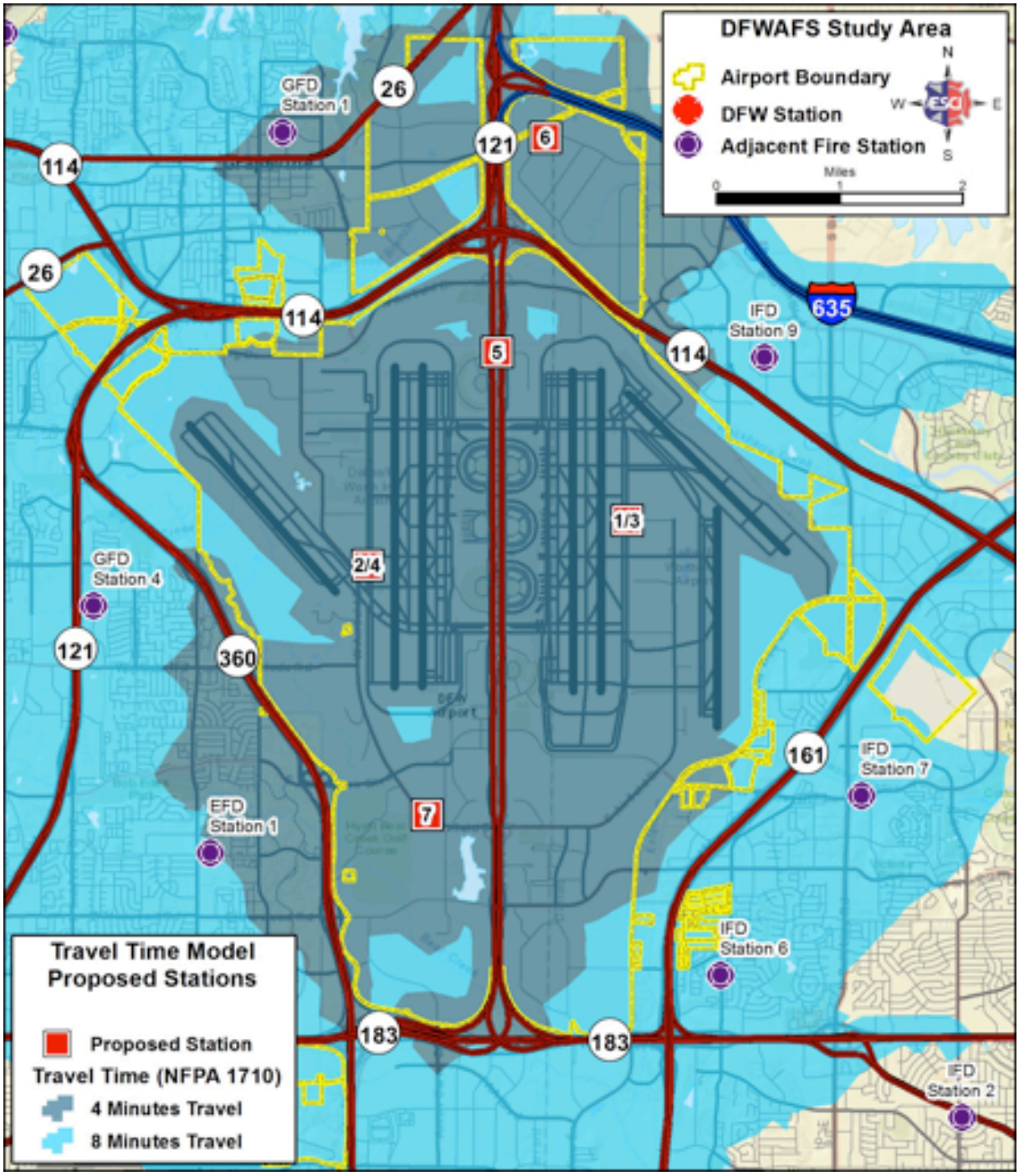


Currently, ARFF apparatus from two stations are required to meet the FAA operational guideline of three apparatus in four minutes. As displayed in the previous figure, the proposed deployment model provides four ARFF apparatus to the midpoint of the runways, from a single station, in three minutes' travel or less.

The following figures use the same street network data modeled in the Service Delivery Analysis in Current Conditions section of the report to examine potential travel time performance and the concentration of resources from the proposed station deployment model.

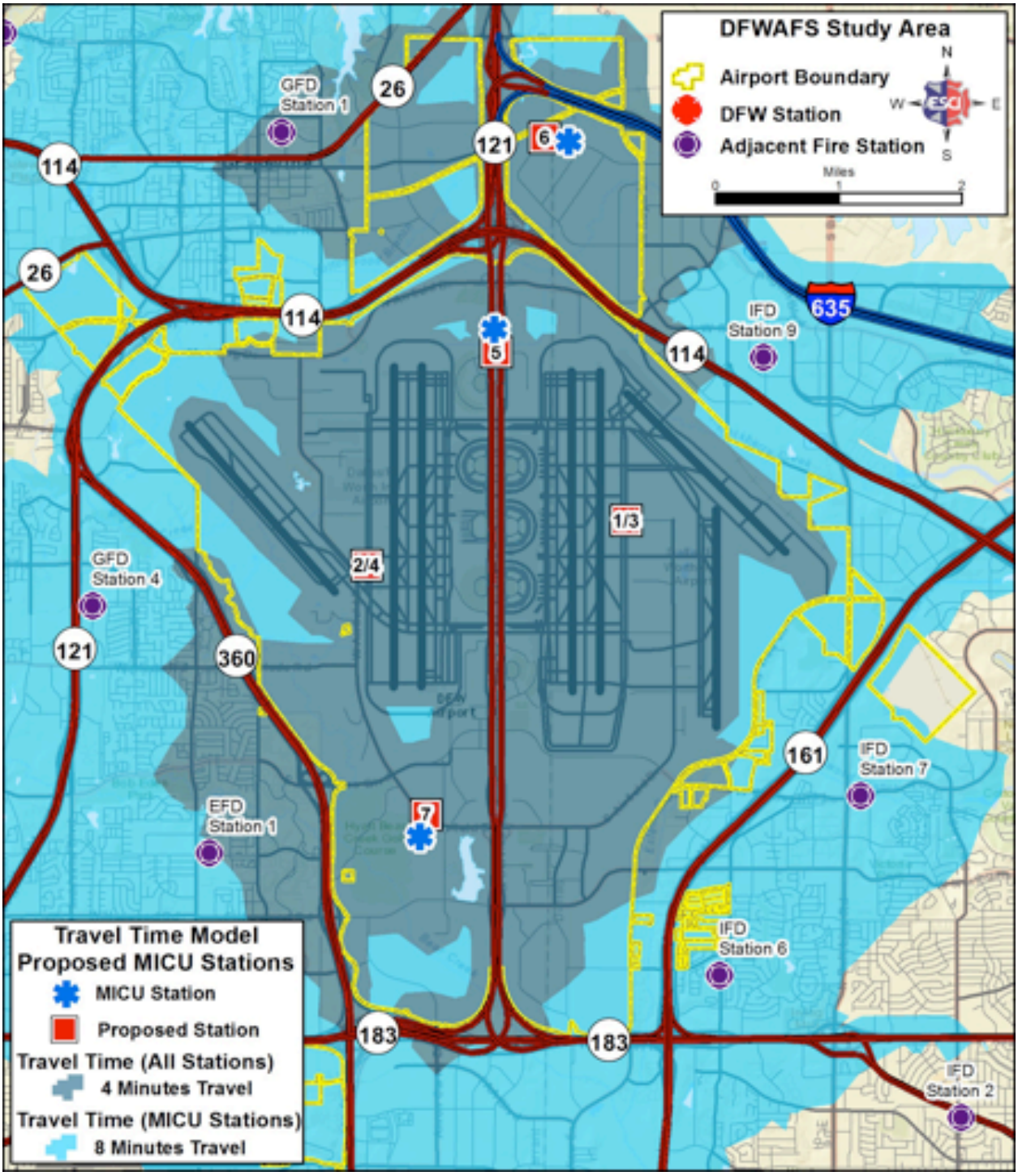
The NFPA 1710 standard recommends that the first fire department apparatus arrive in four minutes' travel time for fire and EMS emergencies. Additionally, NFPA 1710 specifies that the full first alarm assignment arrive at a fire suppression incident in eight minutes' travel or less. The NFPA standard states that an advanced life support (ALS) unit should arrive at the scene of an emergency in eight minutes, when ALS service is provided by the fire department.

Figure 95: Proposed Stations Travel Time Model, NPFA 1710 Criteria



The travel time model from the proposed stations displays a similar travel time footprint to the model displayed in travel time model from the current station locations. However, the location of the new Station 7 improves potential travel time performance in the southern portions of the DFWAFS service area (Passport Park, Bear Creek area). The proposed station distribution reaches nearly 100 percent of 2016 service demand in four minutes' travel or less. The following figure displays a proposed distribution of MICUs throughout the service area.

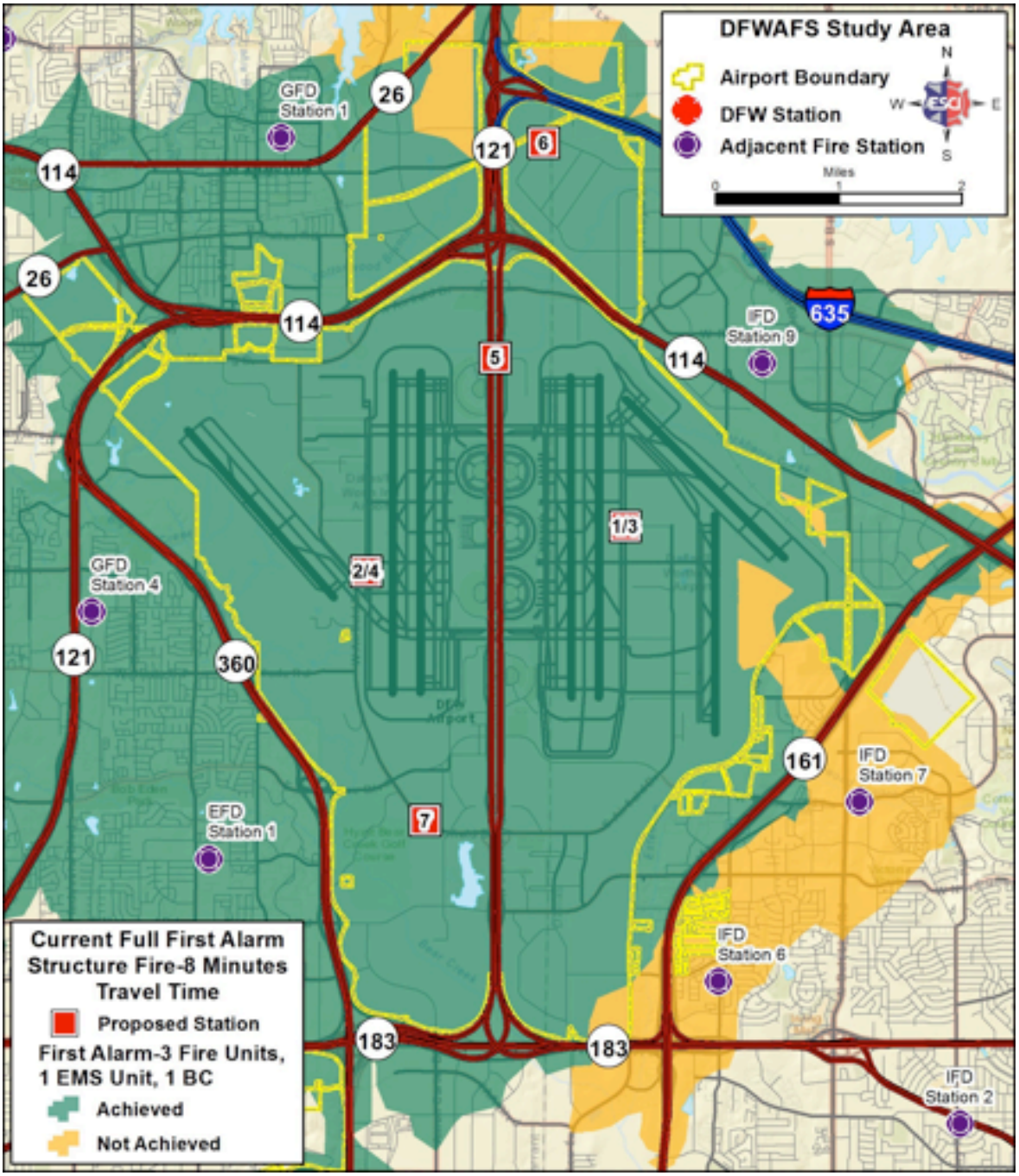
Figure 96: Proposed Stations Travel Time, MICUs



The proposed station deployment model provides good coverage for first responders throughout the service area. Moving the ALS MICUs from the current Station 5 location to the three locations indicated in this figure (Stations 5, 6, and 7) will improve the distribution of ALS resources throughout the service area. This configuration still provides good ALS EMS access to the terminal area; and will optimize coverage in the off-airfield portions of the service area slated for future development.

The following figure displays the portions of the DFWAFS service area within eight minutes' travel (NFPA 1710 standard) of full first alarm assignment for a structure fire from the proposed future station locations.

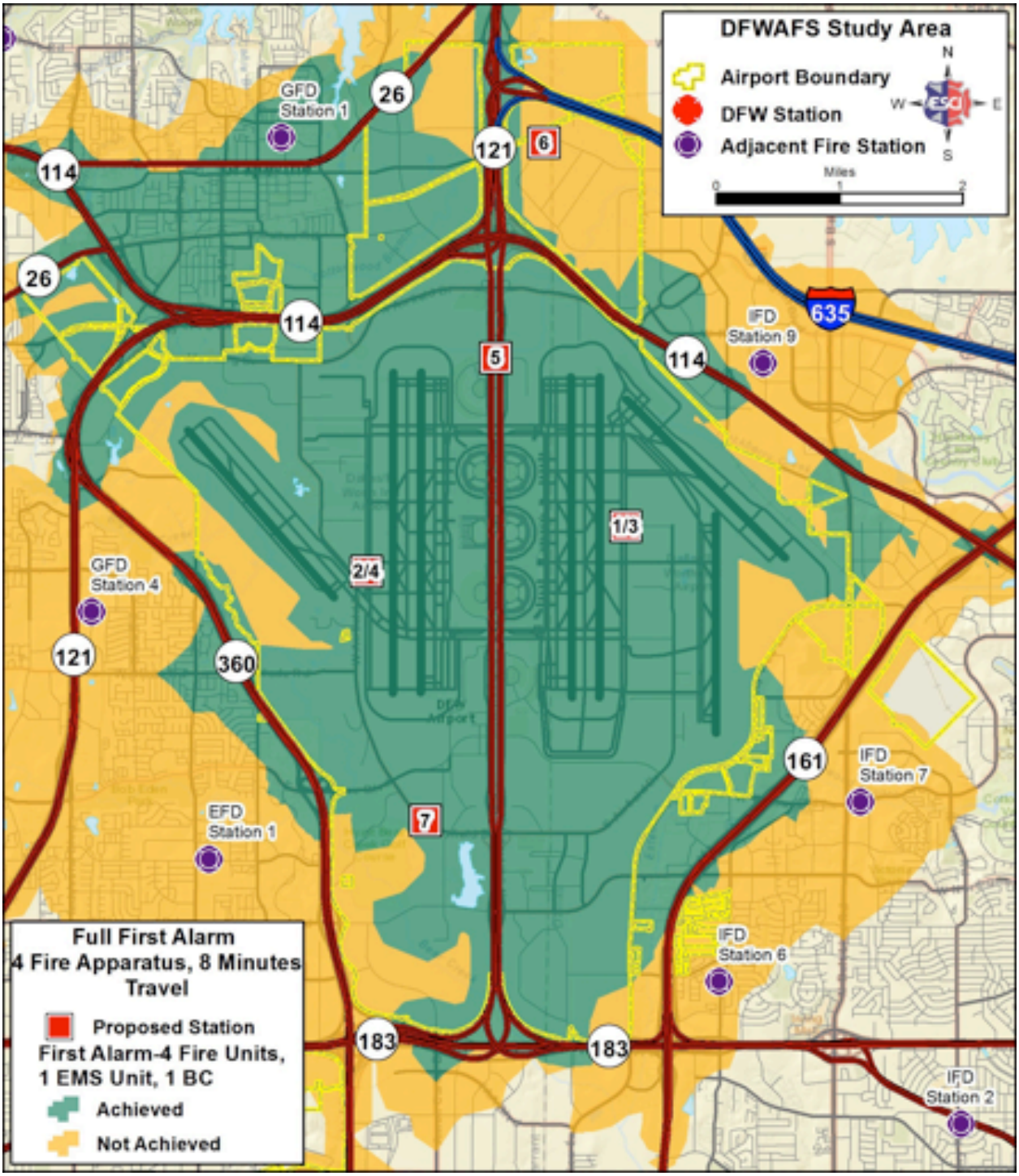
Figure 97: Proposed Stations Full First Alarm-Structure Fire



Relocating Station 5 to the north end of the terminal area and placing the new Station 7 at the location displayed provides a good distribution of structural resources necessary to assemble a full first alarm assignment for a structural fire response.

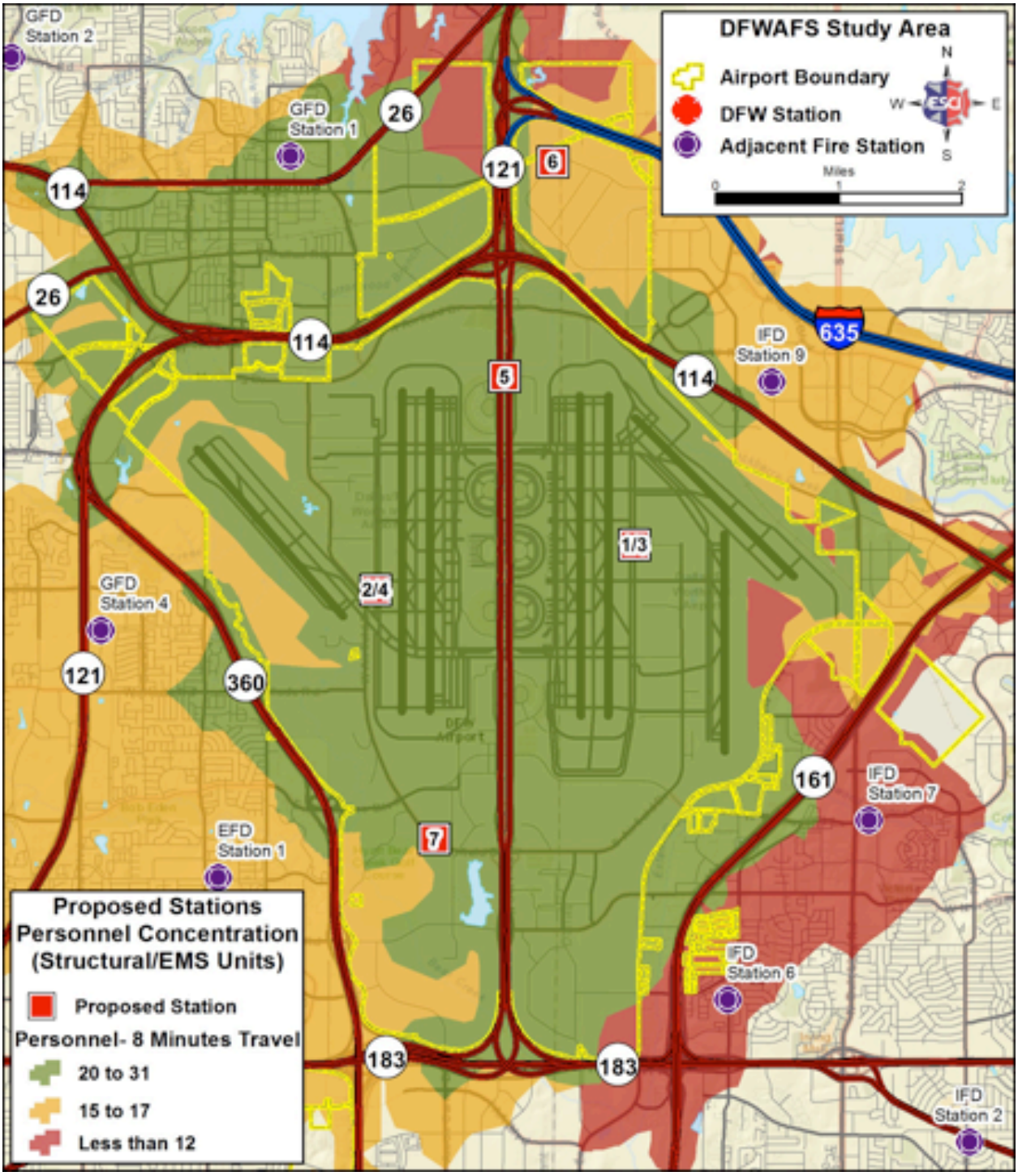
Note that the current first alarm assignment brings a total of 15 personnel to the scene of a fire incident. As discussed in the Risk Analysis, ESCI believes that the current first alarm assignment may not reflect the nature of the risk present in the DFWAFS. The following figure provides a proposed enhanced full first alarm structural fire assignment for the DFWAFS service area. This alarm assignment brings 19 personnel (four fire apparatus, one EMS unit, one battalion chief) to the scene of a structure fire.

Figure 98: Proposed Stations—Enhanced Full First Alarm (Four Fire Apparatus, One EMS Unit, One BC)



Adding an additional fire apparatus reduces the portions of the service area within eight minutes' travel of a full first alarm assignment, however the majority of the airport property is within eight minutes' travel of proposed alarm assignment. Exceptions include portions of the Bear Creek area, the area of the International Commerce Park, and the industrial area east of Highway 161. As discussed, adding an additional fire apparatus increases the minimum number of personnel on scene to 19. The following figure demonstrates the concentration of DFWAFS personnel (ERF) available within eight minutes' travel or less. Note that this analysis is based on the distribution of apparatus displayed in Figure 92: DFWAFS Proposed Station Deployment. Personnel assigned to ARFF apparatus are not included in this analysis; since ARFF apparatus and personnel must remain available for ARFF responses at all times.

Figure 99: Proposed Stations Personnel Concentration (Structural Response)

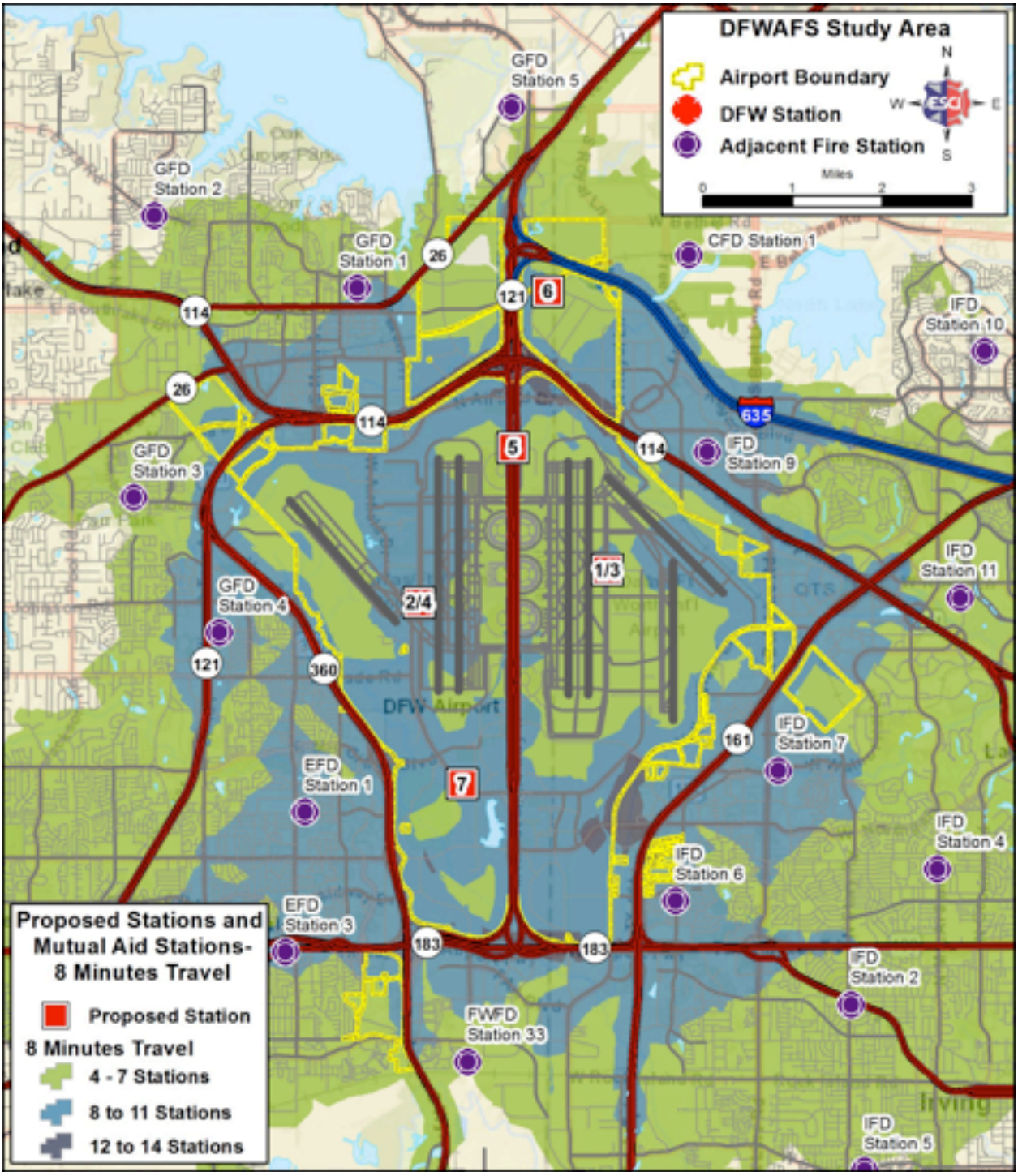


Based on a minimum staffing level of four personnel on structural fire apparatus and two personnel on EMS units, plus the two battalion chiefs; DFWAFS is capable of assembling an ERF of 20 to 31 personnel in the majority of the DFWAFS service area within eight minutes' travel time. Areas around the edge of the service area are within eight minutes' travel of 15 to 17 personnel.

Note that EMS personnel are included in the calculation of the ERF in this figure. Although EMS personnel are certified as firefighters, they are not fully integrated into DFWAFS fire suppression operations. Fully integrating EMS personnel into fire ground operations can enhance emergency operations on the scene of a fire event.

Up to this point the analysis of the proposed future station deployment has been confined to DFWAFS apparatus and personnel. As discussed in the Service Delivery analysis, the utilization of mutual or automatic aid resources is an effective strategy to increase the concentration of resources available to mitigate complex, higher risk incidents. In addition, appropriate automatic aid can improve response performance in boundary areas. The following figure displays the concentration of resources within eight minutes' travel of the DFWAFS service area.

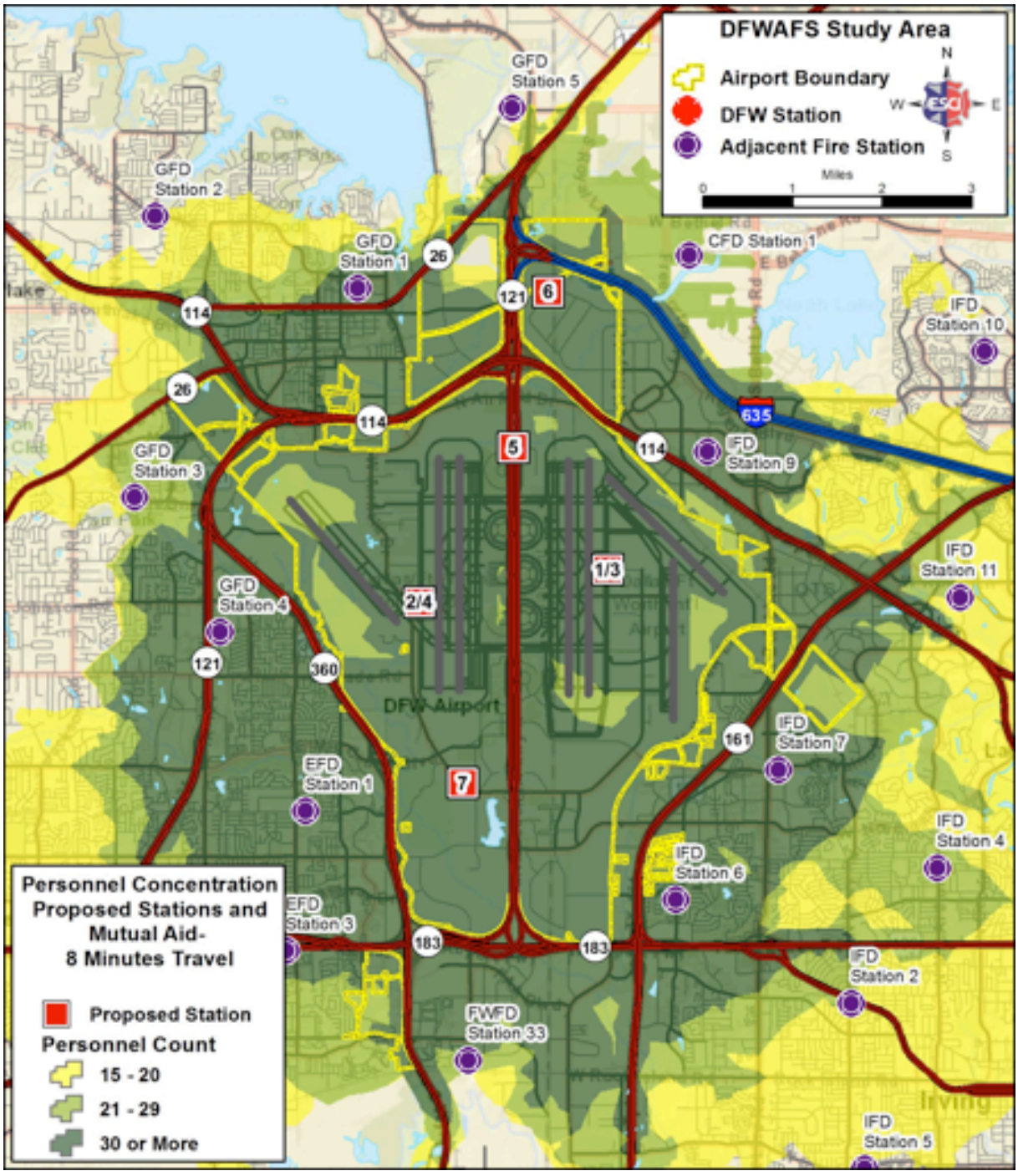
Figure 100: Proposed Stations and Mutual/Automatic Aid Stations



Five fire jurisdictions (Coppell, Euless, Grapevine, Irving, and Fort Worth) are adjacent to the DFWAFS service area. GIS analysis reveals that 18 staffed fire stations are within eight minutes' travel of some portion of the DFWAFS service area. These mutual aid stations plus the proposed five DFWAFS stations provides a concentration of up to 14 stations.

When mutual aid resources from these stations are available, these resources can significantly increase the number of personnel available to mitigate complex, higher risk incidents. In the following figure, ESCI assumes that at least one mutual aid apparatus staffed with four personnel is available to respond to a DFWAFS mutual aid request. Using the current staffing for DFWAFS structural apparatus, GIS software is used to model the concentration of DFWAFS and mutual aid personnel available in eight minutes' travel.

Figure 101: Personnel Concentration – Proposed Stations and Mutual Aid



As discussed in Figure 99, DFWAFS can assemble an ERF of 20 to 31 personnel in the core of the service area. The previous figure demonstrates that by utilizing mutual aid resources, more than 30 personnel are available in eight minutes' travel or less in the entire service area. Exceptions exist in areas where the road network is not developed. Examination of the GIS data reveals that 34 to 40 personnel are available in the central terminal area; 30 to 35 personnel can reach the Bear Creek area; and 44 to 50 personnel are within eight minutes' travel of Passport Park and Southgate Plaza.

By establishing automatic aid agreements whereby resources from adjacent jurisdictions are part of the first alarm assignment for specified incidents; DFWAFS can ensure that adequate resources are available to mitigate high risk incidents. The effectiveness of this type of automatic aid delivery system is dependent on computer aided dispatch (CAD) systems from participating agencies being connected and integrated. This seamless functionality is essential to ensure the required automatic aid units are available and can be dispatched without delay.

SHORT-TERM KEY RECOMMENDATIONS

The previous sections of this report detail a considerable volume of observations, comments, and recommendations relating to DFWAFS management and operations. The process of understanding, prioritizing and implementing the recommended enhancements can be daunting, simply due to the amount of work that may be involved. To help the organization navigate through the process, the following discussion defines the short-term priorities and combines all the key recommendations that ESCI has identified as part of the current conditions analysis in a single table. ESCI has included an easy to follow and track table format for use and consideration by the DFWAFS.

Short-Term Key Recommendations

Key Recommendations	Status		
	Started	50%	Complete
1. It is recommended that the DFWAFS provide quarterly performance, fire department master plan progress, and outcome data elements for review by the DFW Board of Directors. This report should be in the form of a visual dashboard with supporting documentation and submitted to the Vice President of DPS for distribution or presentation to the CEO and Board of Directors.			
2. Consider developing a long-range apparatus replacement schedule based upon life expectancy and usage by apparatus type and then moving to a replacement schedule over time where a uniform amount (plus inflation) of funding is budgeted each year for this recurring expense.			
3. Consider formal adoption of this master plan and completion of a strategic plan.			
4. Consider annual review of fire service strategic planning elements and ensure complete DFWAFS plan is adopted and utilized.			
5. SOPs should be reviewed annually for accuracy and compliance with mandates.			
6. Maintain and distribute minutes for weekly staff meetings.			
7. Consider periodic newsletter for DFW airport-wide distribution of DFWAFS news, trends, and safety education materials.			
8. Develop customer satisfaction survey link that can be given to customers/passengers served by DFWAFS.			
9. Facilitate the updating of the DFW annual “Employee Engagement Survey” to be more applicable and measurable based on DFWAFS and DPS standards and services.			

Key Recommendations	Status		
	Started	50%	Complete
10. Review regulatory documents annually to ensure accuracy and compliance.			
11. Consider separation of policies and procedures (policies administratively based) and SOGs (evolution and procedurally based).			
12. Secure hard copy files and documents in locked cabinets when office is not staffed.			
13. Consider periodic reports of performance and outcome to Airport Authority Board.			
14. Further automate the utilization of Telestaff including integration with Kronos personnel and time card documentation (eliminate the hard copy time card system).			
15. Implement a fully integrated records management system to include, fire, EMS, ARFF, fire prevention, and training data and records.			
16. Restore dedicated IT services for the DFWAFS to ensure adequate maintenance and integration of hardware and software.			
17. Ensure adequate Wi-Fi services are available in all HazMat and other special operations vehicles to optimize functionality and effectiveness.			
18. Pursue CAD-to-CAD interface with automatic aid dispatch centers to implement seamless alarm dispatch procedures.			
19. Consolidate and redistribute stations, personnel, and apparatus to meet build out population, customer/client load, and commercial/warehouse risk profile.			
20. Increase relief factor to decrease overtime to below 5% DFW Airport target.			

Key Recommendations	Status		
	Started	50%	Complete
21. Increase staffing to a two-person minimum on all ARFF apparatus.			
22. Fully integrate fire and EMS operations to have a seamless cross trained, dual role organization.			
23. Have BLS squad at Station 5 and respond from station versus posting at terminals to reduce negative impacts to suppression capabilities and the effective response force.			
24. Consider alternative staffing model of BLS squad by Community Risk Reduction Personnel (Fire Prevention) and future location of unit at terminal with a CRR office.			
25. Consider modification of trade policy to make it more permissive to reduce PTO utilization.			
26. Establish task books to sign off on minimum qualification to act as drive operator and captain.			
27. Implement upgrade pay program consistent with promotional pay scale.			
28. Review and adjust position salaries and specialty pay (e.g. paramedic) to address compaction, regional practices, and incentivize promotional participation.			
29. Utilize established FD entry level and promotional testing company to ensure competency based testing is administered in a way that is relevant, consistent, and fair.			
30. Have CDD take the lead and establish a succession planning/leadership development committee to develop and implement a succession and leadership development plan.			

Key Recommendations	Status		
	Started	50%	Complete
31. Adopt and implement a wellness and fitness initiative utilizing CPAT entry level physical ability testing and annual incumbent physical ability testing and medical exams in compliance with NFPA 1582 standards.			
32. The DFWAFS Career Development Division (CDD) should conduct all training, education, certification and oversight of all DFWAS fire, EMS, and ARFF training.			
33. The Career Development Division should produce, distribute, and monitor all annual, quarterly, and monthly training plans and maintain records and tracking of mandates and topics.			
34. The Career Development Division should have designated suppression, EMS, and ARFF apparatus and equipment to limit the amount of in service equipment utilized during non DFWAFS training.			
35. Develop and implement a comprehensive EMS integration and training program.			
36. CDD to coordinate EMS training in coordination with the medical director.			
37. Conduct integrated fire and EMS training and combined ALS/BLS scenarios.			
38. Develop a functioning EMS training lab with computer and advanced mannequin training resources.			
39. Host suppression, HazMat, rescue, and other regional training classes in addition to ARFF training.			
40. Develop and deliver dual role cross training for all DFWAFS EMS personnel.			
41. Upon consolidation of ARFF stations, consider utilization of old Station 4 for training, housing, and 24/7 training capabilities for customers purchasing training from DFWAFS.			

Key Recommendations	Status		
	Started	50%	Complete
42. Develop a strategic plan during calendar year 2017.			
43. Establish a capital replacement schedule for fire apparatus and equipment.			
44. Cross train fire and EMS personnel for use in either discipline, as needed.			
45. Encourage the medical director to conduct periodic ride-alongs with EMS units.			
46. Conduct routine case reviews on a regular basis, randomly reviewing any cases, not limited to critical or problem incidents.			
47. Establish a routine practice of review of patient transport refusal reports.			
48. Consider including Advanced Cardiac Life Support (ACLS) training in continuing education			
49. Consider adding HazMat Safety Officer certification to special operations training.			
50. Establish standard operating guidelines for technical rescue disciplines.			
51. Establish defined response protocol for Technical Rescue Team deployment.			

MID TO LONG-TERM RECOMMENDATIONS

The short and mid-term strategies discussed will move the organization forward substantially. A longer-term, high-level view of future needs is also important to provide a "big picture" view of how the organization needs to continue with future initiatives. Primarily, long-term strategies are centered around community growth and related workload and how both impact the future deployment of fire stations and personnel.

The following mid and long-term recommendations based on the evaluation of current conditions contained within this report are achievable in the mid-term; typically, within a maximum of 10 to 15 years. However, given the rapid pace of growth and increased service demand within the DFWAFS service area, it is anticipated that these mid- to long-term recommendations will need to be addressed within five to seven years.

Recommendation 1: Consideration of a 52-Hour versus 56-Hour Workweek Staffing Model.

ESCI recommends the DFWAFS consider several presented options regarding staffing levels and shift schedules to address the identified staffing and FTE counts to ensure optimized efficiency and service delivery capabilities. In addition, ESCI has also provided short-term deployment and service delivery recommendations that will enhance current capabilities.

ESCI has provided the following analysis and recommendations/options to address the staffing issues being impacted by the identified drivers in the current conditions section of this report. ESCI has analyzed each staffing issue using the current 52-hour work week in addition to a 56-hour work week option for consideration.

A 56-hour work week is an option available to the DFWAFS under the FLSA 7K exemption currently utilized under the existing work schedule. A 56-hour work week schedule will put DFWAFS in sync with the neighboring and comparable departments within the DFW metroplex region. A 56-hour shift schedule will provide an additional four hours per employee per week. The 56-hour shift schedule requires the fewest number of FTEs to fill the number of required positions on each 24-hour shift of any schedule available (minimum total number of department staffing under 52-hour work week is 130, while it would be 120 under a 56-hour work week). This minimum total number of employees covers the basic work hours for a minimum staffing of 40 positions per day. These staffing levels do not account for any leave of absence or other vacancies, meaning any vacancy would be filled using overtime. A detailed analysis of appropriate relief factors to account for and offset overtime amounts is included later in this report.

A net reduction in the overall number of additional personnel needed to fill sick/vacation openings to maintain minimum staffing—the desired relief factor—is achieved based upon the additional hours gained at no additional cost in compensation. With a slight reduction in the total number of employees needed to meet the desired relief factor, the department is further ahead in reducing the overtime needed to cover vacancies. With some basic adjustments to department policy, current leave allowances, trade policies, and platoon assignments can be maintained utilizing the 56-hour work week option. Overall annual compensation would remain the same for each firefighter, but the hourly rate would change. The starting point for the analysis was to determine the minimum number of personnel needed to fill the minimum 40 daily staffing positions for fire and EMS operations. This first analysis does not consider an established relief factor that is addressed in the next element:

- 365 days per year x 24 hours per day = 8,760 hours per year of necessary coverage per position for all 365 days in the year.
- 8,760 hours of coverage per position per year x (40) minimum positions = 350,400 hours per year, that must be staffed for 24/7 coverage.
- A 52-hour work week equals 2,704 scheduled hours per position annually:
  350,400/2,704 = 130 FTE positions needed to fill the 40 daily minimum staffing requirement.
  On the 52-hour week schedule, this number exceeds the minimum staffing number of 120 FTE (40 needed daily x 3 shifts) because of Kelly days and short shifts.
- A 56-hour work week equals 2,912 scheduled hours per position annually:
  350,400/2,912 = 120 FTE positions for minimum staffing.

The next staffing factor to be analyzed is the "relief factor," or the amount of additional FTE positions that need assigned to fire operations and EMS to reasonably cover vacancies and "approved time off," including leave, training, vacancies, etc. The following is an industry-accepted methodology used to determine a relief factor to adequately cover paid leave, training time off, and vacancies for 24-hour fire department shifts.

Fifty-Two-Hour Relief Factor:

- The average of DFWAFS 2014 and 2015 fire and EMS operations paid leave, time off for training, unscheduled time off, and position vacancies is 81,102 hours annually. Note that if all the department's operationally budgeted FTE positions are filled, the average annual department leave hours would be somewhat reduced. Therefore, the following analysis slightly overestimates the relief factor needed to maintain minimum staffing.
- 81,102 hours = 3,379 days (24-hour shifts) that need to be filled to account for leave or vacancies annually.
- 3,379 days/shifts divided by the 130 employees needed for minimum staffing on a 52-hour work week = an average of 26 days/shifts of leave per employee (FTE) per year.

- Subtract the average 26 days/shifts of leave from the 113 scheduled shifts for a 52-hour week (2,704 annual hours/24 hours/shift) = 87 on duty shifts annually per FTE.
- Divide the 113 scheduled shifts by the 87 on duty shifts = a relief factor of 1.30 for fire and EMS operations. This relief factor then requires a total of 169 FTE positions or 39 FTE positions over the required 130 minimum staffing and 17 FTE positions over the current 152 FTEs budgeted for fire and EMS operations staffing levels. This level of staffing will minimize overtime created as a result of paid and scheduled leave.

Fifty-Six-Hour Relief Factor:

- The average of DFWAFS 2014 and 2015 fire and EMS operations paid leave, time off for training, unscheduled time off, and position vacancies is 81,102 hours annually.
- 81,102 hours = 3,379 days (24-hour shifts) that need to be filled to account for leave or vacancies annually.
- 3,379 days/shifts divided by the 120 employees needed for minimum staffing on a 56-hour work week = an average of 28 days/shifts of leave per employee (FTE) per year.
- Subtract the average 28 days/shifts of leave from the 121 scheduled shifts for a 56-hour week (2,912 annual hours/24 hours/shift) = 93 on duty shifts annually per FTE.
- Divide 56-hour work week, 120 scheduled shifts by the 93 on duty shifts = a relief factor of 1.29 for fire and EMS operations. This relief factor then requires a total of 155 FTE positions or 35 FTE positions over the required 120 minimum staffing and 3 FTE positions over current 152 FTEs budgeted for fire and EMS operations staffing levels. This level of staffing will minimize overtime created as a result of paid and scheduled leave.

The next figure is the total FTE positions needed to cover the DFWAFS minimum staffing model with the necessary relief factor to cover leave, training, and vacancies in the Fire Operations and EMS Divisions.

Fifty-Two-Hour Staffing versus Current Budgeted FTE:

- DFWAFS needs 169 fire and EMS operations personnel to achieve the 1.30 relief factor and currently has 152 fire and EMS operational FTEs available. Therefore, the net additional need is 17 FTEs.

Figure 102: 52-Hour 1.30 Relief Factor FTE Positions

Fire Operations	FTE	EMS Operations	FTE	Current Total	1.30 Relief	New Total
Battalion Chief	6*	Battalion Chief				
Captain	21	Captain	3	24		24
FF/Driver	48			48		48
Firefighter	52			52		52
		Firefighter Paramedic	28	28	17	45
TOTAL	**121**		**31**	**152**	**17**	**169**

*Battalion Chiefs are not included in staffing number based on limited overtime impact.

Fifty-Six-Hour Staffing versus Current Budgeted FTE:

- DFWAFS needs 156 fire and EMS operations personnel to achieve the 1.30 relief factor and currently has 152 fire and EMS operational FTEs available. Therefore, the net additional need is 3 FTEs.

Figure 103: 56-Hour 1.29 Relief Factor FTE Positions

Fire Operations	FTE	EMS Operations	FTE	Current Total	1.33 Relief	New Total
Battalion Chief	6*	Battalion Chief				
Captain	21	Captain	3	24		24
FF/Driver	48			48		48
Firefighter	52			52		52
		Firefighter Paramedic	28	28	3	31
TOTAL	**121**		**31**	**152**	**3**	**155**

*Battalion Chiefs not included in staffing number based on limited overtime impact.

Based on the minimum staffing and relief factor analysis and the risk profile and service delivery analysis, ESCI has identified several staffing adjustments that will assist the DFWAFS in meeting the current and future risk and service demand profile. These staffing adjustments have been displayed for a fifty-two and fifty-six-hour work week for each identified service delivery recommendation.

Recommendation 2: Staffing ARFF Units with Two Personnel.

Staff all ARFF units with a minimum of two personnel. These ARFF units are currently responding with one-person per apparatus. These units respond to aircraft emergencies at significant speeds crossing runways, navigating around airport traffic, and conducting 15–17 individual actions within the cab of the vehicle to initiate airport rescue firefighting procedures. Having a second person on the vehicle will allow for safer operations and protect DFWAFS personnel, airport staff, and passengers. Two-person staffing on ARFF units is the established industry best practice and utilized by the comparable airport fire departments benchmarked in this report.

DFWAFS is currently staffing eight ARFF units daily, four on the west runways and four on the east runways. Once the determination of hourly schedule is decided, increasing the daily staffing from one to two personnel will require the addition of eight minimum staffing positions daily. Filling eight ARFF response positions per day, requires 26 FTE positions on a 52-hour work week and 24 FTEs on a 56-hour work week for three shift “minimum” coverage. Utilizing the relief factors calculated above, DFWAFS will need to add 34 personnel on a 52-hour work week and 31 personnel on a 56-hour work week to achieve two-person staffing on all ARFF units while offsetting overtime costs due to approved and planned leave.

- 8,760 hours of coverage per position per year x eight minimum positions per day = 70,080 hours a year that must be staffed for a second person on eight ARFF units providing 24/7 coverage.
- A 52-hour work week equals 2,704 scheduled hours per position annually: 70,080/2,704 = 26 FTE positions for a minimum number of positions to meet a daily staffing of eight ARFF positions to cover Kelly days and short shifts.
- Accounting for the relief factor of 1.30 means that a total of 34 additional FTE positions will need to be added on a 52-hour work week.
- A 56-hour work week equals 2,912 scheduled hours per position annually: 70,080/2,912 = 24 FTE positions for minimum staffing.
- Accounting for the relief factor of 1.29 means that a total of 31 additional FTE positions will need to be added on a 56-hour work week.

ESCI recommends staffing these ARFF units as soon as possible. This is a significant safety issue for DFWAFS personnel, as well as airport staff and passengers. The following figures display example staffing increase options for three, five, and seven years for 52 and 56-hour work week schedules, for consideration.

Figure 104: Notional 52-Hour Staffing Hiring Schedule

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Three Year	10 FTE	12 FTE	12 FTE				
Five Year	6 FTE	6 FTE	7 FTE	7 FTE	8 FTE		
Seven Year	3 FTE	4 FTE	4 FTE	5 FTE	5 FTE	6 FTE	7 FTE

Figure 105: Notional 56-Hour Staffing Hiring Schedule

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Three Year	9 FTE	10 FTE	12 FTE				
Five Year	5 FTE	6 FTE	6 FTE	7 FTE	7 FTE		
Seven Year	3 FTE	4 FTE	4 FTE	5 FTE	5 FTE	5 FTE	5 FTE

Recommendation 3: Increase Relief Factor to Reduce Overtime.

The DFWAFS fire chief and executive staff advised ESCI that the corporate policy of the DFW is to maintain overtime costs at five percent or less of the salaries and wages budget. ESCI has noted that the current overtime percentage of eight to nine percent is consistent with similar 24/7 fire service staffing models. To meet the five percent target of the airport administration policy, ESCI recommends consideration of the following relief factor to reduce overtime costs.

ESCI recommends maintaining the needed FTEs to achieve the appropriate relief factor. This will reduce current excessive overtime expense due to coverage of vacancies below the five percent threshold, better cover for allowed leave utilization, and reduce excessive hours worked. ESCI has analyzed the current 52-hour shift schedule and identified several complexities and leave utilization trends that contribute to increased overtime costs. It is also noted that DFWAFS pay and benefit comparisons to determine salary ranges are based in large on comparable departments that work a 56-hour work week. This comparison inflates DFWAFS salaries versus comparable hourly and monthly pay rates.

This analysis assumes the current FLSA schedule stays the same and hourly rates change to reflect the adopted work week schedule. Thus, the overall annual compensation per employee remains the same.

ESCI has provided a detailed operational and financial analysis of the current 52-hour work week and a possible 56-hour work week that will provide for easier administration and increased four hours of work per FTE weekly, reduced sick leave utilization, and a slightly reduced FTE count to meet the relief factor calculated above. In either case, moving toward a 1.30 relief factor will require an increase in staffing levels. On the current 52-hour work week schedule, an additional 17 FTEs are required to meet the 1.30 relief factor. If DFWAFS were to convert to a 56-hour work week schedule, only three additional FTEs would be needed to achieve a 1.29 relief factor.

If DFW were to fill to the complete 1.30 relief factor, a large portion of the unscheduled overtime costs related to vacancies would be eliminated. Currently, DFWAFS overtime budget is at approximately 8.6 percent of the total salaries and wages budget. It is ESCI's understanding of DFW's administrative policy that overtime should not exceed five percent of the salaries and wages budget. Taking this into consideration, if DFWAFS were to implement the recommended relief factor, overtime costs should fall below the five percent target threshold.

NOTE: The new FTEs necessary for relief factor coverage will be partially offset by overtime reductions. The total relief factor based on 1.30 is 17 FTEs on a 52-hour work week and three FTEs on a 56-hour work week.

Figure 106: Five Percent Overtime Relief Factor Hiring Schedule

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
52-hour—Three Year	3 FTE	7 FTE	7 FTE				
56-hour—Three Year	1 FTE	1 FTE	1 FTE				
52-hour—Five Year	4 FTE	4 FTE	4 FTE	4 FTE	1 FTE		
56-hour—Five Year	1 FTE	1 FTE	1 FTE				
52-hour—Seven Year	2 FTE	2 FTE	2 FTE	2 FTE	3 FTE	3 FTE	3 FTE
56-hour—Seven Year	1 FTE	1 FTE	1 FTE				

Recommendation 4: Initiate an automatic aid agreement with the Irving Fire Department (Phase I); Staff an additional EMS Squad (Phase II); and add an additional station with relocated engine company from Superstation 1/3 for southern airport coverage (Phase III) to address southern airport commercial/warehouse expansion in the Passport Park Development Area.

It is recommended that DFWAFS utilize a phased approach to providing fire and EMS services to the southern development area of the airport. ESCI feels this approach will adequately address the fire and emergency service delivery needs of this area while allowing for corresponding revenue and capital resources to be funded and completed.

Phase I: Establish an automatic aid agreement with the Irving Fire Department for response as part of a first alarm structural assignment to the Passport Park development area. This response will be in addition to assigned DFW Airport units and should reduce response from DFWAFS northern stations. This will also ensure an effective response force is dispatched and can arrive in accordance with DFW adopted structural response time standards. EMS responses during construction can be handled by existing DFWAFS Station 5. ESCI recommends that automatic aid be reciprocal with response by DFW resources to Irving and structured in a cost neutral manner.

Phase II: Upon occupancy of the Passport Park development, ESCI recommends the staffing of an additional EMS squad for response from Station 5 to cover EMS and first due responses to the Passport Park development and southern airport areas, as determined needed based on population, building type, and risk profile.

Phase III: Upon adoption of the ESCI fire service master plan station location and resource distribution recommendations; combined with the following "permanent station action criteria" being reached, build and staff a new southern fire station in accordance with DFW fire station and equipment standards. Based on initial evaluation, this is likely to be a relocation of existing station and apparatus (engine and ambulance) and *may not* result in additional station, apparatus, or personnel.

Response Time Thresholds and Triggers—When Is a New Station Needed?

When a community creates a fire department and builds its first fire station, a response time criterion is usually established. This response time anticipates that it applies to 100 percent of the area covered by the boundaries of that fire station. This is especially true when there is only one fire station and a small area to cover. Simply speaking, a central fire station is among the first public buildings created in most communities, no matter the size. As the community grows away from that station in incremental steps, the expectation is that the original fire station will still provide adequate coverage.

When a New Station or Response Resource is Needed

The question that many fire agencies must address is when is a fire station, additional response resource, or alternative response program required to meet time goals? The problem comes in finding a quantifiable threshold to determine that point for each specific situation, because it varies from community to community and even within a specific jurisdiction. The overall answer is part financial and part professional judgment. In fact, in the literature of the fire service today, there is very little definitive guidance on how this should be accomplished.

There are several steps that can be identified. They consist of:

- Identifying areas with minimum coverage;
- Identifying feasible locations for a new facility or response resource; and
- Evaluating those locations using specific criterion.

Further, decisions about whether or not to add resources, and the timing of those decisions, needs to be based on verifiable data and performance measures. If there is a problem with response performance and coverage, it should be documented and tracked over time. The first step in doing so is to establish appropriate standards of response and response time targets. The targets are measurable. An example of common benchmark time standards used is:

- Alarm processing time — 60 seconds
- Turnout time — 90 seconds
- Travel time
  - Fire response — five minutes, 90 percent of the time
  - BLS response — five minutes, 90 percent of the time
  - ALS response — eight minutes, 90 percent of the time

Once established, response performance is monitored and documented. When failures occur, or when other measures indicate response compromise, modifying resource deployment or adding resources is called for. The point is that the decision is made based on quantifiable measures.

In addition to the time-based standards listed, other measures should be combined to properly develop a response performance picture. One is “call concurrency,” that is, a measure of how frequently incidents in a response area occur at the same time as another emergency. If call concurrency is trending upward, workload (incident volume) may be increasing to an unacceptable level. Another measure is “unit hour utilization” which is simply a process of tracking how often each response unit is unavailable because it is committed to another call. Again, if unit hour utilization is increasing over a period, resources are being stretched.

As growth and development extends beyond the range of travel time of one station, the percentage of calls that exceed the performance requirement should begin to increase. It should be noted that growth, in and of itself, does not create an instantaneous demand. New construction has the advantage of better codes, a higher level of owner interest, and limited deterioration of fire-breeding conditions.

Based upon actual response time analysis, one threshold for consideration is the increase in alarms and the percent of calls handled under the criterion adopted. Anything more than a ten percent increase in calls and a ten percent reduction in performance is a signal to evaluate the level of services provided. In general, if more than one measure is slipping, an evaluation of all Standards of Coverage factors, is required. A one-year snapshot may not be valid if the agency had a big storm or catastrophic weather event, such as a major wildland fire, and stacked a bunch of calls for just a month of the year. What should be noted is that being slightly out of the response standard range does not automatically trigger a new facility or additional response unit from an existing facility.

One industry threshold for additional response capabilities should be to provide a new fire station or additional response unit into the appropriate zone in the city or jurisdiction that has more than 35 to 50 percent of its parcels developed. Some of the secondary measures currently being used are 300 to 500 calls for service for any individual fire company, or a service population of 10,000 to justify a full-time paid company or response unit. The following criterion grid illustrates a series of measures that may be useful in deciding when a new fire station or additional response unit should be deployed within a city. Similar grids should be developed to help establish triggers for the deployment of additional emergency equipment and personnel in the DFW Airport response areas that are difficult to currently serve and areas experiencing significant development.

- DFW Airport Fire Station 1 and 5 are approximately 3 miles to the Hwy 183 border.
- DFW Airport Fire Station 7 will be approximately 1 mile from the Hwy 183 border.
- As of February 15, 2017, five (5) 250,000 square foot warehouses are proposed on the Hwy 183 frontage road between “County Line Road” and Valley View Lane.

Figure 107: Criterion Grid to Determine When a New Station Is Needed

Action Choices	Travel Distance	Criterion		
		Response Time Parameter	Out of Area Calls	Building/Risk Inventory
Maintain status quo	All risks within 1.5 miles	1st due company is within 5 minutes' total response time, 90 percent of the time.	100 percent in first due area	Existing inventory and infill
Temporary facilities and minimal staffing	Risks 1.5 to 3.0 miles from existing station	1st due company exceeds 5 minutes' travel time 10% of the time, but never exceeds 8 minutes.	More than 10% of calls are in adjacent area	New area has 25% of same risk distribution as in initial area
Permanent station needed	Risk locations exceeding 4.0 miles from the station	1st due company exceeds 5 minutes' travel time 20-25% of the time. Some calls < 8 minutes.	More than 20–25% of calls are in outlying area	New area has 35% of same risk distribution as in initial area of coverage
Permanent station essential	Outlying risk locations exceeding 5.0 miles from the 1st station	1st due company exceeds 5 minutes' travel time 30% of the time. Some calls < 10 minutes.	More than 30% of calls are in outlying area	New area has 50% of same risk distribution as in initial area

The decision process has to be placed into the context of staffing pattern decisions. It is not uncommon to have a station constructed and have the staffing patterns utilizing alternative response options evolve over years from one system to another. In the case of a station or alternative response resource under consideration, it should be anticipated that a policy decision need to be made with respect to the staffing system to be used as soon as possible. Conversely, a fully staffed paid company has a significant price tag. A combination staffing system would seem to be the most practical for the first five years of consideration.

ESCI has spent a significant amount of time analyzing the existing response capabilities of the DFW Airport Fire Services and looking at the distribution and concentration of resources to ensure optimized positioning and response capabilities. In the short term, ESCI recommends DFW Airport consider an alternative means of providing coverage on an incremental/phased basis. For example, while the development of the Passport Park and the southern airport area is likely to result in the need for a future fire station, the need will become incrementally more apparent over time. It may be appropriate to implement automatic mutual aid response in that area, until the development is further built out.

ESCI's experience has been that it takes multiple elements of the standards of coverage to be out of balance, along with having additional economic resources to justify an additional paid company or staffing increase on one or more companies.

The following phased approach is worthy of consideration utilizing the above-mentioned criteria to determine the timing and implementation of the following phases.

Recommendation 5: Establish Automatic Aid Agreements with CAD Links and Seamless Alarm Response Districts with Irving, Euless, Coppell, Fort Worth, and Grapevine Fire Departments.

The current initial response assignments within the DFWAFS service area includes only on site DFWAFS apparatus with requests for mutual aid made through the corresponding county mutual aid programs. These mutual aid requests have built-in delays of 90 seconds or more due to the lack of CAD integration and individual agency coordination and approval of the response.

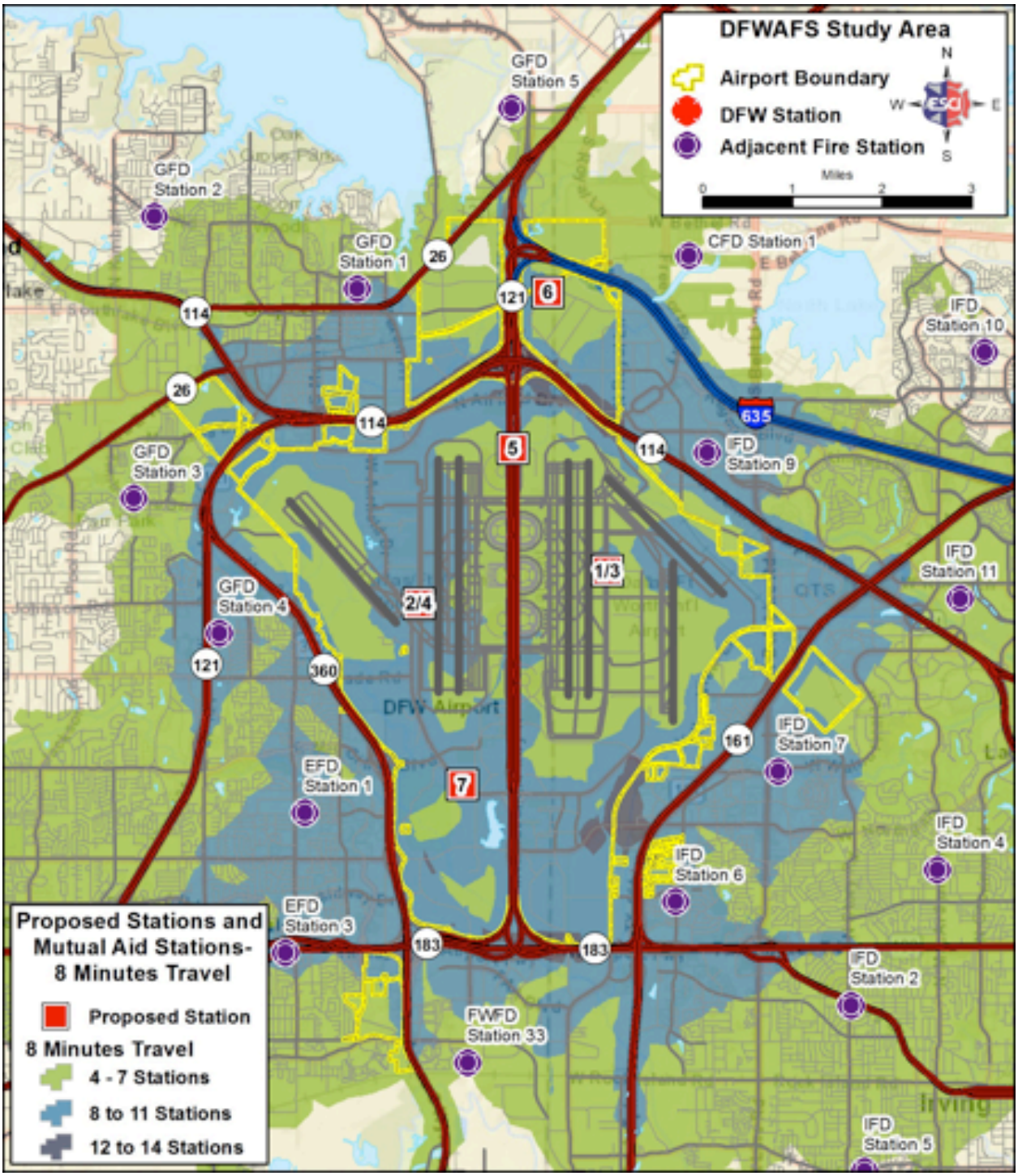
ESCI noted in a previous section that the risk profile of the buildings and uses of the DFW Airport warrant a significant or high-risk fire and large-scale disaster response that is best accomplished in partnership with surrounding fire jurisdictions. This approach will allow for a quicker assembly of an effective response force and significantly enhance the efficiency and effectiveness of responses into the DFW airport, as well as increase assistance by the DFWAFS to the surrounding jurisdictions.

ESCI recommends the automatic aid agreements be built around a seamless alarm and run card system that sends the closest and most appropriate units to the emergency. This level of integration and automation will need to be administered through a CAD-to-CAD link with each of the jurisdictions to ensure accurate system status, unit availability, and immediate dispatch as part of an alarm/run card assignment.

ESCI recognizes these automatic aid and CAD-to-CAD link agencies are in multiple counties and have different/disparate CAD and communication systems. While this will add significant operational, political, and administrative complexity to addressing this recommendation, ESCI feels a detailed operational plan and incremental approach can achieve significant response time and operational enhancements. This project can also serve as a catalyst to encourage and identify better integrated and standardized regional efforts in the areas of dispatch, CAD, communication systems, and automatic aid participation.

The following figure demonstrates the large amount of available resources that are within an eight-minute travel time to the DFW Airport. With the exception of the terminals and runway areas, 8 to 14 stations from adjacent jurisdictions can be utilized as part of an effective response force.

Figure 108: Mutual Aid Effective Response Force



Recommendation 6: Consolidation and Relocation of DFWAFS Station 1/3 and 2/4 into East and West ARFF Super Stations; and Relocation of Station 5 to the North of the Terminal Area.

Currently there are two ARFF response stations located on the east side of the airport (stations one and three) and two on the west side of the airport (stations two and four). These stations provide reasonably good coverage to the runways and airfield response area. Structural response units reside in each station and have some limitations and delays in response to the general airport area. By consolidating stations one and three and two and four into two (2) superstations—one on the east and one of the west side—there will be enhanced response capabilities and reduced response times.

Currently, ARFF apparatus from two stations are required to meet the FAA operational guideline of three apparatus in four minutes. As displayed in the figures on the following pages, the proposed deployment model provides four ARFF apparatus to the midpoint of the runways, from a single station, in three minutes' travel or less.

In addition, ESCI recommends the relocation of Station 5 to the north end of the terminal area. This relocation will result in enhanced structural and EMS coverage to the north end of the airport property as well as access to the terminal area. This station relocation will also allow the construction and expansion of a future F terminal in area Station 5 is currently located.

The following figure is an example of an ARFF-based superstation that can serve the ARFF, as well as the structural and EMS responses of the DFWAFS. The additional two figures show the proposed new station locations and apparatus assignments for DFWAFS, and the improved ARFF response capabilities from the new station locations.

Figure 109: DFW Superstation Concept

Figure 110: DFW Future Station Deployment

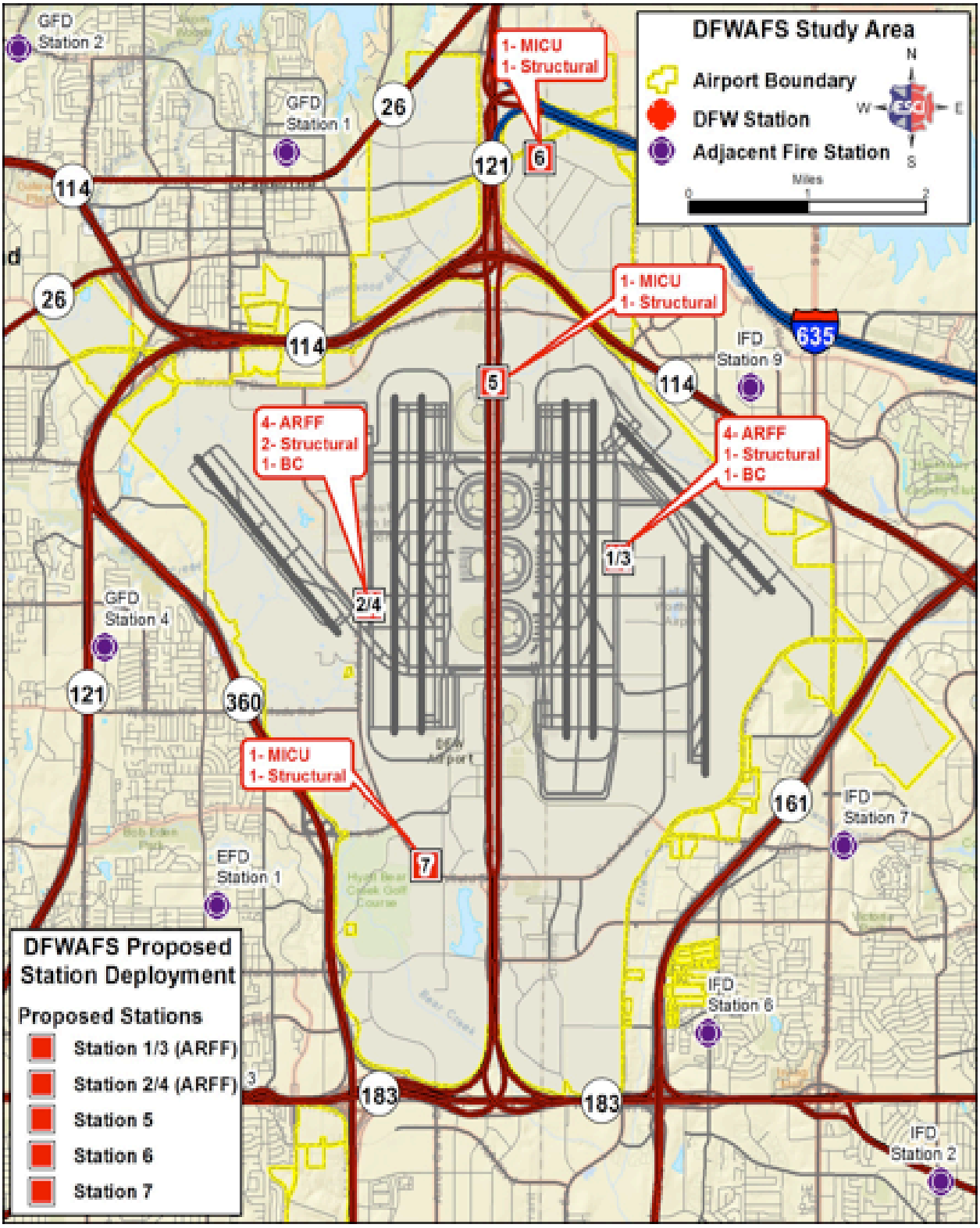
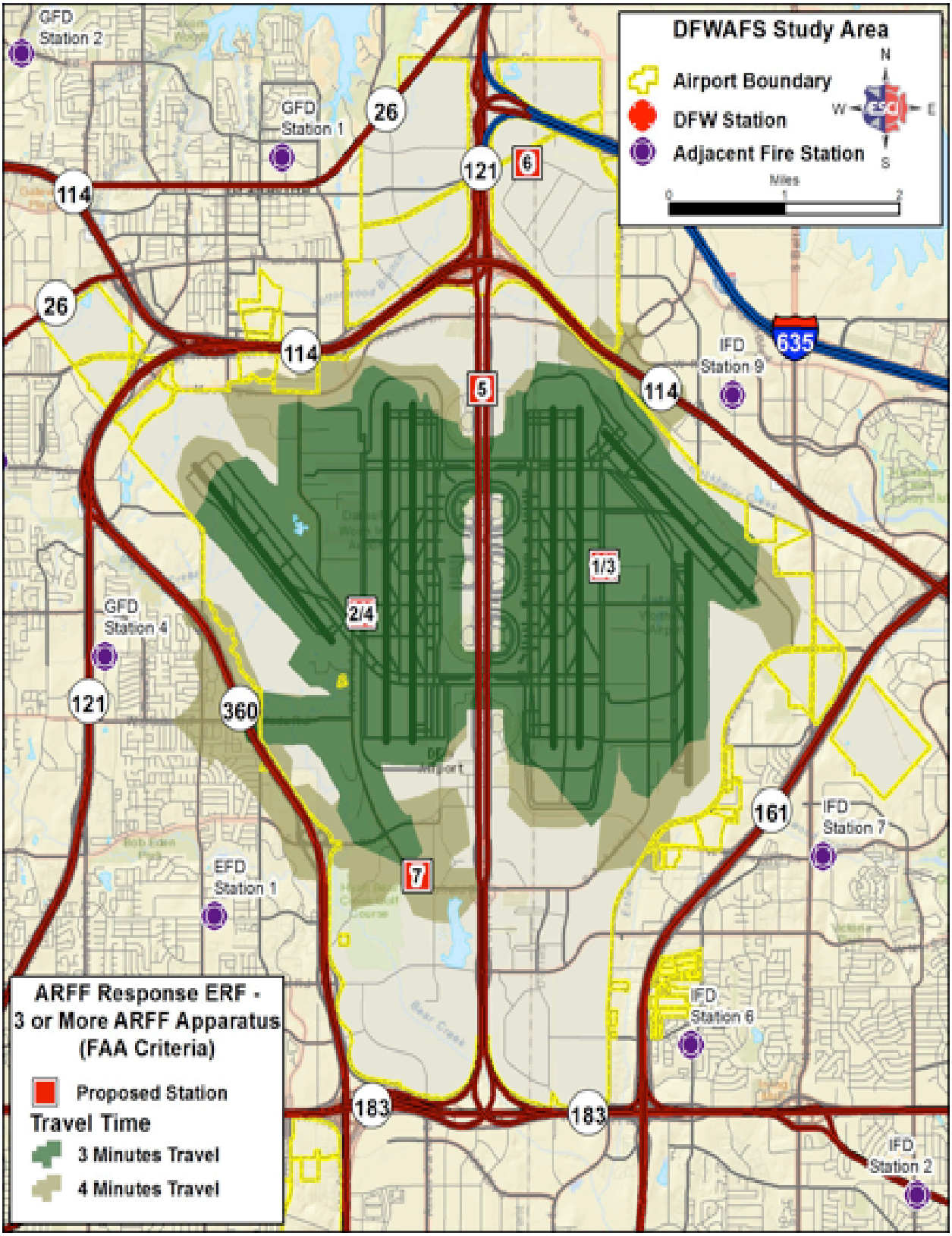


Figure 111: DFW Future ARFF Station FAA Response



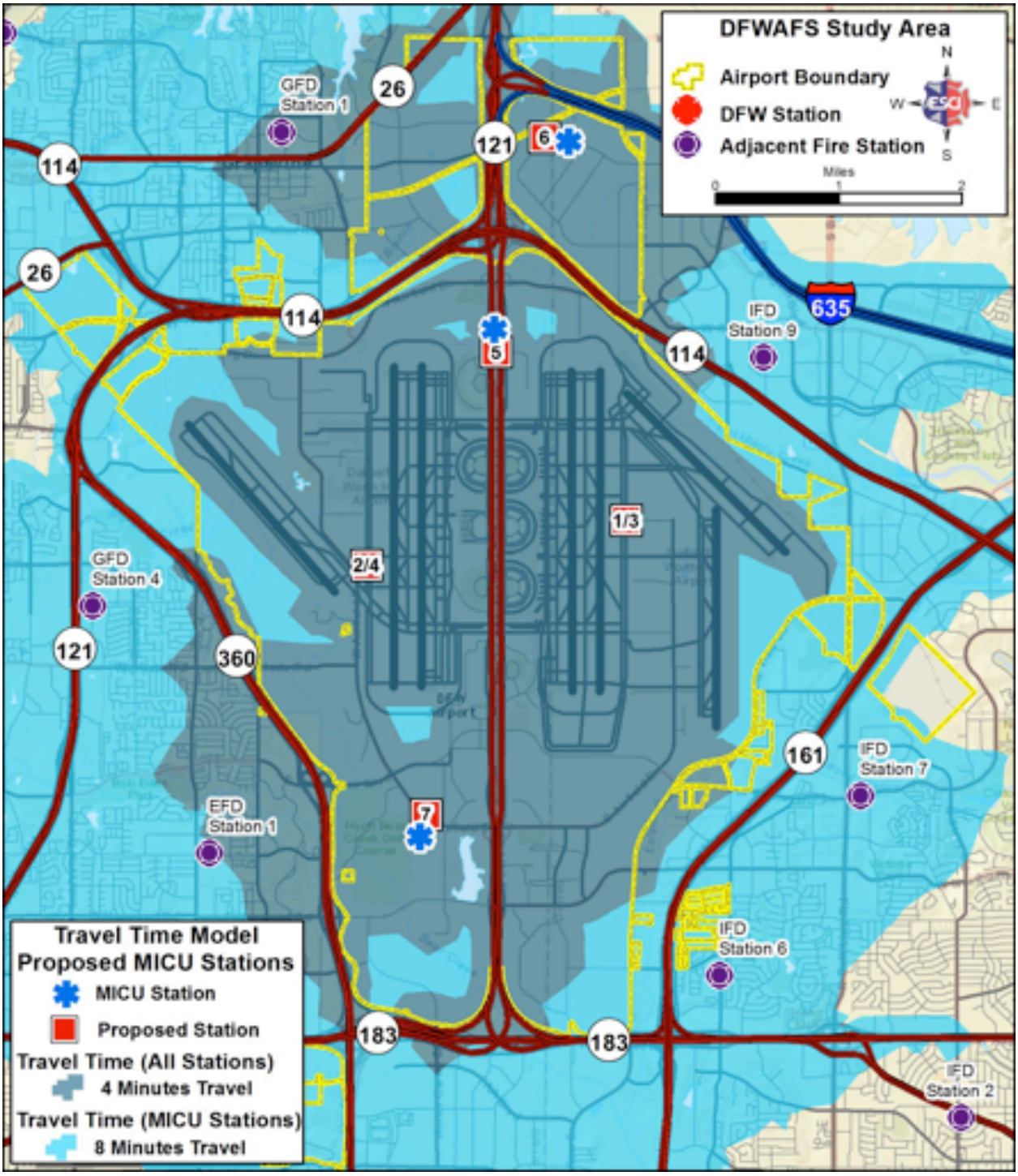
Recommendation 7: Relocate Ambulances to Station 6, New Station 5, and the New Station 7 (Southern Station) to Enhance Coverage and Reduce Response Times.

ESCI has conducted extensive analysis of station, fire, ARFF, and EMS coverage. It is noted that three staffed ambulances are currently located at stations 5 and 6 for access to the terminal. Based on the proposed terminal expansion, significant commercial and warehouse development, and recommended enhance automatic aid with surrounding jurisdictions, ESCI recommends ambulances be permanently located at Station 6, relocate north Station 5, and a new southern station (Station 7). This configuration will allow for reduced response times to all airport emergencies and will optimize geographic coverage for the entire DFWAFS service area.

ESCI does not believe current the unit hour utilization and service demand justify a fourth advanced life support transport ambulance within the proposed/recommended service delivery options. This proposed configuration will enhance ambulance response times to the entire DFW service area. In addition, this deployment model will provide added value as a cross trained dual role response unit as part of an effective response force (ERF) for non-medical incidents. Lastly, this deployment scheme will enhance the inherent value of the DFWAFS ambulance transportation system to surrounding jurisdictions such as Irvine, Coppell, and Grapevine and contribute to enhance fire and EMS automatic aid capabilities and resources available for the DFW service area.

The following figure demonstrates an increase EMS MICU ambulance coverage for the DFW Airport service area and automatic aid service areas by locating one 24/7 MICU ambulance in stations 5, 6, and 7.

Figure 112: DFW Future MICU Ambulance Stations



Recommendation 8: Place a First Responder Advanced Life Support (FRALS) Engine Company in Service at Stations 6 and 7.

Stations 6 and 5 are the most northern and southern fire stations for DFWAFS. The primary response district for these stations consists of structural and medical responses for commercial warehouse and roadway emergencies. They also are located to best provide automatic and mutual aid to surrounding jurisdictions. ESCI has noted that some jurisdictions are reluctant to utilize DFWAFS units as part of automatic aid based on units not having advanced life support capabilities on responding engines.

To enhance automatic aid agreements with Coppell, Grapevine, Euless, and Irving, ESCI recommends these two engine companies function as FRALS units with 24/7 paramedic staffing on the engine company. This service level will enhance medical response capabilities and depth in the non-terminal areas of the airport and the value of these companies to participate in automatic aid with surrounding jurisdictions.

Recommendation 9: CDD to Develop and Administer a Comprehensive Cross Training/Dual Role Integration Training Program for Ambulance and Suppression Personnel. CDD to Focus on Enhanced HazMat and All-Risk Regional and International Training Opportunities.

Since the integration of ambulance services into the DFWAFS there has not been a formal program or process to move the organization to a fully integrated cross trained, dual role department. ESCI recommends that the CDD create and implement a comprehensive integration training program that will allow ambulance personnel to function in suppression roles, and suppression and apparatus personnel to function on ambulances, or as First Responder Advanced Life Support units. To support this training and integration program, ESCI recommends that a minimum of three ambulances be staffed from 0800-1700 hours. During these hours, it is recommended that the “one” ambulance be designated and assigned to CDD training for the purpose or accomplishing established suppression training and education. This unit should be made available for third out ambulance calls. This cross training, dual role program should result in full cross training capabilities between suppression and ambulance transportation units.

Hazardous Materials Response Training

Like EMS training, hazardous materials, or HazMat, responders are required to undergo initial certification training at a level selected by the responding agency. Above the most basic “awareness level,” the necessary training is highly technical and involves advanced curriculum and hands-on skills development. In addition to initial certification training, responders must undergo minimum continuing training. Responders need to prevent skills deterioration as well as stay current on emerging technologies and hazardous materials.

Again, considering the technical resources available to DFWAFS at the training center, expanding HazMat training outreach would be beneficial. ESCI recommends that the agency offer and host advanced levels of hazardous materials response training to expand its outreach to external agencies. DFWAFS would have a significant amount of value and opportunity for efficiency and cost recovery by participating in and hosting training with the NEFDA response cooperative in Tarrant County.

Expansion of Regional, National, and International Outreach

It is recommended that the agency explore the expansion of offerings beyond ARFF training in the future. EMS and HazMat training outreach can be expanded, as discussed, beyond the current offerings which are limited to ARFF training. It is ESCI's opinion that DFWAFS expand training beyond the DFW sphere of influence to include regional, national, and international responders. Additional offerings could include technical rescue, firefighter safety and survival, structural and specialized fire suppression, SARA Title III classes, and a host of other subject areas.

Recommendation 10: Apparatus Replacement Scheduling.

Unfortunately, no piece of mechanical equipment can be expected to last forever. As a vehicle ages, repairs tend to become more frequent, parts are more difficult to obtain, and downtime for repair increases. Given the emergency mission that is so critical to the community, downtime is one of the most frequently identified reasons for apparatus replacement.

Because of the expense of ARFF and structural fire apparatus, most agencies develop replacement plans. DFWAFS has done so via the DFW Capital Replacement Program and had identified projected service lives and replacement criteria as follows:

Structural Fire Apparatus

- Total life cycle – 10 years or 75,000 miles
- Maintenance cost exceed 25% of residual value
- Down time exceeds 600 hours/annually

ARFF Mass Application Vehicle (MAV) Apparatus

- Life cycle – 8 years or 6,000 miles
- Maintenance cost exceed 25% of residual value
- Down time exceeds 500 hours/annually

As stated previously, the above criteria have been developed by DFWAFS staff based on benchmarking studies that the agency completed. Commendably, it is developed not only with consideration to age and mileage, but also accounting for maintenance cost factors and out of service time. The criteria are appropriate for use in replacement planning. However, a schedule of anticipated future replacements is not in place.

To enable such planning, agencies often turn to the accepted practice of using project life cycles for the apparatus that results in an anticipated replacement date for each vehicle. The governing bodies then set aside incremental funds during the life of the vehicle, so cash is available when needed. This decision is influenced by many factors:

- Actual hours of use of any specific piece of equipment can vary significantly in comparison to other similar apparatus, even within the same fire department. Attempts to shuffle like-apparatus among busy and slower fire stations to distribute hours of use more evenly have proven difficult. Frequent changes in apparatus create familiarity and training challenges. In addition, certain response areas may have equipment and tool requirements that are not common to others.
- Actual hours of use, even if evenly distributed, do not necessarily equate to intensity of use. For example, a pumper making mostly emergency medical responses will not age as rapidly as a pumper with a high volume of working fire incidents that require intense use of the pump or hydraulics. However, for every hour you idle an engine it is equivalent to driving 33 to 35 miles of wear and tear. Likewise, road mileage can also be a poor indicator of deterioration and wear.
- Technology, which is increasingly a factor in fire equipment design, becomes outdated even if the apparatus wear is not as significant. In some departments, crews at different fire stations deal with widely different technology on pumpers simply because of the age of the equipment. These differences can be significant, affecting everything from safety and lighting systems to automated digital pump pressure controls and injection foam generation.

National Fire Protection Association (NFPA) 1901: Standard for Automotive Fire Apparatus is a nationally recognized standard for the design, maintenance, and operation of fire suppression apparatus.[14] The issue of replacement cycles for various types of apparatus has been discussed in the committee that develops the standard for many years. In developing its latest edition, the NFPA Fire Department Apparatus Committee called for a life cycle of 15 years for front-line service and 5 years in reserve status for engines, 20 years in front-line service and 5 years in reserve status for ladder trucks.

Does this mean that a fire engine cannot be effective as a front-line pumper beyond 15 years? A visit to many fire departments in the United States might prove otherwise. Small, volunteer fire departments with only a hundred or so calls per year often get up to 25 years from a pumper, though the technology is admittedly not up-to-date. Likewise, busy downtown fire stations in some urban communities move their engines out of front-line status in as little as 8 years. In an airport environment, cycles will differ based on the specialized use that ARFF and structural apparatus experience.

As applied to ARFF apparatus, *National Fire Protection Association (NFPA) 414: Standard for Aircraft Rescue and Firefighting Vehicles* presents design, performance, and acceptance criteria for aircraft rescue and firefighting vehicles intended to carry personnel and equipment to the scene of an aircraft emergency, to rescue occupants, and conduct rescue and firefighting operations.[15]

[14] *NFPA 1901: Standard for Automotive Fire Apparatus*, 2016 edition.
[15] *NFPA 414: Standard for Aircraft Rescue and Fire-Fighting Vehicles,* 2017 edition.

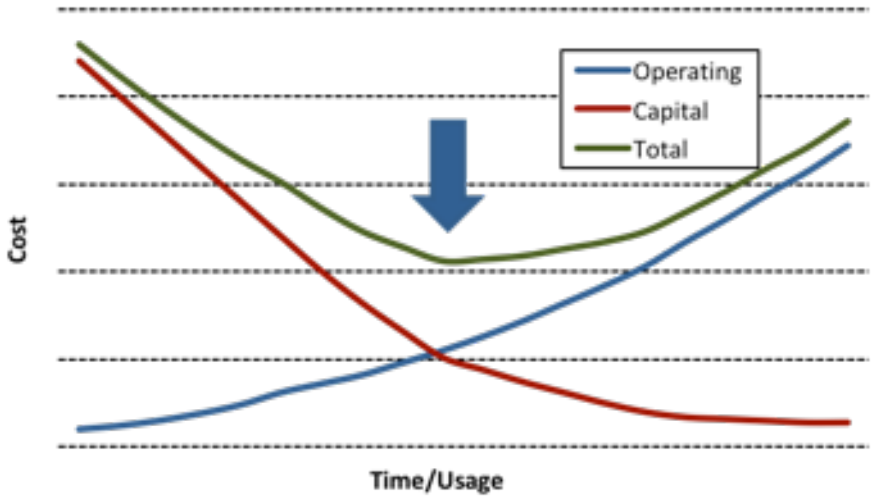
The reality is that it may be best to establish a life cycle for use in the development of replacement funding for various types of apparatus; yet, apply a different method (such as a maintenance and performance review) for determining the replacement date in real life, thereby achieving greater cost efficiency when possible.

In order to accurately provide financial modeling that addresses capital replacement for future regional fire protection models in this report, a standardized capital replacement planning, and funding methodology is referenced. Upon adoption of the referenced model, or another standardized capital replacement program, planning should be based on an annual evaluation system, assigning points relative to observations that are revisited annually as a part of the budget process. The criterions evaluated are:

- Reliability
- Maintenance Cost
- Condition

The conceptual model that has been utilized in this report is based on the *Economic Theory of Vehicle Replacement*. The theory states that, as a vehicle ages, the cost of capital diminishes and its operating cost increases. The combination of these two costs produces a total cost curve. The model suggests the optimal time to replace any piece of apparatus is when the operating cost begins to exceed the capital costs. This optimal time may not be a fixed point, but rather a range of time. The flat spot at the bottom of the total curve in the following figure represents the replacement window.

Figure 113: Economic Theory of Vehicle Replacement



Shortening the replacement cycle to this window allows an apparatus to be replaced at optimal savings to the department. If an agency does not routinely replace equipment in a timely manner, the overall reduction in replacement spending can result in a quick increase of maintenance and repair expenditures. Officials who assume that deferring replacement purchases is a good tactic for balancing the budget need to understand two possible outcomes that may happen because of that decision:

1) Costs are transferred from the capital budget to the operating budget.

2) Such deferral may increase overall fleet costs.

Regardless of its net effect on current apparatus costs, the deferral of replacement purchases unquestionably increases future replacement spending need and may impact operational capabilities and safe and efficient use of the apparatus.

As stated earlier, DFWAFS operates effectively identified replacement criteria for its primary response vehicles. ESCI has used those values, and estimated some that are not defined, to develop a sample replacement schedule for major apparatus, using the following criteria. It is recognized that DFWAFS may elect to use differing values.

Figure 114: Sample Vehicle Life Expectancy and Replacement Cost

Vehicle Type	Life Expectancy	Replacement Cost
ARFF Mass Application Vehicles (MAV)	8	$1,350,000
ARFF Rapid Intervention Vehicles (RIV)	8	$600,000
Custom Pumper (Engine)	10	$550,000
Quint Aerial Apparatus	10	$1,205,000
Platform Aerial Apparatus	10	$1,346,000
MICU Ambulance	10	$270,000

Service lives and replacement costs for ambulances, hazardous materials, and other specialized vehicles were not provided to ESCI, but should also be include in future replacement planning.

The following sample replacement schedule is based on the criteria provide by DFWAFS and the aforementioned vehicle economic replacement theory. This sample vehicle replacement schedule combines all major apparatus, using data from the current condition analysis.

Figure 115: Sample Vehicle Life Replacement and Funding Schedule

Unit	Year	Replacement Cost	Future Replacement Cost w/ inflation	Annual Fund Contributions w/ inflation	Current Cash Requirements	Life Expectancy	Replacement Year
EZ 12 MAV	2015	$1,350,000	$1,915,001	$319,167	$478,750	8	2023
EZ 22 MAV	2015	$1,350,000	$1,915,001	$319,167	$478,750	8	2023
EZ 31 MAV	2013	$1,350,000	$1,704,344	$426,086	$852,172	8	2021
EZ 32 MAV	2013	$1,350,000	$1,704,344	$426,086	$852,172	8	2021
EZ 41 MAV	2013	$1,350,000	$1,704,344	$426,086	$852,172	8	2021
EZ 42 MAV	2013	$1,350,000	$1,704,344	$426,086	$852,172	8	2021
R 4 MAV (Res)	2013	$1,350,000	$1,704,344	$426,086	$852,172	8	2021
R 3 MAV (Res)	2013	$1,350,000	$1,704,344	$426,086	$852,172	8	2021
EZ 19 RIV	2013	$600,000	$956,309	$119,539	$318,770	12	2025
EZ 29 RIV	2013	$600,000	$760,062	$95,008	$253,354	12	2025
Quint 15	2011	$1,205,000	$1,356,238	$339,060	$813,743	10	2021
Quint 25	2009	$1,205,000	$1,278,385	$639,192	$1,022,708	10	2019
Truck 44 Plat.	2011	$1,346,000	$1,514,935	$378,734	$908,961	10	2021
Truck 34	2008	$1,346,000	$1,386,380	$1,386,380	$1,247,742	10	2018
Engine 53	2011	$550,000	$619,030	$154,757	$371,418	10	2021
Engine 63	2010	$550,000	$601,000	$200,333	$420,700	10	2020
Medic 601	2013	$270,000	$322,394	$53,732	$128,958	10	2023
Medic 602	2016	$270,000	$352,289	$39,143	$35,229	10	2026
Medic 603	2010	$270,000	$295,036	$98,345	$206,525	10	2020
Medic 604	2006	$270,000	$270,000	NA	$270,000	10	OVERDUE
Medic 605	2010	$270,000	$362,857	$36,286	$206,525	10	2020
TOTAL/Avg.	**2012**		**$24,130,980**	**$6,735,359**	**$12,275,164**		

Were the above schedule utilized by DFWAFS, and *fully funded,* an amount of $12,275,164 would be currently in reserve and each year $6,735,359 would need to be encumbered for future purchase of replacement vehicles.

The above financial projections include a six percent annual inflation factor. The percentage was used because it was listed in some of the documentation provided by DFWAFS. ESCI recommends that the agency review this inflation cost with apparatus manufacturers, as it is may be higher than necessary. Further, it is recommended that the projected service lives, replacement costs, and replacement years be reviewed closely and modified as necessary.

It is understood that the DFW Capital Improvement Plan drives future apparatus replacement planning. The above schedule is offered as a means by which DFW and the Airport Fire Services may be able to enhance future planning to assure timely replacement and financial stability.

REVENUE & EXPENDITURE FORECAST

ESCI developed a forecast of revenues and expenditures to assess the near term financial trajectory of current operations and test various operational and/or service level adjustments. The following forecasts are based upon historical actual revenues and expenditures and informed assumptions about how those revenues and expenditures will change in the future. The key assumptions used in the forecasts are presented below followed by the forecast results and selected metrics.

Although the DFWAFS actually resides as a component budget department in one fund (102 Fund) for general operating revenue and expense with related expenditures in another for capital expenses and related debt service (the Capital Fund), the forecast looks at the budget components in aggregate to the extent possible so that management can take a more holistic view of the department.

However, it should be remembered that some direct costs associated with the department are still carried in other 102 Fund departments such as work compensation costs, vehicle maintenance and fuel costs, etc. It is also understood that indirect support costs such as procurement, finance and budget, legal, risk, human resources, administration, and some other costs are budgeted elsewhere in the 102 Fund. Many of the assumptions used are common to status quo as well as other forecasts. Where different, the variances will be noted.

Forecast Assumptions

Revenue Assumptions

- Ambulance Billing
  - Ambulance billing revenue has fluctuated considerably between FY 2012 and FY 2017 as projected with no discernable trend, dropping from $991,841 in FY 2012 to a low of $691,037 in FY 2014 before climbing back to just over $1 million by FY 2016.
  - It is anticipated that there will be some growth in EMS call volume as additional terminals are brought on line and passenger volume increases. However, historical increased passenger volume has not directly produced a corresponding increase in payable patient transports.
  - The forecast assumes that ambulance billing revenue will increase at 1 percent annually from the FY 2017 budget amount of $1,056,503.
  - Historical ambulance revenue is reduced annually by the cost of the third-party ambulance billing contract (EMS contractual losses) which varied from a high of $51,343 in FY 2012 to a projected low of $9,400 in FY 2017. The forecast assumes that these recurring expenses (losses or revenue reductions as currently budgeted) will approximate the average loss over the period FY 2012 through FY 2017 of $30,402 rounded to $30,000.

- ARFF Training Center
  - The ARFF Training Center total revenue is comprised of the following programs which will each be forecast separately; FTRC On-Campus Training, FTRC Off-Campus Training, FTRC On-line Module Training, FTRC Interactive Software, and FTRC Miscellaneous revenue.
  - On-campus training is the largest component and driver for the overall increase of FTRC revenue having increased from $152,740 in FY 2012 to $850,000 in FY 2017. This represents an average annual increase of 47.5 percent.
  - While the department has, and continues, to aggressively market all of its products, including the on-campus training program, it is probably not realistic to expect continued annual revenue increases of almost 50 percent. Therefore, the forecast uses a more conservative, yet still fairly robust, average annual increase of 10 percent.
  - Off-campus training, begun in FY 2014, has shown variable results through the expected FY 2017 budget but has averaged $39,804 (rounded to $40,000). The forecast assumes that this product will continue to grow from $40,000 in FY 2018 at an annual rate of 5 percent.
  - The FTRC On-line module training product began in FY 2016 but only produced slightly under $2,000 in revenue. This is projected to increase to $40,900 in FY 2017. The forecast assumes that this product will increase at 5 percent annually from the FY 2017 amount.
  - Similarly, the FTRC Interactive Software product line began in FY 2016 and produced slightly over $2,000 increasing to an estimated $35,000 in FY 2017. The forecast assumes that revenue from this product will also increase at 5 percent annually.
  - Miscellaneous FTRC revenue is forecast to remain at $1,500 per year as seen in FY 2016 and estimated for FY 2017.

Expense Assumptions

- Salaries/Wages
  - No change in staffing levels is contemplated for the status quo scenario and the first forecast assumes that the DFWAFS will continue to experience an annual vacancy factor (not necessarily a valid assumption at the current level of vacancy). A second status quo scenario that assumes full staffing is shown for comparison.
  - All other forecasts start with FY 2017 at full budgeted operational staffing levels (152 FTEs).

- New firefighter paramedic positions are included at an annual salary of $68,835 (Step 4 of 2017 Salary Table) based upon staff provided salary information. New firefighters (not recruits) are included at $58,841 (Step 1 of 2017 Salary Table). First year on-boarding costs (gear, training, etc.) are estimated at $5,000 per FTE (FY 2017).

- Regular salaries and wages rose from $13,494,309 in FY 2012 to $15,368,614 as adopted in FY 2017; an average annual rate of 2.7 percent.

- For purposes of this forecast, it is assumed that the regular salaries and wages line item will increase by 2.7 percent.

- Overtime rose from $954,424 in FY 2012 to a projected $1,441,935 in FY 2017 which represents an average annual increase of 8.8 percent. Although this may be reflective of vacancy rate in budgeted positions among other causal factors, the status quo forecasts assume that overtime will continue to rise at this rate annually.

- Benefits

  - Historical personnel benefits have increased from FY 12/13 to FY 16/17 in a generally linear manner at an average annual rate of 9.7 percent.

  - Benefit rate increase is driven largely by annual increases in employer contribution to the retirement system (including OPEB and employee plan contributions) which rose from $3,085,867 in FY 2012 to $4,214,146 as projected for FY 2017. This represents an average annual increase of 6.7 percent.

  - The forecast assumes that retirement costs will continue to rise at 6.7 percent annually.

  - Social Security and Medicare contributions have historically increased annually at 2.53 percent and 2.56 percent; respectively. The forecast assumes that these increase rates will continue.

  - Other Employee Benefits have historically increased at 2.34 percent annually and the forecast assumes that this rate of increase will continue.

- Operating Expense

  - The United States Department of Labor, Bureau of Labor Statistics reported that the CPI-U (Consumer Price Index for all Urban Consumers) for the Dallas–Fort Worth Metropolitan Statistical Area (MSA) was at 2.7 percent in January of 2017 and had fallen to 2.2 percent by March. Where used, the forecast assumes an inflation rate of 2 percent.

  - While the General Administrative and Other expense category fluctuated from $165,458 in FY 2012 to a high of $233,780 in FY 2016 and is expected to be only $150,241 in FY 2017, it averages $190,955 annually.

- The forecast assumes that this category will be $191,000 in FY 2018 and will increase at the rate of inflation, estimated at 2 percent annually.

- The Other Contract Services line item rose from $260,647 in FY 2012 to a projected $450,242 in FY 2017 representing an average annual increase of 16 percent. The forecast assumes that this line item will increase at 10 percent annually.

- The Facilities Maintenance Contract line item increased from $73,562 in FY 2012 to $220,082 as anticipated in FY 2017; an increase of $146,520 representing an average annual increase is 26.6 percent.

- The forecast assumes with newer facilities on line, this line item will not increase at the high historical rate seen between FY 2012 and FY 2017. Rather, it is assumed that this line item will increase at half the historical rate or 13 percent per year.

- Training center fuel costs rose steadily from $276,422 in FY 2013 to a projected $407,292 in FY 2017; an average annual increase of 13 percent. The forecast assumes this trend will continue.

- The Communications charge from the DFW Department of Public Safety (DPS) 911 Dispatch Center rose from $1,373,234 in FY 2012 to $1,817,375 as anticipated in FY 2017; an average annual increase is 6.7 percent.

- The forecast assumes that the communications charge will increase at the historical rate of 6.7 percent per year.

- The Equipment and Supplies line item has varied annually from a low of $621,129 in FY 2014 to a high of $830,611 in FY 2013 but has averaged $701,046 for the period FY 2012 through FY 2017 as adopted.

- The forecast assumes that the FY 2018 Equipment and Other Supplies line item will be $700,000 and will increase at the assumed 2 percent rate of inflation.

- Capital Expense

  - The status quo forecast assumes no capital facility construction for the forecast period.

  - The status quo forecast also assumes that there will be no expenditures in the Improvements Other Than Buildings category.

  - ARFF vehicle replacement between FY 1999 and FY 2016 has averaged $1.1 million annually while structural apparatus replacement for the same period has averaged $523,000 per year.

- For the purposes of the forecast, it is assumed that the department will fund an ARFF replacement program at an average annual rate of $1.1 million and a structural apparatus replacement program at an average annual rate of $523,000.

- ESCI has typically seen apparatus manufacturers prices increase by 3 percent annually. Therefore, an apparatus inflation factor of 3 percent is modeled in the forecast for apparatus replacement. It assumed that all vehicles will be purchased fully equipped as part of an equipment replacement program.

- Debt Service

  - DFWAFS staff provided an analysis of future debt service for that portion of various bond issue proceeds used for fire department capital projects. The following figure provides a summary of the department-related debt service for the forecast period.

  - Debt service as provided to ESCI begins with two interest payments in FY 2017.

  - As stated, all scenarios utilize the capital replacement amount for FY 16/17 (which may be too low) with an annual rate of increase of 5 percent.

  - Forecast for all scenarios assumes no additional debt service will be added and that the current debt will not be refinanced.

Figure 116: DFWAFS Share of Bond Debt Service FY 2017 Adopted–FY 2023 Forecast

Debt Service	FY 2017 Adopted	FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast
Principal	$0	$117,831	$149,312	$132,222	$140,317	$151,111	$170,899
Interest	$346,416	$414,326	$617,942	$635,696	$629,085	$613,524	$622,069
Total	**$346,416**	**$532,157**	**$767,254**	**$767,918**	**$769,402**	**$764,635**	**$792,968**

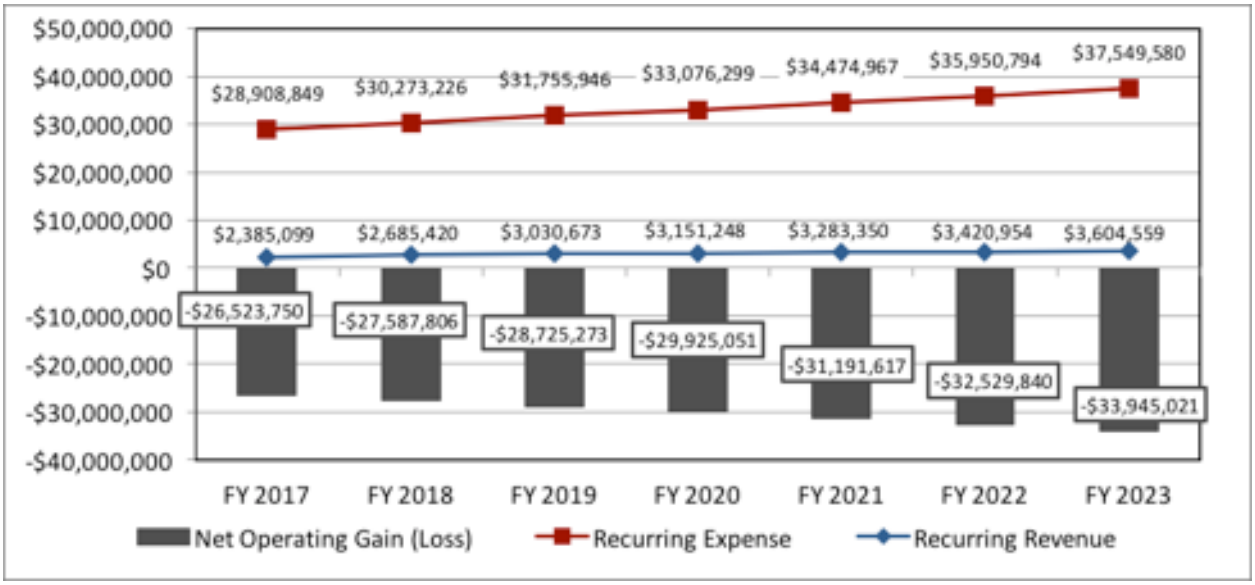
Financial Forecast Results

Scenario 1A—Status Quo

As mentioned above at the beginning of this section, the following status quo scenario is modeled utilizing historical revenue and expenditure trends with conservative estimates of future trajectory.

Utilizing the assumptions presented, recurring fire-specific revenue (including fire-specific debt service funding budgeted elsewhere) as shown in the following figure (in blue) is expected to increase from $2,385,099 in FY 2017 to $3,604,559 as forecast in FY 2023. The average annual growth for the first two years of the forecast averages approximately 12.7 percent as debt service payments increase; however, this levels off to an average annual growth rate of 4.4 percent as forecast from FY 2020 onward.

Figure 117: Scenario 1A Revenue, Expense, and Net Gain (Loss) FY 2017 Adopted–FY 2023 Forecast



Recurring expenditures (including fire-specific debt service expense budgeted elsewhere) as shown in the figure (in red) are expected to increase from $28,908,849 in FY 2017 as adopted to $37,549,580 as forecast in FY 2023. This represents an average annual rate of increase of 4.5 percent for the forecast period. Recurring expense exceeds recurring revenue resulting in an annual operating deficit (gray bars) which is funded from general operating revenue of the 102 Fund. Because recurring expenses are an order of magnitude greater than recurring revenues and are growing at a slightly higher rate, the annual operating deficit continues to grow each year.

The following figures show in tabular format how the various components of the recurring revenue and expenditure budgets increase during the forecast period given the assumptions previously detailed.

Figure 118: Scenario 1A DFWAFS Financial Resources FY 2017 Adopted–FY 2023 Forecast

Financial Resources	FY 2017 Budget	FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast
Emergency Medical Services	$1,056,503	$1,067,069	$1,077,739	$1,088,517	$1,099,402	$1,110,396	$1,121,500
EMS Contractual	-$9,400	$30,000	$30,000	$30,000	$30,000	$30,000	$30,000
ARFF Training Center	$991,580	$1,056,195	$1,155,679	$1,264,813	$1,384,546	$1,515,923	$1,660,091
FTRC On Campus Training	*$850,000*	*$935,000*	*$1,028,500*	*$1,131,350*	*$1,244,485*	*$1,368,933*	*$1,505,826*
FTRC On-line Mod. Training	*$40,900*	*$42,945*	*$45,092*	*$47,347*	*$49,714*	*$52,200*	*$54,810*
FTRC Off Campus Training	*$64,180*	*$40,000*	*$42,000*	*$44,100*	*$46,305*	*$48,620*	*$51,051*
FTRC Interactive Software	*$35,000*	*$36,750*	*$38,588*	*$40,517*	*$42,543*	*$44,670*	*$46,903*
Misc.–ARFF Training Center	*$1,500*	*$1,500*	*$1,500*	*$1,500*	*$1,500*	*$1,500*	*$1,500*
Capital Fund Debt Service[1]	$346,416	$532,157	$767,254	$767,918	$769,402	$764,635	$792,968
Recurring Revenue	$2,385,099	$2,685,420	$3,030,673	$3,151,248	$3,283,350	$3,420,954	$3,604,559
Bond Proceeds/Cap Fund[2]	$0	$1,623,000	$1,671,690	$1,721,841	$1,773,496	$1,826,701	$1,881,502
Non-Recurring Revenue	$0	$1,623,000	$1,671,690	$1,721,841	$1,773,496	$1,826,701	$1,881,502
Financial Resources	**$2,385,099**	**$4,308,420**	**$4,702,363**	**$4,873,089**	**$5,056,846**	**$5,247,655**	**$5,486,061**

[1]Debt service is paid out of a different fund (Capital Fund) but revenue is shown here to offset fire department-related debt service payments.

[2]Capital funding comes out of a different fund (Capital Fund) but is shown here to offset fire department-related capital expenses forecast.

Figure 119: Scenario 1A DFWAFS Expenditures FY 2017 Adopted–FY 2023 Forecast

EXPENSE	FY 2017 Adopted	FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast
Salaries and Wages	$15,368,614	$15,783,566	$16,209,722	$16,647,385	$17,096,864	$17,558,480	$18,032,559
Overtime	$1,441,935	$1,568,825	$1,706,882	$1,857,088	$2,020,511	$2,198,316	$2,391,768
Salaries and Wages Subtotal	$16,810,549	$17,352,392	$17,916,604	$18,504,473	$19,117,376	$19,756,796	$20,424,327
Social Security	$985,340	$1,010,269	$1,035,829	$1,062,036	$1,088,905	$1,116,455	$1,144,701
Medicare	$231,017	$236,931	$242,996	$249,217	$255,597	$262,140	$268,851
Retirement	$4,214,146	$4,496,493	$4,797,759	$5,119,208	$5,462,195	$5,828,162	$6,218,649
Other Employee Benefits	$2,550,954	$2,610,646	$2,671,735	$2,734,254	$2,798,235	$2,863,714	$2,930,725
Benefits Subtotal	$7,981,456	$8,354,340	$8,748,319	$9,164,715	$9,604,933	$10,070,471	$10,562,926
Personal Services - Subtotal	**$24,792,005**	**$25,706,731**	**$26,664,923**	**$27,669,187**	**$28,722,308**	**$29,827,267**	**$30,987,253**
Facility Maint. Contracts	$220,082	$248,693	$281,023	$317,556	$358,838	$405,487	$458,200
Other Contract Services	$450,242	$495,267	$544,793	$599,273	$659,200	$725,120	$797,632
Equip. and Other Supplies	$725,196	$700,000	$714,000	$728,280	$742,846	$757,703	$772,857
Fuels	$407,292	$460,240	$520,071	$587,680	$664,079	$750,409	$847,962
General, Admin. and Other	$150,241	$191,000	$194,820	$198,716	$202,691	$206,745	$210,879
Communications Expense	$1,817,375	$1,939,139	$2,069,061	$2,207,689	$2,355,604	$2,513,429	$2,681,829
Opex - Subtotal	**$3,770,428**	**$4,034,338**	**$4,323,769**	**$4,639,194**	**$4,983,257**	**$5,358,892**	**$5,769,359**
Buildings							
Improv. Other than Bldgs							
Apparatus Replacement	$0	$1,623,000	$1,671,690	$1,721,841	$1,773,496	$1,826,701	$1,881,502
ARFF[1]	*$0*	*$1,100,000*	*$1,133,000*	*$1,166,990*	*$1,202,000*	*$1,238,060*	*$1,275,201*
Structural[1]	*$0*	*$523,000*	*$538,690*	*$554,851*	*$571,496*	*$588,641*	*$606,300*
Capex - Subtotal[2]	**$0**	**$1,623,000**	**$1,671,690**	**$1,721,841**	**$1,773,496**	**$1,826,701**	**$1,881,502**
Principal	$0	$117,831	$149,312	$132,222	$140,317	$151,111	$170,899
Interest	$346,416	$414,326	$617,942	$635,696	$629,085	$613,524	$622,069
Debt Service - Subtotal[3]	**$346,416**	**$532,157**	**$767,254**	**$767,918**	**$769,402**	**$764,635**	**$792,968**
Expense Total	**$28,908,849**	**$31,896,226**	**$33,427,636**	**$34,798,140**	**$36,248,463**	**$37,777,495**	**$39,431,082**

[1]Assumes average annual replacement at fixed rate each year based upon detailed apparatus life, use and replacement schedule.

[2]Fire-specific expenditure is actually budgeted in Capital Fund but shown here for more complete view of DFWAFS costs.

[3]Fire-specific debt service is actually budgeted in Capital Fund but shown here for more complete view of DFWAFS costs.

Figure 120: Scenario 1A DFWAFS Status Quo Forecast Expenses FY 2017 Adopted–FY 2023 Forecast

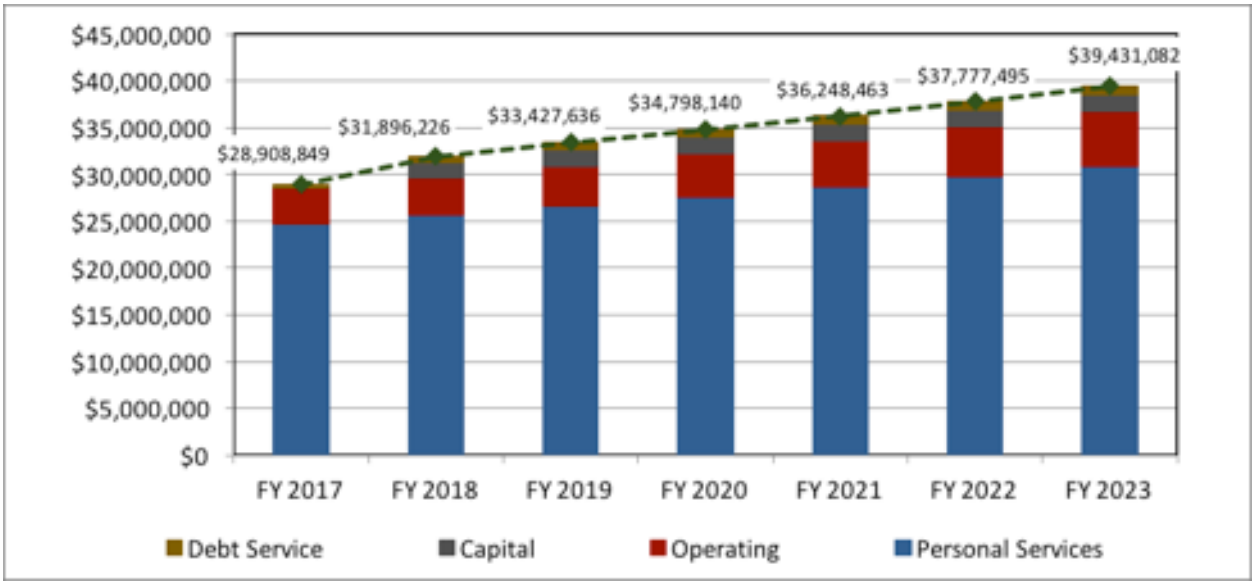


Figure 120 shows the trend of major expenditure budget components for the DFWAFS along with the total expenditures for the forecast period. Personal Services increase from $24,792,005 as adopted in FY 2017 to $30,987,253 as forecast in FY 2023, at an average annual rate of 3.8 percent. Operating expenses increase from $3,770,428 in FY 2012 as adopted to $5,769,359 as forecast in FY 2023, at an average annual rate of 7.4 percent. As discussed previously, it is assumed that capital apparatus replacement in this scenario is placed on a cycle that uniformly distributes replacement of ARFF and structural apparatus such that a set amount (plus an inflation factor) is budgeted for expense each year. Capital replacement costs grow from $1,623,000 in FY 2018 as forecast to $1,881,502 as forecast in FY 2023 at an average annual rate of increase of 3 percent.

Scenario 1B—Status Quo

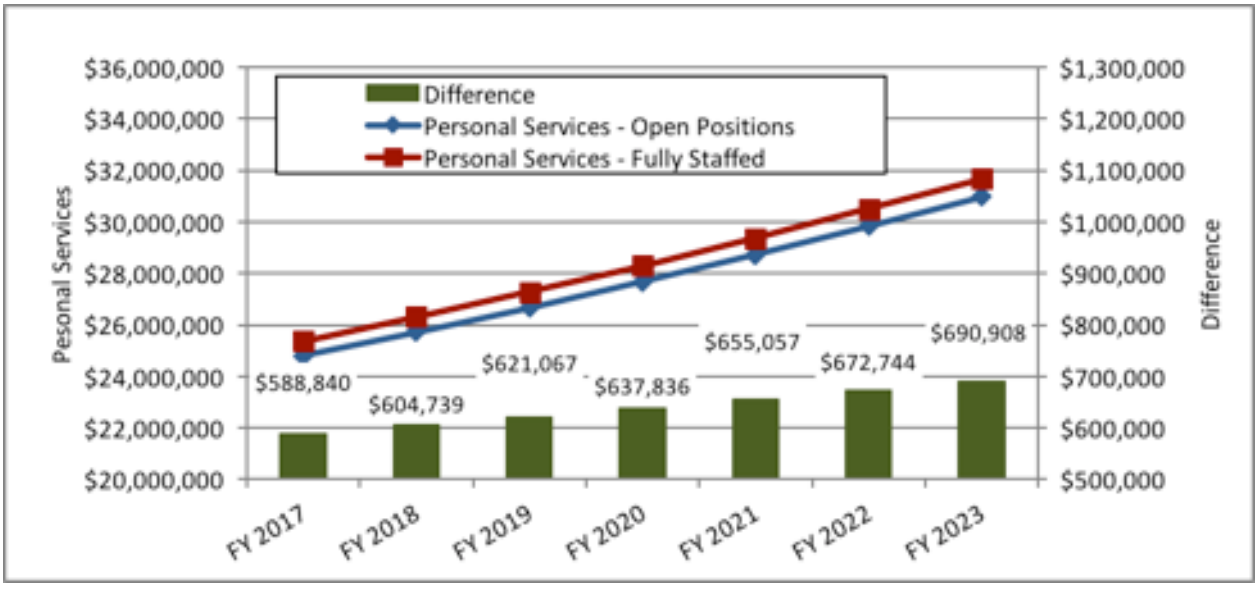
The only difference between Scenario 1B—Status Quo and the previous status quo scenario is that Scenario 1B assumes full operational staffing for FY 2017 (152 FTEs). It is likely that a fully staffed fire department, while not having the appropriate relief factors to significantly reduce overtime from its current level, will see some reduction from its current level of 8.6 percent of total salaries and wages.

Figure 121: Scenario 1B DFWAFS Expenditures FY 2017 Adopted–FY 2023 Forecast

EXPENSE	FY 2017 Adopted	FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast
Salaries and Wages	$15,957,454	$16,388,305	$16,830,789	$17,285,220	$17,751,921	$18,231,223	$18,723,466
Overtime	$1,441,935	$1,568,825	$1,706,882	$1,857,088	$2,020,511	$2,198,316	$2,391,768
Salaries and Wages Subtotal	$17,399,389	$17,957,130	$18,537,671	$19,142,308	$19,772,433	$20,429,540	$21,115,235
Social Security	$985,340	$1,010,269	$1,035,829	$1,062,036	$1,088,905	$1,116,455	$1,144,701
Medicare	$231,017	$236,931	$242,996	$249,217	$255,597	$262,140	$268,851
Retirement	$4,214,146	$4,496,493	$4,797,759	$5,119,208	$5,462,195	$5,828,162	$6,218,649
Other Employee Benefits	$2,550,954	$2,610,646	$2,671,735	$2,734,254	$2,798,235	$2,863,714	$2,930,725
Benefits Subtotal	$7,981,456	$8,354,340	$8,748,319	$9,164,715	$9,604,933	$10,070,471	$10,562,926
Personal Services - Subtotal	**$25,380,845**	**$26,311,470**	**$27,285,990**	**$28,307,023**	**$29,377,365**	**$30,500,011**	**$31,678,160**

The following figure illustrates the impact of full staffing versus the current vacancy rate (approximately 9 positions at the time of the analysis) on the status quo forecast of personal services expenditures. For FY 2017 as adopted, if full staffing were achieved, the budget would increase by almost $600,000. There should be a modest offsetting reduction in the level of overtime, which would have a positive impact on the overall budget. The current minimum staffing level is 130 FTEs and the full budgeted staff count is 152 FTEs. As seen previously, in order to practically eliminate the overtime, the department would need to have 39 positions over minimum staffing needs for a total operational FTE count of 169 (17 of these positions would be new while 22 positions are either currently filled or budgeted but vacant).

Figure 122: Impact of Current Staff Vacancy Rate on FY 2017 Adopted–FY 2023 Forecast



RECOMMENDATION 2—STAFFING ARFF UNITS WITH TWO PERSONNEL

Recommendation 2 (from the previous Recommendations section) adds a second firefighter to each of the eight ARFF units, which adds eight firefighters to the current minimum daily staffing requirement of 40. With three shifts, this equates to an additional 24 firefighter positions needed. Dependent upon whether the department remains on a 52-hour work week or moves to a 56-hour work week this would require the hiring 34 or 31 firefighters; respectively, if the respective relief factors or 1.30 (52-hour schedule) or 1.29 (56-hour schedule) are taken into account. For each schedule, a forecast has been prepared assuming the department completes the implementation of this recommendation over three, five, or seven years.

The forecast assumes that a certified firefighter hired in FY 2017 for work on an ARFF unit enters at the entry level and is paid at the 2017 Step 1 annual rate of $58,841. Benefits are assumed to be 32.1 percent of the total compensation. The following figures show the cumulative forecast cost of adding the necessary firefighters (including those needed for an appropriate relief factor) over the various time frames. The first figure shows costs for adding 34 firefighters working a 52-hour work week schedule while the second figure shows the costs for adding 31 firefighters working on a 56-hour work week schedule. The difference amounts to approximately $380,000 per year in recurring costs by FY 2024. These costs do include a one-time cost for on-boarding (as discussed previously) which is inflated along with total compensation each year commensurate with the year in which the FTEs are added. These on-boarding costs drop off the second year of the employees' tenure with the recurring compensation costs continuing at an inflated rate each subsequent year.

Figure 123: Recommendation 2—Financial Impact for 52-Hour Work Week Schedule
FY 2018–2024 Forecast

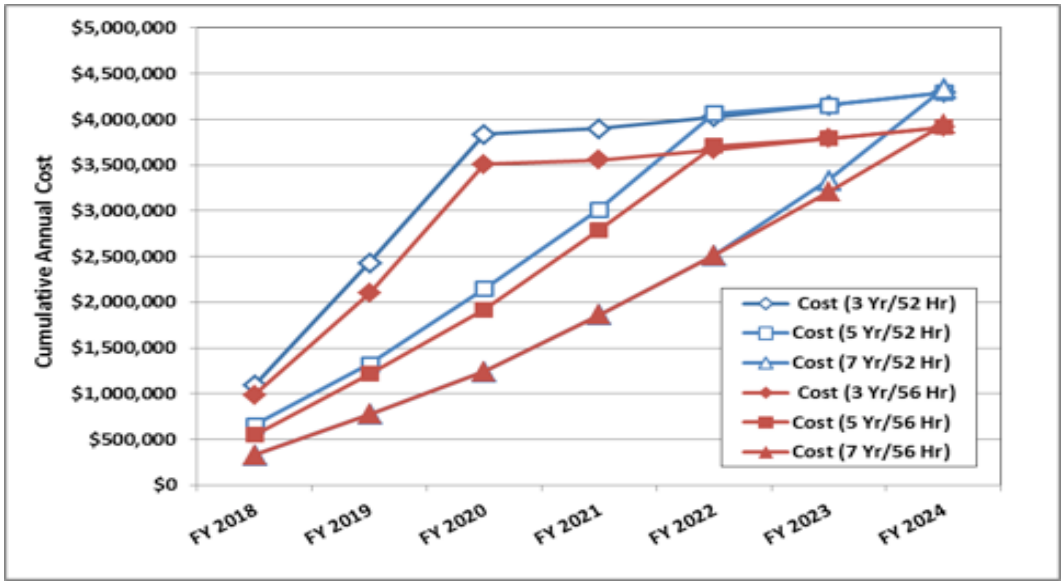
52-Hour Work Week		FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast	FY 2024 Forecast
Three-Year Plan	FTE	10	12	12				
	Cost	$1,093,601	$2,429,475	$3,839,461	$3,897,898	$4,024,710	$4,156,447	$4,292,869
Five-Year Plan	FTE	6	6	7	7	8		
	Cost	$656,161	$1,322,331	$2,147,142	$3,018,631	$4,068,874	$4,156,447	$4,292,869
Seven-Year Plan	FTE	3	4	4	5	5	6	7
	Cost	$328,080	$773,961	$1,242,803	$1,861,366	$2,513,453	$3,334,493	$4,333,073

Figure 124: Recommendation 2—Financial Impact for 56-Hour Work Week Schedule
FY 2018–2024 Forecast

56-Hour Work Week		FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast	FY 2024 Forecast
Three-Year Plan	FTE	9	10	12				
	Cost	$984,241	$2,096,292	$3,506,303	$3,553,966	$3,669,589	$3,789,702	$3,914,086
Five-Year Plan	FTE	5	6	6	7	7		
	Cost	$546,801	$1,214,738	$1,919,731	$2,789,343	$3,708,232	$3,789,702	$3,914,086
Seven-Year Plan	FTE	3	4	4	5	5	5	5
	Cost	$328,080	$773,961	$1,242,803	$1,861,366	$2,513,453	$3,206,614	$3,942,803

The following figure compares the cumulative annual costs (and the one-time on-boarding costs) for the various hiring programs (three, five, and seven years), as well as the two shift schedules. The three hiring programs using a 52-hour work week are shown in blue with the three, five, and seven-year programs shown as diamonds, squares, and triangles; respectively. The three hiring programs using a 56-hour work week are shown in red.

Figure 125: Recommendation 2—Cumulative Annual Forecast Cost of Second ARFF Firefighter Under Differing Timeframes



RECOMMENDATION 3—INCREASE RELIEF FACTOR TO REDUCE OVERTIME

Recommendation 3 involves the addition of the needed FTEs to achieve a 1.30 relief factor. This will reduce excessive overtime expense due to coverage of vacancies below the five percent target. Dependent upon whether the department remains on a 52-hour work week or moves to a 56-hour work week, this would require the hiring of 17 additional firefighters (of the necessary 39 over minimum staffing to eliminate unscheduled overtime to cover leave and vacant positions) or 3 firefighters (of the necessary 35); respectively. For each schedule, a forecast has been prepared assuming the department implements this recommendation over three, five, or seven years.

This recommendation assumes that total compensation remains the same and hourly rates change to reflect the adopted work week schedule. The forecast assumes that a certified firefighter hired in FY 2017 enters at the entry level and is paid at the 2017 Step 1 annual rate of $58,841. Benefits are assumed to be 32.1 percent of the total compensation. The following figures show the cumulative forecast cost of adding the necessary firefighters for a relief factor of 1.30 over the various time frames.

The first figure shows costs for adding 17 firefighters working a 52-hour work week schedule while the second figure shows the costs for adding 3 firefighters working a 56-hour work week schedule. The difference amounts to approximately $1.8 million per year in recurring costs by FY 2024. These costs do include a one-time cost for on-boarding as discussed previously which is inflated along with total compensation each year commensurate with the year in which the FTEs are added. These on-boarding costs drop off the second year of the employees' tenure with the recurring compensation costs continuing at an inflated rate each subsequent year. Since so few firefighters are needed in the 56-hour schedule case, it would make sense to hire all three in the first year.

Figure 126: Recommendation 3—Financial Impact for 52-Hour Work Week Schedule FY 2018–2024 Forecast

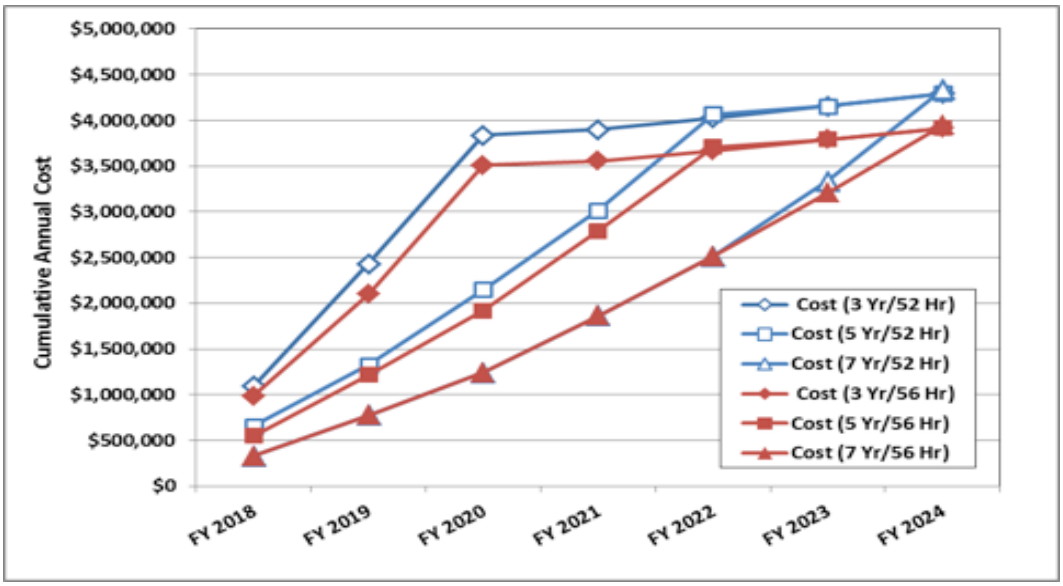
52-Hour Work Week		FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast	FY 2024 Forecast
Three-Year Plan	FTE	3	7	7				
	Cost	$328,080	$1,112,346	$1,925,037	$1,948,949	$2,012,355	$2,078,224	$2,146,434
Five-Year Plan	FTE	4	4	4	4	1		
	Cost	$437,440	$881,554	$1,353,855	$1,855,954	$2,017,876	$2,078,224	$2,146,434
Seven-Year Plan	FTE	2	2	2	2	3	3	3
	Cost	$218,720	$440,777	$676,928	$927,977	$1,318,673	$1,728,371	$2,163,665

Figure 127: Recommendation 3—Financial Impact for 56-Hour Work Week Schedule FY 2018–2024 Forecast

56-Hour Work Week		FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast	FY 2024 Forecast
Three-Year Plan	FTE	1	1	1				
	Cost	$109,360	$220,388	$338,464	$343,932	$355,122	$366,745	$378,783
Five-Year Plan	FTE	1	1	1				
	Cost	$109,360	$220,388	$338,464	$343,932	$355,122	$366,745	$378,783
Seven-Year Plan	FTE	1	1	1				
	Cost	$109,360	$220,388	$338,464	$343,932	$355,122	$366,745	$378,783

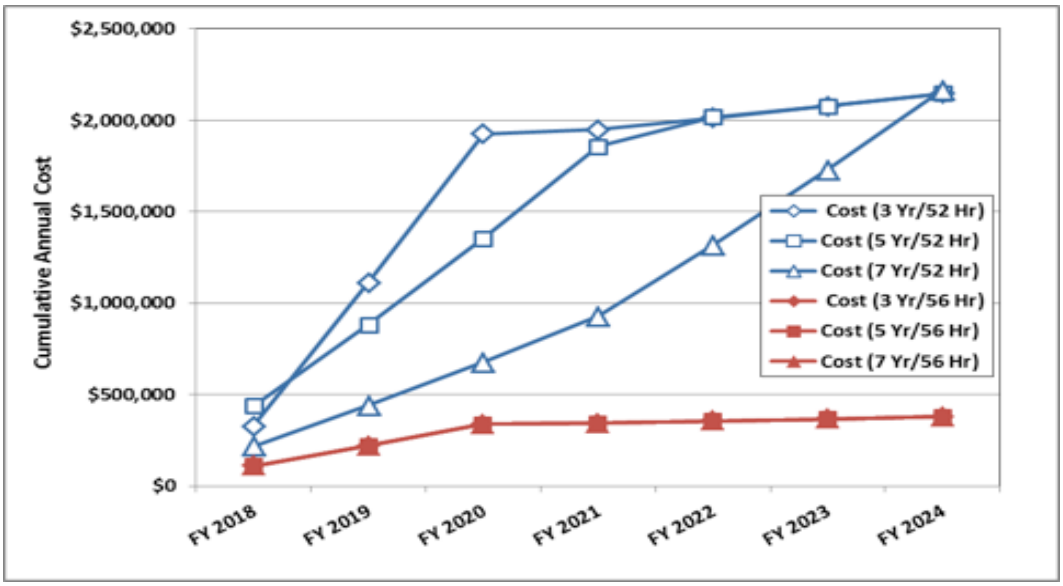
The following figure compares the cumulative annual costs (and the one-time on-boarding costs) for the various hiring programs (three, five, and seven years), as well as the two shift schedules. The three hiring programs using a 52-hour work week are shown in blue with the three, five, and seven-year programs shown as diamonds, squares, and triangles; respectively. The three hiring programs using a 56-hour work week are shown in red.

Figure 128: Recommendation 3—Cumulative Annual Forecast Cost of Second ARFF Firefighter Under Differing Timeframes



As discussed previously, by filling the complete 1.30 relief factor the department would eliminate almost all of the unscheduled overtime costs related to vacancies. Currently, the DFWAFS overtime budget is approximately 8.6 percent of the total salaries and wages budget; projected at $1,441,935 in FY 2017 and forecast at $2,604,244 by FY 2024. By implementing the recommended relief factor, overtime costs should fall well below the five percent target threshold. The new FTEs necessary for relief factor coverage will be partially offset by overtime reductions. ESCI estimates that the recurring cost savings by FY 2024 would be approximately $450,000 when subtracting the recurring cost of the relief employees at $2.15 million from the projected overtime costs of $2.6 million on a 52-hour work week.

Figure 129: Recommendation 3—Cumulative Annual Cost to Increase Relief Factor Under Differing Timeframes



RECOMMENDATION 4—PHASED APPROACH TO IMPROVING SOUTH END SERVICE LEVEL

Recommendation 4 is a three-phase recommendation to improve services to the growing south end of the airport development. Phase I is an automatic aid agreement with the City of Irving Fire Department. Phase II is the staffing of an additional EMS squad. Phase III is the construction of a new fire station in the southern portion of the airport.

Phase I is not anticipated to involve any one-time or recurring costs to the DFWAFS budget. The recommendation is to establish a reciprocal automatic aid agreement with the Irving Fire Department for response as part of a first alarm structural assignment to the Passport Park development area. This response should be structured in a cost neutral manner.

Phase II will add a staffed EMS squad upon occupancy of the Passport Park development. The squad would be staffed by a paramedic/firefighter and an EMT/firefighter on each of three shifts or an addition of six FTEs. With the 1.30 relief factor, the department would need to hire four EMT/firefighters and four paramedic/firefighters. It is assumed that the EMT/firefighter will be an entry level position on the 2017 salary chart (Step 1 Firefighter) at an annual salary of $58,841. It is further assumed that a paramedic/firefighter will start at firefighter Step 4 or $68,835 per year. Benefits are calculated at 32.1 percent of total salary.

The two charts in the following figure show the first-year salary and benefit costs of adding an additional EMS squad. In either the 52-hour work week or the 56-hour work week case, it will take four EMT/firefighters and four paramedic/firefighters with relief factor of 1.30 to fully staff the unit. While the same number of staff is shown in both cases, the cost is higher by approximately eight percent in the 52-hour work week example because the employees work fewer overall hours and there will be additional coverage required to fill the positions year-round. On-boarding costs per employee have not been included here but are estimated at $5,000 per employee in FY 2017 and should be inflated at two percent annually. The total non-recurring on-boarding cost for the eight FTEs, were they to be hired in FY 2018 would be $48,000 ($5,100 x 8 FTEs).

Figure 130: First Year Cost to Staff Additional EMS Squad by Forecast Year
52-Hour versus 56-Hour Schedule

52-Hour Work Week	FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast	FY 2024 Forecast
4-EMT/FF	$450,404	$464,803	$479,747	$495,262	$495,262	$528,113	$545,447
4-PM/FF	$526,904	$543,748	$561,231	$579,382	$598,231	$617,812	$638,090
8-Total FTE	$977,307	$1,008,551	$1,040,978	$1,074,644	$1,093,493	$1,145,925	$1,183,536

56-Hour Work Week	FY 2018 Forecast	FY 2019 Forecast	FY 2020 Forecast	FY 2021 Forecast	FY 2022 Forecast	FY 2023 Forecast	FY 2024 Forecast
4-EMT/FF	$417,040	$430,373	$444,210	$458,576	$473,495	$488,994	$505,043
4-PM/FF	$487,874	$503,471	$519,658	$536,464	$553,917	$572,048	$590,824
8-Total FTE	$904,914	$933,844	$963,869	$995,041	$1,027,413	$1,061,042	$1,095,867

Phase III envisions the construction of a new southern fire station in accordance with DFW fire station and equipment standards. Because it is likely to be a relocation of an existing station and associated apparatus (engine and ambulance) and personnel, it is anticipated that only non-recurring capital funding would be required. The most recent fire station constructed by DFW was Station 6. Total capital costs for this project were $10,249,645. The project took a total of six years from beginning to end with the bulk of the construction occurring over two years (FY 2010–11). It is not unlikely that with inflation, a similar station begun in FY 2018 might be as much as $1.1 million more than Station 6.

RECOMMENDATION 5—ESTABLISH AUTOMATIC AID AGREEMENTS, INCLUDING CAD LINKS, WITH SURROUNDING AGENCIES

Recommendation 5 is that DFWAFS establish automatic aid agreements with the surrounding jurisdictions of Irving, Euless, Coppell, Fort Worth, and Grapevine. These response agreements should be made on a cost neutral basis. However, a further recommendation to significantly cut down response time involves the automatic transfer of calls between jurisdictions which may require software patches to be installed in the event that CAD systems are not the same or if links have not already been established. This can be costly and range as high as $100,000 per CAD link. It may be more beneficial for all agencies to examine common CAD software at some future date.

RECOMMENDATION 6—CONSOLIDATION OF FOUR STATIONS INTO TWO AND RELOCATION OF ANOTHER EXISTING FIRE STATION

Recommendation 6 is that DFWAFS stations 1 and 3, and 2 and 4 be closed and each of the pairs combined into one superstation, respectively. The two superstations would be located on the east and west sides of the airport. Further, ESCI recommends that Station 5 be relocated to the north end of the airport, north of the terminal area. No additional units or personnel would be needed. Rather, existing units and personnel would be relocated. Therefore, the costs involved would be demolition of existing buildings (unless there was an alternative use), and construction of new facilities.

As discussed in Recommendation 4, a new fire station could be expected to cost on the order of $11.5–12 million if bid in FY 2018. It is not known how much a superstation might cost, but it is not unrealistic to expect that it would be at least 50 percent more than a Station 6-style facility, and perhaps even as much as double. Again, unless the existing stations could be re-purposed, there would be demolition costs involved which could be very significant.

RECOMMENDATION 7—RELOCATE THREE EXISTING AMBULANCES TO OTHER STATIONS

Recommendation 7 is that DFWFS relocated three already staffed ambulances to other fire stations where they would be more readily able to improve coverage and enhance response times to EMS incidents. No cost would be involved in relocating these ambulances from their current stations to Station 6, new Station 5 when it is constructed, and new Station 7 once it is built in the southern portion of the airport service area.

RECOMMENDATION 8—ADD FIRST RESPONDER ADVANCED LIFE SUPPORT (FRALS) TO TWO ENGINE COMPANIES

Recommendation 8 is that the BLS engine companies located on the north and south ends of the airport response area be converted to first responder ALS engines. This would require the placement of one paramedic and on each of the two units each shift. As the department adds more staff, it should consider hiring paramedic/firefighters to fill this role.

There would be an initial cost of equipment and supplies for each of the two units and a recurring costs of consumable EMS supplies. Initial costs could be expected to be $75–100,000 with recurring costs of $10–20,000, depending upon call volume. If the department specifically hired paramedic/firefighters for this role rather than reassigning existing staff, there would be a cost differential between the EMT/firefighter originally staffing the unit and the paramedic/firefighter that replaced them. This would not be a major recurring cost.

RECOMMENDATION 9—DEVELOP COMPREHENSIVE IN-SERVICE CROSS-TRAINING PROGRAM

Recommendation 9 is that the department should develop a comprehensive in-service training program to better integrate fire and EMS personnel. While they are cross-certified, they are not necessarily familiar with and capable of performing multiple roles. This program could be put in place using existing staffing and equipment and would incur little cost.

Conclusion

The ESCI project team began collecting information concerning the Dallas–Fort Worth Airport Fire Services in January of 2017. The team members recognize this report contains a large amount of information and ESCI would like to thank DFWAFS staff and many elected officials, and DFW corporate personnel for their tireless efforts in bringing this project to fruition. ESCI would also like to thank the various individuals and external organizations for their input, opinions, and candid conversations throughout this process. It is ESCI's sincere hope the information contained in this report is used to its fullest extent and the emergency services provided to the travelers and customers of the DFW Airport and the surrounding area will be improved by its implementation.

Appendices

APPENDIX A: TABLE OF FIGURES